

Whiting Oil and Gas Corporation

Weld County, CO
Sec. 26-T10N-R58W
Razor #26K-3505A

Plan D

Design: Actual Field Surveys

Sperry Drilling Services Standard Report

09 April, 2014

Well Coordinates: 1,541,928.22 N, 3,460,992.77 E (40° 48' 32.73" N, 103° 50' 04.72" W)
Ground Level: 4,737.50 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Razor #26K-3505A

KB 22 ft @ 4759.50usft (Frontier 26)

N

True

API - US Survey Feet - Custom

HALLIBURTON

Design Report for Razor #26K-3505A - Actual Field Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
170.00	0.18	217.39	170.00	-0.21	-0.16	0.22	0.11
Sperry First Survey							
261.00	0.12	230.67	261.00	-0.39	-0.32	0.40	0.08
352.00	0.31	265.41	352.00	-0.47	-0.64	0.50	0.24
443.00	0.60	248.66	443.00	-0.66	-1.33	0.72	0.35
535.00	1.09	253.62	534.99	-1.08	-2.62	1.21	0.54
626.00	1.08	260.68	625.97	-1.46	-4.30	1.67	0.15
718.00	1.23	291.12	717.95	-1.25	-6.07	1.54	0.68
808.00	0.61	311.41	807.94	-0.58	-7.33	0.94	0.77
900.00	0.75	304.56	899.93	0.08	-8.20	0.32	0.18
992.00	0.35	306.86	991.93	0.59	-8.92	-0.16	0.44
1,083.00	0.04	9.93	1,082.93	0.79	-9.13	-0.34	0.37
1,175.00	0.54	126.81	1,174.93	0.56	-8.78	-0.13	0.61
1,450.00	3.97	156.37	1,449.68	-8.94	-3.93	9.12	1.28
1,510.00	4.07	159.54	1,509.53	-12.84	-2.35	12.94	0.41
1,527.00	4.37	161.11	1,526.48	-14.02	-1.93	14.09	1.89
1,637.00	4.77	160.18	1,636.13	-22.28	0.98	22.21	0.37
1,728.00	4.04	193.82	1,726.88	-28.96	1.50	28.85	2.90
1,819.00	4.56	188.21	1,817.62	-35.65	0.21	35.60	0.73
1,911.00	4.00	193.20	1,909.37	-42.39	-1.04	42.39	0.73
2,003.00	3.88	192.02	2,001.15	-48.56	-2.42	48.62	0.16
2,094.00	5.21	210.01	2,091.86	-55.15	-5.13	55.34	2.13
2,185.00	5.25	215.75	2,182.49	-62.11	-9.63	62.50	0.58
2,276.00	3.42	185.99	2,273.23	-68.19	-12.35	68.71	3.12
2,368.00	4.33	194.32	2,365.02	-74.28	-13.49	74.85	1.16
2,459.00	3.47	196.54	2,455.81	-80.25	-15.12	80.89	0.96
2,551.00	4.14	199.91	2,547.61	-86.04	-17.05	86.77	0.77
2,643.00	5.90	205.00	2,639.25	-93.45	-20.18	94.32	1.97
2,734.00	4.52	210.04	2,729.87	-100.79	-23.95	101.84	1.60
2,825.00	5.08	199.02	2,820.56	-107.71	-27.06	108.90	1.18
2,917.00	4.03	190.81	2,912.27	-114.73	-28.99	116.01	1.34
3,008.00	5.11	204.40	3,002.98	-121.57	-31.27	122.94	1.67
3,100.00	4.91	196.70	3,094.63	-129.07	-34.09	130.57	0.76
3,190.00	5.38	193.18	3,184.26	-136.87	-36.16	138.46	0.63
3,282.00	5.69	194.77	3,275.84	-145.48	-38.30	147.17	0.38
3,374.00	4.42	197.45	3,367.48	-153.27	-40.53	155.06	1.40
3,465.00	4.82	200.92	3,458.18	-160.18	-42.95	162.08	0.54
3,558.00	3.82	178.14	3,550.92	-166.93	-44.24	168.88	2.11
3,649.00	4.26	191.04	3,641.70	-173.28	-44.79	175.25	1.11
3,740.00	3.46	188.47	3,732.49	-179.31	-45.84	181.33	0.90
3,832.00	2.48	187.83	3,824.37	-184.03	-46.52	186.07	1.07
3,924.00	3.45	193.73	3,916.24	-188.69	-47.45	190.77	1.10
4,015.00	2.97	199.49	4,007.10	-193.57	-48.89	195.72	0.63
4,107.00	4.58	203.88	4,098.90	-199.18	-51.17	201.43	1.78
4,199.00	4.65	198.72	4,190.60	-206.07	-53.85	208.44	0.46
4,291.00	4.27	198.04	4,282.32	-212.86	-56.11	215.33	0.42
4,382.00	3.96	193.22	4,373.09	-219.14	-57.88	221.69	0.51
4,473.00	3.85	199.09	4,463.87	-225.08	-59.60	227.71	0.46
4,564.00	3.40	200.37	4,554.69	-230.50	-61.53	233.22	0.50

Design Report for Razor #26K-3505A - Actual Field Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,656.00	3.13	200.31	4,646.54	-235.41	-63.36	238.21	0.29
4,751.00	4.33	198.27	4,741.34	-241.25	-65.38	244.14	1.27
4,846.00	3.84	192.34	4,836.10	-247.76	-67.18	250.74	0.68
4,920.00	3.32	190.59	4,909.95	-252.29	-68.11	255.30	0.72
4,941.00	3.21	187.47	4,930.92	-253.47	-68.30	256.49	0.99
4,973.00	4.41	190.94	4,962.85	-255.57	-68.65	258.60	3.82
5,005.00	8.05	189.61	4,994.65	-258.99	-69.25	262.05	11.38
5,036.00	12.34	195.57	5,025.16	-264.32	-70.51	267.44	14.23
5,068.00	16.83	199.97	5,056.12	-271.97	-73.01	275.20	14.44
5,100.00	21.72	202.09	5,086.32	-281.82	-76.82	285.22	15.43
5,131.00	25.71	204.79	5,114.69	-293.24	-81.80	296.87	13.34
5,163.00	28.38	204.83	5,143.19	-306.45	-87.90	310.36	8.34
5,195.00	31.16	202.51	5,170.97	-321.00	-94.27	325.21	9.40
5,226.00	33.03	199.82	5,197.23	-336.36	-100.20	340.84	7.59
5,258.00	34.60	198.44	5,223.82	-353.19	-106.03	357.92	5.46
5,290.00	36.89	198.15	5,249.79	-370.94	-111.90	375.94	7.18
5,321.00	38.90	198.25	5,274.25	-389.02	-117.85	394.29	6.49
5,353.00	39.37	197.82	5,299.07	-408.23	-124.10	413.78	1.70
5,385.00	38.88	197.46	5,323.90	-427.47	-130.22	433.29	1.69
5,416.00	40.27	199.05	5,347.79	-446.22	-136.41	452.33	5.55
5,448.00	42.76	199.95	5,371.75	-466.21	-143.49	472.64	8.00
5,480.00	46.16	199.14	5,394.59	-487.33	-150.99	494.10	10.77
5,511.00	48.99	198.30	5,415.50	-509.00	-158.32	516.10	9.35
5,543.00	51.60	198.21	5,435.94	-532.38	-166.04	539.82	8.16
5,575.00	53.78	198.94	5,455.33	-556.51	-174.14	564.31	7.05
5,606.00	55.89	199.57	5,473.19	-580.43	-182.50	588.61	7.01
5,638.00	58.55	198.75	5,490.51	-605.84	-191.33	614.42	8.59
5,669.00	61.32	196.89	5,506.04	-631.38	-199.53	640.33	10.33
5,701.00	63.93	194.98	5,520.75	-658.70	-207.33	668.00	9.73
5,733.00	67.98	194.44	5,533.79	-686.96	-214.75	696.59	12.75
5,764.00	70.55	194.67	5,544.76	-715.02	-222.03	724.97	8.32
5,796.00	74.04	195.11	5,554.49	-744.48	-229.86	754.77	10.98
5,828.00	76.97	197.09	5,562.50	-774.24	-238.46	784.91	10.94
5,859.00	79.53	197.82	5,568.82	-803.19	-247.56	814.27	8.57
5,891.00	81.30	198.61	5,574.14	-833.16	-257.42	844.69	6.04
5,923.00	84.35	198.82	5,578.14	-863.22	-267.61	875.21	9.55
5,954.00	87.19	197.90	5,580.43	-892.56	-277.35	904.99	9.63
6,029.00	90.83	198.04	5,581.72	-963.88	-300.48	977.35	4.86
6,123.00	88.46	195.48	5,582.31	-1,053.87	-327.58	1,068.55	3.71
6,218.00	88.34	195.94	5,584.96	-1,145.29	-353.29	1,161.11	0.50
6,314.00	89.01	195.21	5,587.18	-1,237.74	-379.06	1,254.70	1.03
6,408.00	88.40	191.61	5,589.30	-1,329.14	-400.85	1,347.05	3.88
6,472.00	89.17	190.92	5,590.66	-1,391.89	-413.35	1,410.33	1.62
6,535.00	89.06	186.99	5,591.63	-1,454.10	-423.16	1,472.95	6.24
6,598.00	88.37	183.68	5,593.05	-1,516.80	-429.01	1,535.86	5.37
6,661.00	88.13	180.03	5,594.97	-1,579.73	-431.05	1,598.81	5.80
6,724.00	88.03	177.09	5,597.08	-1,642.67	-429.47	1,661.60	4.67
6,787.00	87.36	173.61	5,599.62	-1,705.40	-424.37	1,724.01	5.62
6,851.00	87.36	171.35	5,602.56	-1,768.78	-416.00	1,786.91	3.53
6,914.00	87.92	171.46	5,605.16	-1,831.02	-406.59	1,848.62	0.91
6,977.00	88.06	170.97	5,607.37	-1,893.24	-396.98	1,910.30	0.81

Design Report for Razor #26K-3505A - Actual Field Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
7,041.00	86.34	169.59	5,610.50	-1,956.24	-386.19	1,972.70	3.44
7,104.00	86.13	169.23	5,614.63	-2,018.03	-374.63	2,033.86	0.66
7,167.00	86.83	169.48	5,618.50	-2,079.83	-363.02	2,095.02	1.18
7,262.00	87.91	173.17	5,622.86	-2,173.63	-348.71	2,188.01	4.04
7,357.00	88.46	176.39	5,625.87	-2,268.18	-340.07	2,282.02	3.44
7,452.00	87.36	179.49	5,629.34	-2,363.04	-336.66	2,376.61	3.46
7,547.00	88.27	180.85	5,632.96	-2,457.96	-336.94	2,471.44	1.72
7,641.00	89.60	181.05	5,634.71	-2,551.93	-338.50	2,565.37	1.43
7,733.00	89.79	180.78	5,635.19	-2,643.92	-339.97	2,657.32	0.36
7,824.00	89.82	180.12	5,635.50	-2,734.92	-340.68	2,748.24	0.73
7,915.00	90.09	180.14	5,635.58	-2,825.92	-340.89	2,839.15	0.30
8,007.00	90.29	179.18	5,635.27	-2,917.91	-340.34	2,931.01	1.07
8,098.00	91.46	181.32	5,633.88	-3,008.89	-340.74	3,021.90	2.68
8,189.00	91.73	181.04	5,631.35	-3,099.84	-342.61	3,112.83	0.43
8,281.00	91.76	180.82	5,628.55	-3,191.78	-344.10	3,204.74	0.24
8,372.00	92.02	180.54	5,625.55	-3,282.73	-345.18	3,295.63	0.42
8,463.00	92.00	180.78	5,622.35	-3,373.67	-346.23	3,386.51	0.26
8,555.00	92.19	180.75	5,618.99	-3,465.60	-347.46	3,478.39	0.21
8,647.00	92.19	180.65	5,615.47	-3,557.52	-348.58	3,570.26	0.11
8,738.00	91.33	181.11	5,612.68	-3,648.47	-349.98	3,661.17	1.07
8,830.00	89.57	180.32	5,611.96	-3,740.45	-351.13	3,753.10	2.10
8,921.00	89.37	180.56	5,612.80	-3,831.45	-351.83	3,844.02	0.34
9,013.00	88.99	180.50	5,614.12	-3,923.43	-352.68	3,935.94	0.42
9,104.00	89.91	179.65	5,614.99	-4,014.43	-352.80	4,026.83	1.38
9,195.00	89.20	178.74	5,615.70	-4,105.41	-351.52	4,117.65	1.27
9,287.00	89.97	178.24	5,616.36	-4,197.38	-349.09	4,209.39	1.00
9,378.00	90.18	177.67	5,616.24	-4,288.32	-345.85	4,300.06	0.67
9,470.00	90.83	177.44	5,615.43	-4,380.23	-341.92	4,391.68	0.75
9,561.00	91.28	178.12	5,613.76	-4,471.15	-338.40	4,482.31	0.90
9,652.00	89.78	179.65	5,612.92	-4,562.12	-336.63	4,573.09	2.35
9,744.00	91.00	181.08	5,612.29	-4,654.11	-337.21	4,665.00	2.04
9,834.00	90.99	181.25	5,610.73	-4,744.08	-339.04	4,754.95	0.19
9,926.00	91.17	180.94	5,608.99	-4,836.05	-340.80	4,846.90	0.39
10,018.00	91.08	181.14	5,607.19	-4,928.02	-342.47	4,938.84	0.24
10,109.00	91.18	180.66	5,605.39	-5,018.99	-343.90	5,029.77	0.54
10,201.00	90.56	180.42	5,603.99	-5,110.97	-344.76	5,121.69	0.72
10,292.00	90.71	180.19	5,602.99	-5,201.96	-345.25	5,212.60	0.30
10,384.00	91.54	180.27	5,601.18	-5,293.94	-345.62	5,304.49	0.91
10,475.00	90.10	181.50	5,599.88	-5,384.92	-347.02	5,395.42	2.08
10,567.00	88.61	182.16	5,600.91	-5,476.86	-349.96	5,487.40	1.77
10,658.00	89.64	182.66	5,602.30	-5,567.77	-353.79	5,578.39	1.26
10,749.00	88.27	181.22	5,603.96	-5,658.70	-356.87	5,669.36	2.18
10,841.00	90.22	178.88	5,605.17	-5,750.68	-356.95	5,761.23	3.31
10,932.00	89.91	178.08	5,605.07	-5,841.65	-354.53	5,851.98	0.94
11,024.00	90.62	178.40	5,604.65	-5,933.60	-351.71	5,943.68	0.85
11,116.00	88.69	178.65	5,605.20	-6,025.57	-349.34	6,035.42	2.12
11,208.00	88.78	178.41	5,607.23	-6,117.51	-346.98	6,127.15	0.28
11,299.00	89.64	179.43	5,608.49	-6,208.49	-345.27	6,217.93	1.47
11,391.00	89.92	179.17	5,608.84	-6,300.48	-344.14	6,309.76	0.42
11,482.00	89.01	177.76	5,609.69	-6,391.44	-341.70	6,400.49	1.84

Design Report for Razor #26K-3505A - Actual Field Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
11,574.00	89.60	179.36	5,610.80	-6,483.40	-339.39	6,492.23	1.85
11,666.00	90.35	178.43	5,610.84	-6,575.38	-337.62	6,584.02	1.30
11,758.00	91.02	180.14	5,609.74	-6,667.36	-336.47	6,675.84	2.00
11,849.00	91.09	179.19	5,608.07	-6,758.35	-335.94	6,766.69	1.05
11,940.00	90.92	180.18	5,606.47	-6,849.33	-335.44	6,857.54	1.10
12,032.00	90.34	180.68	5,605.46	-6,941.32	-336.13	6,949.45	0.83
12,123.00	90.71	180.22	5,604.63	-7,032.31	-336.84	7,040.37	0.65
12,211.00	91.25	179.35	5,603.12	-7,120.30	-336.51	7,128.24	1.16
Straight Line Projection							
12,260.00	91.25	179.35	5,602.05	-7,169.28	-335.96	7,177.14	0.00

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
170.00	170.00	-0.21	-0.16	Sperry First Survey
12,211.00	5,603.12	-7,120.30	-336.51	Straight Line Projection

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	Razor 26K-3505A WP6	182.79	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
170.00	1,527.00	Surface_Sperry MWD Surveys	MWD+IFR1+MS+sag
1,637.00	5,954.00	Vertical and Build_Sperry MWD Surveys	MWD+IFR1+MS+sag
6,029.00	12,211.00	Lateral_Sperry MWD Surveys	MWD+IFR1+MS+sag

Design Report for Razor #26K-3505A - Actual Field Surveys**Wellbore Targets**

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Razor 26K-3505A B - actual wellpath misses target center by 26.73usft at 12260.00usft MD (5602.05 TVD, -7169.28 N, -335.96 E) - Point	0.00	0.00	5,582.00	-7,180.68	-349.46	1,534,742.21	3,460,778.22	40° 47' 21.779 N	103° 50' 9.262 W
Razor 26K-3505A W - actual wellpath misses target center by 59.64usft at 6559.64usft MD (5592.10 TVD, -1478.59 N, -425.88 E) - Point	0.00	0.00	5,600.00	-1,483.91	-367.00	1,540,437.67	3,460,653.70	40° 48' 18.069 N	103° 50' 9.491 W
Razor 26K-3505A W - actual wellpath misses target center by 19.37usft at 12260.00usft MD (5602.05 TVD, -7169.28 N, -335.96 E) - Point	0.00	0.00	5,610.00	-7,180.68	-349.46	1,534,742.21	3,460,778.22	40° 47' 21.779 N	103° 50' 9.262 W
Razor 26K-3505A W - actual wellpath misses target center by 2.34usft at 8776.91usft MD (5612.03 TVD, -3687.37 N, -350.62 E) - Point	0.00	0.00	5,610.00	-3,687.37	-349.46	1,538,234.92	3,460,712.62	40° 47' 56.296 N	103° 50' 9.262 W
Razor 26K-3505A B - actual wellpath misses target center by 19.37usft at 12260.00usft MD (5602.05 TVD, -7169.28 N, -335.96 E) - Point	0.00	0.00	5,610.00	-7,180.68	-349.46	1,534,742.21	3,460,778.22	40° 47' 21.779 N	103° 50' 9.262 W
Razor 26K-3505A W - actual wellpath misses target center by 20.57usft at 7074.66usft MD (5612.68 TVD, -1989.27 N, -380.06 E) - Point	0.00	0.00	5,615.00	-1,985.36	-360.00	1,539,936.44	3,460,670.12	40° 48' 13.114 N	103° 50' 9.400 W
Razor 26K-3505A W - actual wellpath misses target center by 14.90usft at 7575.04usft MD (5633.71 TVD, -2485.99 N, -337.37 E) - Point	0.00	0.00	5,625.00	-2,485.95	-349.46	1,539,436.13	3,460,690.06	40° 48' 8.167 N	103° 50' 9.262 W
Razor 26K-3505A W - actual wellpath misses target center by 10.14usft at 8075.74usft MD (5634.39 TVD, -2986.65 N, -340.33 E) - Point	0.00	0.00	5,630.00	-2,986.54	-349.46	1,538,935.63	3,460,699.46	40° 48' 3.221 N	103° 50' 9.262 W

Directional Difficulty Index

Average Dogleg over Survey:	1.90 °/100usft	Maximum Dogleg over Survey:	15.43 °/100usft at 5,100.00 usft
Net Tortousity applicable to Plans:	0.48 °/100usft	Directional Difficulty Index:	6.565

Audit Info



North Reference Sheet for Sec. 26-T10N-R58W - Razor #26K-3505A - Plan D

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.
Vertical Depths are relative to KB 22 ft @ 4759.50usft (Frontier 26). Northing and Easting are relative to Razor #26K-3505A
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: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 1.00000428

Grid Coordinates of Well: 1,541,928.22 usft N, 3,460,992.77 usft E
Geographical Coordinates of Well: 40° 48' 32.73" N, 103° 50' 04.72" W
Grid Convergence at Surface is: 1.08°

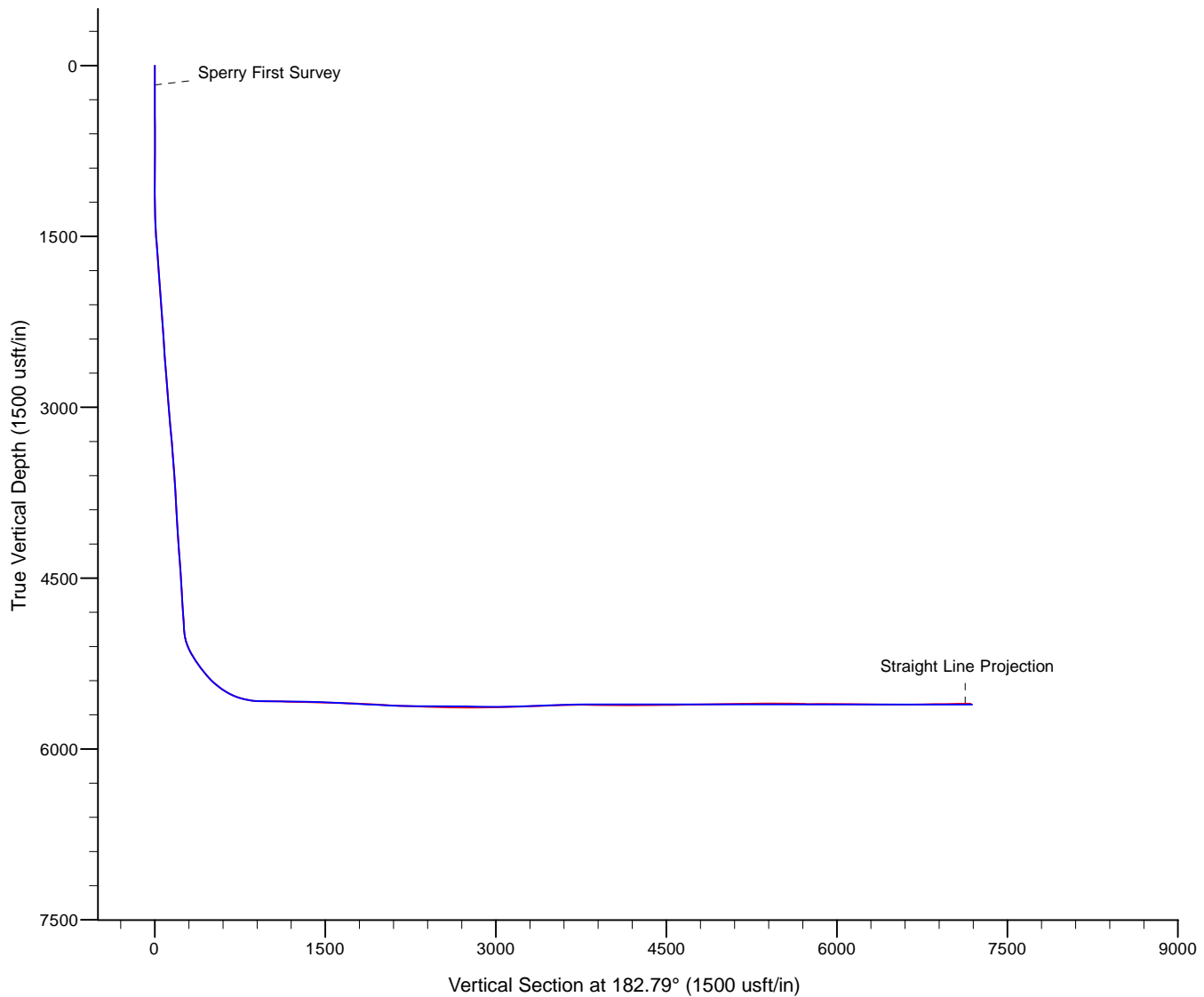
Based upon Minimum Curvature type calculations, at a Measured Depth of 12,260.00usft
the Bottom Hole Displacement is 7,177.15usft in the Direction of 182.68° (True).

Magnetic Convergence at surface is: -7.00° (18 December 2013, , BGGM2013)

Magnetic Model: BGGM2013
Date: 18-Dec-13
Declination: 8.07°
Inclination/Dip: 67.43°
Field Strength: 53097
Grid North is 1.08° East of True North (Grid Convergence)
Magnetic North is 8.07° East of True North (Magnetic Declination)
Magnetic North is 7.00° East of Grid North (Magnetic Convergence)
To convert a True Direction to a Grid Direction, Subtract 1.08°
To convert a Magnetic Direction to a True Direction, Add 8.07° East
To convert a Magnetic Direction to a Grid Direction, Add 7.00°

LEGEND

- Razor #26K-3505A, Plan D, Actual Field Surveys V0
- Rev D0



LEGEND

- - - Razor #26K-3505A, Plan D, Actual Field Surveys V0
- - - Rev D0

