



COMPANY/RIG: Noble Energy/Production/CoreTech  
WELL/API: Gruen 22-33/05-123-22023  
DECLINATION: 8.27 Degrees  
TD AS DRILLED: 7105 Feet  
COUNTY/STATE: Weld/Colorado  
VS-Azi: 0.000 Degrees  
Latitude: 40.46621, Longitude: -104.54335  
Grid North = True North -0.62 degs (NAD 27)  
Grid Convergence Applied = -0.62 degs



DEPTH REFERENCE : RKB = GL Elevation = 4717

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro.ut

Minimum Curvature Method

Report Date/Time: 10/12/2015 / 14:23

LAT & LONG OBTAINED BY HANDHELD GPS AT WELLHEAD

NORTH REFERENCE: GRID

HENDERSON, COLORADO

303-853-4976

Surveyor: JUSTIN WILLIAMS / Gruen 22-33

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	0.397	133.481	99.999	-0.238	0.251	-0.238	0.346	133.481	0.397
200.000	0.251	110.084	199.998	-0.552	0.708	-0.552	0.898	127.927	0.194
300.000	0.214	111.828	299.997	-0.697	1.087	-0.697	1.291	122.644	0.037
400.000	0.356	142.033	399.996	-1.011	1.452	-1.011	1.769	124.845	0.202
500.000	0.244	128.908	499.994	-1.389	1.808	-1.389	2.280	127.529	0.131
600.000	0.381	245.037	599.993	-1.663	1.672	-1.663	2.358	134.834	0.535
700.000	0.556	214.141	699.990	-2.205	1.099	-2.205	2.463	153.513	0.302
800.000	0.662	230.768	799.985	-2.972	0.379	-2.972	2.996	172.739	0.205
900.000	0.483	212.481	899.980	-3.693	-0.295	-3.693	3.705	184.573	0.253
1000.000	0.721	229.466	999.974	-4.458	-1.000	-4.458	4.569	192.644	0.295
1100.000	0.456	220.457	1099.969	-5.169	-1.736	-5.169	5.453	198.565	0.280
1200.000	0.478	218.704	1199.965	-5.798	-2.255	-5.798	6.221	201.254	0.027
1300.000	0.558	246.187	1299.961	-6.320	-2.961	-6.320	6.979	205.106	0.258
1400.000	0.514	244.854	1399.957	-6.707	-3.813	-6.707	7.715	209.617	0.045
1500.000	0.529	209.154	1499.953	-7.301	-4.444	-7.301	8.547	211.329	0.320
1600.000	0.751	226.981	1599.947	-8.151	-5.148	-8.151	9.641	212.275	0.295
1700.000	0.639	174.489	1699.941	-9.154	-5.574	-9.154	10.717	211.338	0.623
1800.000	0.550	187.097	1799.935	-10.185	-5.580	-10.185	11.613	208.716	0.158

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	0.427	208.223	1899.932	-10.989	-5.815	-10.989	12.432	207.887	0.216
2000.000	0.390	211.430	1999.929	-11.607	-6.169	-11.607	13.145	207.988	0.043
2100.000	0.451	201.211	2099.926	-12.265	-6.489	-12.265	13.875	207.880	0.097
2200.000	0.315	345.838	2199.926	-12.365	-6.698	-12.365	14.063	208.444	0.731
2300.000	0.545	24.287	2299.923	-11.665	-6.570	-11.665	13.388	209.389	0.357
2400.000	0.650	51.868	2399.918	-10.882	-5.928	-10.882	12.392	208.581	0.303
2500.000	0.549	64.355	2499.912	-10.324	-5.050	-10.324	11.493	206.066	0.164
2600.000	0.436	26.021	2599.909	-9.775	-4.451	-9.775	10.740	204.483	0.341
2700.000	0.377	17.555	2699.906	-9.119	-4.185	-9.119	10.033	204.651	0.084
2800.000	0.518	8.194	2799.903	-8.358	-4.021	-8.358	9.275	205.693	0.158
2900.000	0.376	62.471	2899.900	-7.759	-3.665	-7.759	8.581	205.287	0.427
3000.000	0.062	56.863	2999.900	-7.577	-3.328	-7.577	8.276	203.715	0.314
3100.000	0.236	359.272	3099.899	-7.341	-3.285	-7.341	8.043	204.110	0.209
3200.000	0.456	57.283	3199.898	-6.920	-2.953	-6.920	7.524	203.111	0.387
3300.000	0.539	75.890	3299.894	-6.591	-2.162	-6.591	6.936	198.165	0.180
3400.000	0.493	126.214	3399.890	-6.730	-1.360	-6.730	6.866	191.421	0.441
3500.000	0.199	269.559	3499.889	-6.985	-1.186	-6.985	7.085	189.639	0.663
3600.000	0.543	271.824	3599.887	-6.971	-1.834	-6.971	7.208	194.737	0.344
3700.000	0.668	273.581	3699.881	-6.920	-2.889	-6.920	7.499	202.663	0.127
3800.000	0.687	278.360	3799.874	-6.796	-4.064	-6.796	7.919	210.881	0.059
3900.000	0.672	280.204	3899.867	-6.605	-5.234	-6.605	8.428	218.395	0.027
4000.000	0.411	279.240	3999.863	-6.444	-6.165	-6.444	8.918	223.735	0.261
4100.000	0.440	140.864	4099.862	-6.684	-6.277	-6.684	9.169	223.200	0.796
4200.000	0.610	77.449	4199.858	-6.866	-5.515	-6.866	8.807	218.771	0.570
4300.000	0.974	67.819	4299.849	-6.430	-4.208	-6.430	7.685	213.206	0.387
4400.000	0.825	72.419	4399.836	-5.891	-2.735	-5.891	6.495	204.899	0.165
4500.000	0.719	44.299	4499.827	-5.224	-1.610	-5.224	5.467	197.123	0.389
4600.000	1.260	12.155	4599.813	-3.701	-0.940	-3.701	3.818	194.248	0.755
4700.000	0.855	355.928	4699.796	-1.882	-0.761	-1.882	2.030	202.019	0.500
4800.000	1.149	357.534	4799.780	-0.136	-0.857	-0.136	0.868	260.963	0.296
4900.000	0.502	26.720	4899.770	1.257	-0.703	1.257	1.441	330.775	0.752
5000.000	0.302	46.779	4999.767	1.829	-0.314	1.829	1.856	350.258	0.242
5100.000	0.518	321.386	5099.766	2.363	-0.404	2.363	2.398	350.300	0.578
5200.000	0.908	292.169	5199.758	3.016	-1.420	3.016	3.333	334.781	0.522
5300.000	1.381	297.168	5299.738	3.865	-3.226	3.865	5.034	320.147	0.482
5400.000	1.779	293.566	5399.700	5.035	-5.721	5.035	7.621	311.355	0.411
5500.000	1.968	305.109	5499.646	6.644	-8.549	6.644	10.827	307.854	0.421
5600.000	2.035	306.224	5599.585	8.681	-11.386	8.681	14.318	307.323	0.077
5700.000	1.347	301.827	5699.541	10.350	-13.817	10.350	17.264	306.836	0.699
5800.000	1.140	296.970	5799.518	11.421	-15.703	11.421	19.417	306.030	0.233

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	0.979	284.666	5899.501	12.089	-17.415	12.089	21.200	304.766	0.278
6000.000	0.503	256.046	5999.492	12.199	-18.668	12.199	22.300	303.163	0.589
6100.000	0.596	254.250	6099.488	11.952	-19.595	11.952	22.952	301.380	0.095
6200.000	0.674	301.527	6199.482	12.118	-20.598	12.118	23.898	300.469	0.515
6300.000	0.533	332.071	6299.477	12.837	-21.317	12.837	24.884	301.055	0.346
6400.000	0.606	353.418	6399.472	13.773	-21.595	13.773	25.613	302.528	0.223
6500.000	0.782	21.938	6499.465	14.931	-21.401	14.931	26.095	304.903	0.382
6600.000	0.816	90.624	6599.457	15.556	-20.434	15.556	25.682	307.282	0.902
6700.000	1.581	123.405	6699.436	14.789	-18.570	14.789	23.739	308.533	0.998
6800.000	2.337	134.338	6799.377	12.604	-15.960	12.604	20.337	308.299	0.840