

PDC Energy, Inc.
Fourth Quarter 2019 Groundwater Monitoring Summary

December 6, 2019

Former JR #1 Tank Battery
SESW Section 13 T6N R65W
Remediation # 12319

This groundwater monitoring summary has been prepared by Tasman Geosciences, Inc. for the former JR #1 tank battery. On November 8, 2019, groundwater monitoring was conducted at five monitoring well locations (BH01 – BH05). Five groundwater samples were submitted to Summit Scientific Laboratory for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8260B.

Fourth quarter 2019 analytical results indicated that the benzene concentration was above the applicable COGCC Table 910-1 groundwater standard in monitoring well BH01. BTEX concentrations were below regulatory standards in the four remaining monitoring well locations. Analytical results are summarized in Table 1 and the laboratory report is included as Attachment A. Sample locations and corresponding analytical results are illustrated on Figure 1. Groundwater elevation data is illustrated in Figure 2.

Monitored natural attenuation (MNA) was selected as the remediation strategy for this site during the first quarter 2019 and will remain the selected remediation strategy for the first quarter 2020.

First quarter 2020 groundwater sampling will be conducted during February 2020.



DATE:	December 6, 2019
DESIGNED BY:	C. Hamlin
DRAWN BY:	J. McCarver



TASMAN
GEOSCIENCES

Tasman Geosciences, Inc.
6855 W. 119th Ave.
Broomfield, CO 80020

PDC Energy, Inc. – DJ Basin
Former JR #1 Tank Battery
SESW, Section 13, Township 6 North, Range 65 West
Weld County, Colorado

**GROUNDWATER
ANALYTICAL RESULTS
MAP**

**FIGURE
1**



DATE:	November 18, 2019
DESIGNED BY:	C. Hamlin
DRAWN BY:	L. Martin



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6855 W. 119th Ave
Broomfield, CO 80020

PDC Energy, Inc. – DJ Basin
Former JR #1 Tank Battery
SESW, Section 13, Township 6 North, Range 65 West
Weld County, Colorado

**GROUNDWATER
ELEVATION CONTOUR
MAP (11/08/2019)**

**FIGURE
2**

TABLE 1
FORMER JR #1 TANK BATTERY
GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE

Sample ID	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	Depth to Water ⁽²⁾ (ft.)	Groundwater Elevation (ft. AMSL)
COGCC Table 910-1 Groundwater Standard (µg/L) ⁽¹⁾		5	560	700	1,400		
GW01	1/4/2019	5.2	<1.0	1.1	11	~ 16	NM
BH01	2/22/2019	81	7.7	88	1,300	15.12	4681.14
BH01	5/30/2019	180	1.0	<1.0	2,400	15.39	4680.45
BH01	8/16/2019	42	<1.0	13	160	11.04	4684.80
BH01	11/8/2019	53	<1.0	24	120	13.11	4682.90
BH02	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.29	4681.30
BH02	5/30/2019	<1.0	<1.0	<1.0	<2.0	15.71	4680.65
BH02	8/16/2019	<1.0	<1.0	<1.0	<2.0	11.33	4685.03
BH02	11/8/2019	<1.0	<1.0	<1.0	<2.0	12.58	4683.78
BH03	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.11	4681.50
BH03	5/30/2019	<1.0	<1.0	<1.0	<2.0	15.54	4680.85
BH03	8/16/2019	<1.0	<1.0	<1.0	<2.0	10.77	4685.62
BH03	11/8/2019	<1.0	<1.0	<1.0	<2.0	12.28	4684.09
BH04	2/22/2019	8.5	<1.0	<1.0	<2.0	15.12	4680.82
BH04	5/30/2019	<1.0	<1.0	<1.0	<2.0	16.67	4678.97
BH04	8/16/2019	<1.0	<1.0	<1.0	<2.0	12.60	4683.04
BH04	11/8/2019	<1.0	<1.0	<1.0	<2.0	12.47	4682.10
BH05	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.43	4680.29
BH05	5/30/2019	<1.0	<1.0	<1.0	<2.0	16.06	4679.56
BH05	8/16/2019	<1.0	<1.0	<1.0	<2.0	12.19	4683.43
BH05	11/8/2019	<1.0	<1.0	<1.0	<2.0	11.83	4683.60
BH06	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.29	4680.56
BH06	5/30/2019	Destroyed					

Notes:

1. Groundwater standards referenced from 2 CCR 404-1, Table 910-1, effective May 1, 2018.

2. Depth to water measurements were measured from ground surface for excavation samples. Monitoring well measurements were collected from top of casing and adjusted using survey data to reflect depth of water from ground surface.

COGCC = Colorado Oil and Gas Conservation Commission

µg/L = Micrograms per liter

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

ft. = Feet

AMSL = Above Mean Sea Level

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

Attachment A

Summit Scientific

4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

November 14, 2019

Mark Longhurst

PDC Energy

1775 Sherman St. STE. 3000

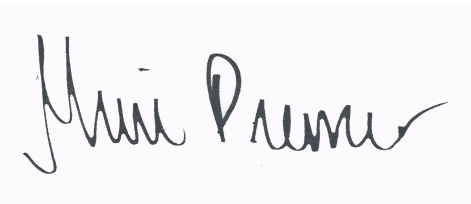
Denver, CO 80203

RE: JR #1

Work Order # 1911113

Enclosed are the results of analyses for samples received by Summit Scientific on 11/08/19 17:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink on a light blue background. The signature is written in a cursive style and reads "Muri Premier".

Muri Premier For Paul Shrewsbury

President



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

Project: JR #1

Project Number: [none]

Project Manager: Mark Longhurst

Reported:
11/14/19 15:01

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	1911113-01	Water	11/08/19 11:53	11/08/19 17:30
BH02	1911113-02	Water	11/08/19 11:33	11/08/19 17:30
BH03	1911113-03	Water	11/08/19 11:44	11/08/19 17:30
BH04	1911113-04	Water	11/08/19 11:23	11/08/19 17:30
BH05	1911113-05	Water	11/08/19 11:02	11/08/19 17:30

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.

Summit Scientific

Page 1 of 1

Project Manager: Mark Longhurst
E-Mail: mark.longhurst@pdce.com
Project Name: JR #1
Project Number: n/a

				Preservative				Matrix				Analyze For:								
Sample Description	Date Sampled	Time Sampled	Number of Containers	HCl	HNO ₃	None	Other (Specify)	Groundwater	Soil	Air - Canister Serial #	Other (Specify)	BTEX								Special Instructions
BH01	11/8/19	1153	3	X				X				X								
BH02	11/8/19	1133	3	X				X				X								
BH03	11/8/19	1144	3	X				X				X								
BH04	11/8/19	1123	3			X		X				X								
BH05	11/8/19	1102	3	X				X				X								
Relinquished by: Ali Dahl Date/Time: 11/8/2019 1530				Received by: Tasman Luke Box Date/Time: 11/8/2019 1530				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: Sample Integrity: 4.3 Temperature Upon Receipt: Intact: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>								
Relinquished by: LOCKBOX 11/08/19 1730				Received by: [Signature] Date/Time: 11/08/19 1730																
Relinquished by: Date/Time:				Received in Lab by: Date/Time:																

Sample Receipt Checklist

S2 Work Order

1911113

Client:

DOC / Hasman

Client Project ID:

SR#1

Shipped Via: H.D. P.U. / FedEx/UPS/USPS/Other

Airbill #:

Matrix (check all that apply):

☐ Air

☐ Soil/Solid

☒ Water

☐ Other:

(Describe)

Temp (°C)

4.3

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature at 4°C +/- 2°C ⁽¹⁾ ?				
NOTE: If samples are delivered the same day of sampling, this requirement is met provided that there is evidence that cooling has begun.	X			
Were all samples received intact ⁽¹⁾ ?	X			
Was adequate sample volume provided ⁽¹⁾ ?	X			
If custody seals are present, are they intact ⁽¹⁾ ?			X	
Are samples with holding times due within 48 hours sample due within 48 hours present?		X		
Is a chain-of-custody (COC) form present and filled out completely ⁽¹⁾ ?	X			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	X			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	X			
Is the COC properly relinquished by the client w/ date and time recorded ⁽¹⁾ ?	X			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.		X		
Are samples preserved that require preservation (excluding cooling) ⁽¹⁾ ?	X			HCC
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 ⁽¹⁾ ?			X	
Record the pH in Comments.				
If dissolved metals are requested, were samples field filtered?			X	
Additional Comments (if any):				
⁽¹⁾ If NO, then contact the client before proceeding with analysis and note in case narrative.				

Custodian Printed Name or Initials

Signature of Custodian

Date/Time

11/13/19 1800



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

Project: JR #1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
11/14/19 15:01

BH01
191113-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **11/08/19 11:53**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Benzene	53	1.0		ug/l	1	1911116	11/11/19	11/12/19	EPA 8260B	
Toluene	ND	1.0		"	"	"	"	"	"	
Ethylbenzene	24	1.0		"	"	"	"	"	"	
Xylenes (total)	120	2.0		"	"	"	"	"	"	

Date Sampled: **11/08/19 11:53**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: 1,2-Dichloroethane-d4		107 %		23-173		"	"	"	"	
Surrogate: Toluene-d8		82.4 %		20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.6 %		21-167		"	"	"	"	

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

Project: JR #1
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
11/14/19 15:01

BH02
1911113-02 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **11/08/19 11:33**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1911116	11/11/19	11/12/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **11/08/19 11:33**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		124 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		83.5 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		95.2 %	21-167		"	"	"	"	

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

Project: JR #1

Project Number: [none]

Project Manager: Mark Longhurst

Reported:

11/14/19 15:01

BH03

1911113-03 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: 11/08/19 11:44

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1911116	11/11/19	11/12/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: 11/08/19 11:44

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		116 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		86.3 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		95.6 %	21-167		"	"	"	"	

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

Project: JR #1
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
11/14/19 15:01

BH04
191113-04 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **11/08/19 11:23**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1911116	11/11/19	11/12/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **11/08/19 11:23**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		128 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		81.5 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		95.3 %	21-167		"	"	"	"	

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

Project: JR #1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
11/14/19 15:01

BH05
191113-05 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **11/08/19 11:02**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1911116	11/11/19	11/12/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **11/08/19 11:02**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		117 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		83.3 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		96.8 %	21-167		"	"	"	"	

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

Project: JR #1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
11/14/19 15:01

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 1911116 - EPA 5030 Water MS

Blank (1911116-BLK1)

Prepared & Analyzed: 11/11/19

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	2.0	"							
Surrogate: 1,2-Dichloroethane-d4	15.9		"	13.3		120	23-173			
Surrogate: Toluene-d8	10.4		"	13.3		77.9	20-170			
Surrogate: 4-Bromofluorobenzene	13.3		"	13.3		100	21-167			

LCS (1911116-BS1)

Prepared & Analyzed: 11/11/19

Benzene	41.1	1.0	ug/l	33.3		123	51-132			
Toluene	28.4	1.0	"	33.3		85.1	51-138			
Ethylbenzene	34.0	1.0	"	33.3		102	58-146			
m,p-Xylene	63.8	2.0	"	66.7		95.7	57-144			
o-Xylene	31.8	1.0	"	33.3		95.5	53-146			
Surrogate: 1,2-Dichloroethane-d4	14.5		"	13.3		109	23-173			
Surrogate: Toluene-d8	11.3		"	13.3		84.7	20-170			
Surrogate: 4-Bromofluorobenzene	13.3		"	13.3		99.5	21-167			

Matrix Spike (1911116-MS1)

Source: 1911091-01

Prepared & Analyzed: 11/11/19

Benzene	38.0	1.0	ug/l	33.3	ND	114	34-141			
Toluene	26.3	1.0	"	33.3	ND	79.0	27-151			
Ethylbenzene	33.6	1.0	"	33.3	ND	101	29-160			
m,p-Xylene	63.1	2.0	"	66.7	ND	94.6	20-166			
o-Xylene	31.3	1.0	"	33.3	ND	93.9	33-159			
Surrogate: 1,2-Dichloroethane-d4	14.7		"	13.3		110	23-173			
Surrogate: Toluene-d8	10.7		"	13.3		80.1	20-170			
Surrogate: 4-Bromofluorobenzene	13.3		"	13.3		99.6	21-167			

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

Project: JR #1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
11/14/19 15:01

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 1911116 - EPA 5030 Water MS

Matrix Spike Dup (1911116-MSD1)		Source: 1911091-01			Prepared & Analyzed: 11/11/19					
Benzene	44.3	1.0	ug/l	33.3	ND	133	34-141	15.2	30	
Toluene	31.9	1.0	"	33.3	ND	95.8	27-151	19.2	30	
Ethylbenzene	37.9	1.0	"	33.3	ND	114	29-160	12.2	30	
m,p-Xylene	71.3	2.0	"	66.7	ND	107	20-166	12.2	30	
o-Xylene	35.8	1.0	"	33.3	ND	107	33-159	13.4	30	
Surrogate: 1,2-Dichloroethane-d4	15.1		"	13.3		113	23-173			
Surrogate: Toluene-d8	11.4		"	13.3		85.7	20-170			
Surrogate: 4-Bromofluorobenzene	13.3		"	13.3		99.7	21-167			

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PDC Energy

1775 Sherman St. STE. 3000

Denver CO, 80203

Project: JR #1

Project Number: [none]

Project Manager: Mark Longhurst

Reported:

11/14/19 15:01

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