



Nicholson GeoSolutions, LLC

3433 East Lake Drive
Centennial, CO 80121

April 21, 2020

Mr. Don Wilbourn
Berry Petroleum Company
235 Callahan Avenue
Parachute, Colorado 81635

Subject: J15 Pipeline Spill Soil Investigation

Dear Don:

Nicholson GeoSolutions LLC was retained by Berry Petroleum Company (Berry) to conduct soil sampling at the site of a produced water/condensate spill near the J15 well pad on Long Ridge, Garfield County, Colorado. About 50 barrels of produced water and condensate were reported to be lost from a pipeline that runs along the main road on Long Ridge to the J15 well pad. Upon discovery of the leak, an excavation contractor was immediately mobilized to the site to begin excavation of impacted soils.

Nicholson GeoSolutions inspected the site on April 8th, 2020. Excavation of the spill area was conducted prior to the inspection and extends into bedrock about 8-10 feet. Impacted soil and rock was stored on plastic sheeting in a bermed area on the J15 well pad. During the inspection the perimeter of the excavation was mapped using a hand-held GPS unit and a photoionization detector (PID) was used to screen the walls and floor of the excavation to select sampling locations. PID readings ranged from 0.0-1.9 ppm for the east wall, 1.0-3.4 ppm for the north wall, 10-59 ppm for the west wall, and 3.0-587 ppm for the floor of the excavation.

Seven discrete soil samples were collected to evaluate compliance with COGCC standards (samples J15-S-1 through J15-S-7). Samples from the walls were collected at a level below the elevation of the pipelines. Figure 1 shows the approximate extent of the excavation and the locations of the seven confirmation samples collected. All samples were analyzed for Total Volatile Petroleum Hydrocarbons (TVPH – gasoline range), Total Extractable Petroleum Hydrocarbons (TEPH – diesel and motor oil range), BTEX (benzene, toluene, ethylbenzene, and xylenes), sodium adsorption ratio (SAR), pH, and conductivity.

Table 1 provides analytical results for the soil samples collected. The laboratory analytical report is contained in Appendix A. All parameters for the samples from the east wall and north wall were below the standards. Conductivity was below the standard for six of seven samples, SAR was below the standard for five of seven samples, and pH was below the standard for all samples. Total TPH exceeded the standard of 500 mg/kg for samples from the NW wall (1,222.4

mg/kg), the west wall (1,181 mg/kg), and the floor (1,109.16-13,022.1 mg/kg). In addition, benzene, toluene, and total xylenes exceeded the standards for the north floor sample collected beneath the pipelines.

Nicholson GeoSolutions LLC



David K. Nicholson, P.G.
Principal Geologist

Table 1 J15 Spill Soil Sample Results – April 8, 2020

Parameter	Table 910-1 Standards	J15-S-1 East Wall	J15-S-2 North Wall	J15-S-3 NW Wall	J15-S-4 North Floor
sp. conductance (mmhos/cm)	<4	0.14	0.445	1.01	6.18
pH (standard units)	6-9	8.18	7.95	7.66	7.42
SAR (ratio)	<12	0.637	1.23	5.23	37.8
TVPH – gasoline range	500 ¹	77.5	3.82	556	3650
TEPH – diesel/motor oil range		85.2	181.7	666.4	9372.1
benzene	0.17	<0.0005	0.00406	<0.05	7.63
toluene	85	<0.005	0.00825	0.685	119
ethylbenzene	100	0.0301	<0.0005	0.418	14.5
xylenes	175	0.205	0.0173	23.2	188

Parameter	Table 910-1 Standards	J15-S-5 West Wall	J15-S-6 Center Floor	J15-S-7 South Floor
sp. conductance (mmhos/cm)	<4	1.25	1.63	0.671
pH (standard units)	6-9	8.05	7.82	7.63
SAR (ratio)	<12	2.47	13.3	3.04
TVPH – gasoline range	500 ¹	219	320	372
TEPH – diesel/motor oil range		962	789.16	787.7
benzene	0.17	<0.05	<0.05	<0.1
toluene	85	0.73	<0.5	<1
ethylbenzene	100	0.218	0.205	0.229
xylenes	175	5.37	3.18	8.56

¹The standard is 500 for the combined total of TVPH and TEPH

Values in bold type exceed standards

All units in mg/kg except where indicated



Figure 1

April
2020

GeoSolutions
NICHOLSON

Legend

 Confirmation Sample

 Pipeline

 Spill Perimeter

0 30 60 Feet

1" = 60'

Berry Petroleum Company

Long Ridge J-15 Pipeline
Spill Response
Garfield County, Colorado

APPENDIX A
Laboratory Report

April 20, 2020

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Berry Petroleum - Denver, CO

Sample Delivery Group: L1207784

Samples Received: 04/10/2020

Project Number:

Description: J-15 Spill

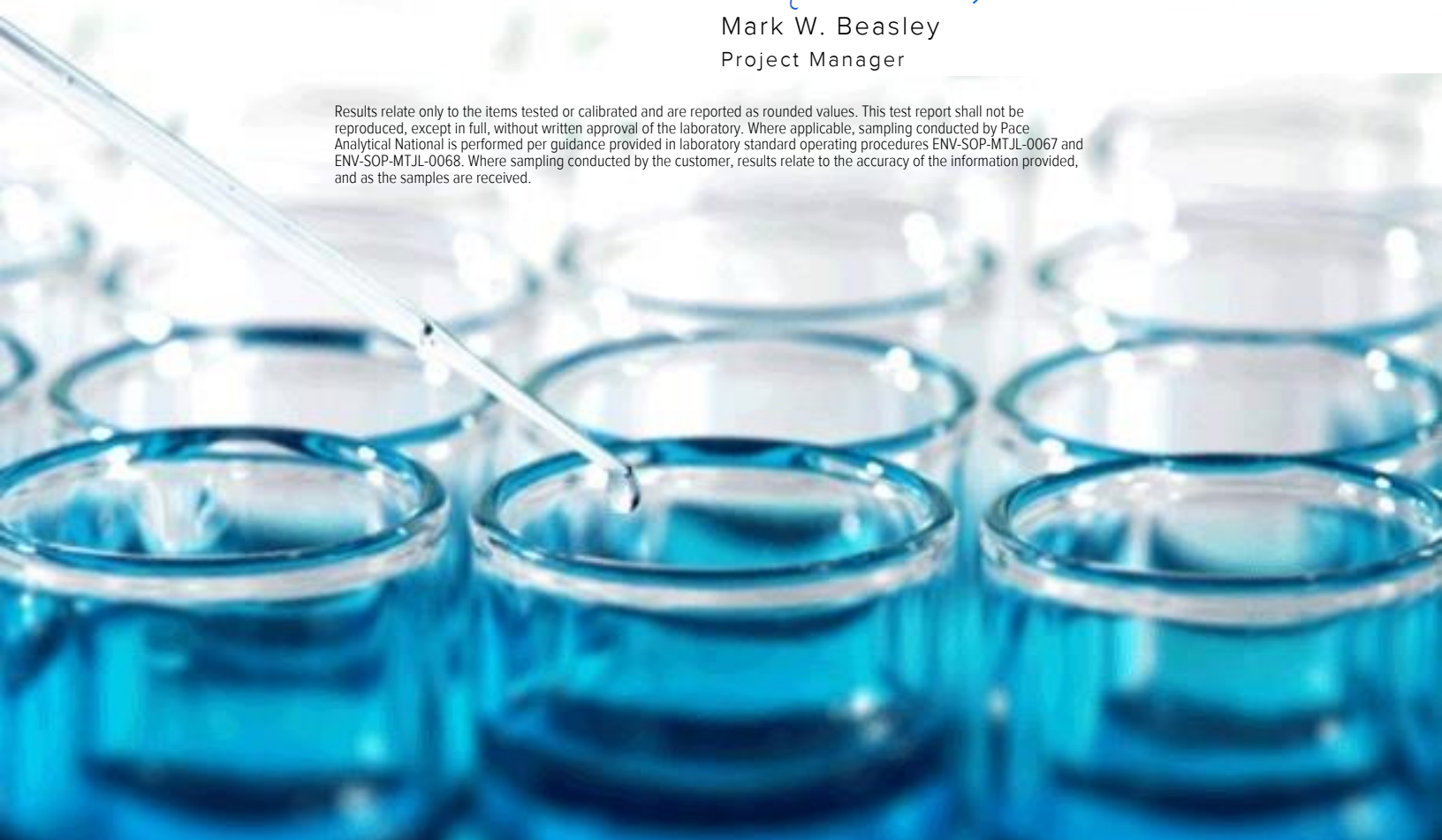
Report To: Dave Nicholson
3433 E. Lake Dr
Centennial, CO 80121

Entire Report Reviewed By:



Mark W. Beasley
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





Cp: Cover Page	1
Tc: Table of Contents	2
Ss: Sample Summary	3
Cn: Case Narrative	5
Sr: Sample Results	6
J15-S-1 L1207784-01	6
J15-S-2 L1207784-02	7
J15-S-3 L1207784-03	8
J15-S-4 L1207784-04	9
J15-S-5 L1207784-05	10
J15-S-6 L1207784-06	11
J15-S-7 L1207784-07	12
Qc: Quality Control Summary	13
Wet Chemistry by Method 9045D	13
Wet Chemistry by Method 9050AMod	15
Volatile Organic Compounds (GC) by Method 8015	16
Volatile Organic Compounds (GC) by Method 8015/8021	17
Semi-Volatile Organic Compounds (GC) by Method 8015	19
Gl: Glossary of Terms	20
Al: Accreditations & Locations	21
Sc: Sample Chain of Custody	22



SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



J15-S-1 L1207784-01 Solid

Collected by
DK Nicholson

Collected date/time
04/08/20 10:30

Received date/time
04/10/20 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1459230	1	04/14/20 21:45	04/14/20 21:45	CCE	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1460291	1	04/14/20 15:30	04/14/20 17:00	KAB	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1459708	1	04/14/20 15:45	04/14/20 16:20	JIC	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015	WG1462431	25	04/14/20 08:32	04/17/20 19:56	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8021	WG1460405	1	04/14/20 08:32	04/14/20 15:36	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	1	04/14/20 22:53	04/15/20 11:08	FM	Mt. Juliet, TN

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

J15-S-2 L1207784-02 Solid

Collected by
DK Nicholson

Collected date/time
04/08/20 10:40

Received date/time
04/10/20 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1459230	1	04/14/20 21:47	04/14/20 21:47	CCE	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1460878	1	04/15/20 11:48	04/15/20 14:35	KPS	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1459708	1	04/14/20 15:45	04/14/20 16:20	JIC	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015/8021	WG1460405	1	04/14/20 08:32	04/14/20 15:59	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	1	04/14/20 22:53	04/15/20 12:01	FM	Mt. Juliet, TN

J15-S-3 L1207784-03 Solid

Collected by
DK Nicholson

Collected date/time
04/08/20 10:50

Received date/time
04/10/20 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1459230	1	04/14/20 21:50	04/14/20 21:50	CCE	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1460878	1	04/15/20 11:48	04/15/20 14:35	KPS	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1459708	1	04/14/20 15:45	04/14/20 16:20	JIC	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015/8021	WG1460405	100	04/14/20 08:32	04/14/20 18:56	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	1	04/14/20 22:53	04/15/20 12:28	FM	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	5	04/14/20 22:53	04/16/20 00:02	KME	Mt. Juliet, TN

J15-S-4 L1207784-04 Solid

Collected by
DK Nicholson

Collected date/time
04/08/20 11:00

Received date/time
04/10/20 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1459230	1	04/14/20 21:53	04/14/20 21:53	CCE	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1460878	1	04/15/20 11:48	04/15/20 14:35	KPS	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1459708	1	04/14/20 15:45	04/14/20 16:20	JIC	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015/8021	WG1460405	500	04/14/20 08:32	04/14/20 21:31	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	100	04/14/20 22:53	04/16/20 01:40	KME	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	5	04/14/20 22:53	04/15/20 13:47	FM	Mt. Juliet, TN

J15-S-5 L1207784-05 Solid

Collected by
DK Nicholson

Collected date/time
04/08/20 11:10

Received date/time
04/10/20 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1459230	1	04/14/20 21:56	04/14/20 21:56	CCE	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1460878	1	04/15/20 11:48	04/15/20 14:35	KPS	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1459708	1	04/14/20 15:45	04/14/20 16:20	JIC	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015/8021	WG1460405	100	04/14/20 08:32	04/14/20 19:18	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	1	04/14/20 22:53	04/15/20 10:55	FM	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	10	04/14/20 22:53	04/16/20 01:24	KME	Mt. Juliet, TN

ACCOUNT:

Berry Petroleum - Denver, CO

PROJECT:

SDG:

L1207784

DATE/TIME:

04/20/20 15:03

PAGE:

3 of 22

SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



J15-S-6 L1207784-06 Solid

Collected by
DK Nicholson

Collected date/time
04/08/20 11:20

Received date/time
04/10/20 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1459230	1	04/14/20 21:58	04/14/20 21:58	CCE	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1460878	1	04/15/20 11:48	04/15/20 14:35	KPS	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1459708	1	04/14/20 15:45	04/14/20 16:20	JIC	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015/8021	WG1460405	100	04/14/20 08:32	04/14/20 19:40	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	1	04/14/20 22:53	04/15/20 11:22	CLG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	5	04/14/20 22:53	04/16/20 00:34	KME	Mt. Juliet, TN

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

J15-S-7 L1207784-07 Solid

Collected by
DK Nicholson

Collected date/time
04/08/20 11:30

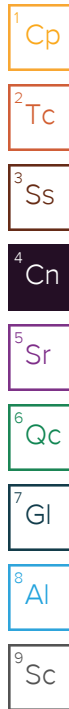
Received date/time
04/10/20 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1459230	1	04/14/20 22:01	04/14/20 22:01	CCE	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1460878	1	04/15/20 11:48	04/15/20 14:35	KPS	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1459708	1	04/14/20 15:45	04/14/20 16:20	JIC	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015/8021	WG1460405	200	04/14/20 08:32	04/14/20 21:09	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	1	04/14/20 22:53	04/15/20 13:07	FM	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1460641	5	04/14/20 22:53	04/16/20 00:18	KME	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.

Mark W. Beasley
Project Manager





Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	0.637		1	04/14/2020 21:45	WG1459230

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.18	T8	1	04/14/2020 17:00	WG1460291

Sample Narrative:

L1207784-01 WG1460291: 8.18 at 21.8C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	umhos/cm		umhos/cm			
Specific Conductance	140		10.0	1	04/14/2020 16:20	WG1459708

Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	mg/kg		mg/kg			
Benzene	ND		0.000500	1	04/14/2020 15:36	WG1460405
Toluene	ND		0.00500	1	04/14/2020 15:36	WG1460405
Ethylbenzene	0.0301		0.000500	1	04/14/2020 15:36	WG1460405
Total Xylene	0.205		0.00150	1	04/14/2020 15:36	WG1460405
TPH (GC/FID) Low Fraction	77.5		2.50	25	04/17/2020 19:56	WG1462431
(S) a,a,a-Trifluorotoluene(FID)	87.5		77.0-120		04/14/2020 15:36	WG1460405
(S) a,a,a-Trifluorotoluene(FID)	94.4		59.0-128		04/17/2020 19:56	WG1462431
(S) a,a,a-Trifluorotoluene(PID)	98.2		72.0-128		04/14/2020 15:36	WG1460405
(S) a,a,a-Trifluorotoluene(PID)	93.7		54.0-144		04/17/2020 19:56	WG1462431

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	mg/kg		mg/kg			
C10-C28 Diesel Range	85.2		4.00	1	04/15/2020 11:08	WG1460641
C28-C40 Oil Range	ND		4.00	1	04/15/2020 11:08	WG1460641
(S) o-Terphenyl	40.8		18.0-148		04/15/2020 11:08	WG1460641

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	1.23		1	04/14/2020 21:47	WG1459230

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	7.95	T8	1	04/15/2020 14:35	WG1460878

Sample Narrative:

L1207784-02 WG1460878: 7.95 at 19.7C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	umhos/cm		umhos/cm			
	445		10.0	1	04/14/2020 16:20	WG1459708

Volatile Organic Compounds (GC) by Method 8015/8021

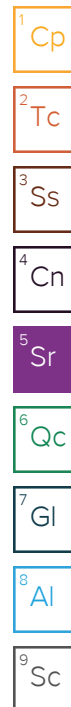
Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	0.00406		0.000500	1	04/14/2020 15:59	WG1460405
Toluene	0.00825		0.00500	1	04/14/2020 15:59	WG1460405
Ethylbenzene	ND		0.000500	1	04/14/2020 15:59	WG1460405
Total Xylene	0.0173		0.00150	1	04/14/2020 15:59	WG1460405
TPH (GC/FID) Low Fraction	3.82		0.100	1	04/14/2020 15:59	WG1460405
(S) a,a,a-Trifluorotoluene(FID)	92.7		77.0-120		04/14/2020 15:59	WG1460405
(S) a,a,a-Trifluorotoluene(PID)	97.6		72.0-128		04/14/2020 15:59	WG1460405

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	157		4.00	1	04/15/2020 12:01	WG1460641
C28-C40 Oil Range	24.7		4.00	1	04/15/2020 12:01	WG1460641
(S) o-Terphenyl	0.000	J2	18.0-148		04/15/2020 12:01	WG1460641

Sample Narrative:

L1207784-02 WG1460641: Surrogate failure due to matrix interference





Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	5.23		1	04/14/2020 21:50	WG1459230

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	7.66	T8	1	04/15/2020 14:35	WG1460878

Sample Narrative:

L1207784-03 WG1460878: 7.66 at 19.8C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	umhos/cm		umhos/cm			
Specific Conductance	1010		10.0	1	04/14/2020 16:20	WG1459708

Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.0500	100	04/14/2020 18:56	WG1460405
Toluene	0.685		0.500	100	04/14/2020 18:56	WG1460405
Ethylbenzene	0.418		0.0500	100	04/14/2020 18:56	WG1460405
Total Xylene	23.2		0.150	100	04/14/2020 18:56	WG1460405
TPH (GC/FID) Low Fraction	556	J5	10.0	100	04/14/2020 18:56	WG1460405
(S) a,a,a-Trifluorotoluene(FID)	82.2		77.0-120		04/14/2020 18:56	WG1460405
(S) a,a,a-Trifluorotoluene(PID)	99.5		72.0-128		04/14/2020 18:56	WG1460405

Sample Narrative:

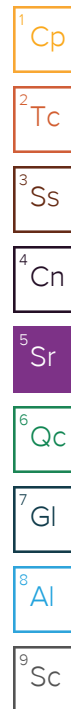
L1207784-03 WG1460405: Non-target compounds too high to run at a lower dilution.

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	651		20.0	5	04/16/2020 00:02	WG1460641
C28-C40 Oil Range	15.4		4.00	1	04/15/2020 12:28	WG1460641
(S) o-Terphenyl	0.000	J2	18.0-148		04/15/2020 12:28	WG1460641
(S) o-Terphenyl	51.8		18.0-148		04/16/2020 00:02	WG1460641

Sample Narrative:

L1207784-03 WG1460641: Surrogate failure due to matrix interference





Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	37.8		1	04/14/2020 21:53	WG1459230

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	7.42	T8	1	04/15/2020 14:35	WG1460878

Sample Narrative:

L1207784-04 WG1460878: 7.42 at 19.8C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	umhos/cm		umhos/cm			
	6180		10.0	1	04/14/2020 16:20	WG1459708

Volatile Organic Compounds (GC) by Method 8015/8021

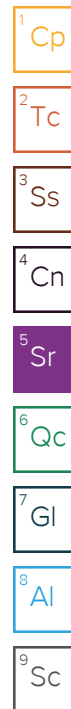
Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	7.63		0.250	500	04/14/2020 21:31	WG1460405
Toluene	119		2.50	500	04/14/2020 21:31	WG1460405
Ethylbenzene	14.5		0.250	500	04/14/2020 21:31	WG1460405
Total Xylene	188		0.750	500	04/14/2020 21:31	WG1460405
TPH (GC/FID) Low Fraction	3650		50.0	500	04/14/2020 21:31	WG1460405
(S) a,a,a-Trifluorotoluene(FID)	96.9		77.0-120		04/14/2020 21:31	WG1460405
(S) a,a,a-Trifluorotoluene(PID)	102		72.0-128		04/14/2020 21:31	WG1460405

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	9320		400	100	04/16/2020 01:40	WG1460641
C28-C40 Oil Range	52.1		20.0	5	04/15/2020 13:47	WG1460641
(S) o-Terphenyl	0.000	J2	18.0-148		04/15/2020 13:47	WG1460641
(S) o-Terphenyl	0.000	J7	18.0-148		04/16/2020 01:40	WG1460641

Sample Narrative:

L1207784-04 WG1460641: Surrogate failure due to matrix interference





Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	2.47		1	04/14/2020 21:56	WG1459230

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.05	T8	1	04/15/2020 14:35	WG1460878

Sample Narrative:

L1207784-05 WG1460878: 8.05 at 20.3C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	umhos/cm		umhos/cm			
Specific Conductance	1250		10.0	1	04/14/2020 16:20	WG1459708

Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.0500	100	04/14/2020 19:18	WG1460405
Toluene	0.730		0.500	100	04/14/2020 19:18	WG1460405
Ethylbenzene	0.218		0.0500	100	04/14/2020 19:18	WG1460405
Total Xylene	5.37		0.150	100	04/14/2020 19:18	WG1460405
TPH (GC/FID) Low Fraction	219		10.0	100	04/14/2020 19:18	WG1460405
(S) a,a,a-Trifluorotoluene(FID)	100		77.0-120		04/14/2020 19:18	WG1460405
(S) a,a,a-Trifluorotoluene(PID)	101		72.0-128		04/14/2020 19:18	WG1460405

Sample Narrative:

L1207784-05 WG1460405: Non-target compounds too high to run at a lower dilution.

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	962		40.0	10	04/16/2020 01:24	WG1460641
C28-C40 Oil Range	ND		4.00	1	04/15/2020 10:55	WG1460641
(S) o-Terphenyl	0.000	J2	18.0-148		04/15/2020 10:55	WG1460641
(S) o-Terphenyl	49.4		18.0-148		04/16/2020 01:24	WG1460641

Sample Narrative:

L1207784-05 WG1460641: Surrogate failure due to matrix interference

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	13.3		1	04/14/2020 21:58	WG1459230

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	7.82	T8	1	04/15/2020 14:35	WG1460878

Sample Narrative:

L1207784-06 WG1460878: 7.82 at 20.3C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	umhos/cm		umhos/cm			
Specific Conductance	1630		10.0	1	04/14/2020 16:20	WG1459708

Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.0500	100	04/14/2020 19:40	WG1460405
Toluene	ND		0.500	100	04/14/2020 19:40	WG1460405
Ethylbenzene	0.205		0.0500	100	04/14/2020 19:40	WG1460405
Total Xylene	3.18		0.150	100	04/14/2020 19:40	WG1460405
TPH (GC/FID) Low Fraction	320		10.0	100	04/14/2020 19:40	WG1460405
(S) a,a,a-Trifluorotoluene(FID)	95.4		77.0-120		04/14/2020 19:40	WG1460405
(S) a,a,a-Trifluorotoluene(PID)	99.8		72.0-128		04/14/2020 19:40	WG1460405

Sample Narrative:

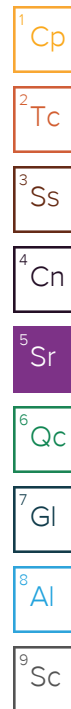
L1207784-06 WG1460405: Non-target compounds too high to run at a lower dilution.

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	781		20.0	5	04/16/2020 00:34	WG1460641
C28-C40 Oil Range	8.16		4.00	1	04/15/2020 11:22	WG1460641
(S) o-Terphenyl	48.5		18.0-148		04/16/2020 00:34	WG1460641
(S) o-Terphenyl	0.000	J2	18.0-148		04/15/2020 11:22	WG1460641

Sample Narrative:

L1207784-06 WG1460641: Surrogate failure due to matrix interference





Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	3.04		1	04/14/2020 22:01	WG1459230

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	7.63	T8	1	04/15/2020 14:35	WG1460878

Sample Narrative:

L1207784-07 WG1460878: 7.63 at 20.1C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	umhos/cm		umhos/cm			
	671		10.0	1	04/14/2020 16:20	WG1459708

Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.100	200	04/14/2020 21:09	WG1460405
Toluene	ND		1.00	200	04/14/2020 21:09	WG1460405
Ethylbenzene	0.229		0.100	200	04/14/2020 21:09	WG1460405
Total Xylene	8.56		0.300	200	04/14/2020 21:09	WG1460405
TPH (GC/FID) Low Fraction	372		20.0	200	04/14/2020 21:09	WG1460405
(S) a,a,a-Trifluorotoluene(FID)	98.2		77.0-120		04/14/2020 21:09	WG1460405
(S) a,a,a-Trifluorotoluene(PID)	99.3		72.0-128		04/14/2020 21:09	WG1460405

Sample Narrative:

L1207784-07 WG1460405: Non-target compounds too high to run at a lower dilution.

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	756		20.0	5	04/16/2020 00:18	WG1460641
C28-C40 Oil Range	31.7		4.00	1	04/15/2020 13:07	WG1460641
(S) o-Terphenyl	56.2		18.0-148		04/16/2020 00:18	WG1460641
(S) o-Terphenyl	0.000	J2	18.0-148		04/15/2020 13:07	WG1460641

Sample Narrative:

L1207784-07 WG1460641: Surrogate failure due to matrix interference

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



L1207784-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1207784-01 04/14/20 17:00 • (DUP) R3518587-2 04/14/20 17:00

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	su	su		%		%
pH	8.18	8.26	1	0.973		1

Sample Narrative:

OS: 8.18 at 21.8C

DUP: 8.26 at 21.6C

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

L1207858-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1207858-01 04/14/20 17:00 • (DUP) R3518587-3 04/14/20 17:00

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	su	su		%		%
pH	7.03	6.96	1	1.00		1

Sample Narrative:

OS: 7.03 at 21.4C

DUP: 6.96 at 21.4C

Laboratory Control Sample (LCS)

(LCS) R3518587-1 04/14/20 17:00

	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 18.6C



L1207732-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1207732-01 04/15/20 14:35 • (DUP) R3518927-2 04/15/20 14:35

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	su	su		%		%
pH	7.90	7.93	1	0.379		1

Sample Narrative:

OS: 7.9 at 20C
DUP: 7.93 at 19.9C

L1207784-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1207784-04 04/15/20 14:35 • (DUP) R3518927-3 04/15/20 14:35

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	su	su		%		%
pH	7.42	7.42	1	0.000		1

Sample Narrative:

OS: 7.42 at 19.8C
DUP: 7.42 at 19.8C

Laboratory Control Sample (LCS)

(LCS) R3518927-1 04/15/20 14:35

	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: 10.01 at 19.1C

1

Cp

2

Tc

3

Ss

4

Cn

5

Sr

6

Qc

7

Gl

8

Al

9

Sc



Method Blank (MB)

(MB) R3518561-1 04/14/20 16:20

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

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

L1207381-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1207381-02 04/14/20 16:20 • (DUP) R3518561-3 04/14/20 16:20

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Specific Conductance	2900	2690	1	7.37		20

L1207784-07 Original Sample (OS) • Duplicate (DUP)

(OS) L1207784-07 04/14/20 16:20 • (DUP) R3518561-4 04/14/20 16:20

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Specific Conductance	671	667	1	0.598		20

Laboratory Control Sample (LCS)

(LCS) R3518561-2 04/14/20 16:20

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	445	446	100	85.0-115	



Method Blank (MB)

(MB) R3519798-3 04/17/20 18:49

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)	98.4			77.0-120
(S) a,a,a-Trifluorotoluene(PID)	105			72.0-128

1
Cp

2
Tc

3
Ss

4
Cn

5
Sr

6
Qc

7
Gl

8
Al

9
Sc

Laboratory Control Sample (LCS)

(LCS) R3519798-2 04/17/20 18:07

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	5.48	99.6	72.0-127	
(S) a,a,a-Trifluorotoluene(FID)			113	77.0-120	
(S) a,a,a-Trifluorotoluene(PID)			108	72.0-128	

Method Blank (MB)

(MB) R3519635-3 04/14/20 14:30

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000120	0.000500
Toluene	U		0.000150	0.00500
Ethylbenzene	U		0.000110	0.000500
Total Xylene	U		0.000460	0.00150
TPH (GC/FID) Low Fraction	0.0664	⬇	0.0217	0.100
(S) a,a,a-Trifluorotoluene(FID)	106			77.0-120
(S) a,a,a-Trifluorotoluene(PID)	100			72.0-128

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Laboratory Control Sample (LCS)

(LCS) R3519635-1 04/14/20 13:23

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.0500	0.0491	98.2	76.0-121	
Toluene	0.0500	0.0514	103	80.0-120	
Ethylbenzene	0.0500	0.0522	104	80.0-124	
Total Xylene	0.150	0.145	96.7	37.0-160	
(S) a,a,a-Trifluorotoluene(FID)			105	77.0-120	
(S) a,a,a-Trifluorotoluene(PID)			100	72.0-128	

Laboratory Control Sample (LCS)

(LCS) R3519635-2 04/14/20 13:45

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	6.81	124	72.0-127	
(S) a,a,a-Trifluorotoluene(FID)			106	77.0-120	
(S) a,a,a-Trifluorotoluene(PID)			107	72.0-128	



L1207784-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1207784-03 04/14/20 18:56 • (MS) R3519635-4 04/14/20 22:37 • (MSD) R3519635-5 04/14/20 22:59

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	5.00	ND	4.65	4.70	93.0	94.0	100	10.0-155			1.07	32
Toluene	5.00	0.685	6.00	5.87	106	104	100	10.0-160			2.19	34
Ethylbenzene	5.00	0.418	5.04	5.15	92.4	94.6	100	10.0-160			2.16	32
Total Xylene	15.0	23.2	33.8	34.3	70.7	74.0	100	10.0-160			1.47	32
(S) a,a,a-Trifluorotoluene(FID)					85.4	85.3		77.0-120				
(S) a,a,a-Trifluorotoluene(PID)					102	104		72.0-128				

Sample Narrative:

OS: Non-target compounds too high to run at a lower dilution.

L1207784-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1207784-03 04/14/20 18:56 • (MS) R3519635-6 04/14/20 23:21 • (MSD) R3519635-7 04/14/20 23:43

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	550	556	1330	1440	141	161	100	10.0-151	E	E J5	7.94	28
(S) a,a,a-Trifluorotoluene(FID)					108	109		77.0-120				
(S) a,a,a-Trifluorotoluene(PID)					109	109		72.0-128				

Sample Narrative:

OS: Non-target compounds too high to run at a lower dilution.

1
Cp

2
Tc

3
Ss

4
Cn

5
Sr

6
Qc

7
Gl

8
Al

9
Sc



Method Blank (MB)

(MB) R3518997-1 04/15/20 10:02

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
C10-C28 Diesel Range	U		1.61	4.00
C28-C40 Oil Range	U		0.274	4.00
(S) o-Terphenyl	62.2			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) R3518997-2 04/15/20 10:15

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
C10-C28 Diesel Range	50.0	33.5	67.0	50.0-150	
(S) o-Terphenyl			65.6	18.0-148	

L1207784-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1207784-06 04/15/20 11:22 • (MS) R3518997-3 04/15/20 11:35 • (MSD) R3518997-4 04/15/20 11:48

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
C10-C28 Diesel Range	50.0	778	559	539	0.000	0.000	1	50.0-150	E V	E V	3.64	20
(S) o-Terphenyl					0.000	0.000		18.0-148	J2	J2		

Sample Narrative:

OS: Surrogate failure due to matrix interference



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

E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
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.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.
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.



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