



September 1, 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  
McDowell 34-1 Tank Battery  
Facility ID #: 319306  
NENW S34 T5N 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 August 19, 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 5 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 and physical parameters 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 included as Attachment A.

### **Conclusions**

Based on the soil analytical data described herein, petroleum hydrocarbon impacts in exceedance of regulatory standards were not encountered during the removal of the produced water vessel. Consequently, no further site investigation is recommended at this time.

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

Sincerely,

Tasman Geosciences, Inc.

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

Christine Wasko  
Program Manager

Enclosures:

Figure 1 – Excavation Site Map

Table 1 – Soil Analytical Results Summary Table

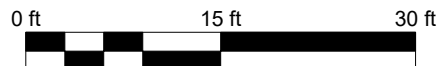
Attachment A – Laboratory Analytical Report



Surface  
Drainage



SS01 @ 5'



Google Earth 2016

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

DRAWN BY: CAW

**Facility Diagram**

PDC Energy, Inc. – DJ Basin  
McDowell 34-1 Tank Battery  
NENW S34 T5N R67W  
Weld 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**  
**McDOWELL 34-1 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)
<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>6-9</b>	<b>&lt;4</b>
SS01 @ 5'	8/19/2016	5	<0.0020	<0.0050	<0.0050	<0.010	<0.010	<50	8.35	0.7

**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.

**ATTACHMENT A**

# Summit Scientific

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741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

August 31, 2016

Christine Wasko  
PDC Energy  
1775 Sherman St. STE. 3000  
Denver, CO 80203  
RE: Mcdowell 34-1

Enclosed are the results of analyses for samples received by Summit Scientific on 08/19/16 16:45. 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: Mcdowell 34-1

Project Number: [none]  
Project Manager: Christine Wasko

**Reported:**  
08/31/16 11:43

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01@5	1608160-01	Soil	08/19/16 15:00	08/19/16 16:45

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: Mcdowell 34-1

Project Number: [none]  
 Project Manager: Christine Wasko

Reported:  
 08/31/16 11:43

**Sample Receipt Checklist**

S2 Work Order: 1608160  
 Client: Tasman/PDC Client Project ID: MCDowell 34-1  
 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)	<u>3.5</u>				

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> ?	<input checked="" type="checkbox"/>			
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> ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
If custody seals are present, are they intact <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	
Are short holding time analytes or samples with HTs due within 48 hours present?			<input checked="" type="checkbox"/>	
Is a chain-of-custody (COC) form present and filled out completely <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client w/ date and time recorded <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.			<input checked="" type="checkbox"/>	
Are samples preserved that require preservation (excluding cooling) <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	
Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect			<input checked="" type="checkbox"/>	
If samples are acid preserved for metals, is the pH ≤ 2 <sup>(1)</sup> ? Record the pH in Comments.			<input checked="" type="checkbox"/>	
If dissolved metals are requested, were samples field filtered?			<input checked="" type="checkbox"/>	
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

8/31/16 1720  
 Date/Time





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

Project: Mcdowell 34-1

Project Number: [none]  
Project Manager: Christine Wasko

Reported:  
08/31/16 11:43

**SS01@5**  
**1608160-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **08/19/16 15:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1608218	08/22/16	08/23/16	8015M	

Date Sampled: **08/19/16 15:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		89.9 %	30-150		"	"	"	"	

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

Date Sampled: **08/19/16 15:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	1608219	08/22/16	08/22/16	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: **08/19/16 15:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		127 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		99.8 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		101 %	21-167		"	"	"	"	

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

Date Sampled: **08/19/16 15:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	<b>0.720</b>	0.0100	mmhos/cm	1	1608209	08/22/16	08/22/16	SM 2510B	

Summit Scientific

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PDC Energy  
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 Denver CO, 80203

Project: Mcdowell 34-1

Project Number: [none]  
 Project Manager: Christine Wasko

**Reported:**  
 08/31/16 11:43

**SS01@5**  
**1608160-01 (Soil)**

**Summit Scientific**

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

Date Sampled: **08/19/16 15:00**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
<b>pH</b>	<b>8.35</b>	0.100	pH Units	1	1608208	08/22/16	08/22/16	EPA 9045	

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 Denver CO, 80203

Project: Mcdowell 34-1

Project Number: [none]  
 Project Manager: Christine Wasko

**Reported:**  
 08/31/16 11:43

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

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

**Batch 1608218 - EPA 3550A**

<b>Blank (1608218-BLK1)</b>				Prepared & Analyzed: 08/22/16							
C10-C28 (DRO)	ND	50	mg/kg								
Surrogate: <i>o</i> -Terphenyl	11.7		"	12.5		93.9	30-150				
<b>LCS (1608218-BS1)</b>				Prepared & Analyzed: 08/22/16							
C10-C28 (DRO)	407	50	mg/kg	499		81.5	73-134				
Surrogate: <i>o</i> -Terphenyl	11.9		"	12.5		94.8	30-150				
<b>Matrix Spike (1608218-MS1)</b>				Source: 1608151-01		Prepared & Analyzed: 08/22/16					
C10-C28 (DRO)	391	50	mg/kg	472	6.69	81.5	50-148				
Surrogate: <i>o</i> -Terphenyl	10.9		"	11.8		92.3	30-150				
<b>Matrix Spike Dup (1608218-MSD1)</b>				Source: 1608151-01		Prepared & Analyzed: 08/22/16					
C10-C28 (DRO)	415	50	mg/kg	478	6.69	85.4	50-148	5.94		20	
Surrogate: <i>o</i> -Terphenyl	11.5		"	12.0		96.3	30-150				

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Denver CO, 80203

Project: Mcdowell 34-1

Project Number: [none]  
Project Manager: Christine Wasko

Reported:  
08/31/16 11:43

**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 1608219 - EPA 5030 Soil MS**

**Blank (1608219-BLK1)**

Prepared & Analyzed: 08/22/16

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>0.0420</i>		<i>"</i>	<i>0.0400</i>		<i>105</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0393</i>		<i>"</i>	<i>0.0400</i>		<i>98.2</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0402</i>		<i>"</i>	<i>0.0400</i>		<i>100</i>	<i>21-167</i>			

**LCS (1608219-BS1)**

Prepared & Analyzed: 08/22/16

Naphthalene	ND	0.010	mg/kg				66-138			
Benzene	0.0959	0.0020	"	0.100		95.9	58-130			
Toluene	0.105	0.0050	"	0.100		105	61-134			
Ethylbenzene	0.0968	0.0050	"	0.0992		97.6	74-139			
m,p-Xylene	0.202	0.010	"	0.200		101	73-137			
o-Xylene	0.0957	0.0050	"	0.0980		97.7	73-141			
Xylenes (total)	0.298	0.010	"				0-200			
Gasoline Range Hydrocarbons	1.62	0.50	"				30-150			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0388</i>		<i>"</i>	<i>0.0400</i>		<i>96.9</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0463</i>		<i>"</i>	<i>0.0400</i>		<i>116</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0395</i>		<i>"</i>	<i>0.0400</i>		<i>98.8</i>	<i>21-167</i>			

**Matrix Spike (1608219-MS1)**

Source: 1608151-01

Prepared & Analyzed: 08/22/16

Naphthalene	ND	0.010	mg/kg		ND		10-158			
Benzene	0.109	0.0020	"	0.0971	ND	113	30-131			
Toluene	0.122	0.0050	"	0.0971	ND	126	30-134			
Ethylbenzene	0.115	0.0050	"	0.0963	ND	119	22-153			
m,p-Xylene	0.241	0.010	"	0.194	ND	124	10-159			
o-Xylene	0.114	0.0050	"	0.0951	ND	120	31-151			
Xylenes (total)	0.356	0.010	"		ND		30-160			
Gasoline Range Hydrocarbons	1.86	0.50	"		ND		30-160			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0449</i>		<i>"</i>	<i>0.0388</i>		<i>116</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0426</i>		<i>"</i>	<i>0.0388</i>		<i>110</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0393</i>		<i>"</i>	<i>0.0388</i>		<i>101</i>	<i>21-167</i>			

Summit Scientific

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1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Mcdowell 34-1

Project Number: [none]  
Project Manager: Christine Wasko

Reported:  
08/31/16 11:43

**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 1608219 - EPA 5030 Soil MS**

<b>Matrix Spike Dup (1608219-MSD1)</b>	<b>Source: 1608151-01</b>			<b>Prepared &amp; Analyzed: 08/22/16</b>						
Naphthalene	ND	0.010	mg/kg	ND	ND	10-158			42	
Benzene	0.114	0.0020	"	0.0935	ND	122	30-131	3.95	34	
Toluene	0.125	0.0050	"	0.0935	ND	134	30-134	2.42	30	
Ethylbenzene	0.129	0.0050	"	0.0927	ND	139	22-153	11.5	24	
m,p-Xylene	0.273	0.010	"	0.187	ND	146	10-159	12.3	68	
o-Xylene	0.130	0.0050	"	0.0916	ND	142	31-151	13.0	38	
Xylenes (total)	0.403	0.010	"		ND		30-160	12.5	30	
Gasoline Range Hydrocarbons	2.05	0.50	"		ND		30-160	9.86	30	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0454</i>		<i>"</i>	<i>0.0374</i>		<i>121</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0384</i>		<i>"</i>	<i>0.0374</i>		<i>103</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0369</i>		<i>"</i>	<i>0.0374</i>		<i>98.7</i>	<i>21-167</i>			

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Project: Mcdowell 34-1

Project Number: [none]  
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**Reported:**  
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**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 1608208 - General Preparation**

<b>LCS (1608208-BS1)</b>					Prepared & Analyzed: 08/22/16					
pH	6.04	0.100	pH Units	8.00	75.5	95-105				
<b>Duplicate (1608208-DUP1)</b>					Source: 1608154-01 Prepared & Analyzed: 08/22/16					
pH	8.91	0.100	pH Units	9.06	1.67	20				

**Batch 1608209 - General Preparation**

<b>Blank (1608209-BLK1)</b>					Prepared & Analyzed: 08/22/16					
Specific Conductance (EC)	ND	0.0100	mmhos/cm							
<b>LCS (1608209-BS1)</b>					Prepared & Analyzed: 08/22/16					
Specific Conductance (EC)	0.508	0.0100	mmhos/cm	0.500	102	90-110				
<b>Duplicate (1608209-DUP1)</b>					Source: 1608154-01 Prepared & Analyzed: 08/22/16					
Specific Conductance (EC)	2.61	0.0100	mmhos/cm	2.97	12.7	20				

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Denver CO, 80203

Project: Mcdowell 34-1

Project Number: [none]  
Project Manager: Christine Wasko

**Reported:**  
08/31/16 11:43

### 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