

January 4, 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**  
**Annie 3-9 Tank Battery**  
**Facility ID: 327364**  
**NENW S9 T5N R65W**  
**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 September 17, 2015, confirmation sampling activities were completed following the removal of the partially buried produced water vessel. Soil encountered in the excavation area was field screened for volatile organic compound (VOC) concentrations using a photoionization detector (PID). One soil sample (SS01) was collected below the former vessel location at approximately 3.5 feet below ground surface (bgs). The sample was submitted to Summit Scientific Laboratories in Golden, Colorado for analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, and total petroleum hydrocarbons (TPH) - gasoline range organics (GRO) by Environmental Protection Agency (EPA) Method 8260B, TPH - diesel range organics (DRO) by EPA Method 8015, pH, and electrical conductivity (EC).

Analytical results indicated organic compound concentrations and physical parameters in soil sample SS01 were in compliance with COGCC Table 910-1 soil standards.

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 provided in Attachment A.

#### **Conclusions**

Based on the soil analytical data described herein, petroleum hydrocarbon impacts were not encountered 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 any questions regarding this report.

Sincerely,

A handwritten signature in blue ink that reads "Christine Wasko".

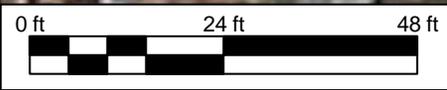
Christine Wasko  
Project Manager  
Tasman Geosciences, Inc.

**Enclosures:**

Figure 1 – Soil Sample Location Map  
Table 1 – Soil Analytical Results Summary Table  
Attachment A – Laboratory Analytical Report



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



DRAWN BY: MAP

DATE: 12/22/2015

**Facility Diagram**  
 PDC Energy – DJ Basin  
 Annie 3-9 Tank Battery  
 NENW S9 T5N R65W  
 Weld County, CO



**TASMAN** 6899 Pecos St., Unit C  
 GEOSCIENCES Denver, CO 80221

**LEGEND**

 Excavation Extent

 Soil Sample Location

All locations are approximate unless otherwise noted

**FIGURE 1**  
**SOIL SAMPLE LOCATION MAP**

**TABLE 1**  
**ANNIE 3-9 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)	EC (mmhos/cm)	pH
<b>COGCC standards for soil (mg/kg) <sup>(1)</sup></b>			<b>0.17</b>	<b>85</b>	<b>100</b>	<b>175</b>	<b>23</b>	<b>500</b>	<b>4 or 2x BG</b>	<b>6-9</b>
SS01 @ 3.5'	9/17/2015	3.5	<0.0020	<0.0050	<0.0050	<0.010	<0.010	<50	1.66	8.62

**Notes:**

1. Standards for soil are taken from 2 CCR 404-1, Table 910-1, effective February 1, 2014.
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.

**ATTACHMENT A**

# Summit Scientific

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741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

September 24, 2015

Mark Longhurst  
PDC Energy  
1775 Sherman St. STE. 3000  
Denver, CO 80203  
RE: Annie 3-9

Enclosed are the results of analyses for samples received by Summit Scientific on 09/18/15 17:45. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Paul Shrewsbury  
President



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

Project: Annie 3-9

Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
09/24/15 08:29

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01@3.5'	1509168-01	Soil	09/17/15 11:09	09/18/15 17:45

# Summit Scientific

1509168

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

Page 1 of 1

Client: PDC Energy  
Address: \_\_\_\_\_  
City/State/Zip: \_\_\_\_\_  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Sampler Name: Matt P

Project Manager: Mark Longhurst  
E-Mail: Mark.Longhurst@PDCE.com  
Project Name: Annie 3-9  
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 - Canister Serial #	Other (Specify)	GBTEXN	DFO	EC	PH		SAR (or Hold)
SS01@3.5'	9/17/15	11:09	1			X		X				X	X	X	X	1	
Relinquished by: <u>[Signature]</u> Date/Time: <u>9/17/15 20:00</u> Received by: <u>[Signature]</u> Date/Time: <u>9/18/15 5:49</u> Relinquished by: _____ Date/Time: _____ 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"/>					Notes:  <u>aw ic</u>		
										Sample Integrity: Temperature Upon Receipt: <u>5.5°C</u> 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: Annie 3-9

Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
09/24/15 08:29

**SS01@3.5'**  
**1509168-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: 09/17/15 11:09

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1509185	09/21/15	09/22/15	8015M	

Date Sampled: 09/17/15 11:09

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		95.3 %	30-150		"	"	"	"	

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

Date Sampled: 09/17/15 11:09

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	1509186	09/21/15	09/22/15	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: 09/17/15 11:09

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		118 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		107 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		109 %	21-167		"	"	"	"	

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

Date Sampled: 09/17/15 11:09

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	1.66	0.0100	mmhos/cm	1	1509191	09/21/15	09/24/15	SM 2510B	

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

Project: Annie 3-9

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 09/24/15 08:29

**SS01@3.5'**  
**1509168-01 (Soil)**

**Summit Scientific**

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

Date Sampled: **09/17/15 11:09**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
<b>pH</b>	<b>8.62</b>	0.100	pH Units	1	1509190	09/21/15	09/24/15	EPA 9045	

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 1775 Sherman St. STE. 3000  
 Denver CO, 80203

Project: Annie 3-9

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 09/24/15 08:29

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

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

**Batch 1509185 - EPA 3550A**

<b>Blank (1509185-BLK1)</b>				Prepared & Analyzed: 09/21/15							
C10-C28 (DRO)	ND	50	mg/kg								
Surrogate: <i>o</i> -Terphenyl	11.6		"	12.2	94.9	30-150					
<b>LCS (1509185-BS1)</b>				Prepared & Analyzed: 09/21/15							
C10-C28 (DRO)	516	50	mg/kg	499	103	73-134					
Surrogate: <i>o</i> -Terphenyl	11.8		"	12.2	96.6	30-150					
<b>Matrix Spike (1509185-MS1)</b>				Source: 1509141-01		Prepared: 09/21/15 Analyzed: 09/22/15					
C10-C28 (DRO)	453	50	mg/kg	485	8.86	91.6	50-148				
Surrogate: <i>o</i> -Terphenyl	11.5		"	11.9	97.1	30-150					
<b>Matrix Spike Dup (1509185-MSD1)</b>				Source: 1509141-01		Prepared: 09/21/15 Analyzed: 09/22/15					
C10-C28 (DRO)	452	50	mg/kg	463	8.86	95.8	50-148	0.295	13		
Surrogate: <i>o</i> -Terphenyl	11.4		"	11.3	101	30-150					

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PDC Energy  
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Denver CO, 80203

Project: Annie 3-9  
Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
09/24/15 08:29

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

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

**Batch 1509186 - EPA 5030 Soil MS**

**Blank (1509186-BLK1)**

Prepared & Analyzed: 09/21/15

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>0.0456</i>		<i>"</i>	<i>0.0396</i>		<i>115</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0422</i>		<i>"</i>	<i>0.0400</i>		<i>105</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0431</i>		<i>"</i>	<i>0.0400</i>		<i>108</i>	<i>21-167</i>			

**LCS (1509186-BS1)**

Prepared & Analyzed: 09/21/15

Naphthalene	ND	0.010	mg/kg				66-138			
Benzene	0.104	0.0020	"	0.100		104	58-130			
Toluene	0.0934	0.0050	"	0.100		93.4	61-134			
Ethylbenzene	0.0992	0.0050	"	0.0992		100	74-139			
m,p-Xylene	0.192	0.010	"	0.200		96.1	73-137			
o-Xylene	0.102	0.0050	"	0.0984		104	73-141			
Xylenes (total)	0.294	0.010	"				0-200			
Gasoline Range Hydrocarbons	2.10	0.50	"				30-150			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0445</i>		<i>"</i>	<i>0.0396</i>		<i>112</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0448</i>		<i>"</i>	<i>0.0400</i>		<i>112</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0437</i>		<i>"</i>	<i>0.0400</i>		<i>109</i>	<i>21-167</i>			

**Matrix Spike (1509186-MS1)**

Source: 1509141-01

Prepared & Analyzed: 09/21/15

Naphthalene	ND	0.010	mg/kg		ND		10-158			
Benzene	0.112	0.0020	"	0.100	ND	112	30-131			
Toluene	0.101	0.0050	"	0.100	ND	101	30-134			
Ethylbenzene	0.109	0.0050	"	0.0992	ND	110	22-153			
m,p-Xylene	0.211	0.010	"	0.200	ND	106	10-159			
o-Xylene	0.113	0.0050	"	0.0984	ND	114	31-151			
Xylenes (total)	0.324	0.010	"		0.00		30-160			
Gasoline Range Hydrocarbons	2.27	0.50	"		ND		30-160			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0482</i>		<i>"</i>	<i>0.0396</i>		<i>122</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0443</i>		<i>"</i>	<i>0.0400</i>		<i>111</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0436</i>		<i>"</i>	<i>0.0400</i>		<i>109</i>	<i>21-167</i>			

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

Project: Annie 3-9

Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
09/24/15 08:29

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

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

**Batch 1509186 - EPA 5030 Soil MS**

<b>Matrix Spike Dup (1509186-MSD1)</b>	<b>Source: 1509141-01</b>			<b>Prepared &amp; Analyzed: 09/21/15</b>						
Naphthalene	ND	0.010	mg/kg	ND	ND	10-158			42	
Benzene	0.116	0.0020	"	0.100	ND	116	30-131	3.61	34	
Toluene	0.105	0.0050	"	0.100	ND	105	30-134	4.12	30	
Ethylbenzene	0.118	0.0050	"	0.0992	ND	119	22-153	7.68	24	
m,p-Xylene	0.225	0.010	"	0.200	ND	113	10-159	6.68	68	
o-Xylene	0.121	0.0050	"	0.0984	ND	123	31-151	6.89	38	
Xylenes (total)	0.346	0.010	"	0.00			30-160	6.76	30	
Gasoline Range Hydrocarbons	2.45	0.50	"		ND		30-160	7.56	30	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0487</i>		<i>"</i>	<i>0.0396</i>		<i>123</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0430</i>		<i>"</i>	<i>0.0400</i>		<i>108</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0442</i>		<i>"</i>	<i>0.0400</i>		<i>111</i>	<i>21-167</i>			

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

Project: Annie 3-9

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 09/24/15 08:29

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

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

**Batch 1509190 - General Preparation**

<b>LCS (1509190-BS1)</b>					Prepared: 09/21/15 Analyzed: 09/24/15					
pH	7.96	0.100	pH Units	8.00	99.5	95-105				
<b>Duplicate (1509190-DUP1)</b>					Prepared: 09/21/15 Analyzed: 09/24/15					
pH	8.61	0.100	pH Units	8.65	0.463	20				

**Batch 1509191 - General Preparation**

<b>Blank (1509191-BLK1)</b>					Prepared: 09/21/15 Analyzed: 09/24/15					
Specific Conductance (EC)	ND	0.0100	mmhos/cm							
<b>LCS (1509191-BS1)</b>					Prepared: 09/21/15 Analyzed: 09/24/15					
Specific Conductance (EC)	502	0.0100	mmhos/cm	500	100	90-110				
<b>Duplicate (1509191-DUP1)</b>					Prepared: 09/21/15 Analyzed: 09/24/15					
Specific Conductance (EC)	3.73	0.0100	mmhos/cm	4.03	7.76	20				

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

Project: Annie 3-9

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
09/24/15 08:29

### 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