

APPENDIX F

DATA VALIDATION REPORTS

VALIDATA

Chemical Services, Inc.

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DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: Standard Method 7500 Ra B
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Aqueous
TYPES OF ANALYSES: Alpha Scintillation (Radium-226, Radium-228)
DATA VALIDATION DATE: January 18, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2209244
SAMPLING DATE(S): September 7-13, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226/228</u>	
		<u>Dissolved</u>	<u>Soluble</u>
CR-L-4-WT	2209244-001	X	X
CR-L-8-WT	2209244-002	X	X
CR-L-30-WT	2209244-003	X	X
CR-M-4-WT	2209244-004	X	X
CR-M-8-WT	2209244-005	X	X
CR-M-30-WT	2209244-006	X	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2209244 - Radiochemistry

Alpha Scintillation –Radium-226, Radium-228

SUMMARY

I.) General:

The laboratory has cited analytical SM 7500 Ra B for the Alpha Scintillation analyses.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-228	LCS	4339b	29-7	03-09-2024
	Radium-226	LCS	4966a	29-7	03-09-2024

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the dissolved and suspended fractions of the SDG. The MB for suspended Radium-228 was 0.684 pCi/l which resulted in the following data qualifications:

- The suspended Radium-228 result in sample CR-L-8-WT was qualified as estimated “J” for having a Normalized Absolute Difference (NAD) between 2 and 3.
- The suspended Radium-228 results in samples CR-L-30-WT, CR-M-4-WT, CR-M-8-WT, and CR-M-30-WT were qualified as estimated and undetected “UJ” for having an NAD value of less than 2.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as “UJ”. When between 2 and 3, results are qualified “J”. The Radium-228 and Radium-226 results were demonstrated to be significantly different ($NAD > 3$) and did not require qualification.

VII.) Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS):

An LCS/LCSD was analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on the LCS/LCSD.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was performed on a sample that was not associated with this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Alpha Scintillation analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results.

The laboratory identified the following sample results as tentatively identified at concentrations between the sample MDC and the required MDC. Consequently, the following result was qualified as estimated (J):

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample MDC</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
CR-L-8-WT	Radium-228 (Dissolved)	1.1	2.1	1.0

The laboratory MDCs were higher than the indicated MDCs in Table A.11 of the Project Work Plan. No action was taken.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were reported for the following:

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample Uncertainty</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
CR-L-4-WT	Radium-228 (Dissolved)	-0.2	1.6	1.0
	Radium-228 (Suspended)	-0.2	2.2	1.0
CR-L-30-WT	Radium-228 (Dissolved)	-1.9	1.5	1.0
CR-M-4-WT	Radium-228 (Dissolved)	-2.0	1.8	3.0

None of the results have an absolute value greater than the 2σ TPU. No action was needed.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
CR-L-8-WT (Suspended)	2209244-002	Alpha Scint	Radium-228	J	Method Blank
CR-L-30-WT (Suspended)	2209244-003		Radium-228	UJ	Method Blank
CR-M-4-WT (Suspended)	2209244-004		Radium-228	UJ	Method Blank
CR-M-8-WT (Suspended)	2209244-005		Radium-228	UJ	Method Blank
CR-M-30-WT (Suspended)	2209244-006		Radium-228	UJ	Method Blank
CR-L-8-WT (Dissolved)	2209244-002		Radium-226	J	Result tentatively quantitated



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-001
ClientSample ID: CR-L-4-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/7/2022 10:00:00 AM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc

Radionuclides - Dissolved

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Radium 226, Radium 226 Precision (±), Radium 226 MDC, Radium 228, Radium 228 Precision (±), Radium 228 MDC, Radium 228 MDC



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-001
ClientSample ID: CR-L-4-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/7/2022 10:00:00 AM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Radionuclides - Suspended							
Radium 226	27.3	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1103	WN
Radium 226 (Suspended) Precision (±)	0.6	pCi/L			SM 7500 Ra-B	11/07/2022 1103	WN
Radium 228	-0.2	pCi/L	U	1	Ga-Tech	11/04/2022 217	WN
Radium 228 Precision (±)	2.2	pCi/L	U		Ga-Tech	11/04/2022 217	WN
Radionuclides - Total							
Total Radium 226	29.6	pCi/L		0.2	Calculation	11/14/2022 1133	WN
Total Radium 226 Precision (±)	0.8	pCi/L			Calculation	11/14/2022 1133	WN
Radium 228	-0.4	pCi/L	U	1	Ga-Tech	11/04/2022 217	WN
Radium 228 Precision (±)	2.2	pCi/L	U		Ga-Tech	11/04/2022 217	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-002
ClientSample ID: CR-L-8-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/7/2022 4:00:00 PM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc

Radionuclides - Dissolved

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Radium 226, Radium 226 Precision (±), Radium 226 MDC, Radium 228, Radium 228 Precision (±), Radium 228 MDC, Radium 228 MDC



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-002
ClientSample ID: CR-L-8-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/7/2022 4:00:00 PM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Suspended

Radium 226	175	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1103 WN
Radium 226 (Suspended) Precision (±)	1.4	pCi/L			SM 7500 Ra-B	11/07/2022 1103 WN
Radium 228	9.3	pCi/L	J	1	Ga-Tech	11/04/2022 521 WN
Radium 228 Precision (±)	3.2	pCi/L			Ga-Tech	11/04/2022 521 WN

Radionuclides - Total

Total Radium 226	177.8	pCi/L		0.2	Calculation	11/14/2022 1133 WN
Total Radium 226 Precision (±)	1.6	pCi/L			Calculation	11/14/2022 1133 WN
Radium 228	10.4	pCi/L		1	Ga-Tech	11/04/2022 521 WN
Radium 228 Precision (±)	3.2	pCi/L			Ga-Tech	11/04/2022 521 WN



Sample Analysis Report

Company: Tetra Tech
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Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-003
ClientSample ID: CR-L-30-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/8/2022 8:00:00 AM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Dissolved

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-003
ClientSample ID: CR-L-30-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/8/2022 8:00:00 AM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Metals - Total

Table listing various metals (Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc) with their respective results, units, and quality indicators.

Radionuclides - Dissolved

Table listing dissolved radionuclides (Radium 226, Radium 228) with their results, units, and quality indicators.

Radionuclides - Suspended

Table listing suspended radionuclides (Radium 226, Radium 228) with their results, units, and quality indicators.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-003
ClientSample ID: CR-L-30-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/8/2022 8:00:00 AM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Total Radium 226	193.6	pCi/L		0.2	Calculation	11/14/2022 1133 WN
Total Radium 226 Precision (±)	1.7	pCi/L			Calculation	11/14/2022 1133 WN
Radium 228	7.8	pCi/L		1	Ga-Tech	11/04/2022 824 WN
Radium 228 Precision (±)	4.0	pCi/L			Ga-Tech	11/04/2022 824 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-004
ClientSample ID: CR-M-4-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/9/2022 9:00:00 AM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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General Parameters

Total Dissolved Solids (180)	1080	mg/L		10	SM 2540	09/16/2022 1607	JMS
Total Suspended Solids	422	mg/L		5	SM 2540	09/16/2022 1526	AB

Metals - Dissolved

Aluminum	0.0951	mg/L	J	0.1	6010C	09/28/2022 1241	DG
Antimony	0.00132	mg/L	J	0.005	6020A	09/30/2022 1513	MS
Arsenic	0.005	mg/L		0.005	6020A	09/30/2022 1513	MS
Barium	0.0697	mg/L	J	0.1	6020A	09/30/2022 1513	MS
Beryllium	ND	mg/L	U	0.001	6010C	09/28/2022 1241	DG
Cadmium	ND	mg/L	U	0.002	6020A	09/30/2022 1513	MS
Calcium	15.6	mg/L		0.5	6010C	09/28/2022 1241	DG
Chromium	0.00464	mg/L	J	0.01	6010C	09/28/2022 1241	DG
Cobalt	ND	mg/L	U	0.01	6010C	09/28/2022 1241	DG
Copper	0.02	mg/L		0.01	6020A	09/30/2022 1513	MS
Iron	0.20	mg/L		0.05	6010C	09/28/2022 1241	DG
Lead	0.002	mg/L		0.001	6020A	09/30/2022 1513	MS
Magnesium	2.2	mg/L		0.5	6010C	09/28/2022 1241	DG
Manganese	0.00301	mg/L	J	0.01	6010C	09/28/2022 1241	DG
Molybdenum	0.00623	mg/L	J	0.02	6020A	09/30/2022 1513	MS
Nickel	0.00131	mg/L	J	0.01	6010C	09/28/2022 1241	DG
Selenium	0.00201	mg/L	J	0.005	6020A	09/30/2022 1513	MS
Silver	ND	mg/L	U	0.003	6020A	09/30/2022 1513	MS
Sodium	305	mg/L		1	6010C	09/28/2022 1241	DG
Thallium	ND	mg/L	U	0.001	6020A	09/30/2022 1513	MS
Thorium	ND	mg/L	U	0.1	6010C	09/28/2022 1241	DG
Uranium	1.04	mg/L		0.001	6020A	09/30/2022 1513	MS
Vanadium	0.09	mg/L		0.02	6020A	09/30/2022 1513	MS
Zinc	ND	mg/L	U	0.05	6010C	09/28/2022 1241	DG



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-004
ClientSample ID: CR-M-4-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/9/2022 9:00:00 AM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Metals - Total

Aluminum	37.6	mg/L		0.1	6010C	09/28/2022 1321	DG
Antimony	0.000624	mg/L	J	0.005	6020A	09/30/2022 1718	MS
Arsenic	0.014	mg/L		0.005	6020A	09/30/2022 1718	MS
Barium	0.5	mg/L		0.1	6020A	09/30/2022 1718	MS
Beryllium	0.003	mg/L		0.001	6010C	09/28/2022 1321	DG
Cadmium	0.000607	mg/L	J	0.002	6020A	09/30/2022 1718	MS
Calcium	27.9	mg/L		0.5	6010C	09/28/2022 1321	DG
Chromium	0.08	mg/L		0.01	6010C	09/28/2022 1321	DG
Cobalt	0.01	mg/L		0.01	6010C	09/28/2022 1321	DG
Copper	0.08	mg/L		0.01	6020A	09/30/2022 1718	MS
Iron	42.0	mg/L		0.05	6010C	09/28/2022 1321	DG
Lead	0.041	mg/L		0.001	6020A	09/30/2022 1718	MS
Magnesium	9.7	mg/L		0.5	6010C	09/28/2022 1321	DG
Manganese	0.64	mg/L		0.01	6010C	09/28/2022 1321	DG
Molybdenum	0.00631	mg/L	J	0.02	6020A	09/30/2022 1718	MS
Nickel	0.03	mg/L		0.01	6010C	09/28/2022 1321	DG
Selenium	0.013	mg/L		0.005	6020A	09/30/2022 1718	MS
Silver	ND	mg/L	U	0.003	6020A	09/30/2022 1718	MS
Sodium	312	mg/L		2	6010C	09/28/2022 1321	DG
Thallium	0.000373	mg/L	J	0.001	6020A	09/30/2022 1718	MS
Thorium	0.1	mg/L		0.1	6010C	09/28/2022 1321	DG
Uranium	1.94	mg/L		0.001	6020A	09/30/2022 1718	MS
Vanadium	0.50	mg/L		0.02	6020A	09/30/2022 1718	MS
Zinc	0.13	mg/L		0.05	6010C	09/28/2022 1321	DG

Radionuclides - Dissolved

Radium 226	36.8	pCi/L		1	SM 7500 Ra-B	10/24/2022 1113	WN
Radium 226 Precision (±)	0.9	pCi/L			SM 7500 Ra-B	10/24/2022 1113	WN
Radium 226 MDC	0.94	pCi/L			SM 7500 Ra-B	10/24/2022 1113	WN
Radium 228	-2.0	pCi/L	U	1	Ga-Tech	11/03/2022 1707	WN
Radium 228 Precision (±)	1.8	pCi/L	U		Ga-Tech	11/03/2022 1707	WN
Radium 228 MDC	2.20	pCi/L			Ga-Tech	11/03/2022 1707	WN
Radium 228 MDC	3.90	pCi/L			Ga-Tech	11/04/2022 1128	WN

Radionuclides - Suspended

Radium 226	376	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1103	WN
Radium 226 (Suspended) Precision (±)	2.1	pCi/L			SM 7500 Ra-B	11/07/2022 1103	WN
Radium 228	4.3	pCi/L	UJ	1	Ga-Tech	11/04/2022 1128	WN
Radium 228 Precision (±)	4.0	pCi/L			Ga-Tech	11/04/2022 1128	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-004
ClientSample ID: CR-M-4-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/9/2022 9:00:00 AM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Total Radium 226	412.8	pCi/L		0.2	Calculation	11/14/2022 1133 WN
Total Radium 226 Precision (±)	3.0	pCi/L			Calculation	11/14/2022 1133 WN
Radium 228	4.3	pCi/L		1	Ga-Tech	11/04/2022 1128 WN
Radium 228 Precision (±)	4.0	pCi/L			Ga-Tech	11/04/2022 1128 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-005
ClientSample ID: CR-M-8-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/12/2022 2:00:00 PM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Dissolved

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-005
ClientSample ID: CR-M-8-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/12/2022 2:00:00 PM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Metals - Total

Aluminum	50.0	mg/L		0.1	6010C	09/28/2022 1327	DG
Antimony	0.000569	mg/L	J	0.005	6020A	09/30/2022 1724	MS
Arsenic	0.019	mg/L		0.005	6020A	09/30/2022 1724	MS
Barium	0.8	mg/L		0.1	6020A	09/30/2022 1724	MS
Beryllium	0.004	mg/L		0.001	6010C	09/28/2022 1327	DG
Cadmium	0.00103	mg/L	J	0.002	6020A	09/30/2022 1724	MS
Calcium	35.3	mg/L		0.5	6010C	09/28/2022 1327	DG
Chromium	0.16	mg/L		0.01	6010C	09/28/2022 1327	DG
Cobalt	0.02	mg/L		0.01	6010C	09/28/2022 1327	DG
Copper	0.11	mg/L		0.01	6020A	09/30/2022 1724	MS
Iron	66.8	mg/L		0.05	6010C	09/29/2022 1151	DG
Lead	0.058	mg/L		0.001	6020A	09/30/2022 1724	MS
Magnesium	12.4	mg/L		0.5	6010C	09/28/2022 1327	DG
Manganese	0.91	mg/L		0.01	6010C	09/28/2022 1327	DG
Molybdenum	0.00802	mg/L	J	0.02	6020A	09/30/2022 1724	MS
Nickel	0.04	mg/L		0.01	6010C	09/28/2022 1327	DG
Selenium	0.018	mg/L		0.005	6020A	09/30/2022 1724	MS
Silver	0.000241	mg/L	J	0.003	6020A	09/30/2022 1724	MS
Sodium	312	mg/L		2	6010C	09/28/2022 1327	DG
Thallium	0.000479	mg/L	J	0.001	6020A	09/30/2022 1724	MS
Thorium	0.1	mg/L		0.1	6010C	09/28/2022 1327	DG
Uranium	2.22	mg/L		0.001	6020A	09/30/2022 1724	MS
Vanadium	0.64	mg/L		0.02	6020A	09/30/2022 1724	MS
Zinc	0.18	mg/L		0.05	6010C	09/28/2022 1327	DG

Radionuclides - Dissolved

Radium 226	37.3	pCi/L		0.3	SM 7500 Ra-B	10/24/2022 1113	WN
Radium 226 Precision (±)	0.7	pCi/L			SM 7500 Ra-B	10/24/2022 1113	WN
Radium 226 MDC	0.23	pCi/L			SM 7500 Ra-B	10/24/2022 1113	WN
Radium 228	0.3	pCi/L	U	1	Ga-Tech	11/03/2022 2010	WN
Radium 228 Precision (±)	2.0	pCi/L	U		Ga-Tech	11/03/2022 2010	WN
Radium 228 MDC	2.40	pCi/L			Ga-Tech	11/03/2022 2010	WN
Radium 228 MDC	3.20	pCi/L			Ga-Tech	11/04/2022 1431	WN

Radionuclides - Suspended

Radium 226	365	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1103	WN
Radium 226 (Suspended) Precision (±)	2.1	pCi/L			SM 7500 Ra-B	11/07/2022 1103	WN
Radium 228	3.3 UJ	pCi/L		1	Ga-Tech	11/04/2022 1431	WN
Radium 228 Precision (±)	3.2	pCi/L			Ga-Tech	11/04/2022 1431	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-005
ClientSample ID: CR-M-8-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/12/2022 2:00:00 PM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Total Radium 226	402.3	pCi/L		0.2	Calculation	11/14/2022 1133 WN
Total Radium 226 Precision (±)	2.8	pCi/L			Calculation	11/14/2022 1133 WN
Radium 228	3.3	pCi/L		1	Ga-Tech	11/04/2022 1431 WN
Radium 228 Precision (±)	3.2	pCi/L			Ga-Tech	11/04/2022 1431 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-006
ClientSample ID: CR-M-30-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/13/2022 2:30:00 PM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Dissolved

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-006
ClientSample ID: CR-M-30-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/13/2022 2:30:00 PM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Metals - Total

Table listing various metals (Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc) with their respective results, units, and analysis dates.

Radionuclides - Dissolved

Table listing dissolved radionuclides (Radium 226, Radium 228) with their results, units, and analysis dates.

Radionuclides - Suspended

Table listing suspended radionuclides (Radium 226, Radium 228) with their results, units, and analysis dates.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/16/2022
Report ID: S2209244001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209244-006
ClientSample ID: CR-M-30-WT
COC: 196831
PWS ID:

WorkOrder: S2209244
CollectionDate: 9/13/2022 2:30:00 PM
DateReceived: 9/16/2022 1:00:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Total Radium 226	135.7	pCi/L		0.2	Calculation	11/14/2022 1133 WN
Total Radium 226 Precision (±)	1.8	pCi/L			Calculation	11/14/2022 1133 WN
Radium 228	4.3	pCi/L		1	Ga-Tech	11/04/2022 1735 WN
Radium 228 Precision (±)	2.9	pCi/L			Ga-Tech	11/04/2022 1735 WN

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: Standard Method 7500 Ra B
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Aqueous
TYPES OF ANALYSES: Alpha Scintillation (Radium-226, Radium-228)
DATA VALIDATION DATE: January 20, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2209316
SAMPLING DATE(S): September 15-21, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226/228</u>	
		<u>Dissolved</u>	<u>Soluble</u>
CR-H-4-WT	2209316-001	X	X
CR-H-8-WT	2209316-002	X	X
CR-M-30-WT	2209316-005	X	X
QV-L-4-WT	2209316-006	X	X
QV-L-8-WT	2209316-007	X	X
QV-L-30-WT	2209316-008	X	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2209316 - Radiochemistry

Alpha Scintillation –Radium-226, Radium-228

SUMMARY

I.) General:

The laboratory has cited analytical SM 7500 Ra B for the Alpha Scintillation analyses.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-228	LCS	4339b	29-7	03-09-2024
	Radium-226	LCS	4966a	29-7	03-09-2024

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the dissolved and suspended fractions of the SDG. The MB for suspended and dissolved Radium-228 was 0.684 pCi/l which resulted in the following data qualifications:

- The dissolved Radium-228 results in samples CR-H-8-WT, CR-M-30-WT, QV-L-4-WT, QV-L-8-WT and QV-L-30-WT were qualified as estimated and undetected “UJ” for having Normalized Absolute Difference (NAD) values of less than 2.
- The suspended Radium-228 result in sample CR-H-4-WT was qualified as estimated and undetected “UJ” for having an NAD value of less than 2.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as “UJ”. When between 2 and 3, results are qualified “J”. The Radium-228 and Radium-226 results were demonstrated to be significantly different (NAD > 3) and did not require qualification.

VII.) Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS):

An LCS/LCSD was analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on the LCS/LCSD.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was performed on a sample that was not associated with this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Alpha Scintillation analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results.

The laboratory identified several Radium-228 sample results as tentatively identified at concentrations between the sample MDC and the required MDC. However, all these results were qualified as estimated and undetected “UJ” due to elevated method blank levels. Consequently, no qualification was made based on detection limits.

The laboratory MDCs were higher than the indicated MDCs in Table A.11 of the Project Work Plan. No action was taken.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were reported for the following:

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample Uncertainty</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
CR-H-4-WT	Radium-228 (Dissolved)	-4.3	2.4	1.0
QV-L-30-WT	Radium-228 (Suspended)	-0.1	2.6	1.0

None of the results have an absolute value greater than the 2 σ TPU. No action was needed.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
CR-H-4-WT (Suspended)	2209316-002	Alpha Scint	Radium-228	UJ	Method Blank
CR-H-8-WT (Dissolved)	2209316-003		Radium-228	UJ	Method Blank
CR-M-30-WT (Dissolved)	2209316-004		Radium-228	UJ	Method Blank
QV-L-4-WT (Dissolved)	2209316-005		Radium-228	UJ	Method Blank
QV-L-8-WT (Dissolved)	2209316-006		Radium-228	UJ	Method Blank
QV-L-30-WT (Dissolved)	2209316-002		Radium-228	UJ	Method Blank



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-001
ClientSample ID: CR-H-4-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/15/2022 10:30:00 AM
DateReceived: 9/21/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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General Parameters

Total Dissolved Solids (180)	950	mg/L		10	SM 2540	09/22/2022 1027	JMS
Total Suspended Solids	40	mg/L		5	SM 2540	09/22/2022 1209	KAT

Metals - Total

Aluminum	2.4	mg/L		0.1	6010C	09/28/2022 1332	DG
Antimony	0.00126	mg/L	J	0.005	6020A	09/30/2022 1736	MS
Arsenic	0.013	mg/L		0.005	6020A	09/30/2022 1736	MS
Barium	0.137	mg/L		0.005	6020A	09/30/2022 1736	MS
Beryllium	ND	mg/L	U	0.001	6010C	09/28/2022 1332	DG
Cadmium	0.0000651	mg/L	J	0.002	6020A	09/30/2022 1736	MS
Calcium	13.6	mg/L		0.2	6010C	09/28/2022 1332	DG
Chromium	0.016	mg/L		0.005	6010C	09/28/2022 1332	DG
Cobalt	ND	mg/L	U	0.01	6010C	09/28/2022 1332	DG
Copper	0.03	mg/L		0.01	6020A	09/30/2022 1736	MS
Iron	2.23	mg/L		0.05	6010C	09/28/2022 1332	DG
Lead	0.007	mg/L		0.001	6020A	09/30/2022 1736	MS
Magnesium	3	mg/L		2	6010C	09/28/2022 1332	DG
Manganese	0.026	mg/L		0.005	6010C	09/28/2022 1332	DG
Molybdenum	0.00398	mg/L	J	0.02	6020A	09/30/2022 1736	MS
Nickel	0.00439	mg/L	J	0.01	6010C	09/28/2022 1332	DG
Selenium	0.069	mg/L		0.005	6020A	09/30/2022 1736	MS
Silver	ND	mg/L	U	0.003	6020A	09/30/2022 1736	MS
Sodium	300	mg/L		2	6010C	09/28/2022 1332	DG
Thallium	ND	mg/L	U	0.001	6020A	09/30/2022 1736	MS
Thorium	0.1	mg/L		0.1	6010C	09/28/2022 1332	DG
Uranium	4.65	mg/L		0.001	6020A	09/30/2022 1736	MS
Vanadium	0.31	mg/L		0.02	6020A	09/30/2022 1736	MS
Zinc	0.0147	mg/L	J	0.02	6010C	09/28/2022 1332	DG

Radionuclides - Dissolved

Radium 226	56.6	pCi/L		0.2	SM 7500 Ra-B	10/26/2022 1130	WN
Radium 226 Precision (±)	0.9	pCi/L			SM 7500 Ra-B	10/26/2022 1130	WN
Radium 226 MDC	0.23	pCi/L			SM 7500 Ra-B	10/26/2022 1130	WN
Radium 228	-4.3	pCi/L	U	1	Ga-Tech	11/04/2022 2038	WN
Radium 228 Precision (±)	2.4	pCi/L	U		Ga-Tech	11/04/2022 2038	WN
Radium 228 MDC	2.80	pCi/L			Ga-Tech	11/05/2022 1459	WN
Radium 228 MDC	2.80	pCi/L			Ga-Tech	11/04/2022 2038	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-001
ClientSample ID: CR-H-4-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/15/2022 10:30:00 AM
DateReceived: 9/21/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Suspended

Radium 226	128	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1103 WN
Radium 226 (Suspended) Precision (±)	1.2	pCi/L			SM 7500 Ra-B	11/07/2022 1103 WN
Radium 228	1.1 UJ	pCi/L		1	Ga-Tech	11/05/2022 1459 WN
Radium 228 Precision (±)	2.7	pCi/L			Ga-Tech	11/05/2022 1459 WN

Radionuclides - Total

Total Radium 226	184.6	pCi/L		0.2	Calculation	11/14/2022 1139 WN
Total Radium 226 Precision (±)	2.1	pCi/L			Calculation	11/14/2022 1139 WN
Radium 228	1.1	pCi/L		1	Ga-Tech	11/05/2022 1459 WN
Radium 228 Precision (±)	2.7	pCi/L			Ga-Tech	11/05/2022 1459 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-002
ClientSample ID: CR-H-8-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/17/2022 3:00:00 PM
DateReceived: 9/21/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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General Parameters

Total Dissolved Solids (180)	940	mg/L		10	SM 2540	09/22/2022 1352 JMS
Total Suspended Solids	12	mg/L		5	SM 2540	09/23/2022 1440 KAT

Metals - Total

Aluminum	1.9	mg/L		0.1	6010C	09/28/2022 1340 DG
Antimony	0.00137	mg/L	J	0.005	6020A	09/30/2022 1748 MS
Arsenic	0.013	mg/L		0.005	6020A	09/30/2022 1748 MS
Barium	0.122	mg/L		0.005	6020A	09/30/2022 1748 MS
Beryllium	ND	mg/L	U	0.001	6010C	09/28/2022 1340 DG
Cadmium	0.0000791	mg/L	J	0.002	6020A	09/30/2022 1748 MS
Calcium	13.5	mg/L		0.2	6010C	09/28/2022 1340 DG
Chromium	0.017	mg/L		0.005	6010C	09/28/2022 1340 DG
Cobalt	ND	mg/L	U	0.01	6010C	09/28/2022 1340 DG
Copper	0.05	mg/L		0.01	6020A	09/30/2022 1748 MS
Iron	1.48	mg/L		0.05	6010C	09/28/2022 1340 DG
Lead	0.004	mg/L		0.001	6020A	09/30/2022 1748 MS
Magnesium	3	mg/L		2	6010C	09/28/2022 1340 DG
Manganese	0.018	mg/L		0.005	6010C	09/28/2022 1340 DG
Molybdenum	0.00475	mg/L	J	0.02	6020A	09/30/2022 1748 MS
Nickel	0.00277	mg/L	J	0.01	6010C	09/28/2022 1340 DG
Selenium	0.071	mg/L		0.005	6020A	09/30/2022 1748 MS
Silver	ND	mg/L	U	0.003	6020A	09/30/2022 1748 MS
Sodium	301	mg/L		2	6010C	09/28/2022 1340 DG
Thallium	ND	mg/L	U	0.001	6020A	09/30/2022 1748 MS
Thorium	0.1	mg/L		0.1	6010C	09/28/2022 1340 DG
Uranium	4.85	mg/L		0.001	6020A	09/30/2022 1748 MS
Vanadium	0.31	mg/L		0.02	6020A	09/30/2022 1748 MS
Zinc	ND	mg/L	U	0.02	6010C	09/28/2022 1340 DG

Radionuclides - Dissolved

Radium 226	60.2	pCi/L		0.2	SM 7500 Ra-B	10/26/2022 1130 WN
Radium 226 Precision (±)	0.9	pCi/L			SM 7500 Ra-B	10/26/2022 1130 WN
Radium 226 MDC	0.20	pCi/L			SM 7500 Ra-B	10/26/2022 1130 WN
Radium 228	0.9	pCi/L	J	1	Ga-Tech	11/04/2022 2342 WN
Radium 228 Precision (±)	2.0	pCi/L	J		Ga-Tech	11/04/2022 2342 WN
Radium 228 MDC	2.30	pCi/L			Ga-Tech	11/12/2022 655 WN
Radium 228 MDC	2.30	pCi/L			Ga-Tech	11/04/2022 2342 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-002
ClientSample ID: CR-H-8-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/17/2022 3:00:00 PM
DateReceived: 9/21/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Suspended

Radium 226	190	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1103 WN
Radium 226 (Suspended) Precision (±)	1.5	pCi/L			SM 7500 Ra-B	11/07/2022 1103 WN
Radium 228	0.2	pCi/L	U	1	Ga-Tech	11/12/2022 655 WN
Radium 228 Precision (±)	1.8	pCi/L	U		Ga-Tech	11/12/2022 655 WN

Radionuclides - Total

Total Radium 226	250.2	pCi/L		0.2	Calculation	11/14/2022 1139 WN
Total Radium 226 Precision (±)	2.4	pCi/L			Calculation	11/14/2022 1139 WN
Radium 228	1.1	pCi/L		1	Ga-Tech	11/12/2022 655 WN
Radium 228 Precision (±)	2.0	pCi/L			Ga-Tech	11/12/2022 655 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-005
ClientSample ID: CR-M-30-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/19/2022 10:50:00 AM
DateReceived: 9/21/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Parameter, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include Total Dissolved Solids (180) and Total Suspended Solids.

Metals - Dissolved

Table with 7 columns: Metal, Result, Units, Qual, RL, Method, Date Analyzed/Init. Lists various metals like Aluminum, Antimony, Arsenic, etc.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-005
ClientSample ID: CR-M-30-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/19/2022 10:50:00 AM
DateReceived: 9/21/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Metals - Total

Table listing various metals (Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc) with their respective results, units, and quality indicators.

Radionuclides - Dissolved

Table listing radionuclides (Radium 226, Radium 228) with their results, units, and quality indicators.

Radionuclides - Suspended

Table listing radionuclides (Radium 226, Radium 228) with their results, units, and quality indicators.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-005
ClientSample ID: CR-M-30-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/19/2022 10:50:00 AM
DateReceived: 9/21/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Total Radium 226	202	pCi/L		0.2	Calculation	11/14/2022 1139 WN
Total Radium 226 Precision (±)	2.1	pCi/L			Calculation	11/14/2022 1139 WN
Radium 228	2.0	pCi/L		1	Ga-Tech	11/12/2022 958 WN
Radium 228 Precision (±)	2.4	pCi/L			Ga-Tech	11/12/2022 958 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-006
ClientSample ID: QV-L-4-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/20/2022 4:50:00 PM
DateReceived: 9/21/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc

Radionuclides - Dissolved

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Radium 226, Radium 226 Precision (±), Radium 226 MDC, Radium 228, Radium 228 Precision (±), Radium 228 MDC, Radium 228 MDC



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-006
ClientSample ID: QV-L-4-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/20/2022 4:50:00 PM
DateReceived: 9/21/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Suspended

Radium 226	13.5	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1104 WN
Radium 226 (Suspended) Precision (±)	0.4	pCi/L			SM 7500 Ra-B	11/07/2022 1104 WN
Radium 228	0.3	pCi/L	U	1	Ga-Tech	11/12/2022 1302 WN
Radium 228 Precision (±)	2.0	pCi/L	U		Ga-Tech	11/12/2022 1302 WN

Radionuclides - Total

Total Radium 226	24.6	pCi/L		0.2	Calculation	11/14/2022 1139 WN
Total Radium 226 Precision (±)	0.8	pCi/L			Calculation	11/14/2022 1139 WN
Radium 228	1.9	pCi/L		1	Ga-Tech	11/12/2022 1302 WN
Radium 228 Precision (±)	2.2	pCi/L			Ga-Tech	11/12/2022 1302 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-007
ClientSample ID: QV-L-8-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/20/2022 6:20:00 PM
DateReceived: 9/21/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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General Parameters

Total Dissolved Solids (180)	940	mg/L		10	SM 2540	09/22/2022 1400	JMS
Total Suspended Solids	19	mg/L		5	SM 2540	09/23/2022 1444	KAT

Metals - Total

Aluminum	2.2	mg/L		0.1	6010C	09/28/2022 1356	DG
Antimony	0.00111	mg/L	J	0.005	6020A	09/30/2022 1829	MS
Arsenic	0.005	mg/L		0.005	6020A	09/30/2022 1829	MS
Barium	0.069	mg/L		0.005	6020A	09/30/2022 1829	MS
Beryllium	ND	mg/L	U	0.001	6010C	09/28/2022 1356	DG
Cadmium	0.0000642	mg/L	J	0.002	6020A	09/30/2022 1829	MS
Calcium	15.8	mg/L		0.2	6010C	09/28/2022 1356	DG
Chromium	0.012	mg/L		0.005	6010C	09/28/2022 1356	DG
Cobalt	ND	mg/L	U	0.01	6010C	09/28/2022 1356	DG
Copper	0.06	mg/L		0.01	6020A	09/30/2022 1829	MS
Iron	2.11	mg/L		0.05	6010C	09/28/2022 1356	DG
Lead	0.003	mg/L		0.001	6020A	09/30/2022 1829	MS
Magnesium	3	mg/L		2	6010C	09/28/2022 1356	DG
Manganese	0.031	mg/L		0.005	6010C	09/28/2022 1356	DG
Molybdenum	0.03	mg/L		0.02	6020A	09/30/2022 1829	MS
Nickel	0.00421	mg/L	J	0.01	6010C	09/28/2022 1356	DG
Selenium	0.066	mg/L		0.005	6020A	09/30/2022 1829	MS
Silver	ND	mg/L	U	0.003	6020A	09/30/2022 1829	MS
Sodium	323	mg/L		2	6010C	09/28/2022 1356	DG
Thallium	ND	mg/L	U	0.001	6020A	09/30/2022 1829	MS
Thorium	0.0783	mg/L	J	0.1	6010C	09/28/2022 1356	DG
Uranium	3.71	mg/L		0.001	6020A	09/30/2022 1829	MS
Vanadium	0.04	mg/L		0.02	6020A	09/30/2022 1829	MS
Zinc	ND	mg/L	U	0.02	6010C	09/28/2022 1356	DG

Radionuclides - Dissolved

Radium 226	8.7	pCi/L		0.3	SM 7500 Ra-B	10/31/2022 1135	WN
Radium 226 Precision (±)	0.3	pCi/L			SM 7500 Ra-B	10/31/2022 1135	WN
Radium 226 MDC	0.20	pCi/L			SM 7500 Ra-B	10/31/2022 1135	WN
Radium 228	0.6	pCi/L	J	1	Ga-Tech	11/05/2022 852	WN
Radium 228 Precision (±)	1.9	pCi/L	J		Ga-Tech	11/05/2022 852	WN
Radium 228 MDC	2.60	pCi/L			Ga-Tech	11/12/2022 1605	WN
Radium 228 MDC	2.30	pCi/L			Ga-Tech	11/05/2022 852	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-007
ClientSample ID: QV-L-8-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/20/2022 6:20:00 PM
DateReceived: 9/21/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Radionuclides - Suspended							
Radium 226	8.7	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1104	WN
Radium 226 (Suspended) Precision (±)	0.3	pCi/L			SM 7500 Ra-B	11/07/2022 1104	WN
Radium 228	0.2	pCi/L	U	1	Ga-Tech	11/12/2022 1605	WN
Radium 228 Precision (±)	2.1	pCi/L	U		Ga-Tech	11/12/2022 1605	WN
Radionuclides - Total							
Total Radium 226	17.4	pCi/L		0.2	Calculation	11/14/2022 1139	WN
Total Radium 226 Precision (±)	0.6	pCi/L			Calculation	11/14/2022 1139	WN
Radium 228	0.8	pCi/L	J	1	Ga-Tech	11/12/2022 1605	WN
Radium 228 Precision (±)	2.1	pCi/L	J		Ga-Tech	11/12/2022 1605	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-008
ClientSample ID: QV-L-30-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/21/2022 7:00:00 AM
DateReceived: 9/21/2022 4:05:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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General Parameters

Total Dissolved Solids (180)	970	mg/L		10	SM 2540	09/22/2022 1402	JMS
Total Suspended Solids	5	mg/L		5	SM 2540	09/23/2022 1445	KAT

Metals - Dissolved

Aluminum	0.2	mg/L		0.1	6010C	09/28/2022 1303	DG
Antimony	0.00150	mg/L	J	0.005	6020A	09/30/2022 1607	MS
Arsenic	0.00496	mg/L	J	0.005	6020A	09/30/2022 1607	MS
Barium	0.0418	mg/L	J	0.1	6020A	09/30/2022 1607	MS
Beryllium	ND	mg/L	U	0.001	6010C	09/28/2022 1303	DG
Cadmium	ND	mg/L	U	0.002	6020A	09/30/2022 1607	MS
Calcium	13.2	mg/L		0.5	6010C	09/28/2022 1303	DG
Chromium	0.00725	mg/L	J	0.01	6010C	09/28/2022 1303	DG
Cobalt	ND	mg/L	U	0.01	6010C	09/28/2022 1303	DG
Copper	0.05	mg/L		0.01	6020A	09/30/2022 1607	MS
Iron	0.14	mg/L		0.05	6010C	09/28/2022 1303	DG
Lead	0.000599	mg/L	J	0.001	6020A	09/30/2022 1607	MS
Magnesium	2.0	mg/L		0.5	6010C	09/28/2022 1303	DG
Manganese	0.00914	mg/L	J	0.01	6010C	09/28/2022 1303	DG
Molybdenum	0.04	mg/L		0.02	6020A	09/30/2022 1607	MS
Nickel	0.00241	mg/L	J	0.01	6010C	09/28/2022 1303	DG
Selenium	0.058	mg/L		0.005	6020A	09/30/2022 1607	MS
Silver	ND	mg/L	U	0.003	6020A	09/30/2022 1607	MS
Sodium	311	mg/L		1	6010C	09/28/2022 1303	DG
Thallium	ND	mg/L	U	0.001	6020A	09/30/2022 1607	MS
Thorium	0.0683	mg/L	J	0.1	6010C	09/28/2022 1303	DG
Uranium	3.45	mg/L		0.001	6020A	09/30/2022 1607	MS
Vanadium	0.03	mg/L		0.02	6020A	09/30/2022 1607	MS
Zinc	ND	mg/L	U	0.05	6010C	09/28/2022 1303	DG

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-008
ClientSample ID: QV-L-30-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/21/2022 7:00:00 AM
DateReceived: 9/21/2022 4:05:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Metals - Total

Aluminum	2.0	mg/L		0.1	6010C	09/28/2022 1403	DG
Antimony	0.00137	mg/L	J	0.005	6020A	09/30/2022 1835	MS
Arsenic	0.006	mg/L		0.005	6020A	09/30/2022 1835	MS
Barium	0.073	mg/L		0.005	6020A	09/30/2022 1835	MS
Beryllium	ND	mg/L	U	0.001	6010C	09/28/2022 1403	DG
Cadmium	0.0000935	mg/L	J	0.002	6020A	09/30/2022 1835	MS
Calcium	14.5	mg/L		0.2	6010C	09/28/2022 1403	DG
Chromium	0.018	mg/L		0.005	6010C	09/28/2022 1403	DG
Cobalt	ND	mg/L	U	0.01	6010C	09/28/2022 1403	DG
Copper	0.07	mg/L		0.01	6020A	09/30/2022 1835	MS
Iron	2.07	mg/L		0.05	6010C	09/28/2022 1403	DG
Lead	0.003	mg/L		0.001	6020A	09/30/2022 1835	MS
Magnesium	2	mg/L		2	6010C	09/28/2022 1403	DG
Manganese	0.040	mg/L		0.005	6010C	09/28/2022 1403	DG
Molybdenum	0.04	mg/L		0.02	6020A	09/30/2022 1835	MS
Nickel	0.00459	mg/L	J	0.01	6010C	09/28/2022 1403	DG
Selenium	0.056	mg/L		0.005	6020A	09/30/2022 1835	MS
Silver	ND	mg/L	U	0.003	6020A	09/30/2022 1835	MS
Sodium	317	mg/L		2	6010C	09/28/2022 1403	DG
Thallium	ND	mg/L	U	0.001	6020A	09/30/2022 1835	MS
Thorium	0.0822	mg/L	J	0.1	6010C	09/28/2022 1403	DG
Uranium	3.38	mg/L		0.001	6020A	09/30/2022 1835	MS
Vanadium	0.03	mg/L		0.02	6020A	09/30/2022 1835	MS
Zinc	ND	mg/L	U	0.02	6010C	09/28/2022 1403	DG

Radionuclides - Dissolved

Radium 226	8.5	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1103	WN
Radium 226 Precision (±)	0.3	pCi/L			SM 7500 Ra-B	11/07/2022 1103	WN
Radium 226 MDC	0.20	pCi/L			SM 7500 Ra-B	11/07/2022 1103	WN
Radium 228	1.3	UU		1	Ga-Tech	11/05/2022 1156	WN
Radium 228 Precision (±)	2.0	pCi/L			Ga-Tech	11/05/2022 1156	WN
Radium 228 MDC	2.20	pCi/L			Ga-Tech	11/05/2022 1156	WN
Radium 228 MDC	2.80	pCi/L			Ga-Tech	11/12/2022 1909	WN

Radionuclides - Suspended

Radium 226	9.9	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1104	WN
Radium 226 (Suspended) Precision (±)	0.3	pCi/L			SM 7500 Ra-B	11/07/2022 1104	WN
Radium 228	-0.1	pCi/L	U	1	Ga-Tech	11/12/2022 1909	WN
Radium 228 Precision (±)	2.6	pCi/L	U		Ga-Tech	11/12/2022 1909	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 11/22/2022
Report ID: S2209316001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2209316-008
ClientSample ID: QV-L-30-WT
COC: 196832
PWS ID:

WorkOrder: S2209316
CollectionDate: 9/21/2022 7:00:00 AM
DateReceived: 9/21/2022 4:05:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Total Radium 226	18.4	pCi/L		0.2	Calculation	11/14/2022 1139 WN
Total Radium 226 Precision (±)	0.6	pCi/L			Calculation	11/14/2022 1139 WN
Radium 228	1.3	pCi/L		1	Ga-Tech	11/12/2022 1909 WN
Radium 228 Precision (±)	2.6	pCi/L			Ga-Tech	11/12/2022 1909 WN

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: Standard Method 7500 Ra B
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Aqueous
TYPES OF ANALYSES: Alpha Scintillation (Radium-226, Radium-228)
DATA VALIDATION DATE: January 21, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2210090
SAMPLING DATE(S): September 30 – October 3, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226/228</u>	
		<u>Dissolved</u>	<u>Soluble</u>
QV-M-4-WT	2210090-001	X	X
QV-M-8-WT	2210090-002	X	X
QV-M-30-WT	2210090-003	X	X
QV-H-4-WT	2210090-004	X	X
QV-H -8-WT	2210090-005	X	X
QV-H -30-WT	2210090-006	X	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2210090 - Radiochemistry

Alpha Scintillation –Radium-226, Radium-228

SUMMARY

I.) General:

The laboratory has cited analytical SM 7500 Ra B for the Alpha Scintillation analyses.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-228	LCS	4339b	29-7	03-09-2024
	Radium-226	LCS	4966a	29-7	03-09-2024

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the dissolved and suspended fractions of the SDG. All MB results were non-detected and no action was taken.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as "UJ". When between 2 and 3, results are qualified "J". The Radium-228 and Radium-226 results were demonstrated to be significantly different ($NAD > 3$) and did not require qualification.

VII.) Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS):

An LCS/LCSD was analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on the LCS/LCSD.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was performed on a sample that was not associated with this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Alpha Scintillation analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results.

The laboratory identified the following sample results as tentatively identified at concentrations between the sample MDC and the required MDC. Consequently, the following result was qualified as estimated (J):

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample MDC</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
QV-M-4-WT (Dissolved)	Radium-228	0.6	2.4	1.0
QV-M-4-WT (Suspended)	Radium-228	2.0	2.4	1.0
QV-M-8-WT (Dissolved)	Radium-228	1.4	2.6	1.0
QV-M-30-WT (Dissolved)	Radium-228	1.4	2.2	1.0
QV-M-30-WT (Suspended)	Radium-228	2.3	2.4	1.0
QV-H-30-WT (Suspended)	Radium-228	2.0	2.4	1.0

The laboratory MDCs were higher than the indicated MDCs in Table A.11 of the Project Work Plan. No action was taken.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were reported for the following:

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample Uncertainty</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
QV-H-4-WT	Radium-228 (Dissolved)	-0.2	1.7	1.0

The result does not have an absolute value greater than the 2σ TPU. No action was needed.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
QV-M-4-WT (Dissolved)	2210090-001	Alpha Scint	Radium-228	J	Result tentatively quantitated
QV-M-4-WT (Suspended)	2210090-001		Radium-228	J	Result tentatively quantitated
QV-M-8-WT (Dissolved)	2210090-002		Radium-228	J	Result tentatively quantitated
QV-M-30-WT (Dissolved)	2210090-003		Radium-228	J	Result tentatively quantitated
QV-M-30-WT (Suspended)	2210090-003		Radium-228	J	Result tentatively quantitated
QV-H-30-WT (Suspended)	2210090-006		Radium-228	J	Result tentatively quantitated



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-001
ClientSample ID: QV-M-4-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 9/30/2022 6:30:00 AM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc

Radionuclides - Dissolved

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Radium 226, Radium 226 Precision (±), Radium 226 MDC, Radium 228, Radium 228 Precision (±), Radium 228 MDC, Radium 228 MDC



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Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-001
ClientSample ID: QV-M-4-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 9/30/2022 6:30:00 AM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Suspended

Radium 226	73.9	pCi/L		0.2	SM 7500 Ra-B	11/08/2022 1042 WN
Radium 226 (Suspended) Precision (±)	1.0	pCi/L			SM 7500 Ra-B	11/08/2022 1042 WN
Radium 228	2.0 J	pCi/L		1	Ga-Tech	11/13/2022 1632 WN
Radium 228 Precision (±)	2.3	pCi/L			Ga-Tech	11/13/2022 1632 WN

Radionuclides - Total

Total Radium 226	85.2	pCi/L		0.2	Calculation	11/22/2022 1328 WN
Total Radium 226 Precision (±)	1.4	pCi/L			Calculation	11/22/2022 1328 WN
Radium 228	2.6	pCi/L		1	Ga-Tech	11/13/2022 1632 WN
Radium 228 Precision (±)	2.3	pCi/L			Ga-Tech	11/13/2022 1632 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-002
ClientSample ID: QV-M-8-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 9/29/2022 7:00:00 PM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc

Radionuclides - Dissolved

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Radium 226, Radium 226 Precision (±), Radium 226 MDC, Radium 228, Radium 228 Precision (±), Radium 228 MDC, Radium 228 MDC



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-002
ClientSample ID: QV-M-8-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 9/29/2022 7:00:00 PM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Suspended

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include Radium 226, Radium 226 (Suspended) Precision, Radium 228, and Radium 228 Precision.

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include Total Radium 226, Total Radium 226 Precision, Radium 228, and Radium 228 Precision.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-003
ClientSample ID: QV-M-30-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 10/1/2022 4:00:00 PM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Parameter, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Dissolved

Table with 7 columns: Metal, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc



Sample Analysis Report

Company: Tetra Tech
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Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-003
ClientSample ID: QV-M-30-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 10/1/2022 4:00:00 PM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Metals - Total

Aluminum	7.6	mg/L		0.1	6010C	10/18/2022 1120	DG
Antimony	0.00162	mg/L	J	0.005	6020A	10/18/2022 2114	MS
Arsenic	0.008	mg/L		0.005	6020A	10/18/2022 2114	MS
Barium	0.247	mg/L		0.005	6020A	10/18/2022 2114	MS
Beryllium	0.000612	mg/L	J	0.001	6010C	10/18/2022 1120	DG
Cadmium	0.000141	mg/L	J	0.002	6020A	10/18/2022 2114	MS
Calcium	11.3	mg/L		0.2	6010C	10/18/2022 1120	DG
Chromium	0.142	mg/L		0.005	6010C	10/18/2022 1120	DG
Cobalt	0.00335	mg/L	J	0.01	6010C	10/18/2022 1120	DG
Copper	0.06	mg/L		0.01	6020A	10/18/2022 2114	MS
Iron	8.65	mg/L		0.05	6010C	10/18/2022 1120	DG
Lead	0.013	mg/L		0.001	6020A	10/18/2022 2114	MS
Magnesium	3	mg/L		2	6010C	10/18/2022 1120	DG
Manganese	0.152	mg/L		0.005	6010C	10/18/2022 1120	DG
Molybdenum	0.07	mg/L		0.02	6020A	10/18/2022 2114	MS
Nickel	0.01	mg/L		0.01	6010C	10/18/2022 1120	DG
Selenium	0.029	mg/L		0.005	6020A	10/18/2022 2114	MS
Silver	ND	mg/L	U	0.003	6020A	10/18/2022 2114	MS
Sodium	308	mg/L		2	6010C	10/18/2022 1120	DG
Thallium	ND	mg/L	U	0.001	6020A	10/18/2022 2114	MS
Thorium	0.0555	mg/L	J	0.1	6010C	10/18/2022 1120	DG
Uranium	2.15	mg/L		0.001	6020A	10/18/2022 2114	MS
Vanadium	0.07	mg/L		0.02	6020A	10/18/2022 2114	MS
Zinc	0.04	mg/L		0.02	6010C	10/18/2022 1120	DG

Radionuclides - Dissolved

Radium 226	12.3	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1308	WN
Radium 226 Precision (±)	0.4	pCi/L			SM 7500 Ra-B	11/07/2022 1308	WN
Radium 226 MDC	0.20	pCi/L			SM 7500 Ra-B	11/07/2022 1308	WN
Radium 228	1.4	pCi/L	J	1	Ga-Tech	11/13/2022 419	WN
Radium 228 Precision (±)	2.1	pCi/L			Ga-Tech	11/13/2022 419	WN
Radium 228 MDC	2.20	pCi/L			Ga-Tech	11/13/2022 419	WN
Radium 228 MDC	2.40	pCi/L			Ga-Tech	11/13/2022 2239	WN

Radionuclides - Suspended

Radium 226	92.9	pCi/L		0.2	SM 7500 Ra-B	11/08/2022 1042	WN
Radium 226 (Suspended) Precision (±)	1.1	pCi/L			SM 7500 Ra-B	11/08/2022 1042	WN
Radium 228	2.3	pCi/L	J	1	Ga-Tech	11/13/2022 2239	WN
Radium 228 Precision (±)	2.4	pCi/L			Ga-Tech	11/13/2022 2239	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-003
ClientSample ID: QV-M-30-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 10/1/2022 4:00:00 PM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Total Radium 226	105.2	pCi/L		0.2	Calculation	11/22/2022 1328 WN
Total Radium 226 Precision (±)	1.5	pCi/L			Calculation	11/22/2022 1328 WN
Radium 228	3.8	pCi/L		1	Ga-Tech	11/13/2022 2239 WN
Radium 228 Precision (±)	2.4	pCi/L			Ga-Tech	11/13/2022 2239 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-004
ClientSample ID: QV-H-4-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 10/2/2022 8:00:00 AM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc

Radionuclides - Dissolved

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Radium 226, Radium 226 Precision (±), Radium 226 MDC, Radium 228, Radium 228 Precision (±), Radium 228 MDC, Radium 228 MDC



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-004
ClientSample ID: QV-H-4-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 10/2/2022 8:00:00 AM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Suspended

Radium 226	41.6	pCi/L		0.2	SM 7500 Ra-B	11/08/2022 1042 WN
Radium 226 (Suspended) Precision (±)	0.7	pCi/L			SM 7500 Ra-B	11/08/2022 1042 WN
Radium 228	6.0	pCi/L		1	Ga-Tech	11/14/2022 142 WN
Radium 228 Precision (±)	3.3	pCi/L			Ga-Tech	11/14/2022 142 WN

Radionuclides - Total

Total Radium 226	64.7	pCi/L		0.2	Calculation	11/22/2022 1328 WN
Total Radium 226 Precision (±)	1.2	pCi/L			Calculation	11/22/2022 1328 WN
Radium 228	6.0	pCi/L		1	Ga-Tech	11/14/2022 142 WN
Radium 228 Precision (±)	3.3	pCi/L			Ga-Tech	11/14/2022 142 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-005
ClientSample ID: QV-H-8-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 10/2/2022 4:00:00 PM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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General Parameters

Total Dissolved Solids (180)	960	mg/L		10	SM 2540	10/06/2022 1624 JMS
Total Suspended Solids	20	mg/L		5	SM 2540	10/06/2022 1607 KAT

Metals - Total

Aluminum	2.8	mg/L		0.1	6010C	10/18/2022 1129 DG
Antimony	0.00193	mg/L	J	0.005	6020A	10/18/2022 2142 MS
Arsenic	0.012	mg/L		0.005	6020A	10/18/2022 2142 MS
Barium	0.124	mg/L		0.005	6020A	10/18/2022 2142 MS
Beryllium	ND	mg/L	U	0.001	6010C	10/18/2022 1129 DG
Cadmium	0.000103	mg/L	J	0.002	6020A	10/18/2022 2142 MS
Calcium	12.0	mg/L		0.2	6010C	10/18/2022 1129 DG
Chromium	0.026	mg/L		0.005	6010C	10/18/2022 1129 DG
Cobalt	ND	mg/L	U	0.01	6010C	10/18/2022 1129 DG
Copper	0.06	mg/L		0.01	6020A	10/18/2022 2142 MS
Iron	2.47	mg/L		0.05	6010C	10/18/2022 1129 DG
Lead	0.005	mg/L		0.001	6020A	10/18/2022 2142 MS
Magnesium	2	mg/L		2	6010C	10/18/2022 1129 DG
Manganese	0.039	mg/L		0.005	6010C	10/18/2022 1129 DG
Molybdenum	0.05	mg/L		0.02	6020A	10/18/2022 2142 MS
Nickel	0.00687	mg/L	J	0.01	6010C	10/18/2022 1129 DG
Selenium	0.052	mg/L		0.005	6020A	10/18/2022 2142 MS
Silver	ND	mg/L	U	0.003	6020A	10/18/2022 2142 MS
Sodium	324	mg/L		2	6010C	10/18/2022 1129 DG
Thallium	ND	mg/L	U	0.001	6020A	10/18/2022 2142 MS
Thorium	0.1	mg/L		0.1	6010C	10/18/2022 1129 DG
Uranium	5.17	mg/L		0.001	6020A	10/18/2022 2142 MS
Vanadium	0.10	mg/L		0.02	6020A	10/18/2022 2142 MS
Zinc	0.0196	mg/L	J	0.02	6010C	10/18/2022 1129 DG

Radionuclides - Dissolved

Radium 226	18.0	pCi/L		0.2	SM 7500 Ra-B	11/07/2022 1308 WN
Radium 226 Precision (±)	0.5	pCi/L			SM 7500 Ra-B	11/07/2022 1308 WN
Radium 226 MDC	0.20	pCi/L			SM 7500 Ra-B	11/07/2022 1308 WN
Radium 228	2.9	pCi/L		1	Ga-Tech	11/13/2022 1026 WN
Radium 228 Precision (±)	2.3	pCi/L			Ga-Tech	11/13/2022 1026 WN
Radium 228 MDC	2.50	pCi/L			Ga-Tech	11/14/2022 445 WN
Radium 228 MDC	2.20	pCi/L			Ga-Tech	11/13/2022 1026 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-005
ClientSample ID: QV-H-8-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 10/2/2022 4:00:00 PM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Suspended

Radium 226	53.1	pCi/L		0.2	SM 7500 Ra-B	11/08/2022 1042 WN
Radium 226 (Suspended) Precision (±)	0.8	pCi/L			SM 7500 Ra-B	11/08/2022 1042 WN
Radium 228	0.5	pCi/L	U	1	Ga-Tech	11/14/2022 445 WN
Radium 228 Precision (±)	2.4	pCi/L	U		Ga-Tech	11/14/2022 445 WN

Radionuclides - Total

Total Radium 226	71.1	pCi/L		0.2	Calculation	11/22/2022 1328 WN
Total Radium 226 Precision (±)	1.3	pCi/L			Calculation	11/22/2022 1328 WN
Radium 228	2.9	pCi/L		1	Ga-Tech	11/14/2022 445 WN
Radium 228 Precision (±)	2.3	pCi/L			Ga-Tech	11/14/2022 445 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-006
ClientSample ID: QV-H-30-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 10/3/2022 10:00:00 AM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Dissolved

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-006
ClientSample ID: QV-H-30-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 10/3/2022 10:00:00 AM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Metals - Total

Table listing various metals (Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc) with their respective results, units, and quality indicators.

Radionuclides - Dissolved

Table listing radionuclides (Radium 226, Radium 228) with their results, units, and quality indicators.

Radionuclides - Suspended

Table listing radionuclides (Radium 226, Radium 228) with their results, units, and quality indicators.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/2/2022
Report ID: S2210090001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210090-006
ClientSample ID: QV-H-30-WT
COC: 19827
PWS ID:

WorkOrder: S2210090
CollectionDate: 10/3/2022 10:00:00 AM
DateReceived: 10/6/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Total Radium 226	144.4	pCi/L		0.2	Calculation	11/22/2022 1328 WN
Total Radium 226 Precision (±)	2.0	pCi/L			Calculation	11/22/2022 1328 WN
Radium 228	1.5	pCi/L		1	Ga-Tech	11/14/2022 748 WN
Radium 228 Precision (±)	2.3	pCi/L			Ga-Tech	11/14/2022 748 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/5/2022
Report ID: S2210140001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210140-001
ClientSample ID: SW-WT-01
COC: 196822
PWS ID:

WorkOrder: S2210140
CollectionDate: 10/5/2022 5:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc

Radionuclides - Dissolved

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Radium 226, Radium 226 Precision (±), Radium 226 MDC, Radium 228, Radium 228 Precision (±), Radium 228 MDC, Radium 228 MDC



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/5/2022
Report ID: S2210140001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210140-001
ClientSample ID: SW-WT-01
COC: 196822
PWS ID:

WorkOrder: S2210140
CollectionDate: 10/5/2022 5:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Radionuclides - Suspended							
Radium 226	0.10	pCi/L	U	0.2	SM 7500 Ra-B	11/11/2022 833	WN
Radium 226 (Suspended) Precision (±)	0.05	pCi/L	U		SM 7500 Ra-B	11/11/2022 833	WN
Radium 228	2.4	pCi/L	J	3.7	Ga-Tech	11/23/2022 1939	WN
Radium 228 Precision (±)	3.4	pCi/L	J		Ga-Tech	11/23/2022 1939	WN
Radionuclides - Total							
Total Radium 226	1.9	pCi/L		0.2	Calculation	11/22/2022 1351	WN
Total Radium 226 Precision (±)	0.2	pCi/L			Calculation	11/22/2022 1351	WN
Radium 228	2.4	pCi/L	J	3.7	Ga-Tech	11/23/2022 1939	WN
Radium 228 Precision (±)	3.4	pCi/L	J		Ga-Tech	11/23/2022 1939	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/5/2022
Report ID: S2210140001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210140-002
ClientSample ID: SW-WT-02
COC: 196822
PWS ID:

WorkOrder: S2210140
CollectionDate: 10/5/2022 5:10:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc

Radionuclides - Dissolved

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Radium 226, Radium 226 Precision (±), Radium 226 MDC, Radium 228, Radium 228 Precision (±), Radium 228 MDC, Radium 228 MDC



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/5/2022
Report ID: S2210140001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210140-002
ClientSample ID: SW-WT-02
COC: 196822
PWS ID:

WorkOrder: S2210140
CollectionDate: 10/5/2022 5:10:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
Radionuclides - Suspended						
Radium 226	0.13	pCi/L	U	0.2	SM 7500 Ra-B	11/11/2022 834 WN
Radium 226 (Suspended) Precision (±)	0.05	pCi/L	U		SM 7500 Ra-B	11/11/2022 834 WN
Radium 228	6.3	pCi/L		4.7	Ga-Tech	11/23/2022 2243 WN
Radium 228 Precision (±)	4.9	pCi/L			Ga-Tech	11/23/2022 2243 WN
Radionuclides - Total						
Total Radium 226	0.8	pCi/L		0.2	Calculation	11/22/2022 1351 WN
Total Radium 226 Precision (±)	0.1	pCi/L			Calculation	11/22/2022 1351 WN
Radium 228	6.3	pCi/L		4.7	Ga-Tech	11/23/2022 2243 WN
Radium 228 Precision (±)	4.9	pCi/L			Ga-Tech	11/23/2022 2243 WN

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: Standard Method 7500 Ra B
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Aqueous
TYPES OF ANALYSES: Alpha Scintillation (Radium-226, Radium-228)
DATA VALIDATION DATE: January 21, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2210140
SAMPLING DATE(S): October 5, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226/228</u>	
		<u>Dissolved</u>	<u>Soluble</u>
SW-WT-01	2210140-001	X	X
SW-WT-02	2210140-002	X	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2210140 - Radiochemistry

Alpha Scintillation –Radium-226, Radium-228

SUMMARY

I.) General:

The laboratory has cited analytical SM 7500 Ra B for the Alpha Scintillation analyses.

II.) Overall Assessment of Data:

All laboratory data were acceptable with no qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-228	LCS	4339b	29-7	03-09-2024
	Radium-226	LCS	4966a	29-7	03-09-2024

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the dissolved and suspended fractions of the SDG. All MB results were non-detected and no action was taken.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as "UJ". When between 2 and 3, results are qualified "J". The Radium-228 and Radium-226 results were demonstrated to be significantly different ($NAD > 3$) and did not require qualification.

VII.) Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS):

An LCS/LCSD was analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on the LCS/LCSD.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was performed on a sample that was not associated with this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Alpha Scintillation analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were reported for the following:

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample Uncertainty</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
SW-WT-01	Radium-228 (Dissolved)	-1.1	2.0	1.0

The result does not have an absolute value greater than the 2σ TPU. No action was needed.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
None					

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: EPA 901.1 Modified, SM 7500 Ra-B, GA-TECH
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Soil/Aqueous
TYPES OF ANALYSES: Gamma Spectrometry (Radium-226 Total), Alpha Scintillation (Radium-226/228 SPLP Soluble)
DATA VALIDATION DATE: January 23, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2210147
SAMPLING DATE(S): August 23-September 12, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Ra 226</u> <u>(SPLP Soluble)</u>	<u>Ra 228</u> <u>(SPLP Soluble)</u>	<u>Ra 226</u> <u>(Total)</u>
CR-L-0-SL-01	2210147-001	X	X	X
CR-M-0-SL-01	2210147-002	X	X	X
CR-H-0-SL-01	2210147-003	X	X	X
QV-L-0-SL-01	2210147-004	X	X	X
QV-M-0-SL-01	2210147-005	X	X	X
QV-H-0-SL-01	2210147-006	X	X	X
CTS-L-0-SL-01	2210147-007	X	X	X
CTS-M-0-SL-01	2210147-008	X	X	X
CTS-H-0-SL-01	2210147-009	X	X	X
CR-L-4-SY Combined +25/+270	2210147-010	X	X	
CR-L-8-SY Combined +25/+270	2210147-011	X	X	
CR-L-30-SY Combined +25/+270	2210147-012	X	X	
CR-M-4-SY Combined +25/+270	2210147-013	X	X	
CR-M-8-SY Combined +25/+270	2210147-014	X	X	

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2210147 - Radiochemistry

Gamma Spectrometry –Radium-226

Alpha Scintillation –Radium-226 and Radium-228 SPLP Soluble

SUMMARY

I.) General:

The laboratory has cited analytical EPA 901.1 Modified for the Gamma Spectrometry analyses and methods SM 7500 Ra-B and GA-TECH for Alpha Scintillation

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Gamma Spectrometry	Radium-226	LCS	4353a	16-5	N/A
Alpha Scintillation	Radium-226	LCS	4966a	29-7	3/9/24
	Radium-228	LCS	4339b	29-7	3/9/24

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the total Radium-226 and the dissolved and suspended fractions of Radium-226/228 in the SDG.

The Dissolved Radium-226 (0.27 pCi/l) and Dissolved Radium-228 (0.914 pCi/l) were detected in the MB. The only Dissolved Radium-228 results associated with the Radium-228 blank were non-detected and no action was taken based on this blank. The associated Radium-226 results all had normalized absolute differences greater than 3. No action was taken.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as "UJ". When between 2 and 3, results are qualified "J". The Radium-228 and Radium-226 results were demonstrated to be significantly different ($NAD > 3$) and did not require qualification.

VII.) Laboratory Control Sample (LCS):

LCS/LCSD samples were analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery and precision. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on QV-H-0-SL-01 for Radium-226 Total. The Duplicate Error Ratio (DER) of 0.51 was less than the DER limit of 2.14. No action was taken.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was not performed for this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Gamma analysis and Alpha Scintillation analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results. Several Radium-228 Dissolved results were reported at values less than the MDC. The laboratory identified the following sample results as tentatively identified at concentrations between the sample MDC and the required MDC. Consequently, the following result was qualified as estimated (J):

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample MDC</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
CR-L-0-SL-01 (Dissolved)	Radium-228	1.0	2.1	1.0
QV-H-0-SL-01 (Dissolved)	Radium-228	2.2	2.3	1.0
CTS-L-0-SL-01 (Dissolved)	Radium-228	2.7	3.9	1.0
CTS-M-0-SL-01(Dissolved)	Radium-228	1.8	3.3	1.0
CR-L-4-SY Combined +25/ +270 (Dissolved)	Radium-228	1.8	2.2	1.0
CR-L-30-SY Combined +25/+270 (Dissolved)	Radium-228	1.1	1.9	1.0

The laboratory MDCs were higher than the indicated MDCs in Table A.11 of the Project Work Plan. No action was taken.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were reported for the following:

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample Uncertainty</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
CR-H-0-SL-01 (Dissolved)	Radium-228	-0.7	1.7	2.4

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> (pCi/g)	<u>Sample Uncertainty</u> (pCi/g)	<u>Required MDC</u> (pCi/g)
QV-L-0-SL-01 (Dissolved)	Radium-228	-0.6	1.7	2.4
CR-M-8-SY Combined +25/+270	Radium-228	-1.9	1.6	2.4

None of the results have an absolute value greater than the 2σ TPU. No action was needed.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were $< 80\%$ of the sample result for values $> 2X$ the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
CR-L-0-SL-01 (Dissolved)	2210147-001	Alpha Scint	Radium-228	J	Result tentatively quantitated
QV-H-0-SL-01 (Dissolved)	2210147-004		Radium-228	J	Result tentatively quantitated
CTS-L-0-SL-01 (Dissolved)	2210147-007		Radium-228	J	Result tentatively quantitated
CTS-M-0-SL-01(Dissolved)	2210147-008		Radium-228	J	Result tentatively quantitated
CR-L-4-SY Combined +25/+270 (Dissolved)	2210147-010		Radium-228	J	Result tentatively quantitated
CR-L-30-SY Combined +25/+270 (Dissolved)	2210147-012		Radium-228	J	Result tentatively quantitated



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-001
ClientSample ID: CR-L-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/23/2022 10:03:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	19.7	pCi/g		0.2	EPA 901.1 Mod.	11/07/2022 1310	WN
Radium 226 Precision (±)	1.2	pCi/g			EPA 901.1 Mod.	11/07/2022 1310	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/07/2022 1517	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/07/2022 1517	MS
Barium	180	mg/Kg		10	6020A	12/07/2022 1517	MS
Beryllium	0.763	mg/Kg	J	10	6020A	12/07/2022 1517	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/07/2022 1517	MS
Chromium	ND	mg/Kg	U	50	6020A	12/07/2022 1517	MS
Cobalt	5.12	mg/Kg	J	50	6020A	12/07/2022 1517	MS
Copper	7.59	mg/Kg	J	10	6020A	12/07/2022 1517	MS
Lead	7.93	mg/Kg	J	10	6020A	12/07/2022 1517	MS
Manganese	180	mg/Kg		10	6020A	12/07/2022 1517	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/07/2022 1517	MS
Nickel	6.82	mg/Kg	J	50	6020A	12/07/2022 1517	MS
Selenium	9.03	mg/Kg	J	50	6020A	12/07/2022 1517	MS
Silver	ND	mg/Kg	U	10	6020A	12/07/2022 1517	MS
Thallium	ND	mg/Kg	U	100	6020A	12/07/2022 1517	MS
Uranium	40	mg/Kg		10	6020A	12/07/2022 1517	MS
Vanadium	32.8	mg/Kg	J	50	6020A	12/07/2022 1517	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-001
ClientSample ID: CR-L-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/23/2022 10:03:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	19.7	mg/L		0.1	EPA 200.7	10/27/2022 1354	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1354	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1354	DG
Barium	0.06	mg/L		0.05	EPA 200.7	10/27/2022 1354	DG
Beryllium	0.000410	mg/L	J	0.02	EPA 200.7	10/27/2022 1354	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1354	DG
Chromium	0.01	mg/L		0.01	EPA 200.7	10/27/2022 1354	DG
Cobalt	0.00224	mg/L	J	0.01	EPA 200.7	10/27/2022 1354	DG
Copper	0.00733	mg/L	J	0.01	EPA 200.7	10/27/2022 1354	DG
Iron	8.79	mg/L		0.05	EPA 200.7	10/27/2022 1354	DG
Lead	0.00331	mg/L	J	0.2	EPA 200.7	10/27/2022 1354	DG
Manganese	0.0490	mg/L	J	0.1	EPA 200.7	10/27/2022 1354	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1354	DG
Nickel	0.00245	mg/L	J	0.02	EPA 200.7	10/27/2022 1354	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1354	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1354	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1354	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1354	DG
Vanadium	0.062	mg/L		0.005	EPA 200.7	10/27/2022 1354	DG
Zinc	0.0266	mg/L	J	0.2	EPA 200.7	10/27/2022 1354	DG
Soluble Radium 226	3.0	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	0.2	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	1.0	pCi/L	J	2.3	Ga-Tech	12/24/2022 2330	WN
Soluble Radium 228 Precision (±)	2.1	pCi/L	J		Ga-Tech	12/24/2022 2330	WN
MDC	2.30	pCi/L			Ga-Tech	12/24/2022 2330	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-002
ClientSample ID: CR-M-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/23/2022 10:32:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	104	pCi/g		0.2	EPA 901.1 Mod.	11/07/2022 1342	WN
Radium 226 Precision (±)	2.6	pCi/g			EPA 901.1 Mod.	11/07/2022 1342	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/07/2022 1530	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/07/2022 1530	MS
Barium	140	mg/Kg		10	6020A	12/07/2022 1530	MS
Beryllium	0.476	mg/Kg	J	10	6020A	12/07/2022 1530	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/07/2022 1530	MS
Chromium	ND	mg/Kg	U	50	6020A	12/07/2022 1530	MS
Cobalt	2.52	mg/Kg	J	50	6020A	12/07/2022 1530	MS
Copper	4.47	mg/Kg	J	10	6020A	12/07/2022 1530	MS
Lead	6.46	mg/Kg	J	10	6020A	12/07/2022 1530	MS
Manganese	170	mg/Kg		10	6020A	12/07/2022 1530	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/07/2022 1530	MS
Nickel	ND	mg/Kg	U	50	6020A	12/07/2022 1530	MS
Selenium	80	mg/Kg		50	6020A	12/07/2022 1530	MS
Silver	ND	mg/Kg	U	10	6020A	12/07/2022 1530	MS
Thallium	ND	mg/Kg	U	100	6020A	12/07/2022 1530	MS
Uranium	260	mg/Kg		10	6020A	12/07/2022 1530	MS
Vanadium	90	mg/Kg		50	6020A	12/07/2022 1530	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-002
ClientSample ID: CR-M-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/23/2022 10:32:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	14.4	mg/L		0.1	EPA 200.7	10/27/2022 1356	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1356	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1356	DG
Barium	0.05	mg/L		0.05	EPA 200.7	10/27/2022 1356	DG
Beryllium	0.000420	mg/L	J	0.02	EPA 200.7	10/27/2022 1356	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1356	DG
Chromium	0.00734	mg/L	J	0.01	EPA 200.7	10/27/2022 1356	DG
Cobalt	0.00217	mg/L	J	0.01	EPA 200.7	10/27/2022 1356	DG
Copper	0.00511	mg/L	J	0.01	EPA 200.7	10/27/2022 1356	DG
Iron	8.04	mg/L		0.05	EPA 200.7	10/27/2022 1356	DG
Lead	0.00553	mg/L	J	0.2	EPA 200.7	10/27/2022 1356	DG
Manganese	0.0610	mg/L	J	0.1	EPA 200.7	10/27/2022 1356	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1356	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1356	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1356	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1356	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1356	DG
Uranium	0.23	mg/L		0.05	EPA 200.7	10/27/2022 1356	DG
Vanadium	0.241	mg/L		0.005	EPA 200.7	10/27/2022 1356	DG
Zinc	0.0230	mg/L	J	0.2	EPA 200.7	10/27/2022 1356	DG
Soluble Radium 226	25.4	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	0.6	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	4.3	pCi/L	J	2.3	Ga-Tech	12/25/2022 233	WN
Soluble Radium 228 Precision (±)	2.6	pCi/L			Ga-Tech	12/25/2022 233	WN
MDC	2.30	pCi/L			Ga-Tech	12/25/2022 233	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-003
ClientSample ID: CR-H-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/23/2022 10:51:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	228	pCi/g		0.2	EPA 901.1 Mod.	11/07/2022 1414	WN
Radium 226 Precision (±)	3.7	pCi/g			EPA 901.1 Mod.	11/07/2022 1414	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/07/2022 1605	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/07/2022 1605	MS
Barium	150	mg/Kg		10	6020A	12/07/2022 1605	MS
Beryllium	0.468	mg/Kg	J	10	6020A	12/07/2022 1605	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/07/2022 1605	MS
Chromium	ND	mg/Kg	U	50	6020A	12/07/2022 1605	MS
Cobalt	2.11	mg/Kg	J	50	6020A	12/07/2022 1605	MS
Copper	ND	mg/Kg	U	10	6020A	12/07/2022 1605	MS
Lead	5.64	mg/Kg	J	10	6020A	12/07/2022 1605	MS
Manganese	100	mg/Kg		10	6020A	12/07/2022 1605	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/07/2022 1605	MS
Nickel	ND	mg/Kg	U	50	6020A	12/07/2022 1605	MS
Selenium	48.7	mg/Kg	J	50	6020A	12/07/2022 1605	MS
Silver	ND	mg/Kg	U	10	6020A	12/07/2022 1605	MS
Thallium	ND	mg/Kg	U	100	6020A	12/07/2022 1605	MS
Uranium	940	mg/Kg		10	6020A	12/07/2022 1605	MS
Vanadium	170	mg/Kg		50	6020A	12/07/2022 1605	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-003
ClientSample ID: CR-H-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/23/2022 10:51:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
SPLP							
Aluminum	2.0	mg/L		0.1	EPA 200.7	10/27/2022 1358	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1358	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1358	DG
Barium	0.09	mg/L		0.05	EPA 200.7	10/27/2022 1358	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1358	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1358	DG
Chromium	0.00107	mg/L	J	0.01	EPA 200.7	10/27/2022 1358	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1358	DG
Copper	0.00119	mg/L	J	0.01	EPA 200.7	10/27/2022 1358	DG
Iron	1.43	mg/L		0.05	EPA 200.7	10/27/2022 1358	DG
Lead	0.00206	mg/L	J	0.2	EPA 200.7	10/27/2022 1358	DG
Manganese	0.0112	mg/L	J	0.1	EPA 200.7	10/27/2022 1358	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1358	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1358	DG
Selenium	0.155	mg/L	J	0.2	EPA 200.7	10/27/2022 1358	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1358	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1358	DG
Uranium	0.22	mg/L		0.05	EPA 200.7	10/27/2022 1358	DG
Vanadium	0.084	mg/L		0.005	EPA 200.7	10/27/2022 1358	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1358	DG
Soluble Radium 226	83.6	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	1.0	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	-0.7	pCi/L	U	2.4	Ga-Tech	12/25/2022 537	WN
Soluble Radium 228 Precision (±)	1.7	pCi/L	U		Ga-Tech	12/25/2022 537	WN
MDC	2.20	pCi/L			Ga-Tech	12/25/2022 537	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-004
ClientSample ID: QV-L-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/26/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision.

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, and Vanadium.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-004
ClientSample ID: QV-L-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/26/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
SPLP							
Aluminum	7.9	mg/L		0.1	EPA 200.7	10/27/2022 1401	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1401	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1401	DG
Barium	0.05	mg/L		0.05	EPA 200.7	10/27/2022 1401	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1401	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1401	DG
Chromium	0.00480	mg/L	J	0.01	EPA 200.7	10/27/2022 1401	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1401	DG
Copper	0.00430	mg/L	J	0.01	EPA 200.7	10/27/2022 1401	DG
Iron	4.47	mg/L		0.05	EPA 200.7	10/27/2022 1401	DG
Lead	0.00395	mg/L	J	0.2	EPA 200.7	10/27/2022 1401	DG
Manganese	0.0442	mg/L	J	0.1	EPA 200.7	10/27/2022 1401	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1401	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1401	DG
Selenium	0.0694	mg/L	J	0.2	EPA 200.7	10/27/2022 1401	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1401	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1401	DG
Uranium	0.26	mg/L		0.05	EPA 200.7	10/27/2022 1401	DG
Vanadium	0.038	mg/L		0.005	EPA 200.7	10/27/2022 1401	DG
Zinc	0.0211	mg/L	J	0.2	EPA 200.7	10/27/2022 1401	DG
Soluble Radium 226	10.6	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	0.4	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	-0.6	pCi/L	U	2.4	Ga-Tech	12/25/2022 840	WN
Soluble Radium 228 Precision (±)	1.7	pCi/L	U		Ga-Tech	12/25/2022 840	WN
MDC	2.40	pCi/L			Ga-Tech	12/25/2022 840	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-005
ClientSample ID: QV-M-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/27/2022 9:25:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	91.9	pCi/g		0.2	EPA 901.1 Mod.	11/07/2022 1517	WN
Radium 226 Precision (±)	2.4	pCi/g			EPA 901.1 Mod.	11/07/2022 1517	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/07/2022 1626	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/07/2022 1626	MS
Barium	90	mg/Kg		10	6020A	12/07/2022 1626	MS
Beryllium	0.409	mg/Kg	J	10	6020A	12/07/2022 1626	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/07/2022 1626	MS
Chromium	ND	mg/Kg	U	50	6020A	12/07/2022 1626	MS
Cobalt	2.21	mg/Kg	J	50	6020A	12/07/2022 1626	MS
Copper	4.25	mg/Kg	J	10	6020A	12/07/2022 1626	MS
Lead	6.52	mg/Kg	J	10	6020A	12/07/2022 1626	MS
Manganese	140	mg/Kg		10	6020A	12/07/2022 1626	MS
Molybdenum	0.895	mg/Kg	J	50	6020A	12/07/2022 1626	MS
Nickel	ND	mg/Kg	U	50	6020A	12/07/2022 1626	MS
Selenium	37.4	mg/Kg	J	50	6020A	12/07/2022 1626	MS
Silver	ND	mg/Kg	U	10	6020A	12/07/2022 1626	MS
Thallium	ND	mg/Kg	U	100	6020A	12/07/2022 1626	MS
Uranium	230	mg/Kg		10	6020A	12/07/2022 1626	MS
Vanadium	70	mg/Kg		50	6020A	12/07/2022 1626	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-005
ClientSample ID: QV-M-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/27/2022 9:25:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include elements like Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, Zinc, and Soluble Radium 226/228.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-006
ClientSample ID: QV-H-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/27/2022 12:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	121	pCi/g		0.2	EPA 901.1 Mod.	11/07/2022 1549	WN
Radium 226 Precision (±)	2.8	pCi/g			EPA 901.1 Mod.	11/07/2022 1549	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/07/2022 1633	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/07/2022 1633	MS
Barium	100	mg/Kg		10	6020A	12/07/2022 1633	MS
Beryllium	0.551	mg/Kg	J	10	6020A	12/07/2022 1633	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/07/2022 1633	MS
Chromium	ND	mg/Kg	U	50	6020A	12/07/2022 1633	MS
Cobalt	2.24	mg/Kg	J	50	6020A	12/07/2022 1633	MS
Copper	3.60	mg/Kg	J	10	6020A	12/07/2022 1633	MS
Lead	6.80	mg/Kg	J	10	6020A	12/07/2022 1633	MS
Manganese	150	mg/Kg		10	6020A	12/07/2022 1633	MS
Molybdenum	2.90	mg/Kg	J	50	6020A	12/07/2022 1633	MS
Nickel	5.51	mg/Kg	J	50	6020A	12/07/2022 1633	MS
Selenium	45.7	mg/Kg	J	50	6020A	12/07/2022 1633	MS
Silver	ND	mg/Kg	U	10	6020A	12/07/2022 1633	MS
Thallium	ND	mg/Kg	U	100	6020A	12/07/2022 1633	MS
Uranium	400	mg/Kg		10	6020A	12/07/2022 1633	MS
Vanadium	90	mg/Kg		50	6020A	12/07/2022 1633	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-006
ClientSample ID: QV-H-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/27/2022 12:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
SPLP							
Aluminum	4.8	mg/L		0.1	EPA 200.7	10/27/2022 1408	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1408	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1408	DG
Barium	0.0482	mg/L	J	0.05	EPA 200.7	10/27/2022 1408	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1408	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1408	DG
Chromium	0.00212	mg/L	J	0.01	EPA 200.7	10/27/2022 1408	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1408	DG
Copper	0.00245	mg/L	J	0.01	EPA 200.7	10/27/2022 1408	DG
Iron	2.79	mg/L		0.05	EPA 200.7	10/27/2022 1408	DG
Lead	0.00324	mg/L	J	0.2	EPA 200.7	10/27/2022 1408	DG
Manganese	0.0327	mg/L	J	0.1	EPA 200.7	10/27/2022 1408	DG
Molybdenum	0.00841	mg/L	J	0.01	EPA 200.7	10/27/2022 1408	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1408	DG
Selenium	0.0821	mg/L	J	0.2	EPA 200.7	10/27/2022 1408	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1408	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1408	DG
Uranium	0.38	mg/L		0.05	EPA 200.7	10/27/2022 1408	DG
Vanadium	0.066	mg/L		0.005	EPA 200.7	10/27/2022 1408	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1408	DG
Soluble Radium 226	42.9	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	0.7	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	2.2 J	pCi/L	J	2.4	Ga-Tech	12/25/2022 1447	WN
Soluble Radium 228 Precision (±)	2.3	pCi/L	J		Ga-Tech	12/25/2022 1447	WN
MDC	2.40	pCi/L			Ga-Tech	12/25/2022 1447	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-007
ClientSample ID: CTS-L-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/30/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision.

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, and Vanadium.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-007
ClientSample ID: CTS-L-0-SL-01
COC: WEB
PWS ID:

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

WorkOrder: S2210147
CollectionDate: 8/30/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	17.2	mg/L		0.1	EPA 200.7	10/27/2022 1410	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1410	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1410	DG
Barium	0.11	mg/L		0.05	EPA 200.7	10/27/2022 1410	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1410	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1410	DG
Chromium	0.01	mg/L		0.01	EPA 200.7	10/27/2022 1410	DG
Cobalt	0.00238	mg/L	J	0.01	EPA 200.7	10/27/2022 1410	DG
Copper	0.00500	mg/L	J	0.01	EPA 200.7	10/27/2022 1410	DG
Iron	7.85	mg/L		0.05	EPA 200.7	10/27/2022 1410	DG
Lead	0.00187	mg/L	J	0.2	EPA 200.7	10/27/2022 1410	DG
Manganese	0.0922	mg/L	J	0.1	EPA 200.7	10/27/2022 1410	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1410	DG
Nickel	0.00221	mg/L	J	0.02	EPA 200.7	10/27/2022 1410	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1410	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1410	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1410	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1410	DG
Vanadium	0.093	mg/L		0.005	EPA 200.7	10/27/2022 1410	DG
Zinc	0.0162	mg/L	J	0.2	EPA 200.7	10/27/2022 1410	DG
Soluble Radium 226	4.3	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	0.2	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	2.7 J	pCi/L	J	4.3	Ga-Tech	12/25/2022 1750	WN
Soluble Radium 228 Precision (±)	3.9	pCi/L	J		Ga-Tech	12/25/2022 1750	WN
MDC	4.30	pCi/L			Ga-Tech	12/25/2022 1750	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-008
ClientSample ID: CTS-M-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/30/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	12.7	pCi/g		0.2	EPA 901.1 Mod.	11/07/2022 1724	WN
Radium 226 Precision (±)	0.9	pCi/g			EPA 901.1 Mod.	11/07/2022 1724	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/07/2022 1646	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/07/2022 1646	MS
Barium	270	mg/Kg		10	6020A	12/07/2022 1646	MS
Beryllium	0.731	mg/Kg	J	10	6020A	12/07/2022 1646	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/07/2022 1646	MS
Chromium	ND	mg/Kg	U	50	6020A	12/07/2022 1646	MS
Cobalt	4.60	mg/Kg	J	50	6020A	12/07/2022 1646	MS
Copper	5.65	mg/Kg	J	10	6020A	12/07/2022 1646	MS
Lead	7.77	mg/Kg	J	10	6020A	12/07/2022 1646	MS
Manganese	430	mg/Kg		10	6020A	12/07/2022 1646	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/07/2022 1646	MS
Nickel	11.5	mg/Kg	J	50	6020A	12/07/2022 1646	MS
Selenium	8.27	mg/Kg	J	50	6020A	12/07/2022 1646	MS
Silver	ND	mg/Kg	U	10	6020A	12/07/2022 1646	MS
Thallium	ND	mg/Kg	U	100	6020A	12/07/2022 1646	MS
Uranium	40	mg/Kg		10	6020A	12/07/2022 1646	MS
Vanadium	240	mg/Kg		50	6020A	12/07/2022 1646	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-008
ClientSample ID: CTS-M-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/30/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	5.1	mg/L		0.1	EPA 200.7	10/27/2022 1413	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1413	DG
Arsenic	0.00480	mg/L	J	0.02	EPA 200.7	10/27/2022 1413	DG
Barium	0.0444	mg/L	J	0.05	EPA 200.7	10/27/2022 1413	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1413	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1413	DG
Chromium	0.00329	mg/L	J	0.01	EPA 200.7	10/27/2022 1413	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1413	DG
Copper	0.00267	mg/L	J	0.01	EPA 200.7	10/27/2022 1413	DG
Iron	2.24	mg/L		0.05	EPA 200.7	10/27/2022 1413	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1413	DG
Manganese	0.0225	mg/L	J	0.1	EPA 200.7	10/27/2022 1413	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1413	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1413	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1413	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1413	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1413	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1413	DG
Vanadium	2.00	mg/L		0.005	EPA 200.7	10/27/2022 1413	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1413	DG
Soluble Radium 226	2.5	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	0.2	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	1.8	pCi/L	J	3.4	Ga-Tech	12/25/2022 2054	WN
Soluble Radium 228 Precision (±)	3.3	pCi/L	J		Ga-Tech	12/25/2022 2054	WN
MDC	3.40	pCi/L			Ga-Tech	12/25/2022 2054	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-009
ClientSample ID: CTS-H-0-SL-01
COC: WEB
PWS ID:

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

WorkOrder: S2210147
CollectionDate: 8/30/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	15.0	pCi/g		0.2	EPA 901.1 Mod.	11/07/2022 1755	WN
Radium 226 Precision (±)	1.0	pCi/g			EPA 901.1 Mod.	11/07/2022 1755	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/07/2022 1653	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/07/2022 1653	MS
Barium	240	mg/Kg		10	6020A	12/07/2022 1653	MS
Beryllium	0.721	mg/Kg	J	10	6020A	12/07/2022 1653	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/07/2022 1653	MS
Chromium	ND	mg/Kg	U	50	6020A	12/07/2022 1653	MS
Cobalt	4.72	mg/Kg	J	50	6020A	12/07/2022 1653	MS
Copper	6.18	mg/Kg	J	10	6020A	12/07/2022 1653	MS
Lead	10	mg/Kg		10	6020A	12/07/2022 1653	MS
Manganese	380	mg/Kg		10	6020A	12/07/2022 1653	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/07/2022 1653	MS
Nickel	11.8	mg/Kg	J	50	6020A	12/07/2022 1653	MS
Selenium	ND	mg/Kg	U	50	6020A	12/07/2022 1653	MS
Silver	ND	mg/Kg	U	10	6020A	12/07/2022 1653	MS
Thallium	ND	mg/Kg	U	100	6020A	12/07/2022 1653	MS
Uranium	50	mg/Kg		10	6020A	12/07/2022 1653	MS
Vanadium	280	mg/Kg		50	6020A	12/07/2022 1653	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/10/2023
Report ID: S2210147002
(Replaces S2210147001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-009
ClientSample ID: CTS-H-0-SL-01
COC: WEB
PWS ID:

WorkOrder: S2210147
CollectionDate: 8/30/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
SPLP							
Aluminum	12.6	mg/L		0.1	EPA 200.7	10/27/2022 1420	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1420	DG
Arsenic	0.00528	mg/L	J	0.02	EPA 200.7	10/27/2022 1420	DG
Barium	0.08	mg/L		0.05	EPA 200.7	10/27/2022 1420	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1420	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1420	DG
Chromium	0.00817	mg/L	J	0.01	EPA 200.7	10/27/2022 1420	DG
Cobalt	0.00199	mg/L	J	0.01	EPA 200.7	10/27/2022 1420	DG
Copper	0.00283	mg/L	J	0.01	EPA 200.7	10/27/2022 1420	DG
Iron	5.68	mg/L		0.05	EPA 200.7	10/27/2022 1420	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1420	DG
Manganese	0.0584	mg/L	J	0.1	EPA 200.7	10/27/2022 1420	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1420	DG
Nickel	0.00138	mg/L	J	0.02	EPA 200.7	10/27/2022 1420	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1420	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1420	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1420	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1420	DG
Vanadium	1.88	mg/L		0.005	EPA 200.7	10/27/2022 1420	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1420	DG
Soluble Radium 226	2.3	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	0.2	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	0.4	pCi/L	U	3.6	Ga-Tech	12/25/2022 2357	WN
Soluble Radium 228 Precision (±)	3.2	pCi/L	U		Ga-Tech	12/25/2022 2357	WN
MDC	3.60	pCi/L			Ga-Tech	12/25/2022 2357	WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-010
ClientSample ID: CR-L-4-SY Combined +25/+270
COC: WEB
PWS ID:

Date Reported: 1/10/2023
Report ID: S2210147002
 (Replaces S2210147001)

WorkOrder: S2210147
CollectionDate: 9/6/2022 4:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	1.1	mg/L		0.1	EPA 200.7	10/27/2022 1422	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1422	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1422	DG
Barium	0.00779	mg/L	J	0.05	EPA 200.7	10/27/2022 1422	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1422	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1422	DG
Chromium	0.00545	mg/L	J	0.01	EPA 200.7	10/27/2022 1422	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1422	DG
Copper	0.02	mg/L		0.01	EPA 200.7	10/27/2022 1422	DG
Iron	0.94	mg/L		0.05	EPA 200.7	10/27/2022 1422	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1422	DG
Manganese	0.0105	mg/L	J	0.1	EPA 200.7	10/27/2022 1422	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1422	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1422	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1422	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1422	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1422	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1422	DG
Vanadium	0.047	mg/L		0.005	EPA 200.7	10/27/2022 1422	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1422	DG
Soluble Radium 226	1.5	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	1.8	pCi/L	J	2.2	Ga-Tech	12/26/2022 301	WN
Soluble Radium 228 Precision (±)	2.2	pCi/L	J		Ga-Tech	12/26/2022 301	WN
MDC	2.20	pCi/L			Ga-Tech	12/26/2022 301	WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-011
ClientSample ID: CR-L-8-SY Combined +25/+270
COC: WEB
PWS ID:

Date Reported: 1/10/2023
Report ID: S2210147002
 (Replaces S2210147001)

WorkOrder: S2210147
CollectionDate: 9/7/2022 2:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	0.1	mg/L		0.1	EPA 200.7	10/27/2022 1425	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1425	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1425	DG
Barium	0.00231	mg/L	J	0.05	EPA 200.7	10/27/2022 1425	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1425	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1425	DG
Chromium	0.00234	mg/L	J	0.01	EPA 200.7	10/27/2022 1425	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1425	DG
Copper	0.01	mg/L		0.01	EPA 200.7	10/27/2022 1425	DG
Iron	0.19	mg/L		0.05	EPA 200.7	10/27/2022 1425	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1425	DG
Manganese	0.00426	mg/L	J	0.1	EPA 200.7	10/27/2022 1425	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1425	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1425	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1425	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1425	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1425	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1425	DG
Vanadium	0.026	mg/L		0.005	EPA 200.7	10/27/2022 1425	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1425	DG
Soluble Radium 226	1.4	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	0.3	pCi/L	U	2.3	Ga-Tech	12/26/2022 604	WN
Soluble Radium 228 Precision (±)	1.9	pCi/L	U		Ga-Tech	12/26/2022 604	WN
MDC	2.30	pCi/L			Ga-Tech	12/26/2022 604	WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-012
ClientSample ID: CR-L-30-SY Combined +25/+270
COC: WEB
PWS ID:

Date Reported: 1/10/2023
Report ID: S2210147002
 (Replaces S2210147001)

WorkOrder: S2210147
CollectionDate: 9/8/2022 8:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
SPLP							
Aluminum	0.0590	mg/L	J	0.1	EPA 200.7	10/27/2022 1427	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1427	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1427	DG
Barium	0.00193	mg/L	J	0.05	EPA 200.7	10/27/2022 1427	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1427	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1427	DG
Chromium	0.00238	mg/L	J	0.01	EPA 200.7	10/27/2022 1427	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1427	DG
Copper	0.00838	mg/L	J	0.01	EPA 200.7	10/27/2022 1427	DG
Iron	0.09	mg/L		0.05	EPA 200.7	10/27/2022 1427	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1427	DG
Manganese	0.00210	mg/L	J	0.1	EPA 200.7	10/27/2022 1427	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1427	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1427	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1427	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1427	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1427	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1427	DG
Vanadium	0.019	mg/L		0.005	EPA 200.7	10/27/2022 1427	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1427	DG
Soluble Radium 226	0.8	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	1.1 J	pCi/L	J	2.2	Ga-Tech	12/26/2022 908	WN
Soluble Radium 228 Precision (±)	1.9	pCi/L	J		Ga-Tech	12/26/2022 908	WN
MDC	2.20	pCi/L			Ga-Tech	12/26/2022 908	WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-013
ClientSample ID: CR-M-4-SY Combined +25/+270
COC: WEB
PWS ID:

Date Reported: 1/10/2023
Report ID: S2210147002
 (Replaces S2210147001)

WorkOrder: S2210147
CollectionDate: 9/9/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	1.7	mg/L		0.1	EPA 200.7	10/27/2022 1429	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1429	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1429	DG
Barium	0.0143	mg/L	J	0.05	EPA 200.7	10/27/2022 1429	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1429	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1429	DG
Chromium	0.02	mg/L		0.01	EPA 200.7	10/27/2022 1429	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1429	DG
Copper	0.02	mg/L		0.01	EPA 200.7	10/27/2022 1429	DG
Iron	1.28	mg/L		0.05	EPA 200.7	10/27/2022 1429	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1429	DG
Manganese	0.0177	mg/L	J	0.1	EPA 200.7	10/27/2022 1429	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1429	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1429	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1429	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1429	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1429	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1429	DG
Vanadium	0.041	mg/L		0.005	EPA 200.7	10/27/2022 1429	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1429	DG
Soluble Radium 226	5.9	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 226 Precision (±)	0.3	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1114	WN
Soluble Radium 228	0.3	pCi/L	U	2.3	Ga-Tech	12/31/2022 550	WN
Soluble Radium 228 Precision (±)	1.9	pCi/L	U		Ga-Tech	12/31/2022 550	WN
MDC	2.30	pCi/L			Ga-Tech	12/31/2022 550	WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210147-014
ClientSample ID: CR-M-8-SY Combined +25/+270
COC: WEB
PWS ID:

Date Reported: 1/10/2023
Report ID: S2210147002
 (Replaces S2210147001)

WorkOrder: S2210147
CollectionDate: 9/12/2022 11:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
SPLP							
Aluminum	0.1	mg/L		0.1	EPA 200.7	10/27/2022 1432	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1432	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1432	DG
Barium	0.00269	mg/L	J	0.05	EPA 200.7	10/27/2022 1432	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1432	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1432	DG
Chromium	0.00521	mg/L	J	0.01	EPA 200.7	10/27/2022 1432	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1432	DG
Copper	0.01	mg/L		0.01	EPA 200.7	10/27/2022 1432	DG
Iron	0.12	mg/L		0.05	EPA 200.7	10/27/2022 1432	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1432	DG
Manganese	0.00297	mg/L	J	0.1	EPA 200.7	10/27/2022 1432	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/27/2022 1432	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	10/27/2022 1432	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1432	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1432	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1432	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/27/2022 1432	DG
Vanadium	0.023	mg/L		0.005	EPA 200.7	10/27/2022 1432	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/27/2022 1432	DG
Soluble Radium 226	5.3	pCi/L		0.3	SM 7500 Ra-B	12/23/2022 1320	WN
Soluble Radium 226 Precision (±)	0.3	pCi/L			SM 7500 Ra-B	12/23/2022 1320	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/23/2022 1320	WN
Soluble Radium 228	-1.9	pCi/L	U	2.4	Ga-Tech	12/31/2022 853	WN
Soluble Radium 228 Precision (±)	1.6	pCi/L	U		Ga-Tech	12/31/2022 853	WN
MDC	2.40	pCi/L			Ga-Tech	12/31/2022 853	WN

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: EPA SM 7500 Ra-B, GA-TECH
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Aqueous
TYPES OF ANALYSES: Alpha Scintillation (Radium-226/228 SPLP Soluble)
DATA VALIDATION DATE: January 23, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2210162
SAMPLING DATE(S): September 13 – October 2, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Ra 226</u> <u>(SPLP Soluble)</u>	<u>Ra 228</u> <u>(SPLP Soluble)</u>
CR-M-30-SY Combined +25/+270	2210162-001	X	X
CR-H-4-SY Combined +25/+270	2210162-002	X	X
CR-H-8-SY Combined +25/+270-01	2210162-003	X	X
CR-H-8-SY Combined +25/+270-02	2210162-004	X	X
CR-H-30-SY Combined +25/+270	2210162-005	X	X
QV-L-4-SY Combined +25/+270	2210162-006	X	X
QV-L-8-SY Combined +25/+270	2210162-007	X	X
QV-L-30-SY Combined +25/+270	2210162-008	X	X
QV-M-4-SY Combined +25/+270	2210162-009	X	X
QV-M-8-SY Combined +25/+270	2210162-010	X	X
QV-M-30-SY Combined +25/+270	2210162-011	X	X
QV-H-4-SY Combined +25/+270	2210162-012	X	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2210162 - Radiochemistry

Alpha Scintillation –Radium-226 and Radium-228 SPLP Soluble

SUMMARY

I.) General:

The laboratory has cited methods SM 7500 Ra-B and GA-TECH for Alpha Scintillation

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-226	LCS	4966a	29-7	3/9/24
	Radium-228	LCS	4339b	29-7	3/9/24

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable

standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the total Radium-226 and the dissolved and suspended fractions of Radium-226/228 in the SDG.

Dissolved Radium-228 (0.914 pCi/l) was detected in the MB. The only Dissolved Radium-228 results associated with the Radium-228 blank were non-detected and no action was taken based on this blank.

The following Dissolved Radium-228 results were qualified due to elevated MB levels:

- Dissolved Radium-228 in samples CR-M-30-SY Combined +25/+270, CR-H-8-SY Combined +25/+270-01, CR-H-30-SY Combined +25/+270, QV-L-4-SY Combined +25/+270, QV-L-8-SY Combined +25/+270, QV-L-30-SY Combined +25/+270, QV-M-4-SY Combined +25/+270, QV-M-8-SY Combined +25/+270, and QV-H-4-SY Combined +25/+270 were qualified as estimated and undetected “UJ” for having a normalized absolute difference of less than 2.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as “UJ”. When between 2 and 3, results are qualified “J”. The Radium-228 and Radium-226 results were demonstrated to be significantly different (NAD > 3) and did not require qualification.

VII.) Laboratory Control Sample (LCS):

LCS/LCSD samples were analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery and precision. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on the LCS/LCSD. No action was taken.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was not performed on samples associated with this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Alpha Scintillation analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results. Several Radium-228 Dissolved results were reported at values less than the MDC. However, all these results were qualified as estimated and undetected "UJ" due to MB exceedances and no action was taken based on the RDL.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were reported for the following:

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> (pCi/g)	<u>Sample Uncertainty</u> (pCi/g)	<u>Required MDC</u> (pCi/g)
QV-M-30-SY Combined +25/+270	Radium-228	-0.2	2.3	2.7

The result did not have an absolute value greater than the 2σ TPU. No action was needed.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
CR-M-30-SY Combined +25/+270 (Dissolved)	2210162-001	Alpha Scint	Radium-228	UJ	Method Blank
CR-H-8-SY Combined +25/+270-01 (Dissolved)	2210162-003		Radium-228	UJ	Method Blank
CR-H-30-SY Combined +25/+270 (Dissolved)	2210162-005		Radium-228	UJ	Method Blank
QV-L-4-SY Combined +25/+270 (Dissolved)	2210162-006		Radium-228	UJ	Method Blank
QV-L-8-SY Combined +25/+270 (Dissolved)	2210162-007		Radium-228	UJ	Method Blank
QV-L-30-SY Combined +25/+270 (Dissolved)	2210162-008		Radium-228	UJ	Method Blank
QV-M-4-SY Combined +25/+270 (Dissolved)	2210162-009		Radium-228	UJ	Method Blank
QV-M-8-SY Combined +25/+270 (Dissolved)	2210162-010		Radium-228	UJ	Method Blank
QV-H-4-SY Combined +25/+270 (Dissolved)	2210162-012		Radium-228	UJ	Method Blank



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-001
ClientSample ID: CR-M-30-SY Combined +25/+270
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 9/13/2022 3:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analytes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include various elements like Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, Zinc, and Soluble Radium 226/228.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-002
ClientSample ID: CR-H-4-SY Combined +25/+270
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 9/15/2022 3:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include elements like Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, Zinc, and Soluble Radium 226/228.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-003
ClientSample ID: CR-H-8-SY Combined +25/+270-01
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 9/17/2022 4:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	1.4	mg/L		0.1	EPA 200.7	10/20/2022 1002	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1002	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1002	DG
Barium	0.0162	mg/L	J	0.05	EPA 200.7	10/20/2022 1002	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1002	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1002	DG
Chromium	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1002	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1002	DG
Copper	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1002	DG
Iron	0.79	mg/L		0.05	EPA 200.7	10/20/2022 1002	DG
Lead	0.0140	mg/L	J	0.2	EPA 200.7	10/20/2022 1002	DG
Manganese	0.0149	mg/L	J	0.1	EPA 200.7	10/20/2022 1002	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1002	DG
Nickel	0.00388	mg/L	J	0.02	EPA 200.7	10/20/2022 1002	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1002	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1002	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1002	DG
Uranium	0.0300	mg/L	J	0.05	EPA 200.7	10/20/2022 1002	DG
Vanadium	0.017	mg/L		0.005	EPA 200.7	10/20/2022 1002	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1002	DG
Soluble Radium 226	9.7	pCi/L		0.2	SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 226 Precision (±)	0.4	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 228	1.4	UJ pCi/L	J	2.5	Ga-Tech	12/31/2022 1803	WN
Soluble Radium 228 Precision (±)	2.2	pCi/L	J		Ga-Tech	12/31/2022 1803	WN
MDC	2.50	pCi/L			Ga-Tech	12/31/2022 1803	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-004
ClientSample ID: CR-H-8-SY Combined +25/+270-02
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 9/17/2022 4:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analytes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include various elements like Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, Zinc, and Soluble Radium 226/228.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-005
ClientSample ID: CR-H-30-SY Combined +25/+270
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 9/19/2022 11:40:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	0.8	mg/L		0.1	EPA 200.7	10/20/2022 1007	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1007	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1007	DG
Barium	0.0118	mg/L	J	0.05	EPA 200.7	10/20/2022 1007	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1007	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1007	DG
Chromium	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1007	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1007	DG
Copper	0.01	mg/L		0.01	EPA 200.7	10/20/2022 1007	DG
Iron	0.33	mg/L		0.05	EPA 200.7	10/20/2022 1007	DG
Lead	0.00650	mg/L	J	0.2	EPA 200.7	10/20/2022 1007	DG
Manganese	0.00786	mg/L	J	0.1	EPA 200.7	10/20/2022 1007	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1007	DG
Nickel	0.00339	mg/L	J	0.02	EPA 200.7	10/20/2022 1007	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1007	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1007	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1007	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1007	DG
Vanadium	0.010	mg/L		0.005	EPA 200.7	10/20/2022 1007	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1007	DG
Soluble Radium 226	5.6	pCi/L		0.2	SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 226 Precision (±)	0.3	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 228	1.5	pCi/L	J	2.6	Ga-Tech	01/01/2023 010	WN
Soluble Radium 228 Precision (±)	2.4	pCi/L	J		Ga-Tech	01/01/2023 010	WN
MDC	2.60	pCi/L			Ga-Tech	01/01/2023 010	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-006
ClientSample ID: QV-L-4-SY Combined +25/+270
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 9/20/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	3.8	mg/L		0.1	EPA 200.7	10/20/2022 1009	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1009	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1009	DG
Barium	0.0187	mg/L	J	0.05	EPA 200.7	10/20/2022 1009	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1009	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1009	DG
Chromium	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1009	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1009	DG
Copper	0.03	mg/L		0.01	EPA 200.7	10/20/2022 1009	DG
Iron	2.69	mg/L		0.05	EPA 200.7	10/20/2022 1009	DG
Lead	0.00283	mg/L	J	0.2	EPA 200.7	10/20/2022 1009	DG
Manganese	0.0367	mg/L	J	0.1	EPA 200.7	10/20/2022 1009	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1009	DG
Nickel	0.00340	mg/L	J	0.02	EPA 200.7	10/20/2022 1009	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1009	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1009	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1009	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1009	DG
Vanadium	0.032	mg/L		0.005	EPA 200.7	10/20/2022 1009	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1009	DG
Soluble Radium 226	2.8	pCi/L		0.2	SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 226 Precision (±)	0.2	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 228	1.6 UJ	pCi/L	J	2.6	Ga-Tech	01/01/2023 313	WN
Soluble Radium 228 Precision (±)	2.4	pCi/L	J		Ga-Tech	01/01/2023 313	WN
MDC	2.60	pCi/L			Ga-Tech	01/01/2023 313	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-007
ClientSample ID: QV-L-8-SY Combined +25/+270
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 9/28/2022 1:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
SPLP							
Aluminum	2.4	mg/L		0.1	EPA 200.7	10/20/2022 1016	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1016	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1016	DG
Barium	0.0165	mg/L	J	0.05	EPA 200.7	10/20/2022 1016	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1016	DG
Cadmium	0.00016	mg/L	J	0.05	EPA 200.7	10/20/2022 1016	DG
Chromium	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1016	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1016	DG
Copper	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1016	DG
Iron	1.94	mg/L		0.05	EPA 200.7	10/20/2022 1016	DG
Lead	0.00807	mg/L	J	0.2	EPA 200.7	10/20/2022 1016	DG
Manganese	0.0292	mg/L	J	0.1	EPA 200.7	10/20/2022 1016	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1016	DG
Nickel	0.00628	mg/L	J	0.02	EPA 200.7	10/20/2022 1016	DG
Selenium	0.00465	mg/L	J	0.2	EPA 200.7	10/20/2022 1016	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1016	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1016	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1016	DG
Vanadium	0.063	mg/L		0.005	EPA 200.7	10/20/2022 1016	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1016	DG
Soluble Radium 226	3.3	pCi/L		0.2	SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 226 Precision (±)	0.2	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 228	1.6	UJ pCi/L	J	2.6	Ga-Tech	01/01/2023 616	WN
Soluble Radium 228 Precision (±)	2.4	pCi/L	J		Ga-Tech	01/01/2023 616	WN
MDC	2.60	pCi/L			Ga-Tech	01/01/2023 616	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-008
ClientSample ID: QV-L-30-SY Combined +25/+270
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 9/29/2022 8:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP						
Aluminum	0.9	mg/L		0.1	EPA 200.7	10/20/2022 1018 DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1018 DG
Arsenic	0.00193	mg/L	J	0.02	EPA 200.7	10/20/2022 1018 DG
Barium	0.0115	mg/L	J	0.05	EPA 200.7	10/20/2022 1018 DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1018 DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1018 DG
Chromium	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1018 DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1018 DG
Copper	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1018 DG
Iron	0.71	mg/L		0.05	EPA 200.7	10/20/2022 1018 DG
Lead	0.00548	mg/L	J	0.2	EPA 200.7	10/20/2022 1018 DG
Manganese	0.0137	mg/L	J	0.1	EPA 200.7	10/20/2022 1018 DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1018 DG
Nickel	0.00431	mg/L	J	0.02	EPA 200.7	10/20/2022 1018 DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1018 DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1018 DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1018 DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1018 DG
Vanadium	0.011	mg/L		0.005	EPA 200.7	10/20/2022 1018 DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1018 DG
Soluble Radium 226	1.4	pCi/L		0.2	SM 7500 Ra-B	12/27/2022 1109 WN
Soluble Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	12/27/2022 1109 WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/27/2022 1109 WN
Soluble Radium 228	2.1	pCi/L	J	2.3	Ga-Tech	01/01/2023 919 WN
Soluble Radium 228 Precision (±)	2.1	pCi/L	J		Ga-Tech	01/01/2023 919 WN
MDC	2.30	pCi/L			Ga-Tech	01/01/2023 919 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-009
ClientSample ID: QV-M-4-SY Combined +25/+270
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 9/30/2022 12:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	2.1	mg/L		0.1	EPA 200.7	10/20/2022 1020	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1020	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1020	DG
Barium	0.0167	mg/L	J	0.05	EPA 200.7	10/20/2022 1020	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1020	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1020	DG
Chromium	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1020	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1020	DG
Copper	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1020	DG
Iron	1.35	mg/L		0.05	EPA 200.7	10/20/2022 1020	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1020	DG
Manganese	0.0289	mg/L	J	0.1	EPA 200.7	10/20/2022 1020	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1020	DG
Nickel	0.00334	mg/L	J	0.02	EPA 200.7	10/20/2022 1020	DG
Selenium	0.00768	mg/L	J	0.2	EPA 200.7	10/20/2022 1020	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1020	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1020	DG
Uranium	0.0290	mg/L	J	0.05	EPA 200.7	10/20/2022 1020	DG
Vanadium	0.016	mg/L		0.005	EPA 200.7	10/20/2022 1020	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1020	DG
Soluble Radium 226	5.9	pCi/L		0.2	SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 226 Precision (±)	0.3	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 228	0.9	pCi/L	UJ	2.3	Ga-Tech	01/01/2023 1223	WN
Soluble Radium 228 Precision (±)	2.1	pCi/L	J		Ga-Tech	01/01/2023 1223	WN
MDC	2.30	pCi/L			Ga-Tech	01/01/2023 1223	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-010
ClientSample ID: QV-M-8-SY Combined +25/+270
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 9/30/2022 9:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
SPLP							
Aluminum	1.4	mg/L		0.1	EPA 200.7	10/20/2022 1022	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1022	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1022	DG
Barium	0.0139	mg/L	J	0.05	EPA 200.7	10/20/2022 1022	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	10/20/2022 1022	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1022	DG
Chromium	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1022	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1022	DG
Copper	0.02	mg/L		0.01	EPA 200.7	10/20/2022 1022	DG
Iron	0.93	mg/L		0.05	EPA 200.7	10/20/2022 1022	DG
Lead	0.0101	mg/L	J	0.2	EPA 200.7	10/20/2022 1022	DG
Manganese	0.0198	mg/L	J	0.1	EPA 200.7	10/20/2022 1022	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	10/20/2022 1022	DG
Nickel	0.00565	mg/L	J	0.02	EPA 200.7	10/20/2022 1022	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1022	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1022	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1022	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	10/20/2022 1022	DG
Vanadium	0.008	mg/L		0.005	EPA 200.7	10/20/2022 1022	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	10/20/2022 1022	DG
Soluble Radium 226	4.7	pCi/L		0.2	SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 226 Precision (±)	0.2	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/27/2022 1109	WN
Soluble Radium 228	2.5	pCi/L	J	2.8	Ga-Tech	01/01/2023 1526	WN
Soluble Radium 228 Precision (±)	2.7	pCi/L	J		Ga-Tech	01/01/2023 1526	WN
MDC	2.80	pCi/L			Ga-Tech	01/01/2023 1526	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-011
ClientSample ID: QV-M-30-SY Combined +25/+270
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 10/1/2022 6:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analytes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include various elements like Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, Zinc, and Radium isotopes.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/11/2023
Report ID: S2210162001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210162-012
ClientSample ID: QV-H-4-SY Combined +25/+270
COC: Web
PWS ID:

WorkOrder: S2210162
CollectionDate: 10/2/2022 5:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include elements like Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, Zinc, and Soluble Radium 226/228.

VALIDATA

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(770) 232-0130

(770) 232-5082 (Fax)

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DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: Standard Method 7500 Ra B
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Aqueous
TYPES OF ANALYSES: Alpha Scintillation (Radium-226, Radium-228)
DATA VALIDATION DATE: January 21, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2210167
SAMPLING DATE(S): October 5-6, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226/228</u>	
		<u>Dissolved</u>	<u>Soluble</u>
CTS-L-4-WT	2210167-001	X	X
CTS-L-8-WT	2210167-002	X	X
CTS-L-30-WT	2210167-003	X	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2210167 - Radiochemistry

Alpha Scintillation –Radium-226, Radium-228

SUMMARY

I.) General:

The laboratory has cited analytical SM 7500 Ra B for the Alpha Scintillation analyses.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-228	LCS	4339b	29-7	03-09-2024
	Radium-226	LCS	4966a	29-7	03-09-2024

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the dissolved and suspended fractions of the SDG. All MB results were non-detected and no action was taken.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as "UJ". When between 2 and 3, results are qualified "J". The Radium-228 and Radium-226 results were demonstrated to be significantly different ($NAD > 3$) and did not require qualification.

VII.) Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS):

An LCS/LCSD was analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on the LCS/LCSD.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was performed on a sample that was not associated with this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Alpha Scintillation analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results.

The laboratory identified the following sample results as tentatively identified at concentrations between the sample MDC and the required MDC. Consequently, the following result was qualified as estimated (J):

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample MDC</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
CTS-L-30-WT (Dissolved)	Radium-228	2.3	4.5	1.0
CTS-L-30-WT (Suspended)	Radium-228	1.0	4.1	1.0

The laboratory MDCs were higher than the indicated MDCs in Table A.11 of the Project Work Plan. No action was taken.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were reported for the following:

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample Uncertainty</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
CTS-L-8-WT	Radium-228 (Dissolved)	-0.7	1.6	1.0

The result does not have an absolute value greater than the 2σ TPU. No action was needed.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
CTS-L-30-WT (Dissolved)	2210167-001	Alpha Scint	Radium-228	J	Result tentatively quantitated
CTS-L-30-WT (Suspended)	2210167-001		Radium-228	J	Result tentatively quantitated



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/6/2022
Report ID: S2210167001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210167-001
ClientSample ID: CTS-L-4-WT
COC: 196825
PWS ID:

WorkOrder: S2210167
CollectionDate: 10/5/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc

Radionuclides - Dissolved

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Radium 226, Radium 226 Precision (±), Radium 226 MDC, Radium 228, Radium 228 Precision (±), Radium 228 MDC, Radium 228 MDC



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/6/2022
Report ID: S2210167001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210167-001
ClientSample ID: CTS-L-4-WT
COC: 196825
PWS ID:

WorkOrder: S2210167
CollectionDate: 10/5/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Suspended

Radium 226	1.5	pCi/L		0.2	SM 7500 Ra-B	11/28/2022 1357 WN
Radium 226 (Suspended) Precision (±)	0.1	pCi/L			SM 7500 Ra-B	11/28/2022 1357 WN
Radium 228	0.0	pCi/L	U	1	Ga-Tech	11/24/2022 753 WN
Radium 228 Precision (±)	5.0	pCi/L	U		Ga-Tech	11/24/2022 753 WN

Radionuclides - Total

Total Radium 226	6.9	pCi/L		0.2	Calculation	12/05/2022 1314 WN
Total Radium 226 Precision (±)	0.4	pCi/L			Calculation	12/05/2022 1314 WN
Radium 228	0.0	pCi/L	U	5.10	Ga-Tech	11/24/2022 753 WN
Radium 228 Precision (±)	5.0	pCi/L	U		Ga-Tech	11/24/2022 753 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/6/2022
Report ID: S2210167001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210167-002
ClientSample ID: CTS-L-8-WT
COC: 196825
PWS ID:

WorkOrder: S2210167
CollectionDate: 10/5/2022 4:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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General Parameters

Total Dissolved Solids (180)	970	mg/L		10	SM 2540	10/12/2022 909 JMS
Total Suspended Solids	48	mg/L		5	SM 2540	10/12/2022 908 AB

Metals - Total

Aluminum	2.0	mg/L		0.1	6010C	10/18/2022 1155 DG
Antimony	0.000579	mg/L	J	0.005	6020A	10/18/2022 2259 MS
Arsenic	0.009	mg/L		0.005	6020A	10/18/2022 2259 MS
Barium	0.188	mg/L		0.005	6020A	10/18/2022 2259 MS
Beryllium	ND	mg/L	U	0.001	6010C	10/18/2022 1155 DG
Cadmium	0.0000613	mg/L	J	0.002	6020A	10/18/2022 2259 MS
Calcium	49.3	mg/L		0.2	6010C	10/18/2022 1155 DG
Chromium	0.00453	mg/L	J	0.005	6010C	10/18/2022 1155 DG
Cobalt	ND	mg/L	U	0.01	6010C	10/18/2022 1155 DG
Copper	0.09	mg/L		0.01	6020A	10/18/2022 2259 MS
Iron	1.64	mg/L		0.05	6010C	10/18/2022 1155 DG
Lead	0.002	mg/L		0.001	6020A	10/18/2022 2259 MS
Magnesium	9	mg/L		2	6010C	10/18/2022 1155 DG
Manganese	0.106	mg/L		0.005	6010C	10/18/2022 1155 DG
Molybdenum	0.0175	mg/L	J	0.02	6020A	10/18/2022 2259 MS
Nickel	0.00747	mg/L	J	0.01	6010C	10/18/2022 1155 DG
Selenium	0.00165	mg/L	J	0.005	6020A	10/18/2022 2259 MS
Silver	ND	mg/L	U	0.003	6020A	10/18/2022 2259 MS
Sodium	290	mg/L		2	6010C	10/18/2022 1155 DG
Thallium	ND	mg/L	U	0.001	6020A	10/18/2022 2259 MS
Thorium	ND	mg/L	U	0.1	6010C	10/18/2022 1155 DG
Uranium	0.087	mg/L		0.001	6020A	10/18/2022 2259 MS
Vanadium	0.07	mg/L		0.02	6020A	10/18/2022 2259 MS
Zinc	0.0169	mg/L	J	0.02	6010C	10/18/2022 1155 DG

Radionuclides - Dissolved

Radium 226	9.4	pCi/L		0.2	SM 7500 Ra-B	11/11/2022 834 WN
Radium 226 Precision (±)	0.4	pCi/L			SM 7500 Ra-B	11/11/2022 834 WN
Radium 226 MDC	0.20	pCi/L			SM 7500 Ra-B	11/11/2022 834 WN
Radium 228	-0.7	pCi/L	U	2.2	Ga-Tech	11/17/2022 955 WN
Radium 228 Precision (±)	1.6	pCi/L	U		Ga-Tech	11/17/2022 955 WN
Radium 228 MDC	4.70	pCi/L			Ga-Tech	11/24/2022 1057 WN
Radium 228 MDC	2.20	pCi/L			Ga-Tech	11/17/2022 955 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/6/2022
Report ID: S2210167001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210167-002
ClientSample ID: CTS-L-8-WT
COC: 196825
PWS ID:

WorkOrder: S2210167
CollectionDate: 10/5/2022 4:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Radionuclides - Suspended							
Radium 226	3.7	pCi/L		0.2	SM 7500 Ra-B	11/28/2022 1340	WN
Radium 226 (Suspended) Precision (±)	0.2	pCi/L			SM 7500 Ra-B	11/28/2022 1340	WN
Radium 228	2.3	pCi/L	J	4.7	Ga-Tech	11/24/2022 1057	WN
Radium 228 Precision (±)	4.2	pCi/L	J		Ga-Tech	11/24/2022 1057	WN
Radionuclides - Total							
Total Radium 226	13.1	pCi/L		0.2	Calculation	12/05/2022 1314	WN
Total Radium 226 Precision (±)	0.6	pCi/L			Calculation	12/05/2022 1314	WN
Radium 228	2.3	pCi/L	J	4.7	Ga-Tech	11/24/2022 1057	WN
Radium 228 Precision (±)	4.2	pCi/L	J		Ga-Tech	11/24/2022 1057	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/6/2022
Report ID: S2210167001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210167-003
ClientSample ID: CTS-L-30-WT
COC: 196825
PWS ID:

WorkOrder: S2210167
CollectionDate: 10/6/2022 4:41:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Dissolved

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/6/2022
Report ID: S2210167001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210167-003
ClientSample ID: CTS-L-30-WT
COC: 196825
PWS ID:

WorkOrder: S2210167
CollectionDate: 10/6/2022 4:41:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Metals - Total

Table listing various metals (Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc) with their respective results, units, and quality indicators.

Radionuclides - Dissolved

Table listing dissolved radionuclides (Radium 226, Radium 228) with their results, units, and quality indicators.

Radionuclides - Suspended

Table listing suspended radionuclides (Radium 226, Radium 228) with their results, units, and quality indicators.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/6/2022
Report ID: S2210167001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210167-003
ClientSample ID: CTS-L-30-WT
COC: 196825
PWS ID:

WorkOrder: S2210167
CollectionDate: 10/6/2022 4:41:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Total Radium 226	3.8	pCi/L		0.2	Calculation	12/05/2022 1314 WN
Total Radium 226 Precision (±)	0.3	pCi/L			Calculation	12/05/2022 1314 WN
Radium 228	3.3	pCi/L	J	4.5	Ga-Tech	11/24/2022 1400 WN
Radium 228 Precision (±)	4.0	pCi/L	J		Ga-Tech	11/24/2022 1400 WN

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: Standard Method 7500 Ra B
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment

SAMPLE MATRIX: Aqueous
TYPES OF ANALYSES: Alpha Scintillation (Radium-226, Radium-228)
DATA VALIDATION DATE: January 21, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2210327
SAMPLING DATE(S): October 13, and 17, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226/228</u>	
		<u>Dissolved</u>	<u>Soluble</u>
CTS-H-8-WT	2210327-001	X	X
CTS-H-30-WT	2210327-002	X	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2210327 - Radiochemistry

Alpha Scintillation –Radium-226, Radium-228

SUMMARY

I.) General:

The laboratory has cited analytical SM 7500 Ra B for the Alpha Scintillation analyses.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-228	LCS	4339b	29-7	03-09-2024
	Radium-226	LCS	4966a	29-7	03-09-2024

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the dissolved and suspended fractions of the SDG. All MB results were non-detected and no action was taken.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as "UJ". When between 2 and 3, results are qualified "J". The Radium-228 and Radium-226 results were demonstrated to be significantly different ($NAD > 3$) and did not require qualification.

VII.) Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS):

An LCS/LCSD was analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on the LCS/LCSD.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was performed on a sample that was not associated with this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Alpha Scintillation analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results.

The laboratory identified the following sample results as tentatively identified at concentrations between the sample MDC and the required MDC. Consequently, the following result was qualified as estimated (J):

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample MDC</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
CTS-H-8-WT (Suspended)	Radium-228	1.6	4.2	1.0
CTS-H-30-WT (Dissolved)	Radium-228	1.1	2.4	1.0
CTS-H-30-WT (Suspended)	Radium-228	2.6	3.3	1.0

The laboratory MDCs were higher than the indicated MDCs in Table A.11 of the Project Work Plan. No action was taken.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were reported for the following:

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample Uncertainty</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
CTS-H-8-WT	Radium-228 (Dissolved)	-1.1	1.6	1.0

The result does not have an absolute value greater than the 2σ TPU. No action was needed.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were $< 80\%$ of the sample result for values $> 2X$ the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
CTS-H-8-WT (Suspended)	2210327-001	Alpha Scint	Radium-228	J	Result tentatively quantitated
CTS-H-30-WT (Dissolved)	2210327-002		Radium-228	J	Result tentatively quantitated
CTS-H-30-WT (Suspended)	2210327-003		Radium-228	J	Result tentatively quantitated



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/29/2022
Report ID: S2210327001

ProjectName: RAES T033/203G5 440033.03.01
Lab ID: S2210327-001
ClientSample ID: CTS-H-8-WT
COC: 196920
PWS ID:

WorkOrder: S2210327
CollectionDate: 10/13/2022 1:14:00 PM
DateReceived: 10/20/2022 12:44:00 PM
FieldSampler: MO
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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General Parameters

Total Dissolved Solids (180)	1000	mg/L		10	SM 2540	10/20/2022 1719	JMS
Total Suspended Solids	49	mg/L		5	SM 2540	10/20/2022 1606	KAT

Metals - Dissolved

Aluminum	ND	mg/L	U	0.1	6010C	10/26/2022 1246	DG
Antimony	0.000529	mg/L	J	0.005	6020A	10/21/2022 2158	MS
Arsenic	0.024	mg/L		0.005	6020A	10/21/2022 2158	MS
Barium	0.0973	mg/L	J	0.1	6020A	10/21/2022 2158	MS
Beryllium	ND	mg/L	U	0.001	6010C	10/26/2022 1246	DG
Cadmium	ND	mg/L	U	0.002	6020A	10/21/2022 2158	MS
Calcium	45.8	mg/L		0.5	6010C	10/26/2022 1246	DG
Chromium	0.00166	mg/L	J	0.01	6010C	10/26/2022 1246	DG
Cobalt	ND	mg/L	U	0.01	6010C	10/26/2022 1246	DG
Copper	0.02	mg/L		0.01	6020A	10/21/2022 2158	MS
Iron	ND	mg/L	U	0.05	6010C	10/26/2022 1246	DG
Lead	ND	mg/L	U	0.001	6020A	10/21/2022 2158	MS
Magnesium	7.8	mg/L		0.5	6010C	10/26/2022 1246	DG
Manganese	ND	mg/L	U	0.01	6010C	10/26/2022 1246	DG
Molybdenum	0.02	mg/L		0.02	6020A	10/21/2022 2158	MS
Nickel	0.00190	mg/L	J	0.01	6010C	10/26/2022 1246	DG
Selenium	0.00423	mg/L	J	0.005	6020A	10/21/2022 2158	MS
Silver	ND	mg/L	U	0.003	6020A	10/21/2022 2158	MS
Sodium	305	mg/L		1	6010C	10/26/2022 1246	DG
Thallium	ND	mg/L	U	0.001	6020A	10/21/2022 2158	MS
Thorium	ND	mg/L	U	0.1	6010C	10/26/2022 1246	DG
Uranium	0.497	mg/L		0.0003	6020A	10/21/2022 2158	MS
Vanadium	3.26	mg/L		0.02	6020A	10/21/2022 2158	MS
Zinc	ND	mg/L	U	0.05	6010C	10/26/2022 1246	DG



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/29/2022
Report ID: S2210327001

ProjectName: RAES T033/203G5 440033.03.01
Lab ID: S2210327-001
ClientSample ID: CTS-H-8-WT
COC: 196920
PWS ID:

WorkOrder: S2210327
CollectionDate: 10/13/2022 1:14:00 PM
DateReceived: 10/20/2022 12:44:00 PM
FieldSampler: MO
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Metals - Total

Table listing various metals (Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc) with their respective results, units, and quality indicators.

Radionuclides - Dissolved

Table listing radionuclides (Radium 226, Radium 228) with their dissolved results, units, and quality indicators.

Radionuclides - Suspended

Table listing radionuclides (Radium 226, Radium 228) with their suspended results, units, and quality indicators.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/29/2022
Report ID: S2210327001

ProjectName: RAES T033/203G5 440033.03.01
Lab ID: S2210327-001
ClientSample ID: CTS-H-8-WT
COC: 196920
PWS ID:

WorkOrder: S2210327
CollectionDate: 10/13/2022 1:14:00 PM
DateReceived: 10/20/2022 12:44:00 PM
FieldSampler: MO
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Total Radium 226	8.5	pCi/L		0.2	Calculation	12/27/2022 1324 WN
Total Radium 226 Precision (±)	0.6	pCi/L			Calculation	12/27/2022 1324 WN
Radium 228	1.6	pCi/L	J	4.2	Ga-Tech	12/24/2022 509 WN
Radium 228 Precision (±)	3.6	pCi/L	J		Ga-Tech	12/24/2022 509 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/29/2022
Report ID: S2210327001

ProjectName: RAES T033/203G5 440033.03.01
Lab ID: S2210327-002
ClientSample ID: CTS-H-30-WT
COC: 196920
PWS ID:

WorkOrder: S2210327
CollectionDate: 10/17/2022 10:17:00 AM
DateReceived: 10/20/2022 12:44:00 PM
FieldSampler: MO
Matrix: Water

Comments

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init

General Parameters

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Total Dissolved Solids (180), Total Suspended Solids

Metals - Dissolved

Table with 7 columns: Analyzes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/29/2022
Report ID: S2210327001

ProjectName: RAES T033/203G5 440033.03.01
Lab ID: S2210327-002
ClientSample ID: CTS-H-30-WT
COC: 196920
PWS ID:

WorkOrder: S2210327
CollectionDate: 10/17/2022 10:17:00 AM
DateReceived: 10/20/2022 12:44:00 PM
FieldSampler: MO
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Metals - Total

Table listing various metals (Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc) with their respective results, units, and quality indicators.

Radionuclides - Dissolved

Table listing dissolved radionuclides (Radium 226, Radium 228) with their results, units, and quality indicators.

Radionuclides - Suspended

Table listing suspended radionuclides (Radium 226, Radium 228) with their results, units, and quality indicators.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/29/2022
Report ID: S2210327001

ProjectName: RAES T033/203G5 440033.03.01
Lab ID: S2210327-002
ClientSample ID: CTS-H-30-WT
COC: 196920
PWS ID:

WorkOrder: S2210327
CollectionDate: 10/17/2022 10:17:00 AM
DateReceived: 10/20/2022 12:44:00 PM
FieldSampler: MO
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Total Radium 226	7	pCi/L		0.2	Calculation	12/27/2022 1324 WN
Total Radium 226 Precision (±)	0.5	pCi/L			Calculation	12/27/2022 1324 WN
Radium 228	3.7	pCi/L	J	4	Ga-Tech	12/24/2022 813 WN
Radium 228 Precision (±)	3.1	pCi/L	J		Ga-Tech	12/24/2022 813 WN

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: Standard Method 7500 Ra B, ACW10
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Aqueous
TYPES OF ANALYSES: Alpha Scintillation (Radium-226, Thorium-230)
DATA VALIDATION DATE: January 21, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2210450
SAMPLING DATE(S): October 11,13, and 18, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Ra-226/Th-230</u> <u>Dissolved</u>	<u>Ra-226/Th-230</u> <u>Soluble</u>
CR Fractionation Water	2210450-001	X	X
QV Fractionation Water	2210450-002	X	X
CTS Fractionation Water	2210450-002	X	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2210450 - Radiochemistry

Alpha Scintillation –Radium-226, Thorium-230

SUMMARY

I.) General:

The laboratory has cited analytical SM 7500 Ra B for the Alpha Scintillation analyses and ACW10 for the Thorium-230 analyses.

II.) Overall Assessment of Data:

All laboratory data were acceptable with no qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Thorium-230	LCS	02242202A	N/A	N/A
	Radium-226	LCS	4966a	29-7	03-09-2024

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable

standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the dissolved and suspended fractions of the SDG. All MB results were non-detected and no action was taken.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as "UJ". When between 2 and 3, results are qualified "J". The Radium-228 and Radium-226 results were demonstrated to be significantly different ($NAD > 3$) and did not require qualification.

VII.) Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS):

An LCS/LCSD was analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on the LCS/LCSD.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was performed on a sample that was not associated with this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Alpha Scintillation analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were reported for the following:

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample Uncertainty</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
SW-WT-01	Radium-228 (Dissolved)	-1.1	2.0	1.0

The result does not have an absolute value greater than the 2σ TPU. No action was needed.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
None					



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210450001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210450-001
ClientSample ID: CR Fractionation Water
COC: 196921
PWS ID:

WorkOrder: S2210450
CollectionDate: 10/13/2022
DateReceived: 10/27/2022 12:01:00 PM
FieldSampler: AH
Matrix: Water

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Metals - Total

Table listing various metals (Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sodium, Thallium, Thorium, Uranium, Vanadium, Zinc) with their respective results, units, and quality indicators.

Radionuclides - Dissolved

Table listing radionuclides (Radium 226) with results, units, and quality indicators.

Radionuclides - Suspended

Table listing radionuclides (Radium 226) with results, units, and quality indicators.

Radionuclides - Total

Table listing total radionuclides (Total Radium 226, Thorium 230) with results, units, and quality indicators.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210450001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210450-002
ClientSample ID: QV Fractionation Water
COC: 196921
PWS ID:

WorkOrder: S2210450
CollectionDate: 10/11/2022
DateReceived: 10/27/2022 12:01:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Metals - Total

Aluminum	ND	mg/L	U	0.1	6010C	11/07/2022 1154	DG
Antimony	0.000294	mg/L	J	0.005	6020A	11/05/2022 821	MS
Arsenic	0.00211	mg/L	J	0.005	6020A	11/05/2022 821	MS
Barium	0.067	mg/L		0.005	6020A	11/05/2022 821	MS
Beryllium	ND	mg/L	U	0.001	6010C	11/07/2022 1154	DG
Cadmium	ND	mg/L	U	0.002	6020A	11/05/2022 821	MS
Calcium	64.0	mg/L		0.2	6010C	11/07/2022 1154	DG
Chromium	0.00119	mg/L	J	0.005	6010C	11/07/2022 1154	DG
Cobalt	ND	mg/L	U	0.01	6010C	11/07/2022 1154	DG
Copper	0.16	mg/L		0.01	6020A	11/05/2022 821	MS
Iron	0.14	mg/L		0.05	6010C	11/07/2022 1154	DG
Lead	0.000246	mg/L	J	0.001	6020A	11/05/2022 821	MS
Magnesium	20	mg/L		2	6010C	11/07/2022 1154	DG
Manganese	0.022	mg/L		0.005	6010C	11/07/2022 1154	DG
Molybdenum	0.00615	mg/L	J	0.02	6020A	11/05/2022 821	MS
Nickel	ND	mg/L	U	0.01	6010C	11/07/2022 1154	DG
Selenium	0.014	mg/L		0.005	6020A	11/05/2022 821	MS
Silver	ND	mg/L	U	0.003	6020A	11/05/2022 821	MS
Sodium	68	mg/L		2	6010C	11/07/2022 1154	DG
Thallium	ND	mg/L	U	0.001	6020A	11/05/2022 821	MS
Thorium	ND	mg/L	U	0.1	6010C	11/07/2022 1154	DG
Uranium	0.726	mg/L		0.001	6020A	11/05/2022 821	MS
Vanadium	0.00978	mg/L	J	0.02	6020A	11/05/2022 821	MS
Zinc	0.06	mg/L		0.02	6010C	11/07/2022 1154	DG

Radionuclides - Dissolved

Radium 226	19.0	pCi/L		0.2	SM 7500 Ra-B	12/30/2022 1045	WN
Radium 226 Precision (±)	0.5	pCi/L			SM 7500 Ra-B	12/30/2022 1045	WN
Radium 226 MDC	0.20	pCi/L			SM 7500 Ra-B	12/30/2022 1045	WN

Radionuclides - Suspended

Radium 226	1.2	pCi/L		0.2	SM 7500 Ra-B	12/30/2022 1045	WN
Radium 226 (Suspended) Precision (±)	0.1	pCi/L			SM 7500 Ra-B	12/30/2022 1045	WN

Radionuclides - Total

Total Radium 226	20.2	pCi/L		0.2	Calculation	12/30/2022 1312	WN
Total Radium 226 Precision (±)	0.6	pCi/L			Calculation	12/30/2022 1312	WN
Thorium 230	0.8	pCi/L		0.2	ACW10	11/29/2022 742	AEF
Thorium 230 Precision (±)	0.2	pCi/L			ACW10	11/29/2022 742	AEF



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210450001

ProjectName: RAES TO33/103G5440033.03.01
Lab ID: S2210450-003
ClientSample ID: CTS Fractionation Water
COC: 196921
PWS ID:

WorkOrder: S2210450
CollectionDate: 10/18/2022
DateReceived: 10/27/2022 12:01:00 PM
FieldSampler: AH
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Metals - Total

Aluminum	0.6	mg/L		0.1	6010C	11/07/2022 1156	DG
Antimony	0.000288	mg/L	J	0.005	6020A	11/05/2022 828	MS
Arsenic	0.00242	mg/L	J	0.005	6020A	11/05/2022 828	MS
Barium	0.097	mg/L		0.005	6020A	11/05/2022 828	MS
Beryllium	ND	mg/L	U	0.001	6010C	11/07/2022 1156	DG
Cadmium	ND	mg/L	U	0.002	6020A	11/05/2022 828	MS
Calcium	80.0	mg/L		0.2	6010C	11/07/2022 1156	DG
Chromium	0.00126	mg/L	J	0.005	6010C	11/07/2022 1156	DG
Cobalt	ND	mg/L	U	0.01	6010C	11/07/2022 1156	DG
Copper	0.08	mg/L		0.01	6020A	11/05/2022 828	MS
Iron	0.31	mg/L		0.05	6010C	11/07/2022 1156	DG
Lead	0.000607	mg/L	J	0.001	6020A	11/05/2022 828	MS
Magnesium	26	mg/L		2	6010C	11/07/2022 1156	DG
Manganese	0.132	mg/L		0.005	6010C	11/07/2022 1156	DG
Molybdenum	0.00349	mg/L	J	0.02	6020A	11/05/2022 828	MS
Nickel	ND	mg/L	U	0.01	6010C	11/07/2022 1156	DG
Selenium	0.008	mg/L		0.005	6020A	11/05/2022 828	MS
Silver	ND	mg/L	U	0.003	6020A	11/05/2022 828	MS
Sodium	80	mg/L		2	6010C	11/07/2022 1156	DG
Thallium	ND	mg/L	U	0.001	6020A	11/05/2022 828	MS
Thorium	ND	mg/L	U	0.1	6010C	11/07/2022 1156	DG
Uranium	0.039	mg/L		0.001	6020A	11/05/2022 828	MS
Vanadium	0.19	mg/L		0.02	6020A	11/05/2022 828	MS
Zinc	0.03	mg/L		0.02	6010C	11/07/2022 1156	DG

Radionuclides - Dissolved

Radium 226	6.0	pCi/L		0.2	SM 7500 Ra-B	12/30/2022 1045	WN
Radium 226 Precision (±)	0.3	pCi/L			SM 7500 Ra-B	12/30/2022 1045	WN
Radium 226 MDC	0.20	pCi/L			SM 7500 Ra-B	12/30/2022 1045	WN

Radionuclides - Suspended

Radium 226	2.2	pCi/L		0.2	SM 7500 Ra-B	12/30/2022 1045	WN
Radium 226 (Suspended) Precision (±)	0.2	pCi/L			SM 7500 Ra-B	12/30/2022 1045	WN

Radionuclides - Total

Total Radium 226	8.2	pCi/L		0.2	Calculation	12/30/2022 1312	WN
Total Radium 226 Precision (±)	0.5	pCi/L			Calculation	12/30/2022 1312	WN
Thorium 230	1.6	pCi/L		0.2	ACW10	11/29/2022 742	AEF
Thorium 230 Precision (±)	0.3	pCi/L			ACW10	11/29/2022 742	AEF

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 4
ANALYTICAL METHODS: EPA SM 7500 Ra-B, GA-TECH
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Aqueous
TYPES OF ANALYSES: Alpha Scintillation (Radium-226/228 SPLP Soluble)
DATA VALIDATION DATE: January 23, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2210474
SAMPLING DATE(S): October 3-17, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Ra 226</u> <u>(SPLP Soluble)</u>	<u>Ra 228</u> <u>(SPLP Soluble)</u>
CR-M-30-SY Combined +25/+270	2210474-001	X	X
CR-H-4-SY Combined +25/+270	2210474-002	X	X
CR-H-8-SY Combined +25/+270-01	2210474-003	X	X
CR-H-8-SY Combined +25/+270-02	2210474-004	X	X
CR-H-30-SY Combined +25/+270	2210474-005	X	X
QV-L-4-SY Combined +25/+270	2210474-006	X	X
QV-L-8-SY Combined +25/+270	2210474-007	X	X
QV-L-30-SY Combined +25/+270	2210474-008	X	X
QV-M-4-SY Combined +25/+270	2210474-009	X	X
QV-M-8-SY Combined +25/+270	2210474-010	X	X
QV-M-30-SY Combined +25/+270	2210474-011	X	X
QV-H-4-SY Combined +25/+270	2210474-012	X	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2210474 - Radiochemistry

Alpha Scintillation –Radium-226 and Radium-228 SPLP Soluble

SUMMARY

I.) General:

The laboratory has cited methods SM 7500 Ra-B and GA-TECH for Alpha Scintillation

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-226	LCS	4966a	29-7	3/9/24
	Radium-228	LCS	4339b	29-7	3/9/24

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable

standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated the dissolved and suspended fractions of Radium-226/228 in the SDG. All MB results were non-detected and no action was taken.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as "UJ". When between 2 and 3, results are qualified "J". The Radium-228 and Radium-226 results were demonstrated to be significantly different ($NAD > 3$) and did not require qualification.

VII.) Laboratory Control Sample (LCS):

LCS/LCSD samples were analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery and precision. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on the LCS/LCSD. No action was taken.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was not performed on samples associated with this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Alpha Scintillation analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results. Several Radium-228 Dissolved results were reported at values less than the MDC. The laboratory identified the following sample results as tentatively identified at concentrations between the sample MDC and the required MDC. Consequently, the following result was qualified as estimated (J):

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample MDC</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
CTS-L-4-SY Combined +25/270 (Dissolved)	Radium-228	1.4	2.1	1.0
CTS-L-30-SY Combined +25/270 (Dissolved)	Radium-228	1.5	2.5	1.0
CTS-H-30-SY Combined +25/270 (Dissolved)	Radium-228	1.8	2.4	1.0
QV-H-30-SY Combined +25/270-01 (Dissolved)	Radium-228	0.7	2.2	1.0
QV-H-30-SY Combined +25/270-02 (Dissolved)	Radium-228	0.7	2.1	1.0

The laboratory MDCs were higher than the indicated MDCs in Table A.11 of the Project Work Plan. No action was taken.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were reported for the following Dissolved analyses:

<u>Sample Number</u>	<u>Isotope</u>	<u>Sample Result</u> <u>(pCi/g)</u>	<u>Sample Uncertainty</u> <u>(pCi/g)</u>	<u>Required MDC</u> <u>(pCi/g)</u>
CTS-H-8-SY Combined +25/270	Radium-228	-0.8	1.8	1.0
CTS-M-8-SY Combined +25/270	Radium-228	-2.7	1.9	1.0
CTS-M-4-SY Combined +25/270	Radium-228	-0.1	1.9	1.0
CTS-L-8-SY Combined +25/270	Radium-228	-2.1	2.5	1.0

The result did not have an absolute value greater than the 2 σ TPU. No action was needed.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 4 and all observed spectra were consistent with the results reported.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 4 and all recalculated sample results were consistent with reported results.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
CTS-L-4-SY Combined +25/270 (Dissolved)	2210474-001	Alpha Scint	Radium-228	J	Result tentatively quantitated
CTS-L-30-SY Combined +25/270 (Dissolved)	2210474-003		Radium-228	J	Result tentatively quantitated
CTS-H-30-SY Combined +25/270 (Dissolved)	2210474-009		Radium-228	J	Result tentatively quantitated
QV-H-30-SY Combined +25/270-01 (Dissolved)	2210474-011		Radium-228	J	Result tentatively quantitated
QV-H-30-SY Combined +25/270-02 (Dissolved)	2210474-012		Radium-228	J	Result tentatively quantitated



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-001
ClientSample ID: CTS-L-4-SY Combined +25/270
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/5/2022 10:32:00 AM
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
SPLP							
Aluminum	0.4	mg/L		0.1	EPA 200.7	11/17/2022 1532	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1532	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1532	DG
Barium	0.00584	mg/L	J	0.05	EPA 200.7	11/17/2022 1532	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1532	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1532	DG
Chromium	0.00134	mg/L	J	0.01	EPA 200.7	11/17/2022 1532	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1532	DG
Copper	0.02	mg/L		0.01	EPA 200.7	11/17/2022 1532	DG
Iron	0.24	mg/L		0.05	EPA 200.7	11/17/2022 1532	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1532	DG
Manganese	0.00774	mg/L	J	0.1	EPA 200.7	11/17/2022 1532	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1532	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1532	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1532	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1532	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1532	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1532	DG
Vanadium	0.048	mg/L		0.005	EPA 200.7	11/17/2022 1532	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1532	DG
Soluble Radium 226	0.7	pCi/L		0.2	SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 228	1.4 J	pCi/L	J	2.4	Ga-Tech	01/10/2023 416	WN
Soluble Radium 228 Precision (±)	2.1	pCi/L	J		Ga-Tech	01/10/2023 416	WN
MDC	2.40	pCi/L			Ga-Tech	01/10/2023 416	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-002
ClientSample ID: CTS-L-8-SY Combined +25/270
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/6/2022 9:45:00 AM
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analytes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include various elements like Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, Zinc, and Radium isotopes.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-003
ClientSample ID: CTS-L-30-SY Combined +25/270
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/6/2022 1:25:00 PM
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP						
Aluminum	0.0668	mg/L	J	0.1	EPA 200.7	11/17/2022 1548 DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1548 DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1548 DG
Barium	0.00292	mg/L	J	0.05	EPA 200.7	11/17/2022 1548 DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1548 DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1548 DG
Chromium	0.00195	mg/L	J	0.01	EPA 200.7	11/17/2022 1548 DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1548 DG
Copper	0.01	mg/L		0.01	EPA 200.7	11/17/2022 1548 DG
Iron	0.0476	mg/L	J	0.05	EPA 200.7	11/17/2022 1548 DG
Lead	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1548 DG
Manganese	0.00207	mg/L	J	0.1	EPA 200.7	11/17/2022 1548 DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1548 DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1548 DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1548 DG
Silver	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1548 DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1548 DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1548 DG
Vanadium	0.037	mg/L		0.005	EPA 200.7	11/17/2022 1548 DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1548 DG
Soluble Radium 226	0.6	pCi/L		0.2	SM 7500 Ra-B	12/28/2022 1050 WN
Soluble Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	12/28/2022 1050 WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/28/2022 1050 WN
Soluble Radium 228	1.5 J	pCi/L	J	2.7	Ga-Tech	01/10/2023 1023 WN
Soluble Radium 228 Precision (±)	2.5	pCi/L	J		Ga-Tech	01/10/2023 1023 WN
MDC	2.70	pCi/L			Ga-Tech	01/10/2023 1023 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-004
ClientSample ID: CTS-M-4-SY Combined +25/270
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/11/2022 9:30:00 AM
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analytes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include various elements like Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, Zinc, and Radium isotopes.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-005
ClientSample ID: CTS-M-8-SY Combined +25/270
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/11/2022
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	0.2	mg/L		0.1	EPA 200.7	11/17/2022 1553	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1553	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1553	DG
Barium	0.00492	mg/L	J	0.05	EPA 200.7	11/17/2022 1553	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1553	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1553	DG
Chromium	0.00222	mg/L	J	0.01	EPA 200.7	11/17/2022 1553	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1553	DG
Copper	0.00436	mg/L	J	0.01	EPA 200.7	11/17/2022 1553	DG
Iron	0.15	mg/L		0.05	EPA 200.7	11/17/2022 1553	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1553	DG
Manganese	0.00300	mg/L	J	0.1	EPA 200.7	11/17/2022 1553	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1553	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1553	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1553	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1553	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1553	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1553	DG
Vanadium	0.174	mg/L		0.005	EPA 200.7	11/17/2022 1553	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1553	DG
Soluble Radium 226	1.3	pCi/L		0.2	SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 228	-2.7	pCi/L	U	2.3	Ga-Tech	01/10/2023 1629	WN
Soluble Radium 228 Precision (±)	1.9	pCi/L	U		Ga-Tech	01/10/2023 1629	WN
MDC	2.30	pCi/L			Ga-Tech	01/10/2023 1629	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-006
ClientSample ID: CTS-M-30-SY Combined +25/270
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/13/2022 8:00:00 AM
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	0.0912	mg/L	J	0.1	EPA 200.7	11/17/2022 1556	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1556	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1556	DG
Barium	0.00325	mg/L	J	0.05	EPA 200.7	11/17/2022 1556	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1556	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1556	DG
Chromium	0.00150	mg/L	J	0.01	EPA 200.7	11/17/2022 1556	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1556	DG
Copper	0.00334	mg/L	J	0.01	EPA 200.7	11/17/2022 1556	DG
Iron	0.07	mg/L		0.05	EPA 200.7	11/17/2022 1556	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1556	DG
Manganese	0.00168	mg/L	J	0.1	EPA 200.7	11/17/2022 1556	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1556	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1556	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1556	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1556	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1556	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1556	DG
Vanadium	0.106	mg/L		0.005	EPA 200.7	11/17/2022 1556	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1556	DG
Soluble Radium 226	0.6	pCi/L		0.2	SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 228	0.1	pCi/L	U	2.3	Ga-Tech	01/10/2023 1933	WN
Soluble Radium 228 Precision (±)	1.8	pCi/L	U		Ga-Tech	01/10/2023 1933	WN
MDC	2.30	pCi/L			Ga-Tech	01/10/2023 1933	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-007
ClientSample ID: CTS-H-4-SY Combined +25/270
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/13/2022 11:30:00 AM
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analytes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include various elements like Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, Zinc, and Radium isotopes.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-008
ClientSample ID: CTS-H-8-SY Combined +25/270
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/13/2022 10:00:00 AM
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	1.1	mg/L		0.1	EPA 200.7	11/17/2022 1600	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1600	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1600	DG
Barium	0.00947	mg/L	J	0.05	EPA 200.7	11/17/2022 1600	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1600	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1600	DG
Chromium	0.00501	mg/L	J	0.01	EPA 200.7	11/17/2022 1600	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1600	DG
Copper	0.00964	mg/L	J	0.01	EPA 200.7	11/17/2022 1600	DG
Iron	0.60	mg/L		0.05	EPA 200.7	11/17/2022 1600	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1600	DG
Manganese	0.0130	mg/L	J	0.1	EPA 200.7	11/17/2022 1600	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1600	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1600	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1600	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1600	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1600	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1600	DG
Vanadium	0.287	mg/L		0.005	EPA 200.7	11/17/2022 1600	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1600	DG
Soluble Radium 226	1.2	pCi/L		0.2	SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 228	-0.8	pCi/L	U	2.4	Ga-Tech	01/11/2023 139	WN
Soluble Radium 228 Precision (±)	1.8	pCi/L	U		Ga-Tech	01/11/2023 139	WN
MDC	2.40	pCi/L			Ga-Tech	01/11/2023 139	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-009
ClientSample ID: CTS-H-30-SY Combined +25/270
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/17/2022 9:53:00 AM
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analytes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include various elements like Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, Zinc, and Soluble Radium 226/228.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-010
ClientSample ID: QV-H-8-SY Combined +25/270
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/3/2022 2:40:00 PM
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
SPLP							
Aluminum	1.2	mg/L		0.1	EPA 200.7	11/17/2022 1605	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1605	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1605	DG
Barium	0.0178	mg/L	J	0.05	EPA 200.7	11/17/2022 1605	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1605	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1605	DG
Chromium	0.02	mg/L		0.01	EPA 200.7	11/17/2022 1605	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1605	DG
Copper	0.01	mg/L		0.01	EPA 200.7	11/17/2022 1605	DG
Iron	0.92	mg/L		0.05	EPA 200.7	11/17/2022 1605	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1605	DG
Manganese	0.0257	mg/L	J	0.1	EPA 200.7	11/17/2022 1605	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1605	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1605	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1605	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1605	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1605	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1605	DG
Vanadium	0.009	mg/L		0.005	EPA 200.7	11/17/2022 1605	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1605	DG
Soluble Radium 226	5.8	pCi/L		0.2	SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 226 Precision (±)	0.3	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 228	5.4	pCi/L		2.7	Ga-Tech	01/11/2023 746	WN
Soluble Radium 228 Precision (±)	3.2	pCi/L			Ga-Tech	01/11/2023 746	WN
MDC	2.70	pCi/L			Ga-Tech	01/11/2023 746	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-011
ClientSample ID: QV-H-30-SY Combined +25/270-01
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/3/2022 9:20:00 PM
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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SPLP

Aluminum	0.7	mg/L		0.1	EPA 200.7	11/17/2022 1617	DG
Antimony	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1617	DG
Arsenic	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1617	DG
Barium	0.0130	mg/L	J	0.05	EPA 200.7	11/17/2022 1617	DG
Beryllium	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1617	DG
Cadmium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1617	DG
Chromium	0.03	mg/L		0.01	EPA 200.7	11/17/2022 1617	DG
Cobalt	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1617	DG
Copper	0.01	mg/L		0.01	EPA 200.7	11/17/2022 1617	DG
Iron	0.31	mg/L		0.05	EPA 200.7	11/17/2022 1617	DG
Lead	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1617	DG
Manganese	0.00833	mg/L	J	0.1	EPA 200.7	11/17/2022 1617	DG
Molybdenum	ND	mg/L	U	0.01	EPA 200.7	11/17/2022 1617	DG
Nickel	ND	mg/L	U	0.02	EPA 200.7	11/17/2022 1617	DG
Selenium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1617	DG
Silver	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1617	DG
Thallium	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1617	DG
Uranium	ND	mg/L	U	0.05	EPA 200.7	11/17/2022 1617	DG
Vanadium	0.00467	mg/L	J	0.005	EPA 200.7	11/17/2022 1617	DG
Zinc	ND	mg/L	U	0.2	EPA 200.7	11/17/2022 1617	DG
Soluble Radium 226	4.2	pCi/L		0.2	SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 226 Precision (±)	0.2	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
MDC	0.20	pCi/L			SM 7500 Ra-B	12/28/2022 1050	WN
Soluble Radium 228	0.7	pCi/L	J	2.6	Ga-Tech	01/11/2023 1049	WN
Soluble Radium 228 Precision (±)	2.2	pCi/L	J		Ga-Tech	01/11/2023 1049	WN
MDC	2.60	pCi/L			Ga-Tech	01/11/2023 1049	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/14/2023
Report ID: S2210474001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210474-012
ClientSample ID: QV-H-30-SY Combined +25/270-02
COC: WEB
PWS ID:

WorkOrder: S2210474
CollectionDate: 10/3/2022 9:20:00 PM
DateReceived: 10/27/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analytes, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows include various elements like Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, Zinc, and Soluble Radium 226/228.

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: EPA 901.1 Mod.
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Soil
TYPES OF ANALYSES: Gamma Spectrometry (Radium-226)
DATA VALIDATION DATE: January 21, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2210480
SAMPLING DATE(S): October 5-24, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226 Total</u>
QV-L-4-SY -270 Concentrate	2210480-001	X
QV-L-8-SY -270 Concentrate	2210480-002	X
QV-L-30-SY -270 Concentrate	2210480-003	X
QV-M-4-SY -270 Concentrate	2210480-004	X
QV-M-8-SY -270 Concentrate	2210480-005	X
QV-M-30-SY -270 Concentrate	2210480-006	X
QV-H-4-SY -270 Concentrate	2210480-007	X
QV-H-8-SY -270 Concentrate	2210480-008	X
QV-H-30-SY -270 Concentrate	2210480-009	X
CR-L-4-SY -270 Concentrate	2210480-010	X
CR-L-8-SY -270 Concentrate	2210480-011	X
CR-L-30-SY -270 Concentrate	2210480-012	X
CR-M-4-SY -270 Concentrate	2210480-013	X
CR-M-8-SY -270 Concentrate	2210480-014	X
CR-M-30-SY -270 Concentrate	2210480-015	X
CTS-H-4-SY -270-01	2210480-016	X
CTS-H-4-SY -270-02	2210480-017	X
CTS-H-8-SY -270	2210480-018	X
CTS-H-30-SY -270	2210480-019	X
CR-H-4-SY -270 Concentrate	2210480-020	X
CR-H-8-SY -270 Concentrate	2210480-021	X
CR-H-30-SY -270 Concentrate	2210480-022	X
CTS-M-4-SY -270	2210480-023	X

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226 Total</u>
CTS-M-8-SY -270	2210480-024	X
CTS-M-30-SY -270	2210480-025	X
CTS-L-4-SY -270	2210480-026	X
CTS-L-8-SY -270-01	2210480-027	X
CTS-L-8-SY -270-02	2210480-028	X
CTS-L-30-SY -270	2210480-029	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2210480 - Radiochemistry

Gamma Spectrometry –Radium-226

SUMMARY

I.) General:

The laboratory has cited analytical EPA 901.1 Modified for the Gamma Spectrometry analyses.

II.) Overall Assessment of Data:

All laboratory data were acceptable with no qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-226	LCS	4353a	16-5	N/A

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the dissolved and suspended fractions of the SDG. The MB in QC Batch 20188 had a value of 0.341 pCi/g. The Normalized Absolute Difference for all samples was greater than 3 and no action was taken.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as "UJ". When between 2 and 3, results are qualified "J". The Radium-228 and Radium-226 results were demonstrated to be significantly different (NAD > 3) and did not require qualification.

VII.) Laboratory Control Sample (LCS):

An LCS was analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on QV-H-4-SY -270 Concentrate and CTS-L-30-SY -270. The Duplicate Error Ratio (DER) for QV-H-4-SY -270 Concentrate (1.49) and CTS-L-30-SY -270 (0.40) were below the DER limit of 2.14. No action was taken.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was not performed for this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Gamma analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were not reported for this SDG.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
None					

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-001
ClientSample ID: QV-L-4-SY -270 Concetrate
COC: WEB
PWS ID:

Date Reported: 12/30/2022
Report ID: S2210480001

WorkOrder: S2210480
CollectionDate: 10/24/2022 6:35:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	112	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1320	WN
Radium 226 Precision (±)	3.6	pCi/g			EPA 901.1 Mod.	12/28/2022 1320	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1422	DG
Barium	1.0	mg/L		0.5	6010C	11/11/2022 1422	DG
Cadmium	0.00292	mg/L	J	0.05	6010C	11/11/2022 1422	DG
Chromium	0.00260	mg/L	J	0.01	6010C	11/11/2022 1422	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1422	DG
Mercury	ND	mg/L	U	0.005	7470A	11/08/2022 2035	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/11/2022 1422	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1422	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2000	MS
Arsenic	7.07	mg/Kg	J	15	6020A	12/19/2022 2000	MS
Barium	340	mg/Kg		10	6020A	12/19/2022 2000	MS
Beryllium	1.62	mg/Kg	J	10	6020A	12/19/2022 2000	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2000	MS
Chromium	80	mg/Kg		50	6020A	12/19/2022 2000	MS
Cobalt	9.50	mg/Kg	J	50	6020A	12/19/2022 2000	MS
Copper	270	mg/Kg		10	6020A	12/19/2022 2000	MS
Lead	30	mg/Kg		10	6020A	12/19/2022 2000	MS
Manganese	420	mg/Kg		10	6020A	12/19/2022 2000	MS
Molybdenum	1.07	mg/Kg	J	50	6020A	12/19/2022 2000	MS
Nickel	16.5	mg/Kg	J	50	6020A	12/19/2022 2000	MS
Selenium	60	mg/Kg		50	6020A	12/19/2022 2000	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2000	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2000	MS
Uranium	230	mg/Kg		10	6020A	12/19/2022 2000	MS
Vanadium	130	mg/Kg		50	6020A	12/19/2022 2000	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-002
ClientSample ID: QV-L-8-SY -270 Concetrate
COC: WEB
PWS ID:

Date Reported: 12/30/2022
Report ID: S2210480001

WorkOrder: S2210480
CollectionDate: 10/24/2022 6:45:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	120	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1352	WN
Radium 226 Precision (±)	3.5	pCi/g			EPA 901.1 Mod.	12/28/2022 1352	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1429	DG
Barium	1.0	mg/L		0.5	6010C	11/11/2022 1429	DG
Cadmium	0.00268	mg/L	J	0.05	6010C	11/11/2022 1429	DG
Chromium	0.00356	mg/L	J	0.01	6010C	11/11/2022 1429	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1429	DG
Mercury	ND	mg/L	U	0.005	7470A	11/08/2022 2038	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/11/2022 1429	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1429	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2014	MS
Arsenic	6.91	mg/Kg	J	15	6020A	12/19/2022 2014	MS
Barium	340	mg/Kg		10	6020A	12/19/2022 2014	MS
Beryllium	1.55	mg/Kg	J	10	6020A	12/19/2022 2014	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2014	MS
Chromium	90	mg/Kg		50	6020A	12/19/2022 2014	MS
Cobalt	9.26	mg/Kg	J	50	6020A	12/19/2022 2014	MS
Copper	200	mg/Kg		10	6020A	12/19/2022 2014	MS
Lead	30	mg/Kg		10	6020A	12/19/2022 2014	MS
Manganese	410	mg/Kg		10	6020A	12/19/2022 2014	MS
Molybdenum	1.13	mg/Kg	J	50	6020A	12/19/2022 2014	MS
Nickel	16.6	mg/Kg	J	50	6020A	12/19/2022 2014	MS
Selenium	60	mg/Kg		50	6020A	12/19/2022 2014	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2014	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2014	MS
Uranium	230	mg/Kg		10	6020A	12/19/2022 2014	MS
Vanadium	120	mg/Kg		50	6020A	12/19/2022 2014	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-003
ClientSample ID: QV-L-30-SY -270 Concetrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 6:55:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	95.5	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1424	WN
Radium 226 Precision (±)	3.0	pCi/g			EPA 901.1 Mod.	12/28/2022 1424	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1435	DG
Barium	1.1	mg/L		0.5	6010C	11/11/2022 1435	DG
Cadmium	0.00281	mg/L	J	0.05	6010C	11/11/2022 1435	DG
Chromium	0.00573	mg/L	J	0.01	6010C	11/11/2022 1435	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1435	DG
Mercury	ND	mg/L	U	0.005	7470A	11/08/2022 2040	JGU
Selenium	0.0146	mg/L	J	0.2	6010C	11/11/2022 1435	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1435	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2049	MS
Arsenic	7.71	mg/Kg	J	15	6020A	12/19/2022 2049	MS
Barium	350	mg/Kg		10	6020A	12/19/2022 2049	MS
Beryllium	1.50	mg/Kg	J	10	6020A	12/19/2022 2049	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2049	MS
Chromium	220	mg/Kg		50	6020A	12/19/2022 2049	MS
Cobalt	9.48	mg/Kg	J	50	6020A	12/19/2022 2049	MS
Copper	240	mg/Kg		10	6020A	12/19/2022 2049	MS
Lead	30	mg/Kg		10	6020A	12/19/2022 2049	MS
Manganese	470	mg/Kg		10	6020A	12/19/2022 2049	MS
Molybdenum	1.60	mg/Kg	J	50	6020A	12/19/2022 2049	MS
Nickel	22.9	mg/Kg	J	50	6020A	12/19/2022 2049	MS
Selenium	50	mg/Kg		50	6020A	12/19/2022 2049	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2049	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2049	MS
Uranium	210	mg/Kg		10	6020A	12/19/2022 2049	MS
Vanadium	120	mg/Kg		50	6020A	12/19/2022 2049	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-004
ClientSample ID: QV-M-4-SY -270 Concentrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 7:04:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	372	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1455	WN
Radium 226 Precision (±)	5.8	pCi/g			EPA 901.1 Mod.	12/28/2022 1455	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1437	DG
Barium	1.0	mg/L		0.5	6010C	11/11/2022 1437	DG
Cadmium	0.00247	mg/L	J	0.05	6010C	11/11/2022 1437	DG
Chromium	0.00422	mg/L	J	0.01	6010C	11/11/2022 1437	DG
Lead	0.0125	mg/L	J	0.2	6010C	11/11/2022 1437	DG
Mercury	ND	mg/L	U	0.005	7470A	11/08/2022 2042	JGU
Selenium	0.0345	mg/L	J	0.2	6010C	11/11/2022 1437	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1437	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2102	MS
Arsenic	7.75	mg/Kg	J	15	6020A	12/19/2022 2102	MS
Barium	400	mg/Kg		10	6020A	12/19/2022 2102	MS
Beryllium	1.49	mg/Kg	J	10	6020A	12/19/2022 2102	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2102	MS
Chromium	50	mg/Kg		50	6020A	12/19/2022 2102	MS
Cobalt	8.08	mg/Kg	J	50	6020A	12/19/2022 2102	MS
Copper	130	mg/Kg		10	6020A	12/19/2022 2102	MS
Lead	20	mg/Kg		10	6020A	12/19/2022 2102	MS
Manganese	440	mg/Kg		10	6020A	12/19/2022 2102	MS
Molybdenum	2.26	mg/Kg	J	50	6020A	12/19/2022 2102	MS
Nickel	10.9	mg/Kg	J	50	6020A	12/19/2022 2102	MS
Selenium	160	mg/Kg		50	6020A	12/19/2022 2102	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2102	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2102	MS
Uranium	770	mg/Kg		10	6020A	12/19/2022 2102	MS
Vanadium	280	mg/Kg		50	6020A	12/19/2022 2102	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-005
ClientSample ID: QV-M-8-SY -270 Concentrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 7:08:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	357	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1527	WN
Radium 226 Precision (±)	6.1	pCi/g			EPA 901.1 Mod.	12/28/2022 1527	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1440	DG
Barium	1.0	mg/L		0.5	6010C	11/11/2022 1440	DG
Cadmium	0.00244	mg/L	J	0.05	6010C	11/11/2022 1440	DG
Chromium	0.00546	mg/L	J	0.01	6010C	11/11/2022 1440	DG
Lead	0.0119	mg/L	J	0.2	6010C	11/11/2022 1440	DG
Mercury	ND	mg/L	U	0.005	7470A	11/08/2022 2044	JGU
Selenium	0.0301	mg/L	J	0.2	6010C	11/11/2022 1440	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1440	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2109	MS
Arsenic	7.51	mg/Kg	J	15	6020A	12/19/2022 2109	MS
Barium	380	mg/Kg		10	6020A	12/19/2022 2109	MS
Beryllium	1.30	mg/Kg	J	10	6020A	12/19/2022 2109	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2109	MS
Chromium	90	mg/Kg		50	6020A	12/19/2022 2109	MS
Cobalt	7.93	mg/Kg	J	50	6020A	12/19/2022 2109	MS
Copper	150	mg/Kg		10	6020A	12/19/2022 2109	MS
Lead	20	mg/Kg		10	6020A	12/19/2022 2109	MS
Manganese	440	mg/Kg		10	6020A	12/19/2022 2109	MS
Molybdenum	2.36	mg/Kg	J	50	6020A	12/19/2022 2109	MS
Nickel	12.9	mg/Kg	J	50	6020A	12/19/2022 2109	MS
Selenium	160	mg/Kg		50	6020A	12/19/2022 2109	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2109	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2109	MS
Uranium	710	mg/Kg		10	6020A	12/19/2022 2109	MS
Vanadium	270	mg/Kg		50	6020A	12/19/2022 2109	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-006
ClientSample ID: QV-M-30-SY -270 Concentrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 7:10:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	328	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1559	WN
Radium 226 Precision (±)	5.5	pCi/g			EPA 901.1 Mod.	12/28/2022 1559	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1442	DG
Barium	1.0	mg/L		0.5	6010C	11/11/2022 1442	DG
Cadmium	0.00266	mg/L	J	0.05	6010C	11/11/2022 1442	DG
Chromium	0.01	mg/L		0.01	6010C	11/11/2022 1442	DG
Lead	0.0131	mg/L	J	0.2	6010C	11/11/2022 1442	DG
Mercury	ND	mg/L	U	0.005	7470A	11/16/2022 1852	JGU
Selenium	0.0258	mg/L	J	0.2	6010C	11/11/2022 1442	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1442	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2116	MS
Arsenic	7.65	mg/Kg	J	15	6020A	12/19/2022 2116	MS
Barium	360	mg/Kg		10	6020A	12/19/2022 2116	MS
Beryllium	1.51	mg/Kg	J	10	6020A	12/19/2022 2116	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2116	MS
Chromium	220	mg/Kg		50	6020A	12/19/2022 2116	MS
Cobalt	7.86	mg/Kg	J	50	6020A	12/19/2022 2116	MS
Copper	170	mg/Kg		10	6020A	12/19/2022 2116	MS
Lead	20	mg/Kg		10	6020A	12/19/2022 2116	MS
Manganese	440	mg/Kg		10	6020A	12/19/2022 2116	MS
Molybdenum	2.37	mg/Kg	J	50	6020A	12/19/2022 2116	MS
Nickel	18.2	mg/Kg	J	50	6020A	12/19/2022 2116	MS
Selenium	140	mg/Kg		50	6020A	12/19/2022 2116	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2116	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2116	MS
Uranium	640	mg/Kg		10	6020A	12/19/2022 2116	MS
Vanadium	250	mg/Kg		50	6020A	12/19/2022 2116	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-007
ClientSample ID: QV-H-4-SY -270 Concetrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 7:21:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	547	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1631	WN
Radium 226 Precision (±)	7.1	pCi/g			EPA 901.1 Mod.	12/28/2022 1631	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1444	DG
Barium	1.3	mg/L		0.5	6010C	11/11/2022 1444	DG
Cadmium	0.00241	mg/L	J	0.05	6010C	11/11/2022 1444	DG
Chromium	0.00402	mg/L	J	0.01	6010C	11/11/2022 1444	DG
Lead	0.0183	mg/L	J	0.2	6010C	11/11/2022 1444	DG
Mercury	ND	mg/L	U	0.005	7470A	11/16/2022 1855	JGU
Selenium	0.0413	mg/L	J	0.2	6010C	11/11/2022 1444	DG
Silver	0.0154	mg/L	J	0.05	6010C	11/11/2022 1444	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2123	MS
Arsenic	8.51	mg/Kg	J	15	6020A	12/19/2022 2123	MS
Barium	380	mg/Kg		10	6020A	12/19/2022 2123	MS
Beryllium	1.27	mg/Kg	J	10	6020A	12/19/2022 2123	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2123	MS
Chromium	60	mg/Kg		50	6020A	12/19/2022 2123	MS
Cobalt	7.81	mg/Kg	J	50	6020A	12/19/2022 2123	MS
Copper	110	mg/Kg		10	6020A	12/19/2022 2123	MS
Lead	30	mg/Kg		10	6020A	12/19/2022 2123	MS
Manganese	440	mg/Kg		10	6020A	12/19/2022 2123	MS
Molybdenum	2.33	mg/Kg	J	50	6020A	12/19/2022 2123	MS
Nickel	12.4	mg/Kg	J	50	6020A	12/19/2022 2123	MS
Selenium	200	mg/Kg		50	6020A	12/19/2022 2123	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2123	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2123	MS
Uranium	1310	mg/Kg		10	6020A	12/19/2022 2123	MS
Vanadium	330	mg/Kg		50	6020A	12/19/2022 2123	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-008
ClientSample ID: QV-H-8-SY -270 Concetrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 7:26:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	510	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1735	WN
Radium 226 Precision (±)	6.9	pCi/g			EPA 901.1 Mod.	12/28/2022 1735	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1446	DG
Barium	1.3	mg/L		0.5	6010C	11/11/2022 1446	DG
Cadmium	0.00252	mg/L	J	0.05	6010C	11/11/2022 1446	DG
Chromium	0.00443	mg/L	J	0.01	6010C	11/11/2022 1446	DG
Lead	0.0169	mg/L	J	0.2	6010C	11/11/2022 1446	DG
Mercury	ND	mg/L	U	0.005	7470A	11/16/2022 1857	JGU
Selenium	0.0311	mg/L	J	0.2	6010C	11/11/2022 1446	DG
Silver	0.0145	mg/L	J	0.05	6010C	11/11/2022 1446	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2130	MS
Arsenic	7.89	mg/Kg	J	15	6020A	12/19/2022 2130	MS
Barium	360	mg/Kg		10	6020A	12/19/2022 2130	MS
Beryllium	1.27	mg/Kg	J	10	6020A	12/19/2022 2130	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2130	MS
Chromium	80	mg/Kg		50	6020A	12/19/2022 2130	MS
Cobalt	7.28	mg/Kg	J	50	6020A	12/19/2022 2130	MS
Copper	100	mg/Kg		10	6020A	12/19/2022 2130	MS
Lead	20	mg/Kg		10	6020A	12/19/2022 2130	MS
Manganese	420	mg/Kg		10	6020A	12/19/2022 2130	MS
Molybdenum	2.25	mg/Kg	J	50	6020A	12/19/2022 2130	MS
Nickel	12.6	mg/Kg	J	50	6020A	12/19/2022 2130	MS
Selenium	190	mg/Kg		50	6020A	12/19/2022 2130	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2130	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2130	MS
Uranium	1170	mg/Kg		10	6020A	12/19/2022 2130	MS
Vanadium	300	mg/Kg		50	6020A	12/19/2022 2130	MS

Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-009
ClientSample ID: QV-H-30-SY -270 Concentrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 7:30:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	493	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1807	WN
Radium 226 Precision (±)	7.1	pCi/g			EPA 901.1 Mod.	12/28/2022 1807	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1451	DG
Barium	1.3	mg/L		0.5	6010C	11/11/2022 1451	DG
Cadmium	0.00264	mg/L	J	0.05	6010C	11/11/2022 1451	DG
Chromium	0.01	mg/L		0.01	6010C	11/11/2022 1451	DG
Lead	0.0147	mg/L	J	0.2	6010C	11/11/2022 1451	DG
Mercury	ND	mg/L	U	0.005	7470A	11/16/2022 1859	JGU
Selenium	0.0191	mg/L	J	0.2	6010C	11/11/2022 1451	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1451	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2137	MS
Arsenic	7.58	mg/Kg	J	15	6020A	12/19/2022 2137	MS
Barium	350	mg/Kg		10	6020A	12/19/2022 2137	MS
Beryllium	1.30	mg/Kg	J	10	6020A	12/19/2022 2137	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2137	MS
Chromium	220	mg/Kg		50	6020A	12/19/2022 2137	MS
Cobalt	7.55	mg/Kg	J	50	6020A	12/19/2022 2137	MS
Copper	150	mg/Kg		10	6020A	12/19/2022 2137	MS
Lead	20	mg/Kg		10	6020A	12/19/2022 2137	MS
Manganese	430	mg/Kg		10	6020A	12/19/2022 2137	MS
Molybdenum	2.80	mg/Kg	J	50	6020A	12/19/2022 2137	MS
Nickel	19.4	mg/Kg	J	50	6020A	12/19/2022 2137	MS
Selenium	170	mg/Kg		50	6020A	12/19/2022 2137	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2137	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2137	MS
Uranium	1090	mg/Kg		10	6020A	12/19/2022 2137	MS
Vanadium	300	mg/Kg		50	6020A	12/19/2022 2137	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-010
ClientSample ID: CR-L-4-SY -270 Concetrate
COC: WEB
PWS ID:

Date Reported: 12/30/2022
Report ID: S2210480001

WorkOrder: S2210480
CollectionDate: 10/24/2022 7:38:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	73.3	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1839	WN
Radium 226 Precision (±)	2.6	pCi/g			EPA 901.1 Mod.	12/28/2022 1839	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1502	DG
Barium	1.0	mg/L		0.5	6010C	11/11/2022 1502	DG
Cadmium	0.00168	mg/L	J	0.05	6010C	11/11/2022 1502	DG
Chromium	0.00290	mg/L	J	0.01	6010C	11/11/2022 1502	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1502	DG
Mercury	ND	mg/L	U	0.005	7470A	11/16/2022 1901	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/11/2022 1502	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1502	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2144	MS
Arsenic	11.5	mg/Kg	J	15	6020A	12/19/2022 2144	MS
Barium	280	mg/Kg		10	6020A	12/19/2022 2144	MS
Beryllium	1.37	mg/Kg	J	10	6020A	12/19/2022 2144	MS
Cadmium	0.410	mg/Kg	J	10	6020A	12/19/2022 2144	MS
Chromium	70	mg/Kg		50	6020A	12/19/2022 2144	MS
Cobalt	10.7	mg/Kg	J	50	6020A	12/19/2022 2144	MS
Copper	240	mg/Kg		10	6020A	12/19/2022 2144	MS
Lead	20	mg/Kg		10	6020A	12/19/2022 2144	MS
Manganese	370	mg/Kg		10	6020A	12/19/2022 2144	MS
Molybdenum	2.10	mg/Kg	J	50	6020A	12/19/2022 2144	MS
Nickel	19.7	mg/Kg	J	50	6020A	12/19/2022 2144	MS
Selenium	36.4	mg/Kg	J	50	6020A	12/19/2022 2144	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2144	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2144	MS
Uranium	160	mg/Kg		10	6020A	12/19/2022 2144	MS
Vanadium	130	mg/Kg		50	6020A	12/19/2022 2144	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-011
ClientSample ID: CR-L-8-SY -270 Concetrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 7:43:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	63.1	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1910	WN
Radium 226 Precision (±)	2.4	pCi/g			EPA 901.1 Mod.	12/28/2022 1910	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/21/2022 1334	DG
Barium	1.0	mg/L		0.5	6010C	11/21/2022 1334	DG
Cadmium	0.00112	mg/L	J	0.05	6010C	11/21/2022 1334	DG
Chromium	0.00403	mg/L	J	0.01	6010C	11/21/2022 1334	DG
Lead	ND	mg/L	U	0.2	6010C	11/21/2022 1334	DG
Mercury	0.0000441	mg/L	J	0.005	7470A	11/22/2022 1649	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/21/2022 1334	DG
Silver	ND	mg/L	U	0.05	6010C	11/21/2022 1334	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2151	MS
Arsenic	9.20	mg/Kg	J	15	6020A	12/19/2022 2151	MS
Barium	280	mg/Kg		10	6020A	12/19/2022 2151	MS
Beryllium	1.33	mg/Kg	J	10	6020A	12/19/2022 2151	MS
Cadmium	0.428	mg/Kg	J	10	6020A	12/19/2022 2151	MS
Chromium	70	mg/Kg		50	6020A	12/19/2022 2151	MS
Cobalt	10.5	mg/Kg	J	50	6020A	12/19/2022 2151	MS
Copper	220	mg/Kg		10	6020A	12/19/2022 2151	MS
Lead	20	mg/Kg		10	6020A	12/19/2022 2151	MS
Manganese	340	mg/Kg		10	6020A	12/19/2022 2151	MS
Molybdenum	1.83	mg/Kg	J	50	6020A	12/19/2022 2151	MS
Nickel	18.5	mg/Kg	J	50	6020A	12/19/2022 2151	MS
Selenium	35.4	mg/Kg	J	50	6020A	12/19/2022 2151	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2151	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2151	MS
Uranium	150	mg/Kg		10	6020A	12/19/2022 2151	MS
Vanadium	100	mg/Kg		50	6020A	12/19/2022 2151	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-012
ClientSample ID: CR-L-30-SY -270 Concetrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 7:46:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	62.6	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 1942	WN
Radium 226 Precision (±)	2.6	pCi/g			EPA 901.1 Mod.	12/28/2022 1942	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/21/2022 1336	DG
Barium	1.0	mg/L		0.5	6010C	11/21/2022 1336	DG
Cadmium	0.00110	mg/L	J	0.05	6010C	11/21/2022 1336	DG
Chromium	0.00479	mg/L	J	0.01	6010C	11/21/2022 1336	DG
Lead	ND	mg/L	U	0.2	6010C	11/21/2022 1336	DG
Mercury	ND	mg/L	U	0.005	7470A	11/22/2022 1658	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/21/2022 1336	DG
Silver	ND	mg/L	U	0.05	6010C	11/21/2022 1336	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2219	MS
Arsenic	9.55	mg/Kg	J	15	6020A	12/19/2022 2219	MS
Barium	310	mg/Kg		10	6020A	12/19/2022 2219	MS
Beryllium	1.10	mg/Kg	J	10	6020A	12/19/2022 2219	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2219	MS
Chromium	120	mg/Kg		50	6020A	12/19/2022 2219	MS
Cobalt	10.9	mg/Kg	J	50	6020A	12/19/2022 2219	MS
Copper	200	mg/Kg		10	6020A	12/19/2022 2219	MS
Lead	20	mg/Kg		10	6020A	12/19/2022 2219	MS
Manganese	340	mg/Kg		10	6020A	12/19/2022 2219	MS
Molybdenum	2.05	mg/Kg	J	50	6020A	12/19/2022 2219	MS
Nickel	21.4	mg/Kg	J	50	6020A	12/19/2022 2219	MS
Selenium	33.4	mg/Kg	J	50	6020A	12/19/2022 2219	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2219	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2219	MS
Uranium	140	mg/Kg		10	6020A	12/19/2022 2219	MS
Vanadium	100	mg/Kg		50	6020A	12/19/2022 2219	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-013
ClientSample ID: CR-M-4-SY -270 Concentrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 7:57:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	407	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 2013	WN
Radium 226 Precision (±)	7.1	pCi/g			EPA 901.1 Mod.	12/28/2022 2013	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/21/2022 1338	DG
Barium	1.2	mg/L		0.5	6010C	11/21/2022 1338	DG
Cadmium	0.00250	mg/L	J	0.05	6010C	11/21/2022 1338	DG
Chromium	0.00424	mg/L	J	0.01	6010C	11/21/2022 1338	DG
Lead	0.0165	mg/L	J	0.2	6010C	11/21/2022 1338	DG
Mercury	0.0000370	mg/L	J	0.005	7470A	11/22/2022 1700	JGU
Selenium	0.0316	mg/L	J	0.2	6010C	11/21/2022 1338	DG
Silver	ND	mg/L	U	0.05	6010C	11/21/2022 1338	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2239	MS
Arsenic	5.76	mg/Kg	J	15	6020A	12/19/2022 2239	MS
Barium	570	mg/Kg		10	6020A	12/19/2022 2239	MS
Beryllium	1.77	mg/Kg	J	10	6020A	12/19/2022 2239	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2239	MS
Chromium	90	mg/Kg		50	6020A	12/19/2022 2239	MS
Cobalt	9.15	mg/Kg	J	50	6020A	12/19/2022 2239	MS
Copper	270	mg/Kg		10	6020A	12/19/2022 2239	MS
Lead	20	mg/Kg		10	6020A	12/19/2022 2239	MS
Manganese	360	mg/Kg		10	6020A	12/19/2022 2239	MS
Molybdenum	0.830	mg/Kg	J	50	6020A	12/19/2022 2239	MS
Nickel	16.6	mg/Kg	J	50	6020A	12/19/2022 2239	MS
Selenium	320	mg/Kg		50	6020A	12/19/2022 2239	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2239	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2239	MS
Uranium	1050	mg/Kg		10	6020A	12/19/2022 2239	MS
Vanadium	350	mg/Kg		50	6020A	12/19/2022 2239	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-014
ClientSample ID: CR-M-8-SY -270 Concentrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 8:02:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	366	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 2045	WN
Radium 226 Precision (±)	6.0	pCi/g			EPA 901.1 Mod.	12/28/2022 2045	WN

Metals - TCLP

Arsenic	0.00950	mg/L	J	0.2	6010C	11/21/2022 1343	DG
Barium	1.1	mg/L		0.5	6010C	11/21/2022 1343	DG
Cadmium	0.00254	mg/L	J	0.05	6010C	11/21/2022 1343	DG
Chromium	0.00379	mg/L	J	0.01	6010C	11/21/2022 1343	DG
Lead	0.0136	mg/L	J	0.2	6010C	11/21/2022 1343	DG
Mercury	0.0000414	mg/L	J	0.005	7470A	11/22/2022 1702	JGU
Selenium	0.0305	mg/L	J	0.2	6010C	11/21/2022 1343	DG
Silver	ND	mg/L	U	0.05	6010C	11/21/2022 1343	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2246	MS
Arsenic	6.23	mg/Kg	J	15	6020A	12/19/2022 2246	MS
Barium	600	mg/Kg		10	6020A	12/19/2022 2246	MS
Beryllium	1.40	mg/Kg	J	10	6020A	12/19/2022 2246	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2246	MS
Chromium	110	mg/Kg		50	6020A	12/19/2022 2246	MS
Cobalt	8.88	mg/Kg	J	50	6020A	12/19/2022 2246	MS
Copper	300	mg/Kg		10	6020A	12/19/2022 2246	MS
Lead	20	mg/Kg		10	6020A	12/19/2022 2246	MS
Manganese	370	mg/Kg		10	6020A	12/19/2022 2246	MS
Molybdenum	0.845	mg/Kg	J	50	6020A	12/19/2022 2246	MS
Nickel	16.9	mg/Kg	J	50	6020A	12/19/2022 2246	MS
Selenium	320	mg/Kg		50	6020A	12/19/2022 2246	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2246	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2246	MS
Uranium	1010	mg/Kg		10	6020A	12/19/2022 2246	MS
Vanadium	340	mg/Kg		50	6020A	12/19/2022 2246	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-015
ClientSample ID: CR-M-30-SY -270 Concentrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 8:05:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	358	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 2117	WN
Radium 226 Precision (±)	6.0	pCi/g			EPA 901.1 Mod.	12/28/2022 2117	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/21/2022 1350	DG
Barium	1.2	mg/L		0.5	6010C	11/21/2022 1350	DG
Cadmium	0.00236	mg/L	J	0.05	6010C	11/21/2022 1350	DG
Chromium	0.00510	mg/L	J	0.01	6010C	11/21/2022 1350	DG
Lead	ND	mg/L	U	0.2	6010C	11/21/2022 1350	DG
Mercury	0.0000411	mg/L	J	0.005	7470A	11/22/2022 1704	JGU
Selenium	0.0303	mg/L	J	0.2	6010C	11/21/2022 1350	DG
Silver	ND	mg/L	U	0.05	6010C	11/21/2022 1350	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2253	MS
Arsenic	6.00	mg/Kg	J	15	6020A	12/19/2022 2253	MS
Barium	620	mg/Kg		10	6020A	12/19/2022 2253	MS
Beryllium	1.32	mg/Kg	J	10	6020A	12/19/2022 2253	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2253	MS
Chromium	240	mg/Kg		50	6020A	12/19/2022 2253	MS
Cobalt	8.93	mg/Kg	J	50	6020A	12/19/2022 2253	MS
Copper	310	mg/Kg		10	6020A	12/19/2022 2253	MS
Lead	20	mg/Kg		10	6020A	12/19/2022 2253	MS
Manganese	410	mg/Kg		10	6020A	12/19/2022 2253	MS
Molybdenum	1.30	mg/Kg	J	50	6020A	12/19/2022 2253	MS
Nickel	22.4	mg/Kg	J	50	6020A	12/19/2022 2253	MS
Selenium	270	mg/Kg		50	6020A	12/19/2022 2253	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2253	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2253	MS
Uranium	860	mg/Kg		10	6020A	12/19/2022 2253	MS
Vanadium	300	mg/Kg		50	6020A	12/19/2022 2253	MS

Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-016
ClientSample ID: CTS-H-4-SY -270-01
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/13/2022 11:30:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	28.3	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 2149	WN
Radium 226 Precision (±)	1.7	pCi/g			EPA 901.1 Mod.	12/28/2022 2149	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1515	DG
Barium	2.3	mg/L		0.5	6010C	11/11/2022 1515	DG
Cadmium	0.00198	mg/L	J	0.05	6010C	11/11/2022 1515	DG
Chromium	0.00124	mg/L	J	0.01	6010C	11/11/2022 1515	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1515	DG
Mercury	ND	mg/L	U	0.005	7470A	11/16/2022 1903	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/11/2022 1515	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1515	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2300	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/19/2022 2300	MS
Barium	350	mg/Kg		10	6020A	12/19/2022 2300	MS
Beryllium	1.11	mg/Kg	J	10	6020A	12/19/2022 2300	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2300	MS
Chromium	27.5	mg/Kg	J	50	6020A	12/19/2022 2300	MS
Cobalt	7.46	mg/Kg	J	50	6020A	12/19/2022 2300	MS
Copper	70	mg/Kg		10	6020A	12/19/2022 2300	MS
Lead	10	mg/Kg		10	6020A	12/19/2022 2300	MS
Manganese	540	mg/Kg		10	6020A	12/19/2022 2300	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/19/2022 2300	MS
Nickel	17.6	mg/Kg	J	50	6020A	12/19/2022 2300	MS
Selenium	ND	mg/Kg	U	50	6020A	12/19/2022 2300	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2300	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2300	MS
Uranium	70	mg/Kg		10	6020A	12/19/2022 2300	MS
Vanadium	270	mg/Kg		50	6020A	12/19/2022 2300	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-017
ClientSample ID: CTS-H-4-SY -270-02
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/13/2022 11:30:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	25.2	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 2220	WN
Radium 226 Precision (±)	1.6	pCi/g			EPA 901.1 Mod.	12/28/2022 2220	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1517	DG
Barium	2.3	mg/L		0.5	6010C	11/11/2022 1517	DG
Cadmium	0.00203	mg/L	J	0.05	6010C	11/11/2022 1517	DG
Chromium	0.00209	mg/L	J	0.01	6010C	11/11/2022 1517	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1517	DG
Mercury	ND	mg/L	U	0.005	7470A	11/16/2022 1905	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/11/2022 1517	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1517	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/19/2022 2307	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/19/2022 2307	MS
Barium	350	mg/Kg		10	6020A	12/19/2022 2307	MS
Beryllium	0.931	mg/Kg	J	10	6020A	12/19/2022 2307	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/19/2022 2307	MS
Chromium	27.1	mg/Kg	J	50	6020A	12/19/2022 2307	MS
Cobalt	7.12	mg/Kg	J	50	6020A	12/19/2022 2307	MS
Copper	70	mg/Kg		10	6020A	12/19/2022 2307	MS
Lead	10	mg/Kg		10	6020A	12/19/2022 2307	MS
Manganese	540	mg/Kg		10	6020A	12/19/2022 2307	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/19/2022 2307	MS
Nickel	17.0	mg/Kg	J	50	6020A	12/19/2022 2307	MS
Selenium	ND	mg/Kg	U	50	6020A	12/19/2022 2307	MS
Silver	ND	mg/Kg	U	10	6020A	12/19/2022 2307	MS
Thallium	ND	mg/Kg	U	100	6020A	12/19/2022 2307	MS
Uranium	70	mg/Kg		10	6020A	12/19/2022 2307	MS
Vanadium	260	mg/Kg		50	6020A	12/19/2022 2307	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-018
ClientSample ID: CTS-H-8-SY -270
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/13/2022 10:00:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	26.2	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 2252	WN
Radium 226 Precision (±)	1.6	pCi/g			EPA 901.1 Mod.	12/28/2022 2252	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1519	DG
Barium	2.3	mg/L		0.5	6010C	11/11/2022 1519	DG
Cadmium	0.00211	mg/L	J	0.05	6010C	11/11/2022 1519	DG
Chromium	0.00259	mg/L	J	0.01	6010C	11/11/2022 1519	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1519	DG
Mercury	0.000301	mg/L	J	0.005	7470A	11/16/2022 1907	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/11/2022 1519	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1519	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 132	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/20/2022 132	MS
Barium	360	mg/Kg		10	6020A	12/20/2022 132	MS
Beryllium	1.07	mg/Kg	J	10	6020A	12/20/2022 132	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 132	MS
Chromium	28.0	mg/Kg	J	50	6020A	12/20/2022 132	MS
Cobalt	6.94	mg/Kg	J	50	6020A	12/20/2022 132	MS
Copper	80	mg/Kg		10	6020A	12/20/2022 132	MS
Lead	10	mg/Kg		10	6020A	12/20/2022 132	MS
Manganese	540	mg/Kg		10	6020A	12/20/2022 132	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 132	MS
Nickel	17.3	mg/Kg	J	50	6020A	12/20/2022 132	MS
Selenium	ND	mg/Kg	U	50	6020A	12/20/2022 132	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 132	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 132	MS
Uranium	80	mg/Kg		10	6020A	12/20/2022 132	MS
Vanadium	270	mg/Kg		50	6020A	12/20/2022 132	MS

Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-019
ClientSample ID: CTS-H-30-SY -270
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/17/2022 9:53:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	23.1	pCi/g		0.2	EPA 901.1 Mod.	12/28/2022 2323	WN
Radium 226 Precision (±)	1.5	pCi/g			EPA 901.1 Mod.	12/28/2022 2323	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1522	DG
Barium	2.3	mg/L		0.5	6010C	11/11/2022 1522	DG
Cadmium	0.00214	mg/L	J	0.05	6010C	11/11/2022 1522	DG
Chromium	0.00233	mg/L	J	0.01	6010C	11/11/2022 1522	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1522	DG
Mercury	ND	mg/L	U	0.005	7470A	11/16/2022 1914	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/11/2022 1522	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1522	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 146	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/20/2022 146	MS
Barium	360	mg/Kg		10	6020A	12/20/2022 146	MS
Beryllium	0.968	mg/Kg	J	10	6020A	12/20/2022 146	MS
Cadmium	0.541	mg/Kg	J	10	6020A	12/20/2022 146	MS
Chromium	40.4	mg/Kg	J	50	6020A	12/20/2022 146	MS
Cobalt	6.50	mg/Kg	J	50	6020A	12/20/2022 146	MS
Copper	70	mg/Kg		10	6020A	12/20/2022 146	MS
Lead	10	mg/Kg		10	6020A	12/20/2022 146	MS
Manganese	520	mg/Kg		10	6020A	12/20/2022 146	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 146	MS
Nickel	16.1	mg/Kg	J	50	6020A	12/20/2022 146	MS
Selenium	ND	mg/Kg	U	50	6020A	12/20/2022 146	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 146	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 146	MS
Uranium	80	mg/Kg		10	6020A	12/20/2022 146	MS
Vanadium	280	mg/Kg		50	6020A	12/20/2022 146	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-020
ClientSample ID: CR-H-4-SY -270 Concetrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 8:14:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	1200	pCi/g		0.5	EPA 901.1 Mod.	12/29/2022 1040	WN
Radium 226 Precision (±)	11.7	pCi/g			EPA 901.1 Mod.	12/29/2022 1040	WN

Metals - TCLP

Arsenic	0.00918	mg/L	J	0.2	6010C	11/21/2022 1357	DG
Barium	1.0	mg/L		0.5	6010C	11/21/2022 1357	DG
Cadmium	0.00254	mg/L	J	0.05	6010C	11/21/2022 1357	DG
Chromium	0.02	mg/L		0.01	6010C	11/21/2022 1357	DG
Lead	0.0306	mg/L	J	0.2	6010C	11/21/2022 1357	DG
Mercury	0.0000492	mg/L	J	0.005	7470A	11/22/2022 1706	JGU
Selenium	0.0405	mg/L	J	0.2	6010C	11/21/2022 1357	DG
Silver	ND	mg/L	U	0.05	6010C	11/21/2022 1357	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 207	MS
Arsenic	9.01	mg/Kg	J	15	6020A	12/20/2022 207	MS
Barium	610	mg/Kg		10	6020A	12/20/2022 207	MS
Beryllium	1.25	mg/Kg	J	10	6020A	12/20/2022 207	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 207	MS
Chromium	110	mg/Kg		50	6020A	12/20/2022 207	MS
Cobalt	7.49	mg/Kg	J	50	6020A	12/20/2022 207	MS
Copper	200	mg/Kg		10	6020A	12/20/2022 207	MS
Lead	20	mg/Kg		10	6020A	12/20/2022 207	MS
Manganese	320	mg/Kg		10	6020A	12/20/2022 207	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 207	MS
Nickel	11.8	mg/Kg	J	50	6020A	12/20/2022 207	MS
Selenium	240	mg/Kg		50	6020A	12/20/2022 207	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 207	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 207	MS
Uranium	4380	mg/Kg		10	6020A	12/20/2022 207	MS
Vanadium	750	mg/Kg		50	6020A	12/20/2022 207	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-021
ClientSample ID: CR-H-8-SY -270 Concetrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 8:17:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	1140	pCi/g		0.5	EPA 901.1 Mod.	12/29/2022 1112	WN
Radium 226 Precision (±)	10.9	pCi/g			EPA 901.1 Mod.	12/29/2022 1112	WN

Metals - TCLP

Arsenic	0.0110	mg/L	J	0.2	6010C	11/21/2022 1359	DG
Barium	1.0	mg/L		0.5	6010C	11/21/2022 1359	DG
Cadmium	0.00249	mg/L	J	0.05	6010C	11/21/2022 1359	DG
Chromium	0.02	mg/L		0.01	6010C	11/21/2022 1359	DG
Lead	0.0193	mg/L	J	0.2	6010C	11/21/2022 1359	DG
Mercury	0.0000478	mg/L	J	0.005	7470A	11/22/2022 1709	JGU
Selenium	0.0417	mg/L	J	0.2	6010C	11/21/2022 1359	DG
Silver	ND	mg/L	U	0.05	6010C	11/21/2022 1359	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 235	MS
Arsenic	8.62	mg/Kg	J	15	6020A	12/20/2022 235	MS
Barium	630	mg/Kg		10	6020A	12/20/2022 235	MS
Beryllium	1.53	mg/Kg	J	10	6020A	12/20/2022 235	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 235	MS
Chromium	110	mg/Kg		50	6020A	12/20/2022 235	MS
Cobalt	7.38	mg/Kg	J	50	6020A	12/20/2022 235	MS
Copper	160	mg/Kg		10	6020A	12/20/2022 235	MS
Lead	20	mg/Kg		10	6020A	12/20/2022 235	MS
Manganese	320	mg/Kg		10	6020A	12/20/2022 235	MS
Molybdenum	0.807	mg/Kg	J	50	6020A	12/20/2022 235	MS
Nickel	11.9	mg/Kg	J	50	6020A	12/20/2022 235	MS
Selenium	230	mg/Kg		50	6020A	12/20/2022 235	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 235	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 235	MS
Uranium	4210	mg/Kg		10	6020A	12/20/2022 235	MS
Vanadium	730	mg/Kg		50	6020A	12/20/2022 235	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-022
ClientSample ID: CR-H-30-SY -270 Concetrate
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/24/2022 8:22:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	1010	pCi/g		0.5	EPA 901.1 Mod.	12/29/2022 1145	WN
Radium 226 Precision (±)	9.7	pCi/g			EPA 901.1 Mod.	12/29/2022 1145	WN

Metals - TCLP

Arsenic	0.00860	mg/L	J	0.2	6010C	11/21/2022 1401	DG
Barium	1.2	mg/L		0.5	6010C	11/21/2022 1401	DG
Cadmium	0.00208	mg/L	J	0.05	6010C	11/21/2022 1401	DG
Chromium	0.02	mg/L		0.01	6010C	11/21/2022 1401	DG
Lead	0.0204	mg/L	J	0.2	6010C	11/21/2022 1401	DG
Mercury	ND	mg/L	U	0.005	7470A	11/22/2022 1711	JGU
Selenium	0.0293	mg/L	J	0.2	6010C	11/21/2022 1401	DG
Silver	ND	mg/L	U	0.05	6010C	11/21/2022 1401	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 242	MS
Arsenic	7.87	mg/Kg	J	15	6020A	12/20/2022 242	MS
Barium	610	mg/Kg		10	6020A	12/20/2022 242	MS
Beryllium	1.36	mg/Kg	J	10	6020A	12/20/2022 242	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 242	MS
Chromium	300	mg/Kg		50	6020A	12/20/2022 242	MS
Cobalt	6.71	mg/Kg	J	50	6020A	12/20/2022 242	MS
Copper	160	mg/Kg		10	6020A	12/20/2022 242	MS
Lead	20	mg/Kg		10	6020A	12/20/2022 242	MS
Manganese	330	mg/Kg		10	6020A	12/20/2022 242	MS
Molybdenum	1.66	mg/Kg	J	50	6020A	12/20/2022 242	MS
Nickel	20.3	mg/Kg	J	50	6020A	12/20/2022 242	MS
Selenium	180	mg/Kg		50	6020A	12/20/2022 242	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 242	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 242	MS
Uranium	3320	mg/Kg		10	6020A	12/20/2022 242	MS
Vanadium	580	mg/Kg		50	6020A	12/20/2022 242	MS

Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-023
ClientSample ID: CTS-M-4-SY -270
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/11/2022 9:30:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	23.4	pCi/g		0.5	EPA 901.1 Mod.	12/29/2022 1218	WN
Radium 226 Precision (±)	1.5	pCi/g			EPA 901.1 Mod.	12/29/2022 1218	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1533	DG
Barium	2.1	mg/L		0.5	6010C	11/11/2022 1533	DG
Cadmium	0.00208	mg/L	J	0.05	6010C	11/11/2022 1533	DG
Chromium	0.00193	mg/L	J	0.01	6010C	11/11/2022 1533	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1533	DG
Mercury	ND	mg/L	U	0.005	7470A	11/16/2022 1922	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/11/2022 1533	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1533	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 248	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/20/2022 248	MS
Barium	340	mg/Kg		10	6020A	12/20/2022 248	MS
Beryllium	0.744	mg/Kg	J	10	6020A	12/20/2022 248	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 248	MS
Chromium	22.7	mg/Kg	J	50	6020A	12/20/2022 248	MS
Cobalt	5.72	mg/Kg	J	50	6020A	12/20/2022 248	MS
Copper	90	mg/Kg		10	6020A	12/20/2022 248	MS
Lead	10	mg/Kg		10	6020A	12/20/2022 248	MS
Manganese	500	mg/Kg		10	6020A	12/20/2022 248	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 248	MS
Nickel	14.2	mg/Kg	J	50	6020A	12/20/2022 248	MS
Selenium	ND	mg/Kg	U	50	6020A	12/20/2022 248	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 248	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 248	MS
Uranium	60	mg/Kg		10	6020A	12/20/2022 248	MS
Vanadium	200	mg/Kg		50	6020A	12/20/2022 248	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-024
ClientSample ID: CTS-M-8-SY -270
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/11/2022
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	21.8	pCi/g		0.5	EPA 901.1 Mod.	12/29/2022 1249	WN
Radium 226 Precision (±)	1.4	pCi/g			EPA 901.1 Mod.	12/29/2022 1249	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1535	DG
Barium	2.1	mg/L		0.5	6010C	11/11/2022 1535	DG
Cadmium	0.00194	mg/L	J	0.05	6010C	11/11/2022 1535	DG
Chromium	0.00136	mg/L	J	0.01	6010C	11/11/2022 1535	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1535	DG
Mercury	ND	mg/L	U	0.005	7470A	11/16/2022 1935	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/11/2022 1535	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1535	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 255	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/20/2022 255	MS
Barium	390	mg/Kg		10	6020A	12/20/2022 255	MS
Beryllium	1.04	mg/Kg	J	10	6020A	12/20/2022 255	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 255	MS
Chromium	32.7	mg/Kg	J	50	6020A	12/20/2022 255	MS
Cobalt	6.76	mg/Kg	J	50	6020A	12/20/2022 255	MS
Copper	70	mg/Kg		10	6020A	12/20/2022 255	MS
Lead	10	mg/Kg		10	6020A	12/20/2022 255	MS
Manganese	560	mg/Kg		10	6020A	12/20/2022 255	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 255	MS
Nickel	17.0	mg/Kg	J	50	6020A	12/20/2022 255	MS
Selenium	ND	mg/Kg	U	50	6020A	12/20/2022 255	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 255	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 255	MS
Uranium	70	mg/Kg		10	6020A	12/20/2022 255	MS
Vanadium	250	mg/Kg		50	6020A	12/20/2022 255	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-025
ClientSample ID: CTS-M-30-SY -270
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/13/2022 8:00:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	22.4	pCi/g		0.5	EPA 901.1 Mod.	12/29/2022 1321	WN
Radium 226 Precision (±)	1.5	pCi/g			EPA 901.1 Mod.	12/29/2022 1321	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1537	DG
Barium	2.1	mg/L		0.5	6010C	11/11/2022 1537	DG
Cadmium	0.00190	mg/L	J	0.05	6010C	11/11/2022 1537	DG
Chromium	0.00284	mg/L	J	0.01	6010C	11/11/2022 1537	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1537	DG
Mercury	ND	mg/L	U	0.005	7470A	11/16/2022 1937	JGU
Selenium	0.0139	mg/L	J	0.2	6010C	11/11/2022 1537	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1537	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 302	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/20/2022 302	MS
Barium	430	mg/Kg		10	6020A	12/20/2022 302	MS
Beryllium	0.803	mg/Kg	J	10	6020A	12/20/2022 302	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 302	MS
Chromium	60	mg/Kg		50	6020A	12/20/2022 302	MS
Cobalt	6.71	mg/Kg	J	50	6020A	12/20/2022 302	MS
Copper	70	mg/Kg		10	6020A	12/20/2022 302	MS
Lead	10	mg/Kg		10	6020A	12/20/2022 302	MS
Manganese	580	mg/Kg		10	6020A	12/20/2022 302	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 302	MS
Nickel	18.3	mg/Kg	J	50	6020A	12/20/2022 302	MS
Selenium	ND	mg/Kg	U	50	6020A	12/20/2022 302	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 302	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 302	MS
Uranium	70	mg/Kg		10	6020A	12/20/2022 302	MS
Vanadium	270	mg/Kg		50	6020A	12/20/2022 302	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-026
ClientSample ID: CTS-L-4-SY -270
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/5/2022 10:32:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	2.9	pCi/g		0.5	EPA 901.1 Mod.	12/29/2022 1352	WN
Radium 226 Precision (±)	0.6	pCi/g			EPA 901.1 Mod.	12/29/2022 1352	WN

Metals - TCLP

Arsenic	ND	mg/L	HU	0.2	6010C	11/11/2022 1539	DG
Barium	2.07	mg/L	H	0.5	6010C	11/11/2022 1539	DG
Cadmium	0.00138	mg/L	JH	0.05	6010C	11/11/2022 1539	DG
Chromium	ND	mg/L	HU	0.01	6010C	11/11/2022 1539	DG
Lead	ND	mg/L	HU	0.2	6010C	11/11/2022 1539	DG
Mercury	ND	mg/L	HU	0.005	7470A	11/08/2022 2046	JGU
Selenium	ND	mg/L	HU	0.2	6010C	11/11/2022 1539	DG
Silver	ND	mg/L	HU	0.05	6010C	11/11/2022 1539	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 309	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/20/2022 309	MS
Barium	320	mg/Kg		10	6020A	12/20/2022 309	MS
Beryllium	0.986	mg/Kg	J	10	6020A	12/20/2022 309	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 309	MS
Chromium	31.6	mg/Kg	J	50	6020A	12/20/2022 309	MS
Cobalt	7.39	mg/Kg	J	50	6020A	12/20/2022 309	MS
Copper	100	mg/Kg		10	6020A	12/20/2022 309	MS
Lead	10	mg/Kg		10	6020A	12/20/2022 309	MS
Manganese	550	mg/Kg		10	6020A	12/20/2022 309	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 309	MS
Nickel	18.1	mg/Kg	J	50	6020A	12/20/2022 309	MS
Selenium	ND	mg/Kg	U	50	6020A	12/20/2022 309	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 309	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 309	MS
Uranium	4.14	mg/Kg	J	10	6020A	12/20/2022 309	MS
Vanadium	44.2	mg/Kg	J	50	6020A	12/20/2022 309	MS

Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-027
ClientSample ID: CTS-L-8-SY -270-01
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/6/2022 8:45:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	2.7	pCi/g		0.5	EPA 901.1 Mod.	12/29/2022 1423	WN
Radium 226 Precision (±)	0.5	pCi/g			EPA 901.1 Mod.	12/29/2022 1423	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1542	DG
Barium	2.5	mg/L		0.5	6010C	11/11/2022 1542	DG
Cadmium	0.00290	mg/L	J	0.05	6010C	11/11/2022 1542	DG
Chromium	0.00130	mg/L	J	0.01	6010C	11/11/2022 1542	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1542	DG
Mercury	ND	mg/L	U	0.005	7470A	11/08/2022 2048	JGU
Selenium	0.0168	mg/L	J	0.2	6010C	11/11/2022 1542	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1542	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 316	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/20/2022 316	MS
Barium	320	mg/Kg		10	6020A	12/20/2022 316	MS
Beryllium	0.958	mg/Kg	J	10	6020A	12/20/2022 316	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 316	MS
Chromium	36.2	mg/Kg	J	50	6020A	12/20/2022 316	MS
Cobalt	7.24	mg/Kg	J	50	6020A	12/20/2022 316	MS
Copper	80	mg/Kg		10	6020A	12/20/2022 316	MS
Lead	10	mg/Kg		10	6020A	12/20/2022 316	MS
Manganese	550	mg/Kg		10	6020A	12/20/2022 316	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 316	MS
Nickel	18.1	mg/Kg	J	50	6020A	12/20/2022 316	MS
Selenium	ND	mg/Kg	U	50	6020A	12/20/2022 316	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 316	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 316	MS
Uranium	3.88	mg/Kg	J	10	6020A	12/20/2022 316	MS
Vanadium	42.9	mg/Kg	J	50	6020A	12/20/2022 316	MS

Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-028
ClientSample ID: CTS-L-8-SY -270-02
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/6/2022 8:45:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	2.8	pCi/g		0.5	EPA 901.1 Mod.	12/29/2022 1455	WN
Radium 226 Precision (±)	0.5	pCi/g			EPA 901.1 Mod.	12/29/2022 1455	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1544	DG
Barium	2.5	mg/L		0.5	6010C	11/11/2022 1544	DG
Cadmium	0.00305	mg/L	J	0.05	6010C	11/11/2022 1544	DG
Chromium	0.00140	mg/L	J	0.01	6010C	11/11/2022 1544	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1544	DG
Mercury	ND	mg/L	U	0.005	7470A	11/08/2022 2050	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/11/2022 1544	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1544	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 323	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/20/2022 323	MS
Barium	290	mg/Kg		10	6020A	12/20/2022 323	MS
Beryllium	0.825	mg/Kg	J	10	6020A	12/20/2022 323	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 323	MS
Chromium	32.4	mg/Kg	J	50	6020A	12/20/2022 323	MS
Cobalt	6.70	mg/Kg	J	50	6020A	12/20/2022 323	MS
Copper	90	mg/Kg		10	6020A	12/20/2022 323	MS
Lead	10	mg/Kg		10	6020A	12/20/2022 323	MS
Manganese	500	mg/Kg		10	6020A	12/20/2022 323	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 323	MS
Nickel	16.6	mg/Kg	J	50	6020A	12/20/2022 323	MS
Selenium	ND	mg/Kg	U	50	6020A	12/20/2022 323	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 323	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 323	MS
Uranium	3.47	mg/Kg	J	10	6020A	12/20/2022 323	MS
Vanadium	38.0	mg/Kg	J	50	6020A	12/20/2022 323	MS

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/30/2022
Report ID: S2210480001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210480-029
ClientSample ID: CTS-L-30-SY -270
COC: WEB
PWS ID:

WorkOrder: S2210480
CollectionDate: 10/6/2022 1:25:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	2.9	pCi/g		0.5	EPA 901.1 Mod.	12/29/2022 1526	WN
Radium 226 Precision (±)	0.5	pCi/g			EPA 901.1 Mod.	12/29/2022 1526	WN

Metals - TCLP

Arsenic	ND	mg/L	U	0.2	6010C	11/11/2022 1548	DG
Barium	2.6	mg/L		0.5	6010C	11/11/2022 1548	DG
Cadmium	0.00288	mg/L	J	0.05	6010C	11/11/2022 1548	DG
Chromium	0.00220	mg/L	J	0.01	6010C	11/11/2022 1548	DG
Lead	ND	mg/L	U	0.2	6010C	11/11/2022 1548	DG
Mercury	ND	mg/L	U	0.005	7470A	11/08/2022 2053	JGU
Selenium	ND	mg/L	U	0.2	6010C	11/11/2022 1548	DG
Silver	ND	mg/L	U	0.05	6010C	11/11/2022 1548	DG

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 337	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/20/2022 337	MS
Barium	320	mg/Kg		10	6020A	12/20/2022 337	MS
Beryllium	0.867	mg/Kg	J	10	6020A	12/20/2022 337	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 337	MS
Chromium	50	mg/Kg		50	6020A	12/20/2022 337	MS
Cobalt	7.10	mg/Kg	J	50	6020A	12/20/2022 337	MS
Copper	80	mg/Kg		10	6020A	12/20/2022 337	MS
Lead	10	mg/Kg		10	6020A	12/20/2022 337	MS
Manganese	530	mg/Kg		10	6020A	12/20/2022 337	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 337	MS
Nickel	18.6	mg/Kg	J	50	6020A	12/20/2022 337	MS
Selenium	ND	mg/Kg	U	50	6020A	12/20/2022 337	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 337	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 337	MS
Uranium	4.22	mg/Kg	J	10	6020A	12/20/2022 337	MS
Vanadium	42.8	mg/Kg	J	50	6020A	12/20/2022 337	MS

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 4
ANALYTICAL METHODS: EPA 901.1 Mod.
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Soil
TYPES OF ANALYSES: Gamma Spectrometry (Radium-226)
DATA VALIDATION DATE: January 22, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2210485
SAMPLING DATE(S): August 30-September 15, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226 Total</u>
CR-L-0-SL-01 +25/+50/+100 Composite	2210485-004	X
CR-L-0-SL-01 +140/+200/+270 Composite	2210485-008	X
CR-L-0-SL-01 -270	2210485-009	X
CR-L-4-SY +25/+50/+100-01/+100-02 Composite	2210485-014	X
CTS-L-0-+1/4-inch	2210485-015	X
CR-L-4-SY +140/+200/+270 Composite	2210485-019	X
CR-L-8-SY +25/+50/+100 Composite	2210485-023	X
CR-L-8-SY +140/+200/+270 Composite	2210485-027	X
CR-L-30-SY +25/+50/+100 Composite	2210485-031	X
CR-L-30-SY +140/+200/+270 Composite	2210485-035	X
CR-M-0-SL-01 +25/+50/+100.01/+100-02 Composite	2210485-040	X
CTS-M-0-+1/4-inch	2210485-042	X
CR-M-0-SL-01 +140/+200/+270 Composite	2210485-045	X
CR-M-0-SL-01 -270	2210485-046	X
CR-M-4-SY +25/+50/+100 Composite	2210485-050	X
CR-M-4-SY +140/+200/+270 Composite	2210485-054	X
CR-M-8-SY +25/+50/+100 Composite	2210485-058	X
CR-M-8-SY +140/+200/+270 Composite	2210485-062	X
CR-M-30-SY +25/+50/+100.01/+100.02 Composite	2210485-067	X
CTS-H-0-+1/4 inch Bulk Assay	2210485-068	X
CR-M-30-SY +140/+200/+270 Composite	2210485-072	X
CR-H-0-SL-01 +25	2210485-073	X
CR-H-0-SL-01 +50	2210485-074	X
CR-H-0-SL-01 +100/+140/+200/+270 Composite	2210485-079	X
CR-H-0-SL-01 -270	2210485-080	X

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226 Total</u>
CR-H-4-SY +25	2210485-081	X
CR-H-4-SY +50	2210485-082	X
CR-H-4-SY +100/+140/+200/+270 Composite	2210485-087	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2210485 - Radiochemistry

Gamma Spectrometry –Radium-226

SUMMARY

I.) General:

The laboratory has cited analytical EPA 901.1 Modified for the Gamma Spectrometry analyses.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-226	LCS	4353a	16-5	N/A

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the dissolved and suspended fractions of the SDG. All MB results were reported as non-detected and no action was taken.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as "UJ". When between 2 and 3, results are qualified "J". The Radium-228 and Radium-226 results were demonstrated to be significantly different (NAD > 3) and did not require qualification.

VII.) Laboratory Control Sample (LCS):

LCS/LCSD samples were analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery and precision. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on samples CTS-L-0-+1/4-inch, CTS-M-0-+1/4-inch, and CTS-H-0-+1/4 inch Bulk Assay. The Duplicate Error Ratio (DER) of samples CTS-L-0-+1/4-inch (2.62) and CTS-M-0-+1/4-inch (3.15) exceeded the DER limit of 2.14. The Radium-226 results for samples CTS-L-0-+1/4-inch and CTS-M-0-+1/4-inch were qualified as estimated "J" as a result of duplicate results that were outside the DER criteria.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was not performed for this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Gamma analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were not reported for this SDG.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The instrument spectra and instrument data were examined and found to be consistent with the sample results.

XVIII.) Sample Activity Calculation Verification (Level 4):

Radium-226 results samples CTS-L-0-+1/4-inch, CTS-M-0-+1/4-inch, and CTS-H-0-+1/4 inch Bulk Assay were verified from the instrument data and found to be correct.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
CTS-M-0-+1/4-inch	2210485-042	903.1	Radium-226	J	Duplicate Precision
CTS-L-0-+1/4-inch	2210485-015	903.1	Radium-226	J	Duplicate Precision



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-004
ClientSample ID: CR-L-0-SL-01 +25/+50/+100 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/9/2022 9:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	11.0	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 1307 WN
Radium 226 Precision (±)	1.1	pCi/g			EPA 901.1 Mod.	12/06/2022 1307 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-008
ClientSample ID: CR-L-0-SL-01 +140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/9/2022 9:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	9.6	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 1339	WN
Radium 226 Precision (±)	0.9	pCi/g			EPA 901.1 Mod.	12/06/2022 1339	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-009
ClientSample ID: CR-L-0-SL-01 -270
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/9/2022 9:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision.

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, and Vanadium.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-014
ClientSample ID: CR-L-4-SY +25/+50/+100-01/+100-02 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/6/2022 4:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	9.7	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 1442 WN
Radium 226 Precision (±)	1.1	pCi/g			EPA 901.1 Mod.	12/06/2022 1442 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-015
ClientSample ID: CTS-L-0-+1/4-inch
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 8/30/2022 10:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision.

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, and Vanadium.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-019
ClientSample ID: CR-L-4-SY +140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/6/2022 4:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	9.8	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 1616 WN
Radium 226 Precision (±)	1.0	pCi/g			EPA 901.1 Mod.	12/06/2022 1616 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-023
ClientSample ID: CR-L-8-SY +25/+50/+100 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/7/2022 2:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	9.0	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 1647 WN
Radium 226 Precision (±)	1.0	pCi/g			EPA 901.1 Mod.	12/06/2022 1647 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-027
ClientSample ID: CR-L-8-SY +140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/7/2022 2:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	6.6	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 1719 WN
Radium 226 Precision (±)	0.8	pCi/g			EPA 901.1 Mod.	12/06/2022 1719 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-031
ClientSample ID: CR-L-30-SY +25/+50/+100 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/8/2022 8:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	6.2	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 1750 WN
Radium 226 Precision (±)	0.9	pCi/g			EPA 901.1 Mod.	12/06/2022 1750 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-035
ClientSample ID: CR-L-30-SY +140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/8/2022 8:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	5.3	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 1821 WN
Radium 226 Precision (±)	0.8	pCi/g			EPA 901.1 Mod.	12/06/2022 1821 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-040
ClientSample ID: CR-M-0-SL-01 +25/+50/+100.01/+100-02 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/14/2022 11:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	32.0	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 1853	WN
Radium 226 Precision (±)	1.4	pCi/g			EPA 901.1 Mod.	12/06/2022 1853	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-042
ClientSample ID: CTS-M-0-+1/4-inch
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 8/30/2022 10:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision.

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, and Vanadium.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-045
ClientSample ID: CR-M-0-SL-01 +140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/14/2022 11:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	76.8	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 2028 WN
Radium 226 Precision (±)	4.0	pCi/g			EPA 901.1 Mod.	12/06/2022 2028 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-046
ClientSample ID: CR-M-0-SL-01 -270
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/14/2022 11:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	430	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 2059	WN
Radium 226 Precision (±)	9.4	pCi/g			EPA 901.1 Mod.	12/06/2022 2059	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/13/2022 209	MS
Arsenic	5.92	mg/Kg	J	15	6020A	12/13/2022 209	MS
Barium	530	mg/Kg		10	6020A	12/13/2022 209	MS
Beryllium	1.66	mg/Kg	J	10	6020A	12/13/2022 209	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/13/2022 209	MS
Chromium	17.5	mg/Kg	J	50	6020A	12/13/2022 209	MS
Cobalt	8.93	mg/Kg	J	50	6020A	12/13/2022 209	MS
Copper	370	mg/Kg		10	6020A	12/13/2022 209	MS
Lead	20	mg/Kg		10	6020A	12/13/2022 209	MS
Manganese	340	mg/Kg		10	6020A	12/13/2022 209	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/13/2022 209	MS
Nickel	12.5	mg/Kg	J	50	6020A	12/13/2022 209	MS
Selenium	370	mg/Kg		50	6020A	12/13/2022 209	MS
Silver	ND	mg/Kg	U	10	6020A	12/13/2022 209	MS
Thallium	ND	mg/Kg	U	100	6020A	12/13/2022 209	MS
Uranium	1200	mg/Kg		10	6020A	12/13/2022 209	MS
Vanadium	360	mg/Kg		50	6020A	12/13/2022 209	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-050
ClientSample ID: CR-M-4-SY +25/+50/+100 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/9/2022 10:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	16.8	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 2131 WN
Radium 226 Precision (±)	1.0	pCi/g			EPA 901.1 Mod.	12/06/2022 2131 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-054
ClientSample ID: CR-M-4-SY +140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/9/2022 10:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	51.3	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 2202 WN
Radium 226 Precision (±)	3.4	pCi/g			EPA 901.1 Mod.	12/06/2022 2202 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-058
ClientSample ID: CR-M-8-SY +25/+50/+100 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/12/2022 11:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	15.5	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 2233 WN
Radium 226 Precision (±)	0.9	pCi/g			EPA 901.1 Mod.	12/06/2022 2233 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-062
ClientSample ID: CR-M-8-SY +140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/12/2022 11:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	39.8	pCi/g		0.2	EPA 901.1 Mod.	12/06/2022 2305 WN
Radium 226 Precision (±)	3.0	pCi/g			EPA 901.1 Mod.	12/06/2022 2305 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-067
ClientSample ID: CR-M-30-SY +25/+50/+100.01/+100.02 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/13/2022 3:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	10.9	pCi/g		0.2	EPA 901.1 Mod.	12/07/2022 1043 WN
Radium 226 Precision (±)	0.8	pCi/g			EPA 901.1 Mod.	12/07/2022 1043 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-068
ClientSample ID: CTS-H-0-+1/4 inch Bulk Assay
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 8/30/2022 10:00:00 AM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	129	pCi/g		0.2	EPA 901.1 Mod.	12/07/2022 1114	WN
Radium 226 Precision (±)	3.1	pCi/g			EPA 901.1 Mod.	12/07/2022 1114	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/12/2022 2030	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/12/2022 2030	MS
Barium	80	mg/Kg		10	6020A	12/12/2022 2030	MS
Beryllium	0.288	mg/Kg	J	10	6020A	12/12/2022 2030	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/12/2022 2030	MS
Chromium	33.9	mg/Kg	J	50	6020A	12/12/2022 2030	MS
Cobalt	1.50	mg/Kg	J	50	6020A	12/12/2022 2030	MS
Copper	4.66	mg/Kg	J	10	6020A	12/12/2022 2030	MS
Lead	10	mg/Kg		10	6020A	12/12/2022 2030	MS
Manganese	290	mg/Kg		10	6020A	12/12/2022 2030	MS
Molybdenum	5.65	mg/Kg	J	50	6020A	12/12/2022 2030	MS
Nickel	22.8	mg/Kg	J	50	6020A	12/12/2022 2030	MS
Selenium	7.06	mg/Kg	J	50	6020A	12/12/2022 2030	MS
Silver	ND	mg/Kg	U	10	6020A	12/12/2022 2030	MS
Thallium	ND	mg/Kg	U	100	6020A	12/12/2022 2030	MS
Uranium	610	mg/Kg		10	6020A	12/12/2022 2030	MS
Vanadium	1730	mg/Kg		50	6020A	12/12/2022 2030	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-072
ClientSample ID: CR-M-30-SY +140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/13/2022 3:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	23.6	pCi/g		0.2	EPA 901.1 Mod.	12/07/2022 1217	WN
Radium 226 Precision (±)	2.2	pCi/g			EPA 901.1 Mod.	12/07/2022 1217	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-073
ClientSample ID: CR-H-0-SL-01 +25
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/19/2022 5:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	86.7	pCi/g		0.2	EPA 901.1 Mod.	12/07/2022 1249	WN
Radium 226 Precision (±)	3.5	pCi/g			EPA 901.1 Mod.	12/07/2022 1249	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/12/2022 2112	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/12/2022 2112	MS
Barium	290	mg/Kg		10	6020A	12/12/2022 2112	MS
Beryllium	ND	mg/Kg	U	10	6020A	12/12/2022 2112	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/12/2022 2112	MS
Chromium	ND	mg/Kg	U	50	6020A	12/12/2022 2112	MS
Cobalt	0.848	mg/Kg	J	50	6020A	12/12/2022 2112	MS
Copper	ND	mg/Kg	U	10	6020A	12/12/2022 2112	MS
Lead	2.17	mg/Kg	J	10	6020A	12/12/2022 2112	MS
Manganese	70	mg/Kg		10	6020A	12/12/2022 2112	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/12/2022 2112	MS
Nickel	ND	mg/Kg	U	50	6020A	12/12/2022 2112	MS
Selenium	30.9	mg/Kg	J	50	6020A	12/12/2022 2112	MS
Silver	ND	mg/Kg	U	10	6020A	12/12/2022 2112	MS
Thallium	ND	mg/Kg	U	100	6020A	12/12/2022 2112	MS
Uranium	170	mg/Kg		10	6020A	12/12/2022 2112	MS
Vanadium	39.4	mg/Kg	J	50	6020A	12/12/2022 2112	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-074
ClientSample ID: CR-H-0-SL-01 +50
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/19/2022 5:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	40.4	pCi/g		0.2	EPA 901.1 Mod.	12/07/2022 1320	WN
Radium 226 Precision (±)	1.8	pCi/g			EPA 901.1 Mod.	12/07/2022 1320	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/12/2022 2140	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/12/2022 2140	MS
Barium	30	mg/Kg		10	6020A	12/12/2022 2140	MS
Beryllium	ND	mg/Kg	U	10	6020A	12/12/2022 2140	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/12/2022 2140	MS
Chromium	ND	mg/Kg	U	50	6020A	12/12/2022 2140	MS
Cobalt	0.369	mg/Kg	J	50	6020A	12/12/2022 2140	MS
Copper	ND	mg/Kg	U	10	6020A	12/12/2022 2140	MS
Lead	1.08	mg/Kg	J	10	6020A	12/12/2022 2140	MS
Manganese	30	mg/Kg		10	6020A	12/12/2022 2140	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/12/2022 2140	MS
Nickel	ND	mg/Kg	U	50	6020A	12/12/2022 2140	MS
Selenium	ND	mg/Kg	U	50	6020A	12/12/2022 2140	MS
Silver	ND	mg/Kg	U	10	6020A	12/12/2022 2140	MS
Thallium	ND	mg/Kg	U	100	6020A	12/12/2022 2140	MS
Uranium	90	mg/Kg		10	6020A	12/12/2022 2140	MS
Vanadium	24.4	mg/Kg	J	50	6020A	12/12/2022 2140	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-079
ClientSample ID: CR-H-0-SL-01 +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/19/2022 5:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	94.8	pCi/g		0.2	EPA 901.1 Mod.	12/07/2022 1352	WN
Radium 226 Precision (±)	2.9	pCi/g			EPA 901.1 Mod.	12/07/2022 1352	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-080
ClientSample ID: CR-H-0-SL-01 -270
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/19/2022 5:00:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision (±).

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, and Vanadium.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-081
ClientSample ID: CR-H-4-SY +25
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/15/2022 1:30:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	36.1	pCi/g		0.2	EPA 901.1 Mod.	12/07/2022 1456	WN
Radium 226 Precision (±)	2.2	pCi/g			EPA 901.1 Mod.	12/07/2022 1456	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/12/2022 2235	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/12/2022 2235	MS
Barium	30	mg/Kg		10	6020A	12/12/2022 2235	MS
Beryllium	ND	mg/Kg	U	10	6020A	12/12/2022 2235	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/12/2022 2235	MS
Chromium	ND	mg/Kg	U	50	6020A	12/12/2022 2235	MS
Cobalt	0.625	mg/Kg	J	50	6020A	12/12/2022 2235	MS
Copper	3.29	mg/Kg	J	10	6020A	12/12/2022 2235	MS
Lead	2.13	mg/Kg	J	10	6020A	12/12/2022 2235	MS
Manganese	30	mg/Kg		10	6020A	12/12/2022 2235	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/12/2022 2235	MS
Nickel	ND	mg/Kg	U	50	6020A	12/12/2022 2235	MS
Selenium	ND	mg/Kg	U	50	6020A	12/12/2022 2235	MS
Silver	ND	mg/Kg	U	10	6020A	12/12/2022 2235	MS
Thallium	ND	mg/Kg	U	100	6020A	12/12/2022 2235	MS
Uranium	60	mg/Kg		10	6020A	12/12/2022 2235	MS
Vanadium	17.8	mg/Kg	J	50	6020A	12/12/2022 2235	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-082
ClientSample ID: CR-H-4-SY +50
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/15/2022 1:30:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	20.3	pCi/g		0.2	EPA 901.1 Mod.	12/07/2022 1527	WN
Radium 226 Precision (±)	1.2	pCi/g			EPA 901.1 Mod.	12/07/2022 1527	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/12/2022 2256	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/12/2022 2256	MS
Barium	20	mg/Kg		10	6020A	12/12/2022 2256	MS
Beryllium	ND	mg/Kg	U	10	6020A	12/12/2022 2256	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/12/2022 2256	MS
Chromium	ND	mg/Kg	U	50	6020A	12/12/2022 2256	MS
Cobalt	0.214	mg/Kg	J	50	6020A	12/12/2022 2256	MS
Copper	3.90	mg/Kg	J	10	6020A	12/12/2022 2256	MS
Lead	0.893	mg/Kg	J	10	6020A	12/12/2022 2256	MS
Manganese	30	mg/Kg		10	6020A	12/12/2022 2256	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/12/2022 2256	MS
Nickel	ND	mg/Kg	U	50	6020A	12/12/2022 2256	MS
Selenium	ND	mg/Kg	U	50	6020A	12/12/2022 2256	MS
Silver	ND	mg/Kg	U	10	6020A	12/12/2022 2256	MS
Thallium	ND	mg/Kg	U	100	6020A	12/12/2022 2256	MS
Uranium	30	mg/Kg		10	6020A	12/12/2022 2256	MS
Vanadium	11.3	mg/Kg	J	50	6020A	12/12/2022 2256	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 12/21/2022
Report ID: S2210485001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2210485-087
ClientSample ID: CR-H-4-SY +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2210485
CollectionDate: 9/15/2022 1:30:00 PM
DateReceived: 10/10/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	43.0	pCi/g		0.2	EPA 901.1 Mod.	12/07/2022 1559	WN
Radium 226 Precision (±)	2.0	pCi/g			EPA 901.1 Mod.	12/07/2022 1559	WN

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: EPA 901.1 Mod.
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Soil
TYPES OF ANALYSES: Gamma Spectrometry (Radium-226)
DATA VALIDATION DATE: January 22, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2211015
SAMPLING DATE(S): August 24-October 4, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226 Total</u>
CR-H-8-SY +25	2211015-001	X
CR-H-8-SY +50-01	2211015-002	X
CR-H-8-SY +50-02	2211015-003	X
CR-H-0-KY	2211015-004	X
CR-H-8-SY +100/+140/+200/+270 Composite	2211015-009	X
CR-H-30-SY +25/+50 Composite	2211015-012	X
CR-H-30-SY +100/+140/+200/+270 Composite	2211015-017	X
QV-L-0-SL-01 +25/+50 Composite	2211015-020	X
QV-L-0-SL-01 +100/+140/+200/+270 Composite	2211015-025	X
QV-L-0-SL-01 -270	2211015-026	X
QV-L-4-SY +100/+140/+200/+270 Composite	2211015-035	X
QV-L-8-SY +25/+50 Composite	2211015-038	X
QV-L-8-SY +100/+140/+200/+270 Composite	2211015-043	X
QV-L-30-SY +25/+50 Composite	2211015-046	X
QV-L-30-SY +100/+140/+200/+270 Composite	2211015-051	X
QV-M-4-SY +25	2211015-052	X
QV-M-4-SY +50	2211015-053	X
QV-M-4-SY +100-01/+100-02/+140/+200/+270 Composite	2211015-059	X
QV-M-0-SL-01 +25	2211015-060	X
QV-M-0-SL-01 +50	2211015-061	X
QV-M-0-SL-01 +100/+140/+200/+270 Composite-01	2211015-066	X
QV-M-0-SL-01 +100/+140/+200/+270 Composite-02	2211015-067	X
QV-M-0-SL-01 -270	2211015-068	X
QV-M-8-SY +25	2211015-069	X
QV-M-8-SY +50	2211015-070	X

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226 Total</u>
QV-M-8-SY +100/+140/+200/+270 Composite	2211015-075	X
QV-M-30-SY +25/+50 Composite	2211015-078	X
QV-M-30-SY +100/+140/+200/+270 Composite	2211015-084	X
QV-H-4-SY +25	2211015-085	X
QV-H-4-SY +50-01	2211015-086	X
QV-H-4-SY +50-02	2211015-087	X
QV-H-4-SY +100/+140/+200/+270 Composite	2211015-092	X
QV-H-0-SL-01 +25	2211015-093	X
QV-H-0-SL-01 +50	2211015-094	X
QV-H-0-SL-01 +100/+140/+200/+270 Composite-01	2211015-099	X
QV-H-0-SL-01 +100/+140/+200/+270 Composite-02	2211015-100	X
QV-H-0-SL-01 -270	2211015-101	X
QV-H-30-SY +25	2211015-102	X
QV-H-30-SY +50-01	2211015-104	X
QV-H-30-SY +50-02	2211015-105	X
QV-H-30-SY+100-01/+100-02/+140/+200/+270	2211015-111	X
QV-H-8-SY +25	2211015-112	X
QV-H-8-SY +50	2211015-113	X
QV-H-8-SY +100/+140/+200/+270 Composite	2211015-118	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2211015 - Radiochemistry

Gamma Spectrometry –Radium-226

SUMMARY

I.) General:

The laboratory has cited analytical EPA 901.1 Modified for the Gamma Spectrometry analyses.

II.) Overall Assessment of Data:

All laboratory data were acceptable with no qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-226	LCS	4353a	16-5	N/A

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the dissolved and suspended fractions of the SDG. All MB results were reported as non-detected and no action was taken.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as "UJ". When between 2 and 3, results are qualified "J". The Radium-228 and Radium-226 results were demonstrated to be significantly different ($NAD > 3$) and did not require qualification.

VII.) Laboratory Control Sample (LCS):

LCS/LCSD samples were analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery and precision. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on CR-H-0-KY. The Duplicate Error Ratio (DER) of 0.06 was less than the DER limit of 2.14. No action was taken.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was not performed for this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Gamma analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were not reported for this SDG.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
None					



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-001
ClientSample ID: CR-H-8-SY +25
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/17/2022 4:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	24.5	pCi/g		0.2	EPA 901.1 Mod.	12/08/2022 1226	WN
Radium 226 Precision (±)	1.8	pCi/g			EPA 901.1 Mod.	12/08/2022 1226	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 412	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/20/2022 412	MS
Barium	30	mg/Kg		10	6020A	12/20/2022 412	MS
Beryllium	ND	mg/Kg	U	10	6020A	12/20/2022 412	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 412	MS
Chromium	ND	mg/Kg	U	50	6020A	12/20/2022 412	MS
Cobalt	0.488	mg/Kg	J	50	6020A	12/20/2022 412	MS
Copper	ND	mg/Kg	U	10	6020A	12/20/2022 412	MS
Lead	1.18	mg/Kg	J	10	6020A	12/20/2022 412	MS
Manganese	20	mg/Kg		10	6020A	12/20/2022 412	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 412	MS
Nickel	ND	mg/Kg	U	50	6020A	12/20/2022 412	MS
Selenium	ND	mg/Kg	U	50	6020A	12/20/2022 412	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 412	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 412	MS
Uranium	40	mg/Kg		10	6020A	12/20/2022 412	MS
Vanadium	14.8	mg/Kg	J	50	6020A	12/20/2022 412	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-002
ClientSample ID: CR-H-8-SY +50-01
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/17/2022 4:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision.

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, and Vanadium.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-003
ClientSample ID: CR-H-8-SY +50-02
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/17/2022 4:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	22.1	pCi/g		0.2	EPA 901.1 Mod.	12/08/2022 1329	WN
Radium 226 Precision (±)	1.9	pCi/g			EPA 901.1 Mod.	12/08/2022 1329	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/20/2022 425	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/20/2022 425	MS
Barium	30	mg/Kg		10	6020A	12/20/2022 425	MS
Beryllium	ND	mg/Kg	U	10	6020A	12/20/2022 425	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/20/2022 425	MS
Chromium	ND	mg/Kg	U	50	6020A	12/20/2022 425	MS
Cobalt	0.241	mg/Kg	J	50	6020A	12/20/2022 425	MS
Copper	3.28	mg/Kg	J	10	6020A	12/20/2022 425	MS
Lead	0.675	mg/Kg	J	10	6020A	12/20/2022 425	MS
Manganese	40	mg/Kg		10	6020A	12/20/2022 425	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/20/2022 425	MS
Nickel	ND	mg/Kg	U	50	6020A	12/20/2022 425	MS
Selenium	ND	mg/Kg	U	50	6020A	12/20/2022 425	MS
Silver	ND	mg/Kg	U	10	6020A	12/20/2022 425	MS
Thallium	ND	mg/Kg	U	100	6020A	12/20/2022 425	MS
Uranium	20	mg/Kg		10	6020A	12/20/2022 425	MS
Vanadium	10.1	mg/Kg	J	50	6020A	12/20/2022 425	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-004
ClientSample ID: CR-H-0-KY
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 8/24/2022 12:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	77.2	pCi/g		0.2	EPA 901.1 Mod.	12/08/2022 1400	WN
Radium 226 Precision (±)	2.3	pCi/g			EPA 901.1 Mod.	12/08/2022 1400	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/28/2022 1950	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/28/2022 1950	MS
Barium	90	mg/Kg		10	6020A	12/28/2022 1950	MS
Beryllium	0.341	mg/Kg	J	10	6020A	12/28/2022 1950	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/28/2022 1950	MS
Chromium	47.4	mg/Kg	J	50	6020A	12/28/2022 1950	MS
Cobalt	1.34	mg/Kg	J	50	6020A	12/28/2022 1950	MS
Copper	5.25	mg/Kg	J	10	6020A	12/28/2022 1950	MS
Lead	2.22	mg/Kg	J	10	6020A	12/28/2022 1950	MS
Manganese	70	mg/Kg		10	6020A	12/28/2022 1950	MS
Molybdenum	38.8	mg/Kg	J	50	6020A	12/28/2022 1950	MS
Nickel	31.9	mg/Kg	J	50	6020A	12/28/2022 1950	MS
Selenium	5.37	mg/Kg	J	50	6020A	12/28/2022 1950	MS
Silver	ND	mg/Kg	U	10	6020A	12/28/2022 1950	MS
Thallium	ND	mg/Kg	U	100	6020A	12/28/2022 1950	MS
Uranium	220	mg/Kg		10	6020A	12/28/2022 1950	MS
Vanadium	45.3	mg/Kg	J	50	6020A	12/28/2022 1950	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-009
ClientSample ID: CR-H-8-SY +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/17/2022 4:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	36.6	pCi/g		0.2	EPA 901.1 Mod.	12/08/2022 1504	WN
Radium 226 Precision (±)	1.9	pCi/g			EPA 901.1 Mod.	12/08/2022 1504	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-012
ClientSample ID: CR-H-30-SY +25/+50 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/19/2022 11:40:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	15.3	pCi/g		0.2	EPA 901.1 Mod.	12/08/2022 1535	WN
Radium 226 Precision (±)	1.0	pCi/g			EPA 901.1 Mod.	12/08/2022 1535	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-017
ClientSample ID: CR-H-30-SY +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/19/2022 11:40:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	22.1	pCi/g		0.2	EPA 901.1 Mod.	12/08/2022 1606	WN
Radium 226 Precision (±)	1.5	pCi/g			EPA 901.1 Mod.	12/08/2022 1606	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-020
ClientSample ID: QV-L-0-SL-01 +25/+50 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/29/2022 6:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	7.5	pCi/g		0.2	EPA 901.1 Mod.	12/08/2022 1638	WN
Radium 226 Precision (±)	0.9	pCi/g			EPA 901.1 Mod.	12/08/2022 1638	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-025
ClientSample ID: QV-L-0-SL-01 +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/29/2022 6:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	7.1	pCi/g		0.2	EPA 901.1 Mod.	12/08/2022 1709 WN
Radium 226 Precision (±)	0.8	pCi/g			EPA 901.1 Mod.	12/08/2022 1709 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-026
ClientSample ID: QV-L-0-SL-01 -270
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/29/2022 6:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	141	pCi/g		0.2	EPA 901.1 Mod.	12/08/2022 1741	WN
Radium 226 Precision (±)	4.9	pCi/g			EPA 901.1 Mod.	12/08/2022 1741	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/28/2022 2215	MS
Arsenic	6.60	mg/Kg	J	15	6020A	12/28/2022 2215	MS
Barium	370	mg/Kg		10	6020A	12/28/2022 2215	MS
Beryllium	1.41	mg/Kg	J	10	6020A	12/28/2022 2215	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/28/2022 2215	MS
Chromium	18.1	mg/Kg	J	50	6020A	12/28/2022 2215	MS
Cobalt	9.47	mg/Kg	J	50	6020A	12/28/2022 2215	MS
Copper	340	mg/Kg		10	6020A	12/28/2022 2215	MS
Lead	30	mg/Kg		10	6020A	12/28/2022 2215	MS
Manganese	390	mg/Kg		10	6020A	12/28/2022 2215	MS
Molybdenum	0.944	mg/Kg	J	50	6020A	12/28/2022 2215	MS
Nickel	12.8	mg/Kg	J	50	6020A	12/28/2022 2215	MS
Selenium	60	mg/Kg		50	6020A	12/28/2022 2215	MS
Silver	ND	mg/Kg	U	10	6020A	12/28/2022 2215	MS
Thallium	ND	mg/Kg	U	100	6020A	12/28/2022 2215	MS
Uranium	240	mg/Kg		10	6020A	12/28/2022 2215	MS
Vanadium	130	mg/Kg		50	6020A	12/28/2022 2215	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-035
ClientSample ID: QV-L-4-SY +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/20/2022 10:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	5.4	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1130 WN
Radium 226 Precision (±)	0.8	pCi/g			EPA 901.1 Mod.	12/09/2022 1130 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-038
ClientSample ID: QV-L-8-SY +25/+50 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/28/2022 1:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	5.3	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1201	WN
Radium 226 Precision (±)	0.6	pCi/g			EPA 901.1 Mod.	12/09/2022 1201	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-043
ClientSample ID: QV-L-8-SY +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/28/2022 1:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	3.9	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1233	WN
Radium 226 Precision (±)	0.6	pCi/g			EPA 901.1 Mod.	12/09/2022 1233	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-046
ClientSample ID: QV-L-30-SY +25/+50 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/29/2022 8:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	4.2	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1304	WN
Radium 226 Precision (±)	0.6	pCi/g			EPA 901.1 Mod.	12/09/2022 1304	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-051
ClientSample ID: QV-L-30-SY +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/29/2022 8:00:00 AM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	3.9	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1335	WN
Radium 226 Precision (±)	0.5	pCi/g			EPA 901.1 Mod.	12/09/2022 1335	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-052
ClientSample ID: QV-M-4-SY +25
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/30/2022 12:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	12.1	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1407	WN
Radium 226 Precision (±)	1.3	pCi/g			EPA 901.1 Mod.	12/09/2022 1407	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/29/2022 347	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/29/2022 347	MS
Barium	20	mg/Kg		10	6020A	12/29/2022 347	MS
Beryllium	ND	mg/Kg	U	10	6020A	12/29/2022 347	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/29/2022 347	MS
Chromium	ND	mg/Kg	U	50	6020A	12/29/2022 347	MS
Cobalt	0.765	mg/Kg	J	50	6020A	12/29/2022 347	MS
Copper	ND	mg/Kg	U	10	6020A	12/29/2022 347	MS
Lead	1.94	mg/Kg	J	10	6020A	12/29/2022 347	MS
Manganese	40	mg/Kg		10	6020A	12/29/2022 347	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/29/2022 347	MS
Nickel	ND	mg/Kg	U	50	6020A	12/29/2022 347	MS
Selenium	12.1	mg/Kg	J	50	6020A	12/29/2022 347	MS
Silver	ND	mg/Kg	U	10	6020A	12/29/2022 347	MS
Thallium	ND	mg/Kg	U	100	6020A	12/29/2022 347	MS
Uranium	30	mg/Kg		10	6020A	12/29/2022 347	MS
Vanadium	13.1	mg/Kg	J	50	6020A	12/29/2022 347	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-053
ClientSample ID: QV-M-4-SY +50
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/30/2022 12:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	6.6	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1438	WN
Radium 226 Precision (±)	0.8	pCi/g			EPA 901.1 Mod.	12/09/2022 1438	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/29/2022 354	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/29/2022 354	MS
Barium	7.39	mg/Kg	J	10	6020A	12/29/2022 354	MS
Beryllium	ND	mg/Kg	U	10	6020A	12/29/2022 354	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/29/2022 354	MS
Chromium	ND	mg/Kg	U	50	6020A	12/29/2022 354	MS
Cobalt	0.193	mg/Kg	J	50	6020A	12/29/2022 354	MS
Copper	3.45	mg/Kg	J	10	6020A	12/29/2022 354	MS
Lead	0.892	mg/Kg	J	10	6020A	12/29/2022 354	MS
Manganese	30	mg/Kg		10	6020A	12/29/2022 354	MS
Molybdenum	ND	mg/Kg	U	50	6020A	12/29/2022 354	MS
Nickel	ND	mg/Kg	U	50	6020A	12/29/2022 354	MS
Selenium	ND	mg/Kg	U	50	6020A	12/29/2022 354	MS
Silver	ND	mg/Kg	U	10	6020A	12/29/2022 354	MS
Thallium	ND	mg/Kg	U	100	6020A	12/29/2022 354	MS
Uranium	10	mg/Kg		10	6020A	12/29/2022 354	MS
Vanadium	ND	mg/Kg	U	50	6020A	12/29/2022 354	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-059
ClientSample ID: QV-M-4-SY +100-01/+100-02/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/30/2022 12:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	7.1	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1438	WN
Radium 226 Precision (±)	0.8	pCi/g			EPA 901.1 Mod.	12/09/2022 1438	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-060
ClientSample ID: QV-M-0-SL-01 +25
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/2/2022 12:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	29.9	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1541	WN
Radium 226 Precision (±)	2.6	pCi/g			EPA 901.1 Mod.	12/09/2022 1541	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	12/29/2022 449	MS
Arsenic	ND	mg/Kg	U	15	6020A	12/29/2022 449	MS
Barium	40	mg/Kg		10	6020A	12/29/2022 449	MS
Beryllium	ND	mg/Kg	U	10	6020A	12/29/2022 449	MS
Cadmium	ND	mg/Kg	U	10	6020A	12/29/2022 449	MS
Chromium	ND	mg/Kg	U	50	6020A	12/29/2022 449	MS
Cobalt	1.75	mg/Kg	J	50	6020A	12/29/2022 449	MS
Copper	ND	mg/Kg	U	10	6020A	12/29/2022 449	MS
Lead	3.73	mg/Kg	J	10	6020A	12/29/2022 449	MS
Manganese	140	mg/Kg		10	6020A	12/29/2022 449	MS
Molybdenum	1.47	mg/Kg	J	50	6020A	12/29/2022 449	MS
Nickel	ND	mg/Kg	U	50	6020A	12/29/2022 449	MS
Selenium	23.0	mg/Kg	J	50	6020A	12/29/2022 449	MS
Silver	ND	mg/Kg	U	10	6020A	12/29/2022 449	MS
Thallium	ND	mg/Kg	U	100	6020A	12/29/2022 449	MS
Uranium	110	mg/Kg		10	6020A	12/29/2022 449	MS
Vanadium	25.7	mg/Kg	J	50	6020A	12/29/2022 449	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-061
ClientSample ID: QV-M-0-SL-01 +50
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/2/2022 12:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision.

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, and Vanadium.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-066
ClientSample ID: QV-M-0-SL-01 +100/+140/+200/+270 Composite-01
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/2/2022 12:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	24.0	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1644	WN
Radium 226 Precision (±)	2.2	pCi/g			EPA 901.1 Mod.	12/09/2022 1644	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-067
ClientSample ID: QV-M-0-SL-01 +100/+140/+200/+270 Composite-02
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/2/2022 12:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	28.0	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1715 WN
Radium 226 Precision (±)	2.3	pCi/g			EPA 901.1 Mod.	12/09/2022 1715 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-068
ClientSample ID: QV-M-0-SL-01 -270
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/2/2022 12:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	374	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1746	WN
Radium 226 Precision (±)	8.0	pCi/g			EPA 901.1 Mod.	12/09/2022 1746	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	01/03/2023 2109	MS
Arsenic	7.16	mg/Kg	J	15	6020A	01/03/2023 2109	MS
Barium	420	mg/Kg		10	6020A	01/03/2023 2109	MS
Beryllium	1.28	mg/Kg	J	10	6020A	01/03/2023 2109	MS
Cadmium	ND	mg/Kg	U	10	6020A	01/03/2023 2109	MS
Chromium	ND	mg/Kg	U	50	6020A	01/03/2023 2109	MS
Cobalt	7.56	mg/Kg	J	50	6020A	01/03/2023 2109	MS
Copper	250	mg/Kg		10	6020A	01/03/2023 2109	MS
Lead	20	mg/Kg		10	6020A	01/03/2023 2109	MS
Manganese	400	mg/Kg		10	6020A	01/03/2023 2109	MS
Molybdenum	1.71	mg/Kg	J	50	6020A	01/03/2023 2109	MS
Nickel	8.60	mg/Kg	J	50	6020A	01/03/2023 2109	MS
Selenium	160	mg/Kg		50	6020A	01/03/2023 2109	MS
Silver	ND	mg/Kg	U	10	6020A	01/03/2023 2109	MS
Thallium	ND	mg/Kg	U	100	6020A	01/03/2023 2109	MS
Uranium	840	mg/Kg		10	6020A	01/03/2023 2109	MS
Vanadium	270	mg/Kg		50	6020A	01/03/2023 2109	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-069
ClientSample ID: QV-M-8-SY +25
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/30/2022 9:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	11.1	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1818	WN
Radium 226 Precision (±)	1.5	pCi/g			EPA 901.1 Mod.	12/09/2022 1818	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	01/03/2023 2116	MS
Arsenic	ND	mg/Kg	U	15	6020A	01/03/2023 2116	MS
Barium	20	mg/Kg		10	6020A	01/03/2023 2116	MS
Beryllium	ND	mg/Kg	U	10	6020A	01/03/2023 2116	MS
Cadmium	ND	mg/Kg	U	10	6020A	01/03/2023 2116	MS
Chromium	ND	mg/Kg	U	50	6020A	01/03/2023 2116	MS
Cobalt	0.418	mg/Kg	J	50	6020A	01/03/2023 2116	MS
Copper	3.56	mg/Kg	J	10	6020A	01/03/2023 2116	MS
Lead	1.65	mg/Kg	J	10	6020A	01/03/2023 2116	MS
Manganese	50	mg/Kg		10	6020A	01/03/2023 2116	MS
Molybdenum	ND	mg/Kg	U	50	6020A	01/03/2023 2116	MS
Nickel	ND	mg/Kg	U	50	6020A	01/03/2023 2116	MS
Selenium	9.50	mg/Kg	J	50	6020A	01/03/2023 2116	MS
Silver	ND	mg/Kg	U	10	6020A	01/03/2023 2116	MS
Thallium	ND	mg/Kg	U	100	6020A	01/03/2023 2116	MS
Uranium	20	mg/Kg		10	6020A	01/03/2023 2116	MS
Vanadium	11.6	mg/Kg	J	50	6020A	01/03/2023 2116	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-070
ClientSample ID: QV-M-8-SY +50
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/30/2022 9:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision.

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals like Antimony, Arsenic, Barium, etc.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-075
ClientSample ID: QV-M-8-SY +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 9/30/2022 9:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	9.2	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1921 WN
Radium 226 Precision (±)	1.0	pCi/g			EPA 901.1 Mod.	12/09/2022 1921 WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-078
ClientSample ID: QV-M-30-SY +25/+50 Composite
COC: WEB
PWS ID:

Date Reported: 1/16/2023
Report ID: S2211015001

WorkOrder: S2211015
CollectionDate: 10/1/2022 6:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	4.9	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 1952 WN
Radium 226 Precision (±)	0.6	pCi/g			EPA 901.1 Mod.	12/09/2022 1952 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-084
ClientSample ID: QV-M-30-SY +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/1/2022 6:30:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	6.6	pCi/g		0.2	EPA 901.1 Mod.	12/09/2022 2024 WN
Radium 226 Precision (±)	0.8	pCi/g			EPA 901.1 Mod.	12/09/2022 2024 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-085
ClientSample ID: QV-H-4-SY +25
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/2/2022 5:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	16.5	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1245 WN
Radium 226 Precision (±)	1.5	pCi/g			EPA 901.1 Mod.	12/14/2022 1245 WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	01/03/2023 2334 MS
Arsenic	ND	mg/Kg	U	15	6020A	01/03/2023 2334 MS
Barium	30	mg/Kg		10	6020A	01/03/2023 2334 MS
Beryllium	ND	mg/Kg	U	10	6020A	01/03/2023 2334 MS
Cadmium	ND	mg/Kg	U	10	6020A	01/03/2023 2334 MS
Chromium	ND	mg/Kg	U	50	6020A	01/03/2023 2334 MS
Cobalt	0.907	mg/Kg	J	50	6020A	01/03/2023 2334 MS
Copper	3.38	mg/Kg	J	10	6020A	01/03/2023 2334 MS
Lead	2.02	mg/Kg	J	10	6020A	01/03/2023 2334 MS
Manganese	60	mg/Kg		10	6020A	01/03/2023 2334 MS
Molybdenum	0.921	mg/Kg	J	50	6020A	01/03/2023 2334 MS
Nickel	4.74	mg/Kg	J	50	6020A	01/03/2023 2334 MS
Selenium	9.55	mg/Kg	J	50	6020A	01/03/2023 2334 MS
Silver	ND	mg/Kg	U	10	6020A	01/03/2023 2334 MS
Thallium	ND	mg/Kg	U	100	6020A	01/03/2023 2334 MS
Uranium	30	mg/Kg		10	6020A	01/03/2023 2334 MS
Vanadium	20.2	mg/Kg	J	50	6020A	01/03/2023 2334 MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-086
ClientSample ID: QV-H-4-SY +50-01
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/2/2022 5:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	10.6	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1316	WN
Radium 226 Precision (±)	1.1	pCi/g			EPA 901.1 Mod.	12/14/2022 1316	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	01/04/2023 111	MS
Arsenic	ND	mg/Kg	U	15	6020A	01/04/2023 111	MS
Barium	8.39	mg/Kg	J	10	6020A	01/04/2023 111	MS
Beryllium	ND	mg/Kg	U	10	6020A	01/04/2023 111	MS
Cadmium	ND	mg/Kg	U	10	6020A	01/04/2023 111	MS
Chromium	ND	mg/Kg	U	50	6020A	01/04/2023 111	MS
Cobalt	0.188	mg/Kg	J	50	6020A	01/04/2023 111	MS
Copper	3.13	mg/Kg	J	10	6020A	01/04/2023 111	MS
Lead	1.80	mg/Kg	J	10	6020A	01/04/2023 111	MS
Manganese	30	mg/Kg		10	6020A	01/04/2023 111	MS
Molybdenum	ND	mg/Kg	U	50	6020A	01/04/2023 111	MS
Nickel	ND	mg/Kg	U	50	6020A	01/04/2023 111	MS
Selenium	ND	mg/Kg	U	50	6020A	01/04/2023 111	MS
Silver	ND	mg/Kg	U	10	6020A	01/04/2023 111	MS
Thallium	ND	mg/Kg	U	100	6020A	01/04/2023 111	MS
Uranium	20	mg/Kg		10	6020A	01/04/2023 111	MS
Vanadium	12.5	mg/Kg	J	50	6020A	01/04/2023 111	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-087
ClientSample ID: QV-H-4-SY +50-02
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/2/2022 5:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	11.8	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1348	WN
Radium 226 Precision (±)	1.2	pCi/g			EPA 901.1 Mod.	12/14/2022 1348	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-092
ClientSample ID: QV-H-4-SY +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/2/2022 5:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	11.5	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1419	WN
Radium 226 Precision (±)	0.9	pCi/g			EPA 901.1 Mod.	12/14/2022 1419	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-093
ClientSample ID: QV-H-0-SL-01 +25
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/4/2022 12:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision.

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, and Vanadium.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-094
ClientSample ID: QV-H-0-SL-01 +50
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/4/2022 12:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	18.6	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1522	WN
Radium 226 Precision (±)	1.5	pCi/g			EPA 901.1 Mod.	12/14/2022 1522	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	01/04/2023 234	MS
Arsenic	ND	mg/Kg	U	15	6020A	01/04/2023 234	MS
Barium	10	mg/Kg		10	6020A	01/04/2023 234	MS
Beryllium	ND	mg/Kg	U	10	6020A	01/04/2023 234	MS
Cadmium	ND	mg/Kg	U	10	6020A	01/04/2023 234	MS
Chromium	ND	mg/Kg	U	50	6020A	01/04/2023 234	MS
Cobalt	0.375	mg/Kg	J	50	6020A	01/04/2023 234	MS
Copper	ND	mg/Kg	U	10	6020A	01/04/2023 234	MS
Lead	1.32	mg/Kg	J	10	6020A	01/04/2023 234	MS
Manganese	30	mg/Kg		10	6020A	01/04/2023 234	MS
Molybdenum	ND	mg/Kg	U	50	6020A	01/04/2023 234	MS
Nickel	ND	mg/Kg	U	50	6020A	01/04/2023 234	MS
Selenium	ND	mg/Kg	U	50	6020A	01/04/2023 234	MS
Silver	ND	mg/Kg	U	10	6020A	01/04/2023 234	MS
Thallium	ND	mg/Kg	U	100	6020A	01/04/2023 234	MS
Uranium	50	mg/Kg		10	6020A	01/04/2023 234	MS
Vanadium	19.7	mg/Kg	J	50	6020A	01/04/2023 234	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-099
ClientSample ID: QV-H-0-SL-01 +100/+140/+200/+270 Composite-01
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/4/2022 12:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	35.3	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1554	WN
Radium 226 Precision (±)	2.7	pCi/g			EPA 901.1 Mod.	12/14/2022 1554	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-100
ClientSample ID: QV-H-0-SL-01 +100/+140/+200/+270 Composite-02
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/4/2022 12:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	39.3	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1625	WN
Radium 226 Precision (±)	2.9	pCi/g			EPA 901.1 Mod.	12/14/2022 1625	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-101
ClientSample ID: QV-H-0-SL-01 -270
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/4/2022 12:00:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision.

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, and Vanadium.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-102
ClientSample ID: QV-H-30-SY +25
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/3/2022 9:20:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	10.8	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1728	WN
Radium 226 Precision (±)	1.6	pCi/g			EPA 901.1 Mod.	12/14/2022 1728	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	01/04/2023 323	MS
Arsenic	ND	mg/Kg	U	15	6020A	01/04/2023 323	MS
Barium	20	mg/Kg		10	6020A	01/04/2023 323	MS
Beryllium	ND	mg/Kg	U	10	6020A	01/04/2023 323	MS
Cadmium	ND	mg/Kg	U	10	6020A	01/04/2023 323	MS
Chromium	ND	mg/Kg	U	50	6020A	01/04/2023 323	MS
Cobalt	0.491	mg/Kg	J	50	6020A	01/04/2023 323	MS
Copper	ND	mg/Kg	U	10	6020A	01/04/2023 323	MS
Lead	1.52	mg/Kg	J	10	6020A	01/04/2023 323	MS
Manganese	30	mg/Kg		10	6020A	01/04/2023 323	MS
Molybdenum	ND	mg/Kg	U	50	6020A	01/04/2023 323	MS
Nickel	ND	mg/Kg	U	50	6020A	01/04/2023 323	MS
Selenium	7.58	mg/Kg	J	50	6020A	01/04/2023 323	MS
Silver	ND	mg/Kg	U	10	6020A	01/04/2023 323	MS
Thallium	ND	mg/Kg	U	100	6020A	01/04/2023 323	MS
Uranium	20	mg/Kg		10	6020A	01/04/2023 323	MS
Vanadium	10.3	mg/Kg	J	50	6020A	01/04/2023 323	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-104
ClientSample ID: QV-H-30-SY +50-01
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/3/2022 9:20:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	7.2	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1800 WN
Radium 226 Precision (±)	1.2	pCi/g			EPA 901.1 Mod.	12/14/2022 1800 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-105
ClientSample ID: QV-H-30-SY +50-02
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/3/2022 9:20:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	6.0	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1831	WN
Radium 226 Precision (±)	1.1	pCi/g			EPA 901.1 Mod.	12/14/2022 1831	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-111
ClientSample ID: QV-H-30-SY+100-01/+100-02/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/3/2022 9:20:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	8.1	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1903 WN
Radium 226 Precision (±)	0.8	pCi/g			EPA 901.1 Mod.	12/14/2022 1903 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-112
ClientSample ID: QV-H-8-SY +25
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/3/2022 2:40:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	11.5	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 1934	WN
Radium 226 Precision (±)	1.4	pCi/g			EPA 901.1 Mod.	12/14/2022 1934	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	01/04/2023 439	MS
Arsenic	ND	mg/Kg	U	15	6020A	01/04/2023 439	MS
Barium	20	mg/Kg		10	6020A	01/04/2023 439	MS
Beryllium	ND	mg/Kg	U	10	6020A	01/04/2023 439	MS
Cadmium	ND	mg/Kg	U	10	6020A	01/04/2023 439	MS
Chromium	ND	mg/Kg	U	50	6020A	01/04/2023 439	MS
Cobalt	0.567	mg/Kg	J	50	6020A	01/04/2023 439	MS
Copper	ND	mg/Kg	U	10	6020A	01/04/2023 439	MS
Lead	2.09	mg/Kg	J	10	6020A	01/04/2023 439	MS
Manganese	30	mg/Kg		10	6020A	01/04/2023 439	MS
Molybdenum	ND	mg/Kg	U	50	6020A	01/04/2023 439	MS
Nickel	ND	mg/Kg	U	50	6020A	01/04/2023 439	MS
Selenium	6.70	mg/Kg	J	50	6020A	01/04/2023 439	MS
Silver	ND	mg/Kg	U	10	6020A	01/04/2023 439	MS
Thallium	ND	mg/Kg	U	100	6020A	01/04/2023 439	MS
Uranium	20	mg/Kg		10	6020A	01/04/2023 439	MS
Vanadium	13.5	mg/Kg	J	50	6020A	01/04/2023 439	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-113
ClientSample ID: QV-H-8-SY +50
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/3/2022 2:40:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	6.9	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 2005	WN
Radium 226 Precision (±)	0.7	pCi/g			EPA 901.1 Mod.	12/14/2022 2005	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	01/11/2023 1407	MS
Arsenic	ND	mg/Kg	U	15	6020A	01/11/2023 1407	MS
Barium	8.06	mg/Kg	J	10	6020A	01/11/2023 1407	MS
Beryllium	0.178	mg/Kg	J	10	6020A	01/11/2023 1407	MS
Cadmium	ND	mg/Kg	U	10	6020A	01/11/2023 1407	MS
Chromium	ND	mg/Kg	U	50	6020A	01/11/2023 1407	MS
Cobalt	0.151	mg/Kg	J	50	6020A	01/11/2023 1407	MS
Copper	ND	mg/Kg	U	10	6020A	01/11/2023 1407	MS
Lead	0.903	mg/Kg	J	10	6020A	01/11/2023 1407	MS
Manganese	20	mg/Kg		10	6020A	01/11/2023 1407	MS
Molybdenum	ND	mg/Kg	U	50	6020A	01/11/2023 1407	MS
Nickel	ND	mg/Kg	U	50	6020A	01/11/2023 1407	MS
Selenium	ND	mg/Kg	U	50	6020A	01/11/2023 1407	MS
Silver	ND	mg/Kg	U	10	6020A	01/11/2023 1407	MS
Thallium	ND	mg/Kg	U	100	6020A	01/11/2023 1407	MS
Uranium	20	mg/Kg		10	6020A	01/11/2023 1407	MS
Vanadium	ND	mg/Kg	U	50	6020A	01/11/2023 1407	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/16/2023
Report ID: S2211015001

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211015-118
ClientSample ID: QV-H-8-SY +100/+140/+200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211015
CollectionDate: 10/3/2022 2:40:00 PM
DateReceived: 10/11/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	10.4	pCi/g		0.2	EPA 901.1 Mod.	12/14/2022 2037	WN
Radium 226 Precision (±)	0.8	pCi/g			EPA 901.1 Mod.	12/14/2022 2037	WN

VALIDATA

Chemical Services, Inc.

2159 Wynnton Pointe, Duluth, GA 30097

(770) 232-0130

(770) 232-5082 (Fax)

www.datavalidator.com

DATA VALIDATION SUMMARY REPORT - RADIOCHEMISTRY

COMPANY: Tetra Tech, Inc., Fort Collins, Colorado
PROJECT NAME: RAES-TO33-Ablation Study
PROJECT NUMBER: 103G5440016.14.01
CONTRACTED LAB: Pace Analytical Services, Sheridan, Wyoming
CONTRACT NO.: EP-S9-17-03
QA/QC LEVEL: EPA Stage 2B
ANALYTICAL METHODS: EPA 901.1 Mod.
VALIDATION GUIDELINES: Sampling and Analysis Plan / Quality Assurance Project Plan Response, Assessment, and Evaluation Services (RAES); April 2018; MARLAP; NRC; July 2004, Professional Judgment
SAMPLE MATRIX: Soil
TYPES OF ANALYSES: Gamma Spectrometry (Radium-226)
DATA VALIDATION DATE: January 22, 2023
DATA REVIEWER(S): Robert J. Thielke
SDG NUMBER: 2211026
SAMPLING DATE(S): October 4-17, 2022

SAMPLES:

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226 Total</u>
CTS-L-4-SY +25/+50/+100/+140 Composite	2211026-005	X
CTS-L-4-SY +200/+270 Composite	2211026-008	X
CTS-L-8-SY +25/+50/+100/+140 Composite	2211026-013	X
CTS-L-8-SY +200/+270 Composite	2211026-016	X
CTS-L-30-SY +25/+50/+100-01/+100-02/+140 Composite	2211026-022	X
CTS-L-30-SY +200/+270 Composite	2211026-025	X
CTS-L-0-SL-01 +25/+50/+100/+140 Composite	2211026-030	X
CTS-L-0-SL-01 +200/+270 Composite	2211026-033	X
CTS-L-0-SL-01 -270	2211026-034	X
CTS-M-4-SY +25/+50/+100/+140 Composite	2211026-039	X
CTS-M-4-SY +200/+270 Composite	2211026-042	X
CTS-M-8-SY +25/+50/+100-02/+100-02/+140 Composite	2211026-048	X
CTS-M-8-SY +200/+270 Composite	2211026-051	X
CTS-M-30-SY +25/+50/+100/+140 Composite	2211026-056	X
CTS-M-30-SY +200/+270 Composite	2211026-059	X
CTS-M-0-SL-01 +25/+50/+100/+140 Composite	2211026-064	X
CTS-M-0-SL-01 +200/+270 Composite	2211026-067	X
CTS-M-0-SL-01 -270	2211026-068	X
CTS-H-4-SY +25/+50/+100-01/+100-02/+140 Composite	2211026-074	X
CTS-H-4-SY +200/+270 Composite	2211026-077	X
CTS-H-8-SY +25/+50/+100/+140 Composite	2211026-082	X
CTS-H-8-SY +200/+270 Composite	2211026-085	X
CTS-H-0-SL-01 +25/+50/+100/+140 Composite	2211026-090	X
CTS-H-0-SL-01 +200/+270 Composite	2211026-093	X
CTS-H-0-SL-01 -270	2211026-094	X

<u>Client Sample ID</u>	<u>Laboratory ID</u>	<u>Radium-226 Total</u>
CTS-H-30-SY +25/+50/+100-01/+100-02/+140 Composite	2211026-100	X
CTS-H-30-SY +200/+270 Composite	2211026-103	X

Suffix Codes: DUP = LABORATORY DUPLICATE, FD = FIELD DUPLICATE

Qualifier	Definition
No qualifier	Confirmed identification. The analyte was positively identified at the reported value. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated quality control criteria.
J	The analyte was detected at the reported concentration; the quantitation is an estimate.
J+	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased high.
J-	The analyte was detected at the reported concentration; the quantitation is an estimate and may be biased low.
R	The result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
U	Not considered detected. The associated number is the reported concentration.
UJ	Not considered detected. The associated number is the reported concentration, which may be inaccurate.

DATA VALIDATION SUMMARY

Pace Analytical Services – SDG: 2211026 - Radiochemistry

Gamma Spectrometry –Radium-226

SUMMARY

I.) General:

The laboratory has cited analytical EPA 901.1 Modified for the Gamma Spectrometry analyses.

II.) Overall Assessment of Data:

All laboratory data were acceptable with no qualifications.

MAJOR ISSUES

No major issues were encountered in this fraction of the SDG.

MINOR ISSUES / COMPLIANT DATA

I.) Sample Receipt, Preservation, Preparation, and Holding Times:

All Sample Receipt, Preservation, Preparation, and Holding Time criteria were met.

II.) Standard Traceability:

All Standard Traceability criteria were met. NIST traceable calibration standard certificates were included in the data package. The following quality control (QC) standard certificates were included in the data package:

<u>Analysis</u>	<u>Isotope/Analyte</u>	<u>QC Type</u>	<u>Primary Standard ID</u>	<u>Working Standard ID</u>	<u>Expiration</u>
Alpha Scintillation	Radium-226	LCS	4353a	16-5	N/A

III.) Instrument Performance:

Instrument performance checks were performed prior to sample counting for energy, resolution, and efficiency. All Instrument Performance criteria were met. No data qualification was necessary.

IV.) Calibration:

Initial and Verification Calibrations were performed at the required frequency with NIST traceable standards. All Calibration criteria were met. No action was required.

V.) Background Level:

All Background Level criteria were met. No action was required.

VI.) Blanks:

Method Blank (MB):

One MB was analyzed for each preparation batch for the samples associated with the dissolved and suspended fractions of the SDG. All MB results were reported as non-detected and no action was taken.

Notes: Normalized differences less than 3.0 indicate the sample is not statistically different from the Blank. When normalized difference is 2.0 or less, results are qualified as "UJ". When between 2 and 3, results are qualified "J". The Radium-228 and Radium-226 results were demonstrated to be significantly different ($NAD > 3$) and did not require qualification.

VII.) Laboratory Control Sample (LCS):

LCS/LCSD samples were analyzed for each preparation batch for the samples associated with this fraction of the SDG. All target nuclides were within the laboratory QC control limits for percent recovery and precision. No action was required.

VIII.) Laboratory Duplicate (DUP):

Duplicate analytical analyses were performed on the LCS/LCSD samples.

IX.) Field Duplicate (FD):

There were no Field Duplicates associated with this SDG.

X.) Matrix Spike (MS):

An MS/MSD analysis was not performed for this SDG. No action was necessary.

XI.) Tracer Yield and Uncertainty:

The Gamma analysis does not utilize a tracer. No data qualification was required.

XII.) Nuclide Identification and Interferences:

Sample peak energies were within their expected region of interest (ROI) and were properly identified.

XIII.) Required Detection Limits (RDLs):

All isotope-specific MDCs were less than the Project RDLs for non-detected isotope results.

XIV.) Detection Decisions:

All reported sample results that were less than their sample-specific MDC were considered undetected (U). All Detection Decision criteria were met. No data qualification was needed.

XV.) Negative Sample Results:

Negative sample results were not reported for this SDG.

XVI.) Sample Uncertainty:

All sample-specific total propagated uncertainties (TPUs) were reasonable based on professional judgment. TPUs were < 80% of the sample result for values > 2X the MDC. No data qualification was needed.

XVII.) Spectral Interpretation (Level 4):

The SDG was validated at Level 2B.

XVII.) Sample Activity Calculation Verification (Level 4):

The SDG was validated at Level 2B.

Overall Comments:

No associated sample data were rejected based on this evaluation. Overall, the data meet the requirements and intent of the methods and indicate that the preparatory process and analytical system were in control. Based on the evaluation, the validator-qualified laboratory results are of sufficient quality for their intended purpose. Below is a table summarizing the sample validation qualifiers.

Data Qualification Summary Table

Client Sample ID	Laboratory Sample ID	Analysis	Isotope/ Analyte	Validation Qualifier	Qualifier Reason
None					



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-005
ClientSample ID: CTS-L-4-SY +25/+50/+100/+140 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/5/2022 10:32:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	1.1	pCi/g		0.2	EPA 901.1 Mod.	12/21/2022 1229 WN
Radium 226 Precision (±)	0.4	pCi/g			EPA 901.1 Mod.	12/21/2022 1229 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-008
ClientSample ID: CTS-L-4-SY +200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/5/2022 10:32:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	0.7	pCi/g		0.2	EPA 901.1 Mod.	12/21/2022 1300	WN
Radium 226 Precision (±)	0.4	pCi/g			EPA 901.1 Mod.	12/21/2022 1300	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-013
ClientSample ID: CTS-L-8-SY +25/+50/+100/+140 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/6/2022 8:45:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	1.1	pCi/g		0.2	EPA 901.1 Mod.	12/21/2022 1332	WN
Radium 226 Precision (±)	0.4	pCi/g			EPA 901.1 Mod.	12/21/2022 1332	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-016
ClientSample ID: CTS-L-8-SY +200/+270 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/6/2022 8:45:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	1.1	pCi/g		0.2	EPA 901.1 Mod.	12/21/2022 1403 WN
Radium 226 Precision (±)	0.5	pCi/g			EPA 901.1 Mod.	12/21/2022 1403 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-022
ClientSample ID: CTS-L-30-SY +25/+50/+100-01/+100-02/+140 Compsite
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/6/2022 1:25:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	0.9	pCi/g		0.2	EPA 901.1 Mod.	12/21/2022 1434 WN
Radium 226 Precision (±)	0.6	pCi/g			EPA 901.1 Mod.	12/21/2022 1434 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-025
ClientSample ID: CTS-L-30-SY +200/+270 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/6/2022 1:25:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	0.8	pCi/g		0.2	EPA 901.1 Mod.	12/21/2022 1506 WN
Radium 226 Precision (±)	0.5	pCi/g			EPA 901.1 Mod.	12/21/2022 1506 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-030
ClientSample ID: CTS-L-0-SL-01 +25/+50/+100/+140 Compsite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/4/2022 3:31:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	1.0	pCi/g		0.2	EPA 901.1 Mod.	12/21/2022 1537	WN
Radium 226 Precision (±)	0.4	pCi/g			EPA 901.1 Mod.	12/21/2022 1537	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-033
ClientSample ID: CTS-L-0-SL-01 +200/+270 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/4/2022 3:31:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	1.3	pCi/g		0.2	EPA 901.1 Mod.	12/21/2022 1608	WN
Radium 226 Precision (±)	0.4	pCi/g			EPA 901.1 Mod.	12/21/2022 1608	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-039
ClientSample ID: CTS-M-4-SY +25/+50/+100/+140 Composite
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/11/2022 9:30:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	9.8	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1035 WN
Radium 226 Precision (±)	1.2	pCi/g			EPA 901.1 Mod.	12/22/2022 1035 WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-042
ClientSample ID: CTS-M-4-SY +200/+270 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
 (Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/11/2022 9:30:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	6.2	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1106 WN
Radium 226 Precision (±)	1.2	pCi/g			EPA 901.1 Mod.	12/22/2022 1106 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-048
ClientSample ID: CTS-M-8-SY +25/+50/+100-02/+100-02/+140 Composite
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/11/2022
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	9.3	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1137 WN
Radium 226 Precision (±)	1.2	pCi/g			EPA 901.1 Mod.	12/22/2022 1137 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-051
ClientSample ID: CTS-M-8-SY +200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/11/2022
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	5.5	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1209 WN
Radium 226 Precision (±)	1.1	pCi/g			EPA 901.1 Mod.	12/22/2022 1209 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-056
ClientSample ID: CTS-M-30-SY +25/+50/+100/+140 Composite
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/13/2022 8:00:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	7.0	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1240 WN
Radium 226 Precision (±)	1.0	pCi/g			EPA 901.1 Mod.	12/22/2022 1240 WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-059
ClientSample ID: CTS-M-30-SY +200/+270 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
 (Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/13/2022 8:00:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	4.7	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1312 WN
Radium 226 Precision (±)	1.0	pCi/g			EPA 901.1 Mod.	12/22/2022 1312 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-064
ClientSample ID: CTS-M-0-SL-01 +25/+50/+100/+140 Compisite
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/11/2022 8:00:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	14.6	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1343	WN
Radium 226 Precision (±)	1.3	pCi/g			EPA 901.1 Mod.	12/22/2022 1343	WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-067
ClientSample ID: CTS-M-0-SL-01 +200/+270 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
 (Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/11/2022 8:00:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	7.5	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1415 WN
Radium 226 Precision (±)	1.1	pCi/g			EPA 901.1 Mod.	12/22/2022 1415 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-074
ClientSample ID: CTS-H-4-SY +25/+50/+100-01/+100-02/+140 Composite
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/13/2022 11:30:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	15.2	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1517 WN
Radium 226 Precision (±)	1.5	pCi/g			EPA 901.1 Mod.	12/22/2022 1517 WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-077
ClientSample ID: CTS-H-4-SY +200/+270 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
 (Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/13/2022 11:30:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	6.3	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1549 WN
Radium 226 Precision (±)	1.1	pCi/g			EPA 901.1 Mod.	12/22/2022 1549 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-082
ClientSample ID: CTS-H-8-SY +25/+50/+100/+140 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/13/2022 10:00:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	11.3	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1620 WN
Radium 226 Precision (±)	1.3	pCi/g			EPA 901.1 Mod.	12/22/2022 1620 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-085
ClientSample ID: CTS-H-8-SY +200/+270 Composite
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/13/2022 10:00:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	6.9	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1651 WN
Radium 226 Precision (±)	1.0	pCi/g			EPA 901.1 Mod.	12/22/2022 1651 WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-090
ClientSample ID: CTS-H-0-SL-01 +25/+50/+100/+140 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
 (Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/12/2022 8:40:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	20.1	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1723 WN
Radium 226 Precision (±)	1.6	pCi/g			EPA 901.1 Mod.	12/22/2022 1723 WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-093
ClientSample ID: CTS-H-0-SL-01 +200/+270 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
 (Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/12/2022 8:40:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	7.2	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1754	WN
Radium 226 Precision (±)	0.9	pCi/g			EPA 901.1 Mod.	12/22/2022 1754	WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-100
ClientSample ID: CTS-H-30-SY +25/+50/+100-01/+100-02/+140 Composite
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/17/2022 9:53:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	8.8	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1857	WN
Radium 226 Precision (±)	1.3	pCi/g			EPA 901.1 Mod.	12/22/2022 1857	WN



Sample Analysis Report

Company: Tetra Tech
 1999 Harrison St Suite 500
 Oakland, CA 94612

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-103
ClientSample ID: CTS-H-30-SY +200/+270 Composite
COC: WEB
PWS ID:

Date Reported: 1/18/2023
Report ID: S2211026002
 (Replaces S2211026001)

WorkOrder: S2211026
CollectionDate: 10/17/2022 9:53:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	5.0	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1928 WN
Radium 226 Precision (±)	1.0	pCi/g			EPA 901.1 Mod.	12/22/2022 1928 WN



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-034
ClientSample ID: CTS-L-0-SL-01 -270
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/4/2022 3:31:00 PM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	2.0	pCi/g		0.2	EPA 901.1 Mod.	12/21/2022 1640	WN
Radium 226 Precision (±)	0.5	pCi/g			EPA 901.1 Mod.	12/21/2022 1640	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	01/13/2023 348	MS
Arsenic	ND	mg/Kg	U	15	6020A	01/13/2023 348	MS
Barium	280	mg/Kg		10	6020A	01/13/2023 348	MS
Beryllium	1.00	mg/Kg	J	10	6020A	01/13/2023 348	MS
Cadmium	ND	mg/Kg	U	10	6020A	01/13/2023 348	MS
Chromium	17.5	mg/Kg	J	50	6020A	01/13/2023 348	MS
Cobalt	6.53	mg/Kg	J	50	6020A	01/13/2023 348	MS
Copper	150	mg/Kg		10	6020A	01/13/2023 348	MS
Lead	10	mg/Kg		10	6020A	01/13/2023 348	MS
Manganese	500	mg/Kg		10	6020A	01/13/2023 348	MS
Molybdenum	ND	mg/Kg	U	50	6020A	01/13/2023 348	MS
Nickel	15.4	mg/Kg	J	50	6020A	01/13/2023 348	MS
Selenium	ND	mg/Kg	U	50	6020A	01/13/2023 348	MS
Silver	ND	mg/Kg	U	10	6020A	01/13/2023 348	MS
Thallium	ND	mg/Kg	U	100	6020A	01/13/2023 348	MS
Uranium	3.06	mg/Kg	J	10	6020A	01/13/2023 348	MS
Vanadium	33.9	mg/Kg	J	50	6020A	01/13/2023 348	MS



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-068
ClientSample ID: CTS-M-0-SL-01 -270
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/11/2022 8:00:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init

Radionuclides - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for Radium 226 and Radium 226 Precision.

Metals - Total

Table with 7 columns: Analyses, Result, Units, Qual, RL, Method, Date Analyzed/Init. Rows for various metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium.



Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported: 1/18/2023
Report ID: S2211026002
(Replaces S2211026001)

ProjectName: RAES-TO33-Ablation Study
Lab ID: S2211026-094
ClientSample ID: CTS-H-0-SL-01 -270
COC: WEB
PWS ID:

WorkOrder: S2211026
CollectionDate: 10/12/2022 8:40:00 AM
DateReceived: 10/28/2022
FieldSampler: AH
Matrix: Soil

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
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Radionuclides - Total

Radium 226	19.9	pCi/g		0.2	EPA 901.1 Mod.	12/22/2022 1825	WN
Radium 226 Precision (±)	1.2	pCi/g			EPA 901.1 Mod.	12/22/2022 1825	WN

Metals - Total

Antimony	ND	mg/Kg	U	10	6020A	01/12/2023 2332	MS
Arsenic	ND	mg/Kg	U	15	6020A	01/12/2023 2332	MS
Barium	300	mg/Kg		10	6020A	01/12/2023 2332	MS
Beryllium	0.881	mg/Kg	J	10	6020A	01/12/2023 2332	MS
Cadmium	ND	mg/Kg	U	10	6020A	01/12/2023 2332	MS
Chromium	19.3	mg/Kg	J	50	6020A	01/12/2023 2332	MS
Cobalt	6.24	mg/Kg	J	50	6020A	01/12/2023 2332	MS
Copper	110	mg/Kg		10	6020A	01/12/2023 2332	MS
Lead	10	mg/Kg		10	6020A	01/12/2023 2332	MS
Manganese	470	mg/Kg		10	6020A	01/12/2023 2332	MS
Molybdenum	ND	mg/Kg	U	50	6020A	01/12/2023 2332	MS
Nickel	14.7	mg/Kg	J	50	6020A	01/12/2023 2332	MS
Selenium	ND	mg/Kg	U	50	6020A	01/12/2023 2332	MS
Silver	ND	mg/Kg	U	10	6020A	01/12/2023 2332	MS
Thallium	ND	mg/Kg	U	100	6020A	01/12/2023 2332	MS
Uranium	50	mg/Kg		10	6020A	01/12/2023 2332	MS
Vanadium	170	mg/Kg		50	6020A	01/12/2023 2332	MS