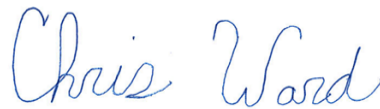


Absaroka Energy & Environmental - WY

Sample Delivery Group: L1073298
Samples Received: 02/26/2019
Project Number: SANDRIDGE ENERGY COL
Description: Mutual 1-17H
Site: 324757
Report To: Joel Mason
112 High St
Buffalo, WY 82834

Entire Report Reviewed By:



Chris Ward
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



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SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



SDE_M1-17_SS_02_1_2 L1073298-01 Solid

Collected by
Joel Mason

Collected date/time
02/23/19 12:05

Received date/time
02/26/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1242573	1	02/28/19 16:25	02/28/19 16:25	TRB	Mt. Juliet, TN
Calculated Results	WG1241960	1	02/26/19 18:12	02/28/19 16:44	JZW	Mt. Juliet, TN
Wet Chemistry by Method 3060A/7196A	WG1242647	1	02/27/19 08:00	02/28/19 16:44	JZW	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1242757	1	02/27/19 13:08	02/27/19 15:20	SJM	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1242515	1	02/27/19 13:14	02/27/19 15:14	MJA	Mt. Juliet, TN
Mercury by Method 7471A	WG1242473	1	02/26/19 17:38	02/26/19 21:44	TCT	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1241960	1	02/26/19 18:12	02/27/19 11:16	TRB	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015/8021	WG1242770	1	02/26/19 19:41	02/27/19 19:33	BMB	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1242705	1	02/27/19 17:37	02/27/19 22:35	DMW	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1242218	1	02/26/19 18:02	02/26/19 23:51	DMG	Mt. Juliet, TN

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

SDE_M1-17_SS_C_1_2 L1073298-02 Solid

Collected by
Joel Mason

Collected date/time
02/23/19 12:30

Received date/time
02/26/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1242573	1	02/28/19 16:27	02/28/19 16:27	TRB	Mt. Juliet, TN
Calculated Results	WG1241960	1	02/26/19 18:12	02/28/19 16:44	JZW	Mt. Juliet, TN
Wet Chemistry by Method 3060A/7196A	WG1242647	1	02/27/19 08:00	02/28/19 16:44	JZW	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1242757	1	02/27/19 13:08	02/27/19 15:20	SJM	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1242515	1	02/27/19 13:14	02/27/19 15:14	MJA	Mt. Juliet, TN
Mercury by Method 7471A	WG1242473	1	02/26/19 17:38	02/26/19 21:47	TCT	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1241960	1	02/26/19 18:12	02/27/19 11:19	TRB	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015/8021	WG1242770	1	02/26/19 19:41	02/27/19 19:54	BMB	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1242705	1	02/27/19 17:37	02/27/19 22:47	DMW	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1242218	1	02/26/19 18:02	02/27/19 00:13	DMG	Mt. Juliet, TN

ACCOUNT:

Absaroka Energy & Environmental - WY

PROJECT:

SANDRIDGE ENERGY COL

SDG:

L1073298

DATE/TIME:

03/01/19 18:45

PAGE:

3 of 22



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 Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc



Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	9.94		1	02/28/2019 16:25	WG1242573

Calculated Results

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Chromium, Trivalent	10.4		0.140	1.00	1	02/28/2019 16:44	WG1241960

Wet Chemistry by Method 3060A/7196A

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Chromium, Hexavalent	U		0.640	2.00	1	02/28/2019 16:44	WG1242647

Wet Chemistry by Method 9045D

Analyte	Result su	Qualifier	Dilution	Analysis date / time	Batch
pH	7.87	<u>T8</u>	1	02/27/2019 15:20	WG1242757

Sample Narrative:

L1073298-01 WG1242757: 7.87 at 19.7C

Wet Chemistry by Method 9050AMod

Analyte	Result umhos/cm	Qualifier	RDL umhos/cm	Dilution	Analysis date / time	Batch
Specific Conductance	2840		10.0	1	02/27/2019 15:14	WG1242515

Mercury by Method 7471A

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Mercury	0.0103	<u>J</u>	0.00280	0.0200	1	02/26/2019 21:44	WG1242473

Metals (ICP) by Method 6010B

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Arsenic	1.49	<u>J</u>	0.460	2.00	1	02/27/2019 11:16	WG1241960
Barium	543		0.170	0.500	1	02/27/2019 11:16	WG1241960
Boron	U		1.26	10.0	1	02/27/2019 11:16	WG1241960
Cadmium	U		0.0700	0.500	1	02/27/2019 11:16	WG1241960
Chromium	10.4		0.140	1.00	1	02/27/2019 11:16	WG1241960
Copper	11.0		0.530	2.00	1	02/27/2019 11:16	WG1241960
Lead	2.79		0.190	0.500	1	02/27/2019 11:16	WG1241960
Nickel	12.1		0.490	2.00	1	02/27/2019 11:16	WG1241960
Selenium	U		0.620	2.00	1	02/27/2019 11:16	WG1241960
Silver	U		0.120	1.00	1	02/27/2019 11:16	WG1241960
Zinc	35.2		0.590	5.00	1	02/27/2019 11:16	WG1241960

Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.000340	<u>J</u>	0.000120	0.000500	1	02/27/2019 19:33	WG1242770
Toluene	0.000529	<u>B J</u>	0.000150	0.00500	1	02/27/2019 19:33	WG1242770
Ethylbenzene	0.00101		0.000110	0.000500	1	02/27/2019 19:33	WG1242770
Total Xylene	0.000714	<u>J</u>	0.000460	0.00150	1	02/27/2019 19:33	WG1242770



Volatile Organic Compounds (GC) by Method 8015/8021

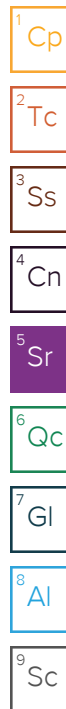
Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.0424	J	0.0217	0.100	1	02/27/2019 19:33	WG1242770
(S) a,a,a-Trifluorotoluene(FID)	93.8			77.0-120		02/27/2019 19:33	WG1242770
(S) a,a,a-Trifluorotoluene(PID)	95.0			72.0-128		02/27/2019 19:33	WG1242770

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	11.3		0.769	4.00	1	02/27/2019 22:35	WG1242705
(S) o-Terphenyl	69.1			18.0-148		02/27/2019 22:35	WG1242705

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

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Anthracene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Acenaphthene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Acenaphthylene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Benzo(a)anthracene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Benzo(a)pyrene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Benzo(b)fluoranthene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Benzo(g,h,i)perylene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Benzo(k)fluoranthene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Chrysene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Dibenz(a,h)anthracene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Fluoranthene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Fluorene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Indeno(1,2,3-cd)pyrene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Naphthalene	U		0.00200	0.0200	1	02/26/2019 23:51	WG1242218
Phenanthrene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
Pyrene	U		0.00600	0.00600	1	02/26/2019 23:51	WG1242218
1-Methylnaphthalene	0.00208	J	0.00200	0.0200	1	02/26/2019 23:51	WG1242218
2-Methylnaphthalene	0.00273	J	0.00200	0.0200	1	02/26/2019 23:51	WG1242218
2-Chloronaphthalene	U		0.00200	0.0200	1	02/26/2019 23:51	WG1242218
(S) p-Terphenyl-d14	45.6			23.0-120		02/26/2019 23:51	WG1242218
(S) Nitrobenzene-d5	58.6			14.0-149		02/26/2019 23:51	WG1242218
(S) 2-Fluorobiphenyl	50.4			34.0-125		02/26/2019 23:51	WG1242218





Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	22.6		1	02/28/2019 16:27	WG1242573

Calculated Results

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Chromium, Trivalent	8.76		0.140	1.00	1	02/28/2019 16:44	WG1241960

Wet Chemistry by Method 3060A/7196A

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Chromium, Hexavalent	U		0.640	2.00	1	02/28/2019 16:44	WG1242647

Wet Chemistry by Method 9045D

Analyte	Result su	Qualifier	Dilution	Analysis date / time	Batch
pH	7.95	<u>T8</u>	1	02/27/2019 15:20	WG1242757

Sample Narrative:

L1073298-02 WG1242757: 7.95 at 18.6C

Wet Chemistry by Method 9050AMod

Analyte	Result umhos/cm	Qualifier	RDL umhos/cm	Dilution	Analysis date / time	Batch
Specific Conductance	1630		10.0	1	02/27/2019 15:14	WG1242515

Mercury by Method 7471A

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Mercury	0.0149	<u>J</u>	0.00280	0.0200	1	02/26/2019 21:47	WG1242473

Metals (ICP) by Method 6010B

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Arsenic	0.658	<u>J</u>	0.460	2.00	1	02/27/2019 11:19	WG1241960
Barium	425		0.170	0.500	1	02/27/2019 11:19	WG1241960
Boron	U		1.26	10.0	1	02/27/2019 11:19	WG1241960
Cadmium	U		0.0700	0.500	1	02/27/2019 11:19	WG1241960
Chromium	8.76		0.140	1.00	1	02/27/2019 11:19	WG1241960
Copper	9.74		0.530	2.00	1	02/27/2019 11:19	WG1241960
Lead	2.73		0.190	0.500	1	02/27/2019 11:19	WG1241960
Nickel	8.17		0.490	2.00	1	02/27/2019 11:19	WG1241960
Selenium	U		0.620	2.00	1	02/27/2019 11:19	WG1241960
Silver	U		0.120	1.00	1	02/27/2019 11:19	WG1241960
Zinc	27.8		0.590	5.00	1	02/27/2019 11:19	WG1241960

Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.000737		0.000120	0.000500	1	02/27/2019 19:54	WG1242770
Toluene	0.00105	<u>B J</u>	0.000150	0.00500	1	02/27/2019 19:54	WG1242770
Ethylbenzene	0.000479	<u>J</u>	0.000110	0.000500	1	02/27/2019 19:54	WG1242770
Total Xylene	0.00254		0.000460	0.00150	1	02/27/2019 19:54	WG1242770



Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.178		0.0217	0.100	1	02/27/2019 19:54	WG1242770
(S) a,a,a-Trifluorotoluene(FID)	88.0			77.0-120		02/27/2019 19:54	WG1242770
(S) a,a,a-Trifluorotoluene(PID)	90.8			72.0-128		02/27/2019 19:54	WG1242770

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	9.43		0.769	4.00	1	02/27/2019 22:47	WG1242705
(S) o-Terphenyl	62.2			18.0-148		02/27/2019 22:47	WG1242705

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

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Anthracene	0.000838	J	0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Acenaphthene	U		0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Acenaphthylene	U		0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Benzo(a)anthracene	0.00160	J	0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Benzo(a)pyrene	0.00100	J	0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Benzo(b)fluoranthene	0.00156	J	0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Benzo(g,h,i)perylene	0.000789	J	0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Benzo(k)fluoranthene	0.000612	J	0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Chrysene	0.00129	J	0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Dibenz(a,h)anthracene	U		0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Fluoranthene	0.00263	J	0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Fluorene	0.00118	J	0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Indeno(1,2,3-cd)pyrene	U		0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Naphthalene	0.00458	J	0.00200	0.0200	1	02/27/2019 00:13	WG1242218
Phenanthrene	0.00293	J	0.000600	0.00600	1	02/27/2019 00:13	WG1242218
Pyrene	0.00314	J	0.000600	0.00600	1	02/27/2019 00:13	WG1242218
1-Methylnaphthalene	0.00901	J	0.00200	0.0200	1	02/27/2019 00:13	WG1242218
2-Methylnaphthalene	0.00950	J	0.00200	0.0200	1	02/27/2019 00:13	WG1242218
2-Chloronaphthalene	U		0.00200	0.0200	1	02/27/2019 00:13	WG1242218
(S) p-Terphenyl-d14	86.6			23.0-120		02/27/2019 00:13	WG1242218
(S) Nitrobenzene-d5	108			14.0-149		02/27/2019 00:13	WG1242218
(S) 2-Fluorobiphenyl	92.1			34.0-125		02/27/2019 00:13	WG1242218

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

Method Blank (MB)

(MB) R3387723-1 02/28/19 16:34

	MB Result	MB Qualifier	MB MDL	MB RDL
Analyte	mg/kg		mg/kg	mg/kg
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

L1070849-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1070849-04 02/28/19 16:35 • (DUP) R3387723-3 02/28/19 16:35

	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

L1073298-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1073298-01 02/28/19 16:44 • (DUP) R3387723-8 02/28/19 16:44

	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) R3387723-2 02/28/19 16:34

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Analyte	mg/kg	mg/kg	%	%	
Chromium,Hexavalent	24.0	22.3	93.0	80.0-120	

L1073223-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1073223-01 02/27/19 15:20 • (DUP) R3387459-2 02/27/19 15:20

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	su	su		%		%
pH	8.66	8.70	1	0.461		1

Sample Narrative:

OS: 8.66 at 18.5C
DUP: 8.7 at 19.5C

L1073402-10 Original Sample (OS) • Duplicate (DUP)

(OS) L1073402-10 02/27/19 15:20 • (DUP) R3387459-3 02/27/19 15:20

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	su	su		%		%
pH	8.65	8.65	1	0.000		1

Sample Narrative:

OS: 8.65 at 20.2C
DUP: 8.65 at 20.1C

Laboratory Control Sample (LCS)

(LCS) R3387459-1 02/27/19 15:20

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

Sample Narrative:

LCS: 10.04 at 17.8C

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Method Blank (MB)

(MB) R3387367-1 02/27/19 15:14

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

L1073402-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1073402-01 02/27/19 15:14 • (DUP) R3387367-3 02/27/19 15:14

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Specific Conductance	130	113	1	13.6		20

L1073402-06 Original Sample (OS) • Duplicate (DUP)

(OS) L1073402-06 02/27/19 15:14 • (DUP) R3387367-4 02/27/19 15:14

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Specific Conductance	69.7	61.0	1	13.3		20

Laboratory Control Sample (LCS)

(LCS) R3387367-2 02/27/19 15:14

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	877	878	100	90.0-110	



Method Blank (MB)

(MB) R3387101-1 02/26/19 21:01

	MB Result	MB Qualifier	MB MDL	MB RDL
Analyte	mg/kg		mg/kg	mg/kg
Mercury	U		0.00280	0.0200

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) R3387101-2 02/26/19 21:08 • (LCSD) R3387101-3 02/26/19 21:11

	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	0.488	0.472	97.7	94.4	80.0-120			3.37	20

L1073273-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1073273-01 02/26/19 21:13 • (MS) R3387101-4 02/26/19 21:16 • (MSD) R3387101-5 02/26/19 21:19

	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	ND	0.452	0.497	87.8	96.8	1	75.0-125			9.48	20



Method Blank (MB)

(MB) R3387292-1 02/27/19 10:15

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
Boron	U		1.26	10.0
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) R3387292-2 02/27/19 10:18 • (LCSD) R3387292-3 02/27/19 10:20

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	91.8	93.5	91.8	93.5	80.0-120			1.84	20
Barium	100	99.0	100	99.0	100	80.0-120			1.17	20
Boron	100	95.6	99.4	95.6	99.4	80.0-120			3.91	20
Cadmium	100	93.4	94.4	93.4	94.4	80.0-120			1.10	20
Chromium	100	97.5	98.5	97.5	98.5	80.0-120			1.06	20
Copper	100	95.6	96.8	95.6	96.8	80.0-120			1.32	20
Lead	100	94.7	95.7	94.7	95.7	80.0-120			1.07	20
Nickel	100	95.5	96.4	95.5	96.4	80.0-120			0.917	20
Selenium	100	93.1	93.8	93.1	93.8	80.0-120			0.758	20
Silver	20.0	18.0	18.2	90.1	90.8	80.0-120			0.787	20
Zinc	100	93.4	94.8	93.4	94.8	80.0-120			1.39	20

L1073036-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1073036-01 02/27/19 10:22 • (MS) R3387292-6 02/27/19 10:30 • (MSD) R3387292-7 02/27/19 10:32

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	12.3	101	100	89.0	87.7	1	75.0-125			1.31	20
Barium	100	93.9	190	190	96.3	96.2	1	75.0-125			0.0376	20
Boron	100	ND	83.4	82.3	83.4	82.3	1	75.0-125			1.26	20
Cadmium	100	ND	91.1	90.7	90.9	90.5	1	75.0-125			0.433	20
Chromium	100	20.3	114	114	93.9	93.6	1	75.0-125			0.305	20



[L1073298-01,02](#)

L1073036-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1073036-01 02/27/19 10:22 • (MS) R3387292-6 02/27/19 10:30 • (MSD) R3387292-7 02/27/19 10:32

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 %
Copper	100	16.7	112	111	95.1	94.6	1	75.0-125			0.421	20
Lead	100	14.3	113	114	98.5	99.7	1	75.0-125			1.11	20
Nickel	100	22.0	125	125	103	103	1	75.0-125			0.313	20
Selenium	100	ND	88.9	88.3	88.9	88.3	1	75.0-125			0.615	20
Silver	20.0	ND	17.4	17.3	87.1	86.3	1	75.0-125			0.948	20
Zinc	100	59.5	152	181	92.5	121	1	75.0-125			17.2	20

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc



Method Blank (MB)

(MB) R3387740-5 02/27/19 18:11

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000120	0.000500
Toluene	0.000175	J	0.000150	0.00500
Ethylbenzene	U		0.000110	0.000500
Total Xylene	U		0.000460	0.00150
TPH (GC/FID) Low Fraction	U		0.0217	0.100
(S) a,a,a-Trifluorotoluene(FID)	96.5			77.0-120
(S) a,a,a-Trifluorotoluene(PID)	99.9			72.0-128

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Cp

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Tc

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Ss

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Cn

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Sr

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Qc

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Gl

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Al

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Sc

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

(LCS) R3387740-1 02/27/19 16:25 • (LCSD) R3387740-2 02/27/19 16:46

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 %
Benzene	0.0500	0.0557	0.0474	111	94.9	76.0-121			16.0	20
Toluene	0.0500	0.0544	0.0457	109	91.3	80.0-120			17.4	20
Ethylbenzene	0.0500	0.0547	0.0461	109	92.2	80.0-124			17.0	20
Total Xylene	0.150	0.159	0.134	106	89.1	37.0-160			17.5	20
(S) a,a,a-Trifluorotoluene(FID)				95.1	95.5	77.0-120				
(S) a,a,a-Trifluorotoluene(PID)				97.9	97.7	72.0-128				

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

(LCS) R3387740-3 02/27/19 17:07 • (LCSD) R3387740-4 02/27/19 17:28

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 %
TPH (GC/FID) Low Fraction	5.50	5.08	5.06	92.3	92.0	72.0-127			0.300	20
(S) a,a,a-Trifluorotoluene(FID)				108	108	77.0-120				
(S) a,a,a-Trifluorotoluene(PID)				106	109	72.0-128				



L1073402-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1073402-04 02/28/19 00:30 • (MS) R3387740-6 02/28/19 00:52 • (MSD) R3387740-7 02/28/19 01:13												
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 %
Benzene	0.0500	2.68	44.0	45.4	82.7	85.4	1000	10.0-155			3.07	32
Toluene	0.0500	23.2	54.3	56.0	62.1	65.5	1000	10.0-160			3.04	34
Ethylbenzene	0.0500	2.65	43.1	44.0	80.8	82.8	1000	10.0-160			2.23	32
Total Xylene	0.150	42.0	146	150	69.3	72.2	1000	10.0-160	J6		2.90	32
(S) a,a,a-Trifluorotoluene(FID)					93.2	93.1		77.0-120				
(S) a,a,a-Trifluorotoluene(PID)					97.4	97.2		72.0-128				

L1073402-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1073402-04 02/28/19 00:30 • (MS) R3387740-8 02/28/19 01:34 • (MSD) R3387740-9 02/28/19 01:55												
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	1050	6670	6150	102	92.9	1000	10.0-151			8.00	28
(S) a,a,a-Trifluorotoluene(FID)					115	114		77.0-120				
(S) a,a,a-Trifluorotoluene(PID)					114	113		72.0-128				

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Cp

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Tc

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Ss

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Cn

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Sr

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Qc

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Gl

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Al

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Sc

Method Blank (MB)

(MB) R3387535-1 02/27/19 21:59

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	72.2			18.0-148

1

Cp

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Tc

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Ss

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Cn

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Sr

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Qc

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Gl

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Al

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Sc

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

(LCS) R3387535-2 02/27/19 22:11 • (LCSD) R3387535-3 02/27/19 22:23

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 %
TPH (GC/FID) High Fraction	50.0	39.1	37.4	78.2	74.8	50.0-150			4.44	20
(S) o-Terphenyl				91.4	86.8	18.0-148				

Method Blank (MB)

(MB) R3387106-3 02/26/19 22:47

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	101			34.0-125
(S) p-Terphenyl-d14	106			23.0-120

1

Cp

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Tc

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Ss

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Cn

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Sr

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Qc

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Gl

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Sc

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

(LCS) R3387106-1 02/26/19 22:04 • (LCSD) R3387106-2 02/26/19 22:25

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 %
Anthracene	0.0800	0.0779	0.0754	97.4	94.3	50.0-126			3.26	20
Acenaphthene	0.0800	0.0744	0.0724	93.0	90.5	50.0-120			2.72	20
Acenaphthylene	0.0800	0.0771	0.0755	96.4	94.4	50.0-120			2.10	20
Benzo(a)anthracene	0.0800	0.0846	0.0802	106	100	45.0-120			5.34	20
Benzo(a)pyrene	0.0800	0.0679	0.0667	84.9	83.4	42.0-120			1.78	20
Benzo(b)fluoranthene	0.0800	0.0763	0.0760	95.4	95.0	42.0-121			0.394	20
Benzo(g,h,i)perylene	0.0800	0.0751	0.0728	93.9	91.0	45.0-125			3.11	20
Benzo(k)fluoranthene	0.0800	0.0810	0.0812	101	102	49.0-125			0.247	20
Chrysene	0.0800	0.0806	0.0777	101	97.1	49.0-122			3.66	20
Dibenz(a,h)anthracene	0.0800	0.0836	0.0809	105	101	47.0-125			3.28	20
Fluoranthene	0.0800	0.0840	0.0806	105	101	49.0-129			4.13	20

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

(LCS) R3387106-1 02/26/19 22:04 • (LCSD) R3387106-2 02/26/19 22:25

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	<u>LCS Qualifier</u>	<u>LCSD Qualifier</u>	RPD %	RPD Limits %
Fluorene	0.0800	0.0760	0.0739	95.0	92.4	49.0-120			2.80	20
Indeno(1,2,3-cd)pyrene	0.0800	0.0797	0.0761	99.6	95.1	46.0-125			4.62	20
Naphthalene	0.0800	0.0744	0.0724	93.0	90.5	50.0-120			2.72	20
Phenanthrene	0.0800	0.0784	0.0754	98.0	94.3	47.0-120			3.90	20
Pyrene	0.0800	0.0778	0.0738	97.3	92.3	43.0-123			5.28	20
1-Methylnaphthalene	0.0800	0.0801	0.0774	100	96.8	51.0-121			3.43	20
2-Methylnaphthalene	0.0800	0.0791	0.0772	98.9	96.5	50.0-120			2.43	20
2-Chloronaphthalene	0.0800	0.0769	0.0746	96.1	93.3	50.0-120			3.04	20
(S) Nitrobenzene-d5				99.6	103	14.0-149				
(S) 2-Fluorobiphenyl				93.2	95.4	34.0-125				
(S) p-Terphenyl-d14				97.8	97.4	23.0-120				

L1073273-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1073273-01 02/27/19 00:34 • (MS) R3387106-4 02/27/19 00:56 • (MSD) R3387106-5 02/27/19 01:17

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	0.0792	ND	0.0708	0.0708	89.4	93.2	1	10.0-145			0.000	30
Acenaphthene	0.0792	ND	0.0643	0.0648	81.2	85.3	1	14.0-127			0.775	27
Acenaphthylene	0.0792	ND	0.0661	0.0667	83.5	87.8	1	21.0-124			0.904	25
Benzo(a)anthracene	0.0792	ND	0.0694	0.0709	87.6	93.3	1	10.0-139			2.14	30
Benzo(a)pyrene	0.0792	ND	0.0693	0.0707	87.5	93.0	1	10.0-141			2.00	31
Benzo(b)fluoranthene	0.0792	ND	0.0670	0.0695	84.6	91.4	1	10.0-140			3.66	36
Benzo(g,h,i)perylene	0.0792	ND	0.0646	0.0663	80.2	85.8	1	10.0-140			2.60	33
Benzo(k)fluoranthene	0.0792	ND	0.0714	0.0726	90.2	95.5	1	10.0-137			1.67	31
Chrysene	0.0792	ND	0.0674	0.0690	85.1	90.8	1	10.0-145			2.35	30
Dibenz(a,h)anthracene	0.0792	ND	0.0690	0.0701	87.1	92.2	1	10.0-132			1.58	31
Fluoranthene	0.0792	ND	0.0727	0.0731	91.8	96.2	1	10.0-153			0.549	33
Fluorene	0.0792	ND	0.0646	0.0654	81.6	86.1	1	11.0-130			1.23	29
Indeno(1,2,3-cd)pyrene	0.0792	ND	0.0656	0.0674	82.8	88.7	1	10.0-137			2.71	32
Naphthalene	0.0792	ND	0.0682	0.0675	86.1	88.8	1	10.0-135			1.03	27
Phenanthrene	0.0792	ND	0.0670	0.0676	84.6	88.9	1	10.0-144			0.892	31
Pyrene	0.0792	ND	0.0643	0.0655	81.2	86.2	1	10.0-148			1.85	35
1-Methylnaphthalene	0.0792	ND	0.0686	0.0696	86.6	91.6	1	10.0-142			1.45	28
2-Methylnaphthalene	0.0792	ND	0.0704	0.0687	88.9	90.4	1	10.0-137			2.44	28
2-Chloronaphthalene	0.0792	ND	0.0663	0.0667	83.7	87.8	1	29.0-120			0.602	24
(S) Nitrobenzene-d5					95.4	99.9		14.0-149				
(S) 2-Fluorobiphenyl					89.0	93.1		34.0-125				
(S) p-Terphenyl-d14					87.9	93.6		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.

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

B	The same analyte is found in the associated blank.
J	The identification of the analyte is acceptable; the reported value is an estimate.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
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

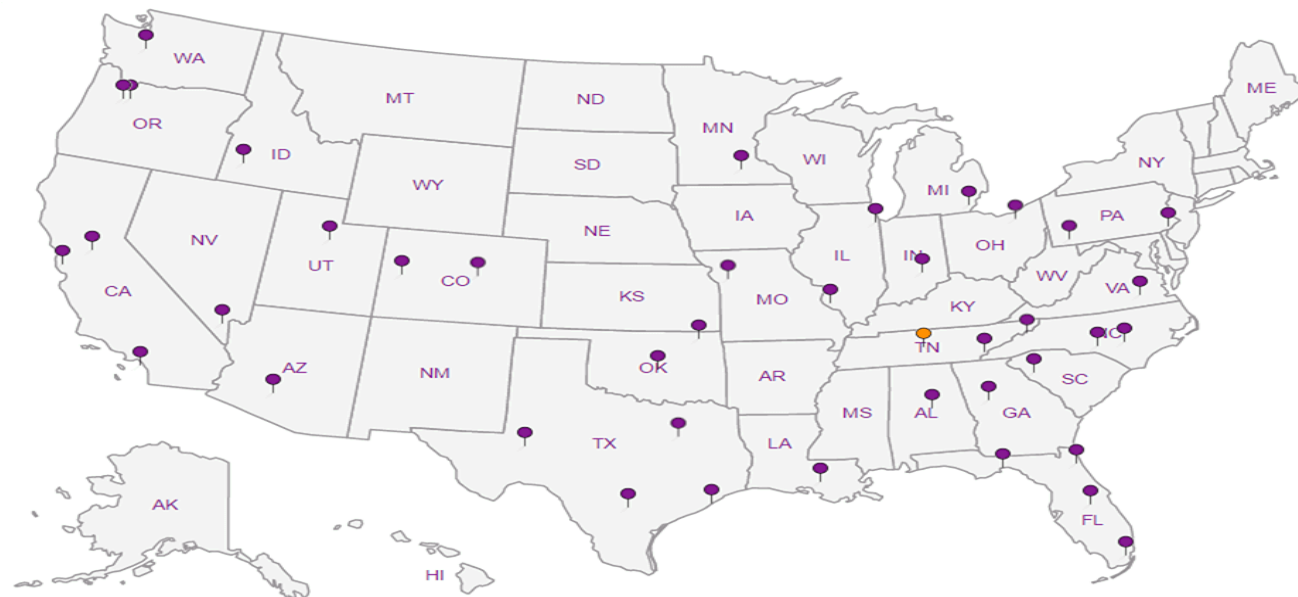
Third Party Federal Accreditations

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.



Hold:	Condition:
	NCF // O