



Nicholson GeoSolutions LLC

3433 East Lake Drive
Centennial, CO 80121

May 19, 2018

Mr. Derek Johnson
Berry Petroleum Company
235 Callahan Avenue
Parachute, Colorado 81635

Subject: O-36B Landfarm Screening Soil Sample Results

Dear Derek:

Nicholson GeoSolutions LLC collected a screening level soil sample from the landfarm on the O-36B well pad in the Garden Gulch area, Garfield County, Colorado on May 5th, 2018. The sample was composited from 16 subsamples collected at depths of about 18 inches across the surface of the landfarm. The sample was analyzed for Total Volatile Petroleum Hydrocarbons (TVPH – gasoline range), Total Extractable Petroleum Hydrocarbons (TEPH – diesel and motor oil range), PAHs, and BTEX (benzene, toluene, ethylbenzene, and xylenes) to evaluate compliance with the COGCC Table 910-1 standards and whether additional treatment is necessary. The laboratory report is attached.

TPH was reported at 489.3 mg/kg, slightly below the COGCC standard of 500 mg/kg. All other results were below the standards. Given these results, continued treatment of the landfarm is recommended. The landfarm should be sampled again in the fall of 2018 to reassess the TPH concentration and degradation rate.

Nicholson GeoSolutions LLC

A handwritten signature in blue ink that reads "DK Nicholson".

David K. Nicholson, P.G.
Principal Geologist

APPENDIX A
Laboratory Report

May 16, 2018

Berry Petroleum - Denver, CO

Sample Delivery Group: L991930
Samples Received: 05/08/2018
Project Number:
Description:

Report To: Dave Nicholson
1999 Broadway, Suite 3700
Denver, CO 93309

Entire Report Reviewed By:



Jason Romer
Technical Service Representative

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 ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



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SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



036-B L991930-01 Solid

Collected by
DK Nicholson

Collected date/time
05/05/18 16:00

Received date/time
05/08/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1109082	1	05/09/18 09:40	05/09/18 21:19	DWR
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1109622	10	05/12/18 15:46	05/13/18 18:28	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1109641	1	05/11/18 20:42	05/12/18 17:33	KM
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1109641	10	05/11/18 20:42	05/13/18 21:59	KM

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

O-29 L991930-02 Solid

Collected by
DK Nicholson

Collected date/time
05/06/18 10:10

Received date/time
05/08/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1109082	1	05/09/18 09:40	05/09/18 21:41	DWR
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1109622	2	05/12/18 15:46	05/13/18 15:24	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1109641	1	05/11/18 20:42	05/12/18 17:55	KM

I-31 L991930-03 Solid

Collected by
DK Nicholson

Collected date/time
05/06/18 10:50

Received date/time
05/08/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1109082	1	05/09/18 09:40	05/09/18 22:03	DWR
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1109622	2	05/12/18 15:46	05/13/18 15:39	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1109795	1	05/11/18 00:45	05/11/18 09:22	DMG

F-01 L991930-04 Solid

Collected by
DK Nicholson

Collected date/time
05/06/18 11:00

Received date/time
05/08/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1109082	1	05/09/18 09:40	05/09/18 22:25	DWR
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1109622	2	05/12/18 15:46	05/13/18 16:35	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1109795	1	05/11/18 00:45	05/11/18 09:43	DMG

LI-02 L991930-05 Solid

Collected by
DK Nicholson

Collected date/time
05/06/18 11:30

Received date/time
05/08/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1109082	1	05/09/18 09:40	05/09/18 22:48	DWR
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1109622	5	05/12/18 15:46	05/13/18 17:04	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1109795	1	05/11/18 00:45	05/11/18 10:04	DMG

O-06 L991930-06 Solid

Collected by
DK Nicholson

Collected date/time
05/06/18 12:00

Received date/time
05/08/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1109082	1	05/09/18 09:40	05/09/18 23:10	DWR
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1109622	10	05/12/18 15:46	05/13/18 18:42	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1109795	1	05/11/18 00:45	05/11/18 10:25	DMG

ACCOUNT:

Berry Petroleum - Denver, CO

PROJECT:

SDG:

L991930

DATE/TIME:

05/16/18 14:56

PAGE:

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I-11 L991930-07 Solid

Collected by
DK NicholsonCollected date/time
05/06/18 13:20Received date/time
05/08/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1109082	1	05/09/18 09:40	05/09/18 23:32	DWR
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1109622	20	05/12/18 15:46	05/13/18 18:57	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1109795	1	05/11/18 00:45	05/11/18 10:46	DMG

¹Cp²Tc³Ss⁴Cn⁵Sr⁶Qc⁷Gl⁸Al⁹Sc

J-13 L991930-08 Solid

Collected by
DK NicholsonCollected date/time
05/06/18 13:50Received date/time
05/08/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1109082	1	05/09/18 09:40	05/09/18 23:54	DWR
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1109622	20	05/12/18 15:46	05/13/18 19:11	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1109795	1	05/11/18 00:45	05/11/18 11:29	DMG



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 radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. 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.

Jason Romer
Technical Service Representative

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00346		0.000500	1	05/09/2018 21:19	WG1109082
Toluene	0.00645		0.00500	1	05/09/2018 21:19	WG1109082
Ethylbenzene	0.00245	B	0.000500	1	05/09/2018 21:19	WG1109082
Total Xylene	0.00515	B	0.00150	1	05/09/2018 21:19	WG1109082
TPH (GC/FID) Low Fraction	0.243		0.100	1	05/09/2018 21:19	WG1109082
(S) a,a,a-Trifluorotoluene(FID)	92.4		77.0-120		05/09/2018 21:19	WG1109082
(S) a,a,a-Trifluorotoluene(PID)	101		75.0-128		05/09/2018 21:19	WG1109082

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	418		40.0	10	05/13/2018 18:28	WG1109622
C28-C40 Oil Range	71.1		40.0	10	05/13/2018 18:28	WG1109622
(S) o-Terphenyl	115		18.0-148		05/13/2018 18:28	WG1109622

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		0.0600	10	05/13/2018 21:59	WG1109641
Acenaphthene	0.0725		0.00600	1	05/12/2018 17:33	WG1109641
Acenaphthylene	ND		0.00600	1	05/12/2018 17:33	WG1109641
Benzo(a)anthracene	ND		0.00600	1	05/12/2018 17:33	WG1109641
Benzo(a)pyrene	ND		0.00600	1	05/12/2018 17:33	WG1109641
Benzo(b)fluoranthene	0.00670		0.00600	1	05/12/2018 17:33	WG1109641
Benzo(g,h,i)perylene	0.00697		0.00600	1	05/12/2018 17:33	WG1109641
Benzo(k)fluoranthene	ND		0.00600	1	05/12/2018 17:33	WG1109641
Chrysene	0.0103		0.00600	1	05/12/2018 17:33	WG1109641
Dibenz(a,h)anthracene	ND		0.00600	1	05/12/2018 17:33	WG1109641
Fluoranthene	ND		0.0600	10	05/13/2018 21:59	WG1109641
Fluorene	0.0503		0.00600	1	05/12/2018 17:33	WG1109641
Indeno(1,2,3-cd)pyrene	ND		0.00600	1	05/12/2018 17:33	WG1109641
Naphthalene	0.244		0.0200	1	05/12/2018 17:33	WG1109641
Phenanthrene	0.223		0.0600	10	05/13/2018 21:59	WG1109641
Pyrene	0.150		0.00600	1	05/12/2018 17:33	WG1109641
1-Methylnaphthalene	0.411		0.0200	1	05/12/2018 17:33	WG1109641
2-Methylnaphthalene	0.749		0.0200	1	05/12/2018 17:33	WG1109641
2-Chloronaphthalene	ND		0.0200	1	05/12/2018 17:33	WG1109641
(S) p-Terphenyl-d14	77.3		23.0-120		05/13/2018 21:59	WG1109641
(S) p-Terphenyl-d14	82.3		23.0-120		05/12/2018 17:33	WG1109641
(S) Nitrobenzene-d5	53.1		14.0-149		05/13/2018 21:59	WG1109641
(S) Nitrobenzene-d5	62.9		14.0-149		05/12/2018 17:33	WG1109641
(S) 2-Fluorobiphenyl	77.2		34.0-125		05/13/2018 21:59	WG1109641
(S) 2-Fluorobiphenyl	64.8		34.0-125		05/12/2018 17:33	WG1109641

Sample Narrative:

L991930-01 WG1109641: IS/SURR failed on lower dilution.



Method Blank (MB)

(MB) R3309371-5 05/09/18 14:13

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000120	0.000500
Toluene	0.000311	U	0.000150	0.00500
Ethylbenzene	0.000255	U	0.000110	0.000500
Total Xylene	U		0.000460	0.00150
TPH (GC/FID) Low Fraction	0.0230	U	0.0217	0.100
(S) a,a,a-Trifluorotoluene(FID)	99.1			77.0-120
(S) a,a,a-Trifluorotoluene(PID)	108			75.0-128

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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Gl

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

(LCS) R3309371-1 05/09/18 12:22 • (LCSD) R3309371-2 05/09/18 12:44

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	0.0539	0.0528	108	106	71.0-121			2.00	20
Toluene	0.0500	0.0544	0.0529	109	106	72.0-120			2.63	20
Ethylbenzene	0.0500	0.0563	0.0559	113	112	76.0-121			0.641	20
Total Xylene	0.150	0.165	0.164	110	109	75.0-124			0.668	20
(S) a,a,a-Trifluorotoluene(FID)				95.6	97.5	77.0-120				
(S) a,a,a-Trifluorotoluene(PID)				104	105	75.0-128				

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

(LCS) R3309371-3 05/09/18 13:06 • (LCSD) R3309371-4 05/09/18 13:29

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	5.02	5.30	91.2	96.3	70.0-136			5.47	20
(S) a,a,a-Trifluorotoluene(FID)				109	111	77.0-120				
(S) a,a,a-Trifluorotoluene(PID)				117	119	75.0-128				

L991935-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L991935-01 05/10/18 00:17 • (MS) R3309371-6 05/10/18 00:39 • (MSD) R3309371-7 05/10/18 01:01

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	5.72	24.7	25.3	75.8	78.3	500	10.0-146			2.53	29
Toluene	0.0500	3.12	25.6	25.3	89.7	88.8	500	10.0-143			0.926	30
Ethylbenzene	0.0500	30.5	46.6	46.9	64.3	65.8	500	10.0-147			0.802	31
Total Xylene	0.150	58.2	115	115	75.3	76.3	500	10.0-149			0.608	30
(S) a,a,a-Trifluorotoluene(FID)					130	131		77.0-120	J1	J1		
(S) a,a,a-Trifluorotoluene(PID)					133	134		75.0-128	J1	J1		

L991935-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L991935-01 05/10/18 00:17 • (MS) R3309371-8 05/10/18 01:23 • (MSD) R3309371-9 05/10/18 01:45

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	1360	1950	1860	21.6	18.0	500	10.0-147			5.15	30
(S) a,a,a-Trifluorotoluene(FID)					139	137		77.0-120	J1	J1		
(S) a,a,a-Trifluorotoluene(PID)					141	139		75.0-128	J1	J1		

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc



Method Blank (MB)

(MB) R3309771-1 05/13/18 12:49

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	74.7			18.0-148

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

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

(LCS) R3309771-2 05/13/18 13:03 • (LCSD) R3309771-3 05/13/18 13:17

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 %
C10-C28 Diesel Range	50.0	27.0	28.7	53.9	57.5	50.0-150			6.39	20
(S) o-Terphenyl				67.9	66.7	18.0-148				

L991930-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L991930-05 05/13/18 17:04 • (MS) R3309771-4 05/13/18 17:18 • (MSD) R3309771-5 05/13/18 17:31

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	176	223	248	94.4	145	5	50.0-150			10.8	20
(S) o-Terphenyl					51.5	60.0		18.0-148				

Method Blank (MB)

(MB) R3309273-3 05/12/18 12:05

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	67.1			14.0-149
(S) 2-Fluorobiphenyl	88.4			34.0-125
(S) p-Terphenyl-d14	87.2			23.0-120

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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) R3309273-1 05/12/18 11:21 • (LCSD) R3309273-2 05/12/18 11:43

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	0.0703	0.0685	87.8	85.6	50.0-125			2.54	20
Acenaphthene	0.0800	0.0631	0.0601	78.8	75.2	52.0-120			4.72	20
Acenaphthylene	0.0800	0.0645	0.0617	80.6	77.1	51.0-120			4.43	20
Benzo(a)anthracene	0.0800	0.0674	0.0640	84.2	80.1	46.0-121			5.07	20
Benzo(a)pyrene	0.0800	0.0691	0.0661	86.3	82.6	42.0-121			4.37	20
Benzo(b)fluoranthene	0.0800	0.0652	0.0611	81.5	76.4	42.0-123			6.42	20
Benzo(g,h,i)perylene	0.0800	0.0784	0.0738	98.0	92.3	43.0-128			5.99	20
Benzo(k)fluoranthene	0.0800	0.0702	0.0671	87.7	83.9	45.0-128			4.43	20
Chrysene	0.0800	0.0690	0.0666	86.3	83.2	48.0-127			3.58	20
Dibenz(a,h)anthracene	0.0800	0.0800	0.0767	100	95.8	43.0-132			4.32	20
Fluoranthene	0.0800	0.0723	0.0679	90.3	84.9	49.0-129			6.23	20

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

(LCS) R3309273-1 05/12/18 11:21 • (LCSD) R3309273-2 05/12/18 11:43

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	0.0628	0.0601	78.5	75.2	50.0-120			4.30	20
Indeno(1,2,3-cd)pyrene	0.0800	0.0802	0.0765	100	95.7	44.0-131			4.66	20
Naphthalene	0.0800	0.0558	0.0546	69.8	68.2	50.0-120			2.24	20
Phenanthrene	0.0800	0.0661	0.0636	82.6	79.5	48.0-120			3.87	20
Pyrene	0.0800	0.0665	0.0638	83.2	79.7	48.0-135			4.22	20
1-Methylnaphthalene	0.0800	0.0578	0.0558	72.3	69.8	52.0-122			3.52	20
2-Methylnaphthalene	0.0800	0.0555	0.0537	69.3	67.1	52.0-120			3.26	20
2-Chloronaphthalene	0.0800	0.0651	0.0633	81.3	79.1	50.0-120			2.78	20
(S) Nitrobenzene-d5				71.8	68.4	14.0-149				
(S) 2-Fluorobiphenyl				94.6	88.9	34.0-125				
(S) p-Terphenyl-d14				88.2	84.0	23.0-120				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

L991927-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L991927-02 05/12/18 15:22 • (MS) R3309273-4 05/12/18 15:44 • (MSD) R3309273-5 05/12/18 16:06

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>	<u>MSD Qualifier</u>	RPD %	RPD Limits %
Anthracene	0.0800	0.0121	0.0861	0.0764	92.5	80.4	1	20.0-136			11.9	24
Acenaphthene	0.0800	0.0140	0.0682	0.0693	67.7	69.1	1	29.0-124			1.60	20
Acenaphthylene	0.0800	ND	0.0640	0.0675	80.0	84.3	1	35.0-120			5.31	20
Benzo(a)anthracene	0.0800	0.117	0.195	0.177	97.2	74.6	1	13.0-132			9.76	27
Benzo(a)pyrene	0.0800	0.107	0.174	0.157	83.8	63.3	1	14.0-138			9.94	27
Benzo(b)fluoranthene	0.0800	0.291	0.350	0.322	73.3	38.2	1	10.0-129			8.35	31
Benzo(g,h,i)perylene	0.0800	0.170	0.234	0.213	80.6	54.7	1	10.0-133			9.28	30
Benzo(k)fluoranthene	0.0800	0.0587	0.146	0.134	110	93.8	1	15.0-131			8.99	27
Chrysene	0.0800	0.172	0.246	0.219	93.1	59.3	1	15.0-137			11.6	25
Dibenz(a,h)anthracene	0.0800	0.0742	0.145	0.132	88.1	72.2	1	15.0-132			9.19	27
Fluoranthene	0.0800	0.127	0.199	0.175	90.2	60.5	1	13.0-139			12.7	28
Fluorene	0.0800	0.0137	0.0730	0.0689	74.1	69.1	1	27.0-122			5.71	22
Indeno(1,2,3-cd)pyrene	0.0800	0.140	0.211	0.192	88.4	64.7	1	11.0-133			9.41	29
Naphthalene	0.0800	0.226	0.249	0.229	28.6	4.58	1	18.0-136		J6	8.05	21
Phenanthrene	0.0800	0.133	0.184	0.164	63.7	38.4	1	15.0-133			11.6	25
Pyrene	0.0800	0.0791	0.140	0.127	76.5	60.1	1	11.0-146			9.77	29
1-Methylnaphthalene	0.0800	0.214	0.223	0.206	11.8	0.000	1	24.0-137	J6	J6	8.18	22
2-Methylnaphthalene	0.0800	0.446	0.438	0.387	0.000	0.000	1	23.0-136	V	V	12.5	22
2-Chloronaphthalene	0.0800	ND	0.0589	0.0628	73.6	78.5	1	36.0-120			6.34	20
(S) Nitrobenzene-d5					77.2	76.1		14.0-149				
(S) 2-Fluorobiphenyl					80.6	81.5		34.0-125				
(S) p-Terphenyl-d14					84.6	79.9		23.0-120				

Method Blank (MB)

(MB) R3309041-3 05/11/18 08:40

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	82.0			14.0-149
(S) 2-Fluorobiphenyl	73.3			34.0-125
(S) p-Terphenyl-d14	80.5			23.0-120

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

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

(LCS) R3309041-1 05/11/18 07:57 • (LCSD) R3309041-2 05/11/18 08:19

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	0.0549	0.0523	68.6	65.3	50.0-125			4.88	20
Acenaphthene	0.0800	0.0474	0.0480	59.3	60.0	52.0-120			1.20	20
Acenaphthylene	0.0800	0.0484	0.0492	60.4	61.5	51.0-120			1.77	20
Benzo(a)anthracene	0.0800	0.0543	0.0513	67.9	64.1	46.0-121			5.69	20
Benzo(a)pyrene	0.0800	0.0559	0.0530	69.9	66.3	42.0-121			5.39	20
Benzo(b)fluoranthene	0.0800	0.0518	0.0503	64.8	62.9	42.0-123			3.01	20
Benzo(g,h,i)perylene	0.0800	0.0542	0.0514	67.7	64.2	43.0-128			5.32	20
Benzo(k)fluoranthene	0.0800	0.0582	0.0541	72.7	67.7	45.0-128			7.17	20
Chrysene	0.0800	0.0556	0.0525	69.5	65.6	48.0-127			5.74	20
Dibenz(a,h)anthracene	0.0800	0.0540	0.0512	67.4	63.9	43.0-132			5.32	20
Fluoranthene	0.0800	0.0561	0.0529	70.1	66.1	49.0-129			5.79	20

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

(LCS) R3309041-1 05/11/18 07:57 • (LCSD) R3309041-2 05/11/18 08:19

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	0.0481	0.0482	60.1	60.3	50.0-120			0.353	20
Indeno(1,2,3-cd)pyrene	0.0800	0.0545	0.0518	68.1	64.8	44.0-131			5.01	20
Naphthalene	0.0800	0.0416	0.0445	52.1	55.7	50.0-120			6.71	20
Phenanthrene	0.0800	0.0509	0.0483	63.6	60.4	48.0-120			5.13	20
Pyrene	0.0800	0.0559	0.0530	69.9	66.2	48.0-135			5.33	20
1-Methylnaphthalene	0.0800	0.0470	0.0490	58.7	61.3	52.0-122			4.26	20
2-Methylnaphthalene	0.0800	0.0449	0.0470	56.1	58.8	52.0-120			4.67	20
2-Chloronaphthalene	0.0800	0.0477	0.0494	59.7	61.7	50.0-120			3.33	20
(S) Nitrobenzene-d5				87.8	77.5	14.0-149				
(S) 2-Fluorobiphenyl				75.0	67.1	34.0-125				
(S) p-Terphenyl-d14				76.0	66.2	23.0-120				

L992400-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L992400-01 05/11/18 15:21 • (MS) R3309041-4 05/11/18 15:42 • (MSD) R3309041-5 05/11/18 16:03

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>	<u>MSD Qualifier</u>	RPD %	RPD Limits %
Anthracene	0.116	ND	0.0797	0.0733	69.0	63.4	1	20.0-136			8.43	24
Acenaphthene	0.116	ND	0.0502	0.0472	43.5	40.8	1	29.0-124			6.18	20
Acenaphthylene	0.116	ND	0.0534	0.0504	46.2	43.6	1	35.0-120			5.72	20
Benzo(a)anthracene	0.116	0.0723	0.154	0.114	70.3	36.2	1	13.0-132		J3	29.5	27
Benzo(a)pyrene	0.116	0.0667	0.107	0.0864	35.3	17.1	1	14.0-138			21.7	27
Benzo(b)fluoranthene	0.116	0.272	0.319	0.193	40.6	0.000	1	10.0-129		J3 J6	49.3	31
Benzo(g,h,i)perylene	0.116	0.169	0.146	0.131	0.000	0.000	1	10.0-133	J6	J6	11.2	30
Benzo(k)fluoranthene	0.116	0.0688	0.135	0.109	57.3	34.5	1	15.0-131			21.6	27
Chrysene	0.116	0.0956	0.240	0.146	125	43.9	1	15.0-137		J3	48.6	25
Dibenz(a,h)anthracene	0.116	0.0260	0.0690	0.0645	37.2	33.3	1	15.0-132			6.78	27
Fluoranthene	0.116	0.0708	0.132	0.113	52.7	36.1	1	13.0-139			15.7	28
Fluorene	0.116	ND	0.0544	0.0506	43.8	40.5	1	27.0-122			7.21	22
Indeno(1,2,3-cd)pyrene	0.116	0.112	0.127	0.113	12.6	0.824	1	11.0-133		J6	11.3	29
Naphthalene	0.116	ND	0.0595	0.0507	39.5	32.0	1	18.0-136			15.8	21
Phenanthrene	0.116	0.0211	0.0743	0.0760	46.0	47.6	1	15.0-133			2.35	25
Pyrene	0.116	0.128	0.198	0.164	61.0	31.2	1	11.0-146			19.0	29
1-Methylnaphthalene	0.116	ND	0.0646	0.0575	47.1	41.0	1	24.0-137			11.6	22
2-Methylnaphthalene	0.116	ND	0.0658	0.0593	41.1	35.5	1	23.0-136			10.5	22
2-Chloronaphthalene	0.116	ND	0.0499	0.0459	43.2	39.7	1	36.0-120			8.36	20
(S) Nitrobenzene-d5					58.9	70.3		14.0-149				
(S) 2-Fluorobiphenyl					38.9	43.8		34.0-125				
(S) p-Terphenyl-d14					49.4	57.3		23.0-120				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
B	The same analyte is found in the associated blank.
J	The identification of the analyte is acceptable; the reported value is an estimate.
J1	Surrogate recovery limits have been exceeded; values are outside upper control limits.
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.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.
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



ESC Lab Sciences 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 ESC Lab Sciences.

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	TN2000002
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	T 104704245-17-14
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

ESC Lab Sciences 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. ESC Lab Sciences performs all testing at our central laboratory.



Berry Petroleum - Denver, CO

1999 Broadway, Suite 3700
Denver, CO 93309

Report to:
Dave Nicholson

Project
Description:

Phone: 303-999-4400
Fax: 303-999-4401

Client Project #

303-601-2023

City/State
Collected:

Lab Project #
BERPETDCO-NICHOLSON

Collected by (print):

Site/Facility ID #

P.O. #

Collected by (signature):

DK Nicholson
Immediately
Packed on Ice N ☒

Rush? (Lab MUST Be Notified)

☐ Same Day ☐ Five Day
☐ Next Day ☐ 5 Day (Rad Only)
☐ Two Day ☐ 10 Day (Rad Only)
☐ Three Day

Quote #

Date Results Needed

No.
of
Cntrs

Sample ID

Comp/Grab

Matrix *

Depth

Date

Time

No.
of
Cntrs

~~03~~ 036-B
0-29
I-31
F-01
LI-02
O-06
I-11
J-13

SS

5/5

1600

2

X

X

SS

5/6

1010

2

X

X

SS

1050

2

X

X

SS

1100

2

X

X

SS

1130

2

X

X

SS

1200

2

X

X

SS

1320

2

X

X

SS

1350

2

X

X

SS

2

X

X

SS

2

X

X

* Matrix:

SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other

Remarks:

Samples returned via:

☐ UPS ☐ FedEx ☐ Courier

Tracking #

4276 0141 2910

Relinquished by: (Signature)

DK Nicholson

Date:

5/7/18

Time:

1200

Received by: (Signature)

Fedex

Trip Blank Received: Yes/No

HCL/MeOH
TBR

Relinquished by: (Signature)

Date:

Time:

Received by: (Signature)

Temp: 0.5°C Bottles Received: 16

Relinquished by: (Signature)

Date:

Time:

Received for lab by: (Signature)

Date: 5-8-18 Time: 2845

Hold:

Condition:

NCF / 10

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



L.A.B. S.C.I.E.N.C.E.S.

a subsidiary of

12065 Lebaron Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859



L# 991930

T# E173

Acctnum: BERPETDCO

Template: T134889

Prelogin: P648203

TSR: 134 - Mark W. Beasley

PB: 4-10-18 cm

Shipped Via: FedEX Ground

Remarks

Sample # (lab only)

01

02

03

04

05

06

07

08

Sample Receipt Checklist

COC Seal Present/Intact: ☒ Y ☐ N

COC Signed/Accurate: ☒ Y ☐ N

Bottles arrive intact: ☒ Y ☐ N

Correct bottles used: ☒ Y ☐ N

Sufficient volume sent: ☒ Y ☐ N

If Applicable

VOA Zero Headspace: ☐ Y ☐ N

Preservation Correct/Checked: ☐ Y ☐ N

If preservation required by Login: Date/Time