

June 29, 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: L1231275
Samples Received: 06/19/2020
Project Number:
Description: LW USA 1

Report To: Blair Rollins
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:

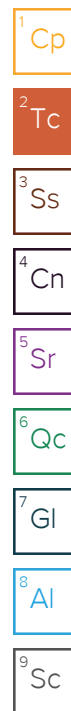
Chris Ward

Chris Ward
Project Manager

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SAMPLE SUMMARY

20200618-LW USA1-SP1 (10") L1231275-01 Solid

Collected by Blair K. Rollins
 Collected date/time 06/18/20 09:00
 Received date/time 06/19/20 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1496590	1	06/26/20 08:40	06/26/20 08:40	TRB	Mt. Juliet, TN
Calculated Results	WG1498016	1	06/24/20 14:05	06/26/20 16:56	KEG	Mt. Juliet, TN
Wet Chemistry by Method 3060A/7196A	WG1499053	1	06/25/20 16:00	06/26/20 16:56	KEG	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1498662	1	06/25/20 15:00	06/25/20 22:21	KEG	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1499219	1	06/26/20 11:38	06/26/20 14:05	SL	Mt. Juliet, TN
Mercury by Method 7471A	WG1497920	1	06/23/20 21:52	06/24/20 11:34	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1498016	1	06/24/20 14:05	06/25/20 16:41	EL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1500352	1	06/20/20 12:33	06/28/20 19:40	ACG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1496686	1	06/20/20 12:33	06/22/20 03:29	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1497982	1	06/24/20 06:41	06/26/20 02:08	TH	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1498378	1	06/24/20 21:41	06/25/20 11:43	AAT	Mt. Juliet, TN

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

20200618-LW USA1-SP2(10") L1231275-02 Solid

Collected by Blair K. Rollins
 Collected date/time 06/18/20 09:15
 Received date/time 06/19/20 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1496590	1	06/26/20 08:43	06/26/20 08:43	TRB	Mt. Juliet, TN
Calculated Results	WG1498016	1	06/24/20 14:05	06/26/20 16:56	KEG	Mt. Juliet, TN
Wet Chemistry by Method 3060A/7196A	WG1499053	1	06/25/20 16:00	06/26/20 16:56	KEG	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1498662	1	06/25/20 15:00	06/25/20 22:21	KEG	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1499219	1	06/26/20 11:38	06/26/20 14:05	SL	Mt. Juliet, TN
Mercury by Method 7471A	WG1497920	1	06/23/20 21:52	06/24/20 11:37	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1498016	1	06/24/20 14:05	06/25/20 16:54	EL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1500352	1	06/20/20 12:33	06/28/20 20:01	ACG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1496686	1	06/20/20 12:33	06/22/20 03:48	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1497982	1	06/24/20 06:41	06/26/20 03:36	TH	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1498378	1	06/24/20 21:41	06/25/20 12:06	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	06/26/2020 08:40	WG1496590

Calculated Results

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chromium, Trivalent	8.71		1.00	1	06/26/2020 16:56	WG1498016

Wet Chemistry by Method 3060A/7196A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chromium, Hexavalent	ND		2.00	1	06/26/2020 16:56	WG1499053

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.12	<u>T8</u>	1	06/25/2020 22:21	WG1498662

Sample Narrative:

L1231275-01 WG1498662: 8.12 at 22.2C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	2280		10.0	1	06/26/2020 14:05	WG1499219

Mercury by Method 7471A

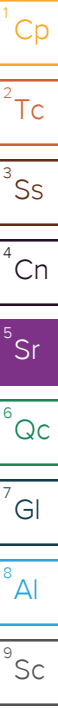
Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Mercury	ND		0.0400	1	06/24/2020 11:34	WG1497920

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Arsenic	ND		2.00	1	06/25/2020 16:41	WG1498016
Barium	410	<u>J3 O1 V</u>	0.500	1	06/25/2020 16:41	WG1498016
Cadmium	ND		0.500	1	06/25/2020 16:41	WG1498016
Chromium	8.71		1.00	1	06/25/2020 16:41	WG1498016
Copper	9.32		2.00	1	06/25/2020 16:41	WG1498016
Lead	7.30		0.500	1	06/25/2020 16:41	WG1498016
Nickel	7.37		2.00	1	06/25/2020 16:41	WG1498016
Selenium	ND		2.00	1	06/25/2020 16:41	WG1498016
Silver	ND		1.00	1	06/25/2020 16:41	WG1498016
Zinc	30.0		5.00	1	06/25/2020 16:41	WG1498016

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.189		0.100	1	06/28/2020 19:40	WG1500352
(S) a, a, a-Trifluorotoluene(FID)	95.3		77.0-120		06/28/2020 19:40	WG1500352





Collected date/time: 06/18/20 09:00

L1231275

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

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00138		0.00100	1	06/22/2020 03:29	WG1496686
Toluene	0.00585		0.00500	1	06/22/2020 03:29	WG1496686
Ethylbenzene	ND		0.00250	1	06/22/2020 03:29	WG1496686
Total Xylenes	0.0142		0.00650	1	06/22/2020 03:29	WG1496686
(S) Toluene-d8	110		75.0-131		06/22/2020 03:29	WG1496686
(S) 4-Bromofluorobenzene	89.1		67.0-138		06/22/2020 03:29	WG1496686
(S) 1,2-Dichloroethane-d4	84.6		70.0-130		06/22/2020 03:29	WG1496686

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

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	ND		4.00	1	06/26/2020 02:08	WG1497982
(S) o-Terphenyl	68.1		18.0-148		06/26/2020 02:08	WG1497982

6 Qc

7 Gl

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	06/25/2020 11:43	WG1498378
Acenaphthene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Acenaphthylene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Benzo(a)anthracene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Benzo(a)pyrene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Benzo(b)fluoranthene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Benzo(g,h,i)perylene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Benzo(k)fluoranthene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Chrysene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Dibenz(a,h)anthracene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Fluoranthene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Fluorene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Indeno(1,2,3-cd)pyrene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Naphthalene	ND		0.0200	1	06/25/2020 11:43	WG1498378
Phenanthrene	ND		0.00600	1	06/25/2020 11:43	WG1498378
Pyrene	ND		0.00600	1	06/25/2020 11:43	WG1498378
1-Methylnaphthalene	ND		0.0200	1	06/25/2020 11:43	WG1498378
2-Methylnaphthalene	ND		0.0200	1	06/25/2020 11:43	WG1498378
2-Chloronaphthalene	ND		0.0200	1	06/25/2020 11:43	WG1498378
(S) p-Terphenyl-d14	58.5		23.0-120		06/25/2020 11:43	WG1498378
(S) Nitrobenzene-d5	56.2		14.0-149		06/25/2020 11:43	WG1498378
(S) 2-Fluorobiphenyl	47.7		34.0-125		06/25/2020 11:43	WG1498378

8 Al

9 Sc



Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	13.3		1	06/26/2020 08:43	WG1496590

Calculated Results

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chromium, Trivalent	11.4		1.00	1	06/26/2020 16:56	WG1498016

Wet Chemistry by Method 3060A/7196A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chromium, Hexavalent	ND		2.00	1	06/26/2020 16:56	WG1499053

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.12	<u>T8</u>	1	06/25/2020 22:21	WG1498662

Sample Narrative:

L1231275-02 WG1498662: 8.12 at 22.2C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	2580		10.0	1	06/26/2020 14:05	WG1499219

Mercury by Method 7471A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Mercury	ND		0.0400	1	06/24/2020 11:37	WG1497920

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Arsenic	11.6		2.00	1	06/25/2020 16:54	WG1498016
Barium	512		0.500	1	06/25/2020 16:54	WG1498016
Cadmium	ND		0.500	1	06/25/2020 16:54	WG1498016
Chromium	11.4		1.00	1	06/25/2020 16:54	WG1498016
Copper	15.4		2.00	1	06/25/2020 16:54	WG1498016
Lead	9.47		0.500	1	06/25/2020 16:54	WG1498016
Nickel	10.9		2.00	1	06/25/2020 16:54	WG1498016
Selenium	ND		2.00	1	06/25/2020 16:54	WG1498016
Silver	ND		1.00	1	06/25/2020 16:54	WG1498016
Zinc	41.6		5.00	1	06/25/2020 16:54	WG1498016

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.146		0.100	1	06/28/2020 20:01	WG1500352
(S) a, a, a-Trifluorotoluene(FID)	94.2		77.0-120		06/28/2020 20:01	WG1500352

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Collected date/time: 06/18/20 09:15

L1231275

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

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00100	1	06/22/2020 03:48	WG1496686
Toluene	ND		0.00500	1	06/22/2020 03:48	WG1496686
Ethylbenzene	ND		0.00250	1	06/22/2020 03:48	WG1496686
Total Xylenes	ND		0.00650	1	06/22/2020 03:48	WG1496686
(S) Toluene-d8	109		75.0-131		06/22/2020 03:48	WG1496686
(S) 4-Bromofluorobenzene	90.2		67.0-138		06/22/2020 03:48	WG1496686
(S) 1,2-Dichloroethane-d4	88.1		70.0-130		06/22/2020 03:48	WG1496686

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

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	ND		4.00	1	06/26/2020 03:36	WG1497982
(S) o-Terphenyl	64.4		18.0-148		06/26/2020 03:36	WG1497982

6 Qc

7 Gl

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	06/25/2020 12:06	WG1498378
Acenaphthene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Acenaphthylene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Benzo(a)anthracene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Benzo(a)pyrene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Benzo(b)fluoranthene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Benzo(g,h,i)perylene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Benzo(k)fluoranthene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Chrysene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Dibenz(a,h)anthracene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Fluoranthene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Fluorene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Indeno(1,2,3-cd)pyrene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Naphthalene	ND		0.0200	1	06/25/2020 12:06	WG1498378
Phenanthrene	ND		0.00600	1	06/25/2020 12:06	WG1498378
Pyrene	ND		0.00600	1	06/25/2020 12:06	WG1498378
1-Methylnaphthalene	ND		0.0200	1	06/25/2020 12:06	WG1498378
2-Methylnaphthalene	ND		0.0200	1	06/25/2020 12:06	WG1498378
2-Chloronaphthalene	ND		0.0200	1	06/25/2020 12:06	WG1498378
(S) p-Terphenyl-d14	53.6		23.0-120		06/25/2020 12:06	WG1498378
(S) Nitrobenzene-d5	56.7		14.0-149		06/25/2020 12:06	WG1498378
(S) 2-Fluorobiphenyl	40.1		34.0-125		06/25/2020 12:06	WG1498378

8 Al

9 Sc



Method Blank (MB)

(MB) R3543555-1 06/26/20 16:41

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

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

L1231274-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1231274-01 06/26/20 16:53 • (DUP) R3543555-7 06/26/20 16:54

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Chromium,Hexavalent	ND	ND	1	0.000		20

Original Sample (OS) • Duplicate (DUP)

(OS) • (DUP) R3543555-8 06/26/20 17:04

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Chromium,Hexavalent		ND	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3543555-2 06/26/20 16:45

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Chromium,Hexavalent	24.0	24.6	102	80.0-120	

L1230982-10 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1230982-10 06/26/20 16:48 • (MS) R3543555-3 06/26/20 16:49 • (MSD) R3543555-4 06/26/20 16:50

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Chromium,Hexavalent	20.0	ND	9.18	9.06	45.9	45.3	1	75.0-125	<u>J6</u>	<u>J6</u>	1.32	20

Sample Narrative:

OS: Sample is a reducer



L1230982-10 Original Sample (OS) • Matrix Spike (MS)

(OS) L1230982-10 06/26/20 16:48 • (MS) R3543555-5 06/26/20 16:50

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MS Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>
Chromium,Hexavalent	669	ND	519	77.5	50	75.0-125	

Sample Narrative:

OS: Sample is a reducer

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc



Laboratory Control Sample (LCS)

(LCS) R3543138-1 06/25/20 22:21

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	<u>LCS Qualifier</u>
	su	su	%	%	
pH	10.0	9.99	99.9	99.0-101	

Sample Narrative:

LCS: 9.99 at 20.3C

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



Method Blank (MB)

(MB) R3543429-1 06/26/20 14:05

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

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

L1231274-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1231274-01 06/26/20 14:05 • (DUP) R3543429-3 06/26/20 14:05

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	3970	3990	1	0.503		20

L1232111-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1232111-01 06/26/20 14:05 • (DUP) R3543429-4 06/26/20 14:05

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	262	269	1	2.75		20

Laboratory Control Sample (LCS)

(LCS) R3543429-2 06/26/20 14:05

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	445	444	99.8	85.0-115	



Method Blank (MB)

(MB) R3542319-1 06/24/20 10:38

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Mercury	U		0.0180	0.0400

¹Cp

²Tc

³Ss

Laboratory Control Sample (LCS)

(LCS) R3542319-2 06/24/20 10:40

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Mercury	0.500	0.401	80.3	80.0-120	

⁴Cn

⁵Sr

⁶Qc

L1230982-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1230982-03 06/24/20 10:43 • (MS) R3542319-3 06/24/20 10:45 • (MSD) R3542319-4 06/24/20 10:48

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Mercury	0.500	ND	0.490	0.469	93.1	88.9	1	75.0-125			4.35	20

⁷Gl

⁸Al

⁹Sc



Method Blank (MB)

(MB) R3543156-1 06/25/20 16:35

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/kg		mg/kg	mg/kg
Arsenic	U		0.460	2.00
Barium	U		0.240	0.500
Cadmium	U		0.0810	0.500
Chromium	U		0.250	1.00
Copper	U		0.506	2.00
Lead	U		0.208	0.500
Nickel	U		0.490	2.00
Selenium	U		0.617	2.00
Silver	U		0.228	1.00
Zinc	U		0.939	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) R3543156-2 06/25/20 16:38

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/kg	mg/kg	%	%	
Arsenic	100	99.9	99.9	80.0-120	
Barium	100	106	106	80.0-120	
Cadmium	100	103	103	80.0-120	
Chromium	100	104	104	80.0-120	
Copper	100	105	105	80.0-120	
Lead	100	103	103	80.0-120	
Nickel	100	104	104	80.0-120	
Selenium	100	101	101	80.0-120	
Silver	20.0	18.9	94.6	80.0-120	
Zinc	100	102	102	80.0-120	

L1231275-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1231275-01 06/25/20 16:41 • (MS) R3543156-5 06/25/20 16:48 • (MSD) R3543156-6 06/25/20 16:51

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/kg	mg/kg	mg/kg	mg/kg	%	%		%			%	%
Arsenic	100	ND	96.6	95.4	94.8	93.6	1	75.0-125			1.23	20
Barium	100	410	578	768	168	358	1	75.0-125	V	J3 V	28.3	20
Cadmium	100	ND	99.0	97.4	99.0	97.4	1	75.0-125			1.66	20
Chromium	100	8.71	106	106	97.2	97.2	1	75.0-125			0.00349	20
Copper	100	9.32	114	113	105	104	1	75.0-125			0.796	20
Lead	100	7.30	104	104	96.4	96.7	1	75.0-125			0.289	20
Nickel	100	7.37	107	106	99.9	99.0	1	75.0-125			0.819	20



L1231275-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1231275-01 06/25/20 16:41 • (MS) R3543156-5 06/25/20 16:48 • (MSD) R3543156-6 06/25/20 16:51

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 %
Selenium	100	ND	96.8	93.4	96.8	93.4	1	75.0-125			3.57	20
Silver	20.0	ND	18.0	17.6	89.9	88.0	1	75.0-125			2.11	20
Zinc	100	30.0	127	124	97.5	94.4	1	75.0-125			2.48	20

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



Method Blank (MB)

(MB) R3544074-3 06/28/20 17:36

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TPH (GC/FID) Low Fraction	U		0.0217	0.100
^(S) a,a,a-Trifluorotoluene(FID)	104			77.0-120

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS)

(LCS) R3544074-2 06/28/20 16:55

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	6.02	109	72.0-127	
^(S) a,a,a-Trifluorotoluene(FID)			101	77.0-120	

5 Sr

6 Qc

7 Gl

L1233632-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1233632-04 06/28/20 23:28 • (MS) R3544074-4 06/29/20 01:52 • (MSD) R3544074-5 06/29/20 02:13

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 %
TPH (GC/FID) Low Fraction	135	ND	140	147	103	108	25	10.0-151			4.88	28
^(S) a,a,a-Trifluorotoluene(FID)					99.3	101		77.0-120				

8 Al

9 Sc



Method Blank (MB)

(MB) R3543224-2 06/21/20 17:55

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/kg		mg/kg	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
<i>(S) Toluene-d8</i>	109			75.0-131
<i>(S) 4-Bromofluorobenzene</i>	91.9			67.0-138
<i>(S) 1,2-Dichloroethane-d4</i>	91.3			70.0-130

Laboratory Control Sample (LCS)

(LCS) R3543224-1 06/21/20 16:59

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/kg	mg/kg	%	%	
Benzene	0.125	0.0951	76.1	70.0-123	
Ethylbenzene	0.125	0.102	81.6	74.0-126	
Toluene	0.125	0.109	87.2	75.0-121	
Xylenes, Total	0.375	0.281	74.9	72.0-127	
<i>(S) Toluene-d8</i>			104	75.0-131	
<i>(S) 4-Bromofluorobenzene</i>			94.9	67.0-138	
<i>(S) 1,2-Dichloroethane-d4</i>			92.3	70.0-130	

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3542779-1 06/24/20 14:05

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
<i>(S) o-Terphenyl</i>	77.0			18.0-148

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3542779-2 06/24/20 14:18

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) High Fraction	50.0	39.3	78.6	50.0-150	
<i>(S) o-Terphenyl</i>			89.2	18.0-148	

L1230773-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1230773-06 06/26/20 02:58 • (MS) R3543426-1 06/26/20 03:11 • (MSD) R3543426-2 06/26/20 03:23

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	49.0	ND	37.3	39.2	70.1	74.1	1	50.0-150			4.97	20
<i>(S) o-Terphenyl</i>					84.3	85.1		18.0-148				



Method Blank (MB)

(MB) R3543031-2 06/25/20 03:35

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	61.2			14.0-149
(S) 2-Fluorobiphenyl	69.3			34.0-125
(S) p-Terphenyl-d14	71.7			23.0-120

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Laboratory Control Sample (LCS)

(LCS) R3543031-1 06/25/20 03:12

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Anthracene	0.0800	0.0590	73.8	50.0-126	
Acenaphthene	0.0800	0.0515	64.4	50.0-120	
Acenaphthylene	0.0800	0.0548	68.5	50.0-120	
Benzo(a)anthracene	0.0800	0.0590	73.8	45.0-120	
Benzo(a)pyrene	0.0800	0.0529	66.1	42.0-120	
Benzo(b)fluoranthene	0.0800	0.0583	72.9	42.0-121	
Benzo(g,h,i)perylene	0.0800	0.0568	71.0	45.0-125	
Benzo(k)fluoranthene	0.0800	0.0583	72.9	49.0-125	
Chrysene	0.0800	0.0590	73.8	49.0-122	
Dibenz(a,h)anthracene	0.0800	0.0556	69.5	47.0-125	
Fluoranthene	0.0800	0.0619	77.4	49.0-129	



Laboratory Control Sample (LCS)

(LCS) R3543031-1 06/25/20 03:12

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Fluorene	0.0800	0.0532	66.5	49.0-120	
Indeno(1,2,3-cd)pyrene	0.0800	0.0581	72.6	46.0-125	
Naphthalene	0.0800	0.0507	63.4	50.0-120	
Phenanthrene	0.0800	0.0539	67.4	47.0-120	
Pyrene	0.0800	0.0599	74.9	43.0-123	
1-Methylnaphthalene	0.0800	0.0548	68.5	51.0-121	
2-Methylnaphthalene	0.0800	0.0520	65.0	50.0-120	
2-Chloronaphthalene	0.0800	0.0503	62.9	50.0-120	
(S) Nitrobenzene-d5			65.0	14.0-149	
(S) 2-Fluorobiphenyl			64.7	34.0-125	
(S) p-Terphenyl-d14			70.4	23.0-120	

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1231259-22 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1231259-22 06/25/20 08:34 • (MS) R3543031-3 06/25/20 08:58 • (MSD) R3543031-4 06/25/20 09:21

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	0.0780	ND	0.0691	0.0661	88.6	84.3	1	10.0-145			4.44	30
Acenaphthene	0.0780	0.0155	0.0642	0.0590	62.4	55.5	1	14.0-127			8.44	27
Acenaphthylene	0.0780	ND	0.0521	0.0476	66.8	60.7	1	21.0-124			9.03	25
Benzo(a)anthracene	0.0780	ND	0.0589	0.0598	75.5	76.3	1	10.0-139			1.52	30
Benzo(a)pyrene	0.0780	ND	0.0579	0.0585	74.2	74.6	1	10.0-141			1.03	31
Benzo(b)fluoranthene	0.0780	ND	0.0549	0.0589	68.0	72.7	1	10.0-140			7.03	36
Benzo(g,h,i)perylene	0.0780	ND	0.0542	0.0548	66.7	67.2	1	10.0-140			1.10	33
Benzo(k)fluoranthene	0.0780	ND	0.0558	0.0523	71.5	66.7	1	10.0-137			6.48	31
Chrysene	0.0780	ND	0.0563	0.0562	72.2	71.7	1	10.0-145			0.178	30
Dibenz(a,h)anthracene	0.0780	ND	0.0519	0.0524	66.5	66.8	1	10.0-132			0.959	31
Fluoranthene	0.0780	ND	0.0668	0.0646	80.6	77.4	1	10.0-153			3.35	33
Fluorene	0.0780	0.0167	0.0730	0.0690	72.2	66.7	1	11.0-130			5.63	29
Indeno(1,2,3-cd)pyrene	0.0780	ND	0.0539	0.0543	69.1	69.3	1	10.0-137			0.739	32
Naphthalene	0.0780	ND	0.0574	0.0634	55.1	62.5	1	10.0-135			9.93	27
Phenanthrene	0.0780	0.0280	0.0918	0.0841	81.8	71.6	1	10.0-144			8.75	31
Pyrene	0.0780	ND	0.0673	0.0658	81.3	78.9	1	10.0-148			2.25	35
1-Methylnaphthalene	0.0780	ND	0.0647	0.0604	67.1	61.2	1	10.0-142			6.87	28
2-Methylnaphthalene	0.0780	ND	0.0594	0.0539	67.1	59.7	1	10.0-137			9.71	28
2-Chloronaphthalene	0.0780	ND	0.0419	0.0391	53.7	49.9	1	29.0-120			6.91	24
(S) Nitrobenzene-d5					0.000	0.000		14.0-149	J2	J2		
(S) 2-Fluorobiphenyl					61.7	55.9		34.0-125				
(S) p-Terphenyl-d14					62.9	66.3		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

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

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.
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

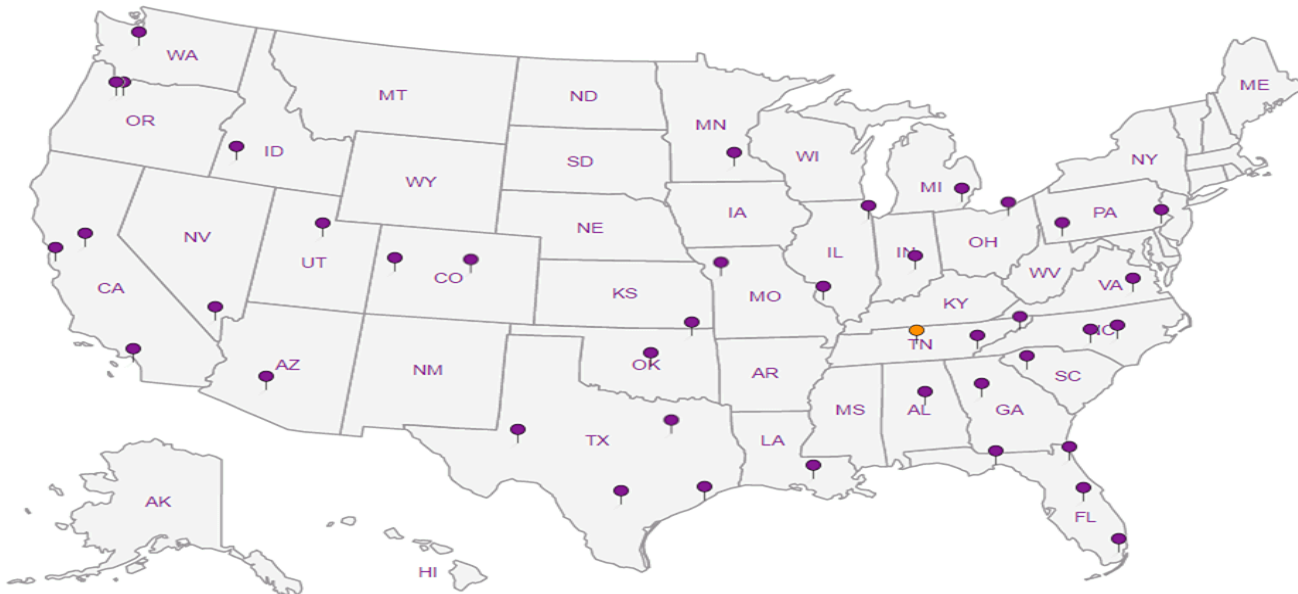
Third Party Federal Accreditations

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.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

