



PDC Energy, Inc.
Fourth Quarter 2016 Groundwater Monitoring Summary

January 29, 2017

H&S (Mineral) #1 Tank Battery
NWSW S6 T4N R65W
Weld County, API # 05-123-11529
Facility ID # 319594
Remediation # 7945

This groundwater summary has been prepared by Tasman Geosciences, Inc. for the H&S (Mineral) #1 tank battery. On October 19, 2016 groundwater sampling was conducted at all eight monitoring well locations (BH01R, and BH02 – BH08). Eight groundwater samples were submitted to Summit Scientific Laboratories for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8260B. Analytical results are summarized in Table 1 and the laboratory analytical report is included as Attachment A. Sample locations and corresponding analytical results are illustrated on Figure 1. Fourth quarter 2016 analytical results indicate that the benzene concentration is above the applicable COGCC Table 910-1 standard in monitoring well BH02. BTEX concentrations are below applicable COGCC regulatory standards in the remaining seven well locations.

Tasman initiated enhanced fluid recovery (EFR) and air sparge (AS) events at the site during the third quarter 2013. 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 first quarter 2017.

The first quarter 2017 groundwater sampling event will be conducted during January 2017.

TABLE 1
H & S (MINERAL) #1 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	
BH01	7/25/2013	6,700	6,200	1,100	19,000	16.53
BH01	10/31/2013	1,700	1,800	170	4,400	15.65
BH01	1/24/2014	6.5	<1.0	<1.0	3,000	17.19
BH01	4/30/2014	290	990	76	2,700	17.35
BH01	7/25/2014	45	100	53	2,100	14.68
BH01	10/27/2014	21	19	21	2,100	13.75
BH01	1/20/2015	9.7	13	<1.0	1,600	15.85
BH01	5/13/2015	4.9	13	5.2	2,600	15.90
BH01	7/30/2015	<1.0	6.5	<1.0	290	14.23
BH01	10/26/2015	1.1	15	5.3	400	13.57
BH01	1/26/2016	3.1	19	<1.0	980	16.04
BH01	4/21/2016	NS	NS	NS	NS	16.64
BH01	7/18/2016	Destroyed				
BH01R	7/18/2016	<1.0	2.4	<1.0	1,200	15.42
BH01R	10/19/2016	<1.0	<1.0	<1.0	240	14.60
BH02	7/25/2013	3,300	4,700	2,100	36,000	17.63
BH02	10/31/2013	770	24	39	3,300	16.75
BH02	1/24/2014	730	20	<1.0	2,600	18.25
BH02	4/30/2014	84	12	3.8	410	18.39
BH02	7/25/2014	53	2.3	<1.0	68	15.75
BH02	10/27/2014	4.3	<1.0	<1.0	24	14.91
BH02	1/20/2015	160	<1.0	<1.0	390	17.02
BH02	5/13/2015	93	1.2	<1.0	75	17.14
BH02	7/30/2015	3.4	1.1	<1.0	57	15.61
BH02	10/26/2015	39	16	3.9	450	14.70
BH02	1/26/2016	<1.0	2.5	1.4	18	17.16
BH02	4/21/2016	81	<1.0	2.7	7.8	17.74
BH02	7/18/2016	71	1.0	<1.0	14	15.33
BH02	10/19/2016	9.9	1.2	<1.0	63	14.55

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COGCC Table 910-1 Groundwater Standard (µg/L) ⁽¹⁾		5	560	700	1,400	
BH03	7/25/2013	760	4,400	1,300	23,000	15.98
BH03	10/31/2013	3.6	8.6	2.2	100	15.15
BH03	1/24/2014	2.6	2.0	<1.0	62	16.63
BH03	4/30/2014	1.1	1.6	<1.0	45	16.79
BH03	7/25/2014	33	20	<1.0	480	14.14
BH03	10/27/2014	17	3.3	<1.0	210	13.27
BH03	1/20/2015	<1.0	<1.0	<1.0	8.7	15.35
BH03	5/13/2015	<1.0	<1.0	<1.0	8.2	15.38
BH03	7/30/2015	<1.0	<1.0	<1.0	4.9	13.72
BH03	10/26/2015	<1.0	<1.0	<1.0	12	13.09
BH03	1/26/2016	<1.0	1.4	<1.0	9.7	15.55
BH03	4/21/2016	<1.0	1.0	<1.0	5.7	16.16
BH03	7/18/2016	<1.0	<1.0	<1.0	<1.0	13.75
BH03	10/19/2016	<1.0	<1.0	<1.0	5.9	12.94
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BH04	7/25/2013	1,700	170	1,200	19,000	15.91
BH04	10/31/2013	2,500	140	620	13,000	15.09
BH04	1/24/2014	2,100	320	740	14,000	16.60
BH04	4/30/2014	1,700	300	1,100	19,000	16.74
BH04	7/25/2014	410	9.3	36	6,400	14.11
BH04	10/27/2014	37	2.4	<1.0	630	13.22
BH04	1/20/2015	45	<1.0	<1.0	520	15.46
BH04	5/13/2015	2.6	<1.0	<1.0	110	15.40
BH04	7/30/2015	8.8	1.2	2.4	780	13.76
BH04	10/26/2015	3.2	3.9	7.2	450	13.05
BH04	1/26/2016	<1.0	2.2	2.4	43	15.51
BH04	4/21/2016	<1.0	<1.0	<1.0	10	16.10
BH04	7/18/2016	<1.0	<1.0	<1.0	2.0	13.71
BH04	10/19/2016	<1.0	<1.0	<1.0	<1.0	12.88
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BH05	7/25/2013	17	3,300	930	15,000	13.07
BH05	10/31/2013	<1.0	<1.0	2.0	85	12.01

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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	
BH05	1/24/2014	<1.0	<1.0	<1.0	<1.0	13.52
BH05	4/30/2014	<1.0	<1.0	<1.0	4.5	13.65
BH05	7/25/2014	<1.0	<1.0	<1.0	5.8	11.03
BH05	10/27/2014	<1.0	<1.0	<1.0	2.9	10.37
BH05	1/20/2015	<1.0	<1.0	<1.0	<1.0	12.50
BH05	5/13/2015	<1.0	<1.0	<1.0	<1.0	12.41
BH05	7/30/2015	<1.0	<1.0	<1.0	2.3	10.91
BH05	10/26/2015	<1.0	<1.0	<1.0	<1.0	10.17
BH05	1/26/2016	<1.0	<1.0	<1.0	<1.0	12.79
BH05	4/21/2016	<1.0	<1.0	<1.0	<1.0	13.20
BH05	7/18/2016	<1.0	<1.0	<1.0	<1.0	11.11
BH05	10/19/2016	<1.0	<1.0	<1.0	<1.0	10.03
BH06	7/25/2013	1.9	12	3,100	46,000	13.47
BH06	10/31/2013	<1.0	<1.0	1.9	57	12.46
BH06	1/24/2014	<1.0	<1.0	<1.0	2.9	13.95
BH06	4/30/2014	<1.0	<1.0	2.0	49	14.06
BH06	7/25/2014	<1.0	<1.0	<1.0	4.9	11.44
BH06	10/27/2014	<1.0	<1.0	<1.0	2.6	10.81
BH06	1/20/2015	<1.0	<1.0	<1.0	2.3	12.93
BH06	5/13/2015	<1.0	<1.0	750	10,000	12.82
BH06	7/30/2015	<1.0	<1.0	<1.0	<1.0	11.32
BH06	10/26/2015	<1.0	<1.0	<1.0	<1.0	10.59
BH06	1/26/2016	<1.0	<1.0	<1.0	<1.0	13.09
BH06	4/21/2016	<1.0	<1.0	270	4,800	13.55
BH06	7/18/2016	<1.0	<1.0	9.6	240	11.18
BH06	10/19/2016	<1.0	<1.0	<1.0	250	10.36
BH07	7/25/2013	<1.0	<1.0	<1.0	<1.0	15.33
BH07	10/31/2013	<1.0	<1.0	<1.0	<1.0	14.31
BH07	1/24/2014	<1.0	<1.0	<1.0	<1.0	15.81
BH07	4/30/2014	<1.0	<1.0	<1.0	<1.0	15.96

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COGCC Table 910-1 Groundwater Standard (µg/L) ⁽¹⁾		5	560	700	1,400	
BH07	7/25/2014	<1.0	<1.0	<1.0	<1.0	13.27
BH07	10/27/2014	<1.0	<1.0	<1.0	<1.0	10.60
BH07	1/20/2015	<1.0	<1.0	<1.0	<1.0	14.78
BH07	5/13/2015	<1.0	<1.0	<1.0	<1.0	14.53
BH07	7/30/2015	<1.0	<1.0	<1.0	<1.0	13.17
BH07	10/26/2015	<1.0	<1.0	<1.0	<1.0	12.37
BH07	1/26/2016	<1.0	<1.0	<1.0	<1.0	14.92
BH07	4/21/2016	<1.0	<1.0	<1.0	<1.0	15.39
BH07	7/18/2016	<1.0	<1.0	<1.0	<1.0	13.11
BH07	10/19/2016	<1.0	<1.0	<1.0	<1.0	12.29
BH08	7/25/2013	<1.0	<1.0	<1.0	<1.0	13.47
BH08	10/31/2013	<1.0	<1.0	<1.0	<1.0	12.41
BH08	1/24/2014	<1.0	<1.0	<1.0	<1.0	13.91
BH08	4/30/2014	<1.0	<1.0	<1.0	<1.0	14.05
BH08	7/25/2014	<1.0	<1.0	<1.0	<1.0	11.42
BH08	10/27/2014	NS	NS	NS	NS	NM
BH08	1/22/2015	<1.0	<1.0	<1.0	<1.0	12.88
BH08	5/13/2015	<1.0	<1.0	<1.0	<1.0	12.90
BH08	7/30/2015	<1.0	<1.0	<1.0	<1.0	11.30
BH08	10/26/2015	<1.0	<1.0	<1.0	<1.0	10.56
BH08	1/26/2016	<1.0	<1.0	<1.0	<1.0	13.04
BH08	4/21/2016	<1.0	<1.0	<1.0	<1.0	13.57
BH08	7/18/2016	<1.0	<1.0	<1.0	<1.0	11.22
BH08	10/19/2016	<1.0	<1.0	<1.0	<1.0	10.38

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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	

Notes:

COGCC = Colorado Oil and Gas Conservation Commission

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

2. Depth to water measured from top of well casing

µg/L = Micrograms per liter

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

NM = Not measured

NS = Not sampled

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

TABLE 2
H&S (MINERAL) #1 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)
Third Quarter 2013						
8/6/2013	BH02, BH03, BH04, BH05, BH06	6	50	BH01, BH02, BH03, BH05, BH06	10	NR
8/19/2013	BH01, BH02, BH03, BH04, BH05, BH06	6	80	BH01, BH02, BH03, BH04, BH05, BH06	10	NR
9/8/2013		6	21		10	NR
9/16/2013		6	80	10	NR	
9/30/2013		5	90	BH01, BH02, BH03, BH05, BH06	20	NR
Quarterly Totals		29	321		-	-
Fourth Quarter 2013						
10/11/2013	BH01, BH02, BH03, BH04, BH05, BH06	6	80	BH01, BH02, BH03, BH05, BH06	10	NR
10/24/2013	BH01, BH02, BH03, BH04, BH06	6	110	BH01, BH02, BH03, BH05, BH06	12	NR
11/26/2013	BH01, BH02, BH03, BH04, BH05, BH06	6	40		10	NR
12/17/2013		6	42		10	NR
Quarterly Totals		24	272		-	-
First Quarter 2014						
1/7/2014	BH01, BH02, BH03, BH04, BH05, BH06	5.5	90	BH01, BH02, BH03, BH05, BH06	10	NR
1/22/2014		6	230		10	NR
2/24/2014		6	180		10	23.2
3/11/2014		6	90		10	38.4
3/20/2014		6	135		10	30
Quarterly Totals		29.5	725		-	-
Second Quarter 2014						
4/10/2014	BH01, BH02, BH03, BH04, BH05	8	230	BH01, BH02, BH03, BH05	10	29.5
4/23/2014	BH01, BH02, BH03, BH04, BH05, BH06	6	180	BH01, BH02, BH03, BH04, BH05, BH06	20	29.5
5/13/2014		6	220		10	21.5
5/28/2014		6	180		20	31
6/10/2014		8	270		25	39
6/23/2014		6	185		20	27
Quarterly Totals		40	1265		-	-
Third Quarter 2014						
7/11/2014	BH01, BH02, BH03, BH04, BH05, BH06	6	150	BH01, BH02, BH03, BH04, BH05, BH06	20	20
7/16/2014		6	240		15	16.5
8/8/2014		6	250		15	21.5
8/25/2014		6	230		20	21.5
9/10/2014		6	300		20	27
9/22/2014		6	350		20	24.5
Quarterly Totals		36	1520		-	-

TABLE 2
H&S (MINERAL) #1 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 2014						
10/10/2014	BH01, BH02, BH03, BH04, BH05, BH06	6	100		20	20
10/24/2014	Pipe, BH01, BH02,	6	50	BH01, BH02, BH03, BH04, BH05, BH06	15	16.7
11/7/2014	BH03, BH05, BH06	6	270		20	30.5
11/25/2014	Pipe, BH01, BH02, BH03, BH05	6	207		20	27.5
12/10/2014	BH01, BH02, BH03, BH04, BH05, BH06	6	18	BH01, BH02, BH03, BH05, BH06	30	25
Quarterly Totals		30	645		-	-
First Quarter 2015						
1/2/2015	Pipe, BH01, BH02, BH03, BH05, BH06	6	150	BH01, BH02, BH03, BH04, BH05, BH06	15	29.7
1/14/2015	Pipe, BH01, BH02, BH03, BH04	5	245	BH01, BH02, BH03, BH04	20	28.5
2/3/2015	Pipe, BH01, BH02, BH03, BH05, BH06	6	120	BH01, BH02, BH03, BH04, BH05, BH06	20	25.1
2/18/2015	Pipe, BH01, BH02,	6	250		20	25
3/13/2015	BH03, BH04, BH05,	6	100		20	27
3/25/2015	BH06	6	160		20	22
Quarterly Totals		35	1025		-	-
Second Quarter 2015						
4/1/2015	Pipe, BH01, BH02, BH03, BH04, BH05, BH06	6	165	BH01, BH02, BH03, BH04, BH05, BH06	20	24
4/21/2015	Pipe, BH01, BH02, BH03, BH04, BH05	6	180	BH01, BH02, BH03, BH04, BH05	20	15.6
5/5/2015	Pipe, BH01, BH02, BH03, BH04, BH05, BH06	6	80	BH01, BH02, BH03, BH04, BH05, BH06	20	17.5
5/19/2015		6	250		20	17.5
6/2/2015		6	270		20	30
6/16/2015		6	350		20	22
6/30/2015		6	340		20	25
Quarterly Totals		42	1635		-	-
Third Quarter 2015						
7/14/2015	Pipe, BH01, BH02, BH03, BH04, BH05, BH06	6	375	BH01, BH02, BH03,	20	25
7/28/2015		6	405	BH04, BH05, BH06	20	25
8/11/2015		6	320	BH01, BH02, BH04, BH05	20	20
8/25/2015		6	505	BH01, BH02, BH03, BH04, BH05, BH06	20	25
9/8/2015		6	90		20	22.5
9/22/2015		6	700		20	23.5
Quarterly Totals		36	2395		-	-

**TABLE 2
H&S (MINERAL) #1 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 2015						
10/6/2015	Pipe, BH01, BH02, BH03, BH04, BH05, BH06	6	550	BH01, BH02, BH03, BH04, BH05, BH06	20	22
10/20/2015		6	400		20	22.5
11/3/2015	Pipe, BH01, BH02, BH03, BH04, BH05	6	552		20	25
11/19/2015	Pipe, BH01, BH03, BH05, BH06	6	320	BH01, BH02, BH03, BH04, BH05	20	19.3
12/1/2015		6	142		20	25
12/22/2015	Pipe, BH01, BH02, BH03	6	260	BH02, BH03, BH04	20	25
Quarterly Totals		36	2224		-	-
First Quarter 2016						
1/13/2016	Pipe, BH01, BH03, BH05, BH06	6	20	BH01, BH02, BH03, BH04, BH05	20	20
2/12/2016		6	200		20	27.7
2/25/2016		6	420		20	20
3/10/2016		6	250		20	17.3
3/24/2016		6	320		24	18.9
Quarterly Totals		30	1210		-	-
Second Quarter 2016						
4/7/2016	Pipe, BH03, BH05, BH06	6	840	BH01, BH02, BH03, BH04, BH05, BH06	20	20
4/22/2016		6	250		25	16.8
5/19/2016		6	210		20	12
6/2/2016		6	210		20	10
6/16/2016		6	294		20	10
6/28/2016		6	350		20	10.4
Quarterly Totals		36	2154		-	-
Third Quarter 2016						
7/14/2016	Pipe, BH03, BH05, BH06	6	294	BH01, BH02, BH03, BH04, BH05, BH06	20	10
7/26/2016		6	320		20	10
8/11/2016		6	270		20	17.7
8/23/2016		6	210		20	9
Quarterly Totals		24	1094		-	-

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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						
10/7/2016	Pipe, BH02, BH03, BH05	2	420	BH01, BH04, BH05, BH06	18	20
10/21/2016		6	2520	BH01, BH02, BH03, BH04, BH05, BH06	20	25
11/4/2016		6	840		20	12
11/29/2016		6	210		20	10
12/13/2016	Pipe, BH02, BH03, BH05, BH06	6	0	BH01, BH02, BH03, BH04, BH05, BH06	20	10
12/27/2016	Pipe, BH02, BH03, BH05	6	420		20	15
Quarterly Totals		32	4410		-	-

Notes:

EFR = Enhanced fluid recovery

AS = Air sparge

psi = Pounds per square inch

cfm = Cubic feet per minute

NR = Not recorded



BH02		
Compound (µg/L)	7/18/2016	10/19/2016
Benzene	71	9.9
Toluene	1.0	1.2
Ethylbenzene	<1.0	<1.0
Total Xylenes	14	63

BH01R		
Compound (µg/L)	7/18/2016	10/19/2016
Benzene	<1.0	<1.0
Toluene	2.4	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	1200	240

BH04		
Compound (µg/L)	7/18/2016	10/19/2016
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	2.0	<1.0

BH07		
Compound (µg/L)	7/18/2016	10/19/2016
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

BH03		
Compound (µg/L)	7/18/2016	10/19/2016
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	5.9

BH06		
Compound (µg/L)	7/18/2016	10/19/2016
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	9.6	<1.0
Total Xylenes	240	250

BH05		
Compound (µg/L)	7/18/2016	10/19/2016
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

BH08		
Compound (µg/L)	7/18/2016	10/19/2016
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

Surface
Drainage

Note: Surface drainage direction is estimated based on site topography and is not related to regional topography.

0 ft 35 ft 70 ft



Facility Diagram

PDC Energy – DJ Basin
H&S (Mineral) #1 Tank Battery
NWSW S6 T4N R65W
Weld County, CO



6899 Pecos Street
Unit C
Denver, CO 80221

- LEGEND**
- Monitoring Well - Destroyed
 - Monitoring Well
 - Horizontal Remediation Well
 - Groundwater Flow Direction
 - Point of Release
 - Excavation Extent

All locations are approximate unless otherwise noted

FIGURE 1
GROUNDWATER ANALYTICAL RESULTS MAP

DRAWN BY: BRN

DATE: 1/29/2017

ATTACHMENT A

Summit Scientific

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

October 26, 2016

Mark Longhurst
PDC Energy
1775 Sherman St. STE. 3000
Denver, CO 80203
RE: H&S Mineral #1

Enclosed are the results of analyses for samples received by Summit Scientific on 10/19/16 17:00. 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: H&S Mineral #1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
10/26/16 16:07

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01R	1610155-01	Water	10/19/16 12:58	10/19/16 17:00
BH02	1610155-02	Water	10/19/16 12:53	10/19/16 17:00
BH03	1610155-03	Water	10/19/16 12:40	10/19/16 17:00
BH04	1610155-04	Water	10/19/16 12:45	10/19/16 17:00
BH05	1610155-05	Water	10/19/16 12:34	10/19/16 17:00
BH06	1610155-06	Water	10/19/16 12:30	10/19/16 17:00
BH07	1610155-07	Water	10/19/16 12:15	10/19/16 17:00
BH08	1610155-08	Water	10/19/16 12:20	10/19/16 17:00

Summit Scientific

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

Project: H&S Mineral #1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
10/26/16 16:07

Summit Scientific

1610155

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 Peas St, Unit C
City/State/Zip: Denver, CO 80221
Phone: _____ Fax: _____
Sampler Name: Mitch Weller / Max Garza

Project Manager: Mark Longhurst
E-Mail: mark.longhurst@pdc.com
Project Name: H&S Mineral #1
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)	BTX	PAH		Other	Other
BH01B	10-11-16	1256	1			X										
BH02		1253														
BH03		1240														
BH04		1245														
BH05		1234														
BH06		1230														
BH07		1215														
BH08		1220														
Relinquished by: <u>Max Garza</u> Date/Time: <u>10/19/16 1700</u>				Received by: <u>[Signature]</u> Date/Time: <u>10/19/16 1700</u>				Turn Around Time (Check)				Notes:				
Relinquished by: <u>[Signature]</u> Date/Time: <u>10/19/16 1740</u>				Received by: <u>[Signature]</u> Date/Time: <u>10/19/16 1740</u>				Same Day <input type="checkbox"/> 72 Hours <input type="checkbox"/>				On ice				
Relinquished by: _____ Date/Time: _____				Received in Lab by: _____ Date/Time: _____				24 Hours <input type="checkbox"/> 48 Hours <input type="checkbox"/> Standard <input checked="" type="checkbox"/>								
Relinquished by: _____ Date/Time: _____				Received in Lab by: _____ Date/Time: _____				Sample Integrity: Temperature Upon Receipt: <u>3.4°C</u>								
								Intact: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No								

www.s2scientific.com

Summit Scientific

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

Project: H&S Mineral #1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
10/26/16 16:07

Sample Receipt Checklist

S2 Work Order: 1610155
Client: PDC/Tasman Client Project ID: H+S Mineral
Shipped Via: P/U Airbill #: _____
(UPS, FedEx, Hand Delivered, Pick-up, etc.)
Matrix (check all that apply): Air Soil/Solid Water Other: _____
(Describe)

Cooler ID					
Temp (°C)	<u>3.4</u>				

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature just above 0°C to ≤ 6°C ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
NOTE: If samples are delivered the same day of sampling, this requirement is waived 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

10/26/16 1740
Date/Time

[Signature]



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

Project: H&S Mineral #1

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 10/26/16 16:07

BH01R
1610155-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **10/19/16 12:58**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610222	10/21/16	10/21/16	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	240	1.0	"	"	"	"	"	"	

Date Sampled: **10/19/16 12:58**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		119 %	37-154		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		103 %	45-149		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		111 %	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: H&S Mineral #1
 Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 10/26/16 16:07

BH02
1610155-02 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **10/19/16 12:53**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	9.9	1.0	ug/l	1	1610222	10/21/16	10/21/16	EPA 8260B	
Toluene	1.2	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	63	1.0	"	"	"	"	"	"	

Date Sampled: **10/19/16 12:53**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		118 %	37-154		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		103 %	45-149		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		115 %	45-146		"	"	"	"	

Summit Scientific

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

Project: H&S Mineral #1

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 10/26/16 16:07

BH03
1610155-03 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **10/19/16 12:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610222	10/21/16	10/21/16	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	5.9	1.0	"	"	"	"	"	"	

Date Sampled: **10/19/16 12:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		123 %	37-154		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		104 %	45-149		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		108 %	45-146		"	"	"	"	

Summit Scientific

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

Project: H&S Mineral #1

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 10/26/16 16:07

BH04
1610155-04 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **10/19/16 12:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610222	10/21/16	10/21/16	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **10/19/16 12:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		<i>115 %</i>	<i>37-154</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	
<i>Surrogate: Toluene-d8</i>		<i>101 %</i>	<i>45-149</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>		<i>109 %</i>	<i>45-146</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	

Summit Scientific

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

Project: H&S Mineral #1

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 10/26/16 16:07

BH05
1610155-05 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **10/19/16 12:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610222	10/21/16	10/21/16	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **10/19/16 12:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		<i>114 %</i>	<i>37-154</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	
<i>Surrogate: Toluene-d8</i>		<i>106 %</i>	<i>45-149</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>		<i>107 %</i>	<i>45-146</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	

Summit Scientific

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

Project: H&S Mineral #1

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 10/26/16 16:07

BH06
1610155-06 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **10/19/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610222	10/21/16	10/21/16	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	250	1.0	"	"	"	"	"	"	

Date Sampled: **10/19/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		113 %	37-154		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		101 %	45-149		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		110 %	45-146		"	"	"	"	

Summit Scientific

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

Project: H&S Mineral #1

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 10/26/16 16:07

BH07
1610155-07 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **10/19/16 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610222	10/21/16	10/21/16	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **10/19/16 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		<i>115 %</i>	<i>37-154</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	
<i>Surrogate: Toluene-d8</i>		<i>104 %</i>	<i>45-149</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>		<i>106 %</i>	<i>45-146</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	

Summit Scientific

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

Project: H&S Mineral #1

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 10/26/16 16:07

BH08
1610155-08 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **10/19/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610222	10/21/16	10/21/16	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **10/19/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		<i>118 %</i>	<i>37-154</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	
<i>Surrogate: Toluene-d8</i>		<i>103 %</i>	<i>45-149</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>		<i>106 %</i>	<i>45-146</i>		<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>	

Summit Scientific

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

Project: H&S Mineral #1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
10/26/16 16:07

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 1610222 - EPA 5030 Water MS

Blank (1610222-BLK1)

Prepared & Analyzed: 10/21/16

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	1.0	"							
Surrogate: 1,2-Dichloroethane-d4	15.5		"	13.3		116	37-154			
Surrogate: Toluene-d8	14.2		"	13.3		107	45-149			
Surrogate: 4-Bromofluorobenzene	15.0		"	13.3		112	45-146			

LCS (1610222-BS1)

Prepared & Analyzed: 10/21/16

Benzene	28.6	1.0	ug/l	33.3		85.9	51-132			
Toluene	29.4	1.0	"	33.3		88.3	51-138			
Ethylbenzene	35.2	1.0	"	33.1		106	58-146			
m,p-Xylene	64.3	2.0	"	66.5		96.6	57-144			
o-Xylene	34.0	1.0	"	32.7		104	53-146			
Surrogate: 1,2-Dichloroethane-d4	16.5		"	13.3		124	37-154			
Surrogate: Toluene-d8	13.8		"	13.3		103	45-149			
Surrogate: 4-Bromofluorobenzene	14.3		"	13.3		107	45-146			

Matrix Spike (1610222-MS1)

Source: 1610152-03

Prepared & Analyzed: 10/21/16

Benzene	28.2	1.0	ug/l	33.3	ND	84.6	34-141			
Toluene	29.1	1.0	"	33.3	ND	87.3	27-151			
Ethylbenzene	35.0	1.0	"	33.1	ND	106	29-160			
m,p-Xylene	63.8	2.0	"	66.5	ND	95.9	20-166			
o-Xylene	33.4	1.0	"	32.7	ND	102	33-159			
Surrogate: 1,2-Dichloroethane-d4	16.4		"	13.3		123	37-154			
Surrogate: Toluene-d8	13.7		"	13.3		102	45-149			
Surrogate: 4-Bromofluorobenzene	14.2		"	13.3		106	45-146			

Summit Scientific

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

Project: H&S Mineral #1

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 10/26/16 16:07

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 1610222 - EPA 5030 Water MS

Matrix Spike Dup (1610222-MSD1)	Source: 1610152-03			Prepared & Analyzed: 10/21/16						
Benzene	28.3	1.0	ug/l	33.3	ND	84.9	34-141	0.354	32	
Toluene	28.7	1.0	"	33.3	ND	86.0	27-151	1.52	25	
Ethylbenzene	36.6	1.0	"	33.1	ND	111	29-160	4.44	50	
m,p-Xylene	66.1	2.0	"	66.5	ND	99.4	20-166	3.60	36	
o-Xylene	34.1	1.0	"	32.7	ND	104	33-159	1.93	26	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>17.9</i>		<i>"</i>	<i>13.3</i>		<i>135</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>14.6</i>		<i>"</i>	<i>13.3</i>		<i>110</i>	<i>45-146</i>			

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: H&S Mineral #1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
10/26/16 16:07

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