

PDC Energy, Inc.
Second Quarter 2017 Groundwater Monitoring Summary

July 20, 2017

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 June 1, 2017, five monitoring wells (BH01 – BH05) were installed to delineate the extent of dissolved phase hydrocarbons associated with the release discovered on January 9, 2017. On June 5, 2017, 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. 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. Second quarter 2017 analytical results indicate that BTEX concentrations are above applicable COGCC Table 910-1 groundwater standards in monitoring wells BH02 – BH05. BTEX concentrations are below applicable regulatory standards in monitoring well BH01.

Monitored natural attenuation (MNA) was selected as the remediation strategy for this site during the second quarter 2017 and will remain as the selected remediation strategy through the third quarter 2017.

Third quarter 2017 groundwater sampling will be conducted during September 2017. Plans to install point of compliance wells are in progress and will be included in the third quarter 2017 groundwater sampling event.

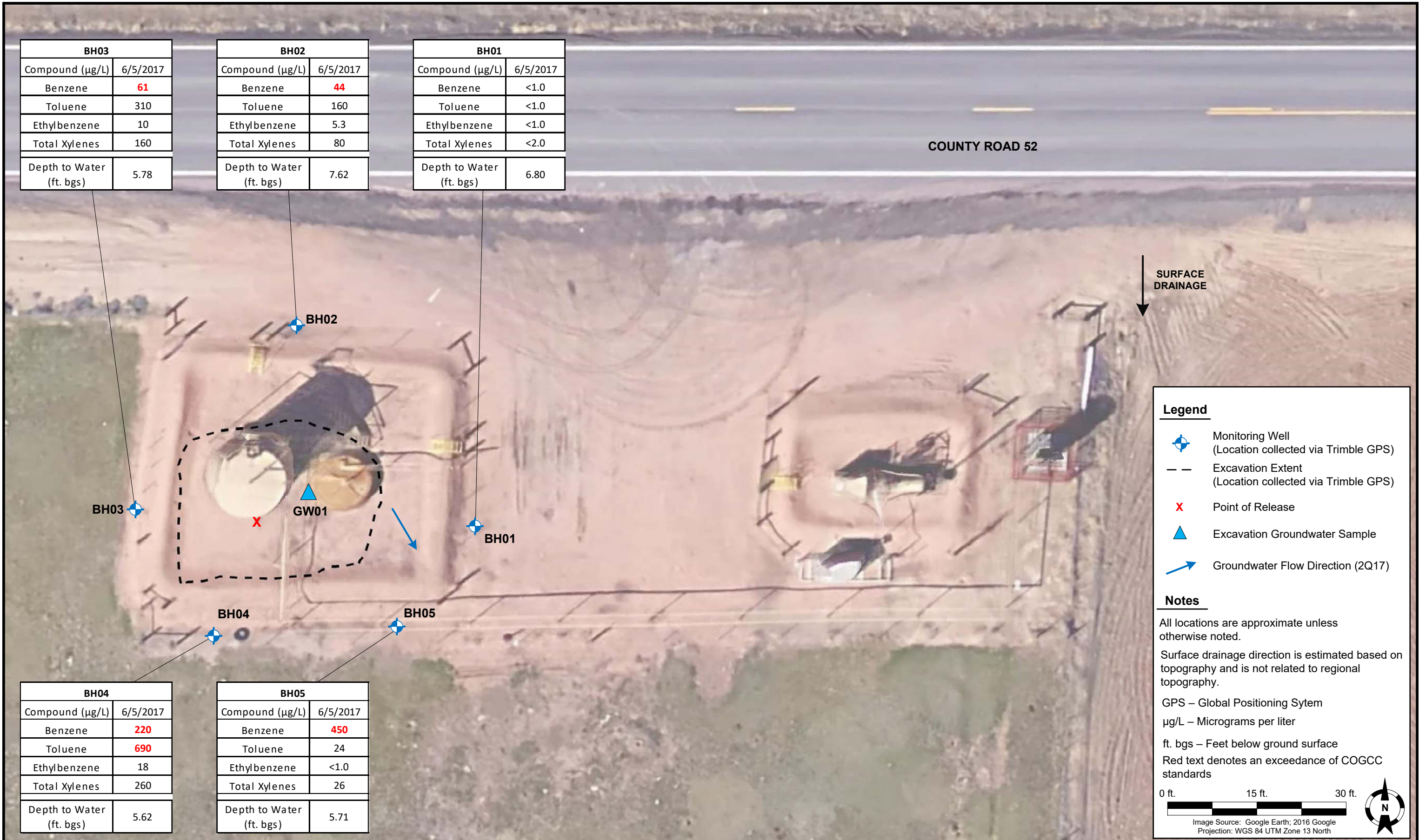
BH03	
Compound (µg/L)	6/5/2017
Benzene	61
Toluene	310
Ethylbenzene	10
Total Xylenes	160
Depth to Water (ft. bgs)	
	5.78

BH02	
Compound (µg/L)	6/5/2017
Benzene	44
Toluene	160
Ethylbenzene	5.3
Total Xylenes	80
Depth to Water (ft. bgs)	
	7.62

BH01	
Compound (µg/L)	6/5/2017
Benzene	<1.0
Toluene	<1.0
Ethylbenzene	<1.0
Total Xylenes	<2.0
Depth to Water (ft. bgs)	
	6.80

BH04	
Compound (µg/L)	6/5/2017
Benzene	220
Toluene	690
Ethylbenzene	18
Total Xylenes	260
Depth to Water (ft. bgs)	
	5.62

BH05	
Compound (µg/L)	6/5/2017
Benzene	450
Toluene	24
Ethylbenzene	<1.0
Total Xylenes	26
Depth to Water (ft. bgs)	
	5.71



DATE: June 19, 2017

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

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 ⁽²⁾ (feet)
COGCC Table 910-1 Groundwater Standard (µg/L) ⁽¹⁾		5	560	700	1,400	
GW01	2/6/2017	210	350	6.2	360	~ 10
BH01	6/5/2017	<1.0	<1.0	<1.0	<2.0	6.80
BH02	6/5/2017	44	160	5.3	80	7.62
BH03	6/5/2017	61	310	10	160	5.78
BH04	6/5/2017	220	690	18	260	5.62
BH05	6/5/2017	450	24	<1.0	26	5.71

Notes:

1. Groundwater standards referenced from 2 CCR 404-1, Table 910-1, effective January 30, 2015.
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.

COGCC = Colorado Oil and Gas Conservation Commission

µg/L = Micrograms per liter

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

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

ATTACHMENT A

Summit Scientific

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

June 12, 2017

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 06/05/17 17:45. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Paul Shrewsbury
President



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

Project: Nelson 11, 21-33

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
06/12/17 14:56

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	1706047-01	Water	06/05/17 10:29	06/05/17 17:45
BH02	1706047-02	Water	06/05/17 10:42	06/05/17 17:45
BH03	1706047-03	Water	06/05/17 11:11	06/05/17 17:45
BH04	1706047-04	Water	06/05/17 11:26	06/05/17 17:45
BH05	1706047-05	Water	06/05/17 11:39	06/05/17 17:45

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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:
06/12/17 14:56

Summit Scientific

1706047

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

Page 1 of 1

Client: PDC
Address: _____
City/State/Zip: _____
Phone: _____ Fax: _____
Sampler Name: Tyler Blessing

Project Manager: Mark Longhurst
E-Mail: Mark.Longhurst@pdce.com
Project Name: Nelson 11, 21-33
Project Number: _____

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	6/5/2017	10:24:00	3	X				X				X							
BH02	6/5/2017	10:42	3	X				X				X							
BH03	6/5/2017	11:11	3	X				X				X							
BH04	6/5/2017	11:26	3	X				X				X							
BH05	6/5/2017	11:39	3	X				X				X							
Relinquished by: _____ Date/Time: 6/5/17 17:45				Received by: _____ Date/Time: 6/5/17 17:45				Turn Around Time (Check)				Notes:							
Same Day <input type="checkbox"/>				72 Hours <input type="checkbox"/>				24 Hours <input type="checkbox"/>				Standard <input checked="" type="checkbox"/>				on ice			
48 Hours <input type="checkbox"/>				Sample Integrity:															
Temperature Upon Receipt: 4.6°C				Intact: <input checked="" type="radio"/> Yes <input type="radio"/> No															
Relinquished by: _____ Date/Time: 6/5/17 8:15				Received in Lab by: _____ Date/Time: 6-5-17 18:17															

www.s2scientific.com

S₂

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

Project: Nelson 11, 21-33

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
06/12/17 14:56

Sample Receipt Checklist

S2 Work Order: 1706047
Client: PDC Client Project ID: Nelson 11, 21-33
Shipped Via: PIU (UPS, FedEx, Hand Delivered, Pick-up, etc.) Airbill #: _____
Matrix (check all that apply): Air Soil/Solid Water Other: _____ (Describe)

Cooler ID					
Temp (°C)	<u>4.6</u>				

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature at 4°C +/- 2°C ⁽¹⁾ ?	<input checked="" 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 ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
If custody seals are present, are they intact ⁽¹⁾ ?			<input checked="" type="checkbox"/>	
Are short holding time analytes or samples with HTs due within 48 hours present?			<input checked="" type="checkbox"/>	
Is a chain-of-custody (COC) form present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client w/ date and time recorded ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.		<input checked="" type="checkbox"/>		
Are samples preserved that require preservation (excluding cooling) ⁽¹⁾ ?			<input checked="" type="checkbox"/>	
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⁾ ?			<input checked="" type="checkbox"/>	
Record the pH in Comments.				
If dissolved metals are requested, were samples field filtered?			<input checked="" type="checkbox"/>	
Additional Comments (if any):				

⁽¹⁾ If NO, then contact the client before proceeding with analysis and note in case narrative.

Nakita
Custodian Printed Name

[Signature]
Signature or Initials of Custodian

6/15/17 1810
Date/Time

[Signature]



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

Project: Nelson 11, 21-33

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 06/12/17 14:56

BH01
1706047-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **06/05/17 10:29**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1706057	06/08/17	06/08/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **06/05/17 10:29**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		114 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		98.4 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		94.7 %	45-146		"	"	"	"	

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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:
 06/12/17 14:56

BH02
1706047-02 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **06/05/17 10:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	44	1.0	ug/l	1	1706057	06/09/17	06/09/17	EPA 8260B	
Toluene	160	1.0	"	"	"	"	"	"	
Ethylbenzene	5.3	1.0	"	"	"	"	"	"	
Xylenes (total)	80	2.0	"	"	"	"	"	"	

Date Sampled: **06/05/17 10:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		109 %	37-154		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		100 %	45-149		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		98.4 %	45-146		"	"	"	"	

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 Denver CO, 80203

Project: Nelson 11, 21-33

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 06/12/17 14:56

BH03
1706047-03 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **06/05/17 11:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	61	1.0	ug/l	1	1706057	06/09/17	06/09/17	EPA 8260B	
Toluene	310	10	"	10	"	"	"	"	
Ethylbenzene	10	1.0	"	1	"	"	"	"	
Xylenes (total)	160	2.0	"	"	"	"	"	"	

Date Sampled: **06/05/17 11:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		108 %	37-154		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		100 %	45-149		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		98.9 %	45-146		"	"	"	"	

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Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 06/12/17 14:56

BH04
1706047-04 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **06/05/17 11:26**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	220	1.0	ug/l	1	1706057	06/09/17	06/09/17	EPA 8260B	
Toluene	690	10	"	10	"	"	"	"	
Ethylbenzene	18	1.0	"	1	"	"	"	"	
Xylenes (total)	260	2.0	"	"	"	"	"	"	

Date Sampled: **06/05/17 11:26**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		106 %	37-154		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		100 %	45-149		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		100 %	45-146		"	"	"	"	

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 1775 Sherman St. STE. 3000
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Project: Nelson 11, 21-33

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 06/12/17 14:56

BH05
1706047-05 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **06/05/17 11:39**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	450	10	ug/l	10	1706057	06/09/17	06/09/17	EPA 8260B	
Toluene	24	1.0	"	1	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	26	2.0	"	"	"	"	"	"	

Date Sampled: **06/05/17 11:39**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		109 %	37-154		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		100 %	45-149		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		96.6 %	45-146		"	"	"	"	

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Project: Nelson 11, 21-33

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
06/12/17 14:56

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 1706057 - EPA 5030 Water MS

Blank (1706057-BLK1)

Prepared & Analyzed: 06/08/17

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		"	13.3		99.5	37-154			
Surrogate: Toluene-d8	13.2		"	13.3		98.7	45-149			
Surrogate: 4-Bromofluorobenzene	13.1		"	13.3		98.3	45-146			

LCS (1706057-BS1)

Prepared & Analyzed: 06/08/17

Benzene	32.5	1.0	ug/l	33.3		97.5	51-132			
Toluene	39.0	1.0	"	33.3		117	51-138			
Ethylbenzene	38.5	1.0	"	33.1		116	58-146			
m,p-Xylene	79.2	2.0	"	66.5		119	57-144			
o-Xylene	36.6	1.0	"	32.7		112	53-146			
Surrogate: 1,2-Dichloroethane-d4	14.4		"	13.3		108	37-154			
Surrogate: Toluene-d8	13.3		"	13.3		99.8	45-149			
Surrogate: 4-Bromofluorobenzene	13.0		"	13.3		97.7	45-146			

Matrix Spike (1706057-MS1)

Source: 1706044-01

Prepared & Analyzed: 06/08/17

Benzene	31.7	1.0	ug/l	33.3	ND	95.0	34-141			
Toluene	38.0	1.0	"	33.3	ND	114	27-151			
Ethylbenzene	38.7	1.0	"	33.1	ND	117	29-160			
m,p-Xylene	79.3	2.0	"	66.5	ND	119	20-166			
o-Xylene	36.5	1.0	"	32.7	ND	112	33-159			
Surrogate: 1,2-Dichloroethane-d4	14.3		"	13.3		108	37-154			
Surrogate: Toluene-d8	13.2		"	13.3		98.8	45-149			
Surrogate: 4-Bromofluorobenzene	13.1		"	13.3		98.0	45-146			

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 Denver CO, 80203

Project: Nelson 11, 21-33

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 06/12/17 14:56

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 1706057 - EPA 5030 Water MS

Matrix Spike Dup (1706057-MSD1)	Source: 1706044-01			Prepared & Analyzed: 06/08/17						
Benzene	31.9	1.0	ug/l	33.3	ND	95.7	34-141	0.692	32	
Toluene	37.8	1.0	"	33.3	ND	113	27-151	0.607	25	
Ethylbenzene	38.5	1.0	"	33.1	ND	116	29-160	0.415	50	
m,p-Xylene	77.7	2.0	"	66.5	ND	117	20-166	2.08	36	
o-Xylene	36.2	1.0	"	32.7	ND	111	33-159	0.798	26	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>15.3</i>		<i>"</i>	<i>13.3</i>		<i>115</i>	<i>37-154</i>			
<i>Surrogate: Toluene-d8</i>	<i>13.4</i>		<i>"</i>	<i>13.3</i>		<i>100</i>	<i>45-149</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>13.5</i>		<i>"</i>	<i>13.3</i>		<i>101</i>	<i>45-146</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:
06/12/17 14:56

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