



COMPANY/RIG: Noble Energy/Production/CoreTech
WELL/API: Howard A 27-6/05-123-23615
DECLINATION: 8.23 Degrees
TD AS DRILLED: 7165 Feet
COUNTY/STATE: Weld/Colorado
VS-Azi: 0.000 Degrees
Latitude: 40.46029, Longitude: -104.54095
Grid North = True North -0.62 degs (NAD 27)
Grid Correction Applied = -0.62 degs



DEPTH REFERENCE : RKB = GL Elevation = 4704

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyrosurvey.ut

Minimum Curvature Method

Report Date/Time: 2/4/2016 / 13:27

LAT & LONG OBTAINED BY HANDHELD GPS AT WELLHEAD

NORTH REFERENCE: GRID

HENDERSON, COLORADO

303-853-4976

Surveyor: JUSTIN WILLIAMS / Howard A 27-6

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	****
100.000	0.687	307.044	99.998	0.361	-0.478	0.361	0.599	307.044	0.687
200.000	0.750	299.831	199.990	1.048	-1.525	1.048	1.850	304.498	0.110
300.000	0.706	292.975	299.982	1.614	-2.660	1.614	3.111	301.249	0.097
400.000	0.755	300.154	399.974	2.185	-3.797	2.185	4.381	299.924	0.104
500.000	0.620	323.040	499.967	2.949	-4.692	2.949	5.542	302.149	0.303
600.000	0.565	320.341	599.961	3.761	-5.332	3.761	6.525	305.197	0.062
700.000	0.710	326.219	699.955	4.656	-5.992	4.656	7.588	307.849	0.159
800.000	0.748	315.246	799.947	5.634	-6.796	5.634	8.828	309.662	0.144
900.000	0.364	269.389	899.942	6.094	-7.572	6.094	9.720	308.827	0.559
1000.000	0.390	222.785	999.941	5.841	-8.121	5.841	10.003	305.726	0.299
1100.000	0.407	254.567	1099.938	5.497	-8.694	5.497	10.286	302.302	0.219
1200.000	0.579	216.974	1199.935	4.999	-9.340	4.999	10.594	298.154	0.357
1300.000	0.574	218.833	1299.930	4.205	-9.958	4.205	10.810	292.893	0.019
1400.000	0.483	194.464	1399.926	3.407	-10.377	3.407	10.922	288.174	0.240
1500.000	0.781	174.290	1499.919	2.321	-10.415	2.321	10.670	282.563	0.367
1600.000	1.891	120.509	1599.894	0.806	-8.926	0.806	8.962	275.157	1.562
1700.000	3.212	114.266	1699.793	-1.183	-4.950	-1.183	5.090	256.555	1.348
1800.000	5.031	113.223	1799.530	-4.064	1.634	-4.064	4.380	158.097	1.821

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1900.000	7.077	117.832	1898.967	-8.670	11.113	-8.670	14.095	127.961	2.101
2000.000	9.470	118.626	1997.919	-15.488	23.783	-15.488	28.382	123.073	2.395
2100.000	11.065	120.731	2096.315	-24.334	39.254	-24.334	46.184	121.795	1.639
2200.000	12.350	117.401	2194.234	-34.160	56.998	-34.160	66.450	120.935	1.451
2300.000	12.318	119.997	2291.927	-44.415	75.730	-44.415	87.794	120.391	0.555
2400.000	12.768	120.728	2389.540	-55.394	94.468	-55.394	109.511	120.387	0.477
2500.000	13.413	121.497	2486.940	-67.100	113.856	-67.100	132.158	120.513	0.667
2600.000	12.766	118.973	2584.343	-78.512	133.412	-78.512	154.799	120.477	0.863
2700.000	12.874	119.714	2681.850	-89.386	152.753	-89.386	176.984	120.335	0.197
2800.000	14.299	124.213	2779.052	-101.852	172.643	-101.852	200.448	120.539	1.773
2900.000	14.324	123.993	2875.948	-115.712	193.111	-115.712	225.124	120.930	0.060
3000.000	14.802	121.325	2972.736	-129.269	214.279	-129.269	250.252	121.101	0.824
3100.000	14.826	123.861	3069.413	-143.039	235.816	-143.039	275.807	121.240	0.649
3200.000	14.285	124.808	3166.204	-157.211	256.570	-157.211	300.904	121.497	0.591
3300.000	12.271	121.268	3263.527	-169.771	275.785	-169.771	323.851	121.616	2.171
3400.000	11.011	115.517	3361.471	-179.401	293.489	-179.401	343.977	121.436	1.712
3500.000	11.172	113.508	3459.604	-187.379	310.991	-187.379	363.079	121.070	0.418
3600.000	11.198	119.527	3557.708	-196.029	328.324	-196.029	382.392	120.840	1.167
3700.000	12.689	122.119	3655.541	-206.654	346.075	-206.654	403.081	120.843	1.584
3800.000	13.463	120.097	3752.948	-218.331	365.449	-218.331	425.701	120.856	0.899
3900.000	13.585	121.086	3850.175	-230.233	385.578	-230.233	449.086	120.842	0.261
4000.000	13.451	120.844	3947.405	-242.260	405.622	-242.260	472.461	120.848	0.145
4100.000	13.039	122.720	4044.745	-254.321	425.099	-254.321	495.367	120.890	0.595
4200.000	13.420	120.676	4142.091	-266.339	444.571	-266.339	518.247	120.926	0.603
4300.000	13.395	118.055	4239.367	-277.707	464.773	-277.707	541.420	120.859	0.608
4400.000	13.377	118.401	4336.650	-288.657	485.171	-288.657	564.547	120.751	0.082
4500.000	13.550	120.852	4433.903	-300.167	505.404	-300.167	587.820	120.707	0.596
4600.000	13.663	119.767	4531.096	-312.038	525.713	-312.038	611.344	120.691	0.279
4700.000	12.605	119.714	4628.479	-323.310	545.442	-323.310	634.063	120.657	1.058
4800.000	12.458	121.594	4726.097	-334.370	564.106	-334.370	655.758	120.657	0.433
4900.000	12.363	122.702	4823.761	-345.804	582.303	-345.804	677.242	120.704	0.257
5000.000	12.606	122.619	4921.396	-357.470	600.502	-357.470	698.848	120.765	0.244
5100.000	13.751	124.886	5018.761	-370.151	619.444	-370.151	721.611	120.861	1.256
5200.000	12.664	119.479	5116.118	-382.344	638.738	-382.344	744.428	120.904	1.644
5300.000	10.942	120.900	5214.000	-392.613	656.426	-392.613	764.879	120.884	1.746
5400.000	10.725	119.149	5312.218	-402.019	672.696	-402.019	783.670	120.864	0.394
5500.000	8.908	120.471	5410.750	-410.478	687.497	-410.478	800.715	120.840	1.830
5600.000	6.952	119.566	5509.789	-417.391	699.435	-417.391	814.509	120.827	1.961
5700.000	5.316	122.670	5609.214	-422.878	708.598	-422.878	825.190	120.828	1.668
5800.000	4.358	127.434	5708.857	-427.688	715.515	-427.688	833.594	120.868	1.038

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
5900.000	3.148	130.427	5808.641	-431.779	720.622	-431.779	840.077	120.929	1.225
6000.000	1.997	130.970	5908.538	-434.702	724.028	-434.702	844.502	120.980	1.152
6100.000	1.407	142.102	6008.494	-436.813	726.098	-436.813	847.363	121.031	0.674
6200.000	0.937	123.530	6108.473	-438.233	727.533	-438.233	849.325	121.063	0.598
6300.000	0.428	136.074	6208.466	-438.953	728.474	-438.953	850.502	121.072	0.528
6400.000	0.234	120.077	6308.464	-439.325	728.910	-439.325	851.067	121.078	0.213
6500.000	0.171	142.874	6408.463	-439.546	729.177	-439.546	851.410	121.081	0.101
6600.000	0.058	97.862	6508.463	-439.672	729.317	-439.672	851.595	121.084	0.136
6700.000	0.047	23.069	6608.463	-439.641	729.383	-439.641	851.636	121.080	0.064
6800.000	0.142	314.260	6708.463	-439.517	729.310	-439.517	851.509	121.075	0.133
6900.000	0.253	279.937	6808.462	-439.392	729.004	-439.392	851.183	121.079	0.158