

# Rubicon Oil & Gas

Weld County, CO  
Sec. 27-T9N-R66W  
Pawnee 27-1

Plan #2 (Horizontal)

Survey: Sperry MWD Survey

## Sperry Drilling Services Standard Report

03 November, 2009

Well Coordinates: 1,503,478.10 N, 3,202,672.17 E (40° 42' 47.32" N, 104° 46' 08.09" W)  
Ground Level: 5,216.50 ft

Local Coordinate Origin:	Centered on Well Pawnee 27-1
Viewing Datum:	RKB 10' @ 5226.50ft (Original Well Elev)
TVDs to System:	N
North Reference:	True
Unit System:	API - US Survey Feet - Custom
Geodetic Scale Factor Applied	
Version: 2003.16 Build: 42	

**HALLIBURTON**

**Survey Report for Pawnee 27-1 - Sperry MWD Survey**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,980.00	0.91	294.42	1,979.92	6.50	-14.32	-12.02	0.05
2,080.00	0.78	306.61	2,079.91	7.23	-15.59	-13.04	0.22
2,180.00	1.02	285.40	2,179.89	7.88	-16.99	-14.22	0.41
2,280.00	0.94	265.06	2,279.88	8.04	-18.67	-15.79	0.35
2,380.00	1.24	248.17	2,379.86	7.57	-20.49	-17.67	0.44
2,480.00	0.74	246.44	2,479.85	6.91	-22.08	-19.39	0.50
2,580.00	1.11	265.78	2,579.83	6.58	-23.64	-20.98	0.48
2,680.00	1.31	280.70	2,679.81	6.72	-25.73	-22.95	0.37
2,780.00	1.19	290.11	2,779.79	7.29	-27.83	-24.81	0.24
2,880.00	1.06	266.90	2,879.77	7.60	-29.73	-26.56	0.47
2,980.00	0.98	285.87	2,979.75	7.78	-31.47	-28.19	0.35
3,080.00	0.90	265.93	3,079.74	7.96	-33.08	-29.69	0.33
3,180.00	1.28	269.99	3,179.72	7.90	-34.98	-31.53	0.39
3,280.00	1.34	270.41	3,279.70	7.91	-37.27	-33.73	0.06
3,380.00	1.56	269.64	3,379.66	7.91	-39.80	-36.17	0.22
3,480.00	1.76	277.30	3,479.62	8.10	-42.68	-38.89	0.30
3,580.00	1.28	277.48	3,579.59	8.44	-45.31	-41.33	0.48
3,680.00	1.00	268.66	3,679.57	8.56	-47.29	-43.20	0.33
3,780.00	1.02	271.08	3,779.55	8.56	-49.05	-44.90	0.05
3,880.00	0.57	249.88	3,879.54	8.41	-50.41	-46.25	0.53
3,980.00	0.59	205.78	3,979.54	7.77	-51.10	-47.09	0.44
4,080.00	1.07	184.90	4,079.53	6.38	-51.41	-47.76	0.56
4,180.00	1.06	172.45	4,179.51	4.53	-51.36	-48.22	0.23
4,280.00	1.44	194.58	4,279.49	2.40	-51.56	-48.98	0.61
4,380.00	1.37	208.24	4,379.46	0.13	-52.44	-50.45	0.34
4,480.00	1.12	209.13	4,479.43	-1.78	-53.48	-51.96	0.25
4,580.00	1.39	206.13	4,579.41	-3.72	-54.49	-53.46	0.28
4,680.00	1.65	208.66	4,679.37	-6.07	-55.72	-55.28	0.27
4,780.00	1.48	214.65	4,779.34	-8.40	-57.14	-57.28	0.24
4,880.00	1.75	203.92	4,879.30	-10.86	-58.49	-59.25	0.40
4,980.00	2.26	193.73	4,979.23	-14.17	-59.58	-61.19	0.62
5,080.00	1.40	202.63	5,079.18	-17.21	-60.52	-62.92	0.90
5,180.00	1.02	191.03	5,179.16	-19.21	-61.16	-64.08	0.45
5,280.00	1.22	211.65	5,279.14	-20.99	-61.89	-65.26	0.45
5,380.00	1.35	217.98	5,379.12	-22.83	-63.17	-66.99	0.19
5,480.00	1.58	225.84	5,479.08	-24.72	-64.89	-69.16	0.30
5,580.00	1.63	230.81	5,579.04	-26.58	-66.98	-71.67	0.15
5,680.00	1.35	236.82	5,679.01	-28.12	-69.07	-74.10	0.32
5,780.00	0.93	229.00	5,778.99	-29.30	-70.66	-75.96	0.45
5,880.00	0.60	219.45	5,878.98	-30.23	-71.61	-77.12	0.35
5,980.00	0.30	186.40	5,978.98	-30.90	-71.97	-77.65	0.39
6,080.00	0.92	151.11	6,078.97	-31.86	-71.61	-77.57	0.70
6,180.00	1.22	155.64	6,178.96	-33.53	-70.79	-77.22	0.31
6,280.00	1.11	154.87	6,278.93	-35.38	-69.94	-76.91	0.11
6,380.00	1.17	159.43	6,378.91	-37.21	-69.17	-76.66	0.11
6,480.00	0.94	184.20	6,478.90	-38.99	-68.87	-76.85	0.51
6,580.00	0.74	157.48	6,578.89	-40.40	-68.68	-77.06	0.43
6,680.00	0.71	148.63	6,678.88	-41.53	-68.11	-76.81	0.12
6,780.00	0.99	134.37	6,778.87	-42.66	-67.17	-76.22	0.35

**Survey Report for Pawnee 27-1 - Sperry MWD Survey**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
6,880.00	0.66	127.48	6,878.86	-43.62	-66.10	-75.44	0.34
6,980.00	0.69	127.17	6,978.85	-44.33	-65.16	-74.73	0.03
7,080.00	0.58	138.66	7,078.85	-45.07	-64.34	-74.15	0.17
7,180.00	0.69	122.00	7,178.84	-45.77	-63.50	-73.52	0.21
7,280.00	1.17	118.12	7,278.83	-46.57	-62.09	-72.38	0.48
7,354.00	1.76	127.68	7,352.80	-47.62	-60.52	-71.16	0.86
7,386.00	1.69	91.63	7,384.79	-47.94	-59.66	-70.42	3.34
7,418.00	4.37	79.11	7,416.74	-47.72	-57.99	-68.75	8.58
7,448.00	9.13	80.18	7,446.52	-47.10	-54.52	-65.24	15.87
7,480.00	14.57	81.51	7,477.83	-46.07	-48.04	-58.72	17.02
7,511.00	19.98	81.45	7,507.42	-44.71	-38.94	-49.59	17.45
7,543.00	25.41	79.09	7,536.93	-42.59	-26.78	-37.32	17.20
7,574.00	29.30	77.01	7,564.46	-39.63	-12.85	-23.11	12.92
7,606.00	32.72	75.83	7,591.88	-35.75	3.17	-6.63	10.85
7,636.00	37.25	74.78	7,616.46	-31.38	19.80	10.56	15.23
7,668.00	40.01	74.41	7,641.45	-26.07	39.06	30.53	8.66
7,700.00	42.24	72.66	7,665.56	-20.10	59.24	51.58	7.84
7,732.00	43.40	72.90	7,689.03	-13.66	80.01	73.32	3.66
7,763.00	45.99	72.76	7,711.06	-7.22	100.84	95.11	8.36
7,795.00	47.94	74.72	7,732.90	-0.68	123.29	118.50	7.56
7,826.00	51.26	73.20	7,752.99	5.85	145.98	142.10	11.34
7,856.00	53.84	71.67	7,771.23	13.04	168.68	165.90	9.50
7,888.00	54.83	71.71	7,789.89	21.21	193.36	191.87	3.10
7,919.00	56.82	71.92	7,807.30	29.21	217.72	217.50	6.44
7,951.00	58.93	72.16	7,824.32	37.57	243.50	244.57	6.62
7,983.00	63.16	72.28	7,839.81	46.11	270.16	272.55	13.22
8,014.00	68.27	72.28	7,852.55	54.71	297.07	300.78	16.48
8,046.00	72.06	72.44	7,863.41	63.83	325.75	330.86	11.85
8,077.00	77.30	72.78	7,871.60	72.76	354.27	360.73	16.94
8,107.00	83.21	72.74	7,876.67	81.52	382.50	390.28	19.70
8,139.00	86.24	73.71	7,879.61	90.72	413.00	422.13	9.94
8,160.00	86.58	74.62	7,880.93	96.43	433.16	443.09	4.62
8,242.00	87.91	72.86	7,884.87	119.37	511.79	524.99	2.69
8,274.00	88.23	72.98	7,885.95	128.76	542.36	556.96	1.07
8,306.00	88.24	72.59	7,886.93	138.23	572.91	588.93	1.22
8,339.00	89.32	72.79	7,887.64	148.04	604.41	621.91	3.33
8,372.00	89.69	72.21	7,887.92	157.97	635.88	654.90	2.08
8,403.00	89.78	72.64	7,888.06	167.33	665.43	685.88	1.42
8,467.00	89.54	71.00	7,888.44	187.29	726.23	749.82	2.59
8,532.00	90.18	70.35	7,888.60	208.80	787.57	814.69	1.40
8,564.00	88.19	70.97	7,889.06	219.40	817.76	846.62	6.51
8,595.00	88.09	70.88	7,890.06	229.52	847.04	877.55	0.43
8,627.00	88.36	70.76	7,891.05	240.03	877.25	909.48	0.92
8,659.00	88.91	68.13	7,891.82	251.26	907.20	941.35	8.39
8,692.00	89.48	71.44	7,892.28	262.66	938.16	974.24	10.18
8,757.00	89.45	75.36	7,892.89	281.23	1,000.44	1,039.22	6.03
8,821.00	90.37	77.35	7,892.99	296.33	1,062.63	1,103.17	3.43
8,885.00	91.11	77.23	7,892.16	310.41	1,125.06	1,167.08	1.17
8,950.00	91.95	77.06	7,890.43	324.86	1,188.40	1,231.97	1.32
9,014.00	90.74	75.09	7,888.92	340.26	1,250.50	1,295.92	3.61

**Survey Report for Pawnee 27-1 - Sperry MWD Survey**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,078.00	88.67	75.47	7,889.25	356.52	1,312.40	1,359.90	3.29
9,142.00	89.20	76.68	7,890.44	371.92	1,374.50	1,423.86	2.06
9,205.00	90.40	76.11	7,890.66	386.74	1,435.73	1,486.82	2.11
9,270.00	90.55	76.33	7,890.12	402.22	1,498.86	1,551.78	0.41
9,333.00	90.31	76.00	7,889.65	417.28	1,560.03	1,614.74	0.65
9,398.00	90.43	74.36	7,889.23	433.91	1,622.87	1,679.73	2.53
9,463.00	90.46	75.54	7,888.73	450.79	1,685.63	1,744.72	1.82
9,528.00	90.52	75.43	7,888.17	467.08	1,748.56	1,809.70	0.19
9,593.00	90.80	73.85	7,887.42	484.29	1,811.23	1,874.70	2.47
9,625.00	91.11	72.46	7,886.89	493.56	1,841.85	1,906.69	4.45
9,689.00	91.33	74.47	7,885.53	511.77	1,903.19	1,970.66	3.16
9,753.00	91.94	74.36	7,883.70	528.96	1,964.81	2,034.63	0.97
9,785.00	90.71	72.94	7,882.96	537.97	1,995.50	2,066.62	5.87
9,849.00	89.17	71.19	7,883.03	557.67	2,056.39	2,130.57	3.64
9,914.00	89.44	70.57	7,883.82	578.96	2,117.80	2,195.45	1.04
9,978.00	90.59	71.90	7,883.80	599.55	2,178.40	2,259.36	2.75
10,043.00	90.06	73.26	7,883.43	619.01	2,240.41	2,324.33	2.25
10,108.00	90.34	73.27	7,883.20	637.72	2,302.66	2,389.32	0.43
10,173.00	91.08	74.25	7,882.40	655.90	2,365.06	2,454.31	1.89
10,237.00	89.60	75.16	7,882.02	672.78	2,426.79	2,518.30	2.71
10,302.00	89.45	74.99	7,882.56	689.52	2,489.59	2,583.29	0.35
10,367.00	90.31	74.68	7,882.69	706.53	2,552.33	2,648.29	1.41
10,430.00	90.83	74.12	7,882.07	723.47	2,613.00	2,711.29	1.21
10,494.00	90.93	74.79	7,881.08	740.62	2,674.66	2,775.28	1.06
10,559.00	91.23	73.72	7,879.86	758.25	2,737.20	2,840.26	1.71
10,623.00	91.60	72.96	7,878.28	776.59	2,798.50	2,904.24	1.32
10,687.00	89.78	72.39	7,877.51	795.65	2,859.59	2,968.20	2.98
10,751.00	89.35	70.77	7,877.99	815.87	2,920.31	3,032.13	2.62
10,815.00	89.01	72.78	7,878.91	835.88	2,981.09	3,096.06	3.18
10,879.00	90.59	74.38	7,879.13	853.97	3,042.47	3,160.05	3.51
10,911.00	90.93	74.47	7,878.71	862.57	3,073.29	3,192.04	1.10
10,976.00	91.69	73.37	7,877.22	880.56	3,135.73	3,257.02	2.06
11,008.00	91.88	73.63	7,876.22	889.65	3,166.40	3,289.01	1.01
11,073.00	90.90	73.26	7,874.65	908.16	3,228.69	3,353.98	1.61
11,105.00	90.92	73.70	7,874.14	917.26	3,259.36	3,385.97	1.38
11,138.00	90.71	73.25	7,873.67	926.65	3,290.99	3,418.96	1.50
11,201.00	89.14	73.04	7,873.75	944.91	3,351.29	3,481.95	2.51
11,266.00	88.49	72.76	7,875.10	964.02	3,413.40	3,546.92	1.09
11,331.00	89.82	73.57	7,876.06	982.84	3,475.60	3,611.90	2.40
11,395.00	90.28	73.67	7,876.00	1,000.89	3,537.01	3,675.89	0.74
11,460.00	91.17	72.78	7,875.18	1,019.65	3,599.23	3,740.87	1.94
11,524.00	91.11	71.20	7,873.90	1,039.43	3,660.08	3,804.81	2.47
11,549.00	91.42	70.82	7,873.35	1,047.57	3,683.72	3,829.76	1.96
11,595.00	91.42	70.82	7,872.21	1,062.67	3,727.15	3,875.66	0.00
Extrapolation to bit at TD							

## Survey Report for Pawnee 27-1 - Sperry MWD Survey

### Survey Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
11,595.00	7,872.21	1,062.67	3,727.15	Extrapolation to bit at TD

### Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
Target	Pawnee 27-1 Plan #2 Horizontal BH Tgt	74.28	Slot	0.00	0.00	0.00

### Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
1,980.00	11,595.00	Sperry MWD Survey	MWD

### Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Pawnee 27-1 W. Section - survey hits target - Polygon	0.00	0.00	0.00	0.00	0.00	1,503,478.10	3,202,672.17	40° 42' 47.322 N	104° 46' 8.090 W
Pawnee 27-1 Center N - survey hits target - Polygon	0.00	0.00	0.00	0.00	0.00	1,503,478.10	3,202,672.17	40° 42' 47.322 N	104° 46' 8.090 W
Pawnee 27-1 S. Section - survey hits target - Polygon	0.00	0.00	0.00	0.00	0.00	1,503,478.10	3,202,672.17	40° 42' 47.322 N	104° 46' 8.090 W
Pawnee 27-1 E. Section - survey hits target - Polygon	0.00	0.00	0.00	0.00	0.00	1,503,478.10	3,202,672.17	40° 42' 47.322 N	104° 46' 8.090 W
Pawnee 27-1 Center E - survey hits target - Polygon	0.00	0.00	0.00	0.00	0.00	1,503,478.10	3,202,672.17	40° 42' 47.322 N	104° 46' 8.090 W
Pawnee 27-1 N. Section - survey hits target - Polygon	0.00	0.00	0.00	0.00	0.00	1,503,478.10	3,202,672.17	40° 42' 47.322 N	104° 46' 8.090 W
Pawnee 27-1 Plan #2 I - survey misses by 15.22ft at 11592.59ft MD (7872.27 TVD, 1061.88 N, 3724.88 E) - Point	0.00	0.00	7,880.00	1,049.56	3,729.37	1,504,558.36	3,206,392.72	40° 42' 57.690 N	104° 45' 19.660 W

# North Reference Sheet for Sec. 27-T9N-R66W - Pawnee 27-1 - Plan #2 (Horizontal)

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB 10' @ 5226.50ft (Original Well Elev). Northing and Easting are relative to Pawnee 27-1

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is 105° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99998936

Grid Coordinates of Well: 1,503,478.10 ft N, 3,202,672.17 ft E

Geographical Coordinates of Well: 40° 42' 47.32" N, 104° 46' 08.09" W

Grid Convergence at Surface is: 0.47°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,595.00ft  
the Bottom Hole Displacement is 3,875.69ft in the Direction of 74.09° (True).

Magnetic Convergence at surface is: -8.59° (29 October 2009, , BGGM2009)

