

September 05, 2019

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Caerus Oil and Gas

Sample Delivery Group: L1133967
Samples Received: 08/29/2019
Project Number: L19
Description: L19 Stockpile
Site: L19
Report To: Brett Middleton
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.



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20190827-L19STOCKPILE L1133967-01 Solid

Collected by
Tim DobranskyCollected date/time
08/27/19 13:00Received date/time
08/29/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method 8015/8021	WG1337267	200	08/29/19 11:34	08/30/19 01:54	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1337152	5	08/29/19 16:48	08/30/19 02:07	JDG	Mt. Juliet, TN

¹Cp²Tc³Ss

20190827-L19STOCKPILE L1133967-02 Solid

Collected by
Tim DobranskyCollected date/time
08/27/19 13:00Received date/time
08/29/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1338152	1	09/03/19 09:28	09/03/19 09:28	CCE	Mt. Juliet, TN
Calculated Results	WG1337227	1	08/29/19 16:14	09/01/19 19:01	ANP	Mt. Juliet, TN
Wet Chemistry by Method 3060A/7196A	WG1338424	1	08/31/19 19:21	09/01/19 19:01	ANP	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1337294	1	08/30/19 13:00	08/30/19 14:05	JIC	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1336812	1	08/29/19 15:35	08/29/19 17:57	AKA	Mt. Juliet, TN
Mercury by Method 7471A	WG1337309	1	08/29/19 15:52	08/29/19 20:37	TCT	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1337227	1	08/29/19 16:14	08/30/19 03:03	TRB	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015M	WG1339938	1	09/04/19 15:32	09/05/19 07:14	DAH	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1338627	1	09/02/19 16:55	09/03/19 06:32	DMG	Mt. Juliet, TN

⁴Cn⁵Sr⁶Qc⁷Gl⁸Al⁹Sc



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



Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.126	<u>B</u>	0.100	200	08/30/2019 01:54	WG1337267
Toluene	ND		1.00	200	08/30/2019 01:54	WG1337267
Ethylbenzene	ND		0.100	200	08/30/2019 01:54	WG1337267
Total Xylene	15.7		0.300	200	08/30/2019 01:54	WG1337267
TPH (GC/FID) Low Fraction	527		20.0	200	08/30/2019 01:54	WG1337267
(S) a,a,a-Trifluorotoluene(FID)	94.3		77.0-120		08/30/2019 01:54	WG1337267
(S) a,a,a-Trifluorotoluene(PID)	97.9		72.0-128		08/30/2019 01:54	WG1337267

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	218	<u>J3 V</u>	20.0	5	08/30/2019 02:07	WG1337152
(S) o-Terphenyl	51.4		18.0-148		08/30/2019 02:07	WG1337152

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc



Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	4.83		1	09/03/2019 09:28	WG1338152

Calculated Results

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Chromium, Trivalent	29.5		1.00	1	09/01/2019 19:01	WG1337227

Wet Chemistry by Method 3060A/7196A

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Chromium, Hexavalent	ND		2.00	1	09/01/2019 19:01	WG1338424

Wet Chemistry by Method 9045D

Analyte	Result su	Qualifier	Dilution	Analysis date / time	Batch
pH	8.05	T8	1	08/30/2019 14:05	WG1337294

Sample Narrative:

L1133967-02 WG1337294: 8.05 at 21.1C

Wet Chemistry by Method 9050AMod

Analyte	Result umhos/cm	Qualifier	RDL umhos/cm	Dilution	Analysis date / time	Batch
Specific Conductance	1260		10.0	1	08/29/2019 17:57	WG1336812

Mercury by Method 7471A

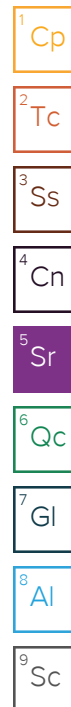
Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Mercury	0.0404		0.0300	1	08/29/2019 20:37	WG1337309

Metals (ICP) by Method 6010B

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Arsenic	12.1		2.00	1	08/30/2019 03:03	WG1337227
Barium	340	J6 Q1	0.500	1	08/30/2019 03:03	WG1337227
Cadmium	0.628		0.500	1	08/30/2019 03:03	WG1337227
Chromium	29.5	Q1	1.00	1	08/30/2019 03:03	WG1337227
Copper	27.2		2.00	1	08/30/2019 03:03	WG1337227
Lead	17.9	Q1	0.500	1	08/30/2019 03:03	WG1337227
Nickel	21.0		2.00	1	08/30/2019 03:03	WG1337227
Selenium	ND		2.00	1	08/30/2019 03:03	WG1337227
Silver	ND		1.00	1	08/30/2019 03:03	WG1337227
Zinc	60.2	Q1	5.00	1	08/30/2019 03:03	WG1337227

Volatile Organic Compounds (GC) by Method 8015M

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Methanol	5.81		0.800	1	09/05/2019 07:14	WG1339938
Ethanol	ND		0.800	1	09/05/2019 07:14	WG1339938





Collected date/time: 08/27/19 13:00

L1133967

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Anthracene	ND		0.00600	1	09/03/2019 06:32	WG1338627
Acenaphthene	0.0148		0.00600	1	09/03/2019 06:32	WG1338627
Acenaphthylene	ND		0.00600	1	09/03/2019 06:32	WG1338627
Benzo(a)anthracene	ND		0.00600	1	09/03/2019 06:32	WG1338627
Benzo(a)pyrene	ND		0.00600	1	09/03/2019 06:32	WG1338627
Benzo(b)fluoranthene	ND		0.00600	1	09/03/2019 06:32	WG1338627
Benzo(g,h,i)perylene	ND		0.00600	1	09/03/2019 06:32	WG1338627
Benzo(k)fluoranthene	ND		0.00600	1	09/03/2019 06:32	WG1338627
Chrysene	ND		0.00600	1	09/03/2019 06:32	WG1338627
Dibenz(a,h)anthracene	ND		0.00600	1	09/03/2019 06:32	WG1338627
Fluoranthene	ND		0.00600	1	09/03/2019 06:32	WG1338627
Fluorene	0.0404		0.00600	1	09/03/2019 06:32	WG1338627
Indeno(1,2,3-cd)pyrene	ND		0.00600	1	09/03/2019 06:32	WG1338627
Naphthalene	0.117		0.0200	1	09/03/2019 06:32	WG1338627
Phenanthrene	0.0214		0.00600	1	09/03/2019 06:32	WG1338627
Pyrene	ND		0.00600	1	09/03/2019 06:32	WG1338627
1-Methylnaphthalene	0.230		0.0200	1	09/03/2019 06:32	WG1338627
2-Methylnaphthalene	0.570		0.0200	1	09/03/2019 06:32	WG1338627
2-Chloronaphthalene	ND		0.0200	1	09/03/2019 06:32	WG1338627
(S) p-Terphenyl-d14	102		23.0-120		09/03/2019 06:32	WG1338627
(S) Nitrobenzene-d5	675	<u>J1</u>	14.0-149		09/03/2019 06:32	WG1338627
(S) 2-Fluorobiphenyl	87.6		34.0-125		09/03/2019 06:32	WG1338627

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3446416-1 09/01/19 18:43

	MB Result	MB Qualifier	MB MDL	MB RDL
Analyte	mg/kg		mg/kg	mg/kg
Chromium,Hexavalent	U		0.640	2.00

L1132915-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1132915-02 09/01/19 18:45 • (DUP) R3446416-3 09/01/19 18:46

	Original Result (dry)	DUP Result (dry)	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	mg/kg	mg/kg		%		%
Chromium,Hexavalent	U	0.000	1	0.000		20

L1134051-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1134051-02 09/01/19 19:07 • (DUP) R3446416-6 09/01/19 19:21

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	mg/kg	mg/kg		%		%
Chromium,Hexavalent	ND	0.000	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3446416-2 09/01/19 18:44

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Analyte	mg/kg	mg/kg	%	%	
Chromium,Hexavalent	24.0	20.2	84.0	80.0-120	

L1132915-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1132915-02 09/01/19 18:45 • (MS) R3446416-4 09/01/19 18:47 • (MSD) R3446416-5 09/01/19 18:48

	Spike Amount (dry)	Original Result (dry)	MS Result (dry)	MSD Result (dry)	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Analyte	mg/kg	mg/kg	mg/kg	mg/kg	%	%		%			%	%
Chromium,Hexavalent	25.0	U	25.0	26.4	99.8	106	1	75.0-125			5.58	20

1

Cp

2

Tc

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Ss

4

Cn

5

Sr

6

Qc

7

Gl

8

Al

9

Sc



L1132915-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1132915-02 09/01/19 18:45 • (MS) R3446416-7 09/01/19 19:44

	Spike Amount (dry)	Original Result (dry)	MS Result (dry)	MS Rec.	Dilution	Rec. Limits	<u>MS Qualifier</u>
Analyte	mg/kg	mg/kg	mg/kg	%		%	
Chromium,Hexavalent	805	U	785	97.5	50	75.0-125	

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc



L1133967-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1133967-02 08/30/19 14:05 • (DUP) R3446046-2 08/30/19 14:05

	Original Result	DUP Result	Dilution	DUP RPD	<u>DUP Qualifier</u>	DUP RPD Limits
Analyte	su	su		%		%
pH	8.05	8.03	1	0.249		1

Sample Narrative:

OS: 8.05 at 21.1C

DUP: 8.03 at 21.2C

L1134166-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1134166-04 08/30/19 14:05 • (DUP) R3446046-3 08/30/19 14:05

	Original Result	DUP Result	Dilution	DUP RPD	<u>DUP Qualifier</u>	DUP RPD Limits
Analyte	su	su		%		%
pH	8.22	8.27	1	0.606		1

Sample Narrative:

OS: 8.22 at 20.9C

DUP: 8.27 at 20.9C

Laboratory Control Sample (LCS)

(LCS) R3446046-1 08/30/19 14:05

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	<u>LCS Qualifier</u>
Analyte	su	su	%	%	
pH	10.0	10.0	100	99.0-101	

Sample Narrative:

LCS: 10 at 20.9C

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc



Method Blank (MB)

(MB) R3445716-1 08/29/19 17:57

Analyte	MB Result umhos/cm	MB Qualifier	MB MDL umhos/cm	MB RDL umhos/cm
Specific Conductance	U		10.0	10.0

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

L1133068-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1133068-02 08/29/19 17:57 • (DUP) R3445716-3 08/29/19 17:57

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Specific Conductance	198	199	1	0.503		20

L1133369-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1133369-04 08/29/19 17:57 • (DUP) R3445716-4 08/29/19 17:57

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Specific Conductance	392	395	1	0.762		20

Laboratory Control Sample (LCS)

(LCS) R3445716-2 08/29/19 17:57

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	393	396	101	85.0-115	



Method Blank (MB)

(MB) R3445758-5 08/29/19 20:57

	MB Result	MB Qualifier	MB MDL	MB RDL
Analyte	mg/kg		mg/kg	mg/kg
Mercury	U		0.00280	0.0300

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3445758-1 08/29/19 19:45 • (LCSD) R3445758-2 08/29/19 19:48

	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
Analyte	mg/kg	mg/kg	mg/kg	%	%	%			%	%
Mercury	0.500	0.467	0.482	93.3	96.5	80.0-120			3.34	20

L1133572-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1133572-03 08/29/19 19:50 • (MS) R3445758-3 08/29/19 19:53 • (MSD) R3445758-4 08/29/19 19:55

	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Analyte	mg/kg	mg/kg	mg/kg	mg/kg	%	%		%			%	%
Mercury	0.500	0.00898	0.435	0.443	85.2	86.9	1	75.0-125			1.92	20

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc



Method Blank (MB)

(MB) R3445797-1 08/30/19 02:55

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Arsenic	U		0.460	2.00
Barium	U		0.170	0.500
Cadmium	U		0.0700	0.500
Chromium	U		0.140	1.00
Copper	U		0.530	2.00
Lead	U		0.190	0.500
Nickel	U		0.490	2.00
Selenium	U		0.620	2.00
Silver	U		0.120	1.00
Zinc	U		0.590	5.00

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3445797-2 08/30/19 02:57 • (LCSD) R3445797-3 08/30/19 03:00

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Arsenic	100	91.6	94.1	91.6	94.1	80.0-120			2.68	20
Barium	100	101	104	101	104	80.0-120			2.75	20
Cadmium	100	93.6	96.0	93.6	96.0	80.0-120			2.56	20
Chromium	100	93.8	96.7	93.8	96.7	80.0-120			3.04	20
Copper	100	91.1	93.7	91.1	93.7	80.0-120			2.85	20
Lead	100	94.7	97.1	94.7	97.1	80.0-120			2.44	20
Nickel	100	98.2	101	98.2	101	80.0-120			3.04	20
Selenium	100	90.3	92.8	90.3	92.8	80.0-120			2.83	20
Silver	20.0	16.7	17.2	83.6	86.1	80.0-120			2.89	20
Zinc	100	94.8	98.1	94.8	98.1	80.0-120			3.44	20

L1133967-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1133967-02 08/30/19 03:03 • (MS) R3445797-6 08/30/19 03:11 • (MSD) R3445797-7 08/30/19 03:14

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Arsenic	100	12.1	113	113	101	101	1	75.0-125			0.756	20
Barium	100	340	460	407	120	67.6	1	75.0-125		J6	12.2	20
Cadmium	100	0.628	101	102	101	101	1	75.0-125			0.393	20
Chromium	100	29.5	119	117	89.3	87.4	1	75.0-125			1.60	20
Copper	100	27.2	124	122	97.0	94.3	1	75.0-125			2.13	20
Lead	100	17.9	118	118	99.7	99.8	1	75.0-125			0.0615	20
Nickel	100	21.0	130	131	109	110	1	75.0-125			0.238	20



L1133967-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1133967-02 08/30/19 03:03 • (MS) R3445797-6 08/30/19 03:11 • (MSD) R3445797-7 08/30/19 03:14

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>	<u>MSD Qualifier</u>	RPD %	RPD Limits %
Selenium	100	ND	97.3	99.2	96.1	97.9	1	75.0-125			1.90	20
Silver	20.0	ND	18.1	18.3	90.4	91.6	1	75.0-125			1.25	20
Zinc	100	60.2	154	152	93.3	91.6	1	75.0-125			1.12	20

¹Cp

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Method Blank (MB)

(MB) R3445961-3 08/29/19 23:45

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	0.000188	⌋	0.000120	0.000500
Toluene	0.000180	⌋	0.000150	0.00500
Ethylbenzene	0.000215	⌋	0.000110	0.000500
Total Xylene	U		0.000460	0.00150
TPH (GC/FID) Low Fraction	0.0243	⌋	0.0217	0.100
(S) a,a,a-Trifluorotoluene(FID)	95.7			77.0-120
(S) a,a,a-Trifluorotoluene(PID)	99.1			72.0-128

1
Cp

2
Tc

3
Ss

4
Cn

5
Sr

6
Qc

7
Gl

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Al

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Sc

Laboratory Control Sample (LCS)

(LCS) R3445961-1 08/29/19 22:36

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.0500	0.0455	91.0	76.0-121	
Toluene	0.0500	0.0449	89.8	80.0-120	
Ethylbenzene	0.0500	0.0449	89.8	80.0-124	
Total Xylene	0.150	0.140	93.1	37.0-160	
(S) a,a,a-Trifluorotoluene(FID)			95.2	77.0-120	
(S) a,a,a-Trifluorotoluene(PID)			97.1	72.0-128	

Laboratory Control Sample (LCS)

(LCS) R3445961-2 08/29/19 22:57

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	5.16	93.8	72.0-127	
(S) a,a,a-Trifluorotoluene(FID)			106	77.0-120	
(S) a,a,a-Trifluorotoluene(PID)			107	72.0-128	



L1132242-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1132242-07 08/30/19 02:14 • (MS) R3445961-4 08/30/19 09:47 • (MSD) R3445961-5 08/30/19 10:07

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 %
Benzene	0.135	U	3.10	0.116	91.6	86.0	25	10.0-155		J3	186	32
Toluene	0.135	0.0201	2.98	0.114	87.7	69.7	25	10.0-160		J3	185	34
Ethylbenzene	0.135	U	3.03	0.117	89.6	86.3	25	10.0-160		J3	185	32
Total Xylene	0.405	0.0633	8.89	0.357	87.1	72.4	25	10.0-160		J3 J6	185	32
(S) a,a,a-Trifluorotoluene(FID)					94.5	93.9		77.0-120				
(S) a,a,a-Trifluorotoluene(PID)					95.9	94.9		72.0-128				

L1132402-10 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1132402-10 08/30/19 06:40 • (MS) R3445961-6 08/30/19 10:27 • (MSD) R3445961-7 08/30/19 10:48

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TPH (GC/FID) Low Fraction	5.50	2340	4390	4760	74.3	87.8	500	10.0-151			8.15	28
(S) a,a,a-Trifluorotoluene(FID)					120	122		77.0-120		J1		
(S) a,a,a-Trifluorotoluene(PID)					117	118		72.0-128				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc



Method Blank (MB)

(MB) R3447350-1 09/05/19 06:35

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Methanol	U		0.252	0.800
Ethanol	U		0.105	0.800

1
Cp

2
Tc

3
Ss

4
Cn

5
Sr

6
Qc

7
Gl

8
Al

9
Sc

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3447350-2 09/05/19 06:41 • (LCSD) R3447350-3 09/05/19 07:06

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Methanol	5.00	5.23	5.05	105	101	55.0-133			3.37	25
Ethanol	5.00	4.82	4.83	96.4	96.6	64.0-124			0.219	20

L1135309-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1135309-01 09/05/19 07:20 • (MS) R3447350-4 09/05/19 07:30 • (MSD) R3447350-5 09/05/19 07:36

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Methanol	5.00	5.70	10.9	11.1	104	108	1	21.0-149			2.10	27
Ethanol	5.00	U	4.85	4.96	97.0	99.1	1	32.0-129			2.21	33



Method Blank (MB)

(MB) R3445780-1 08/29/19 21:25

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	50.8			18.0-148

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Laboratory Control Sample (LCS)

(LCS) R3445780-2 08/29/19 21:38

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) High Fraction	50.0	33.3	66.6	50.0-150	
(S) o-Terphenyl			74.0	18.0-148	

L1133967-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1133967-01 08/30/19 02:07 • (MS) R3445780-3 08/30/19 02:20 • (MSD) R3445780-4 08/30/19 02:34

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TPH (GC/FID) High Fraction	50.0	218	381	297	326	158	5	50.0-150	V	J3 V	24.8	20
(S) o-Terphenyl					60.1	57.4		18.0-148				



Method Blank (MB)

(MB) R3446552-2 09/03/19 00:41

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Anthracene	U		0.000600	0.00600
Acenaphthene	U		0.000600	0.00600
Acenaphthylene	U		0.000600	0.00600
Benzo(a)anthracene	U		0.000600	0.00600
Benzo(a)pyrene	U		0.000600	0.00600
Benzo(b)fluoranthene	U		0.000600	0.00600
Benzo(g,h,i)perylene	U		0.000600	0.00600
Benzo(k)fluoranthene	U		0.000600	0.00600
Chrysene	U		0.000600	0.00600
Dibenz(a,h)anthracene	U		0.000600	0.00600
Fluoranthene	U		0.000600	0.00600
Fluorene	U		0.000600	0.00600
Indeno(1,2,3-cd)pyrene	U		0.000600	0.00600
Naphthalene	U		0.00200	0.0200
Phenanthrene	U		0.000600	0.00600
Pyrene	U		0.000600	0.00600
1-Methylnaphthalene	U		0.00200	0.0200
2-Methylnaphthalene	U		0.00200	0.0200
2-Chloronaphthalene	U		0.00200	0.0200
(S) Nitrobenzene-d5	107			14.0-149
(S) 2-Fluorobiphenyl	93.8			34.0-125
(S) p-Terphenyl-d14	107			23.0-120

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Laboratory Control Sample (LCS)

(LCS) R3446552-1 09/03/19 00:19

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Anthracene	0.0800	0.0668	83.5	50.0-126	
Acenaphthene	0.0800	0.0694	86.8	50.0-120	
Acenaphthylene	0.0800	0.0734	91.8	50.0-120	
Benzo(a)anthracene	0.0800	0.0671	83.9	45.0-120	
Benzo(a)pyrene	0.0800	0.0714	89.3	42.0-120	
Benzo(b)fluoranthene	0.0800	0.0739	92.4	42.0-121	
Benzo(g,h,i)perylene	0.0800	0.0787	98.4	45.0-125	
Benzo(k)fluoranthene	0.0800	0.0793	99.1	49.0-125	
Chrysene	0.0800	0.0732	91.5	49.0-122	
Dibenz(a,h)anthracene	0.0800	0.0840	105	47.0-125	
Fluoranthene	0.0800	0.0642	80.3	49.0-129	

Laboratory Control Sample (LCS)

(LCS) R3446552-1 09/03/19 00:19

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Fluorene	0.0800	0.0669	83.6	49.0-120	
Indeno(1,2,3-cd)pyrene	0.0800	0.0824	103	46.0-125	
Naphthalene	0.0800	0.0728	91.0	50.0-120	
Phenanthrene	0.0800	0.0631	78.9	47.0-120	
Pyrene	0.0800	0.0662	82.8	43.0-123	
1-Methylnaphthalene	0.0800	0.0728	91.0	51.0-121	
2-Methylnaphthalene	0.0800	0.0709	88.6	50.0-120	
2-Chloronaphthalene	0.0800	0.0658	82.3	50.0-120	
(S) Nitrobenzene-d5			125	14.0-149	
(S) 2-Fluorobiphenyl			100	34.0-125	
(S) p-Terphenyl-d14			110	23.0-120	

L1133369-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1133369-01 09/03/19 01:03 • (MS) R3446552-3 09/03/19 01:25 • (MSD) R3446552-4 09/03/19 01:47

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>	<u>MSD Qualifier</u>	RPD %	RPD Limits %
Anthracene	0.0800	ND	0.0559	0.0561	69.9	70.1	1	10.0-145			0.357	30
Acenaphthene	0.0800	0.0103	0.0568	0.0537	58.1	54.3	1	14.0-127			5.61	27
Acenaphthylene	0.0800	ND	0.0576	0.0514	72.0	64.3	1	21.0-124			11.4	25
Benzo(a)anthracene	0.0800	ND	0.0556	0.0562	69.5	70.3	1	10.0-139			1.07	30
Benzo(a)pyrene	0.0800	ND	0.0615	0.0591	76.9	73.9	1	10.0-141			3.98	31
Benzo(b)fluoranthene	0.0800	ND	0.0515	0.0544	64.4	68.0	1	10.0-140			5.48	36
Benzo(g,h,i)perylene	0.0800	ND	0.0623	0.0590	77.9	73.8	1	10.0-140			5.44	33
Benzo(k)fluoranthene	0.0800	ND	0.0714	0.0653	89.3	81.6	1	10.0-137			8.92	31
Chrysene	0.0800	ND	0.0630	0.0610	78.8	76.3	1	10.0-145			3.23	30
Dibenz(a,h)anthracene	0.0800	ND	0.0703	0.0705	87.9	88.1	1	10.0-132			0.284	31
Fluoranthene	0.0800	ND	0.0547	0.0530	68.4	66.3	1	10.0-153			3.16	33
Fluorene	0.0800	0.0268	0.0595	0.0627	40.9	44.9	1	11.0-130			5.24	29
Indeno(1,2,3-cd)pyrene	0.0800	ND	0.0641	0.0632	80.1	79.0	1	10.0-137			1.41	32
Naphthalene	0.0800	0.189	0.0859	0.139	0.000	0.000	1	10.0-135	J6	J3 J6	47.2	27
Phenanthrene	0.0800	0.00968	0.0528	0.0542	53.9	55.7	1	10.0-144			2.62	31
Pyrene	0.0800	ND	0.0463	0.0455	57.9	56.9	1	10.0-148			1.74	35
1-Methylnaphthalene	0.0800	0.196	0.113	0.172	0.000	0.000	1	10.0-142	J6	J3 J6	41.4	28
2-Methylnaphthalene	0.0800	0.547	0.152	0.332	0.000	0.000	1	10.0-137	V	J3 V	74.4	28
2-Chloronaphthalene	0.0800	ND	0.0523	0.0462	65.4	57.8	1	29.0-120			12.4	24
(S) Nitrobenzene-d5					158	181		14.0-149	J1	J1		
(S) 2-Fluorobiphenyl					83.1	57.4		34.0-125				
(S) p-Terphenyl-d14					93.6	85.3		23.0-120				

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.
ND	Not detected at the Reporting Limit (or MDL where applicable).
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.
J1	Surrogate recovery limits have been exceeded; values are outside upper control limits.
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.
O1	The analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.
T8	Sample(s) received past/too close to holding time expiration.
V	The sample concentration is too high to evaluate accurate spike recoveries.

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



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.



Company Name/Address: Caerus 143 Diamond Avenue Parachute, CO 81635		Billing Information: Brett Middleton 143 Diamond Avenue Parachute, CO 81635		Analysis / Container / Preservative												Chain of Custody Page <u>L of L</u>							
Report to: Brett Middleton		Email To: bmiddleton@caerusoilandgas.com																 ESC L.A.B S.C.I.E.N.C.E.S. YOUR LAB OF CHOICE 12065 Lebanon Rd Mount Juliet, TN 37122 Phone: 615-758-5858 Phone: 800-767-5859 Fax: 615-758-5859					
Project Description: L19 STOCKPILE		City/State Collected: Parachute, Co																L# L 1133967 B215					
Phone: 970-987-4650		Client Project # L19																					
Collected by (print): Tim Doreansy		Site/Facility ID # L19		Lab Project #		P.O. #												Acctnum: Template: Prelogin: TSR: PB:					
Collected by (signature): 		Date Results Needed																					
Immediately Packed on Ice N ___ Y X		Rush? (Lab MUST Be Notified) <input checked="" type="checkbox"/> Same Day200% <input type="checkbox"/> Next Day100% <input type="checkbox"/> Two Day50% <input checked="" type="checkbox"/> Three Day25%		Email? ___ No <input checked="" type="checkbox"/> Yes		FAX? <input checked="" type="checkbox"/> No ___ Yes		No. of Cntrs															
Sample ID	Comp/Grab	Matrix *	Depth	Date	Time																	Shipped Via: Rem./Contaminant Sample # (lab only)	
20190827-L19STOCKPILE	Comp	SS	6-12"	8/27/19	1300																		
																		-01/02					
* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other _____																		pH _____ Temp _____					
Remarks: RUSH - 1 DAY TAT / 3 DAY TAT ON REST																		Flow _____ Other _____					
Relinquished by : (Signature)		Date: 8/27/19		Time: 1800		Received by: (Signature)		Samples returned via: <input type="checkbox"/> UPS <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> Courier <input type="checkbox"/> _____				Condition: (lab use only)											
Relinquished by : (Signature)		Date: 8/29/19		Time: 1730		Received by: (Signature)		Temp: °C 2.5 x 0 = 2.5 AS Bottles Received: 0				RAD SCREEN: <0.5 mR/h											
Relinquished by : (Signature)		Date: _____		Time: _____		Received for lab by: (Signature)		Date: 8/29/19 Time: 8:45				COC Seal Intact: ___ Y ___ N <input checked="" type="checkbox"/> NA pH Checked: _____ NCF: _____											