

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**
Teresa 1-27 Tank Battery
Facility ID: 323128
NENW S27 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 June 25, 2015, excavation and 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 produced water vessel location at approximately 8 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, electrical conductivity (EC), pH, and sodium adsorption ratio (SAR).

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

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 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. The facility was decommissioned following site assessment activities.

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

Sincerely,



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.

© 2015 Google

Google earth

DRAWN BY: MAP

DATE: 12/29/2015

Facility Diagram
PDC Energy – DJ Basin
Teresa 1-27 Tank Battery
NENW S27 T5N R65W
Weld County, CO



6899 Pecos St., Unit C
Denver, CO 80221

LEGEND

- Excavation Extent
- + Soil Sample Location

All locations are approximate unless otherwise noted

FIGURE 1
SOIL SAMPLE LOCATION MAP

TABLE 1
TERESA 1-27 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 ⁽²⁾ (mg/kg)	pH (units)	EC (mmhos/cm)	SAR (units)
COGCC standards for soil (mg/kg) ⁽¹⁾			0.17	85	100	175	23	500	6-9	<4	<12
SS01 @ 8'	6/25/2015	8	<0.0020	<0.0050	<0.0050	<0.010	<0.010	0.73	8.74	1.70	6.85

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

SAR = Sodium adsorption ratio

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

ATTACHMENT A

Summit Scientific

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

July 06, 2015

Christine Wasko
PDC Energy
1775 Sherman St. STE. 3000
Denver, CO 80203
RE: Teresa 1-27

Enclosed are the results of analyses for samples received by Summit Scientific on 06/26/15 17:10. 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: Teresa 1-27
Project Number: [none]
Project Manager: Christine Wasko

Reported:
07/06/15 09:27

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01@8'	1506270-01	Soil	06/25/15 08:40	06/26/15 17:10

Summit Scientific

741 Corporate Circle, Suite J&K ♦ Golden, Colorado 80401
303-277-9310 ♦ 303-374-5933

Client: PDC/Tasman Project Manager: Christine Wasko Page 1 of 1
Address: 6899 PECOS ST UNIT 12 E-Mail: christine.wasko@pdcenergy.com
City/State/Zip: DENVER CO 80224
Phone: 970 290 1601 Fax: Project Name: Teresa 1-27
Sampler Name: Andrew J. Felt Project Number:

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative				Matrix			Analysis Requested				Special Instructions
					HCl	HNO3	None	Other (Specify)	Groundwater	Soil	Air-Canister #	Other (Specify)	GBE (8015)	DXO (8015)	pH/EC/STC	
1	SS01@8'	6/25/15	840	1			X			X						
2																
3																
4																
5																
6																
7																
8																
9																
10																

Relinquished by: <u>[Signature]</u>	Date/Time: <u>6/29/15 10:30</u>	Received by: <u>[Signature]</u>	Date/Time: <u>5:10pm 6/24/15</u>	Turn Around Time (Check)	Notes: <u>on ice</u>
Relinquished by:	Date/Time:	Received by:	Date/Time:	Same Day <u>—</u> 72 hours <u>—</u>	
Relinquished by:	Date/Time:	Received by:	Date/Time:	24 hours <u>—</u> Standard <u>X</u>	
Relinquished by:	Date/Time:	Received by:	Date/Time:	48 hours <u>—</u>	
Sample Integrity:				Temperature Upon Receipt: <u>5.8°C</u>	
Intact: <u>Yes</u> No					

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: Teresa 1-27
Project Number: [none]
Project Manager: Christine Wasko

Reported:
07/06/15 09:27

SS01@8'
1506270-01 (Soil)

Summit Scientific

Extractable Petroleum Hydrocarbons by 8015

Date Sampled: **06/25/15 08:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1506354	06/29/15	06/29/15	8015M	

Date Sampled: **06/25/15 08:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		104 %	30-150		"	"	"	"	

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **06/25/15 08:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	1506355	06/29/15	06/29/15	EPA 8260B	
Benzene	ND	0.0020	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.010	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	0.73	0.50	"	"	"	"	"	"	

Date Sampled: **06/25/15 08:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		105 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		97.9 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		93.4 %	21-167		"	"	"	"	

Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis

Date Sampled: **06/25/15 08:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
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Summit Scientific

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

Project: Teresa 1-27
Project Number: [none]
Project Manager: Christine Wasko

Reported:
07/06/15 09:27

SS01@8'
1506270-01 (Soil)

Summit Scientific

Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis

Calcium	548	5.52 mg/kg dry	1	1506353	06/29/15	06/29/15	EPA 6020/Mod. USDA60 6(2, 3A)
Magnesium	88.5	2.76	"	"	"	"	"
Sodium	652	2.76	"	"	"	"	"

Date Sampled: 06/25/15 08:40

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	6.82		units	"	1507006	07/01/15	07/01/15	"	

Physical Parameters by APHA/ASTM/EPA Methods

Date Sampled: 06/25/15 08:40

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	1.70	0.0100 mmhos/cm		1	1506356	06/29/15	06/29/15	SM 2510B	

Date Sampled: 06/25/15 08:40

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.74	0.100 pH Units		"	1506357	06/29/15	06/29/15	EPA 9045	

Date Sampled: 06/25/15 08:40

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	82.1		%	"	1506366	06/30/15	06/30/15	% calculation	

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

Project: Teresa 1-27
Project Number: [none]
Project Manager: Christine Wasko

Reported:
07/06/15 09:27

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 1506354 - EPA 3550A

Blank (1506354-BLK1)

Prepared & Analyzed: 06/29/15

C10-C28 (DRO)	ND	50	mg/kg							
Surrogate: o-Terphenyl	11.5		"	12.2		94.6	30-150			

LCS (1506354-BS1)

Prepared & Analyzed: 06/29/15

C10-C28 (DRO)	578	50	mg/kg	501		115	73-134			
Surrogate: o-Terphenyl	12.1		"	12.2		99.5	30-150			

Matrix Spike (1506354-MS1)

Source: 1506268-01

Prepared & Analyzed: 06/29/15

C10-C28 (DRO)	502	50	mg/kg	485	22.9	98.9	50-148			
Surrogate: o-Terphenyl	11.4		"	11.8		96.8	30-150			

Matrix Spike Dup (1506354-MSD1)

Source: 1506268-01

Prepared & Analyzed: 06/29/15

C10-C28 (DRO)	519	50	mg/kg	493	22.9	101	50-148	3.29	13	
Surrogate: o-Terphenyl	11.7		"	12.0		97.1	30-150			

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

Project: Teresa 1-27
Project Number: [none]
Project Manager: Christine Wasko

Reported:
07/06/15 09:27

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 1506355 - EPA 5030 Soil MS

Blank (1506355-BLK1)

Prepared & Analyzed: 06/29/15

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	"							
Surrogate: 1,2-Dichloroethane-d4	0.0433		"	0.0396	109	23-173				
Surrogate: Toluene-d8	0.0394		"	0.0400	98.4	20-170				
Surrogate: 4-Bromofluorobenzene	0.0387		"	0.0400	96.8	21-167				

LCS (1506355-BS1)

Prepared & Analyzed: 06/29/15

Naphthalene	ND	0.010	mg/kg				66-138			
Benzene	0.109	0.0020	"	0.100	109	58-130				
Toluene	0.109	0.0050	"	0.100	109	61-134				
Ethylbenzene	0.108	0.0050	"	0.0992	108	74-139				
m,p-Xylene	0.213	0.010	"	0.200	107	73-137				
o-Xylene	0.113	0.0050	"	0.0984	115	73-141				
Surrogate: 1,2-Dichloroethane-d4	0.0445		"	0.0396	112	23-173				
Surrogate: Toluene-d8	0.0401		"	0.0400	100	20-170				
Surrogate: 4-Bromofluorobenzene	0.0383		"	0.0400	95.7	21-167				

Matrix Spike (1506355-MS1)

Source: 1506268-01

Prepared & Analyzed: 06/29/15

Naphthalene	ND	0.010	mg/kg		ND		10-158			
Benzene	0.103	0.0020	"	0.0958	ND	108	30-131			
Toluene	0.0993	0.0050	"	0.0958	ND	104	30-134			
Ethylbenzene	0.0987	0.0050	"	0.0950	ND	104	22-153			
m,p-Xylene	0.196	0.010	"	0.191	ND	103	10-159			
o-Xylene	0.106	0.0050	"	0.0943	ND	113	31-151			
Surrogate: 1,2-Dichloroethane-d4	0.0431		"	0.0379	114	23-173				
Surrogate: Toluene-d8	0.0385		"	0.0383	100	20-170				
Surrogate: 4-Bromofluorobenzene	0.0376		"	0.0383	98.2	21-167				

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

Project: Teresa 1-27
Project Number: [none]
Project Manager: Christine Wasko

Reported:
07/06/15 09:27

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 1506355 - EPA 5030 Soil MS

Matrix Spike Dup (1506355-MSD1)		Source: 1506268-01			Prepared & Analyzed: 06/29/15					
Naphthalene	ND	0.010	mg/kg		ND		10-158		42	
Benzene	0.100	0.0020	"	0.0994	ND	101	30-131	3.34	34	
Toluene	0.0931	0.0050	"	0.0994	ND	93.6	30-134	6.49	30	
Ethylbenzene	0.0937	0.0050	"	0.0986	ND	95.0	22-153	5.18	24	
m,p-Xylene	0.185	0.010	"	0.198	ND	93.3	10-159	5.96	68	
o-Xylene	0.102	0.0050	"	0.0978	ND	104	31-151	4.24	38	
Surrogate: 1,2-Dichloroethane-d4	0.0458		"	0.0394		116	23-173			
Surrogate: Toluene-d8	0.0405		"	0.0398		102	20-170			
Surrogate: 4-Bromofluorobenzene	0.0404		"	0.0398		102	21-167			

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

Project: Teresa 1-27
Project Number: [none]
Project Manager: Christine Wasko

Reported:
07/06/15 09:27

Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis - Quality Control
Summit Scientific

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

Batch 1506353 - General Preparation

Blank (1506353-BLK1)

Prepared & Analyzed: 06/29/15

Calcium	ND	10.0	mg/kg wet
Magnesium	ND	5.00	"
Sodium	12.5	5.00	"

LCS (1506353-BS1)

Prepared & Analyzed: 06/29/15

Calcium	580	10.0	mg/kg wet	500	116	82.9-118
Magnesium	540	5.00	"	500	108	77.1-123
Sodium	576	5.00	"	500	115	71-129

Duplicate (1506353-DUP1)

Source: 1506270-01

Prepared & Analyzed: 06/29/15

Calcium	624	5.39	mg/kg dry	548	12.9	200
Magnesium	116	2.69	"	88.5	27.2	200
Sodium	745	2.69	"	652	13.3	200

Matrix Spike (1506353-MS1)

Source: 1506270-01

Prepared & Analyzed: 06/29/15

Calcium	1020	5.69	mg/kg dry	284	548	167	75-125	QM-07
Magnesium	413	2.84	"	284	88.5	114	75-125	
Sodium	1080	2.84	"	284	652	152	75-125	QM-07

Matrix Spike Dup (1506353-MSD1)

Source: 1506270-01

Prepared & Analyzed: 06/29/15

Calcium	2320	9.95	mg/kg dry	498	548	355	75-125	77.6	25	QM-07
Magnesium	741	4.98	"	498	88.5	131	75-125	57.0	25	QM-07
Sodium	1840	4.98	"	498	652	238	75-125	51.5	25	QM-07

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

Project: Teresa 1-27
Project Number: [none]
Project Manager: Christine Wasko

Reported:
07/06/15 09:27

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 1506356 - General Preparation

Blank (1506356-BLK1)

Prepared & Analyzed: 06/29/15

Specific Conductance (EC) ND 0.0100 mmhos/cm

LCS (1506356-BS1)

Prepared & Analyzed: 06/29/15

Specific Conductance (EC) 476 0.0100 mmhos/cm 500 95.2 90-110

Duplicate (1506356-DUP1)

Source: 1506270-01

Prepared & Analyzed: 06/29/15

Specific Conductance (EC) 1.68 0.0100 mmhos/cm 1.70 1.30 20

Batch 1506357 - General Preparation

LCS (1506357-BS1)

Prepared & Analyzed: 06/29/15

pH 8.01 0.100 pH Units 8.00 100 95-105

Duplicate (1506357-DUP1)

Source: 1506270-01

Prepared & Analyzed: 06/29/15

pH 8.72 0.100 pH Units 8.74 0.229 20

Batch 1506366 - General Preparation

Duplicate (1506366-DUP1)

Source: 1506270-01

Prepared & Analyzed: 06/30/15

% Solids 82.0 % 82.1 0.122 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: Teresa 1-27
Project Number: [none]
Project Manager: Christine Wasko

Reported:
07/06/15 09:27

Notes and Definitions

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS/LCSD recovery.

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

Summit Scientific

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