

EXHIBIT (5)D-1

Summit Scientific

4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

August 02, 2021

Joel Mason
Absaroka Solutions
112 High Street
Buffalo, WY 82834

RE: For Sampling-Bighorn S17-CTB
Work Order #2106505

Enclosed are the results of analyses for samples received by Summit Scientific on 06/29/21 08:07. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Paul Shrewsbury
President



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400

Project Manager: Joel Mason

Reported:
08/02/21 12:06

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BW.Bighorn.S17.CTB	2106505-01	Water	06/28/21 10:00	06/29/21 08:07
Trip.Blank.01	2106505-02	Water	06/28/21 10:05	06/29/21 08:07

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Summit Scientific

2106505

S₂

4653 Table Mountain Drive ♦ Golden, Colorado 80403
303-277-9310

Client: Absaroka Energy and Environmental Solutions

Project Manager: Joel Mason

Address: 112 High Street

E-Mail: Joel.Mason@AbsarokaSolutions.com

City/State/Zip: Buffalo, WY 82834

Max.Moran@AbsarokaSolutions.com



Phone: 720-352-5326

Project Name: EOR Sampling - Brigham 517 CTB

Sampler Name: Max Moran

Project Number: D90, CO. 05400

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative				Matrix				Analysis Requested								Special Instructions	
					HCl	HNO3	None	Other	Water	Soil	Air-Canister #	Other	pH, TDS, TSS, SP, Conductance	Alkalinity	Anions/Cations	Ba, B, Se, Sr	Napthalene	TPH C6-C10, C10-C36	BTEX	226Ra/228Ra		5RO-TPH
1	Bw Brigham 517 CTB	6/28/21	1000	10		2	8		X					X	X	X	X	X	X	X	X	
2	T.P. Blank 01	6/28/21	1005	1	X														X		X	
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

Relinquished by: 	Date/Time: 6/24/21 0907	Received by: 	Date/Time: 6/29/21 8:07	Turn Around Time (Check) Same Day <input type="checkbox"/> 72 hours 24 hours <input type="checkbox"/> Standard <input checked="" type="checkbox"/> 48 hours <input type="checkbox"/> Sample Integrity: Temperature Upon Receipt: 25 Samples Intact: <input checked="" type="radio"/> Yes <input type="radio"/> No	Notes: Email results to max moran and joel mason. Please see the attached Rule 909.j.(1)-(5) for explanation of analysis
Relinquished by:	Date/Time:	Received by:	Date/Time:		
Relinquished by:	Date/Time:	Received by:	Date/Time:		

Appendix A
Rule 909.j.(1)-(5)

- j. **Produced Water Quality Analyses.** Beginning January 15, 2021, Operators will submit an initial water quality analysis for produced water for each Well from which produced water is placed into a permitted or registered Pit, including Pits that were constructed prior to January 15, 2021.
- (1) The water sample will be analyzed for the following:
 - A. pH;
 - B. Specific conductance;
 - C. Total dissolved and suspended solids (TDS and TSS);
 - D. Alkalinity (total, bicarbonate, and carbonate as CaCO₃);
 - E. Major anions (bromide, chloride, fluoride, sulfate, nitrate and nitrite as N, and phosphorus);
 - F. Major cations (calcium, iron, magnesium, manganese, potassium, and sodium);
 - G. Other elements (barium, boron, selenium, and strontium);
 - H. Naphthalene;
 - I. Total petroleum hydrocarbons ("TPH") as total volatile hydrocarbons (C6 to C10) and total extractable hydrocarbons (C10 to C36);
 - J. BTEX compounds (benzene, toluene, ethylbenzene, and xylenes); and
 - K. Radium (226Ra and 228Ra).
 - (2) Operators will collect samples according to standard environmental procedures.
 - (3) Operators will analyze samples in an accredited laboratory using established methodologies. For those analytes with Groundwater threshold concentrations listed in WQCC Regulation 41, as incorporated by reference in Rule 901.b, the analytical technique will be capable of achieving, and will achieve, reporting limits at concentrations less than the WQCC Regulation 41 thresholds in the matrix submitted. The Director may review the analytical standard used for each analyte and may request the analysis be run by a different method.

2106505

Sample Receipt Checklist

S2 Work Order _____

Client: Absarokh Client Project ID: EUR Sampling - Big Horn

Shipped Via: H.D./P.U./FedEx/UPS/USPS/Other _____ Airbill #: _____

Matrix (check all that apply): Air Soil/Solid Water Other: _____ (Describe)

Temp (°C)	2.5
-----------	-----

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature at 4°C +/- 2°C ⁽¹⁾ ? NOTE: If samples are delivered the same day of sampling, this requirement is met provided that there is evidence that cooling has begun.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	sure
Were all samples received intact ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
If custody seals are present, are they intact ⁽¹⁾ ?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Are samples with holding times due within 48 hours sample due within 48 hours present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	pH, Amics
Is a chain-of-custody (COC) form present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the COC properly relinquished by the client w/ date and time recorded ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Are samples preserved that require preservation (excluding cooling) ⁽¹⁾ ? Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	HNO3
If samples are acid preserved for metals, is the pH ≤ 2 ⁽¹⁾ ? Record the pH in Comments.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2.2
If dissolved metals are requested, were samples field filtered?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Additional Comments (if any):				
⁽¹⁾ If NO, then contact the client before proceeding with analysis and note in case narrative.				

Custodian Printed Name or Initials

Signature of Custodian

Date/Time

6/29/11 0807



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
Project Manager: Joel Mason

Reported:
08/02/21 12:06

BW.Bighorn.S17.CTB
2106505-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **06/28/21 10:00**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Benzene	7100	100		ug/l	100	BEF0617	06/30/21	07/01/21	EPA 8260B	
Toluene	4700	100		"	"	"	"	"	"	
Ethylbenzene	350	100		"	"	"	"	"	"	
Xylenes (total)	1400	200		"	"	"	"	"	"	
Naphthalene	140	1.0		"	1	"	"	"	"	
Gasoline Range Hydrocarbons	21000	5000		"	10	"	"	"	"	

Date Sampled: **06/28/21 10:00**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: 1,2-Dichloroethane-d4		98.3 %		23-173		"	"	"	"	
Surrogate: Toluene-d8		105 %		20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		100 %		21-167		"	"	"	"	

Extractable Petroleum Hydrocarbons by 8015

Date Sampled: **06/28/21 10:00**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
C10-C28 (DRO)	6.4	5.0		mg/L	1	BEF0616	06/30/21	07/01/21	EPA 8015M	
C28-C36 (ORO)	ND	5.0		"	"	"	"	"	"	

Date Sampled: **06/28/21 10:00**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: o-Terphenyl		98.6 %		58.9-148		"	"	"	"	

Total Metals by EPA Method 200.8

Date Sampled: **06/28/21 10:00**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Phosphorus	5820	10.0		ug/l	1	BEF0609	06/30/21	06/30/21	EPA 200.8	

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
Project Manager: Joel Mason

Reported:
08/02/21 12:06

BW.Bighorn.S17.CTB
2106505-01 (Water)

Summit Scientific

Total Metals by EPA Method 200.8

Analyte	Result	Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Strontium	103000	1.00	ug/l	1	BEF0609	06/30/21	06/30/21	EPA 200.8	
Barium	83300	1.00	"	"	"	"	"	"	
Boron	3400	10.0	"	"	"	"	"	"	
Calcium	527000	50.0	"	"	"	"	"	"	
Iron	82350	10.00	"	"	"	"	"	"	
Magnesium	67600	50.0	"	"	"	"	"	"	
Manganese	1110	1.00	"	"	"	"	"	"	
Potassium	51100	50.0	"	"	"	"	"	"	
Selenium	4.32	1.00	"	"	"	"	"	"	
Sodium	12800000	50.0	"	"	"	"	"	"	

Anions by EPA Method 300.0

Date Sampled: **06/28/21 10:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bromide	476	200	mg/L	1000	BEF0622	06/30/21	07/02/21	EPA 300.0	
Chloride	26400	60.0	"	"	"	"	"	"	
Fluoride	ND	40.0	"	"	"	"	"	"	R-01
Nitrate as N	ND	50.0	"	"	"	"	"	"	R-01
Nitrite as N	1020	60.0	"	"	"	"	"	"	
Orthophosphate as P	ND	100	"	"	"	"	"	"	R-01
Sulfate	604	300	"	"	"	"	"	"	

Alkalinity by SM2320

Date Sampled: **06/28/21 10:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Total Alkalinity	490	10.0	mg/L as CaCO3	1	BEF0600	06/30/21	07/06/21	SM2320-B	
Carbonate	ND	10.0	"	"	"	"	"	"	
Bicarbonate	490	10.0	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	10.0	"	"	"	"	"	"	

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
Project Manager: Joel Mason

Reported:
08/02/21 12:06

BW.Bighorn.S17.CTB
2106505-01 (Water)

Summit Scientific

Physical Parameters by APHA/ASTM/EPA Methods

Date Sampled: **06/28/21 10:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Total Suspended Solids	363	5.00	mg/L	1	BEF0597	06/30/21	06/30/21	SM2540D	

Specific Conductance by SM2510B

Date Sampled: **06/28/21 10:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	59100	1.00	umhos/cm	1	BEF0599	06/30/21	06/30/21	SM2510B	

Total Dissolved Solids by SM2540C

Date Sampled: **06/28/21 10:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Total Dissolved Solids	28500	10.0	mg/L	1	BEF0598	06/30/21	06/30/21	SM2540C	

pH by SM4500

Date Sampled: **06/28/21 10:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	7.23	1.00	pH Units	1	BEG0017	06/29/21	07/01/21	SM4500-H+ B	I-03

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
 112 High Street
 Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB
 Project Number: D90.CO.05400
 Project Manager: Joel Mason

Reported:
 08/02/21 12:06

Trip.Blank.01
2106505-02 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **06/28/21 10:05**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Benzene	ND	1.0		ug/l	1	BEF0617	06/30/21	07/01/21	EPA 8260B	
Toluene	ND	1.0		"	"	"	"	"	"	
Ethylbenzene	ND	1.0		"	"	"	"	"	"	
Xylenes (total)	ND	2.0		"	"	"	"	"	"	
Naphthalene	ND	1.0		"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	500		"	"	"	"	"	"	

Date Sampled: **06/28/21 10:05**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: 1,2-Dichloroethane-d4		103 %		23-173		"	"	"	"	
Surrogate: Toluene-d8		104 %		20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		100 %		21-167		"	"	"	"	

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
Project Manager: Joel Mason

Reported:
08/02/21 12:06

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting		Spike Level	Source Result	%REC		RPD		Notes
		Limit	Units			Limit	RPD	Limit	RPD	

Batch BEF0617 - EPA 5030 Water MS

Blank (BEF0617-BLK1)

Prepared: 06/30/21 Analyzed: 07/01/21

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	2.0	"							
Naphthalene	ND	1.0	"							
Gasoline Range Hydrocarbons	ND	500	"							
Surrogate: 1,2-Dichloroethane-d4	13.5		"	13.3		101		23-173		
Surrogate: Toluene-d8	13.7		"	13.3		103		20-170		
Surrogate: 4-Bromofluorobenzene	13.7		"	13.3		103		21-167		

LCS (BEF0617-BS1)

Prepared: 06/30/21 Analyzed: 07/01/21

Benzene	23.4	1.0	ug/l	33.3		70.3		70-130		
Toluene	31.7	1.0	"	33.3		95.2		70-130		
Ethylbenzene	35.5	1.0	"	33.3		106		70-130		
m,p-Xylene	68.5	2.0	"	66.7		103		70-130		
o-Xylene	28.4	1.0	"	33.3		85.4		70-130		
Surrogate: 1,2-Dichloroethane-d4	14.0		"	13.3		105		23-173		
Surrogate: Toluene-d8	14.1		"	13.3		106		20-170		
Surrogate: 4-Bromofluorobenzene	13.5		"	13.3		102		21-167		

Matrix Spike (BEF0617-MS1)

Source: 2106470-01

Prepared: 06/30/21 Analyzed: 07/01/21

Benzene	27.5	1.0	ug/l	33.3	6.29	63.6		70-130		QM-07
Toluene	102	1.0	"	33.3	41.2	182		70-130		QM-07
Ethylbenzene	77.9	1.0	"	33.3	4.69	220		70-130		QM-07
m,p-Xylene	209	2.0	"	66.7	72.8	205		70-130		QM-07
o-Xylene	163	1.0	"	33.3	112	155		70-130		QM-07
Surrogate: 1,2-Dichloroethane-d4	15.1		"	13.3		113		23-173		
Surrogate: Toluene-d8	14.1		"	13.3		106		20-170		
Surrogate: 4-Bromofluorobenzene	13.7		"	13.3		103		21-167		

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
Project Manager: Joel Mason

Reported:
08/02/21 12:06

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Reporting			Spike	Source		%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit		

Batch BEF0617 - EPA 5030 Water MS

Matrix Spike Dup (BEF0617-MSD1)

Source: 2106470-01

Prepared: 06/30/21 Analyzed: 07/01/21

Benzene	24.4	1.0	ug/l	33.3	6.29	54.2	70-130	12.0	30	QM-07
Toluene	88.8	1.0	"	33.3	41.2	143	70-130	13.6	30	QM-07
Ethylbenzene	70.7	1.0	"	33.3	4.69	198	70-130	9.70	30	QM-07
m,p-Xylene	186	2.0	"	66.7	72.8	170	70-130	11.9	30	QM-07
o-Xylene	143	1.0	"	33.3	112	95.2	70-130	13.0	30	
Surrogate: 1,2-Dichloroethane-d4	15.5		"	13.3		116	23-173			
Surrogate: Toluene-d8	14.1		"	13.3		106	20-170			
Surrogate: 4-Bromofluorobenzene	13.7		"	13.3		103	21-167			

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
Project Manager: Joel Mason

Reported:
08/02/21 12:06

Extractable Petroleum Hydrocarbons by 8015 - Quality Control
Summit Scientific

Analyte	Result	Reporting		Spike Level	Source		%REC		RPD		Notes
		Limit	Units		Result	%REC	Limits	RPD	Limit		

Batch BEF0616 - EPA 3520B

Blank (BEF0616-BLK1)

Prepared & Analyzed: 06/30/21

C10-C28 (DRO)	ND	5.0	mg/L							
C28-C36 (ORO)	ND	5.0	"							

LCS (BEF0616-BS1)

Prepared & Analyzed: 06/30/21

C10-C28 (DRO)	45.6	5.0	mg/L	50.0	91.2	54.3-147				
---------------	------	-----	------	------	------	----------	--	--	--	--

LCS Dup (BEF0616-BSD1)

Prepared & Analyzed: 06/30/21

C10-C28 (DRO)	48.2	5.0	mg/L	50.0	96.5	54.3-147	5.61	15		
---------------	------	-----	------	------	------	----------	------	----	--	--

Matrix Spike (BEF0616-MS1)

Source: 2106469-01

Prepared & Analyzed: 06/30/21

C10-C28 (DRO)	69.7	5.0	mg/L	50.0	12.5	114	81.6-126			
---------------	------	-----	------	------	------	-----	----------	--	--	--

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
Project Manager: Joel Mason

Reported:
08/02/21 12:06

Total Metals by EPA Method 200.8 - Quality Control
Summit Scientific

Analyte	Reporting			Spike	Source	%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

Batch BEF0609 - EPA 200.8

Blank (BEF0609-BLK1)

Prepared & Analyzed: 06/30/21

Phosphorus	ND	10.0	ug/l							
Strontium	ND	1.00	"							
Barium	ND	1.00	"							
Boron	ND	10.0	"							
Calcium	ND	50.0	"							
Iron	ND	10.00	"							
Magnesium	ND	50.0	"							
Manganese	ND	1.00	"							
Potassium	ND	50.0	"							
Selenium	ND	1.00	"							
Sodium	ND	50.0	"							

LCS (BEF0609-BS1)

Prepared & Analyzed: 06/30/21

Phosphorus	5360	10.0	ug/l	5000	107	85-115				
Strontium	558	1.00	"	500	112	85-115				
Barium	559	1.00	"	500	112	85-115				
Boron	2500	10.0	"	2500	99.8	85-115				
Calcium	5710	50.0	"	5000	114	85-115				
Iron	5036	10.00	"	5000	101	85-115				
Magnesium	5140	50.0	"	5000	103	85-115				
Manganese	523	1.00	"	500	105	85-115				
Potassium	5590	50.0	"	5000	112	85-115				
Selenium	45.9	1.00	"	50.0	91.8	85-115				
Sodium	5570	50.0	"	5000	111	85-115				

Duplicate (BEF0609-DUP1)

Source: 2106495-01

Prepared & Analyzed: 06/30/21

Phosphorus	28.6	10.0	ug/l		31.6		10.1	20		
Strontium	2530	1.00	"		2430		3.85	20		
Barium	17.2	1.00	"		16.1		6.15	20		
Boron	579	10.0	"		565		2.57	20		
Calcium	188000	50.0	"		178000		5.37	20		
Iron	55.59	10.00	"		66.19		17.4	20		
Magnesium	72300	50.0	"		71100		1.59	20		
Manganese	17.9	1.00	"		18.0		0.542	20		
Potassium	3620	50.0	"		3610		0.375	20		
Selenium	5.75	1.00	"		5.31		7.93	20		
Sodium	185000	50.0	"		181000		1.96	20		

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
Project Manager: Joel Mason

Reported:
08/02/21 12:06

Total Metals by EPA Method 200.8 - Quality Control
Summit Scientific

Analyte	Reporting			Spike	Source		%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit		

Batch BEF0609 - EPA 200.8

Matrix Spike (BEF0609-MS1)

Source: 2106495-01

Prepared & Analyzed: 06/30/21

Phosphorus	5750	10.0	ug/l	5000	31.6	114	70-130			
Strontium	2980	1.00	"	500	2430	109	70-130			
Barium	588	1.00	"	500	16.1	114	70-130			
Boron	2980	10.0	"	2500	565	96.5	70-130			
Calcium	184000	50.0	"	5000	178000	107	70-130			
Iron	5060	10.00	"	5000	66.19	99.9	70-130			
Magnesium	77200	50.0	"	5000	71100	121	70-130			
Manganese	526	1.00	"	500	18.0	102	70-130			
Potassium	8870	50.0	"	5000	3610	105	70-130			
Selenium	55.5	1.00	"	50.0	5.31	100	70-130			
Sodium	185000	50.0	"	5000	181000	88.6	70-130			

Matrix Spike Dup (BEF0609-MSD1)

Source: 2106495-01

Prepared & Analyzed: 06/30/21

Phosphorus	5170	10.0	ug/l	5000	31.6	103	70-130	10.6	25
Strontium	3080	1.00	"	500	2430	129	70-130	3.15	25
Barium	529	1.00	"	500	16.1	103	70-130	10.5	25
Boron	2770	10.0	"	2500	565	88.3	70-130	7.06	25
Calcium	184000	50.0	"	5000	178000	118	70-130	0.291	25
Iron	5100	10.00	"	5000	66.19	101	70-130	0.789	25
Magnesium	75800	50.0	"	5000	71100	93.7	70-130	1.81	25
Manganese	524	1.00	"	500	18.0	101	70-130	0.400	25
Potassium	9100	50.0	"	5000	3610	110	70-130	2.56	25
Selenium	57.0	1.00	"	50.0	5.31	103	70-130	2.58	25
Sodium	186000	50.0	"	5000	181000	109	70-130	0.553	25

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
Project Manager: Joel Mason

Reported:
08/02/21 12:06

Anions by EPA Method 300.0 - Quality Control
Summit Scientific

Analyte	Reporting			Spike	Source	%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

Batch BEF0622 - General Preparation

Blank (BEF0622-BLK1)

Prepared: 06/30/21 Analyzed: 07/01/21

Bromide	ND	0.200	mg/L							
Chloride	ND	0.0600	"							
Fluoride	ND	0.0400	"							
Nitrate as N	ND	0.0500	"							
Nitrite as N	ND	0.0600	"							
Orthophosphate as P	ND	0.100	"							
Sulfate	ND	0.300	"							

LCS (BEF0622-BS1)

Prepared: 06/30/21 Analyzed: 07/01/21

Bromide	9.98	0.200	mg/L	10.0		99.8	90-110			
Chloride	2.82	0.0600	"	3.00		93.9	90-110			
Fluoride	1.84	0.0400	"	2.00		91.8	90-110			
Nitrate as N	2.76	0.0500	"	3.00		91.9	90-110			
Nitrite as N	2.94	0.0600	"	3.00		98.0	90-110			
Orthophosphate as P	5.11	0.100	"	5.00		102	90-110			
Sulfate	16.2	0.300	"	15.0		108	90-110			

Duplicate (BEF0622-DUP1)

Source: 2106390-01

Prepared: 06/30/21 Analyzed: 07/01/21

Bromide	ND	40.0	mg/L		ND				20	
Chloride	257	12.0	"		239			6.94	20	
Fluoride	ND	8.00	"		ND				20	
Nitrate as N	3.20	10.0	"		3.60			11.8	20	
Nitrite as N	ND	12.0	"		ND				20	
Orthophosphate as P	ND	20.0	"		ND				20	
Sulfate	70.0	60.0	"		60.0			15.4	20	

Matrix Spike (BEF0622-MS1)

Source: 2106390-01

Prepared: 06/30/21 Analyzed: 07/01/21

Bromide	1740	40.0	mg/L	2000	ND	87.1	80-120			
Chloride	744	12.0	"	600	239	84.1	80-120			
Fluoride	372	8.00	"	400	ND	93.0	80-120			
Nitrate as N	575	10.0	"	600	3.60	95.2	80-120			
Nitrite as N	573	12.0	"	600	ND	95.5	80-120			
Orthophosphate as P	1170	20.0	"	1000	ND	117	80-120			
Sulfate	3390	60.0	"	3000	60.0	111	80-120			

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
Project Manager: Joel Mason

Reported:
08/02/21 12:06

Alkalinity by SM2320 - Quality Control
Summit Scientific

Analyte	Result	Reporting		Spike Level	Source		%REC		RPD		Notes
		Limit	Units		Result	%REC	Limits	RPD	Limit		

Batch BEF0600 - General Preparation

Blank (BEF0600-BLK1)

Prepared: 06/30/21 Analyzed: 07/06/21

Total Alkalinity	ND	10.0	mg/L as CaCO3								
Carbonate	ND	10.0	"								
Bicarbonate	ND	10.0	"								
Hydroxide Alkalinity	ND	10.0	"								

LCS (BEF0600-BS1)

Prepared: 06/30/21 Analyzed: 07/06/21

Total Alkalinity	90.0	10.0	mg/L as CaCO3	100		90.0	80-120				
------------------	------	------	---------------	-----	--	------	--------	--	--	--	--

Duplicate (BEF0600-DUP1)

Source: 2106505-01

Prepared: 06/30/21 Analyzed: 07/06/21

Total Alkalinity	490	10.0	mg/L as CaCO3		490			0.00	20		
Carbonate	ND	10.0	"		ND				20		
Bicarbonate	490	10.0	"		490			0.00	20		
Hydroxide Alkalinity	ND	10.0	"		ND				20		

Matrix Spike (BEF0600-MS1)

Source: 2106505-01

Prepared: 06/30/21 Analyzed: 07/06/21

Total Alkalinity	580	10.0	mg/L as CaCO3	100	490	90.0	80-120				
------------------	-----	------	---------------	-----	-----	------	--------	--	--	--	--

Matrix Spike Dup (BEF0600-MSD1)

Source: 2106505-01

Prepared: 06/30/21 Analyzed: 07/06/21

Total Alkalinity	580	10.0	mg/L as CaCO3	100	490	90.0	80-120	0.00	20		
------------------	-----	------	---------------	-----	-----	------	--------	------	----	--	--

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
 112 High Street
 Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
 Project Manager: Joel Mason

Reported:
 08/02/21 12:06

Physical Parameters by APHA/ASTM/EPA Methods - Quality Control

Summit Scientific

Analyte	Result	Reporting		Spike Level	Source		%REC		RPD		Notes
		Limit	Units		Result	%REC	Limits	RPD	Limit		

Batch BEF0597 - General Preparation

Blank (BEF0597-BLK1)

Prepared & Analyzed: 06/30/21

Total Suspended Solids ND 5.00 mg/L

Duplicate (BEF0597-DUP1)

Source: 2106465-01

Prepared & Analyzed: 06/30/21

Total Suspended Solids 8.00 5.00 mg/L 7.00 13.3 20

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
 112 High Street
 Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
 Project Manager: Joel Mason

Reported:
 08/02/21 12:06

Specific Conductance by SM2510B - Quality Control

Summit Scientific

Analyte	Result	Reporting		Spike		Source		%REC		RPD		Notes
		Limit	Units	Level	Result	%REC	Limits	RPD	Limit			

Batch BEF0599 - General Preparation

Blank (BEF0599-BLK1)

Prepared & Analyzed: 06/30/21

Specific Conductance (EC) ND 1.00 umhos/cm

Duplicate (BEF0599-DUP1)

Source: 2106505-01

Prepared & Analyzed: 06/30/21

Specific Conductance (EC) 59100 1.00 umhos/cm 59100 0.0508 20

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
 112 High Street
 Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
 Project Manager: Joel Mason

Reported:
 08/02/21 12:06

Total Dissolved Solids by SM2540C - Quality Control
Summit Scientific

Analyte	Result	Reporting		Spike Level	Source		%REC		RPD		Notes
		Limit	Units		Result	%REC	Limits	RPD	Limit		

Batch BEF0598 - General Preparation

Blank (BEF0598-BLK1)

Prepared & Analyzed: 06/30/21

Total Dissolved Solids ND 10.0 mg/L

Duplicate (BEF0598-DUP1)

Source: 2106472-01

Prepared & Analyzed: 06/30/21

Total Dissolved Solids 667 10.0 mg/L 667 0.0450 20

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Absaroka Solutions
 112 High Street
 Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
 Project Manager: Joel Mason

Reported:
 08/02/21 12:06

pH by SM4500 - Quality Control
Summit Scientific

Analyte	Result	Reporting		Spike Level	Source Result	%REC		RPD		Notes
		Limit	Units			%REC	Limits	RPD	Limit	

Batch BEG0017 - General Preparation

LCS (BEG0017-BS1)

Prepared: 06/29/21 Analyzed: 07/01/21

pH	9.29	1.00	pH Units	9.21	101	90-110
----	------	------	----------	------	-----	--------

Duplicate (BEG0017-DUP1)

Source: 2106504-01

Prepared: 06/29/21 Analyzed: 07/01/21

pH	6.86	1.00	pH Units	6.87	0.146	20
----	------	------	----------	------	-------	----

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Radium-226 Case Narrative

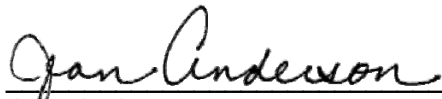
Summit Scientific

2106505

Work Order Number: 2107077

1. This report consists of the analytical results for one wliquid sample received by ALS on 07/06/2021.
2. The sample was prepared and analyzed according to the current revisions of SOP 783 and SOP 736. The analysis was completed on 07/30/2021.
3. The analysis results for this sample are reported on an 'As Received' basis in units of pCi/gram.
4. Sample volume was insufficient to allow preparation of a duplicate. A laboratory control sample duplicate (LCSD) was prepared in lieu of a client sample duplicate.
5. No anomalous situations were encountered during the preparation or analysis of this sample. All quality control criteria were met.

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



Jean Anderson
Radiochemistry Primary Data Reviewer

7/31/21
Date



Radiochemistry Final Data Reviewer

8/17/21
Date

Section 1

CHAIN OF CUSTODY

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 2107077

Client Name: Summit Scientific

Client Project Name: 2106505

Client Project Number:

Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
BW_Bighorn_517_CTB	2107077-1		WLIQUID	28-Jun-21	10:00



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: SUMMIT SCIENTIFIC Workorder No: 2107077

Project Manager: KMB Initials: JPE Date: 07/06/21

				N/A	YES	NO
1. Are airbills / shipping documents present and/or removable?				X		
Tracking number: _____						
2. Are custody seals on shipping containers intact?				X		
3. Are custody seals on sample containers intact?				X		
4. Is there a COC (chain-of-custody) present?					X	
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)					X	
6. Are short-hold samples present?						X
7. Are all samples within holding times for the requested analyses?					X	
8. Were all sample containers received intact? (not broken or leaking)					X	
9. Is there sufficient sample for the requested analyses?					X	
10. Are samples in proper containers for requested analyses? (form 250, <i>Sample Handling Guidelines</i>)					X	
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)					X	
12. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)				X		
13. Were the samples shipped on ice?					X	
14. Were cooler temperatures measured at 0.1-6.0°C?				IR gun used*:	#5	
				RAD ONLY	X	
Cooler #: <u>1</u>						
Temperature (°C): <u>5.8</u>						
# of custody seals on cooler: <u>0</u>						
External µR/hr reading: <u>NA</u>						
Background µR/hr reading: <u>11</u>						
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? <u>Na</u>						

*** Please provide details here for NO responses to boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.**

Were unpreserved bottles pH checked? N/A All client bottle ID's vs ALS lab ID's double-checked by JE

If applicable, was the client contacted? NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: Kelley Benyas 07/07/21

Section 2

2

SAMPLE RESULTS SUMMARY

Radium-226 by Radon Emanation - Method 903.1 Sample Results Summary

Client Name: Summit Scientific
 Client Project Name: 2106505
 Client Project Number:
 Laboratory Name: ALS -- Fort Collins
 PAI Work Order: 2107077

Page: 1 of 1

Reported on: Friday, July 30, 2021
 5:40:37 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	DL	Units	Matrix	Prep Batch	Date Analyze	Flags
2107077-1	BW_Bighorn_517_CTB	Sample	Ra-226	0.11 +/- 0.11	0.16	NA	pCi/g	WLIQUID	RE210708-2	7/30/2021	U

Comments:

Data Package ID: RE2107077-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty
- MDC - Sample specific Minimum Detectable Concentration
- BDL - Below Detection Limit

Date Printed: Friday, July 30, 2021

ALS -- Fort Collins
 LIMS Version: 7.020

Page 1 of 1

Section 3

QC RESULTS SUMMARY

3

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 15

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2107077

Client Name: Summit Scientific

ClientProject ID: 2106505

Lab ID: RE210708-2MB

Sample Matrix: WLIQUID

Prep Batch: RE210708-2

Final Aliquot: 2.00 g

Prep SOP: PAI 783 Rev 15

QCBatchID: RE210708-2-2

Result Units: pCi/g

Date Collected: 08-Jul-21

Run ID: RE210708-2A

File Name: Manual Entry

Date Prepared: 08-Jul-21

Count Time: 15 minutes

Date Analyzed: 30-Jul-21

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.053 +/- 0.065	0.097	1	NA	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

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

Y2 - Chemical Yield outside default limits.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

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

DL - Decision Level

Data Package ID: RE2107077-1

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 15

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 2107077
Client Name: Summit Scientific
ClientProject ID: 2106505

Lab ID: RE210708-2LCS

Sample Matrix: WLIQUID
Prep SOP: PAI 783 Rev 15
Date Collected: 08-Jul-21
Date Prepared: 08-Jul-21
Date Analyzed: 30-Jul-21

Prep Batch: RE210708-2
QCBatchID: RE210708-2-2
Run ID: RE210708-2A
Count Time: 15 minutes

Final Aliquot: 2.00 g
Result Units: pCi/g
File Name: Manual Entry

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13982-63-3	Ra-226	20.6 +/- 3.8	0.1	23.39	88.1	57 - 126	P

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration

Data Package ID: RE2107077-1

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 15

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 2107077
Client Name: Summit Scientific
ClientProject ID: 2106505

Lab ID: RE210708-2LCSD	Sample Matrix: WLIQUID	Prep Batch: RE210708-2	Final Aliquot: 2.00 g
	Prep SOP: PAI 783 Rev 15	QCBatchID: RE210708-2-2	Result Units: pCi/g
	Date Collected: 08-Jul-21	Run ID: RE210708-2A	File Name: Manual Entry
	Date Prepared: 08-Jul-21	Count Time: 15 minutes	
	Date Analyzed: 30-Jul-21		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13982-63-3	Ra-226	21.7 +/- 4.0	0.2	23.39	92.8	57 - 126	P

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration

Data Package ID: RE2107077-1

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 15

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 2107077
Client Name: Summit Scientific
ClientProject ID: 2106505

Field ID:	
Lab ID:	RE210708-2LCSD

Sample Matrix: WLIQUID
Prep SOP: PAI 783 Rev 15
Date Collected: 08-Jul-21
Date Prepared: 08-Jul-21
Date Analyzed: 30-Jul-21

Prep Batch: RE210708-2
QCBatchID: RE210708-2-2
Run ID: RE210708-2A
Count Time: 15 minutes

Final Aliquot: 2.00 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Manual Entry

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
13982-63-3	Ra-226	20.6 +/-	3.8	0.1	P	21.7 +/-	4.0	0.2	P	0.199	2.13

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty
DER - Duplicate Error Ratio
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: RE2107077-1

Section 4

INDIVIDUAL SAMPLE RESULTS



Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 15

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2107077
Client Name: Summit Scientific
ClientProject ID: 2106505

Field ID:	BW_Bighorn_517_CTB
Lab ID:	2107077-1

Sample Matrix: WLIQUID
Prep SOP: PAI 783 Rev 15
Date Collected: 28-Jun-21
Date Prepared: 08-Jul-21
Date Analyzed: 30-Jul-21

Prep Batch: RE210708-2
QCBatchID: RE210708-2-2
Run ID: RE210708-2A
Count Time: 15 minutes
Report Basis: As Received

Final Aliquot: 2.01 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.11 +/- 0.11	0.16	1	NA	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

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

Y2 - Chemical Yield outside default limits.

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

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: RE2107077-1

Section 5

RAW DATA

5

Radium-226 by Radon Emanation - Method 903.1 Raw Data Report

Laboratory Name: ALS -- Fort Collins
 PAI Work Order: 2107077

Prep SOP: PAI 783
 Analytical SOP: PAI 783

Reported on: Friday, July 30, 2021
 2:02:46 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QC Batch ID	Ingrowth Date/Time	Decay Date/Time	Matrix %Moist.	Samp Aliq Analy Aliq	Inst ID Det ID	AntRunID File Name	Count Date/Time	Gr Cnts Bkg Cnts	BaseEff ProgEff	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DeclEv	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
2107077-1	Ra-226 Trg. Analyte	6/28/2021 10:00:00 AM	RE210708-2 RE210708-2-2	7/24/2021 2:08:00 PM	7/30/2021 7:13:00 AM	WLIQUID NA	2.01 g 2.01 g	Alpha Scin G300	RE210708-2A Manual Entry	7/30/2021 11:13 AM	10,000 3,000	157.59% NA	15 NA	0.11 0.11	0.16	pC/ig As Received	NA	U
RE210708-2	Ra-226 Trg. Analyte	7/8/2021 4:46:42 PM	RE210708-2 RE210708-2-2	7/24/2021 2:08:00 PM	7/30/2021 7:51:00 AM	WLIQUID NA	2 g 2 g	Alpha Scin B002	RE210708-2A Manual Entry	7/30/2021 11:54 AM	5,000 1,000	181.34% NA	15 NA	0.053 0.065	0.097	pC/ig As Received	NA	U
RE210708-2	Ra-226 Trg. Analyte	7/8/2021 4:46:42 PM	RE210708-2 RE210708-2-2	7/24/2021 2:08:00 PM	7/30/2021 7:51:00 AM	WLIQUID NA	2 g 2 g	Alpha Scin A001	RE210708-2A Manual Entry	7/30/2021 11:54 AM	1418,000 2,000	164.67% NA	15 NA	20.6 3.8	0.1	pC/ig As Received	NA	88.1 P
RE210708-2	Ra-226 Trg. Analyte	7/8/2021 4:46:42 PM	RE210708-2 RE210708-2-2	7/24/2021 2:08:00 PM	7/30/2021 7:51:00 AM	WLIQUID NA	2 g 2 g	Alpha Scin C003	RE210708-2A Manual Entry	7/30/2021 11:54 AM	1652,000 6,000	181.69% NA	15 NA	21.7 4.0	0.2	pC/ig As Received	0.20	92.8 P

Comments:

Data Package ID: RE2107077-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- +- Duplicate RPD not within limits.
- LT - Result is less than Request MDC, greater than sample specific MDC
- * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'
- # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

Notes:

- 1) The Tracer results are not yield corrected (i.e. activity measured not activity added).
- 2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

- TR - Tracer
- TA - Target Analyte
- TPU - Total Propagated Uncertainty
- MDC - Minimum Detectable Concentration
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit



Radium-228 Case Narrative


Summit Scientific

2106505

Work Order Number: 2107077

1. This report consists of the analytical results for one wliquid sample received by ALS on 07/06/2021.
2. This sample was prepared according to the current revisions of SOP 749 and SOP 736
3. The sample was analyzed for the presence of ^{228}Ra by low background gas flow proportional counting of ^{228}Ac , which is the ingrown progeny of ^{228}Ra , according to the current revision of SOP 724. The analysis was completed on 7/23/2021.
4. The analysis results for this sample are reported on an 'As Received' basis in units of pCi/gram.
5. No anomalous situations were noted during the preparation and analysis of this sample. All quality control criteria were met.

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



Dakota Wylde
Radiochemistry Primary Data Reviewer

7/31/21
Date



Radiochemistry Final Data Reviewer

8/17/21
Date

Section 1

CHAIN OF CUSTODY

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 2107077

Client Name: Summit Scientific

Client Project Name: 2106505

Client Project Number:

Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
BW_Bighorn_517_CTB	2107077-1		WLIQUID	28-Jun-21	10:00



ALS Environmental

225 Commerce Drive, Fort Collins, Colorado 80524
 TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

Chain-of-Custody

Form 2026

WORKORDER #	2107077
-------------	---------

PROJECT NAME	2106505	SAMPLER		DATE		PAGE	1 of 1
PROJECT No.		SITE ID		TURNAROUND		DISPOSAL	By Lab or Return to Client
COMPANY NAME	Summit Scientific	EDD FORMAT		Return 226 + 228			
SEND REPORT TO	Paul Shrewsbury	PURCHASE ORDER					
ADDRESS	4653 Table Mountain Drive	BILL TO COMPANY	Same				
CITY / STATE / ZIP	Golden, CO 80403	INVOICE ATTN TO	Ben Shrewsbury				
PHONE	303-277-9310	ADDRESS	Same				
FAX		CITY / STATE / ZIP					
E-MAIL	pshrewsbury@s2scientific.com	PHONE					
		FAX					
		E-MAIL	bshrewsbury@s2scientific.com				
Lab ID	Field ID	Matrix	Sample Date	Sample Time	# Bottles	Pres.	QC
	BW_Bighorn_517_CTB	W	6/28	1000	1	2	X

*Time Zone (Circle): EST CST MST PST Matrix: O = oil S = soil NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments: CC: mpremer@s2scientific.com	QC PACKAGE (check below)
	<input type="checkbox"/> LEVEL II (Standard QC)
	<input checked="" type="checkbox"/> LEVEL III (Std QC + forms)
	<input type="checkbox"/> LEVEL IV (Std QC + forms + raw data)
Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035	

	SIGNATURE	PRINTED NAME	DATE	TIME
RELINQUISHED BY	<i>Jack Breer</i>	Jack Breer	7/6/21	1400
RECEIVED BY	<i>Josh Eckey</i>	Josh Eckey	7/6/21	1400
RELINQUISHED BY				
RECEIVED BY				
RELINQUISHED BY				
RECEIVED BY				



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: SUMMIT SCIENTIFIC Workorder No: 2107077

Project Manager: KMB Initials: JPE Date: 07/06/21

				N/A	YES	NO
1. Are airbills / shipping documents present and/or removable?				X		
Tracking number:						
2. Are custody seals on shipping containers intact?				X		
3. Are custody seals on sample containers intact?				X		
4. Is there a COC (chain-of-custody) present?					X	
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)					X	
6. Are short-hold samples present?						X
7. Are all samples within holding times for the requested analyses?					X	
8. Were all sample containers received intact? (not broken or leaking)					X	
9. Is there sufficient sample for the requested analyses?					X	
10. Are samples in proper containers for requested analyses? (form 250, <i>Sample Handling Guidelines</i>)					X	
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)					X	
12. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)				X		
13. Were the samples shipped on ice?					X	
14. Were cooler temperatures measured at 0.1-6.0°C?				IR gun used*:	#5	
				RAD ONLY	X	
Cooler #: <u>1</u>						
Temperature (°C): <u>5.8</u>						
# of custody seals on cooler: <u>0</u>						
External µR/hr reading: <u>NA</u>						
Background µR/hr reading: <u>11</u>						
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? <u>Na</u>						

*** Please provide details here for NO responses to boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.**

Were unpreserved bottles pH checked? N/A All client bottle ID's vs ALS lab ID's double-checked by JE

If applicable, was the client contacted? NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: Kelley Benyas 07/07/21

Section 2

2

SAMPLE RESULTS SUMMARY

Radium-228 Analysis by GFPC Sample Results Summary

Client Name: Summit Scientific
Client Project Name: 2106505
Client Project Number:
Laboratory Name: ALS -- Fort Collins
PAI Work Order: 2107077

Page: 1 of 1
Reported on: Friday, July 30, 2021
 5:10:51 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	DL	Units	Matrix	Prep Batch	Date Analyzed	Flags
2107077-1	BW_Bighorn_517_CTB	Sample	Ra-228	0.28 +/- 0.40	0.85	NA	pCi/g	WLIQUID	RA210720-2	7/23/2021	U

Comments:

Data Package ID: RA2107077-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty
- MDC - Sample specific Minimum Detectable Concentration
- BDL - Below Detection Limit

Section 3

QC RESULTS SUMMARY

3

Radium-228 Analysis by GFPC

PAI 724 Rev 14

Method Blank Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2107077
Client Name: Summit Scientific
ClientProject ID: 2106505

Lab ID: RA210720-2MB	Sample Matrix: WLIQUID Prep SOP: SOP749 Rev 7 Date Collected: 20-Jul-21 Date Prepared: 20-Jul-21 Date Analyzed: 23-Jul-21	Prep Batch: RA210720-2 QCBatchID: RA210720-2-3 Run ID: RA210720-2A Count Time: 150 minutes	Final Aliquot: 0.997 g Result Units: pCi/g File Name: raa0723
----------------------	---	---	---

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
15262-20-1	Ra-228	0.24 +/- 0.39	0.83	5	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34890	34820	ug	99.8	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Sample specific Minimum Detectable Concentration
BDL - Below Detection Limit

M - Requested MDC not met.
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.
DL - Decision Level

Data Package ID: RA2107077-1

Radium-228 Analysis by GFPC

PAI 724 Rev 14

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 2107077
Client Name: Summit Scientific
ClientProject ID: 2106505

Lab ID: RA210720-2LCS	Sample Matrix: WLIQUID	Prep Batch: RA210720-2	Final Aliquot: 0.997 g
	Prep SOP: SOP749 Rev 7	QCBatchID: RA210720-2-3	Result Units: pCi/g
	Date Collected: 20-Jul-21	Run ID: RA210720-2A	File Name: raa0723
	Date Prepared: 20-Jul-21	Count Time: 150 minutes	
	Date Analyzed: 23-Jul-21		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
15262-20-1	Ra-228	22.5 +/- 5.3	0.8	21.48	105	70 - 130	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	35340	34210	ug	96.8	40 - 110 %	

Comments:

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS Recovery within control limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty
- MDC - Minimum Detectable Concentration

Data Package ID: RA2107077-1

Radium-228 Analysis by GFPC

PAI 724 Rev 14

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 2107077

Client Name: Summit Scientific

ClientProject ID: 2106505

Field ID:	BW_Bighorn_517_CTB
Lab ID:	2107077-1DUP

Sample Matrix: WLIQUID
Prep SOP: SOP749 Rev 7
Date Collected: 28-Jun-21
Date Prepared: 20-Jul-21
Date Analyzed: 23-Jul-21

Prep Batch: RA210720-2
QCBatchID: RA210720-2-3
Run ID: RA210720-2A
Count Time: 150 minutes
Report Basis: As Received

Final Aliquot: 1.01 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: rac0723

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
15262-20-1	Ra-228	0.28 +/-	0.40	0.85	U	0.17 +/-	0.42	0.91	U	0.183	2.13

Comments:

Duplicate Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- LT - Result is less than Request MDC, greater than sample specific MDC
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits

Abbreviations:

- TPU - Total Propagated Uncertainty
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit
- NR - Not Reported

Data Package ID: RA2107077-1

Section 4

INDIVIDUAL SAMPLE RESULTS



Radium-228 Analysis by GFPC

PAI 724 Rev 14

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2107077

Client Name: Summit Scientific

ClientProject ID: 2106505

Field ID: BW_Bighorn_517_CTB

Lab ID: 2107077-1

Sample Matrix: WLIQUID

Prep SOP: SOP749 Rev 7

Date Collected: 28-Jun-21

Date Prepared: 20-Jul-21

Date Analyzed: 23-Jul-21

Prep Batch: RA210720-2

QCBatchID: RA210720-2-3

Run ID: RA210720-2A

Count Time: 150 minutes

Report Basis: As Received

Final Aliquot: 1.01 g

Prep Basis: As Received

Moisture(%): NA

Result Units: pCi/g

File Name: rac0723

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
15262-20-1	Ra-228	0.28 +/- 0.40	0.85	5	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34890	31710	ug	90.9	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

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

Y2 - Chemical Yield outside default limits.

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

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: RA2107077-1

Radium-228 Analysis by GFPC

PAI 724 Rev 14

Sample Duplicate Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2107077
Client Name: Summit Scientific
ClientProject ID: 2106505

Field ID: BW_Bighorn_517_CTB	Sample Matrix: WLIQUID	Prep Batch: RA210720-2	Final Aliquot: 1.01 g
Lab ID: 2107077-1DUP	Prep SOP: SOP749 Rev 7	QCBatchID: RA210720-2-3	Prep Basis: As Received
	Date Collected: 28-Jun-21	Run ID: RA210720-2A	Moisture(%): NA
	Date Prepared: 20-Jul-21	Count Time: 150 minutes	Result Units: pCi/g
	Date Analyzed: 23-Jul-21	Report Basis: As Received	File Name: rac0723

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
15262-20-1	Ra-228	0.17 +/- 0.42	0.91	5	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	37570	33470	ug	89.1	40 - 110 %	

Comments:

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.
- W - DER is greater than Warning Limit of 1.42

- D - DER is greater than Control Limit of 2.13

Abbreviations:

- TPU - Total Propagated Uncertainty
- MDC - Sample specific Minimum Detectable Concentration
- BDL - Below Detection Limit
- DL - Decision Level

Data Package ID: RA2107077-1

Date Printed:

Friday, July 30, 2021

ALS -- Fort Collins

LIMS Version: 7.020

Page 1 of 1

Section 5

RAW DATA

5

Radium-228 Analysis by GFPC Raw Data Report

Laboratory Name: ALS -- Fort Collins

Prep SOP: SOP749

Reported on: Monday, July 26, 2021

PAI Work Order: 2107077

Analytical SOP: PAI 724

10:47:41 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	GrossCPM BkgCPM	BaseEff ProgEff	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
2107077-1 SMP	Ra-228 Trg. Analyte	6/28/2021 10:00:00 AM	RA210720-2 RA210720-2-3	7/22/2021 8:10:00 AM	7/23/2021 8:15:00 AM	WLIQUID NA	1.02 g 1.01 g	LB4100-c B1	RA210720-2A rac0723	7/23/2021 9:46 AM	1.820 1.655	42.68% NA	150 90.9%	0.28 0.40	0.85	pCi/g As Received	NA NA	NA U
2107077-1 DUP	Ra-228 Trg. Analyte	6/28/2021 10:00:00 AM	RA210720-2 RA210720-2-3	7/22/2021 8:10:00 AM	7/23/2021 8:15:00 AM	WLIQUID NA	1.02 g 1.01 g	LB4100-c B2	RA210720-2A rac0723	7/23/2021 9:46 AM	1.853 1.754	42.17% NA	150 89.1%	0.17 0.42	0.91	pCi/g As Received	0.18 NA	NA U
RA210720-2 MB	Ra-228 Trg. Analyte	7/20/2021 8:28:27 AM	RA210720-2 RA210720-2-3	7/22/2021 8:10:00 AM	7/23/2021 8:15:00 AM	WLIQUID NA	1 g 0.997 g	LB4100-a B3	RA210720-2A raa0723	7/23/2021 9:46 AM	2.147 1.989	43.95% NA	150 99.8%	0.24 0.39	0.83	pCi/g As Received	NA NA	NA U
RA210720-2 LCS	Ra-228 Trg. Analyte	7/20/2021 8:28:27 AM	RA210720-2 RA210720-2-3	7/22/2021 8:10:00 AM	7/23/2021 8:15:00 AM	WLIQUID NA	1 g 0.997 g	LB4100-a B4	RA210720-2A raa0723	7/23/2021 9:46 AM	16.193 1.894	43.34% NA	150 96.8%	22.5 5.3	0.8	pCi/g As Received	NA NA	105 P

Comments:

Data Package ID: RA2107077-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- + - Duplicate RPD not within limits.
- LT - Result is less than Request MDC, greater than sample specific MDC
- * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC
- B - Analyte concentration greater than MDC.
- B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

- 1) The Tracer results are not yield corrected (i.e. activity measured not activity added).
- 2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

- TR- Tracer TA - Target Analyte
- TPU - Total Propagated Uncertainty
- MDC - Minimum Detectable Concentration
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit

16
16



Absaroka Solutions
112 High Street
Buffalo WY, 82834

Project: For Sampling-Bighorn S17-CTB

Project Number: D90.CO.05400
Project Manager: Joel Mason

Reported:
08/02/21 12:06

Notes and Definitions

- R-01 The Reporting Limit for this analyte has been raised to account for matrix interference.
- QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS/LCSD recovery.
- I-03 This sample was recieved and analyzed outside of the recommended holding time.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference