


Caerus Oil and Gas

Sample Delivery Group: L1605404
Samples Received: 04/14/2023
Project Number:
Description: 909J

Report To: Brett M. , Jake J. , Blair R.
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:



Chris Ward
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

Pace Analytical National

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TABLE OF CONTENTS

Cp: Cover Page	1	¹ Cp
Tc: Table of Contents	2	
Ss: Sample Summary	3	² Tc
Cn: Case Narrative	4	
Sr: Sample Results	5	³ Ss
20230413-OUSOURCE (2HOU-T)) L1605404-01	5	
Qc: Quality Control Summary	6	⁴ Cn
Gravimetric Analysis by Method 2540 C-2011	6	⁵ Sr
Gravimetric Analysis by Method 2540 D-2015	7	
Radiochemistry by Method 904-9320 (TENORM)	8	⁶ Qc
Radiochemistry by Method SM7500Ra B M (TENORM)	9	
Gl: Glossary of Terms	10	⁷ Gl
Al: Accreditations & Locations	11	⁸ Al
Sc: Sample Chain of Custody	12	⁹ Sc

SAMPLE SUMMARY

20230413-OUSOURCE (2HOU-T)) L1605404-01 GW

Collected by: Will Harmon
 Collected date/time: 04/13/23 10:20
 Received date/time: 04/14/23 09:15

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG2045312	1	04/20/23 07:35	04/20/23 10:14	AS	Mt. Juliet, TN
Gravimetric Analysis by Method 2540 D-2015	WG2045929	1	04/20/23 17:02	04/20/23 17:03	AS	Mt. Juliet, TN
Radiochemistry by Method 904-9320 (TENORM)	WG2058465	1	05/11/23 19:03	05/15/23 16:55	SWM	Mt. Juliet, TN
Radiochemistry by Method SM7500Ra B M (TENORM)	WG2055962	1	05/11/23 17:20	05/12/23 20:09	RGT	Mt. Juliet, TN

- ¹Cp
- ²Tc
- ³Ss
- ⁴Cn
- ⁵Sr
- ⁶Qc
- ⁷Gl
- ⁸Al
- ⁹Sc

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.



Chris Ward
Project Manager

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	17900		400	1	04/20/2023 10:14	WG2045312

Gravimetric Analysis by Method 2540 D-2015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	186		35.7	1	04/20/2023 17:03	WG2045929

Radiochemistry by Method 904-9320 (TENORM)

Analyte	Result	Result	Qualifier	Uncertainty	MDA	MDA	Analysis Date	Batch
	pCi/l	pCi/g		+ / -	pCi/l	pCi/g	date / time	
RADIUM-228	23.8	1.31		0.893	0.910	0.0503	05/15/2023 16:55	WG2058465
(T) Barium	266		C1		30.0-143		05/15/2023 16:55	WG2058465
(T) Yttrium	101				30.0-136		05/15/2023 16:55	WG2058465

Radiochemistry by Method SM7500Ra B M (TENORM)

Analyte	Result	Result	Qualifier	Uncertainty	MDA	MDA	Analysis Date	Batch
	pCi/l	pCi/g		+ / -	pCi/l	pCi/g	date / time	
RADIUM-226	3.25	0.180		0.664	0.228	0.0126	05/12/2023 20:09	WG2055962
(T) Barium-133	110				30.0-143		05/12/2023 20:09	WG2055962

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Method Blank (MB)

(MB) R3916130-1 04/20/23 10:14

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Dissolved Solids	U		10.0	10.0

¹Cp

²Tc

³Ss

L1605692-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1605692-02 04/20/23 10:14 • (DUP) R3916130-3 04/20/23 10:14

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	3580	3620	1	1.11		5

⁴Cn

⁵Sr

⁶Qc

L1606505-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1606505-01 04/20/23 10:14 • (DUP) R3916130-4 04/20/23 10:14

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	1070	1130	1	5.91	<u>J3</u>	5

⁷Gl

⁸Al

⁹Sc

Laboratory Control Sample (LCS)

(LCS) R3916130-2 04/20/23 10:14

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Dissolved Solids	8800	7840	89.1	77.3-123	

Method Blank (MB)

(MB) R3915666-1 04/20/23 17:03

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Suspended Solids	U		2.50	2.50

1 Cp

2 Tc

3 Ss

L1605392-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1605392-01 04/20/23 17:03 • (DUP) R3915666-3 04/20/23 17:03

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	123	197	1	46.3	J3	5

4 Cn

5 Sr

6 Qc

Laboratory Control Sample (LCS)

(LCS) R3915666-2 04/20/23 17:03

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Suspended Solids	773	760	98.3	85.7-114	

7 Gl

8 Al

9 Sc

Method Blank (MB)

(MB) R3925547-1 05/15/23 16:55

Analyte	MB Result pCi/l	MB Qualifier	MB Uncertainty + / -	MB MDA pCi/l
Radium-228	-0.0143	<u>U</u>	0.138	0.246
(T) Barium	110		110	
(T) Yttrium	103		103	

L1605057-09 Original Sample (OS) • Duplicate (DUP)

(OS) L1605057-09 05/15/23 16:55 • (DUP) R3925547-5 05/15/23 16:55

Analyte	Original Result pCi/l	Original Uncertainty + / -	Original MDA pCi/l	DUP Result pCi/l	DUP Uncertainty + / -	DUP MDA pCi/l	Dilution	DUP RPD %	DUP RER	DUP Qualifier	DUP RPD Limits %	DUP RER Limit
Radium-228	-0.287	0.261	0.471	0.301	0.356	0.471	1	200	1.33	<u>J</u>	20	3
(T) Barium	102			107	107							
(T) Yttrium	93.0			99.8	99.8							

Laboratory Control Sample (LCS)

(LCS) R3925547-2 05/15/23 16:55

Analyte	Spike Amount pCi/l	LCS Result pCi/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Radium-228	5.00	4.11	82.3	80.0-120	
(T) Barium			115		
(T) Yttrium			99.8		

L1605057-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1605057-03 05/15/23 16:55 • (MS) R3925547-3 05/15/23 16:55 • (MSD) R3925547-4 05/15/23 16:55

Analyte	Spike Amount pCi/l	Original Result pCi/l	MS Result pCi/l	MSD Result pCi/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	MS RER	RPD Limits %
Radium-228	16.7	5.50	17.6	15.7	72.7	61.2	1	70.0-130	<u>J6</u>		11.4		20
(T) Barium		107			124	122							
(T) Yttrium		102			107	99.4							

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Method Blank (MB)

(MB) R3925513-4 05/13/23 00:09

Analyte	MB Result pCi/l	MB Qualifier	MB Uncertainty + / -	MB MDA pCi/l
Radium-226	0.000	<u>U</u>	0.0218	0.0423
(T) Barium-133	99.8		99.8	

L1605658-07 Original Sample (OS) • Duplicate (DUP)

(OS) L1605658-07 05/12/23 20:09 • (DUP) R3925513-5 05/13/23 00:09

Analyte	Original Result pCi/l	Original Uncertainty + / -	Original MDA pCi/l	DUP Result pCi/l	DUP Uncertainty + / -	DUP MDA pCi/l	Dilution	DUP RPD %	DUP RER	DUP Qualifier	DUP RPD Limits %	DUP RER Limit
Radium-226	-0.0569	0.147	0.349	0.291	0.242	0.349	1	200	1.23		20	3
(T) Barium-133	92.4			94.1	94.1							

Laboratory Control Sample (LCS)

(LCS) R3925513-1 05/12/23 20:08

Analyte	Spike Amount pCi/l	LCS Result pCi/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Radium-226	5.01	4.91	97.9	80.0-120	
(T) Barium-133			96.0		

L1605658-15 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1605658-15 05/12/23 20:09 • (MS) R3925513-2 05/12/23 20:08 • (MSD) R3925513-3 05/12/23 20:08

Analyte	Spike Amount pCi/l	Original Result pCi/l	MS Result pCi/l	MSD Result pCi/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	MS RER	RPD Limits %
Radium-226	20.0	1.17	18.7	18.9	87.4	88.6	1	75.0-125			1.23		20
(T) Barium-133		86.6			87.0	89.3							

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

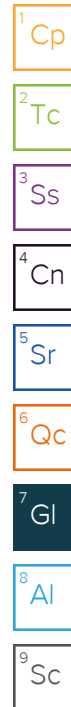
The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDA	Minimum Detectable Activity.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RER	Replicate Error Ratio.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
(T)	Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation.
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
C1	Tracer recovery limits have been exceeded; values are outside upper control limits.
J	The identification of the analyte is acceptable; the reported value is an estimate.
J3	The associated batch QC was outside the established quality control range for precision.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
U	Below Detectable Limits: Indicates that the analyte was not detected.



ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico ¹	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina ¹	DW21704
Georgia	NELAP	North Carolina ³	41
Georgia ¹	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky ^{1,6}	KY90010	South Carolina	84004002
Kentucky ²	16	South Dakota	n/a
Louisiana	AI30792	Tennessee ^{1,4}	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas ⁵	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 ⁵	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

¹ Drinking Water ² Underground Storage Tanks ³ Aquatic Toxicity ⁴ Chemical/Microbiological ⁵ Mold ⁶ Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

