

PDC Energy, Inc.
Second Quarter 2022 Groundwater Monitoring Summary

May 23, 2022

Former LH Miller Unit 1 Tank Battery
NWNW Section 25 T4N R66W
Remediation # 16033

This groundwater monitoring summary has been prepared by Tasman, Inc. for the former LH Miller Unit 1 Tank Battery.

Site History and Background

On January 6, 2021, a historic hydrocarbon release was discovered beneath a buried produced water vessel during ACM abatement activities. Following the discovery, mitigation activities were initiated and between January 6 and January 13, 2021, approximately 360 cubic yards of impacted material were removed from the former excavation. During excavation activities, groundwater was encountered at approximately 6 feet below ground surface (bgs). On April 9, 2021, five monitoring wells (BH01-BH05) were installed within and adjacent to the former excavation extent to confirm the absence of dissolved phase hydrocarbon impacts. Per the approval from the COGCC, organic compounds were removed from the sampling and analysis plan following the first quarter 2022 groundwater monitoring event.

Groundwater Monitoring Activities

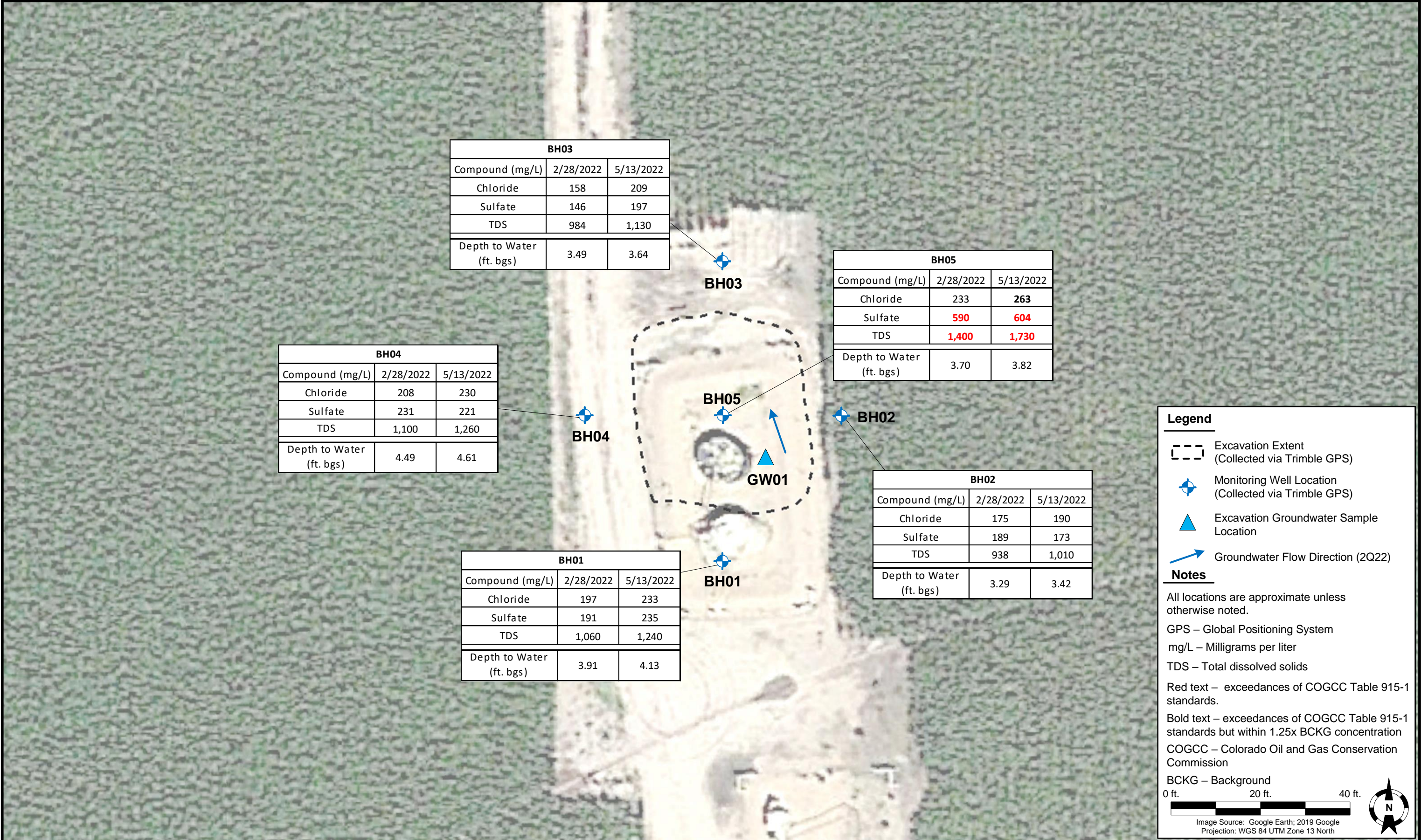
On May 13, 2022, groundwater monitoring was conducted at all five monitoring wells (BH01 – BH05). Five groundwater samples were submitted to Summit Scientific Laboratories for analysis of chloride and sulfate anions by EPA Method 300.0, and total dissolved solids (TDS) by Method SM 2540C.

Second quarter 2022 analytical results indicated that TDS and sulfate anion concentrations were in exceedance of the applicable COGCC Table 915-1 groundwater standards and above 1.25x the background concentrations of the cross-gradient monitoring wells (BH02 and BH04) in monitoring well BH05. Chloride anion concentrations were in compliance with the applicable regulatory standards or within 1.25x the background concentrations in all five monitoring well locations. Sample locations and corresponding analytical results are illustrated on Figures 1. Groundwater elevation data is illustrated on Figure 2. Groundwater analytical results are summarized in Table 1. The laboratory analytical report is included as Attachment A.


Current Remediation Activities and Path Forward

Monitored natural attenuation (MNA) was selected as the remediation strategy for this site during the second quarter 2021 and will remain the selected remediation strategy through the third quarter 2022.

Third quarter 2022 groundwater sampling will be conducted in August 2022.



DATE:	May 23, 2022
DESIGNED BY:	C. Hamlin
DRAWN BY:	T. Murrel



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

PDC Energy, Inc. – DJ Basin
Former LH Miller Unit 1 Tank Battery
NWNW, Section 25, Township 4 North, Range 66 West
Weld County, Colorado

**GROUNDWATER
ANALYTICAL RESULTS
MAP
(INORGANIC PARAMETERS)**

**FIGURE
1**



TABLE 1
FORMER LH MILLER UNIT 1 TANK BATTERY
GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE
INORGANIC PARAMETERS

Sample ID	Date Sampled	TDS (unit)	Chloride Ion (mg/L)	Sulfate Ion (mg/L)	Depth to Water ⁽²⁾ (ft.)	Groundwater Elevation (ft. AMSL)
COGCC Table 915-1 Groundwater Standard (mg/L) ⁽¹⁾		<1.25 x BCKG	250 or <1.25 x BCKG	250 or <1.25 x BCKG	-	-
BH01	5/27/2021	1,020	120	122	4.17	4742.29
BH01	8/26/2021	1,020	159	286	1.51	4744.95
BH01	11/17/2021	1,140	228	340	3.26	4743.20
BH01	2/28/2022	1,060	197	191	3.91	4742.55
BH01	5/13/2022	1,240	233	235	4.13	4742.33
BH02	8/26/2021	1,020	163	241	1.00	4744.51
BH02	11/17/2021	974	217	242	2.61	4742.90
BH02	2/28/2022	938	175	189	3.29	4742.22
BH02	5/13/2022	1,010	190	173	3.42	4742.09
BH03	5/27/2021	957	112	118	3.72	4741.58
BH03	8/26/2021	933	155	246	1.03	4744.27
BH03	11/17/2021	1070	239	332	2.79	4742.51
BH03	2/28/2022	984	158	146	3.49	4741.81
BH03	5/13/2022	1,130	209	197	3.64	4741.66
BH04	5/27/2021	1,090	134	147	4.69	4741.90
BH04	8/26/2021	1,060	182	316	1.84	4744.75
BH04	11/17/2021	1,170	293	392	3.74	4742.85
BH04	2/28/2022	1,100	208	231	4.49	4742.10
BH04	5/13/2022	1,260	230	221	4.61	4741.98
BH05	5/27/2021	1,310	251	1,090	4.14	4741.74
BH05	8/26/2021	1,970	299	1,240	1.98	4743.90
BH05	11/17/2021	1,990	413	1,370	3.00	4742.88
BH05	2/28/2022	1,400	233	590	3.70	4742.18
BH05	5/13/2022	1,730	263	604	3.82	4742.06

TABLE 1
FORMER LH MILLER UNIT 1 TANK BATTERY
GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE
INORGANIC PARAMETERS

Sample ID	Date Sampled	TDS (unit)	Chloride Ion (mg/L)	Sulfate Ion (mg/L)	Depth to Water ⁽²⁾ (ft.)	Groundwater Elevation (ft. AMSL)
COGCC Table 915-1 Groundwater Standard (mg/L) ⁽¹⁾		<1.25 x BCKG	250 or <1.25 x BCKG	250 or <1.25 x BCKG	-	-

Notes:

1. Groundwater standards referenced from 2 CCR 404-1, Table 915-1, January 15, 2021.

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.

TDS = Total dissolved solids

COGCC = Colorado Oil and Gas Conservation Commission

BCKG = Background

mg/L = Milligrams per liter

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

ft. = Feet

AMSL = Above Mean Sea Level

 = Cross-gradient well locations used for background concentration.

BOLD = Analytical result is in exceedance of applicable standard but within 1.25x background concentration.

BOLD = Analytical result is in exceedance of applicable standard.

Attachment A

Summit Scientific

4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

May 19, 2022

Mark Longhurst

PDC Energy

1775 Sherman St. STE. 3000

Denver, CO 80203

RE: LH Miller Unit 1

Work Order #2205217

Enclosed are the results of analyses for samples received by Summit Scientific on 05/13/22 13:10. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'P. Shrewsbury', with a stylized, cursive script.

Paul Shrewsbury

President



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

Project: LH Miller Unit 1
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
05/19/22 13:54

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	2205217-01	Water	05/13/22 11:35	05/13/22 13:10
BH02	2205217-02	Water	05/13/22 11:40	05/13/22 13:10
BH03	2205217-03	Water	05/13/22 11:45	05/13/22 13:10
BH04	2205217-04	Water	05/13/22 11:50	05/13/22 13:10
BH05	2205217-05	Water	05/13/22 11:55	05/13/22 13:10

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

4653 Table Mountain Drive ♦ Golden, Colorado 80403

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: LH Miller Unit 1

Sampler Name: David Vigild

Project Number:

					Preservative				Matrix				Analysis Requested								Special Instructions	
ID	Sample Description	Date Sampled	Time Sampled	# of containers	HCl	HNO3	None	Other	Water	Soil	Air-Canister #	Other	BTEXN - 8260B	TPH - (C6 - C36)	pH, EC, SAR	Boron - HWS	TMBs (1,2,4)&(1,3,5)	PAH - 915	Metals - 915			
1	BH01	5/13/22	1135	1			X		X													pH, EC, SAR by saturated paste
2	BH02	↓	1140	1			X		X												X	
3	BH03		1145	1			X		X												X	
4	BH04		1150	1			X		X												X	
5	BH05		~	1155	1			X		X											X	
6																						
7																						
8																						
9																						
10																						

Relinquished by:	Date/Time:	Received by:	Date/Time:	Turn Around Time	(Check)	Notes:
Dm Nw	5/13/22 1310	Tasman's Lock Box		Same Day	72 hours	
				24 hours	Standard	X
				48 hours		
Relinquished by:	Date/Time:	Received by:	Date/Time:	Sample Integrity:		
Tasman's Lock Box		[Signature]	5/13/22 1310	Temperature Upon Receipt:	Co.1	
Relinquished by:	Date/Time:	Received by:	Date/Time:	Samples Intact:	(Yes) No	

S₂

Sample Receipt Checklist

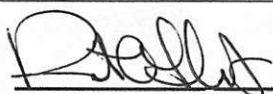
S2 Work Order# 2205212Client: Pactasman Client Project ID: LH Miller Unit 1

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

	-			
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Matrix (Check all that apply) Air ☐ Soil/Solid ☐ Water ☒ Other ☐Temp (°C) 6.1 Thermometer # 1

	Yes	No	N/A	Comments (if any)
If samples require cooling, is the temperature < 6 °C ⁽¹⁾ ? NOTE: If samples are delivered the same day of sampling, this requirement is met if there is evidence that cooling has begun.	-			on ICE
Were all samples received intact ⁽¹⁾ ?	-			
Was adequate sample volume provided ⁽¹⁾ ?	-			
If custody seals are present, are they intact ⁽¹⁾ ?	-			
Are samples due within 48 hours present?		-		
Are water samples with short hold times present? Note the short hold analysis in the comments column - pH, Nitrate/Nitrite, Ferrous Iron (Fe ²⁺), Hexavalent Chromium (Cr ⁶⁺ , Cr VI), COD/BOD, Total Coliform, E. Coli, Total Residual Chlorine (TRC), Dissolved Oxygen			-	
Is a chain-of-custody (COC) form present and filled out completely ⁽¹⁾ ?	-			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	-			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	-			
Is the COC properly relinquished by the client w/ date and time recorded ⁽¹⁾ ?	-			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.		-		
Are samples preserved that require preservation (excluding cooling) ⁽¹⁾ ? Note the type of preservative in the comments column – HCl, H ₂ SO ₄ , NaOH, HNO ₃ , etc.			-	
If samples are acid preserved for metals, is the pH ≤ 2 ⁽¹⁾ ? Record the pH in Comments.			-	
If dissolved metals are requested, were samples field filtered?			-	
Additional Comments (if any):				
⁽¹⁾ If NO, then contact the client before proceeding with analysis and note in case narrative.				



Custodian Printed Name

51322

Date/Time



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

Project: LH Miller Unit 1
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
05/19/22 13:54

BH01
2205217-01 (Water)

Summit Scientific

Anions by EPA Method 300.0

Date Sampled: **05/13/22 11:35**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Chloride	233	12.0	mg/L	200	BFE0391	05/18/22	05/18/22	EPA 300.0	
Sulfate	235	60.0	"	"	"	"	"	"	

Total Dissolved Solids by SM2540C

Date Sampled: **05/13/22 11:35**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Total Dissolved Solids	1240	10.0	mg/L	1	BFE0335	05/16/22	05/16/22	SM2540C	

Summit Scientific

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

Project: LH Miller Unit 1
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
05/19/22 13:54

BH02
2205217-02 (Water)

Summit Scientific

Anions by EPA Method 300.0

Date Sampled: **05/13/22 11:40**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Chloride	190	12.0		mg/L	200	BFE0391	05/18/22	05/18/22	EPA 300.0	
Sulfate	173	60.0		"	"	"	"	"	"	

Total Dissolved Solids by SM2540C

Date Sampled: **05/13/22 11:40**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Total Dissolved Solids	1010	10.0		mg/L	1	BFE0335	05/16/22	05/16/22	SM2540C	

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

Project: LH Miller Unit 1
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
05/19/22 13:54

BH03
2205217-03 (Water)

Summit Scientific

Anions by EPA Method 300.0

Date Sampled: **05/13/22 11:45**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Chloride	209	12.0		mg/L	200	BFE0391	05/18/22	05/18/22	EPA 300.0	
Sulfate	197	60.0		"	"	"	"	"	"	

Total Dissolved Solids by SM2540C

Date Sampled: **05/13/22 11:45**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Total Dissolved Solids	1130	10.0		mg/L	1	BFE0335	05/16/22	05/16/22	SM2540C	

Summit Scientific

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

Project: LH Miller Unit 1
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
05/19/22 13:54

BH04
2205217-04 (Water)

Summit Scientific

Anions by EPA Method 300.0

Date Sampled: **05/13/22 11:50**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Chloride	230	12.0		mg/L	200	BFE0391	05/18/22	05/18/22	EPA 300.0	
Sulfate	221	60.0		"	"	"	"	"	"	

Total Dissolved Solids by SM2540C

Date Sampled: **05/13/22 11:50**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Total Dissolved Solids	1260	10.0		mg/L	1	BFE0335	05/16/22	05/16/22	SM2540C	

Summit Scientific

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

Project: LH Miller Unit 1
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
05/19/22 13:54

BH05
2205217-05 (Water)

Summit Scientific

Anions by EPA Method 300.0

Date Sampled: **05/13/22 11:55**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Chloride	263	12.0		mg/L	200	BFE0391	05/18/22	05/18/22	EPA 300.0	
Sulfate	604	60.0		"	"	"	"	"	"	

Total Dissolved Solids by SM2540C

Date Sampled: **05/13/22 11:55**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Total Dissolved Solids	1730	10.0		mg/L	1	BFE0335	05/16/22	05/16/22	SM2540C	

Summit Scientific

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

Project: LH Miller Unit 1
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
05/19/22 13:54

Anions by EPA Method 300.0 - Quality Control

Summit Scientific

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

Batch BFE0391 - General Preparation

Blank (BFE0391-BLK1)

Prepared & Analyzed: 05/18/22

Chloride	ND	0.0600	mg/L
Sulfate	ND	0.300	"

LCS (BFE0391-BS1)

Prepared & Analyzed: 05/18/22

Chloride	3.03	0.0600	mg/L	3.00	101	90-110
Sulfate	14.1	0.300	"	15.0	94.3	90-110

Duplicate (BFE0391-DUP1)

Source: 2205188-01

Prepared & Analyzed: 05/18/22

Chloride	606	12.0	mg/L	533	12.7	20
Sulfate	755	60.0	"	636	17.2	20

Matrix Spike (BFE0391-MS1)

Source: 2205188-01

Prepared & Analyzed: 05/18/22

Chloride	1280	12.0	mg/L	600	533	124	80-120	QM-02
Sulfate	4030	60.0	"	3000	636	113	80-120	

Summit Scientific

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

Project: LH Miller Unit 1
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
05/19/22 13:54

Total Dissolved Solids by SM2540C - Quality Control
Summit Scientific

Analyte	Result	Reporting			Spike	Source	%REC		RPD		
		Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes	

Batch BFE0335 - General Preparation

Blank (BFE0335-BLK1)

Prepared & Analyzed: 05/16/22

Total Dissolved Solids ND 10.0 mg/L

Duplicate (BFE0335-DUP1)

Source: 2205188-02

Prepared & Analyzed: 05/16/22

Total Dissolved Solids 1880 10.0 mg/L 1760 6.76 20

Summit Scientific

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

Project: LH Miller Unit 1
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
05/19/22 13:54

Notes and Definitions

QM-02	The RPD and/or percent recovery for this QC sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample.
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