



February 23, 2017

Brett Middleton
Environmental Specialist
Encana Oil & Gas (USA) Inc.
143 Diamond Avenue
Parachute, CO 81635

Subject: Report of Work Completed – Soil Boring and Sampling
EF C27 595 – Pit Closure and Remediation System
COGCC Location ID: 335828
NENW, Section 27, T5S-R95W
39.589377/-108.044445 (WGS 84)
Garfield County, Colorado

Dear Mr. Middleton:

Apex Companies, LLC (Apex), prepared this report of work completed for Encana Oil & Gas (USA) Inc. (Encana) to present the results of in-situ soil samples collected during soil boring activities carried out on the C27 well pad in Encana's North Parachute Ranch.

These samples were collected to provide the status of ongoing in-situ remediation efforts at the former site of a produced water storage pit at the location.

BACKGROUND

Based on records acquired from the Colorado Oil & Gas Conservation Commission (COGCC) and provided by Encana, the produced water storage pit at this location was closed in 2014. Per COGCC rules, the closure was documented in a Form 27, and a remediation number was assigned. After removal of the pit liner, collected below-liner soil samples identified organic, inorganic, and metal constituents of concern above COGCC allowable concentrations, indicating a possible liner failure. It appears that a Form 19 was submitted to document the failed liner, but no record of the submittal could be found in the COGCC database. A subsequent site investigation with an environmental drilling rig was undertaken to determine the vertical and horizontal extent of soil impacts, and to install vertical SVE (soil vapor extraction) wells to augment natural attenuation, monitor subsurface conditions, and support future remediation efforts. More detailed descriptions and details of these project phases, may be found in the following COGCC documents associated with this project.

- Form 27 (Doc: 2147922) (Rem: 8255)
- Form 4 (Doc: 400818110)

APPROACH

During November 15 activities on the location, an Apex drilling coordinator and drilling contractor advanced two soil borings with an 8.25-inch hollow-stem auger to depths of 20 to 35 feet below ground surface (bgs). Boring locations were selected based on previous boring sites with elevated soil hydrocarbon concentrations, and where SVE wells were installed. Beginning at pre-determined depths, using a 2-foot split-spoon sampler, soil was field-screened at 5-foot intervals with visual and olfactory observation and a photoionization detector (PID). At targeted sampling intervals, and where field-screening results indicated possible hydrocarbon impacts, soil samples were collected and submitted for laboratory analysis of TPH (DRO and GRO) and BTEX.

Results for the collected samples were compared to previous samples collected at similar depths within the same drilling area. These comparisons were used to provide data on the progress of augmented natural attenuation at the site.

A summary of historic and recent laboratory results is attached to this letter, along with laboratory results from drilling efforts in November, 2016. Figures illustrating the location of the project site and sampling locations are also provided. Historic sampling points identified in the attached figure were approximated from aerial imagery.

FINDINGS

A total of three soil samples were submitted for laboratory analysis, with two showing hydrocarbon concentrations above the COGCC allowable limit for TPH. For the location where previous samples were in the same general area, and at similar depths (SBN01), higher and lower TPH concentrations, at different depths, are observed between initial sampling (2014) and the recent event (2016). The other sample collected in 2016, SBMid01, confirmed previous findings of soil hydrocarbon concentrations below COGCC allowable limits. No groundwater was encountered in any of the soil borings at this location.

CONCLUSIONS

Based on a comparison of sample data from 2014 with recently collected 2016 samples, it appears that hydrocarbon degradation through natural attenuation is occurring. For a more complete understanding of soil conditions at the site, and possible effects of wind-powered SVE wells in augmenting natural attenuation, Apex recommends that a larger number of soil borings and samples be collected in close proximity, and at distance from the installed SVE wells during the next scheduled site characterization event. Several intensive sampling events over several years should provide adequate data to evaluate remediation system effectiveness with greater statistical confidence.

If you have any questions about this report, or the activities and conclusions described, please do not hesitate to contact me at 970-261-1127.

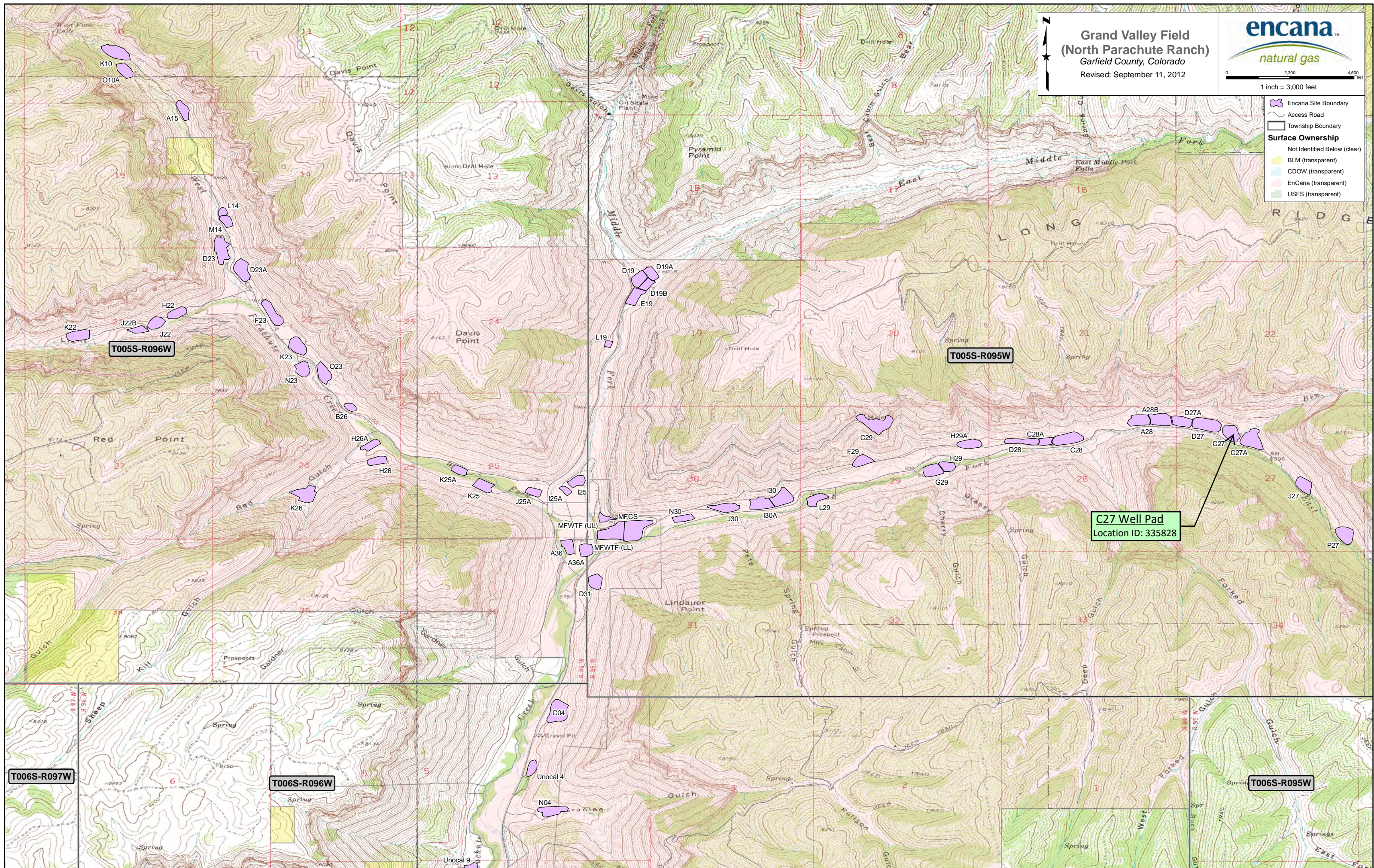
Sincerely,
Apex Companies, LLC

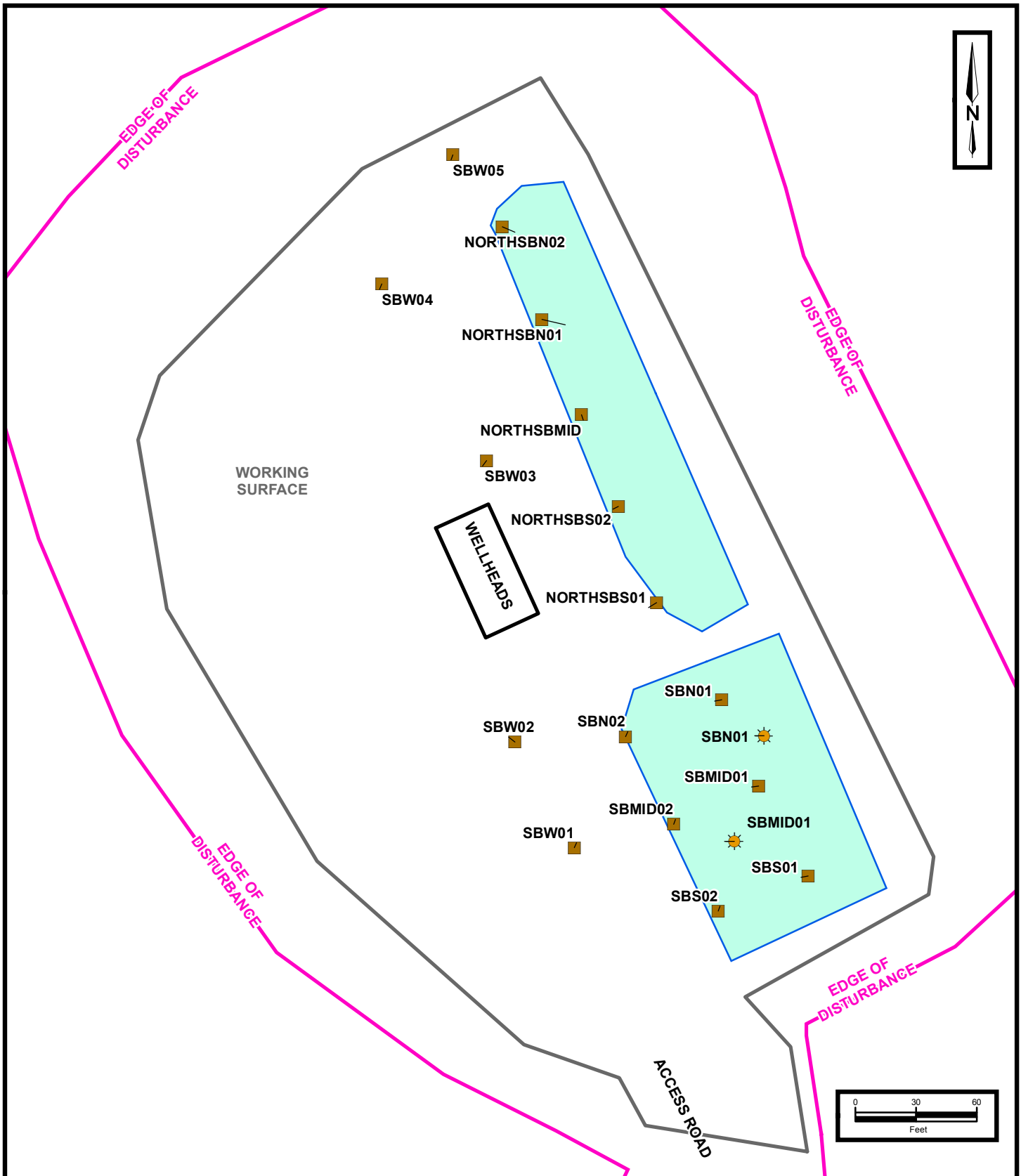


Chris Hines
Project Manager

ATTACHMENTS

- Location Map
- Site Diagram
- Laboratory Results Summary Table
- Laboratory Reports





- Pit Footprint
- ☀ Soil Boring (November 2016)
- Soil Boring (July 2014)



Apex Companies, LLC
 743 Horizon Ct., Suite 110
 Grand Junction, Colorado 81506
 Phone: (970) 263-8679
www.apexcos.com

EF C27 595 Well Pad
COGCC Location ID: 335828
NENW, Section 27, T5S-R95W
39.589377, -108.044445
Garfield County, Colorado

Location	Sample Date:	Sample Matrix	Matrix Notes	Organic Compounds in Soil (mg/kg [ppm])						
				500			0.17	85	100	175
			Allowable Concentration -->	TPH (total volatile and extractable petroleum hydrocarbons) (TPH-GRO + TPH-DRO)	TPH-GRO (C6-C10) Low Fraction	TPH-DRO (C10-C36) High Fraction	Benzene	Toluene	Ethylbenzene	Xylenes - total
C27	04/07/14	Pit	North BL Ewall [10-15']	1801.7	1.7	1800	BDL	BDL	BDL	BDL
C27	04/07/14	Pit	North BL Nbot [10-15']	1201.5	1.5	1200	BDL	BDL	BDL	BDL
C27	04/07/14	Pit	North BL Nwall [10-15']	76	BDL	76	BDL	BDL	BDL	BDL
C27	04/07/14	Pit	North BL Sbot [10-15']	3990	290	3700	0.56	1.6	0.45	12
C27	04/07/14	Pit	North BL Swall [10-15']	BDL	BDL	BDL	0.0029	BDL	BDL	BDL
C27	04/07/14	Pit	North BL Wwall [10-15']	600	180	420	0.044	BDL	0.21	6
C27	06/11/14	Pit	Sout BL Sbot [10-15']	457	57	400	0.013	BDL	BDL	0.068
C27	06/11/14	Pit	South BL Center [10-15']	2106	6	2100	0.012	BDL	BDL	BDL
C27	06/11/14	Pit	South BL Ewall [10-15']	180	BDL	180	BDL	BDL	BDL	BDL
C27	06/11/14	Pit	South BL Nbot [10-15']	647	67	580	0.044	BDL	0.019	0.35
C27	06/11/14	Pit	South BL Nwall [10-15']	262	22	240	BDL	BDL	BDL	BDL
C27	06/11/14	Pit	South BL Swall [10-15']	1200	BDL	1200	0.03	BDL	BDL	0.073
C27	06/11/14	Pit	South BL Wwall [10-15']	1660	360	1300	BDL	BDL	BDL	1.3
C27	09/18/14	Pit	North SB S02 [10-12']	800		800	0.036	BDL	0.029	0.42
C27	09/18/14	Pit	North SB S01 [35-37']	130		130	BDL	BDL	BDL	0.0077
C27	09/18/14	Pit	North SB S01 [40-42']	170		170	BDL	BDL	BDL	0.0086
C27	09/18/14	Pit	North SB S01 [5-7']	1200		1200	0.018	BDL	0.0037	0.076
C27	09/19/14	Pit	North SB Mid [10-12']	1300		1300	BDL	BDL	0.0093	0.056
C27	09/19/14	Pit	North SB Mid [50-52']	110		110	BDL	BDL	BDL	0.015
C27	09/19/14	Pit	North SB S02 [45-47']	200		200	BDL	BDL	BDL	0.035
C27	09/22/14	Pit	North SB Mid [80-82']	82		82	BDL	BDL	BDL	0.014
C27	09/22/14	Pit	North SB N01 [15-17']	230		230	BDL	BDL	BDL	BDL
C27	09/22/14	Pit	North SB N01 [70-72']	110		110	BDL	BDL	BDL	BDL
C27	09/22/14	Pit	North SB N02 [10-12']	3600		3600	0.088	0.76	0.39	3.2
C27	09/22/14	Pit	North SB N02 [45-47']	38		38	BDL	BDL	BDL	BDL
C27	09/24/14	Pit	South SB Mid01 [25-27"]	120		120				
C27	09/24/14	Pit	South SB Mid01 [35-37']	110		110				
C27	09/24/14	Pit	South SB S01 [15-17']	1500		1500				
C27	09/24/14	Pit	South SB S01 [35-37']	70		70				
C27	09/25/14	Pit	South SB N01 [25-27']	3200		3200				
C27	09/25/14	Pit	South SB N01 [30-32']	8800		8800				
C27	09/25/14	Pit	South SB N01 [65-67']	110		110				
C27	09/25/14	Pit	South SB N02 [15-17']	1500		1500				
C27	09/25/14	Pit	South SB N02 [40-42']	110		110				
C27	09/26/14	Pit	South SB Mid02 [15-17']	6100		6100				
C27	09/26/14	Pit	South SB Mid02 [40-42']	71		71				
C27	09/26/14	Pit	South SB S02 [20-22']	44		44				
C27	09/26/14	Pit	South SB S02 [40-42']	220		220				
C27	09/29/14	Pit	SB W01 [45-47']	120		120				
C27	09/29/14	Pit	SB W02 [45-47']	160		160				
C27	09/29/14	Pit	SB W03 [45-47']	240		240				
C27	09/29/14	Pit	SB W04 [45-47']	130		130				
C27	09/30/14	Pit	SB W05 [45-47']	10		10				
C27	11/15/16	Pit	South SB MID01 [15-17']	196.359	0.359	196	0.00555	0.0112	0.00121	0.0129
C27	11/15/16	Pit	South SB N01 [25-27']	4484.2	74.2	4410	0.0392	<0.124	0.152	1.96
C27	11/15/16	Pit	South SB N01 [30-32']	3053.54	3.54	3050	0.0511	1.71	0.109	3.43

EnCana Oil & Gas - Parachute, CO

Sample Delivery Group: L873886
Samples Received: 11/19/2016
Project Number: EF C27 595 PIT CLOSU
Description: EF 27C 595 Site Characterization
Site: EF C27 595
Report To: Brett Middleton
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:



Shane Gambill
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.



¹Cp: Cover Page	1
²Tc: Table of Contents	2
³Ss: Sample Summary	3
⁴Cn: Case Narrative	4
⁵Sr: Sample Results	5
20161115-C27(SBNO1) 25-27 L873886-01	5
20161115-C27(SBNO1) 30-32 L873886-02	6
20161115-C27(SBSMID01) 15-17 L873886-03	7
⁶Gl: Glossary of Terms	8
⁷Al: Accreditations & Locations	9
⁸Sc: Chain of Custody	10

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

SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



20161115-C27(SBNO1) 25-27 L873886-01 Solid

Collected by
Jana Nilsen

Collected date/time
11/15/16 07:30

Received date/time
11/19/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi-Volatile Organic Compounds (GC) by Method 8015	WG929315	20	11/25/16 11:38	11/25/16 21:44	TH
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG928851	24.75	11/17/16 08:24	11/29/16 17:45	BMB
Volatile Organic Compounds (GC/MS) by Method 8260B	WG928848	24.75	11/21/16 14:57	11/29/16 15:35	BMB

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Gl

⁷Al

⁸Sc

20161115-C27(SBNO1) 30-32 L873886-02 Solid

Collected by
Jana Nilsen

Collected date/time
11/15/16 08:15

Received date/time
11/19/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi-Volatile Organic Compounds (GC) by Method 8015	WG929315	20	11/25/16 11:38	11/25/16 21:56	TH
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG928851	1	11/22/16 08:21	11/28/16 20:28	DAH
Volatile Organic Compounds (GC/MS) by Method 8260B	WG928848	25	11/21/16 14:57	11/29/16 15:56	BMB

20161115-C27(SBSMID01) 15-17 L873886-03 Solid

Collected by
Jana Nilsen

Collected date/time
11/15/16 09:00

Received date/time
11/19/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi-Volatile Organic Compounds (GC) by Method 8015	WG929315	1	11/25/16 11:38	11/25/16 20:20	TH
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG928851	1	11/22/16 08:21	11/28/16 22:36	DAH
Volatile Organic Compounds (GC/MS) by Method 8260B	WG928848	1	11/22/16 08:21	11/26/16 20:35	BRA

ACCOUNT:

EnCana Oil & Gas - Parachute, CO

PROJECT:

EF C27 595 PIT CLOSURE

SDG:

L873886

DATE/TIME:

11/30/16 11:35

PAGE:

3 of 11



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. 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.

Shane Gambill
Technical Service Representative

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Gl

⁷ Al

⁸ Sc



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

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	74.2		2.48	24.75	11/29/2016 17:45	WG928851
(S) a,a,a-Trifluorotoluene(FID)	100		59.0-128		11/29/2016 17:45	WG928851

1
Cp2
Tc3
Ss

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

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.0392		0.0248	24.75	11/29/2016 15:35	WG928848
Toluene	ND		0.124	24.75	11/29/2016 15:35	WG928848
Ethylbenzene	0.152		0.0248	24.75	11/29/2016 15:35	WG928848
Total Xylenes	1.96		0.0742	24.75	11/29/2016 15:35	WG928848
(S) Toluene-d8	105		88.7-115		11/29/2016 15:35	WG928848
(S) Dibromofluoromethane	97.7		76.3-123		11/29/2016 15:35	WG928848
(S) a,a,a-Trifluorotoluene	105		87.2-117		11/29/2016 15:35	WG928848
(S) 4-Bromofluorobenzene	120		69.7-129		11/29/2016 15:35	WG928848

4
Cn5
Sr6
Gl7
Al8
Sc

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	4410		80.0	20	11/25/2016 21:44	WG929315
(S) o-Terphenyl	423	J7	50.0-150		11/25/2016 21:44	WG929315



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

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	3.54		0.100	1	11/28/2016 20:28	WG928851
(S) a,a,a-Trifluorotoluene(FID)	100		59.0-128		11/28/2016 20:28	WG928851

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

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.0511		0.0250	25	11/29/2016 15:56	WG928848
Toluene	1.71		0.125	25	11/29/2016 15:56	WG928848
Ethylbenzene	0.109		0.0250	25	11/29/2016 15:56	WG928848
Total Xylenes	3.43		0.0750	25	11/29/2016 15:56	WG928848
(S) Toluene-d8	106		88.7-115		11/29/2016 15:56	WG928848
(S) Dibromofluoromethane	96.3		76.3-123		11/29/2016 15:56	WG928848
(S) a,a,a-Trifluorotoluene	102		87.2-117		11/29/2016 15:56	WG928848
(S) 4-Bromofluorobenzene	107		69.7-129		11/29/2016 15:56	WG928848

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	3050		80.0	20	11/25/2016 21:56	WG929315
(S) o-Terphenyl	111	J7	50.0-150		11/25/2016 21:56	WG929315

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Gl

7 Al

8 Sc



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

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.359		0.100	1	11/28/2016 22:36	WG928851
(S) a,a,a-Trifluorotoluene(FID)	98.5		59.0-128		11/28/2016 22:36	WG928851

1 Cp

2 Tc

3 Ss

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

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00555		0.00100	1	11/26/2016 20:35	WG928848
Toluene	0.0112		0.00500	1	11/26/2016 20:35	WG928848
Ethylbenzene	0.00121		0.00100	1	11/26/2016 20:35	WG928848
Total Xylenes	0.0129		0.00300	1	11/26/2016 20:35	WG928848
(S) Toluene-d8	102		88.7-115		11/26/2016 20:35	WG928848
(S) Dibromofluoromethane	129	J1	76.3-123		11/26/2016 20:35	WG928848
(S) a,a,a-Trifluorotoluene	95.9		87.2-117		11/26/2016 20:35	WG928848
(S) 4-Bromofluorobenzene	93.6		69.7-129		11/26/2016 20:35	WG928848

4 Cn

5 Sr

6 Gl

7 Al

8 Sc

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	196		4.00	1	11/25/2016 20:20	WG929315
(S) o-Terphenyl	97.9		50.0-150		11/25/2016 20:20	WG929315



Abbreviations and Definitions

SDG	Sample Delivery Group.
RDL	Reported Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
(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.

Qualifier	Description
-----------	-------------

J1	Surrogate recovery limits have been exceeded; values are outside upper control limits.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Gl⁷ Al⁸ 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.

State Accreditations

Alabama	40660	Nevada	TN-03-2002-34
Alaska	UST-080	New Hampshire	2975
Arizona	AZ0612	New Jersey–NELAP	TN002
Arkansas	88-0469	New Mexico	TN00003
California	01157CA	New York	11742
Colorado	TN00003	North Carolina	Env375
Connecticut	PH-0197	North Carolina ¹	DW21704
Florida	E87487	North Carolina ²	41
Georgia	NELAP	North Dakota	R-140
Georgia ¹	923	Ohio–VAP	CL0069
Idaho	TN00003	Oklahoma	9915
Illinois	200008	Oregon	TN200002
Indiana	C-TN-01	Pennsylvania	68-02979
Iowa	364	Rhode Island	221
Kansas	E-10277	South Carolina	84004
Kentucky ¹	90010	South Dakota	n/a
Kentucky ²	16	Tennessee ¹⁴	2006
Louisiana	AI30792	Texas	T 104704245-07-TX
Maine	TN0002	Texas ⁵	LAB0152
Maryland	324	Utah	6157585858
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	109
Minnesota	047-999-395	Washington	C1915
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA
Nebraska	NE-OS-15-05		

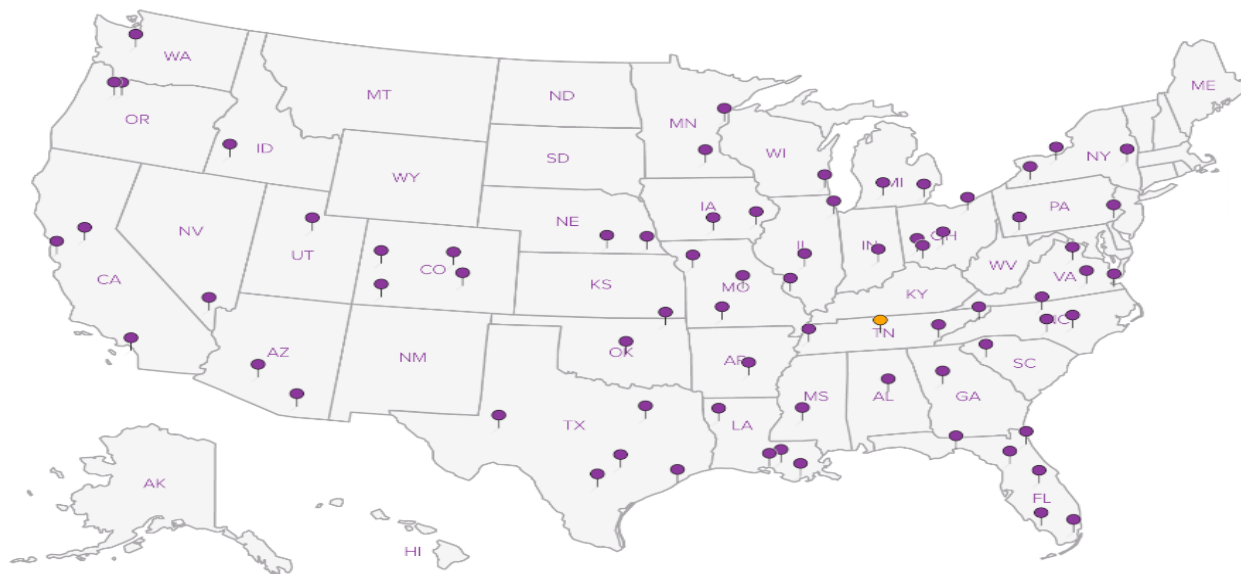
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA	100789
A2LA – ISO 17025 ⁵	1461.02	DOD	1461.01
Canada	1461.01	USDA	S-67674
EPA–Crypto	TN00003		

¹ Drinking Water ² Underground Storage Tanks ³ Aquatic Toxicity ⁴ Chemical/Microbiological ⁵ Mold ^{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.**





Cooler Receipt Form

Client: ENCANACO	SDG#	6873886		
Cooler Received/Opened On: 11-19-16	Temperature Upon Receipt:	2.7 °C		
Received by: Greg Dearmon				
Signature: Greg Dearmon				
Receipt Check List		Yes	No	N/A
Were custody seals on outside of cooler and intact?				/
Were custody papers properly filled out?		/		
Did all bottles arrive in good condition?		/		
Were correct bottles used for the analyses requested?		/		
Was sufficient amount of sample sent in each bottle?		/		
Were all applicable sample containers correctly preserved and checked for preservation? (Any not in accepted range noted on COC)				/
If applicable, was an observable VOA headspace present?				/
Non Conformance Generated. (If yes see attached NCF)				