

April 23, 2020

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Caerus Oil and Gas

Sample Delivery Group: L1209454
Samples Received: 04/16/2020
Project Number: O04-696
Description: O04-696 Cuttings
Site: O04-696
Report To: Jake Janicek
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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20200415-O04-696 (CUTPRO) L1209454-01 Solid

Collected by
Evan MasonCollected date/time
04/15/20 11:00Received date/time
04/16/20 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1462082	1	04/22/20 11:55	04/22/20 11:55	CCE	Mt. Juliet, TN
Calculated Results	WG1462940	1	04/20/20 01:33	04/20/20 21:36	EL	Mt. Juliet, TN
Wet Chemistry by Method 3060A/7196A	WG1461688	1	04/20/20 10:00	04/20/20 14:41	KPS	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1463392	1	04/21/20 18:00	04/21/20 19:00	JIC	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1463605	1	04/22/20 12:00	04/22/20 14:00	CAT	Mt. Juliet, TN
Mercury by Method 7471A	WG1463135	1	04/20/20 13:37	04/20/20 17:49	TCT	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1462940	1	04/20/20 01:33	04/20/20 21:36	EL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1462940	5	04/20/20 01:33	04/20/20 22:45	EL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1463408	1	04/18/20 09:19	04/20/20 15:31	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1462740	1	04/18/20 09:19	04/18/20 17:20	ADM	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1463064	5	04/19/20 15:13	04/21/20 03:07	KME	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1463992	1	04/21/20 18:31	04/22/20 06:06	AAT	Mt. Juliet, TN

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc

20200415-O04-696 (CUTSURF) L1209454-02 Solid

Collected by
Evan MasonCollected date/time
04/15/20 11:30Received date/time
04/16/20 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1462082	1	04/22/20 11:58	04/22/20 11:58	CCE	Mt. Juliet, TN
Calculated Results	WG1462940	1	04/20/20 01:33	04/20/20 21:39	EL	Mt. Juliet, TN
Wet Chemistry by Method 3060A/7196A	WG1461688	1	04/20/20 10:00	04/20/20 14:43	KPS	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1463392	1	04/21/20 18:00	04/21/20 19:00	JIC	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1463605	1	04/22/20 12:00	04/22/20 14:00	CAT	Mt. Juliet, TN
Mercury by Method 7471A	WG1463135	1	04/20/20 13:37	04/20/20 17:51	TCT	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1462940	1	04/20/20 01:33	04/20/20 21:39	EL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1462940	5	04/20/20 01:33	04/20/20 22:48	EL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1463408	1	04/18/20 09:19	04/20/20 15:53	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1462740	1	04/18/20 09:19	04/18/20 17:39	ADM	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1463064	1	04/19/20 15:13	04/21/20 02:27	KME	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1463992	1	04/21/20 18:31	04/22/20 05:49	AAT	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	21.8		1	04/22/2020 11:55	WG1462082

1
Cp2
Tc3
Ss4
Cn5
Sr6
Qc7
Gl8
Al9
Sc

Calculated Results

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Chromium, Trivalent	18.7		1.00	1	04/20/2020 21:36	WG1462940

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	04/20/2020 14:41	WG1461688

Wet Chemistry by Method 9045D

Analyte	Result su	Qualifier	Dilution	Analysis date / time	Batch
pH	10.8	T8	1	04/21/2020 19:00	WG1463392

Sample Narrative:

L1209454-01 WG1463392: 10.82 at 22C

Wet Chemistry by Method 9050AMod

Analyte	Result umhos/cm	Qualifier	RDL umhos/cm	Dilution	Analysis date / time	Batch
Specific Conductance	2660		10.0	1	04/22/2020 14:00	WG1463605

Mercury by Method 7471A

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Mercury	0.0661		0.0400	1	04/20/2020 17:49	WG1463135

Metals (ICP) by Method 6010B

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Arsenic	6.81		2.00	1	04/20/2020 21:36	WG1462940
Barium	16400		2.50	5	04/20/2020 22:45	WG1462940
Cadmium	ND		2.50	5	04/20/2020 22:45	WG1462940
Chromium	18.7		1.00	1	04/20/2020 21:36	WG1462940
Copper	25.8		2.00	1	04/20/2020 21:36	WG1462940
Lead	12.0		0.500	1	04/20/2020 21:36	WG1462940
Nickel	16.0		2.00	1	04/20/2020 21:36	WG1462940
Selenium	ND		2.00	1	04/20/2020 21:36	WG1462940
Silver	ND		1.00	1	04/20/2020 21:36	WG1462940
Zinc	53.9		5.00	1	04/20/2020 21:36	WG1462940

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	1.65		0.100	1	04/20/2020 15:31	WG1463408
(S) a,a,a-Trifluorotoluene(FID)	92.5		77.0-120		04/20/2020 15:31	WG1463408



Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.0137		0.00100	1	04/18/2020 17:20	WG1462740
Toluene	0.0199		0.00500	1	04/18/2020 17:20	WG1462740
Ethylbenzene	0.00368		0.00250	1	04/18/2020 17:20	WG1462740
Total Xylenes	0.0136		0.00650	1	04/18/2020 17:20	WG1462740
(S) Toluene-d8	101		75.0-131		04/18/2020 17:20	WG1462740
(S) 4-Bromofluorobenzene	107		67.0-138		04/18/2020 17:20	WG1462740
(S) 1,2-Dichloroethane-d4	88.4		70.0-130		04/18/2020 17:20	WG1462740

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

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	434		20.0	5	04/21/2020 03:07	WG1463064
(S) o-Terphenyl	0.000	J2	18.0-148		04/21/2020 03:07	WG1463064

Sample Narrative:

L1209454-01 WG1463064: Surrogate failure due to matrix interference

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	04/22/2020 06:06	WG1463992
Acenaphthene	0.00622		0.00600	1	04/22/2020 06:06	WG1463992
Acenaphthylene	ND		0.00600	1	04/22/2020 06:06	WG1463992
Benzo(a)anthracene	ND		0.00600	1	04/22/2020 06:06	WG1463992
Benzo(a)pyrene	ND		0.00600	1	04/22/2020 06:06	WG1463992
Benzo(b)fluoranthene	0.00914		0.00600	1	04/22/2020 06:06	WG1463992
Benzo(g,h,i)perylene	ND		0.00600	1	04/22/2020 06:06	WG1463992
Benzo(k)fluoranthene	ND		0.00600	1	04/22/2020 06:06	WG1463992
Chrysene	0.0183		0.00600	1	04/22/2020 06:06	WG1463992
Dibenz(a,h)anthracene	ND		0.00600	1	04/22/2020 06:06	WG1463992
Fluoranthene	0.00906		0.00600	1	04/22/2020 06:06	WG1463992
Fluorene	0.0284		0.00600	1	04/22/2020 06:06	WG1463992
Indeno(1,2,3-cd)pyrene	ND		0.00600	1	04/22/2020 06:06	WG1463992
Naphthalene	0.127		0.0200	1	04/22/2020 06:06	WG1463992
Phenanthrene	0.0912		0.00600	1	04/22/2020 06:06	WG1463992
Pyrene	0.0136		0.00600	1	04/22/2020 06:06	WG1463992
1-Methylnaphthalene	0.104		0.0200	1	04/22/2020 06:06	WG1463992
2-Methylnaphthalene	0.198		0.0200	1	04/22/2020 06:06	WG1463992
2-Chloronaphthalene	ND		0.0200	1	04/22/2020 06:06	WG1463992
(S) p-Terphenyl-d14	60.5		23.0-120		04/22/2020 06:06	WG1463992
(S) Nitrobenzene-d5	66.6		14.0-149		04/22/2020 06:06	WG1463992
(S) 2-Fluorobiphenyl	46.1		34.0-125		04/22/2020 06:06	WG1463992



Collected date/time: 04/15/20 11:30

L1209454

Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	35.6		1	04/22/2020 11:58	WG1462082

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc

Calculated Results

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Chromium, Trivalent	15.5		1.00	1	04/20/2020 21:39	WG1462940

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	04/20/2020 14:43	WG1461688

Wet Chemistry by Method 9045D

Analyte	Result su	Qualifier	Dilution	Analysis date / time	Batch
pH	9.33	T8	1	04/21/2020 19:00	WG1463392

Sample Narrative:

L1209454-02 WG1463392: 9.33 at 22C

Wet Chemistry by Method 9050AMod

Analyte	Result umhos/cm	Qualifier	RDL umhos/cm	Dilution	Analysis date / time	Batch
Specific Conductance	2310		10.0	1	04/22/2020 14:00	WG1463605

Mercury by Method 7471A

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Mercury	ND		0.0400	1	04/20/2020 17:51	WG1463135

Metals (ICP) by Method 6010B

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Arsenic	12.7		2.00	1	04/20/2020 21:39	WG1462940
Barium	11200		2.50	5	04/20/2020 22:48	WG1462940
Cadmium	ND		0.500	1	04/20/2020 21:39	WG1462940
Chromium	15.5		1.00	1	04/20/2020 21:39	WG1462940
Copper	18.3		2.00	1	04/20/2020 21:39	WG1462940
Lead	12.5		0.500	1	04/20/2020 21:39	WG1462940
Nickel	16.2		2.00	1	04/20/2020 21:39	WG1462940
Selenium	ND		2.00	1	04/20/2020 21:39	WG1462940
Silver	ND		1.00	1	04/20/2020 21:39	WG1462940
Zinc	50.1		5.00	1	04/20/2020 21:39	WG1462940

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	2.03		0.100	1	04/20/2020 15:53	WG1463408
(S) a,a,a-Trifluorotoluene(FID)	79.8		77.0-120		04/20/2020 15:53	WG1463408



Collected date/time: 04/15/20 11:30

L1209454

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00232		0.00100	1	04/18/2020 17:39	WG1462740
Toluene	ND		0.00500	1	04/18/2020 17:39	WG1462740
Ethylbenzene	ND		0.00250	1	04/18/2020 17:39	WG1462740
Total Xylenes	ND		0.00650	1	04/18/2020 17:39	WG1462740
(S) Toluene-d8	102		75.0-131		04/18/2020 17:39	WG1462740
(S) 4-Bromofluorobenzene	104		67.0-138		04/18/2020 17:39	WG1462740
(S) 1,2-Dichloroethane-d4	84.5		70.0-130		04/18/2020 17:39	WG1462740

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

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	24.7	J3 J5	4.00	1	04/21/2020 02:27	WG1463064
(S) o-Terphenyl	67.8		18.0-148		04/21/2020 02:27	WG1463064

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	04/22/2020 05:49	WG1463992
Acenaphthene	ND		0.00600	1	04/22/2020 05:49	WG1463992
Acenaphthylene	ND		0.00600	1	04/22/2020 05:49	WG1463992
Benzo(a)anthracene	ND		0.00600	1	04/22/2020 05:49	WG1463992
Benzo(a)pyrene	ND		0.00600	1	04/22/2020 05:49	WG1463992
Benzo(b)fluoranthene	ND		0.00600	1	04/22/2020 05:49	WG1463992
Benzo(g,h,i)perylene	ND		0.00600	1	04/22/2020 05:49	WG1463992
Benzo(k)fluoranthene	ND		0.00600	1	04/22/2020 05:49	WG1463992
Chrysene	0.00600		0.00600	1	04/22/2020 05:49	WG1463992
Dibenz(a,h)anthracene	ND		0.00600	1	04/22/2020 05:49	WG1463992
Fluoranthene	ND		0.00600	1	04/22/2020 05:49	WG1463992
Fluorene	0.0133		0.00600	1	04/22/2020 05:49	WG1463992
Indeno(1,2,3-cd)pyrene	ND		0.00600	1	04/22/2020 05:49	WG1463992
Naphthalene	0.104		0.0200	1	04/22/2020 05:49	WG1463992
Phenanthrene	0.0440		0.00600	1	04/22/2020 05:49	WG1463992
Pyrene	0.00839		0.00600	1	04/22/2020 05:49	WG1463992
1-Methylnaphthalene	0.0979		0.0200	1	04/22/2020 05:49	WG1463992
2-Methylnaphthalene	0.146		0.0200	1	04/22/2020 05:49	WG1463992
2-Chloronaphthalene	ND		0.0200	1	04/22/2020 05:49	WG1463992
(S) p-Terphenyl-d14	58.7		23.0-120		04/22/2020 05:49	WG1463992
(S) Nitrobenzene-d5	58.0		14.0-149		04/22/2020 05:49	WG1463992
(S) 2-Fluorobiphenyl	47.9		34.0-125		04/22/2020 05:49	WG1463992



Method Blank (MB)

(MB) R3520188-1 04/20/20 14:27

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

L1210128-07 Original Sample (OS) • Duplicate (DUP)

(OS) L1210128-07 04/20/20 14:49 • (DUP) R3520188-6 04/20/20 14:50

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

Laboratory Control Sample (LCS)

(LCS) R3520188-2 04/20/20 14:34

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Analyte	mg/kg	mg/kg	%	%	
Chromium,Hexavalent	24.0	23.6	98.3	80.0-120	

L1209591-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1209591-01 04/20/20 14:43 • (MS) R3520188-3 04/20/20 14:44 • (MSD) R3520188-4 04/20/20 14:44

	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	20.6	U	22.8	23.6	111	115	1	75.0-125			3.55	20

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc



L1209418-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1209418-02 04/21/20 19:00 • (DUP) R3520605-2 04/21/20 19:00

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	su	su		%		%
pH	4.90	4.94	1	0.813		1

Sample Narrative:

OS: 4.9 at 22.2C

DUP: 4.94 at 22.6C

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

L1209929-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1209929-01 04/21/20 19:00 • (DUP) R3520605-3 04/21/20 19:00

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	su	su		%		%
pH	7.51	7.59	1	1.06	J3	1

Sample Narrative:

OS: 7.51 at 21.1C

DUP: 7.59 at 21.1C

Laboratory Control Sample (LCS)

(LCS) R3520605-1 04/21/20 19:00

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Analyte	su	su	%	%	
pH	10.0	9.97	99.7	99.0-101	

Sample Narrative:

LCS: 9.97 at 20.8C



Method Blank (MB)

(MB) R3520984-1 04/22/20 14:00

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

L1209454-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1209454-02 04/22/20 14:00 • (DUP) R3520984-3 04/22/20 14:00

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Specific Conductance	2310	2200	1	4.97		20

Laboratory Control Sample (LCS)

(LCS) R3520984-2 04/22/20 14:00

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	445	445	100	85.0-115	

⁷Gl

⁸Al

⁹Sc



Method Blank (MB)

(MB) R3520270-1 04/20/20 17:37

	MB Result	MB Qualifier	MB MDL	MB RDL
Analyte	mg/kg		mg/kg	mg/kg
Mercury	U		0.0180	0.0400

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

Laboratory Control Sample (LCS)

(LCS) R3520270-2 04/20/20 17:39

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Analyte	mg/kg	mg/kg	%	%	
Mercury	0.500	0.510	102	80.0-120	

⁷Gl

⁸Al

⁹Sc

L1209466-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1209466-02 04/20/20 17:41 • (MS) R3520270-3 04/20/20 17:43 • (MSD) R3520270-4 04/20/20 17:45

	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	U	0.460	0.452	91.9	90.3	1	75.0-125			1.71	20



Method Blank (MB)

(MB) R3520302-1 04/20/20 20:56

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Arsenic	U		1.00	2.00
Barium	U		0.250	0.500
Cadmium	U		0.250	0.500
Chromium	U		0.500	1.00
Copper	U		1.00	2.00
Lead	U		0.250	0.500
Nickel	U		1.00	2.00
Selenium	U		1.00	2.00
Silver	U		0.500	1.00
Zinc	U		2.50	5.00

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Laboratory Control Sample (LCS)

(LCS) R3520302-2 04/20/20 20:59

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Arsenic	100	97.5	97.5	80.0-120	
Barium	100	104	104	80.0-120	
Cadmium	100	98.5	98.5	80.0-120	
Chromium	100	98.0	98.0	80.0-120	
Copper	100	100	100	80.0-120	
Lead	100	100	100	80.0-120	
Nickel	100	103	103	80.0-120	
Selenium	100	98.3	98.3	80.0-120	
Silver	20.0	17.8	89.1	80.0-120	
Zinc	100	100	100	80.0-120	

L1209462-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1209462-02 04/20/20 21:02 • (MS) R3520302-5 04/20/20 21:10 • (MSD) R3520302-6 04/20/20 21:13

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	4.29	92.8	97.0	88.5	92.7	1	75.0-125			4.41	20
Barium	100	216	388	307	172	91.1	1	75.0-125	J5	J3	23.3	20
Cadmium	100	0.179	90.3	94.9	90.1	94.8	1	75.0-125			5.01	20
Chromium	100	20.6	110	114	89.2	93.5	1	75.0-125			3.81	20
Copper	100	12.7	107	112	94.2	98.9	1	75.0-125			4.27	20
Lead	100	12.8	111	117	98.0	104	1	75.0-125			5.46	20
Nickel	100	20.1	121	127	101	107	1	75.0-125			5.31	20



[L1209454-01,02](#)

L1209462-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1209462-02 04/20/20 21:02 • (MS) R3520302-5 04/20/20 21:10 • (MSD) R3520302-6 04/20/20 21:13

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	1.25	89.7	94.0	88.5	92.7	1	75.0-125			4.66	20
Silver	20.0	U	16.2	17.2	81.2	86.1	1	75.0-125			5.87	20
Zinc	100	40.4	129	130	88.6	89.5	1	75.0-125			0.692	20

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc



Method Blank (MB)

(MB) R3520911-2 04/20/20 14:20

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TPH (GC/FID) Low Fraction	0.0590	⬇	0.0217	0.100
(S) a,a,a-Trifluorotoluene(FID)	105			77.0-120

1
Cp

2
Tc

3
Ss

4
Cn

5
Sr

6
Qc

7
Gl

8
Al

9
Sc

Laboratory Control Sample (LCS)

(LCS) R3520911-1 04/20/20 12:48

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	5.49	99.8	72.0-127	
(S) a,a,a-Trifluorotoluene(FID)			104	77.0-120	



Method Blank (MB)

(MB) R3520432-1 04/18/20 12:11

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000467	0.00100
Ethylbenzene	U		0.000737	0.00250
Toluene	U		0.00130	0.00500
Xylenes, Total	U		0.000880	0.00650
(S) Toluene-d8	101			75.0-131
(S) 4-Bromofluorobenzene	98.7			67.0-138
(S) 1,2-Dichloroethane-d4	86.3			70.0-130

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Laboratory Control Sample (LCS)

(LCS) R3520432-4 04/18/20 21:06

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.125	0.109	87.2	70.0-123	
Ethylbenzene	0.125	0.100	80.0	74.0-126	
Toluene	0.125	0.104	83.2	75.0-121	
Xylenes, Total	0.375	0.308	82.1	72.0-127	
(S) Toluene-d8			96.9	75.0-131	
(S) 4-Bromofluorobenzene			103	67.0-138	
(S) 1,2-Dichloroethane-d4			91.1	70.0-130	

L1209459-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1209459-01 04/18/20 19:32 • (MS) R3520432-2 04/18/20 19:51 • (MSD) R3520432-3 04/18/20 20:10

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 %
Benzene	2.50	0.166	2.69	2.69	101	101	20	10.0-149			0.000	37
Ethylbenzene	2.50	0.293	2.63	2.69	93.5	95.9	20	10.0-160			2.26	38
Toluene	2.50	0.755	3.22	3.23	98.6	99.0	20	10.0-156			0.310	38
Xylenes, Total	7.50	1.98	8.94	9.45	92.8	99.6	20	10.0-160			5.55	38
(S) Toluene-d8					97.2	97.9		75.0-131				
(S) 4-Bromofluorobenzene					107	105		67.0-138				
(S) 1,2-Dichloroethane-d4					90.4	90.8		70.0-130				



Method Blank (MB)

(MB) R3520232-1 04/20/20 16:34

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	84.2			18.0-148

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Laboratory Control Sample (LCS)

(LCS) R3520232-2 04/20/20 16:48

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) High Fraction	50.0	39.4	78.8	50.0-150	
(S) o-Terphenyl			86.9	18.0-148	

L1209454-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1209454-02 04/21/20 02:27 • (MS) R3520232-3 04/21/20 02:41 • (MSD) R3520232-4 04/21/20 02:54

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	24.7	80.4	105	111	161	1	50.0-150		J3 J5	26.5	20
(S) o-Terphenyl					28.2	35.9		18.0-148				



Method Blank (MB)

(MB) R3520725-2 04/21/20 23:27

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Anthracene	U		0.00230	0.00600
Acenaphthene	U		0.00209	0.00600
Acenaphthylene	U		0.00216	0.00600
Benzo(a)anthracene	U		0.00173	0.00600
Benzo(a)pyrene	U		0.00179	0.00600
Benzo(b)fluoranthene	U		0.00153	0.00600
Benzo(g,h,i)perylene	U		0.00177	0.00600
Benzo(k)fluoranthene	U		0.00215	0.00600
Chrysene	U		0.00232	0.00600
Dibenz(a,h)anthracene	U		0.00172	0.00600
Fluoranthene	U		0.00227	0.00600
Fluorene	U		0.00205	0.00600
Indeno(1,2,3-cd)pyrene	U		0.00181	0.00600
Naphthalene	U		0.00408	0.0200
Phenanthrene	U		0.00231	0.00600
Pyrene	U		0.00200	0.00600
1-Methylnaphthalene	U		0.00449	0.0200
2-Methylnaphthalene	U		0.00427	0.0200
2-Chloronaphthalene	U		0.00466	0.0200
(S) Nitrobenzene-d5	71.6			14.0-149
(S) 2-Fluorobiphenyl	65.3			34.0-125
(S) p-Terphenyl-d14	79.0			23.0-120

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Laboratory Control Sample (LCS)

(LCS) R3520725-1 04/21/20 23:09

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Anthracene	0.0800	0.0632	79.0	50.0-126	
Acenaphthene	0.0800	0.0610	76.3	50.0-120	
Acenaphthylene	0.0800	0.0658	82.3	50.0-120	
Benzo(a)anthracene	0.0800	0.0684	85.5	45.0-120	
Benzo(a)pyrene	0.0800	0.0569	71.1	42.0-120	
Benzo(b)fluoranthene	0.0800	0.0634	79.3	42.0-121	
Benzo(g,h,i)perylene	0.0800	0.0646	80.7	45.0-125	
Benzo(k)fluoranthene	0.0800	0.0638	79.8	49.0-125	
Chrysene	0.0800	0.0639	79.9	49.0-122	
Dibenz(a,h)anthracene	0.0800	0.0663	82.9	47.0-125	
Fluoranthene	0.0800	0.0642	80.3	49.0-129	



Laboratory Control Sample (LCS)

(LCS) R3520725-1 04/21/20 23:09

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Fluorene	0.0800	0.0629	78.6	49.0-120	
Indeno(1,2,3-cd)pyrene	0.0800	0.0680	85.0	46.0-125	
Naphthalene	0.0800	0.0595	74.4	50.0-120	
Phenanthrene	0.0800	0.0631	78.9	47.0-120	
Pyrene	0.0800	0.0678	84.8	43.0-123	
1-Methylnaphthalene	0.0800	0.0605	75.6	51.0-121	
2-Methylnaphthalene	0.0800	0.0573	71.6	50.0-120	
2-Chloronaphthalene	0.0800	0.0593	74.1	50.0-120	
(S) Nitrobenzene-d5			82.9	14.0-149	
(S) 2-Fluorobiphenyl			73.5	34.0-125	
(S) p-Terphenyl-d14			83.9	23.0-120	

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

L1209444-09 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1209444-09 04/22/20 01:11 • (MS) R3520725-3 04/22/20 01:28 • (MSD) R3520725-4 04/22/20 01:46

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 %
Anthracene	0.0756	U	0.0590	0.0605	78.0	80.0	1	10.0-145			2.51	30
Acenaphthene	0.0756	U	0.0578	0.0604	76.5	79.9	1	14.0-127			4.40	27
Acenaphthylene	0.0756	U	0.0620	0.0641	82.0	84.8	1	21.0-124			3.33	25
Benzo(a)anthracene	0.0756	U	0.0623	0.0654	82.4	86.5	1	10.0-139			4.86	30
Benzo(a)pyrene	0.0756	U	0.0578	0.0603	76.5	79.8	1	10.0-141			4.23	31
Benzo(b)fluoranthene	0.0756	U	0.0567	0.0600	75.0	79.4	1	10.0-140			5.66	36
Benzo(g,h,i)perylene	0.0756	U	0.0610	0.0635	80.7	84.0	1	10.0-140			4.02	33
Benzo(k)fluoranthene	0.0756	U	0.0568	0.0601	75.1	79.5	1	10.0-137			5.65	31
Chrysene	0.0756	U	0.0588	0.0610	77.8	80.7	1	10.0-145			3.67	30
Dibenz(a,h)anthracene	0.0756	U	0.0607	0.0642	80.3	84.9	1	10.0-132			5.60	31
Fluoranthene	0.0756	U	0.0580	0.0600	76.7	79.4	1	10.0-153			3.39	33
Fluorene	0.0756	U	0.0579	0.0612	76.6	81.0	1	11.0-130			5.54	29
Indeno(1,2,3-cd)pyrene	0.0756	U	0.0625	0.0660	82.7	87.3	1	10.0-137			5.45	32
Naphthalene	0.0756	U	0.0568	0.0596	75.1	78.8	1	10.0-135			4.81	27
Phenanthrene	0.0756	U	0.0586	0.0608	77.5	80.4	1	10.0-144			3.69	31
Pyrene	0.0756	U	0.0626	0.0660	82.8	87.3	1	10.0-148			5.29	35
1-Methylnaphthalene	0.0756	U	0.0569	0.0601	75.3	79.5	1	10.0-142			5.47	28
2-Methylnaphthalene	0.0756	U	0.0543	0.0569	71.8	75.3	1	10.0-137			4.68	28
2-Chloronaphthalene	0.0756	U	0.0571	0.0584	75.5	77.2	1	29.0-120			2.25	24
(S) Nitrobenzene-d5					81.7	85.5		14.0-149				
(S) 2-Fluorobiphenyl					74.5	76.9		34.0-125				
(S) p-Terphenyl-d14					85.3	88.6		23.0-120				



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

J	The identification of the analyte is acceptable; the reported value is an estimate.
J2	Surrogate recovery limits have been exceeded; values are outside lower control limits.
J3	The associated batch QC was outside the established quality control range for precision.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.
T8	Sample(s) received past/too close to holding time expiration.

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

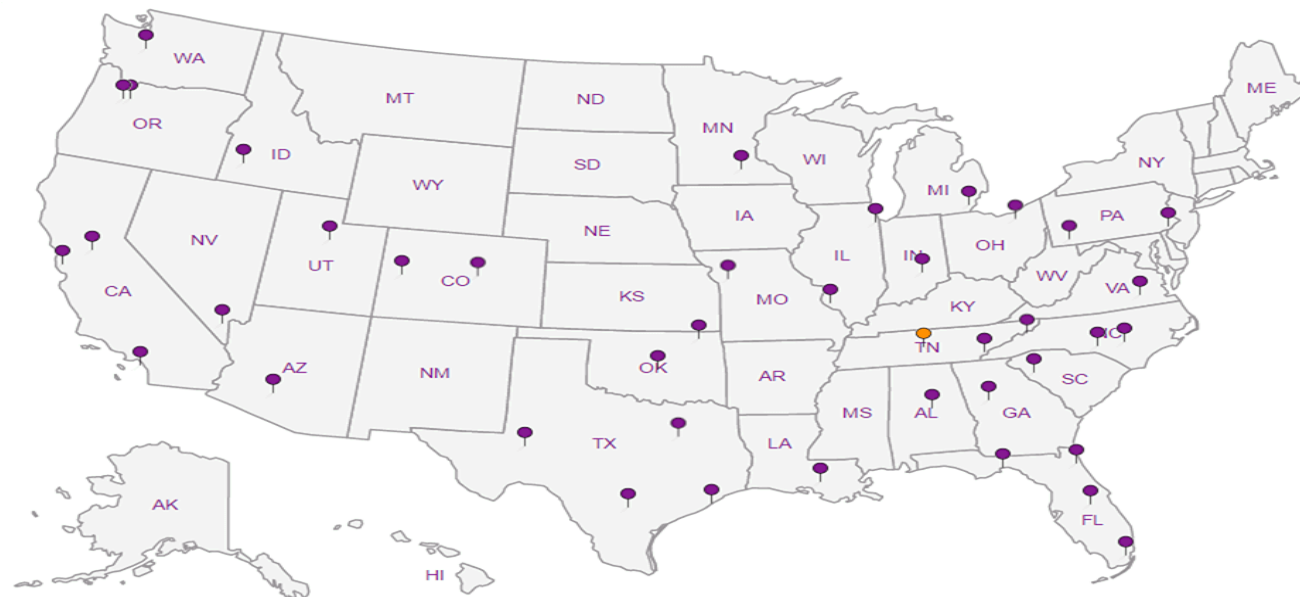
Third Party Federal Accreditations

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.



Caerus Oil & Gas LLC
143 Diamond Avenue
Parachute, CO 81635
970-285-9606

Same as above

Analysis / Container / Preservative

Chain of Custody Page of

Report to:
jjanicek@caerusoilandgas.com

Email To: **jjanicek@caerusoilandgas.com**

Project Description: **004-696 Cuttings**

City/State
Collected: **Parachute, CO**

Client Project #
004-696

Site/Facility ID #
004-696

Standard TAT

TABLE 910- Metals

Shipped Via:

Remarks	Sample # (lab only)
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Sample ID	Comp/Grab	Matrix *	Depth	Date	Time
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20200415-004-696 (CMTPRO)	Comp	SS		4/15/20	1100
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20200415-004-696 (CHTSURF)	Comp	SS		4/15/20	1130
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Hold:	Condition: NCF / OK
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Condition:
NCF / OK