



**PDC Energy, Inc.**  
Third Quarter 2018 Groundwater Monitoring Summary

September 20, 2018

Nelson 11, 21-33 Tank Battery  
NWNW Section 33 T5N R67W  
Spill Point ID # 448930  
Remediation # 10053

This groundwater monitoring summary has been prepared by Tasman Geosciences, Inc. for the Nelson 11, 21-33 tank battery. On July 10, 2018, groundwater monitoring was conducted at all ten monitoring well locations (BH01 – BH03, BH04R, BH05 – BH10). Ten groundwater samples were submitted to Summit Scientific Laboratory for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8260B. 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. Third quarter 2018 analytical results indicate that benzene concentrations are above the applicable COGCC Table 910-1 groundwater standard in monitoring wells BH03 and BH4R. BTEX concentrations are below applicable regulatory standards in eight monitoring well locations.

Monitored natural attenuation (MNA) was selected as the remediation strategy for this site during the second quarter 2017. Due to persisting elevated benzene concentrations, enhanced fluid recovery (EFR) and air sparge (AS) was initiated at the site during the first quarter 2018. A summary of the EFR/AS operational data is provided in Table 2. EFR/AS will remain the selected remediation strategy for the site through the fourth quarter 2018.

Per the Condition of Approval (COA) issued by the COGCC on August 2, 2017, groundwater elevation contours indicating groundwater flow direction are illustrated on the attached Figure 2. Fourth quarter 2018 groundwater sampling will be conducted during October 2018.

COUNTY ROAD 52

SURFACE DRAINAGE

BH07		
Compound (µg/L)	4/17/2018	7/10/2018
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)	7.87	6.24

BH06		
Compound (µg/L)	4/17/2018	7/10/2018
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)	8.70	7.15

BH03		
Compound (µg/L)	4/17/2018	7/10/2018
Benzene	7.3	8.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<2.0	<2.0
Depth to Water (ft. bgs)	6.16	4.79

BH02		
Compound (µg/L)	4/17/2018	7/10/2018
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)	8.17	6.76

BH08		
Compound (µg/L)	4/17/2018	7/10/2018
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)	5.96	4.53

BH01		
Compound (µg/L)	4/17/2018	7/10/2018
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)	7.06	5.82

BH04R		
Compound (µg/L)	4/17/2018	7/10/2018
Benzene	43	10
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	5.1	<2.0
Depth to Water (ft. bgs)	5.98	4.73

BH05		
Compound (µg/L)	4/17/2018	7/10/2018
Benzene	10	1.3
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<2.0	<2.0
Depth to Water (ft. bgs)	6.10	4.85

BH09		
Compound (µg/L)	4/17/2018	7/10/2018
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)	5.76	4.57

BH10		
Compound (µg/L)	4/17/2018	7/10/2018
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)	5.91	4.75

**Legend**

- Monitoring Well (Location collected via Trimble GPS)
- Replacement Monitoring Well (Location collected via Trimble GPS)
- Excavation Extent (Location collected via Trimble GPS)
- Point of Release
- Excavation Groundwater Sample
- Groundwater Flow Direction (3Q18)

**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.

Image Source: Google Earth; 2016 Google  
Projection: WGS 84 UTM Zone 13 North

DATE: July 19, 2018

DESIGNED BY: C. Hamlin

DRAWN BY: T. Blessing



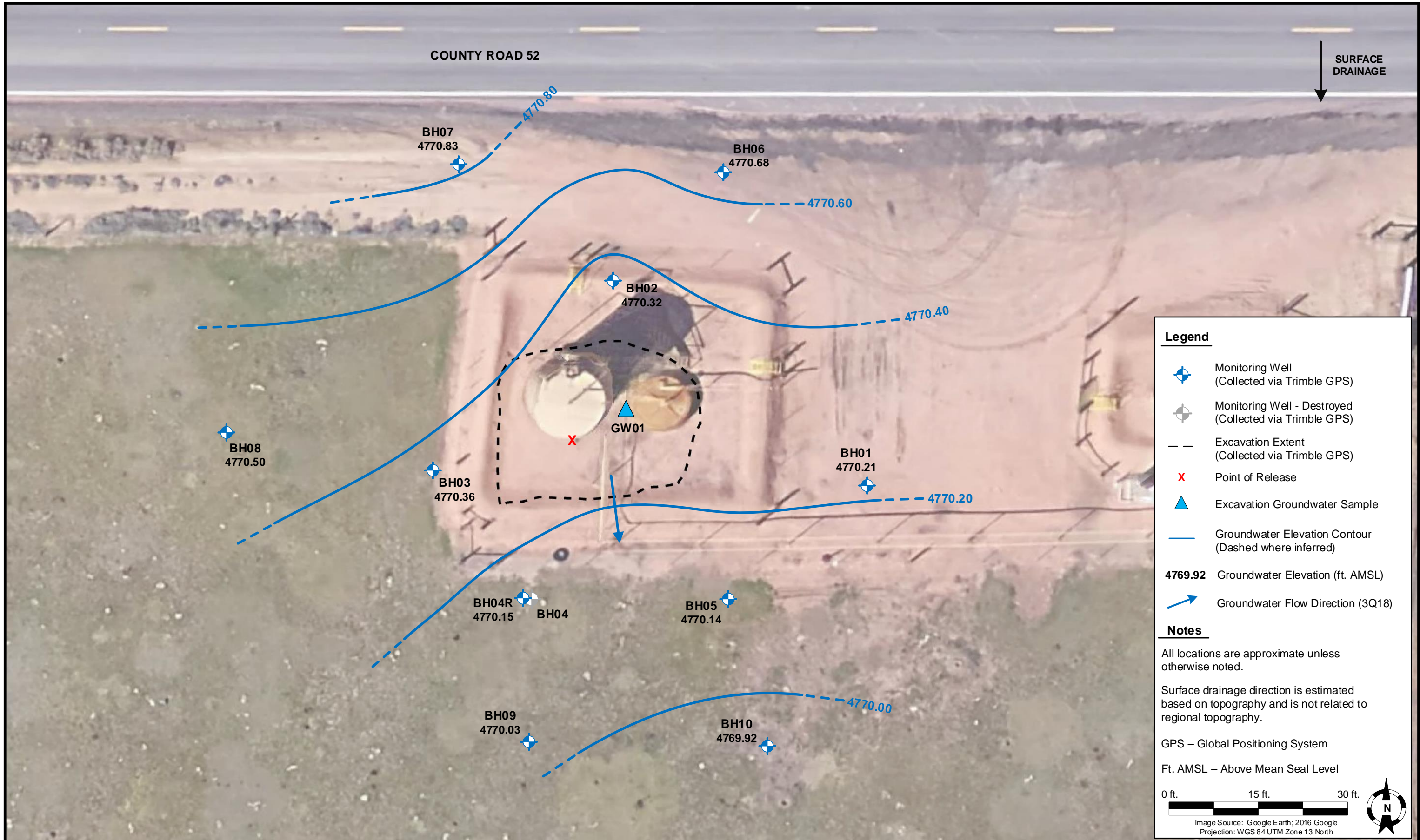
**TASMAN**  
GEOSCIENCES

Tasman Geosciences, Inc.  
6899 Pecos Street – Unit C  
Denver, CO 80221

**PDC Energy, Inc. – DJ Basin**  
**Nelson 11, 21-33 Tank Battery**  
NWNW, Section 33, Township 5 North, Range 67 West  
Weld County, Colorado

GROUNDWATER  
ANALYTICAL RESULTS  
MAP

FIGURE  
1



DATE: July 20, 2018

DESIGNED BY: C. Hamlin

DRAWN BY: D. Cavinder



**Tasman Geosciences, Inc.**  
6899 Pecos Street – Unit C  
Denver, CO 80221

**PDC Energy, Inc. – DJ Basin**  
**Nelson 11, 21-33 Tank Battery**  
NWNW, Section 33, Township 5 North, Range 67 West  
Weld County, Colorado

**GROUNDWATER  
ELEVATION CONTOUR  
MAP (07/10/2018)**

**FIGURE  
2**

**TABLE 1  
NELSON 11, 21-33 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 <sup>(2)</sup> (feet)	Groundwater Elevation (ft AMSL)
<b>COGCC Table 910-1 Groundwater Standard (µg/L) <sup>(1)</sup></b>		<b>5</b>	<b>560</b>	<b>700</b>	<b>1,400</b>		
GW01	2/6/2017	<b>210</b>	350	6.2	360	~ 10	NM
BH01	6/5/2017	<1.0	<1.0	<1.0	<2.0	6.80	4769.41
BH01	7/13/2017	<1.0	<1.0	<1.0	<2.0	5.14	4771.05
BH01	10/2/2017	<1.0	<1.0	<1.0	<2.0	5.15	4771.04
BH01	1/25/2018	<1.0	<1.0	<1.0	<2.0	6.50	4769.69
BH01	4/17/2018	<1.0	<1.0	<1.0	<2.0	7.06	4768.97
BH01	7/10/2018	<1.0	<1.0	<1.0	<2.0	5.82	4770.21
BH02	6/5/2017	<b>44</b>	160	5.3	80	7.62	4769.58
BH02	7/13/2017	<1.0	<1.0	<1.0	<2.0	5.88	4771.31
BH02	10/2/2017	<1.0	<1.0	<1.0	<2.0	6.04	4771.15
BH02	1/25/2018	<b>11</b>	<1.0	<1.0	<2.0	7.49	4769.70
BH02	4/17/2018	<1.0	<1.0	<1.0	<2.0	8.17	4768.91
BH02	7/10/2018	<1.0	<1.0	<1.0	<2.0	6.76	4770.32
BH03	6/5/2017	<b>61</b>	310	10	160	5.78	4769.50
BH03	7/13/2017	<1.0	<1.0	<1.0	<2.0	4.02	4771.17
BH03	10/2/2017	<b>13</b>	6.6	<1.0	7.1	4.15	4771.04
BH03	1/25/2018	<b>33</b>	<1.0	<1.0	<2.0	5.69	4769.50
BH03	4/17/2018	<b>7.3</b>	<1.0	<1.0	<2.0	6.16	4768.99
BH03	7/10/2018	<b>8.0</b>	<1.0	<1.0	<2.0	4.79	4770.36
BH04	6/5/2017	<b>220</b>	<b>690</b>	18	260	5.62	4769.40
BH04	7/13/2017	<1.0	<1.0	<1.0	<2.0	4.06	4770.91
BH04	10/2/2017	<b>63</b>	<1.0	<1.0	16	4.08	4770.89
BH04 <sup>(3)</sup>	1/25/2018	<b>350</b>	<1.0	6.9	30	NM	NM
BH04	1/25/2018	Destroyed					
BH04R	4/17/2018	<b>43</b>	<1.0	<1.0	5.1	5.98	4768.90
BH04R	7/10/2018	<b>10</b>	<1.0	<1.0	<2.0	4.73	4770.15
BH05	6/5/2017	<b>450</b>	24	<1.0	26	5.71	4769.39
BH05	7/13/2017	<1.0	<1.0	<1.0	<2.0	4.15	4770.89
BH05	10/2/2017	<1.0	<1.0	<1.0	<2.0	4.14	4770.90
BH05	1/25/2018	<b>7.9</b>	<1.0	<1.0	<2.0	5.67	4769.37
BH05	4/17/2018	<b>10</b>	<1.0	<1.0	<2.0	6.10	4768.89
BH05	7/10/2018	1.3	<1.0	<1.0	<2.0	4.85	4770.14
BH06	7/13/2017	<1.0	<1.0	<1.0	<2.0	6.33	4771.63
BH06	10/2/2017	<1.0	<1.0	<1.0	<2.0	6.61	4771.35
BH06	1/25/2018	<1.0	<1.0	<1.0	<2.0	8.04	4769.92
BH06	4/17/2018	<1.0	<1.0	<1.0	<2.0	8.70	4769.13
BH06	7/10/2018	<1.0	<1.0	<1.0	<2.0	7.15	4770.68

**TABLE 1**  
**NELSON 11, 21-33 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 <sup>(2)</sup> (feet)	Groundwater Elevation (ft AMSL)
<b>COGCC Table 910-1 Groundwater Standard (µg/L) <sup>(1)</sup></b>		<b>5</b>	<b>560</b>	<b>700</b>	<b>1,400</b>		
BH07	7/13/2017	<1.0	<1.0	<1.0	<2.0	5.61	4771.61
BH07	10/2/2017	<1.0	<1.0	<1.0	<2.0	5.90	4771.32
BH07	1/25/2018	<1.0	<1.0	<1.0	<2.0	7.42	4769.80
BH07	4/17/2018	<1.0	<1.0	<1.0	<2.0	7.87	4769.20
BH07	7/10/2018	<1.0	<1.0	<1.0	<2.0	6.24	4770.83
<hr/>							
BH08	7/13/2017	<1.0	<1.0	<1.0	<2.0	3.89	4771.23
BH08	10/2/2017	<1.0	<1.0	<1.0	<2.0	4.01	4771.11
BH08	1/25/2018	<1.0	<1.0	<1.0	<2.0	5.43	4769.69
BH08	4/17/2018	<1.0	<1.0	<1.0	<2.0	5.96	4769.07
BH08	7/10/2018	<1.0	<1.0	<1.0	<2.0	4.53	4770.50
<hr/>							
BH09	7/13/2017	<1.0	<1.0	<1.0	<2.0	4.03	4770.73
BH09	10/2/2017	<1.0	<1.0	<1.0	<2.0	3.98	4770.78
BH09	1/25/2018	<1.0	<1.0	<1.0	<2.0	5.35	4769.41
BH09	4/17/2018	<1.0	<1.0	<1.0	<2.0	5.76	4768.84
BH09	7/10/2018	<1.0	<1.0	<1.0	<2.0	4.57	4770.03
<hr/>							
BH10	7/13/2017	<1.0	<1.0	<1.0	<2.0	4.11	4770.67
BH10	10/2/2017	<1.0	<1.0	<1.0	<2.0	4.03	4770.75
BH10	1/25/2018	<1.0	<1.0	<1.0	<2.0	5.41	4769.37
BH10	4/17/2018	<1.0	<1.0	<1.0	<2.0	5.91	4768.76
BH10	7/10/2018	<1.0	<1.0	<1.0	<2.0	4.75	4769.92

**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 and product thickness to reflect depth of water from ground surface.
  3. Monitoring well BH04's casing was removed during EFR event on January 3, 2018. 1Q18 groundwater sample was collected from the remaining borehole as a grab sample.
- COGCC = Colorado Oil and Gas Conservation Commission  
µg/L = Micrograms per liter  
(<) = Analytical result is less than the indicated laboratory reporting limit.  
NM = Not measured  
**BOLD** = Analytical result is in exceedance of COGCC groundwater standards.

**TABLE 2**  
**NELSON 11,21-33 TANK BATTERY**  
**EFR / AS OPERATIONAL SUMMARY TABLE**

Date	EFR Wells	Total EFR/AS Duration (hours)	Approximate Gallons Extracted	AS Wells	Air Injection Pressure (psi)	Average Air Flow Rate (cfm)
<b>First Quarter 2018</b>						
1/3/2018	BH04, BH10	3	100	BH03, BH05, BH07, BH08, BH09	20	14
1/18/2018	BH02, BH03, BH05, BH09, BH10	6	84	BH02, BH03, BH05, BH07, BH08, BH09, BH10	20	14.4
1/31/2018		6	410	BH02, BH05, BH07, BH08, BH09, BH10	20	22
2/13/2018		6	300	BH02, BH03, BH05, BH07, BH08, BH09, BH10	15	10.9
2/27/2018	BH02, BH03, BH04, BH05, BH09, BH10	6	300	BH02, BH03, BH05, BH07, BH08, BH09, BH10	20	22
3/14/2018	BH02, BH03, BH04, BH05, BH09	6	180	BH02, BH03, BH04, BH05, BH07, BH09,	20	12.6
3/27/2018		6	170	BH05, BH07, BH09,	20	19.4
<b>Quarterly Totals</b>		<b>39</b>	<b>1544</b>		-	-
<b>Second Quarter 2018</b>						
4/10/2018	BH02, BH03, BH04, BH05, BH09	6	300	BH02, BH03, BH04, BH05, BH07, BH08, BH09, BH10	20	17.4
4/26/2018		6	600	BH02, BH03, BH04, BH05, BH07, BH08, BH09, BH10	20	15.9
5/9/2018		6	380	BH02, BH03, BH04, BH05, BH07, BH09, BH10	20	18
5/22/2018		6	126	BH02, BH03, BH04, BH05, BH07, BH09, BH10	20	18.3
6/6/2018		6	300	BH02, BH03, BH04, BH05, BH07, BH09, BH10	20	17.7
6/20/2018		6	300	BH02, BH03, BH04, BH05, BH07, BH09, BH10	20	22.3
<b>Quarterly Totals</b>		<b>36</b>	<b>2006</b>		-	-
<b>Third Quarter 2018</b>						
7/5/2018	BH02, BH03, BH04, BH05, BH09	6	380	BH02, BH03, BH04, BH05, BH07, BH09, BH10	20	15.4
7/17/2018		6	336	BH02, BH03, BH04, BH05, BH07, BH09, BH10	20	15
7/30/2018		6	336	BH02, BH03, BH04, BH05, BH07, BH09, BH10	20	15
8/13/2018	BH02, BH03, BH05, BH09	6	400	BH02, BH03, BH04, BH05, BH07, BH09, BH10	20	18
8/27/2018		6	336	BH02, BH03, BH04, BH05, BH07, BH09, BH10	20	15
9/10/2018		6	300	BH02, BH03, BH04, BH05, BH07, BH09, BH10	20	16
9/28/2018		5	168	BH02, BH03, BH04, BH05, BH07, BH09, BH10	20	15
<b>Quarterly Totals</b>		<b>41</b>	<b>2256</b>		-	-

**Notes:**

EFR = Enhanced fluid recovery

AS = Air sparge

psi = Pounds per square inch

cfm = Cubic feet per minute

## **ATTACHMENT A**

# Summit Scientific

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741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

July 15, 2018

Mark Longhurst  
PDC Energy  
1775 Sherman St. STE. 3000  
Denver, CO 80203  
RE: Nelson 11, 21-33

Enclosed are the results of analyses for samples received by Summit Scientific on 07/10/18 18:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Paul Shrewsbury For Ben Shrewsbury  
Laboratory Manager



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

Project: Nelson 11, 21-33

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
07/15/18 11:46

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	1807111-01	Water	07/10/18 10:02	07/10/18 18:30
BH02	1807111-02	Water	07/10/18 10:07	07/10/18 18:30
BH03	1807111-03	Water	07/10/18 10:56	07/10/18 18:30
BH04R	1807111-04	Water	07/10/18 10:51	07/10/18 18:30
BH05	1807111-05	Water	07/10/18 10:45	07/10/18 18:30
BH06	1807111-06	Water	07/10/18 09:55	07/10/18 18:30
BH07	1807111-07	Water	07/10/18 10:05	07/10/18 18:30
BH08	1807111-08	Water	07/10/18 10:44	07/10/18 18:30
BH09	1807111-09	Water	07/10/18 10:48	07/10/18 18:30
BH10	1807111-10	Water	07/10/18 10:35	07/10/18 18:30

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.*



Sample Receipt Checklist

S2 Work Order: 1807111

Client: PDC/Herman

Client Project ID: Nelson 11, 21-33

Shipped Via: Pickup  
(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Airbill #: \_\_\_\_\_

Matrix (check all that apply):  Air  Soil/Solid  Water  Other: \_\_\_\_\_ (Describe)

Temp (°C)	<u>9.2</u>
-----------	------------

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature at 4°C +/- 2°C <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
NOTE: If samples are delivered the same day of sampling, this requirement is met provided that there is evidence that cooling has begun.				
Were all samples received intact <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was adequate sample volume provided <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
If custody seals are present, are they intact <sup>(1)</sup> ?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Are samples with holding times due within 48 hours sample due within 48 hours present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Is a chain-of-custody (COC) form present and filled out completely <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the COC properly relinquished by the client w/ date and time recorded <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Are samples preserved that require preservation (excluding cooling) <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	HCl
Note the type of preservative in the Comments column – HCl, H <sub>2</sub> SO <sub>4</sub> , NaOH, HNO <sub>3</sub> , ect				
If samples are acid preserved for metals, is the pH ≤ 2 <sup>(1)</sup> ?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Record the pH in Comments.				
If dissolved metals are requested, were samples field filtered?	<input type="checkbox"/>	<input type="checkbox"/>	<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.

MP  
Custodian Printed Name or Initials

[Signature]  
Signature or Initials of Custodian

2.10.18 1330  
Date/Time



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

Project: Nelson 11, 21-33

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/15/18 11:46

**BH01**  
**1807111-01 (Water)**

**Summit Scientific**

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

Date Sampled: **07/10/18 10:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1807099	07/12/18	07/12/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/18 10:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		107 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		95.0 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		97.5 %	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: Nelson 11, 21-33

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/15/18 11:46

**BH02**  
**1807111-02 (Water)**

**Summit Scientific**

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

Date Sampled: **07/10/18 10:07**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1807099	07/12/18	07/13/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/18 10:07**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		109 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		97.1 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		101 %	21-167		"	"	"	"	

Summit Scientific

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

Project: Nelson 11, 21-33

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/15/18 11:46

**BH03**  
**1807111-03 (Water)**

**Summit Scientific**

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

Date Sampled: **07/10/18 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Benzene</b>	<b>8.0</b>	1.0	ug/l	1	1807099	07/12/18	07/13/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/18 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		109 %	23-173		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		97.8 %	20-170		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		99.7 %	21-167		"	"	"	"	

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

Project: Nelson 11, 21-33

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/15/18 11:46

**BH04R**  
**1807111-04 (Water)**

**Summit Scientific**

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

Date Sampled: **07/10/18 10:51**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Benzene</b>	<b>10</b>	1.0	ug/l	1	1807099	07/12/18	07/13/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/18 10:51**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		107 %	23-173		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		96.4 %	20-170		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		99.2 %	21-167		"	"	"	"	

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

Project: Nelson 11, 21-33

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/15/18 11:46

**BH05**  
**1807111-05 (Water)**

**Summit Scientific**

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

Date Sampled: **07/10/18 10:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Benzene</b>	<b>1.3</b>	1.0	ug/l	1	1807099	07/12/18	07/13/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/18 10:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		105 %	23-173		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		96.4 %	20-170		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		100 %	21-167		"	"	"	"	

Summit Scientific

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

Project: Nelson 11, 21-33

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/15/18 11:46

**BH06**  
**1807111-06 (Water)**

**Summit Scientific**

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

Date Sampled: **07/10/18 09:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1807099	07/12/18	07/13/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/18 09:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		93.8 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		98.9 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		96.5 %	21-167		"	"	"	"	

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

Project: Nelson 11, 21-33

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/15/18 11:46

**BH07**  
**1807111-07 (Water)**

**Summit Scientific**

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

Date Sampled: **07/10/18 10:05**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1807099	07/12/18	07/13/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/18 10:05**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		92.7 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		100 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		95.6 %	21-167		"	"	"	"	

Summit Scientific

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

Project: Nelson 11, 21-33

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/15/18 11:46

**BH08**  
**1807111-08 (Water)**

**Summit Scientific**

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

Date Sampled: **07/10/18 10:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1807099	07/12/18	07/13/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/18 10:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		88.3 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		98.3 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		94.1 %	21-167		"	"	"	"	

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

Project: Nelson 11, 21-33

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/15/18 11:46

**BH09**  
**1807111-09 (Water)**

**Summit Scientific**

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

Date Sampled: **07/10/18 10:48**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1807099	07/12/18	07/13/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/18 10:48**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		92.3 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		101 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.3 %	21-167		"	"	"	"	

Summit Scientific

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

Project: Nelson 11, 21-33

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/15/18 11:46

**BH10**  
**1807111-10 (Water)**

**Summit Scientific**

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

Date Sampled: **07/10/18 10:35**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1807099	07/12/18	07/13/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/10/18 10:35**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		88.9 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		100 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		94.4 %	21-167		"	"	"	"	

Summit Scientific

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

Project: Nelson 11, 21-33

Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
07/15/18 11:46

**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 1807099 - EPA 5030 Water MS**

**Blank (1807099-BLK1)**

Prepared & Analyzed: 07/12/18

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	2.0	"							
Surrogate: 1,2-Dichloroethane-d4	13.3		"	13.2		101	23-173			
Surrogate: Toluene-d8	12.4		"	13.3		92.9	20-170			
Surrogate: 4-Bromofluorobenzene	13.5		"	13.3		101	21-167			

**LCS (1807099-BS1)**

Prepared & Analyzed: 07/12/18

Benzene	31.0	1.0	ug/l	33.3		92.9	70-130			
Toluene	31.3	1.0	"	33.3		94.0	70-130			
Ethylbenzene	36.0	1.0	"	33.3		108	70-130			
m,p-Xylene	65.6	2.0	"	66.7		98.4	70-130			
o-Xylene	31.6	1.0	"	33.3		94.8	70-130			
Surrogate: 1,2-Dichloroethane-d4	13.5		"	13.2		102	23-173			
Surrogate: Toluene-d8	13.0		"	13.3		97.5	20-170			
Surrogate: 4-Bromofluorobenzene	13.0		"	13.3		97.4	21-167			

**Matrix Spike (1807099-MS1)**

Source: 1807111-01

Prepared & Analyzed: 07/12/18

Benzene	35.6	1.0	ug/l	33.3	ND	107	70-130			
Toluene	35.3	1.0	"	33.3	ND	106	70-130			
Ethylbenzene	39.3	1.0	"	33.3	ND	118	70-130			
m,p-Xylene	72.0	2.0	"	66.7	ND	108	70-130			
o-Xylene	34.8	1.0	"	33.3	ND	104	70-130			
Surrogate: 1,2-Dichloroethane-d4	14.3		"	13.2		108	23-173			
Surrogate: Toluene-d8	12.9		"	13.3		96.9	20-170			
Surrogate: 4-Bromofluorobenzene	12.9		"	13.3		96.8	21-167			

Summit Scientific

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

Project: Nelson 11, 21-33

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/15/18 11:46

**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 1807099 - EPA 5030 Water MS**

<b>Matrix Spike Dup (1807099-MSD1)</b>	<b>Source: 1807111-01</b>			<b>Prepared &amp; Analyzed: 07/12/18</b>						
Benzene	33.4	1.0	ug/l	33.3	ND	100	70-130	6.41	30	
Toluene	33.3	1.0	"	33.3	ND	99.9	70-130	5.83	30	
Ethylbenzene	37.7	1.0	"	33.3	ND	113	70-130	4.13	30	
m,p-Xylene	69.8	2.0	"	66.7	ND	105	70-130	3.03	30	
o-Xylene	33.4	1.0	"	33.3	ND	100	70-130	4.11	30	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>14.4</i>		<i>"</i>	<i>13.2</i>		<i>109</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>12.6</i>		<i>"</i>	<i>13.3</i>		<i>94.7</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>12.8</i>		<i>"</i>	<i>13.3</i>		<i>96.3</i>	<i>21-167</i>			

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

Project: Nelson 11, 21-33

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
07/15/18 11:46

### 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