



Company/ Rig: Noble Energy/ CoreTech  
Well/API#: Haythorn 4-12/05-123-26669  
Declination: 8.35 Degrees  
TD as Drilled: 7504 Feet  
County/State: Weld/Colorado  
VS-Azi: 0.000 Degrees  
Latitude: 40.52169, Longitude: -104.78149  
Grid North = True North -0.46 degs (NAD 27)  
Grid Correction Applied = -0.46 degs



Depth Reference : RKB= GL/ Elevation= 4841 Feet

**DRILLOG MS GYRO SURVEY CALCULATIONS**

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

Minimum Curvature Method

Report Date/Time: 4/6/2016 / 15:38

Lat & Long Obtained by Handheld GPS at Wellhead

North Reference: Grid

Henderson, Colorado

303-853-4976

Surveyor: Sean Bratt / Haythorn 4-12

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	0.944	233.610	99.995	-0.489	-0.663	-0.489	0.824	233.610	0.944
200.000	1.048	244.764	199.980	-1.367	-2.153	-1.367	2.551	237.587	0.220
300.000	0.541	282.132	299.971	-1.658	-3.442	-1.658	3.821	244.283	0.700
400.000	0.095	325.530	399.969	-1.490	-3.951	-1.490	4.223	249.333	0.477
500.000	0.123	322.022	499.969	-1.338	-4.064	-1.338	4.278	251.780	0.028
600.000	0.193	155.551	599.969	-1.406	-4.060	-1.406	4.297	250.895	0.313
700.000	0.082	314.595	699.969	-1.509	-4.042	-1.509	4.314	249.528	0.271
800.000	0.560	199.433	799.967	-1.919	-4.255	-1.919	4.668	245.728	0.599
900.000	0.610	237.744	899.963	-2.663	-4.868	-2.663	5.549	241.316	0.387
1000.000	0.726	232.971	999.956	-3.329	-5.823	-3.329	6.708	240.247	0.129
1100.000	0.648	239.672	1099.949	-3.996	-6.817	-3.996	7.902	239.625	0.112
1200.000	0.731	242.367	1199.941	-4.577	-7.870	-4.577	9.104	239.820	0.089
1300.000	0.786	248.730	1299.933	-5.121	-9.074	-5.121	10.419	240.559	0.100
1400.000	0.770	257.178	1399.923	-5.519	-10.368	-5.519	11.745	241.972	0.116
1500.000	0.786	260.108	1499.914	-5.786	-11.699	-5.786	13.051	243.683	0.043
1600.000	0.814	260.365	1599.904	-6.023	-13.074	-6.023	14.395	245.267	0.028
1700.000	0.881	255.917	1699.894	-6.328	-14.519	-6.328	15.839	246.449	0.094
1800.000	0.844	251.028	1799.882	-6.755	-15.961	-6.755	17.331	247.062	0.082

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	0.923	249.076	1899.870	-7.282	-17.409	-7.282	18.871	247.302	0.085
2000.000	1.253	236.501	1999.852	-8.173	-19.073	-8.173	20.751	246.805	0.406
2100.000	1.604	234.456	2099.821	-9.590	-21.124	-9.590	23.199	245.582	0.355
2200.000	1.636	238.741	2199.781	-11.145	-23.484	-11.145	25.994	244.612	0.125
2300.000	1.631	241.316	2299.740	-12.569	-25.953	-12.569	28.836	244.159	0.074
2400.000	1.502	250.632	2399.703	-13.687	-28.438	-13.687	31.560	244.299	0.285
2500.000	0.848	265.806	2499.682	-14.175	-30.412	-14.175	33.553	245.010	0.718
2600.000	0.653	290.933	2599.674	-14.026	-31.683	-14.026	34.648	246.121	0.378
2700.000	0.487	289.643	2699.669	-13.679	-32.615	-13.679	35.368	247.247	0.166
2800.000	0.347	258.322	2799.666	-13.597	-33.312	-13.597	35.981	247.796	0.263
2900.000	0.204	337.570	2899.665	-13.494	-33.677	-13.494	36.280	248.164	0.368
3000.000	0.266	276.672	2999.664	-13.303	-33.975	-13.303	36.487	248.617	0.244
3100.000	0.597	296.153	3099.661	-13.046	-34.674	-13.046	37.047	249.381	0.358
3200.000	0.581	237.291	3199.657	-13.090	-35.568	-13.090	37.901	249.795	0.579
3300.000	1.365	211.119	3299.642	-14.384	-36.611	-14.384	39.335	248.550	0.882
3400.000	1.454	197.392	3399.612	-16.615	-37.606	-16.615	41.113	246.164	0.348
3500.000	1.961	190.845	3499.568	-19.505	-38.307	-19.505	42.987	243.016	0.542
3600.000	2.176	189.061	3599.502	-23.060	-38.928	-23.060	45.245	239.358	0.225
3700.000	2.638	175.458	3699.415	-27.229	-39.044	-27.229	47.602	235.108	0.732
3800.000	3.340	178.205	3799.278	-32.435	-38.771	-32.435	50.549	230.085	0.716
3900.000	3.694	175.628	3899.090	-38.559	-38.434	-38.559	54.442	224.907	0.388
4000.000	4.150	173.097	3998.855	-45.364	-37.754	-45.364	59.019	219.768	0.488
4100.000	3.987	174.475	4098.603	-52.417	-36.984	-52.417	64.151	215.206	0.190
4200.000	3.170	172.558	4198.407	-58.619	-36.291	-58.619	68.943	211.762	0.826
4300.000	2.722	186.169	4298.276	-63.721	-36.188	-63.721	73.280	209.593	0.827
4400.000	2.357	189.125	4398.178	-68.112	-36.769	-68.112	77.403	208.362	0.388
4500.000	2.101	190.735	4498.102	-71.943	-37.437	-71.943	81.101	207.491	0.263
4600.000	1.681	204.172	4598.048	-75.083	-38.379	-75.083	84.323	207.074	0.608
4700.000	1.740	226.663	4698.005	-77.463	-40.084	-77.463	87.219	207.360	0.669
4800.000	2.070	226.536	4797.949	-79.746	-42.498	-79.746	90.364	208.054	0.330
4900.000	1.992	232.955	4897.886	-82.036	-45.197	-82.036	93.662	208.852	0.240
5000.000	2.094	236.799	4997.823	-84.084	-48.113	-84.084	96.876	209.778	0.171
5100.000	2.458	241.654	5097.744	-86.103	-51.529	-86.103	100.344	210.899	0.412
5200.000	1.937	251.373	5197.670	-87.661	-55.019	-87.661	103.496	212.114	0.639
5300.000	2.047	262.750	5297.610	-88.426	-58.392	-88.426	105.966	213.439	0.410
5400.000	2.126	254.597	5397.544	-89.144	-61.952	-89.144	108.558	214.798	0.307
5500.000	2.150	261.781	5497.475	-89.905	-65.598	-89.905	111.292	216.116	0.269
5600.000	1.812	280.445	5597.416	-89.887	-69.009	-89.887	113.322	217.515	0.724
5700.000	1.899	285.147	5697.364	-89.167	-72.162	-89.167	114.709	218.983	0.175
5800.000	1.664	295.932	5797.315	-88.100	-75.067	-88.100	115.744	220.433	0.408

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	1.664	310.649	5897.274	-86.519	-77.474	-86.519	116.137	221.843	0.426
6000.000	1.372	330.095	5997.239	-84.535	-79.173	-84.535	115.821	223.124	0.588
6100.000	1.419	7.236	6097.212	-82.269	-79.614	-82.269	114.484	224.060	0.890
6200.000	1.516	44.061	6197.181	-80.090	-78.538	-80.090	112.172	224.440	0.931
6300.000	1.886	64.562	6297.138	-78.433	-76.132	-78.433	109.306	224.147	0.706
6400.000	2.027	66.855	6397.079	-77.031	-73.020	-77.031	106.140	223.469	0.161
6500.000	2.359	70.816	6497.006	-75.659	-69.450	-75.659	102.702	222.550	0.365
6600.000	2.738	71.660	6596.907	-74.231	-65.239	-74.231	98.825	221.311	0.381
6700.000	2.610	81.347	6696.798	-73.137	-60.720	-73.137	95.058	219.700	0.469
6800.000	2.985	89.546	6796.679	-72.774	-55.865	-72.774	91.744	217.512	0.547
6900.000	2.857	73.823	6896.551	-72.059	-50.869	-72.059	88.205	215.219	0.809
7000.000	2.588	77.966	6996.438	-70.894	-46.268	-70.894	84.656	213.130	0.333
7100.000	3.138	90.009	7096.314	-70.424	-41.323	-70.424	81.652	210.403	0.812
7200.000	3.762	87.965	7196.132	-70.308	-35.307	-70.308	78.675	206.665	0.637