

December 7, 2016

Mr. Randall Ferguson  
EHS Senior Compliance Specialist  
PDC Energy, Inc.  
1775 Sherman Street, Suite 3000  
Denver, CO 80203

**RE: Produced Water Vessel Closure Report  
Smith Lane #1 Tank Battery  
Facility ID #: 319750  
SWSW S5 T1S R67W  
Blanket Remediation #: 9440**

Dear Mr. Ferguson,

On behalf of PDC Energy, Inc. (PDC), Tasman Geosciences, Inc. (Tasman) has prepared this Produced Water Vessel Closure Report (Report) to document environmental sampling activities performed at the above-referenced site. This Report is being submitted under the Form 27 Management Plan for Closure of Produced Water Vessels, which has been assigned Blanket Remediation #9440 by the Colorado Oil and Gas Conservation Commission (COGCC).

A summary of excavation and environmental sampling activities is provided below.

### **Site Assessment Activities**

On November 29, 2016, confirmation sampling activities were conducted following the removal of the partially buried produced water vessel. Soil encountered in the excavation was field screened for volatile organic compound (VOC) concentrations in soil using a photoionization detector (PID). One soil sample (SS01) was collected below the former vessel location at approximately 6 feet below ground surface (bgs). The sample was submitted to Summit Scientific Laboratories in Golden, Colorado for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX), naphthalene, and total petroleum hydrocarbons (TPH) – gasoline range organics (GRO) by United States Environmental Protection Agency (USEPA) Method 8260B, TPH – diesel range organics (DRO) by USEPA Method 8015, pH, and electrical conductivity (EC).

Analytical results indicated that organic compound concentrations were in compliance with COGCC Table 910-1 soil standards. PH was in exceedance of regulatory standards, however no further soil removal is required as the sample was collected below the COGCC designated root zone.

The excavation extent and soil sample location are illustrated on Figure 1. Soil analytical data is summarized in Table 1 and the laboratory analytical report is included as Attachment A.

### **Conclusions**

Based on the soil analytical data described herein, petroleum hydrocarbon impacts in exceedance of regulatory standards were not encountered within the COGCC designated root zone during the removal

of the produced water vessel. Consequently, no further site investigation is recommended at this time. The facility was decommissioned following site assessment activities.

Please contact me at (720) 409-8791 if you have questions regarding this report.

Sincerely,

Tasman Geosciences, Inc.



Christine Hamlin  
Program Manager

Enclosures:

Figure 1 – Excavation Site Map

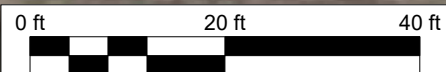
Table 1 – Soil Analytical Results Summary Table

Attachment A – Laboratory Analytical Report



↑  
Surface  
Drainage

SS01 @ 6'



Google Earth 2016

**Note:** Surface drainage direction is estimated based on site topography and is not related to regional topography.

DRAWN BY: BRN

DATE: 12/7/2016

**Facility Diagram**  
PDC Energy, Inc. – DJ Basin  
Smith Lane #1 Tank Battery  
SWSW S5 T1S R67W  
Adams County, CO



6899 Pecos Street, Unit C  
Denver, CO 80221

LEGEND

- Excavation Extent
- Soil Sample Location

All locations are approximate unless otherwise noted

**FIGURE 1**  
EXCAVATION  
SITE MAP

**TABLE 1**  
**SMITH LANE #1 TANK BATTERY**  
**SOIL ANALYTICAL RESULTS SUMMARY TABLE**

Sample ID	Date Sampled	Depth (feet bgs)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	Naphthalene (mg/kg)	TPH <sup>(2)</sup> (mg/kg)	pH (units)	EC (mmhos/cm)
COGCC standards for soil (mg/kg) <sup>(1)</sup>			0.17	85	100	175	23	500	6-9	<4
SS01 @ 6'	11/29/2016	6	<0.0020	<0.0050	<0.0050	<0.010	<0.010	<50	9.50*	1.53

**Notes:**

1. Standards for soil are taken from 2 CCR 404-1, Table 910-1, effective January 30, 2015.

2. TPH - Total volatile and extractable petroleum hydrocarbons. Value calculated by adding GRO and DRO concentrations.

COGCC = Colorado Oil and Gas Conservation Commission

(<) = Analytical result is less than the indicated laboratory reporting limit.

GRO = Total volatile petroleum hydrocarbons - gasoline range organics

DRO = Total extractable petroleum hydrocarbons - diesel range organics

mg/kg = Milligrams per kilogram

bgs = Below ground surface

EC = Electrical conductivity

mmhos/cm = millimhos per centimeter

**BOLD** = Analytical result is in exceedance of COGCC soil standards.

\* = Sample collected from below designated root zone.

## **ATTACHMENT A**

# Summit Scientific

---

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

December 05, 2016

Mark Longhurst  
PDC Energy  
1775 Sherman St. STE. 3000  
Denver, CO 80203  
RE: Smith Lane #1

Enclosed are the results of analyses for samples received by Summit Scientific on 11/29/16 16:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'P. Shrewsbury', with a stylized, cursive script.

Paul Shrewsbury  
President



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Smith Lane #1  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
12/05/16 12:58

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01@6'	1611239-01	Soil	11/29/16 14:00	11/29/16 16:30

Summit Scientific

A handwritten signature in black ink, appearing to be 'MSM'.

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Smith Lane #1  
Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
12/05/16 12:58

## Summit Scientific

1611239

741 Corporate Circle Suite 1 • Golden, Colorado 80401  
303-277-9310 • 303-374-5933 Fax

Client: PDC Energy / Tasmin LLC  
Address: \_\_\_\_\_  
City/State/Zip: \_\_\_\_\_  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Sampler Name: Brian K. Hester

Page 1 of 1  
Project Manager: Mark Longhurst  
E-Mail: \_\_\_\_\_  
Project Name: Smith Lane #1  
Project Number: \_\_\_\_\_

Sample Description	Date Sampled	Time Sampled	Number of Containers	Preservative				Matrix		Analyze For:				Special Instructions	
				HCl	HNO <sub>3</sub>	None	Other (Specify)	Groundwater	Soil	Air - Container Serial #	Other (Specify)	687EXM	8760		TPH - D60 8015
SS02 @ 6'	11/20/16	1400	1												Hold
SS02 @ 5'		1405	1												
SS03 @ 5'		1405	1												
SS04 @ 5'		1407	1												
SS05 @ 5'		1410	1												
Retrieved by: _____ Date/Time: 11/22/16 Received by: _____ Date/Time: 11/29/16 1630															
Relinquished by: _____ Date/Time: 11/29/16 1000 Received by: _____ Date/Time: _____															
Relinquished by: _____ Date/Time: _____ Received in Lab by: _____ Date/Time: _____															
Turn Around Time (Check) Same Day <input type="checkbox"/> 72 Hours <input type="checkbox"/> 24 Hours <input type="checkbox"/> Standard <input checked="" type="checkbox"/> 48 Hours <input type="checkbox"/>															
Sample Integrity: Temperature Upon Receipt: 4.5°C on ice Intact: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>															

www.s2scientific.com

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.





PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Smith Lane #1  
Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
12/05/16 12:58

### Sample Receipt Checklist

S2 Work Order: 1611239

Client: PDC/Tasman

Client Project ID: Smith Lane #1

Shipped Via: P/U

(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Airbill #: \_\_\_\_\_

Matrix (check all that apply): ☐ Air ☒ Soil/Solid ☐ Water ☐ Other: \_\_\_\_\_  
(Describe)

Cooler ID					
Temp (°C)	4.5				

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature just above 0°C to ≤ 6°C <sup>(1)</sup> ?	✓			
NOTE: If samples are delivered the same day of sampling, this requirement is waived provided that there is evidence that cooling has begun.				
Were all samples received intact <sup>(1)</sup> ?	✓			
Was adequate sample volume provided <sup>(1)</sup> ?	✓			
If custody seals are present, are they intact <sup>(1)</sup> ?			✓	
Are short holding time analytes or samples with HTs due within 48 hours present?			✓	
Is a chain-of-custody (COC) form present and filled out completely <sup>(1)</sup> ?	✓			
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	✓			
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	✓			
Is the COC properly relinquished by the client w/ date and time recorded <sup>(1)</sup> ?	✓			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.			✓	
Are samples preserved that require preservation (excluding cooling) <sup>(1)</sup> ?			✓	
Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect			✓	
If samples are acid preserved for metals, is the pH ≤ 2 <sup>(1)</sup> ?			✓	
Record the pH in Comments.			✓	
If dissolved metals are requested, were samples field filtered?			✓	
Additional Comments (if any):				

<sup>(1)</sup> If NO, then contact the client before proceeding with analysis and note in case narrative.

Nakita  
Custodian Printed Name

[Signature]  
Signature or Initials of Custodian

11/29/16 1700  
Date/Time



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Smith Lane #1  
Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
12/05/16 12:58

**SS01@6'**  
**1611239-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **11/29/16 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1611320	11/30/16	12/01/16	8015M	

Date Sampled: **11/29/16 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		97.0 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **11/29/16 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	1611325	11/30/16	12/01/16	EPA 8260B	
Benzene	ND	0.0020	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.010	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **11/29/16 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		95.6 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		102 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		102 %	21-167		"	"	"	"	

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **11/29/16 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	9.50	0.100	pH Units	1	1612021	12/02/16	12/02/16	EPA 9045	

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Smith Lane #1  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
12/05/16 12:58

**SS01@6'**  
**1611239-01 (Soil)**

**Summit Scientific**

**Physical Parameters by APHA/ASTM/EPA Methods**

Specific Conductance (EC)	1.53	0.0100 mmhos/cm	1	1612020	12/02/16	12/02/16	SM 2510B
---------------------------	------	-----------------	---	---------	----------	----------	----------

Summit Scientific

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Smith Lane #1  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
12/05/16 12:58

**Extractable Petroleum Hydrocarbons by 8015 - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1611320 - EPA 3550A**

**Blank (1611320-BLK1)**

Prepared & Analyzed: 11/30/16

C10-C28 (DRO) ND 50 mg/kg

Surrogate: o-Terphenyl 12.8 " 12.5 102 30-150

**LCS (1611320-BS1)**

Prepared & Analyzed: 11/30/16

C10-C28 (DRO) 496 50 mg/kg 499 99.3 73-134

Surrogate: o-Terphenyl 13.0 " 12.5 104 30-150

**Matrix Spike (1611320-MS1)**

Source: 1611238-01

Prepared: 11/30/16 Analyzed: 12/01/16

C10-C28 (DRO) 526 50 mg/kg 499 7.84 104 50-148

Surrogate: o-Terphenyl 12.9 " 12.5 103 30-150

**Matrix Spike Dup (1611320-MSD1)**

Source: 1611238-01

Prepared: 11/30/16 Analyzed: 12/01/16

C10-C28 (DRO) 538 50 mg/kg 499 7.84 106 50-148 2.37 20

Surrogate: o-Terphenyl 13.1 " 12.5 105 30-150

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Smith Lane #1  
Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
12/05/16 12:58

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1611325 - EPA 5030 Soil MS**

**Blank (1611325-BLK1)**

Prepared & Analyzed: 11/30/16

Naphthalene	ND	0.010	mg/kg							
Benzene	ND	0.0020	"							
Toluene	ND	0.0050	"							
Ethylbenzene	ND	0.0050	"							
Xylenes (total)	ND	0.010	"							
Gasoline Range Hydrocarbons	ND	0.50	"							
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0517</i>		<i>"</i>	<i>0.0400</i>		<i>129</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0418</i>		<i>"</i>	<i>0.0400</i>		<i>105</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0418</i>		<i>"</i>	<i>0.0400</i>		<i>105</i>	<i>21-167</i>			

**LCS (1611325-BS1)**

Prepared & Analyzed: 11/30/16

Naphthalene	ND	0.010	mg/kg				66-138			
Benzene	0.0778	0.0020	"	0.100		77.8	58-130			
Toluene	0.0874	0.0050	"	0.100		87.4	61-134			
Ethylbenzene	0.107	0.0050	"	0.0992		108	74-139			
m,p-Xylene	0.193	0.010	"	0.200		96.6	73-137			
o-Xylene	0.0994	0.0050	"	0.0980		101	73-141			
Xylenes (total)	0.292	0.010	"				0-200			
Gasoline Range Hydrocarbons	2.83	0.50	"				30-150			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0492</i>		<i>"</i>	<i>0.0400</i>		<i>123</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0401</i>		<i>"</i>	<i>0.0400</i>		<i>100</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0394</i>		<i>"</i>	<i>0.0400</i>		<i>98.6</i>	<i>21-167</i>			

**Matrix Spike (1611325-MS1)**

Source: 1611246-01

Prepared & Analyzed: 11/30/16

Naphthalene	ND	0.010	mg/kg		ND		10-158			
Benzene	0.0788	0.0020	"	0.100	ND	78.8	30-131			
Toluene	0.0888	0.0050	"	0.100	ND	88.8	30-134			
Ethylbenzene	0.109	0.0050	"	0.0992	ND	110	22-153			
m,p-Xylene	0.196	0.010	"	0.200	ND	98.2	10-159			
o-Xylene	0.102	0.0050	"	0.0980	ND	104	31-151			
Xylenes (total)	0.298	0.010	"		ND		30-160			
Gasoline Range Hydrocarbons	2.81	0.50	"		ND		30-160			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0512</i>		<i>"</i>	<i>0.0400</i>		<i>128</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0400</i>		<i>"</i>	<i>0.0400</i>		<i>100</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0404</i>		<i>"</i>	<i>0.0400</i>		<i>101</i>	<i>21-167</i>			

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Smith Lane #1  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
12/05/16 12:58

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1611325 - EPA 5030 Soil MS**

Matrix Spike Dup (1611325-MSD1)		Source: 1611246-01			Prepared & Analyzed: 11/30/16					
Naphthalene	ND	0.010	mg/kg		ND		10-158		42	
Benzene	0.0789	0.0020	"	0.100	ND	78.9	30-131	0.190	34	
Toluene	0.0896	0.0050	"	0.100	ND	89.6	30-134	0.908	30	
Ethylbenzene	0.107	0.0050	"	0.0992	ND	108	22-153	1.58	24	
m,p-Xylene	0.193	0.010	"	0.200	ND	96.9	10-159	1.36	68	
o-Xylene	0.102	0.0050	"	0.0980	ND	104	31-151	0.618	38	
Xylenes (total)	0.296	0.010	"		ND		30-160	0.678	30	
Gasoline Range Hydrocarbons	2.87	0.50	"		ND		30-160	2.21	30	
Surrogate: 1,2-Dichloroethane-d4	0.0530		"	0.0400		132	23-173			
Surrogate: Toluene-d8	0.0407		"	0.0400		102	20-170			
Surrogate: 4-Bromofluorobenzene	0.0405		"	0.0400		101	21-167			

Summit Scientific

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Smith Lane #1  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
12/05/16 12:58

**Physical Parameters by APHA/ASTM/EPA Methods - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1612020 - General Preparation**

**Blank (1612020-BLK1)**

Prepared & Analyzed: 12/02/16

Specific Conductance (EC) ND 0.0100 mmhos/cm

**LCS (1612020-BS1)**

Prepared & Analyzed: 12/02/16

Specific Conductance (EC) 0.744 0.0100 mmhos/cm 0.750 99.1 90-110

**Duplicate (1612020-DUP1)**

**Source: 1611239-01**

Prepared & Analyzed: 12/02/16

Specific Conductance (EC) 1.45 0.0100 mmhos/cm 1.53 5.47 20

**Batch 1612021 - General Preparation**

**LCS (1612021-BS1)**

Prepared & Analyzed: 12/02/16

pH 8.00 0.100 pH Units 8.00 100 95-105

**Duplicate (1612021-DUP1)**

**Source: 1611239-01**

Prepared & Analyzed: 12/02/16

pH 9.52 0.100 pH Units 9.50 0.210 20

Summit Scientific

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Smith Lane #1

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
12/05/16 12:58

### Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference