



Company/Rig: Noble Energy Inc/Production  
 WELL/API#: Howard A 27-7/05-123-22303  
 DECLINATION: 8.23 Degrees  
 TD AS DRILLED: 7103'  
 COUNTY/STATE: Weld/Colorado  
 VS-Azi: 0.000 Degrees  
 Latitude: 40.45878, Longitude: -104.53343  
 Grid North = True North -0.62 degs (NAD 27)  
 Grid Correction Applied = -0.62 degs



DEPTH REFERENCE : RKB=GL/Elevation=4734'

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro\_run01-01-de\_01.ut

Minimum Curvature Method

Report Date/Time: 2/22/2016 / 11:23

Lat/Long Obtained By Handheld GPS at Wellhead

North Reference: Grid

Denver, Colorado

303-853-4976

Surveyors: Jason Kinchelov / Howard A 27-7

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	0.211	206.721	100.000	-0.164	-0.083	-0.164	0.184	206.721	0.211
200.000	0.130	175.002	199.999	-0.442	-0.156	-0.442	0.469	199.411	0.122
300.000	0.128	250.384	299.999	-0.593	-0.251	-0.593	0.644	202.976	0.158
400.000	0.139	229.639	399.999	-0.708	-0.449	-0.708	0.839	212.356	0.049
500.000	0.209	144.329	499.999	-0.935	-0.435	-0.935	1.031	204.918	0.242
600.000	0.154	184.140	599.998	-1.218	-0.338	-1.218	1.264	195.498	0.134
700.000	0.096	81.990	699.998	-1.340	-0.264	-1.340	1.366	191.159	0.198
800.000	0.226	138.699	799.998	-1.477	-0.051	-1.477	1.478	181.973	0.191
900.000	0.476	91.715	899.996	-1.638	0.495	-1.638	1.711	163.195	0.361
1000.000	0.472	106.849	999.992	-1.769	1.303	-1.769	2.198	143.620	0.125
1100.000	0.540	86.490	1099.989	-1.860	2.168	-1.860	2.856	130.625	0.191
1200.000	0.564	120.859	1199.984	-2.083	3.060	-2.083	3.702	124.241	0.327
1300.000	0.702	103.694	1299.978	-2.480	4.078	-2.480	4.773	121.312	0.233
1400.000	0.743	91.783	1399.970	-2.645	5.320	-2.645	5.942	116.438	0.155
1500.000	0.813	113.671	1499.961	-2.950	6.618	-2.950	7.246	114.028	0.303
1600.000	0.631	104.540	1599.953	-3.373	7.801	-3.373	8.499	113.386	0.215
1700.000	0.594	102.722	1699.948	-3.626	8.839	-3.626	9.553	112.304	0.042
1800.000	0.432	128.097	1799.944	-3.972	9.640	-3.972	10.427	112.394	0.275
1900.000	0.317	129.775	1899.942	-4.382	10.149	-4.382	11.055	113.350	0.116

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
2000.000	0.622	124.564	1999.938	-4.866	10.809	-4.866	11.854	114.238	0.308
2100.000	0.588	111.600	2099.933	-5.363	11.733	-5.363	12.900	114.566	0.141
2200.000	0.542	97.403	2199.928	-5.613	12.678	-5.613	13.865	113.880	0.147
2300.000	0.326	84.023	2299.925	-5.644	13.430	-5.644	14.568	112.795	0.236
2400.000	0.274	1.669	2399.924	-5.376	13.720	-5.376	14.736	111.396	0.397
2500.000	0.409	359.704	2499.922	-4.780	13.725	-4.780	14.534	109.202	0.136
2600.000	0.513	12.400	2599.919	-3.986	13.820	-3.986	14.383	106.089	0.146
2700.000	0.646	357.406	2699.914	-2.986	13.890	-2.986	14.208	102.131	0.200
2800.000	0.753	355.185	2799.906	-1.768	13.810	-1.768	13.922	97.297	0.110
2900.000	0.814	3.650	2899.897	-0.405	13.800	-0.405	13.806	91.680	0.131
3000.000	0.547	344.280	2999.890	0.764	13.716	0.764	13.737	86.810	0.349
3100.000	0.588	312.954	3099.885	1.573	13.211	1.573	13.304	83.208	0.309
3200.000	0.897	321.055	3199.877	2.531	12.344	2.531	12.601	78.411	0.326
3300.000	0.796	290.935	3299.866	3.388	11.203	3.388	11.704	73.173	0.450
3400.000	1.249	286.311	3399.850	3.942	9.508	3.942	10.293	67.480	0.460
3500.000	1.552	298.074	3499.820	4.886	7.268	4.886	8.757	56.089	0.416
3600.000	1.276	305.989	3599.790	6.177	5.172	6.177	8.057	39.937	0.337
3700.000	1.390	310.950	3699.763	7.627	3.355	7.627	8.332	23.742	0.162
3800.000	1.355	309.944	3799.734	9.181	1.532	9.181	9.308	9.473	0.043
3900.000	1.370	309.618	3899.706	10.703	-0.296	10.703	10.707	358.417	0.017
4000.000	1.084	308.408	3999.683	12.053	-1.958	12.053	12.211	350.772	0.287
4100.000	1.201	298.867	4099.663	13.147	-3.617	13.147	13.635	344.615	0.223
4200.000	0.944	306.064	4199.646	14.138	-5.201	14.138	15.064	339.802	0.289
4300.000	0.782	291.996	4299.634	14.878	-6.500	14.878	16.236	336.401	0.266
4400.000	0.911	323.527	4399.624	15.773	-7.605	15.773	17.511	334.258	0.476
4500.000	1.045	291.068	4499.610	16.740	-8.929	16.740	18.973	331.925	0.562
4600.000	1.010	283.842	4599.594	17.279	-10.636	17.279	20.290	328.385	0.134
4700.000	1.134	295.661	4699.577	17.919	-12.384	17.919	21.782	325.350	0.253
4800.000	1.332	294.527	4799.553	18.830	-14.334	18.830	23.665	322.720	0.199
4900.000	1.927	279.561	4899.513	19.592	-17.050	19.592	25.972	318.969	0.726
5000.000	2.013	283.368	4999.454	20.277	-20.416	20.277	28.775	314.804	0.157
5100.000	1.410	276.657	5099.409	20.826	-23.348	20.826	31.286	311.733	0.634
5200.000	0.556	277.427	5199.393	21.031	-25.051	21.031	32.709	310.015	0.855
5300.000	0.334	303.008	5299.390	21.253	-25.776	21.253	33.408	309.506	0.292
5400.000	0.631	241.874	5399.387	21.152	-26.506	21.152	33.911	308.590	0.553
5500.000	0.994	297.964	5499.378	21.299	-27.758	21.299	34.988	307.499	0.828
5600.000	0.275	315.693	5599.372	21.877	-28.692	21.877	36.081	307.325	0.737
5700.000	0.344	343.176	5699.370	22.336	-28.946	22.336	36.562	307.655	0.161
5800.000	0.283	317.583	5799.369	22.805	-29.199	22.805	37.050	307.990	0.151
5900.000	0.546	13.783	5899.366	23.450	-29.252	23.450	37.491	308.717	0.454

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
6000.000	0.911	16.795	5999.358	24.674	-28.909	24.674	38.007	310.481	0.367
6100.000	0.725	17.934	6099.348	26.037	-28.484	26.037	38.591	312.430	0.187
6200.000	0.532	103.736	6199.344	26.528	-27.838	26.528	38.454	313.620	0.867
6300.000	0.455	158.353	6299.340	26.049	-27.241	26.049	37.691	313.719	0.458
6400.000	0.513	149.991	6399.337	25.293	-26.870	25.293	36.902	313.268	0.091
6500.000	0.488	168.691	6499.333	24.488	-26.563	24.488	36.128	312.672	0.164
6600.000	0.512	154.798	6599.329	23.665	-26.289	23.665	35.372	311.993	0.123
6700.000	0.370	161.147	6699.326	22.956	-25.995	22.956	34.680	311.447	0.150
6800.000	0.394	119.253	6799.324	22.482	-25.590	22.482	34.063	311.300	0.274