



# **Extraction Oil & Gas**

**Weld County, CO (NAD83)**

**RBF**

**8**

**OH / Job #61108**

**Survey: Phoenix MWD Surveys**

## **Standard Survey Report**

**07 May, 2017**





# Phoenix Technology Services LP

## Survey Report



<b>Company:</b>	Extraction Oil & Gas	<b>Local Co-ordinate Reference:</b>	Well 8
<b>Project:</b>	Weld County, CO (NAD83)	<b>TVD Reference:</b>	RKB @ 4803.00usft (Patterson 346)
<b>Site:</b>	RBF	<b>MD Reference:</b>	RKB @ 4803.00usft (Patterson 346)
<b>Well:</b>	8	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH / Job #61108	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (Patterson 346)	<b>Database:</b>	Compass 5000 RMR

<b>Project</b>	Weld County, CO (NAD83)		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	Colorado Northern Zone		

Site		RBF			
Site Position:		Northing:	1,416,272.86 usft	Latitude:	40° 28' 27.728 N
From:	Lat/Long	Easting:	3,174,878.37 usft	Longitude:	104° 52' 17.036 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.41 °

Well	8					
Well Position	+N/-S	0.00 usft	Northing:	1,416,161.01 usft	Latitude:	40° 28' 26.623 N
	+E/-W	0.00 usft	Easting:	3,174,878.61 usft	Longitude:	104° 52' 17.044 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	4,778.00 usft

<b>Wellbore</b>	OH / Job #61108				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	HDGM	5/15/2017	8.42	66.93	52,461

Design	Surveys (Patterson 346)				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	272.97	

<b>Survey Program</b>	<b>Date</b>	5/7/2017			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
128.00	1,570.00	Total MWD Surveys (OH / Surface)	MWD	OWSG Rev.2 MWD - Standard	
1,488.00	16,535.00	Phoenix MWD Surveys (OH / Job #61108)	MWD+HDGM	OWSG Rev.2 MWD + HDGM	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>	
1,488.00	1.41	43.94	1,487.83	-3.64	-2.56	2.36	0.00	0.00	0.00	
1,659.00	1.62	3.03	1,658.78	0.29	-0.97	0.98	0.63	0.12	-23.92	
<b>First Phoenix Survey</b>										
1,753.00	3.06	46.68	1,752.70	3.34	0.93	-0.75	2.33	1.53	46.44	
1,846.00	5.16	52.56	1,845.46	7.58	6.05	-5.65	2.30	2.26	6.32	
1,940.00	8.06	56.45	1,938.82	13.80	14.90	-14.17	3.12	3.09	4.14	
2,033.00	7.60	52.66	2,030.96	21.13	25.23	-24.10	0.74	-0.49	-4.08	
2,127.00	6.78	49.94	2,124.22	28.47	34.42	-32.90	0.94	-0.87	-2.89	
2,221.00	6.22	49.12	2,217.61	35.37	42.51	-40.62	0.60	-0.60	-0.87	
2,314.00	5.63	47.35	2,310.12	41.76	49.68	-47.45	0.66	-0.63	-1.90	

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<b>Site:</b>	RBF	<b>MD Reference:</b>	RKB @ 4803.00usft (Patterson 346)
<b>Well:</b>	8	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH / Job #61108	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (Patterson 346)	<b>Database:</b>	Compass 5000 RMR

### Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
2,408.00	7.51	55.92	2,403.50	48.33	58.16	-55.58	2.25	2.00	9.12
2,501.00	7.24	54.14	2,495.73	55.17	67.94	-64.99	0.38	-0.29	-1.91
2,595.00	9.22	52.67	2,588.75	63.21	78.73	-75.35	2.12	2.11	-1.56
2,689.00	7.79	51.57	2,681.72	71.73	89.71	-85.87	1.53	-1.52	-1.17
2,782.00	8.44	40.40	2,773.79	80.85	99.07	-94.75	1.83	0.70	-12.01
2,876.00	7.78	38.21	2,866.85	91.10	107.48	-102.61	0.78	-0.70	-2.33
2,969.00	6.77	37.64	2,959.10	100.39	114.72	-109.36	1.09	-1.09	-0.61
3,063.00	5.74	34.28	3,052.54	108.66	120.75	-114.96	1.16	-1.10	-3.57
3,156.00	7.41	46.44	3,144.93	116.64	127.72	-121.50	2.33	1.80	13.08
3,250.00	6.11	45.44	3,238.28	124.32	135.67	-129.05	1.39	-1.38	-1.06
3,343.00	8.96	49.61	3,330.46	132.49	144.72	-137.66	3.12	3.06	4.48
3,438.00	7.54	48.28	3,424.48	141.43	155.01	-147.47	1.51	-1.49	-1.40
3,532.00	6.08	46.17	3,517.81	148.98	163.20	-155.26	1.58	-1.55	-2.24
3,626.00	5.96	42.96	3,611.29	156.00	170.12	-161.81	0.38	-0.13	-3.41
3,721.00	9.06	45.86	3,705.47	164.82	178.85	-170.07	3.29	3.26	3.05
3,816.00	9.03	43.39	3,799.29	175.45	189.34	-179.99	0.41	-0.03	-2.60
3,908.00	8.44	44.06	3,890.22	185.55	198.99	-189.11	0.65	-0.64	0.73
4,002.00	7.58	46.72	3,983.30	194.76	208.30	-197.93	1.00	-0.91	2.83
4,096.00	6.91	43.81	4,076.55	203.09	216.73	-205.92	0.81	-0.71	-3.10
4,191.00	5.78	40.94	4,170.97	210.83	223.82	-212.60	1.24	-1.19	-3.02
4,285.00	5.51	35.29	4,264.51	218.08	229.53	-217.92	0.66	-0.29	-6.01
4,379.00	7.97	49.35	4,357.86	226.02	237.09	-225.06	3.13	2.62	14.96
4,474.00	6.72	47.71	4,452.08	234.05	246.19	-233.74	1.33	-1.32	-1.73
4,568.00	5.65	46.34	4,545.53	240.94	253.61	-240.79	1.15	-1.14	-1.46
4,662.00	5.02	41.90	4,639.13	247.20	259.70	-246.55	0.80	-0.67	-4.72
4,757.00	7.28	52.69	4,733.58	253.94	267.27	-253.75	2.66	2.38	11.36
4,851.00	8.59	49.42	4,826.67	262.12	277.34	-263.39	1.47	1.39	-3.48
4,945.00	6.80	50.34	4,919.82	270.24	286.95	-272.57	1.91	-1.90	0.98
5,039.00	8.04	55.54	5,013.04	277.51	296.66	-281.88	1.50	1.32	5.53
5,133.00	6.37	54.01	5,106.29	284.29	306.30	-291.16	1.79	-1.78	-1.63
5,228.00	7.54	44.91	5,200.59	291.80	314.96	-299.42	1.69	1.23	-9.58
5,322.00	7.80	48.13	5,293.75	300.43	324.07	-308.07	0.53	0.28	3.43
5,416.00	6.69	47.07	5,387.00	308.42	332.83	-316.40	1.19	-1.18	-1.13
5,510.00	8.11	40.99	5,480.22	317.15	341.19	-324.30	1.72	1.51	-6.47
5,604.00	6.56	40.85	5,573.44	326.22	349.05	-331.68	1.65	-1.65	-0.15
5,699.00	8.49	43.66	5,667.62	335.40	357.44	-339.58	2.07	2.03	2.96
5,793.00	8.25	46.10	5,760.62	345.09	367.09	-348.72	0.46	-0.26	2.60
5,887.00	9.12	43.76	5,853.54	355.15	377.10	-358.20	1.00	0.93	-2.49
5,981.00	6.90	43.08	5,946.62	364.66	386.11	-366.70	2.36	-2.36	-0.72
6,076.00	5.31	42.90	6,041.08	372.05	393.00	-373.20	1.67	-1.67	-0.19
6,170.00	6.37	46.33	6,134.59	378.83	399.74	-379.57	1.19	1.13	3.65
6,264.00	4.58	40.51	6,228.16	385.29	405.95	-385.44	1.99	-1.90	-6.19
6,358.00	3.01	40.44	6,321.95	390.02	409.99	-389.23	1.67	-1.67	-0.07

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<b>Wellbore:</b>	OH / Job #61108	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (Patterson 346)	<b>Database:</b>	Compass 5000 RMR

### Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,453.00	2.17	40.08	6,416.85	393.29	412.76	-391.83	0.88	-0.88	-0.38
6,547.00	1.85	40.65	6,510.79	395.81	414.90	-393.83	0.34	-0.34	0.61
6,571.00	1.76	41.36	6,534.78	396.38	415.39	-394.30	0.39	-0.38	2.96
6,665.00	7.70	284.63	6,628.51	399.06	410.24	-389.02	9.19	6.32	-124.18
6,759.00	19.14	280.15	6,719.80	403.38	388.91	-367.49	12.21	12.17	-4.77
6,854.00	23.64	271.52	6,808.25	406.63	354.51	-332.97	5.77	4.74	-9.08
6,948.00	33.14	274.58	6,890.86	409.19	309.95	-288.34	10.22	10.11	3.26
7,042.00	43.93	274.68	6,964.28	413.91	251.67	-229.89	11.48	11.48	0.11
7,136.00	54.99	266.77	7,025.34	414.41	180.45	-158.74	13.38	11.77	-8.41
7,231.00	64.31	269.11	7,073.29	411.54	98.62	-77.17	10.04	9.81	2.46
7,325.00	68.80	272.11	7,110.69	412.50	12.42	8.97	5.60	4.78	3.19
7,419.00	73.51	272.65	7,141.04	416.20	-76.44	97.90	5.04	5.01	0.57
7,513.00	80.21	271.47	7,162.40	419.47	-167.86	189.37	7.23	7.13	-1.26
7,607.00	87.15	272.55	7,172.74	422.75	-261.18	282.73	7.47	7.38	1.15
7,702.00	89.10	270.14	7,175.85	424.98	-356.09	377.63	3.26	2.05	-2.54
7,796.00	89.59	270.07	7,176.92	425.15	-450.08	471.50	0.53	0.52	-0.07
7,890.00	89.91	269.31	7,177.33	424.65	-544.08	565.35	0.88	0.34	-0.81
7,985.00	90.24	268.54	7,177.21	422.86	-639.06	660.11	0.88	0.35	-0.81
8,079.00	90.85	268.26	7,176.31	420.24	-733.02	753.81	0.71	0.65	-0.30
8,173.00	88.81	271.15	7,176.59	419.75	-827.00	847.64	3.76	-2.17	3.07
8,268.00	89.46	270.90	7,178.03	421.45	-921.98	942.57	0.73	0.68	-0.26
8,362.00	89.79	270.43	7,178.64	422.54	-1,015.97	1,036.49	0.61	0.35	-0.50
8,456.00	89.97	270.07	7,178.84	422.95	-1,109.97	1,130.39	0.43	0.19	-0.38
8,551.00	90.04	269.76	7,178.83	422.81	-1,204.97	1,225.25	0.33	0.07	-0.33
8,645.00	90.41	271.22	7,178.46	423.62	-1,298.96	1,319.16	1.60	0.39	1.55
8,740.00	90.80	271.30	7,177.46	425.71	-1,393.93	1,414.11	0.42	0.41	0.08
8,834.00	91.27	271.99	7,175.76	428.40	-1,487.88	1,508.07	0.89	0.50	0.73
8,929.00	89.42	270.33	7,175.19	430.33	-1,582.85	1,603.02	2.62	-1.95	-1.75
9,023.00	91.71	272.12	7,174.26	432.34	-1,676.81	1,696.96	3.09	2.44	1.90
9,117.00	92.41	271.75	7,170.88	435.51	-1,770.70	1,790.88	0.84	0.74	-0.39
9,212.00	90.99	271.55	7,168.07	438.24	-1,865.61	1,885.81	1.51	-1.49	-0.21
9,306.00	91.17	270.58	7,166.29	439.99	-1,959.58	1,979.74	1.05	0.19	-1.03
9,401.00	89.23	268.02	7,165.96	438.83	-2,054.56	2,074.53	3.38	-2.04	-2.69
9,495.00	89.69	267.95	7,166.85	435.52	-2,148.50	2,168.17	0.49	0.49	-0.07
9,589.00	89.86	271.39	7,167.22	434.98	-2,242.48	2,262.00	3.66	0.18	3.66
9,684.00	89.36	269.09	7,167.86	435.38	-2,337.47	2,356.89	2.48	-0.53	-2.42
9,778.00	90.07	268.50	7,168.33	433.40	-2,431.45	2,450.64	0.98	0.76	-0.63
9,873.00	89.19	267.88	7,168.94	430.40	-2,526.40	2,545.30	1.13	-0.93	-0.65
9,967.00	88.82	269.84	7,170.58	428.53	-2,620.36	2,639.04	2.12	-0.39	2.09
10,062.00	89.16	271.77	7,172.25	429.87	-2,715.33	2,733.95	2.06	0.36	2.03
10,156.00	88.57	271.77	7,174.11	432.77	-2,809.27	2,827.91	0.63	-0.63	0.00
10,250.00	91.44	271.12	7,174.11	435.14	-2,903.22	2,921.87	3.13	3.05	-0.69
10,345.00	90.55	272.43	7,172.46	438.08	-2,998.16	3,016.83	1.67	-0.94	1.38

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### Survey

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10,439.00	90.50	272.46	7,171.59	442.09	-3,092.07	3,110.82	0.06	-0.05	0.03
10,534.00	91.37	273.84	7,170.04	447.31	-3,186.91	3,205.81	1.72	0.92	1.45
10,628.00	89.21	270.33	7,169.57	450.73	-3,280.83	3,299.78	4.38	-2.30	-3.73
10,722.00	89.14	271.48	7,170.92	452.22	-3,374.81	3,393.70	1.23	-0.07	1.22
10,816.00	89.62	271.11	7,171.94	454.34	-3,468.78	3,487.66	0.64	0.51	-0.39
10,910.00	90.65	270.53	7,171.72	455.69	-3,562.76	3,581.59	1.26	1.10	-0.62
11,004.00	89.65	268.74	7,171.47	455.09	-3,656.76	3,675.42	2.18	-1.06	-1.90
11,099.00	90.73	268.97	7,171.16	453.19	-3,751.74	3,770.18	1.16	1.14	0.24
11,193.00	88.70	266.79	7,171.62	449.71	-3,845.66	3,863.80	3.17	-2.16	-2.32
11,287.00	89.12	268.69	7,173.41	446.01	-3,939.57	3,957.38	2.07	0.45	2.02
11,382.00	89.94	267.93	7,174.19	443.20	-4,034.52	4,052.06	1.18	0.86	-0.80
11,476.00	89.47	269.11	7,174.68	440.78	-4,128.49	4,145.78	1.35	-0.50	1.26
11,570.00	89.67	268.27	7,175.38	438.63	-4,222.46	4,239.51	0.92	0.21	-0.89
11,664.00	90.05	270.87	7,175.61	437.92	-4,316.45	4,333.34	2.80	0.40	2.77
11,760.00	91.29	271.09	7,174.49	439.56	-4,412.42	4,429.27	1.31	1.29	0.23
11,853.00	91.96	270.26	7,171.85	440.66	-4,505.38	4,522.16	1.15	0.72	-0.89
11,947.00	88.83	270.52	7,171.20	441.30	-4,599.36	4,616.05	3.34	-3.33	0.28
12,042.00	89.29	270.23	7,172.76	441.92	-4,694.35	4,710.94	0.57	0.48	-0.31
12,137.00	90.86	271.01	7,172.64	442.95	-4,789.34	4,805.85	1.85	1.65	0.82
12,233.00	92.04	270.86	7,170.21	444.51	-4,885.29	4,901.76	1.24	1.23	-0.16
12,328.00	88.76	270.81	7,169.55	445.90	-4,980.27	4,996.68	3.45	-3.45	-0.05
12,423.00	88.55	270.37	7,171.77	446.88	-5,075.24	5,091.57	0.51	-0.22	-0.46
12,518.00	88.81	269.22	7,173.96	446.54	-5,170.21	5,186.40	1.24	0.27	-1.21
12,613.00	90.42	270.11	7,174.60	445.98	-5,265.20	5,281.24	1.94	1.69	0.94
12,709.00	89.41	271.02	7,174.74	446.93	-5,361.19	5,377.15	1.42	-1.05	0.95
12,804.00	88.75	271.90	7,176.27	449.35	-5,456.15	5,472.10	1.16	-0.69	0.93
12,899.00	87.81	270.91	7,179.12	451.68	-5,551.08	5,567.02	1.44	-0.99	-1.04
12,994.00	88.58	270.01	7,182.11	452.44	-5,646.02	5,661.88	1.25	0.81	-0.95
13,089.00	90.00	270.29	7,183.29	452.69	-5,741.01	5,756.76	1.52	1.49	0.29
13,184.00	92.31	271.76	7,181.38	454.39	-5,835.97	5,851.67	2.88	2.43	1.55
13,279.00	91.60	269.95	7,178.13	455.80	-5,930.90	5,946.55	2.05	-0.75	-1.91
13,375.00	91.01	269.19	7,175.95	455.08	-6,026.87	6,042.35	1.00	-0.61	-0.79
13,469.00	88.65	268.64	7,176.23	453.30	-6,120.85	6,136.11	2.58	-2.51	-0.59
13,565.00	88.88	269.81	7,178.30	452.00	-6,216.81	6,231.88	1.24	0.24	1.22
13,659.00	88.11	270.45	7,180.77	452.22	-6,310.78	6,325.73	1.07	-0.82	0.68
13,754.00	89.30	270.55	7,182.91	453.05	-6,405.75	6,420.62	1.26	1.25	0.11
13,849.00	87.49	271.48	7,185.57	454.73	-6,500.69	6,515.52	2.14	-1.91	0.98
13,944.00	88.72	272.00	7,188.71	457.61	-6,595.59	6,610.45	1.41	1.29	0.55
14,038.00	89.80	271.99	7,189.93	460.88	-6,689.53	6,704.42	1.15	1.15	-0.01
14,133.00	91.06	271.26	7,189.22	463.58	-6,784.49	6,799.39	1.53	1.33	-0.77
14,227.00	89.63	270.78	7,188.65	465.25	-6,878.47	6,893.33	1.60	-1.52	-0.51
14,321.00	89.69	270.35	7,189.21	466.18	-6,972.46	6,987.25	0.46	0.06	-0.46
14,417.00	90.34	269.11	7,189.18	465.72	-7,068.46	7,083.09	1.46	0.68	-1.29
14,511.00	91.30	267.30	7,187.84	462.78	-7,162.40	7,176.75	2.18	1.02	-1.93

<b>Company:</b>	Extraction Oil & Gas	<b>Local Co-ordinate Reference:</b>	Well 8
<b>Project:</b>	Weld County, CO (NAD83)	<b>TVD Reference:</b>	RKB @ 4803.00usft (Patterson 346)
<b>Site:</b>	RBF	<b>MD Reference:</b>	RKB @ 4803.00usft (Patterson 346)
<b>Well:</b>	8	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH / Job #61108	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (Patterson 346)	<b>Database:</b>	Compass 5000 RMR

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
14,605.00	90.84	269.10	7,186.08	459.83	-7,256.33	7,270.41	1.98	-0.49	1.91	
14,700.00	89.97	270.90	7,185.41	459.83	-7,351.32	7,365.27	2.10	-0.92	1.89	
14,794.00	90.64	271.23	7,184.91	461.58	-7,445.30	7,459.22	0.79	0.71	0.35	
14,888.00	92.02	270.66	7,182.73	463.13	-7,539.26	7,553.13	1.59	1.47	-0.61	
14,982.00	90.48	269.95	7,180.68	463.63	-7,633.24	7,647.00	1.80	-1.64	-0.76	
15,078.00	91.48	269.31	7,179.03	463.01	-7,729.22	7,742.83	1.24	1.04	-0.67	
15,172.00	91.62	269.00	7,176.49	461.62	-7,823.17	7,836.58	0.36	0.15	-0.33	
15,267.00	90.52	269.45	7,174.72	460.34	-7,918.15	7,931.36	1.25	-1.16	0.47	
15,335.00	90.59	270.33	7,174.06	460.20	-7,986.14	7,999.26	1.30	0.10	1.29	
15,616.00	90.02	270.69	7,172.56	462.71	-8,267.12	8,279.99	0.24	-0.20	0.13	
15,710.00	88.31	270.25	7,173.93	463.48	-8,361.11	8,373.89	1.88	-1.82	-0.47	
15,804.00	89.01	269.63	7,176.13	463.38	-8,455.08	8,467.73	0.99	0.74	-0.66	
15,897.00	91.12	270.16	7,176.03	463.21	-8,548.08	8,560.59	2.34	2.27	0.57	
15,991.00	91.65	270.69	7,173.75	463.91	-8,642.04	8,654.47	0.80	0.56	0.56	
16,085.00	90.15	270.07	7,172.28	464.53	-8,736.03	8,748.36	1.73	-1.60	-0.66	
Final Phoenix MWD Survey										
16,535.00	90.15	270.07	7,171.10	465.08	-9,186.03	9,197.78	0.00	0.00	0.00	
Projection to TD										

Survey Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
1,659.00	1,658.78	0.29	-0.97	First Phoenix Survey	
16,085.00	7,172.28	464.53	-8,736.03	Final Phoenix MWD Survey	
16,535.00	7,171.10	465.08	-9,186.03	Projection to TD	