

PDC Energy, Inc.
Third Quarter 2019 Groundwater Monitoring Summary

July 31, 2019

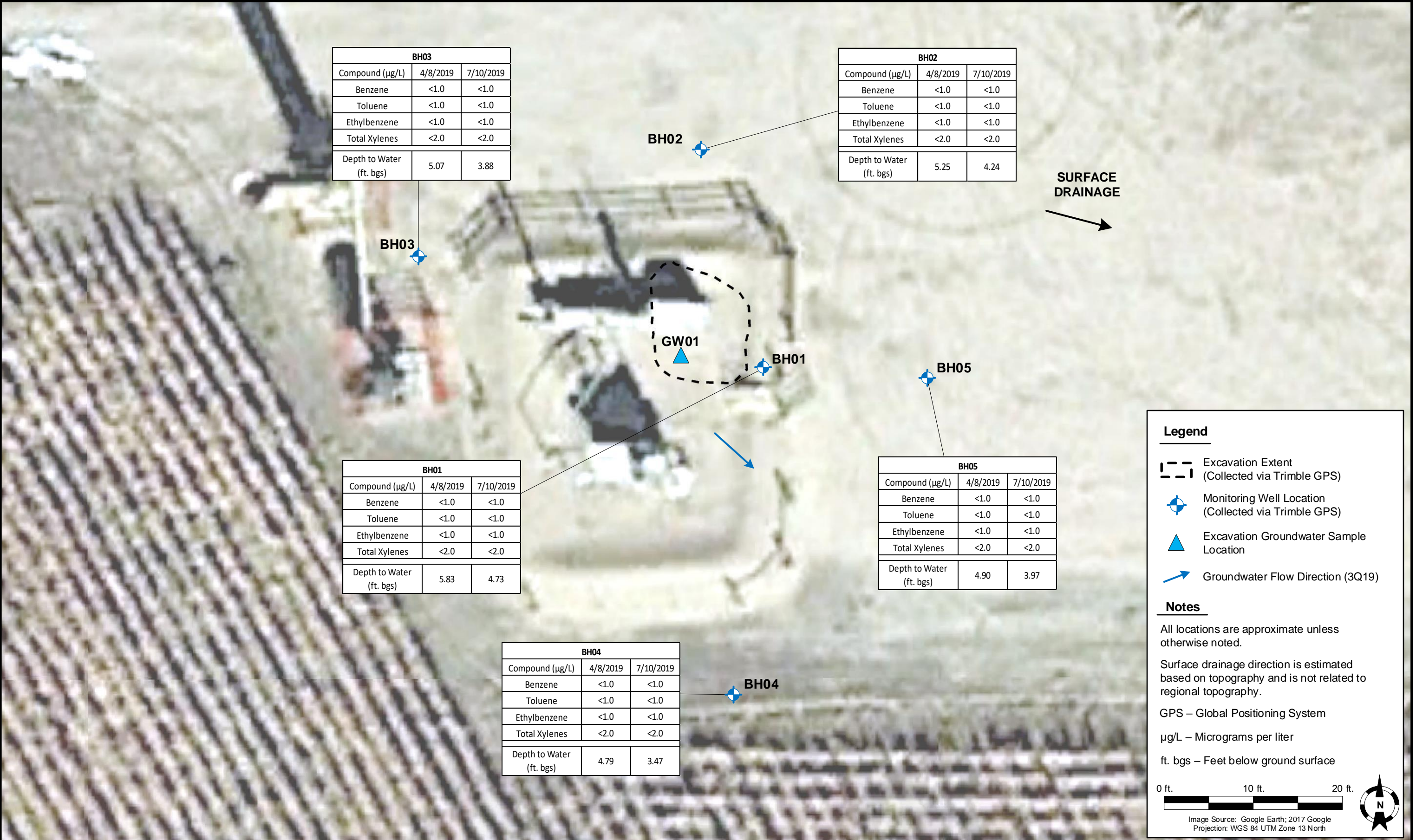
Rotharmel 1; 22-33; 33A Tank Battery
NWNE Section 33 T7N R66W
Remediation # 12529

This groundwater monitoring summary has been prepared by Tasman Geosciences, Inc. for the Rotharmel 1; 22-33; 33A tank battery. On July 10, 2019, groundwater monitoring was conducted at all 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.

Third quarter 2019 analytical results indicated that BTEX concentrations were below the applicable COGCC Table 910-1 standards in all five monitoring well locations.

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

Fourth quarter 2019 groundwater sampling will be conducted during October 2019. Sample locations and corresponding analytical results are illustrated on Figure 1. Groundwater elevation data is illustrated on Figure 2. Groundwater analytical results are summarized in Table 1. The laboratory analytical report is included in Attachment A.



DATE:	July 31, 2019
DESIGNED BY:	C. Hamlin
DRAWN BY:	M. Dahlgren



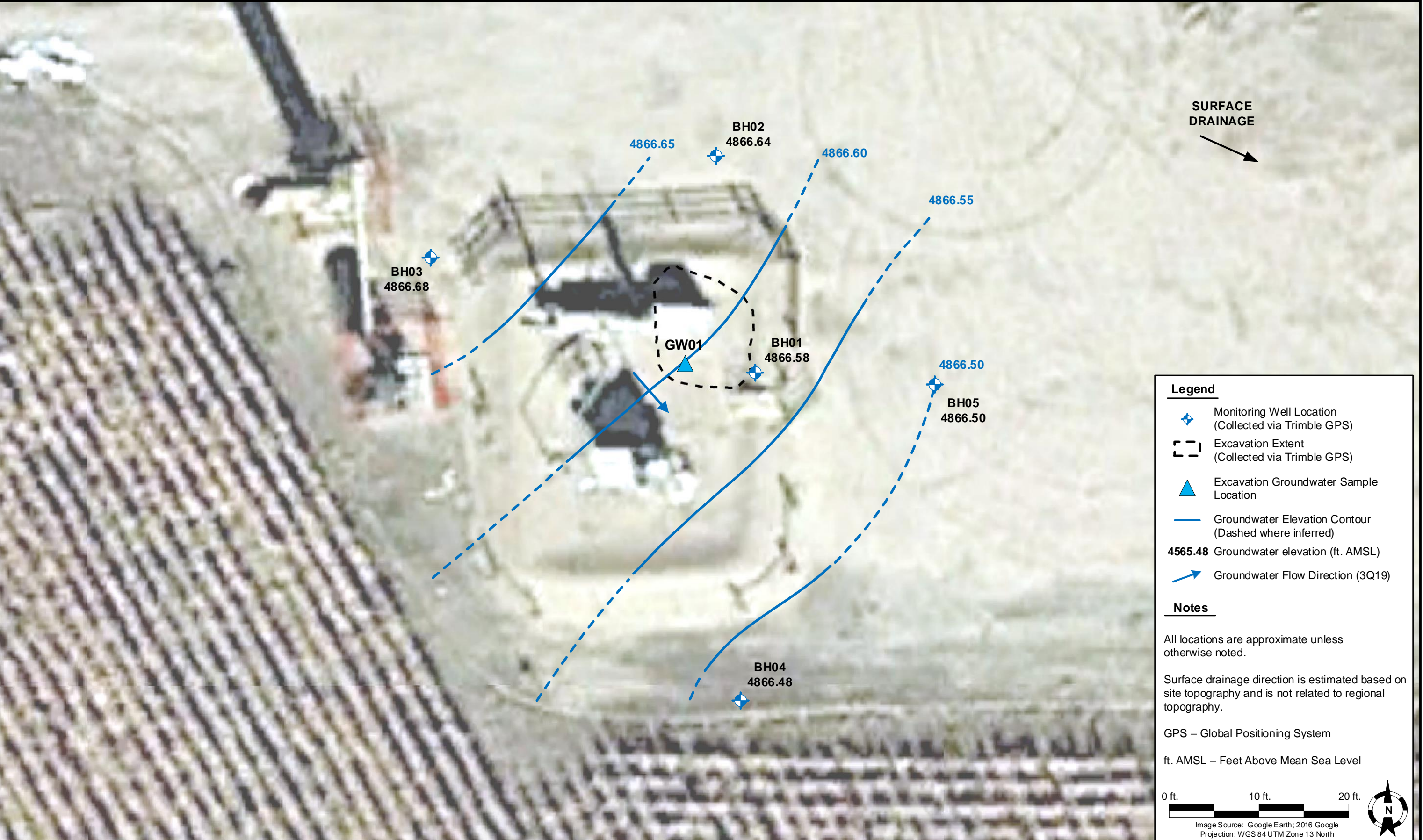
TASMAN
GEOSCIENCES

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

PDC Energy, Inc. – DJ Basin
Rotharmel 1; 22-33; 33A Tank Battery
NWNW Section 33, Township 7 North, Range 66 West
Weld County, Colorado

**GROUNDWATER
ANALYTICAL RESULTS
MAP**

**FIGURE
1**



DATE:	August 9, 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
Rotharmel 1; 22-33; 33A Tank Battery
NWNW, Section 33, Township 7 North, Range 66 West
Weld County, Colorado

**GROUNDWATER
ELEVATION CONTOUR
MAP (07/10/2019)**

**FIGURE
2**

TABLE 1
ROTHARMEL 1; 22-33; 33A 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	2/5/2019	40	<1.0	<1.0	2.2	~ 8	NM
BH01	4/8/2019	<1.0	<1.0	<1.0	<2.0	5.83	4865.48
BH01	7/10/2019	<1.0	<1.0	<1.0	<2.0	4.73	4866.58
BH02	4/8/2019	<1.0	<1.0	<1.0	<2.0	5.25	4865.63
BH02	7/10/2019	<1.0	<1.0	<1.0	<2.0	4.24	4866.64
BH03	4/8/2019	<1.0	<1.0	<1.0	<2.0	5.07	4865.49
BH03	7/10/2019	<1.0	<1.0	<1.0	<2.0	3.88	4866.68
BH04	4/8/2019	<1.0	<1.0	<1.0	<2.0	4.79	4865.16
BH04	7/10/2019	<1.0	<1.0	<1.0	<2.0	3.47	4866.48
BH05	4/8/2019	<1.0	<1.0	<1.0	<2.0	4.90	4865.57
BH05	7/10/2019	<1.0	<1.0	<1.0	<2.0	3.97	4866.50

Notes:

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

2. Groundwater measurements for excavation samples were estimated from ground surface. Depth to water measurements were collected from top of casing and adjusted using survey data and product thickness to reflect depth of water from ground surface.

COGCC = Colorado Oil and Gas Conservation Commission

µg/L = Micrograms per liter

NM = Not measured

(<) = 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

July 17, 2019

Mark Longhurst

PDC Energy

1775 Sherman St. STE. 3000

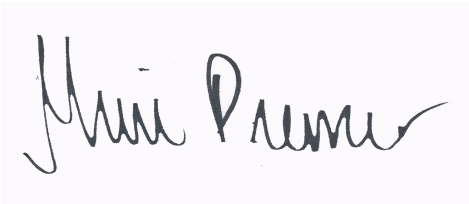
Denver, CO 80203

RE: Rotharmel 1; 22-33 , 33A

Work Order # 1907110

Enclosed are the results of analyses for samples received by Summit Scientific on 07/10/19 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: Rotharmel 1; 22-33 , 33A

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/17/19 16:52

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	1907110-01	Water	07/10/19 11:33	07/10/19 17:30
BH02	1907110-02	Water	07/10/19 11:39	07/10/19 17:30
BH03	1907110-03	Water	07/10/19 11:30	07/10/19 17:30
BH04	1907110-04	Water	07/10/19 11:47	07/10/19 17:30
BH05	1907110-05	Water	07/10/19 11:45	07/10/19 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.

1907110

Summit Scientific

741 Corporate Circle Suite I ♦ Golden, Colorado 80401
303-277-9310 ♦ 303-374-5933 Fax

Page 1 of 1

Client: PDC / Tasman Geosciences
Address: 6899 Pecos St, Unit C
City/State/Zip: Denver, CO 80221
Phone: 303-487-1228 Fax:
Sampler Name: Brian G., Brandon V.

Project Manager: Mark Longhurst
E-Mail: mark.longhurst@pdce.com
Project Name: Rotharmel 1:22-33+33A
Project Number: N/A

Sample Description	Date Sampled	Time Sampled	Number of Containers	Preservative				Matrix				Analyze For:								Special Instructions	
				HCl	HNO ₃	None	Other (Specify)	Groundwater	Soil	Air - Canister Serial #	Other (Specify)	BTEX - 8260									
BH01	7/10/19	1133	3	X				X					X								
BH02		1139																			
BH03		1130																			
BH04		1147																			
BH05		1145																			
Relinquished by: <u>Brandon V.</u>		Date/Time: <u>7/10/19 1500</u>		Received by: <u>Tasman Lock Box</u>		Date/Time: <u>7/10/19 1500</u>		Turn Around Time (Check)				Notes:									
								Same Day <input type="checkbox"/> 72 Hours <input checked="" type="checkbox"/> 24 Hours <input type="checkbox"/> Standard <input checked="" type="checkbox"/> 48 Hours <input type="checkbox"/>													
Relinquished by: <u>Tasman Lock Box</u>		Date/Time: <u>07/10/19 1730</u>		Received by:		Date/Time: <u>07/10/19 1730</u>		Sample Integrity:													
								Temperature Upon Receipt: <u>3.9</u>													
Relinquished by:		Date/Time:		Received in Lab by:		Date/Time:		Intact: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>													

Sample Receipt Checklist

S2 Work Order:

1907110

Client:

PDC/Triunfo Sciences

Client Project ID:

ROTH Annual 1; 22-33 & 33A

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)

3.9

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

KE

Signature of Custodian

[Signature]

Date/Time

07/10/19
1813



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

Project: Rotharmel 1; 22-33 , 33A

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/17/19 16:52

BH01
1907110-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **07/10/19 11:33**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Benzene	ND	1.0	ug/l	1	1907144	07/11/19	07/12/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/19 11:33**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Surrogate: 1,2-Dichloroethane-d4		111 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		95.4 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		93.5 %	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
1775 Sherman St. STE. 3000
Denver CO, 80203

Project: Rotharmel 1; 22-33 , 33A

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/17/19 16:52

BH02
1907110-02 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **07/10/19 11:39**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1907144	07/11/19	07/12/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/19 11:39**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		109 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		92.8 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		90.8 %	21-167		"	"	"	"	

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

Project: Rotharmel 1; 22-33 , 33A

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/17/19 16:52

BH03
1907110-03 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **07/10/19 11:30**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1907144	07/11/19	07/12/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/19 11:30**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		113 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		95.0 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		93.2 %	21-167		"	"	"	"	

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

Project: Rotharmel 1; 22-33 , 33A

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/17/19 16:52

BH04
1907110-04 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **07/10/19 11:47**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1907144	07/11/19	07/12/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/19 11:47**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		111 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		94.6 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		92.6 %	21-167		"	"	"	"	

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

Project: Rotharmel 1; 22-33 , 33A

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/17/19 16:52

BH05
1907110-05 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **07/10/19 11:45**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1907144	07/11/19	07/12/19	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/19 11:45**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		114 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		92.9 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		93.7 %	21-167		"	"	"	"	

Summit Scientific

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

Project: Rotharmel 1; 22-33 , 33A

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/17/19 16:52

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 1907144 - EPA 5030 Water MS

Blank (1907144-BLK1)

Prepared & Analyzed: 07/11/19

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	2.0	"							
Surrogate: 1,2-Dichloroethane-d4	13.9		"	13.3		104	23-173			
Surrogate: Toluene-d8	12.7		"	13.3		95.5	20-170			
Surrogate: 4-Bromofluorobenzene	12.2		"	13.3		91.4	21-167			

LCS (1907144-BS1)

Prepared & Analyzed: 07/11/19

Benzene	43.6	1.0	ug/l	33.3		131	51-132			
Toluene	42.4	1.0	"	33.3		127	51-138			
Ethylbenzene	45.0	1.0	"	33.3		135	58-146			
m,p-Xylene	85.1	2.0	"	66.7		128	57-144			
o-Xylene	44.2	1.0	"	33.3		133	53-146			
Surrogate: 1,2-Dichloroethane-d4	14.0		"	13.3		105	23-173			
Surrogate: Toluene-d8	12.9		"	13.3		96.9	20-170			
Surrogate: 4-Bromofluorobenzene	12.6		"	13.3		94.1	21-167			

Matrix Spike (1907144-MS1)

Source: 1907088-01

Prepared & Analyzed: 07/11/19

Benzene	39.5	1.0	ug/l	33.3	ND	119	34-141			
Toluene	42.7	1.0	"	33.3	ND	128	27-151			
Ethylbenzene	47.1	1.0	"	33.3	ND	141	29-160			
m,p-Xylene	89.4	2.0	"	66.7	ND	134	20-166			
o-Xylene	46.4	1.0	"	33.3	ND	139	33-159			
Surrogate: 1,2-Dichloroethane-d4	13.4		"	13.3		100	23-173			
Surrogate: Toluene-d8	12.8		"	13.3		95.8	20-170			
Surrogate: 4-Bromofluorobenzene	14.3		"	13.3		107	21-167			

Summit Scientific

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

Project: Rotharmel 1; 22-33 , 33A

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/17/19 16:52

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 1907144 - EPA 5030 Water MS

Matrix Spike Dup (1907144-MSD1)		Source: 1907088-01			Prepared & Analyzed: 07/11/19					
Benzene	38.4	1.0	ug/l	33.3	ND	115	34-141	2.77	30	
Toluene	42.9	1.0	"	33.3	ND	129	27-151	0.397	30	
Ethylbenzene	46.6	1.0	"	33.3	ND	140	29-160	1.13	30	
m,p-Xylene	85.9	2.0	"	66.7	ND	129	20-166	3.98	30	
o-Xylene	43.7	1.0	"	33.3	ND	131	33-159	5.84	30	
Surrogate: 1,2-Dichloroethane-d4	13.1		"	13.3		98.1	23-173			
Surrogate: Toluene-d8	12.9		"	13.3		96.5	20-170			
Surrogate: 4-Bromofluorobenzene	13.6		"	13.3		102	21-167			

Summit Scientific

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

Project: Rotharmel 1; 22-33 , 33A

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/17/19 16:52

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