

**PDC Energy, Inc.**  
**Third Quarter 2017 Groundwater Monitoring Summary**

September 7, 2017

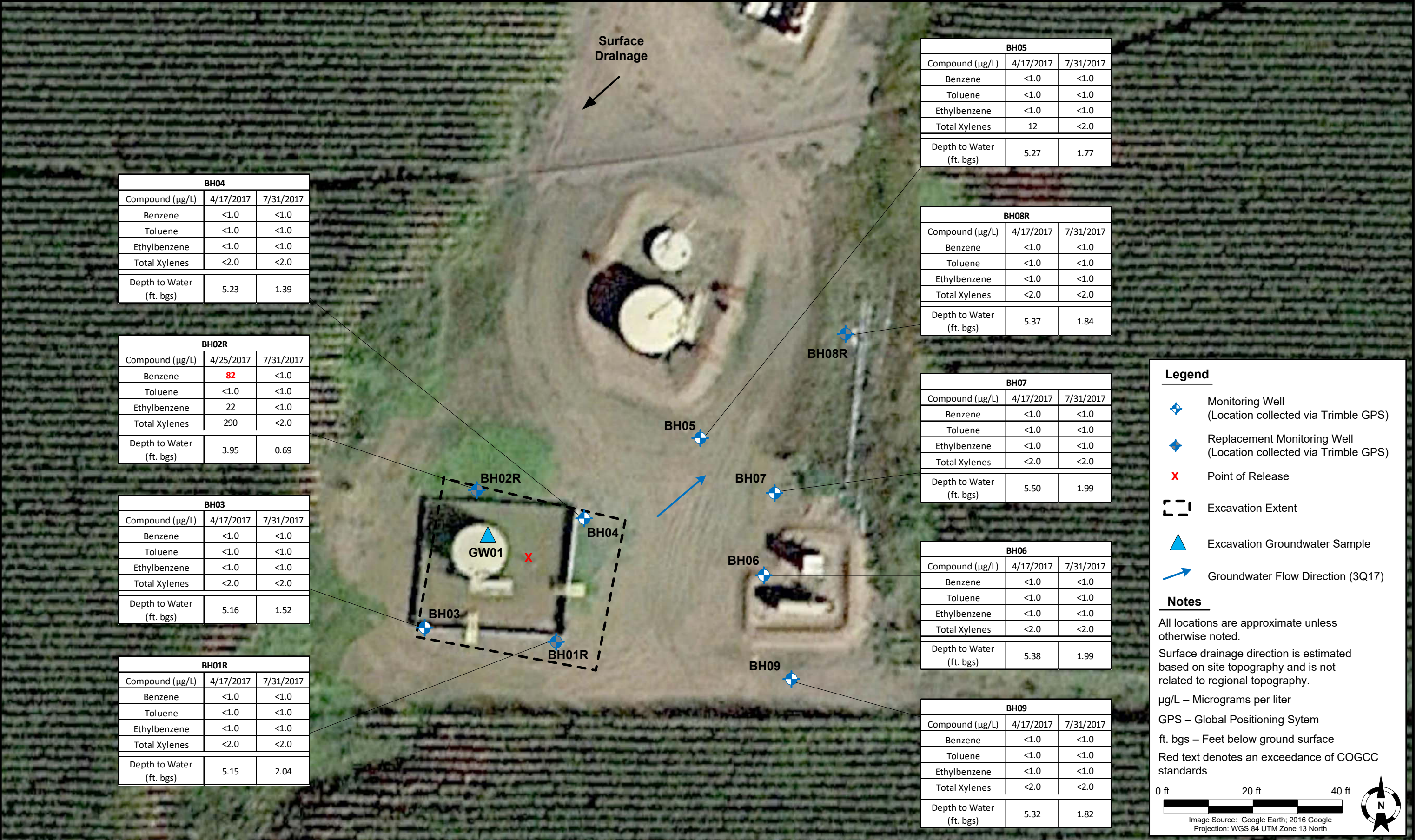
Jerke UP 8-7 Tank Battery  
SENE S7 T4N R65W  
Weld County, API # 05-123-13481  
Facility ID # 245686  
Remediation # 9300

This groundwater summary has been prepared by Tasman Geosciences, Inc. for the Jerke UP 8-7 tank battery. On July 31, 2017, groundwater samples were collected from all nine monitoring well locations (BH01R – BH02R, BH03 – BH07, BH08R, and BH09). Nine 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 2017 analytical results indicate that BTEX concentrations are below the applicable COGCC Table 910-1 groundwater standards all nine monitoring well locations.

Enhanced fluid recovery (EFR) and air sparge (AS) was initiated at the site during the first quarter 2014. A summary of the EFR/AS operational data is provided in Table 2. EFR/AS will remain as the selected remediation strategy for this site through the fourth quarter 2017.

Fourth quarter 2017 groundwater sampling event will be conducted during October 2017.





DATE:	August 8, 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**  
**Jerke UP 8-7 Tank Battery**  
SENE, Section 7, Township 4 North, Range 65 West  
Weld County, Colorado

**GROUNDWATER  
ANALYTICAL RESULTS  
MAP**

**FIGURE  
1**



**TABLE 1**  
**JERKE UP 8-7 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)
COGCC Table 910-1 Groundwater Standard (µg/L) <sup>(1)</sup>		5	560	700	1,400	
GW01	11/12/2013	230	370	160	2,200	~ 5
BH01	1/10/2014	270	2,300	390	5,800	7.41
BH01	4/29/2014	19	130	160	3,100	7.52
BH01	7/29/2014	4.3	<1.0	54	450	5.12
BH01	10/27/2014	1.6	<1.0	9.0	43	4.80
BH01	1/22/2015	2.2	2.4	73.0	690	6.92
BH01	4/20/2015	<1.0	<1.0	<1.0	<1.0	7.49
BH01	7/27/2015	<1.0	<1.0	<1.0	<1.0	4.02
BH01	10/6/2015	1.6	<1.0	56	280	4.67
BH01	1/28/2016	13	1.3	230	1,100	6.68
BH01	4/20/2016	<1.0	<1.0	<1.0	<1.0	6.44
BH01	7/18/2016	<1.0	<1.0	35	130	5.25
BH01	10/11/2016	1.5	<1.0	29	180	0.94
BH01R	1/13/2017	1.1	<1.0	65	2,000	4.47
BH01R	4/17/2017	<1.0	<1.0	<1.0	<2.0	5.15
BH01R	7/31/2017	<1.0	<1.0	<1.0	<2.0	2.04
BH02	1/10/2014	920	4.8	54	2,300	6.98
BH02	4/29/2014	180	<1.0	67	370	7.13
BH02	7/29/2014	27	<1.0	8.0	49	5.07
BH02	10/27/2014	65	<1.0	20	140	4.42
BH02	1/22/2015	14	<1.0	8.8	65	6.20
BH02	4/20/2015	<1.0	<1.0	<1.0	13	5.44
BH02	7/27/2015	1.5	<1.0	1.0	8.3	4.42
BH02	10/6/2015	19	<1.0	1.8	13	4.74
BH02	1/28/2016	1.7	<1.0	<1.0	11	6.79
BH02	4/20/2016	<1.0	<1.0	<1.0	<1.0	6.18
BH02	7/18/2016	15	<1.0	<1.0	2.8	5.18
BH02	10/11/2016	3.4	<1.0	<1.0	<1.0	1.66
BH02R	1/13/2017	72	<1.0	100	430	4.24
BH02R	4/25/2017	82	<1.0	22	290	3.95
BH02R	7/31/2017	<1.0	<1.0	<1.0	<2.0	0.69
BH03	1/10/2014	1.1	1.1	15	240	7.08

**TABLE 1**  
**JERKE UP 8-7 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)
<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>	
BH03	4/29/2014	<1.0	<1.0	2.0	22	7.37
BH03	7/29/2014	<1.0	<1.0	<1.0	3.9	4.59
BH03	10/27/2014	<1.0	<1.0	<1.0	<1.0	4.42
BH03	1/22/2015	<1.0	<1.0	<1.0	<1.0	6.58
BH03	4/20/2015	<1.0	<1.0	<1.0	<1.0	7.14
BH03	7/27/2015	<1.0	<1.0	<1.0	<1.0	4.00
BH03	10/6/2015	<1.0	<1.0	<1.0	<1.0	4.53
BH03	1/28/2016	<1.0	<1.0	<1.0	<1.0	6.61
BH03	4/20/2016	<1.0	<1.0	<1.0	<1.0	6.35
BH03	7/18/2016	<1.0	<1.0	<1.0	<1.0	5.11
BH03	10/11/2016	<1.0	<1.0	<1.0	<1.0	1.59
BH03	1/13/2017	<1.0	<1.0	<1.0	<1.0	4.48
BH03	4/17/2017	<1.0	<1.0	<1.0	<2.0	5.16
BH03	7/31/2017	<1.0	<1.0	<1.0	<2.0	1.52
BH04	1/10/2014	<b>12,000</b>	<b>7,600</b>	<b>940</b>	<b>14,000</b>	4.35
BH04	4/29/2014	<b>150</b>	1.4	33	330	4.64
BH04	7/29/2014	<b>110</b>	4.0	4.8	31	2.03
BH04	10/27/2014	NS	NS	NS	NS	NM
BH04	1/22/2015	<b>9.5</b>	<1.0	24	320	6.63
BH04	4/20/2015	NS	NS	NS	NS	7.09
BH04	7/27/2015	<b>80</b>	<1.0	11	270	4.04
BH04	10/6/2015	<b>150</b>	<1.0	5.8	6.2	4.65
BH04	1/28/2016	2.3	<1.0	<1.0	8.9	6.62
BH04	4/20/2016	<1.0	<1.0	<1.0	<1.0	6.11
BH04	7/18/2016	<1.0	<1.0	<1.0	<1.0	4.81
BH04	10/11/2016	<b>100</b>	<1.0	<1.0	<1.0	1.67
BH04	1/13/2017	<b>380</b>	<1.0	<1.0	<1.0	4.47
BH04	4/17/2017	<1.0	<1.0	<1.0	<2.0	5.23
BH04	7/31/2017	<1.0	<1.0	<1.0	<2.0	1.39
BH05	1/10/2014	<b>1,800</b>	240	230	<b>3,100</b>	4.13
BH05	4/29/2014	1.8	<1.0	<1.0	<1.0	4.47
BH05	7/29/2014	<1.0	<1.0	<1.0	<1.0	1.65
BH05	10/27/2014	<b>5.6</b>	<1.0	<1.0	<1.0	1.52

**TABLE 1**  
**JERKE UP 8-7 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)
<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>	
BH05	1/22/2015	<1.0	<1.0	<1.0	<1.0	3.80
BH05	4/20/2015	<1.0	<1.0	<1.0	<1.0	4.41
BH05	7/27/2015	<1.0	<1.0	<1.0	<1.0	1.30
BH05	10/6/2015	<1.0	<1.0	<1.0	<1.0	1.83
BH05	1/28/2016	180	<1.0	10	64	3.84
BH05	4/20/2016	<1.0	<1.0	<1.0	<1.0	3.67
BH05	7/18/2016	<1.0	<1.0	<1.0	<1.0	2.75
BH05	10/11/2016	<1.0	<1.0	<1.0	<1.0	1.76
BH05	1/13/2017	<1.0	<1.0	<1.0	<1.0	4.58
BH05	4/17/2017	<1.0	<1.0	<1.0	12	5.27
BH05	7/31/2017	<1.0	<1.0	<1.0	<2.0	1.77
BH06	1/10/2014	<1.0	<1.0	<1.0	<1.0	4.63
BH06	4/29/2014	<1.0	<1.0	<1.0	<1.0	4.66
BH06	7/29/2014	1.3	<1.0	<1.0	<1.0	2.07
BH06	10/27/2014	<1.0	<1.0	<1.0	<1.0	1.95
BH06	1/22/2015	<1.0	<1.0	<1.0	<1.0	3.83
BH06	4/20/2015	<1.0	<1.0	<1.0	<1.0	4.46
BH06	7/27/2015	<1.0	<1.0	<1.0	<1.0	1.35
BH06	10/6/2015	2.2	<1.0	<1.0	<1.0	1.84
BH06	1/28/2016	<1.0	<1.0	<1.0	<1.0	3.88
BH06	4/20/2016	<1.0	<1.0	<1.0	<1.0	3.72
BH06	7/18/2016	<1.0	<1.0	<1.0	<1.0	2.48
BH06	10/11/2016	<1.0	<1.0	<1.0	<1.0	1.90
BH06	1/13/2017	<1.0	1.2	<1.0	260	4.73
BH06	4/17/2017	<1.0	<1.0	<1.0	<2.0	5.38
BH06	7/31/2017	<1.0	<1.0	<1.0	<2.0	1.99
BH07	4/29/2014	<1.0	<1.0	<1.0	<1.0	5.51
BH07	7/29/2014	<1.0	<1.0	<1.0	<1.0	2.90
BH07	10/27/2014	<1.0	<1.0	<1.0	<1.0	2.73
BH07	1/22/2015	<1.0	<1.0	<1.0	<1.0	4.63
BH07	4/20/2015	<1.0	<1.0	<1.0	<1.0	5.44
BH07	7/27/2015	<1.0	<1.0	<1.0	<1.0	2.36
BH07	10/6/2015	<1.0	<1.0	<1.0	<1.0	2.83

**TABLE 1**  
**JERKE UP 8-7 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)
<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	1/28/2016	<1.0	<1.0	<1.0	<1.0	4.20
BH07	4/20/2016	<1.0	<1.0	<1.0	<1.0	3.96
BH07	7/18/2016	<1.0	<1.0	<1.0	<1.0	2.72
BH07	10/11/2016	<1.0	<1.0	<1.0	<1.0	1.98
BH07	1/13/2017	<1.0	<1.0	<1.0	<1.0	4.79
BH07	4/17/2017	<1.0	<1.0	<1.0	<2.0	5.50
BH07	7/31/2017	<1.0	<1.0	<1.0	<2.0	1.99
BH08	4/29/2014	<1.0	<1.0	<1.0	<1.0	7.38
BH08	7/29/2014	<1.0	<1.0	<1.0	<1.0	3.78
BH08	10/27/2014	<1.0	<1.0	<1.0	<1.0	3.04
BH08	1/22/2015	<1.0	<1.0	<1.0	<1.0	5.51
BH08	4/20/2015	<1.0	<1.0	<1.0	<1.0	6.31
BH08	7/27/2015	<1.0	<1.0	<1.0	<1.0	3.24
BH08	10/6/2015	<1.0	<1.0	<1.0	<1.0	3.71
BH08	1/28/2016	<1.0	<1.0	<1.0	<1.0	5.72
BH08	4/20/2016	<1.0	<1.0	<1.0	<1.0	5.54
BH08	7/18/2016	<1.0	<1.0	<1.0	<1.0	4.35
BH08 <sup>(3)</sup>	10/11/2016	<1.0	<1.0	<1.0	<1.0	1.78
BH08R	1/13/2017	<1.0	<1.0	<1.0	<1.0	4.62
BH08R	4/17/2017	<1.0	<1.0	<1.0	<2.0	5.37
BH08R	7/31/2017	<1.0	<1.0	<1.0	<2.0	1.84
BH09	4/29/2014	<1.0	<1.0	<1.0	<1.0	4.59
BH09	7/29/2014	<1.0	<1.0	<1.0	<1.0	2.00
BH09	10/27/2014	<1.0	<1.0	<1.0	<1.0	1.85
BH09	1/22/2015	<1.0	<1.0	<1.0	<1.0	3.76
BH09	4/20/2015	<1.0	<1.0	<1.0	<1.0	4.53
BH09	7/27/2015	<1.0	<1.0	<1.0	<1.0	1.43
BH09	10/6/2015	<1.0	<1.0	<1.0	<1.0	2.01
BH09	1/28/2016	<1.0	<1.0	<1.0	<1.0	3.96
BH09	4/20/2016	<1.0	<1.0	<1.0	<1.0	3.80
BH09	7/18/2016	<1.0	<1.0	<1.0	<1.0	2.53
BH09	10/11/2016	<1.0	<1.0	<1.0	<1.0	1.84
BH09	1/13/2017	<1.0	<1.0	<1.0	<1.0	4.68

**TABLE 1**  
**JERKE UP 8-7 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)
<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>	
BH09	4/17/2017	<1.0	<1.0	<1.0	<2.0	5.32
BH09	7/31/2017	<1.0	<1.0	<1.0	<2.0	1.82

**Notes:**

1. Groundwater standards referenced from 2 CCR 404-1, Table 910-1, effective January 30, 2015.
  2. Depth to water measurements collected prior to fourth quarter 2016 were measured from top of casing or ground surface for monitoring well samples and excavation samples, respectively. Subsequent 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. BH08 fourth quarter 2016 depth to water was measured from top of casing.
- COGCC = Colorado Oil and Gas Conservation Commission  
µg/L = Micrograms per liter  
(<) = Analytical result is less than the indicated laboratory reporting limit.  
NS = Not sampled  
NM = Not measured  
**BOLD** = Analytical result is in exceedance of COGCC groundwater standards.

**TABLE 2**  
**JERKE UP 8-7 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)
First Quarter 2014						
1/30/2014	BH01, BH02, BH04,	6	90	BH01, BH02, BH04,	10	36
2/25/2014	BH05	5	0	BH05	10	8.3
Quarterly Totals		11	90		-	-
Second Quarter 2014						
4/7/2014	BH01, BH02, BH04, BH05	6	120	BH01, BH02, BH04, BH05	10	36.7
4/21/2014	BH01, BH02, BH03, BH04, BH05	6.5	120	BH01, BH02, BH03, BH04, BH05	20	28.4
5/9/2014		8	90		20	35
5/23/2014		6	20		20	24.2
6/9/2014		6	20		20	20
Quarterly Totals		32.5	370		-	-
Third Quarter 2014						
7/2/2014	BH01, BH02, BH03, BH04, BH05	7	150	BH01, BH02, BH03, BH04, BH05	25	42
7/18/2014		6	0		15	13.4
9/25/2014		6	100		20	20
Quarterly Totals		19	250		-	-
Fourth Quarter 2014						
10/17/2014	BH01, BH02, BH03, BH05	6	225	BH01, BH02, BH03, BH05	15	17.5
11/3/2014	BH01, BH02, BH03, BH04, BH05	6	50	BH01, BH02, BH03, BH04, BH05	20	30
11/18/2014		6	80		20	30
12/7/2014		6	100		20	31.2
12/20/2014		6	75		20	26
Quarterly Totals		30	530		-	-
First Quarter 2015						
1/9/2015	BH01, BH02, BH03, BH04, BH05	6	0	BH01, BH02, BH03, BH04, BH05	20	25
1/26/2015		6	0		20	25
2/8/2015		6	30		25	35
3/6/2015		6	36		20	27
3/17/2015		6	100		20	35
Quarterly Totals		30	166		-	-



**TABLE 2**  
**JERKE UP 8-7 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)
Second Quarter 2015						
4/6/2015	BH01, BH02, BH03, BH04, BH05	6	10	BH01, BH02, BH03, BH04, BH05	20	28.6
4/13/2015		6	30		20	20.8
4/30/2015		6	0		20	19
5/14/2015		6	80		20	21.2
5/28/2015		6	15		20	27
6/11/2015	BH02, BH03, BH04, BH05	6	40	BH02, BH03, BH04, BH05	20	27.5
6/22/2015	BH01, BH02, BH03, BH04, BH05	6	35	BH01, BH02, BH03, BH04, BH05	20	22.8
Quarterly Totals		42	210		-	-
Third Quarter 2015						
7/9/2015	BH01, BH02, BH03, BH04, BH05	6	184	BH01, BH02, BH03, BH04, BH05	20	22
7/23/2015		6	45		20	29
8/6/2015	BH02, BH03, BH04, BH05	6	30	BH02, BH03, BH04, BH05	20	27.5
8/20/2015	BH01, BH02, BH03, BH04, BH05	6	80	BH01, BH02, BH03, BH04, BH05	20	21.3
Quarterly Totals		24	339		-	-
Fourth Quarter 2015						
10/13/2015	BH01, BH02, BH03, BH04, BH05	6	42	BH03, BH04, BH05	20	23.3
10/27/2015		6	80	BH01, BH02, BH03, BH04, BH05	20	25
11/9/2015	BH01, BH02, BH03, BH05	6	150	BH04	20	35
11/24/2015	BH01, BH02, BH03, BH04, BH05	6	92	BH02, BH04	20	27.5
12/7/2015		6	184		20	27.5
Quarterly Totals		30	548		-	-

**TABLE 2**  
**JERKE UP 8-7 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)
First Quarter 2016						
1/7/2016	BH01, BH02, BH03, BH04, BH05	6	90	BH02, BH04	20	25
1/26/2016		6	80		20	32.5
1/30/2016	BH01, BH02, BH03, BH05	6	160	None	0	0
2/17/2016	BH01, BH02, BH03, BH04, BH05	6	84	BH02, BH04	20	27.5
3/1/2016	BH01, BH02, BH03, BH04, BH05, Pipe	6	80		20	25
3/17/2016		6	350		25	30
Quarterly Totals		36	844		-	-
Second Quarter 2016						
4/1/2016	BH01, BH02, BH03, BH04, BH05, Pipe	6	240	BH02, BH04	20	40.5
4/15/2016	BH01, BH02, BH03, BH07, Pipe	6	80	BH01, BH02, BH03, BH04, BH05, BH07	20	25
4/28/2016		6	80		20	28.8
5/12/2016		6	45		15	21.9
5/25/2016		6	84		20	30.8
6/9/2016		6	42		20	25.8
6/22/2016		6	92		20	25
Quarterly Totals		42	663		-	-
Third Quarter 2016						
7/7/2016	BH01, BH02, BH03, BH07, Pipe	6	84	BH01, BH02, BH03, BH04, BH05, BH07	15	13
7/20/2016		6	135		17.5	15
8/21/2016		6	80		20	20
8/31/2016		6	42		20	33
9/28/2016		6	152		20	30
Quarterly Totals		30	493			-

**TABLE 2**  
**JERKE UP 8-7 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)
Fourth Quarter 2016						
10/13/2016	BH01, BH02, BH03, BH07, Pipe	6	276	BH01, BH02, BH03, BH04, BH05, BH07	20	25
10/26/2016	BH01, BH02, BH03	6	84	BH01, BH02, BH03, BH04, BH05	20	20
11/9/2016	BH01, BH02, BH03, BH07, Pipe	6	126	BH01, BH02, BH04, BH05, BH07	20	20
12/11/2016		6	100	BH01, BH02, BH03, BH04, BH05, BH07	20	25
Quarterly Totals		24	586		-	-
First Quarter 2017						
1/19/2017	BH01, BH02, BH03, BH07, Pipe	6	140	BH01, BH02, BH03, BH04, BH05, BH07	20	23
2/16/2017	BH02, BH03, BH05, Pipe	6	80	BH01, BH02, BH03, BH04, BH06	20	25
3/1/2017		6	2		20	10
3/14/2017		6	42		20	10
3/31/2017		6	70		20	25
Quarterly Totals		30	334		-	-
Second Quarter 2017						
4/11/2017	BH02, BH03, BH05, Pipe	6	42	BH01, BH02, BH03, BH04, BH06	20	15
4/26/2017		6	10		20	15
5/24/2017		6	15		20	15
6/7/2017		6	84		20	10
6/21/2017		5.5	84		20	15
Quarterly Totals		29.5	235		-	-
Third Quarter 2017						
7/5/2017	BH02, BH03, BH05, Pipe	6	65	BH01, BH02, BH04, BH06	50	9
7/17/2017		6	70	BH01, BH02, BH03, BH04, BH06	20	15
8/2/2017		6	147		15	10
8/16/2017	BH02R, BH03, BH05, Pipe	6	84	BH01R, BH02R, BH03, BH04, BH06	15	15
9/13/2017		6	30		15	17.5
9/27/2017		6	42		20	20.0
Quarterly Totals		36	438		-	-

**Notes:**

EFR = Enhanced fluid recovery

AS = Air sparge

psi = Pounds per square inch

cfm = Cubic feet per minute

## **ATTACHMENT A**



# Summit Scientific

---

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

August 07, 2017

Mark Longhurst  
PDC Energy  
1775 Sherman St. STE. 3000  
Denver, CO 80203  
RE: Jerke Up 8-7

Enclosed are the results of analyses for samples received by Summit Scientific on 07/31/17 17:15. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ben Shrewsbury', with a long, sweeping horizontal line extending to the right.

Ben Shrewsbury  
Laboratory Manager



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

Project: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01R	1707254-01	Water	07/31/17 13:27	07/31/17 17:15
BH02R	1707254-02	Water	07/31/17 13:05	07/31/17 17:15
BH03	1707254-03	Water	07/31/17 13:15	07/31/17 17:15
BH04	1707254-04	Water	07/31/17 13:37	07/31/17 17:15
BH05	1707254-05	Water	07/31/17 13:44	07/31/17 17:15
BH06	1707254-06	Water	07/31/17 13:40	07/31/17 17:15
BH07	1707254-07	Water	07/31/17 13:25	07/31/17 17:15
BH08R	1707254-08	Water	07/31/17 13:10	07/31/17 17:15
BH09	1707254-09	Water	07/31/17 13:50	07/31/17 17:15

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 1707254

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:

Project Manager: Mark Longhurst  
E-Mail: mark.longhurst@pdce.com  
Project Name: Jerke JP 8-7  
Project Number: N/A

Sample Description	Date Sampled	Time Sampled	Number of Containers	Preservative				Matrix			Analyze For:										Special Instructions		
				HCl	HNO <sub>3</sub>	None	Other (Specify)	Groundwater	Soil	Air - Canister Serial #	Other (Specify)	BTEX - 8260											
BH 01R	7-31-17	1327	3			X		X					X										
BH 02R		1305																					
BH 03		1315																					
BH 04		1337																					
BH 05		1344																					
BH 06		1340																					
BH 07		1325																					
BH 08R		1310																					
BH 09		1350																					

Relinquished by:	Date/Time:	Received by:	Date/Time:	Turn Around Time (Check)	Notes:
<i>Michael Weller</i>	7-31-17 1715	<i>MA</i>	7/31/17 1715	Same Day <input type="checkbox"/> 72 Hours <input type="checkbox"/> 24 Hours <input type="checkbox"/> Standard <input checked="" type="checkbox"/> 48 Hours <input type="checkbox"/>	on ice
Relinquished by:	Date/Time:	Received by:	Date/Time:	Sample Integrity: Temperature Upon Receipt: 4.2°C Intact: Yes <input type="checkbox"/> No <input type="checkbox"/>	
Relinquished by:	Date/Time:	Received in Lab by:	Date/Time:		

**1707254****Sample Receipt Checklist**

S2 Work Order: \_\_\_\_\_

Client: PDL/TasmanClient Project ID: Ferke Up 8-7Shipped Via: P/U  
(UPS, FedEx, Hand Delivered, Pick-up, etc.)

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

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

Cooler ID					
Temp (°C)	4.2				

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> ?				
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> ?	✓			
Was adequate sample volume provided <sup>(1)</sup> ?	✓			
If custody seals are present, are they intact <sup>(1)</sup> ?			✓	
Are short holding time analytes or samples with HTs due within 48 hours present?			✓	
Is a chain-of-custody (COC) form present and filled out completely <sup>(1)</sup> ?	✓			
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	✓			
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	✓			
Is the COC properly relinquished by the client w/ date and time recorded <sup>(1)</sup> ?	✓			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.		✓		
Are samples preserved that require preservation (excluding cooling) <sup>(1)</sup> ?	✓			
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 <sup>(1)</sup> ?			✓	
Record the pH in Comments.			✓	
If dissolved metals are requested, were samples field filtered?			✓	
Additional Comments (if any):				
<sup>(1)</sup> If NO, then contact the client before proceeding with analysis and note in case narrative.				

Nakita  
Custodian Printed Name[Signature]  
Signature or Initials of Custodian7/31/17 1745  
Date/Time





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

Project: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

**BH01R**  
**1707254-01 (Water)**

**Summit Scientific**

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

Date Sampled: **07/31/17 13:27**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1708027	08/04/17	08/04/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/31/17 13:27**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		106 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		97.9 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		93.9 %	45-146		"	"	"	"	

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: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

**BH02R**  
**1707254-02 (Water)**

**Summit Scientific**

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

Date Sampled: **07/31/17 13:05**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1708027	08/04/17	08/04/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/31/17 13:05**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		104 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		98.0 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		95.7 %	45-146		"	"	"	"	

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: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

**BH03**  
**1707254-03 (Water)**

**Summit Scientific**

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

Date Sampled: **07/31/17 13:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1708027	08/04/17	08/04/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/31/17 13:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		105 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		98.9 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.0 %	45-146		"	"	"	"	

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: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

**BH04**  
**1707254-04 (Water)**

**Summit Scientific**

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

Date Sampled: **07/31/17 13:37**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1708027	08/04/17	08/04/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/31/17 13:37**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		98.7 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		97.8 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		94.1 %	45-146		"	"	"	"	

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: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

**BH05**  
**1707254-05 (Water)**

**Summit Scientific**

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

Date Sampled: **07/31/17 13:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1708027	08/04/17	08/04/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/31/17 13:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		106 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		97.6 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.6 %	45-146		"	"	"	"	

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: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

**BH06**  
**1707254-06 (Water)**

**Summit Scientific**

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

Date Sampled: **07/31/17 13:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1708027	08/04/17	08/04/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/31/17 13:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		103 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		96.7 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		95.6 %	45-146		"	"	"	"	

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: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

**BH07**  
**1707254-07 (Water)**

**Summit Scientific**

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

Date Sampled: **07/31/17 13:25**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1708027	08/04/17	08/04/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/31/17 13:25**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		101 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		97.1 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		95.9 %	45-146		"	"	"	"	

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: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

**BH08R**  
**1707254-08 (Water)**

**Summit Scientific**

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

Date Sampled: **07/31/17 13:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1708027	08/04/17	08/04/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/31/17 13:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		106 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		99.7 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		95.1 %	45-146		"	"	"	"	

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: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

**BH09**  
**1707254-09 (Water)**

**Summit Scientific**

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

Date Sampled: **07/31/17 13:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1708027	08/04/17	08/04/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **07/31/17 13:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		107 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		97.0 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		96.9 %	45-146		"	"	"	"	

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: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

## 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 1708027 - EPA 5030 Water MS

##### Blank (1708027-BLK1)

Prepared & Analyzed: 08/04/17

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	2.0	"							
Surrogate: 1,2-Dichloroethane-d4	14.4		"	13.3		108	37-154			
Surrogate: Toluene-d8	13.2		"	13.3		98.9	45-149			
Surrogate: 4-Bromofluorobenzene	13.2		"	13.3		99.4	45-146			

##### LCS (1708027-BS1)

Prepared & Analyzed: 08/04/17

Benzene	28.4	1.0	ug/l	33.3		85.2	51-132			
Toluene	33.6	1.0	"	33.3		101	51-138			
Ethylbenzene	37.7	1.0	"	33.1		114	58-146			
m,p-Xylene	73.7	2.0	"	66.5		111	57-144			
o-Xylene	35.7	1.0	"	32.7		109	53-146			
Surrogate: 1,2-Dichloroethane-d4	13.9		"	13.3		104	37-154			
Surrogate: Toluene-d8	13.2		"	13.3		98.9	45-149			
Surrogate: 4-Bromofluorobenzene	12.5		"	13.3		93.6	45-146			

##### Matrix Spike (1708027-MS1)

Source: 1707253-02

Prepared & Analyzed: 08/04/17

Benzene	28.8	1.0	ug/l	33.3	ND	86.5	34-141			
Toluene	35.6	1.0	"	33.3	ND	107	27-151			
Ethylbenzene	38.5	1.0	"	33.1	ND	116	29-160			
m,p-Xylene	541	2.0	"	66.5	426	172	20-166			QM-07
o-Xylene	154	1.0	"	32.7	89.0	199	33-159			QM-07
Surrogate: 1,2-Dichloroethane-d4	13.8		"	13.3		104	37-154			
Surrogate: Toluene-d8	13.3		"	13.3		99.9	45-149			
Surrogate: 4-Bromofluorobenzene	13.1		"	13.3		98.6	45-146			

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: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

**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 1708027 - EPA 5030 Water MS**

Matrix Spike Dup (1708027-MSD1)		Source: 1707253-02			Prepared & Analyzed: 08/04/17					
Benzene	29.2	1.0	ug/l	33.3	ND	87.7	34-141	1.38	32	
Toluene	35.5	1.0	"	33.3	ND	106	27-151	0.394	25	
Ethylbenzene	38.4	1.0	"	33.1	ND	116	29-160	0.130	50	
m,p-Xylene	442	2.0	"	66.5	426	24.9	20-166	20.0	36	
o-Xylene	130	1.0	"	32.7	89.0	124	33-159	17.2	26	
Surrogate: 1,2-Dichloroethane-d4	15.1		"	13.3		114	37-154			
Surrogate: Toluene-d8	13.0		"	13.3		97.5	45-149			
Surrogate: 4-Bromofluorobenzene	12.6		"	13.3		94.7	45-146			

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: Jerke Up 8-7  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/07/17 14:23

### Notes and Definitions

QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS/LCSD recovery.
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