

August 05, 2019

Caerus Oil and Gas

Sample Delivery Group: L1122592
Samples Received: 07/26/2019
Project Number: P27
Description: P27 Release
Site: P27
Report To: Blair Rollins
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:

Chris Ward

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.



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
20190725-P27 FL NW WALL L1122592-01	5	
20190725-P27 FL NE WALL L1122592-02	6	⁴ Cn
20190725-P27 FL BOT L1122592-03	7	⁵ Sr
Qc: Quality Control Summary	8	
Wet Chemistry by Method 9045D	8	⁶ Qc
Volatile Organic Compounds (GC) by Method 8015D/GRO	9	
Semi-Volatile Organic Compounds (GC) by Method 8015	11	⁷ Gl
Gl: Glossary of Terms	12	⁸ Al
Al: Accreditations & Locations	13	
Sc: Sample Chain of Custody	14	⁹ Sc



20190725-P27 FL NW WALL L1122592-01 Solid

Collected by
Matt Kasten

Collected date/time
07/25/19 10:55

Received date/time
07/26/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1318123	1	07/31/19 04:18	07/31/19 04:18	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1318312	1	07/29/19 11:41	07/29/19 12:02	AJC	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1321575	1	07/30/19 09:58	08/02/19 21:49	BMB	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1319458	10	07/29/19 20:17	07/30/19 10:45	DMW	Mt. Juliet, TN

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

20190725-P27 FL NE WALL L1122592-02 Solid

Collected by
Matt Kasten

Collected date/time
07/25/19 11:00

Received date/time
07/26/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1318123	1	07/31/19 04:21	07/31/19 04:21	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1318312	1	07/29/19 11:41	07/29/19 12:02	AJC	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1321575	1	07/30/19 09:58	08/02/19 22:13	BMB	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1319458	10	07/29/19 20:17	07/30/19 10:58	DMW	Mt. Juliet, TN

20190725-P27 FL BOT L1122592-03 Solid

Collected by
Matt Kasten

Collected date/time
07/25/19 11:05

Received date/time
07/26/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1318123	1	07/31/19 04:23	07/31/19 04:23	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1318312	1	07/29/19 11:41	07/29/19 12:02	AJC	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1322610	1	07/30/19 09:58	08/04/19 14:34	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1319458	1	07/29/19 20:17	07/30/19 10:31	DMW	Mt. Juliet, TN



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 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



Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	21.6		1	07/31/2019 04:18	WG1318123

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	9.04	<u>T8</u>	1	07/29/2019 12:02	WG1318312

Sample Narrative:

L1122592-01 WG1318312: 9.04 at 22.9C

Volatile Organic Compounds (GC) by Method 8015D/GRO

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	1.16		0.100	1	08/02/2019 21:49	WG1321575
(S) a,a,a-Trifluorotoluene(FID)	98.7		77.0-120		08/02/2019 21:49	WG1321575

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	512		40.0	10	07/30/2019 10:45	WG1319458
(S) o-Terphenyl	107		18.0-148		07/30/2019 10:45	WG1319458

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	5.43		1	07/31/2019 04:21	WG1318123

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.64	<u>T8</u>	1	07/29/2019 12:02	WG1318312

Sample Narrative:

L1122592-02 WG1318312: 8.64 at 23C

Volatile Organic Compounds (GC) by Method 8015D/GRO

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	6.77		0.100	1	08/02/2019 22:13	WG1321575
(S) <i>a,a,a</i> -Trifluorotoluene(FID)	94.3		77.0-120		08/02/2019 22:13	WG1321575

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	223		40.0	10	07/30/2019 10:58	WG1319458
(S) <i>o</i> -Terphenyl	84.7		18.0-148		07/30/2019 10:58	WG1319458

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc



Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	24.1		1	07/31/2019 04:23	WG1318123

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	9.02	<u>T8</u>	1	07/29/2019 12:02	WG1318312

Sample Narrative:

L1122592-03 WG1318312: 9.02 at 23.2C

Volatile Organic Compounds (GC) by Method 8015D/GRO

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.355	<u>B</u>	0.100	1	08/04/2019 14:34	WG1322610
(S) <i>a,a,a</i> -Trifluorotoluene(FID)	95.3		77.0-120		08/04/2019 14:34	WG1322610

Sample Narrative:

L1122592-03 WG1322610: Low IS confirmed with two runs.

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	143		4.00	1	07/30/2019 10:31	WG1319458
(S) <i>o</i> -Terphenyl	78.9		18.0-148		07/30/2019 10:31	WG1319458

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc

L1121552-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1121552-02 07/29/19 12:02 • (DUP) R3435259-2 07/29/19 12:02

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	su	su		%		%
pH	7.84	7.85	1	0.127		1

Sample Narrative:
OS: 7.84 at 23.6C
DUP: 7.85 at 23.6C

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

L1122592-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1122592-03 07/29/19 12:02 • (DUP) R3435259-3 07/29/19 12:02

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	su	su		%		%
pH	9.02	9.02	1	0.000		1

Sample Narrative:
OS: 9.02 at 23.2C
DUP: 9.02 at 23C

Laboratory Control Sample (LCS)

(LCS) R3435259-1 07/29/19 12:02

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Analyte	su	su	%	%	
pH	10.0	9.95	99.5	99.0-101	

Sample Narrative:
LCS: 9.95 at 22.3C



Method Blank (MB)

(MB) R3436898-2 08/02/19 01:53

	MB Result	<u>MB Qualifier</u>	MB MDL	MB RDL
Analyte	mg/kg		mg/kg	mg/kg
TPH (GC/FID) Low Fraction	U		0.0217	0.100
(S) a,a,α-Trifluorotoluene(FID)	100			77.0-120

Laboratory Control Sample (LCS)

(LCS) R3436898-1 08/02/19 01:05

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
TPH (GC/FID) Low Fraction	5.50	4.40	80.0	72.0-127	
(S) a,a,a-Trifluorotoluene(FID)			106	77.0-120	

¹Cp ${}^2\text{Tc}$ 3S_S ${}^4\text{Cn}$ ${}^5\text{Sr}$ ${}^6\text{Qc}$

GI

 ${}^8\text{Al}$ ⁹Sc



Method Blank (MB)

(MB) R3437295-2 08/04/19 13:32

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TPH (GC/FID) Low Fraction	0.0502	⬇	0.0217	0.100
(S) a,a,a-Trifluorotoluene(FID)	100			77.0-120

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Laboratory Control Sample (LCS)

(LCS) R3437295-1 08/04/19 12:51

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	5.38	97.8	72.0-127	
(S) a,a,a-Trifluorotoluene(FID)			92.6	77.0-120	



Method Blank (MB)

(MB) R3435560-1 07/30/19 04:48

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TPH (GC/FID) High Fraction	U		0.769	4.00
(S) o-Terphenyl	81.2			18.0-148

Laboratory Control Sample (LCS)

(LCS) R3435560-2 07/30/19 05:01

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) High Fraction	50.0	37.0	74.0	50.0-150	
(S) o-Terphenyl			97.0	18.0-148	

L1122449-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1122449-01 07/30/19 07:52 • (MS) R3435560-3 07/30/19 08:06 • (MSD) R3435560-4 07/30/19 08:19

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TPH (GC/FID) High Fraction	64.7	353	260	406	0.000	82.0	1	50.0-150	V	J3	43.9	20
(S) o-Terphenyl					66.5	79.1		18.0-148				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc



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

(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
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

B	The same analyte is found in the associated blank.
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.
T8	Sample(s) received past/too close to holding time expiration.
V	The sample concentration is too high to evaluate accurate spike recoveries.





Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

* 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 National.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico ¹	n/a
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}	90010	South Carolina	84004
Kentucky ²	16	South Dakota	n/a
Louisiana	AI30792	Tennessee ^{1 4}	2006
Louisiana ¹	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas ⁵	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

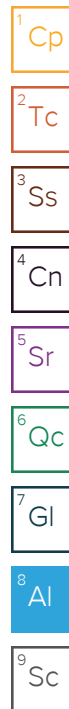
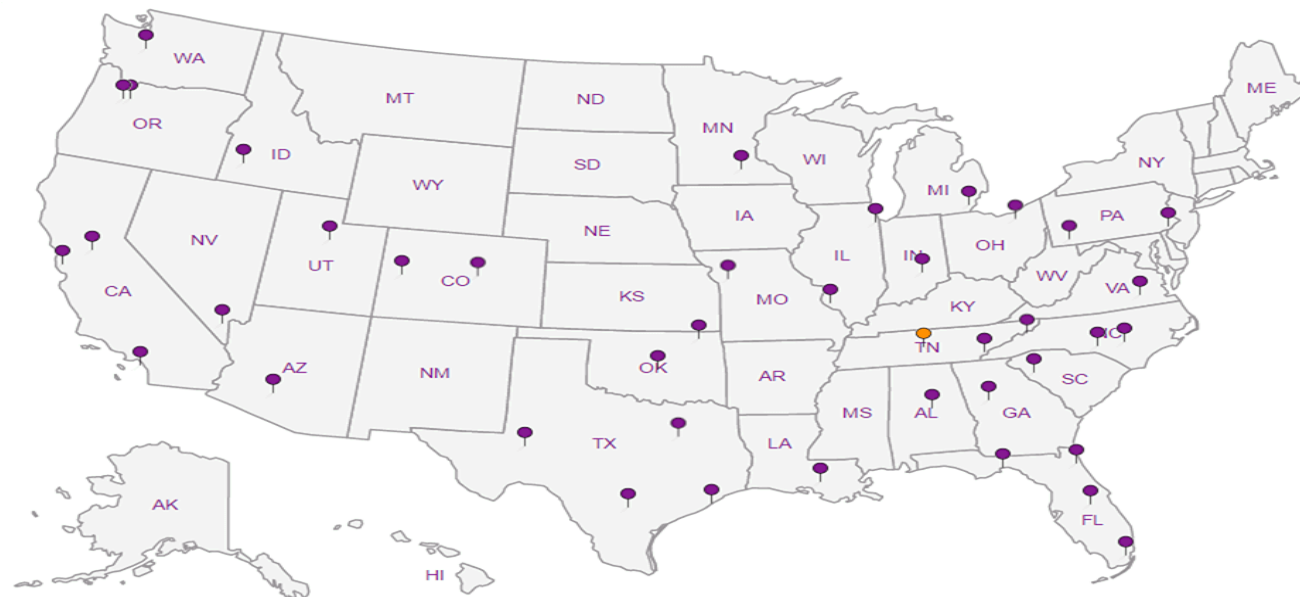
Third Party Federal Accreditations

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

Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



Pace Analytical National Center for Testing & Innovation Cooler Receipt Form

Client:	SDG#:	U1122592	
Cooler Received/Opened On: 7/20/19		Temperature:	4.7
Received By: Hailey Melson			
Signature: <i>Hailey Melson</i>			
Receipt Check List	NP	Yes	No
COC Seal Present / Intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC Signed / Accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bottles arrive intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Correct bottles used?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient volume sent?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If Applicable			
VOA Zero headspace?			
Preservation Correct / Checked?			