PDC Energy, Inc.

Third Quarter 2019 Groundwater Monitoring Summary

September 9, 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 August 16, 2019, groundwater monitoring was conducted at five monitoring well locations (BH01 – BH05). Due to farming activities during the second quarter, 2019, BH06 was destroyed and therefore could not be sampled. Five groundwater samples were submitted to Summit Scientific Laboratory for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8260B.

Second 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.

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 fourth quarter 2019.

Fourth quarter 2019 groundwater sampling will be conducted during November 2019. 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.

SURFACE DRAINAGE

BH03		
Compound (µg/L)	5/30/2019	8/16/2019
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<2.0	<2.0
Depth to Water (ft. bgs)	15.54	10.77

BH03

BH01		
Compound (µg/L)	5/30/2019	8/16/2019
Benzene	**180**	**42**
Toluene	1.0	<1.0
Ethylbenzene	<1.0	13
Total Xylenes	**2,400**	160
Depth to Water (ft. bgs)	15.39	11.04

BH02		
Compound (µg/L)	5/30/2019	8/16/2019
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<2.0	<2.0
Depth to Water (ft. bgs)	15.71	11.33

BH02

GW01

X

BH01

BH06

BH04

BH04		
Compound (µg/L)	5/30/2019	8/16/2019
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<2.0	<2.0
Depth to Water (ft. bgs)	16.67	12.60

BH05		
Compound (µg/L)	5/30/2019	8/16/2019
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<2.0	<2.0
Depth to Water (ft. bgs)	16.06	12.19

BH05

Legend

- Excavation Extent (Collected via Trimble GPS)
- Monitoring Well Location (Collected via Trimble GPS)
- Monitoring Well Location - Destroyed (Collected via Trimble GPS)
- Excavation Groundwater Sample Location
- X — Point of Release
- Groundwater Flow Direction (3Q19)

Notes

All locations are approximate unless otherwise noted.

Surface drainage direction is estimated based on topography and is not related to regional topography.

GPS – Global Positioning System

µg/L – Micrograms per liter

ft. bgs – Feet below ground surface

Red text denotes an exceedance of COGCC standards

COGCC – Colorado Oil and Gas Conservation Commission

0 ft. 15 ft. 30 ft.

N

Image Source: Google Earth; 2017 Google
Projection: WGS 84 UTM Zone 13 North

DATE:	September 9, 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:	August 21, 2019
DESIGNED BY:	C. Hamlin
DRAWN BY:	L. Martin

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 ELEVATION CONTOUR MAP (08/16/2019)

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
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
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
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
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
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

August 22, 2019

Mark Longhurst

PDC Energy

1775 Sherman St. STE. 3000

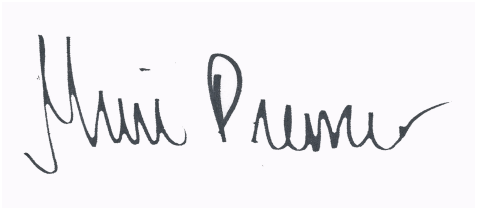
Denver, CO 80203

RE: JR #1

Work Order # 1908208

Enclosed are the results of analyses for samples received by Summit Scientific on 08/16/19 17:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Muri Premer For Paul Shrewsbury

President

S2

PDC Energy	Project: JR #1	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	08/22/19 10:40

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	1908208-01	Water	08/16/19 11:26	08/16/19 17:30
BH02	1908208-02	Water	08/16/19 11:01	08/16/19 17:30
BH03	1908208-03	Water	08/16/19 10:53	08/16/19 17:30
BH04	1908208-04	Water	08/16/19 11:15	08/16/19 17:30
BH05	1908208-05	Water	08/16/19 11:09	08/16/19 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.

1908208

Summit Scientific

S_2

4653 Table Mountain Drive ♦ Golden, Colorado 80403
303-277-9310

Page 1 of 1

Client:	PDC / Tasman	Project Manager:	Mark Longhurst
Address:	6855 W. 119th Ave	E-Mail:	mark.longhurst@PDCE.com
City/State/Zip:	Broomfield / CO/ 80020		
Phone:	303-487-1228	Project Name:	JR #1
Sampler Name:	Alison D., Max D., Morgan S., Brandon V.	Project Number:	n/a

					Preservative				Matrix				Analysis Requested								Special Instructions
ID	Sample Description	Date Sampled	Time Sampled	# of containers	HCl	HNO3	None	Other ___	Water	Soil	Air-Canister #	Other ___	8260 BTEX	8260B GBTEXN	8015 DRO	pH, EC, SAR					
1	BH01	8/16/19	1126	3	X				X				X								
2	BH02	↓	1101	↓	↓				↓				↓								
3	BH03		1053																		
4	BH04		1115																		
5	BH05		1109																		
6																					
7																					
8																					
9																					
10																					

Relinquished by:	Date/Time: 8/16/19 1415	Received by: Tasman's Lock Box	Date/Time: 8/16/19 1415
Relinquished by: Tasman's Lock Box	Date/Time: 8/16/19 1730	Received by:	Date/Time: 8/16/19 1730
Relinquished by:	Date/Time:	Received by:	Date/Time:

Turn Around Time (Check)

Same Day ___ 72 hours ___

24 hours ___ Standard X

48 hours ___

Sample Integrity:

Temperature Upon Receipt: SS

Samples Intact: (Yes) No

Notes:

Sample Receipt Checklist

S2 Work Order 1908208

Client: PDC/Hasman Client Project ID: JR #1

Shipped Via: H.D./P.U./FedEx/UPS/USPS/Other_____ Airbill #: _____

Matrix (check all that apply): _____Air _____Soil/Solid __X__Water ____Other:_____ (Describe)

Temp (°C)	5.5

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)]?			V	
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)]? Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect	X	X		HCl
If samples are acid preserved for metals, is the pH ≤ 2[(1)]? Record the pH in Comments.			X	
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.**

TZ
Custodian Printed Name or Initials

Signature of Custodian

08/16/19 1823
Date/Time

S2

PDC Energy	Project: JR #1	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	08/22/19 10:40

BH01

1908208-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **08/16/19 11:26**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	**42**	1.0	ug/l	1	1908247	08/20/19	08/21/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	**13**	1.0	"	"	"	"	"	"	
Xylenes (total)	**160**	2.0	"	"	"	"	"	"	

Date Sampled: **08/16/19 11:26**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		*132 %*	*23-173*		"	"	"	"	
Surrogate: Toluene-d8		*107 %*	*20-170*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*102 %*	*21-167*		"	"	"	"	

S2

PDC Energy	Project: JR #1	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	08/22/19 10:40

BH02

1908208-02 (Water)

Summit Scientific

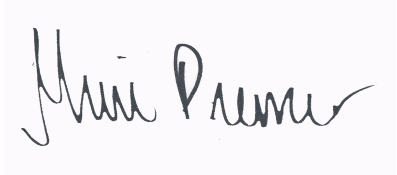
Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **08/16/19 11:01**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1908247	08/20/19	08/21/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **08/16/19 11:01**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		*131 %*	*23-173*		"	"	"	"	
Surrogate: Toluene-d8		*108 %*	*20-170*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*101 %*	*21-167*		"	"	"	"	



S2

PDC Energy	Project: JR #1	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	08/22/19 10:40

BH03

1908208-03 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **08/16/19 10:53**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1908247	08/20/19	08/21/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **08/16/19 10:53**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		*128 %*	*23-173*		"	"	"	"	
Surrogate: Toluene-d8		*102 %*	*20-170*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*103 %*	*21-167*		"	"	"	"	

S2

PDC Energy	Project: JR #1	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	08/22/19 10:40

BH04

1908208-04 (Water)

Summit Scientific

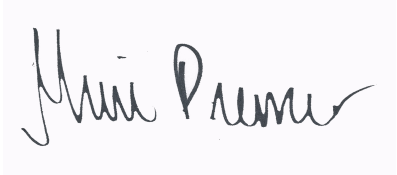
Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **08/16/19 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1908247	08/20/19	08/21/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **08/16/19 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		*133 %*	*23-173*		"	"	"	"	
Surrogate: Toluene-d8		*97.4 %*	*20-170*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*103 %*	*21-167*		"	"	"	"	



S2

PDC Energy	Project: JR #1	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	08/22/19 10:40

BH05

1908208-05 (Water)

Summit Scientific

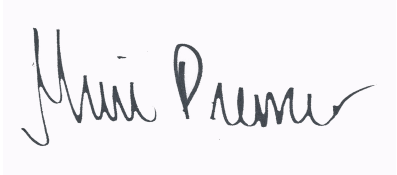
Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **08/16/19 11:09**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1908247	08/20/19	08/21/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **08/16/19 11:09**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		*131 %*	*23-173*		"	"	"	"	
Surrogate: Toluene-d8		*102 %*	*20-170*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*103 %*	*21-167*		"	"	"	"	



S2

PDC Energy	Project: JR #1	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	08/22/19 10:40

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908247 - EPA 5030 Water MS										
Blank (1908247-BLK1)				Prepared & Analyzed: 08/20/19						
Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	2.0	"							
Surrogate: 1,2-Dichloroethane-d4	*15.6*		*"*	*13.3*		*117*	*23-173*			
Surrogate: Toluene-d8	*14.0*		*"*	*13.3*		*105*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*13.9*		*"*	*13.3*		*104*	*21-167*			
LCS (1908247-BS1)				Prepared & Analyzed: 08/20/19						
Benzene	62.9	1.0	ug/l	66.7		94.4	51-132			
Toluene	73.8	1.0	"	66.7		111	51-138			
Ethylbenzene	63.2	1.0	"	66.7		94.8	58-146			
m,p-Xylene	117	2.0	"	133		87.9	57-144			
o-Xylene	62.2	1.0	"	66.7		93.3	53-146			
Surrogate: 1,2-Dichloroethane-d4	*16.0*		*"*	*13.3*		*120*	*23-173*			
Surrogate: Toluene-d8	*15.5*		*"*	*13.3*		*116*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*13.7*		*"*	*13.3*		*103*	*21-167*			
Matrix Spike (1908247-MS1)		**Source: 1908208-01**		Prepared & Analyzed: 08/20/19						
Benzene	79.6	1.0	ug/l	66.7	42.1	56.3	34-141			
Toluene	71.2	1.0	"	66.7	ND	107	27-151			
Ethylbenzene	73.0	1.0	"	66.7	12.8	90.4	29-160			
m,p-Xylene	170	2.0	"	133	119	37.9	20-166			
o-Xylene	84.2	1.0	"	66.7	41.6	63.9	33-159			
Surrogate: 1,2-Dichloroethane-d4	*17.0*		*"*	*13.3*		*128*	*23-173*			
Surrogate: Toluene-d8	*13.6*		*"*	*13.3*		*102*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*13.6*		*"*	*13.3*		*102*	*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.

S2

PDC Energy	Project: JR #1	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	08/22/19 10:40

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908247 - EPA 5030 Water MS										
Matrix Spike Dup (1908247-MSD1)	**Source: 1908208-01**			Prepared: 08/20/19 Analyzed: 08/21/19						
Benzene	73.7	1.0	ug/l	66.7	42.1	47.5	34-141	7.62	30	
Toluene	64.3	1.0	"	66.7	ND	96.5	27-151	10.2	30	
Ethylbenzene	68.1	1.0	"	66.7	12.8	83.0	29-160	6.97	30	
m,p-Xylene	161	2.0	"	133	119	31.2	20-166	5.41	30	
o-Xylene	77.0	1.0	"	66.7	41.6	53.1	33-159	8.92	30	
Surrogate: 1,2-Dichloroethane-d4	*16.3*		*"*	*13.3*		*122*	*23-173*			
Surrogate: Toluene-d8	*13.6*		*"*	*13.3*		*102*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*13.9*		*"*	*13.3*		*105*	*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	Project: JR #1	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	08/22/19 10:40

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