

Company: Noble Energy

Lease/Well: Wells Ranch / 14-15

API: 05-123-22335

Rig Name: Production / Lightning Wireline

State/County: Colorado / Weld

Latitude: 40.481, Longitude: -104.430

GRID North is 0.690 Degrees East of True North

VS-Azi: 0.000 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : RKB = Ground Level

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro_run01-01_ed.ut

Minimum Curvature Method

Report Date/Time: 11/30/2012 / 15:50

Vaughn Energy Services

Henderson Colorado

866-835-8333

Norman Cowan

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	0.395	212.218	99.999	-0.292	-0.184	-0.292	0.345	212.218	0.395
200.000	0.184	219.734	199.998	-0.707	-0.470	-0.707	0.849	213.638	0.214
300.000	0.114	214.898	299.998	-0.912	-0.630	-0.912	1.109	214.633	0.071
400.000	0.207	146.468	399.997	-1.144	-0.588	-1.144	1.286	207.175	0.196
500.000	0.050	143.746	499.997	-1.330	-0.462	-1.330	1.408	199.173	0.157
600.000	0.027	134.507	599.997	-1.381	-0.420	-1.381	1.443	196.924	0.024
700.000	0.139	98.182	699.997	-1.414	-0.284	-1.414	1.442	191.340	0.118
800.000	0.155	144.772	799.996	-1.542	-0.085	-1.542	1.545	183.172	0.117
900.000	0.256	149.337	899.996	-1.845	0.107	-1.845	1.848	176.691	0.102
1000.000	0.263	172.440	999.995	-2.265	0.251	-2.265	2.279	173.681	0.104
1100.000	0.300	165.760	1099.994	-2.747	0.346	-2.747	2.769	172.831	0.049
1200.000	0.144	177.679	1199.993	-3.127	0.415	-3.127	3.154	172.437	0.162
1300.000	0.273	182.773	1299.992	-3.490	0.409	-3.490	3.514	173.321	0.131
1400.000	0.239	176.171	1399.991	-3.936	0.411	-3.936	3.957	174.038	0.045
1500.000	0.229	172.828	1499.990	-4.343	0.450	-4.343	4.366	174.084	0.017
1600.000	0.382	161.423	1599.989	-4.857	0.581	-4.857	4.892	173.177	0.164
1700.000	0.176	177.107	1699.988	-5.327	0.695	-5.327	5.372	172.565	0.217
1800.000	0.385	62.691	1799.987	-5.326	1.001	-5.326	5.420	169.351	0.485
1900.000	0.614	42.898	1899.983	-4.780	1.665	-4.780	5.061	160.798	0.283
2000.000	0.687	57.154	1999.977	-4.062	2.533	-4.062	4.787	148.058	0.177
2100.000	0.757	46.456	2099.969	-3.282	3.515	-3.282	4.809	133.042	0.152
2200.000	0.724	62.085	2199.961	-2.532	4.552	-2.532	5.208	119.081	0.204
2300.000	0.568	56.627	2299.954	-1.963	5.524	-1.963	5.862	109.565	0.168
2400.000	0.410	70.585	2399.951	-1.572	6.275	-1.572	6.469	104.063	0.196
2500.000	0.401	67.859	2499.948	-1.321	6.936	-1.321	7.061	100.784	0.021
2600.000	0.449	53.606	2599.945	-0.957	7.575	-0.957	7.636	97.200	0.116
2700.000	0.463	24.597	2699.942	-0.357	8.059	-0.357	8.067	92.536	0.229
2800.000	0.624	15.838	2799.938	0.535	8.376	0.535	8.393	86.346	0.181
2900.000	0.624	17.211	2899.932	1.579	8.686	1.579	8.828	79.694	0.015
3000.000	0.806	21.988	2999.924	2.752	9.110	2.752	9.517	73.194	0.191
3100.000	0.783	8.419	3099.915	4.079	9.473	4.079	10.314	66.704	0.189
3200.000	0.726	348.898	3199.906	5.377	9.451	5.377	10.874	60.365	0.262
3300.000	0.296	293.825	3299.902	6.103	9.093	6.103	10.951	56.130	0.607
3400.000	0.777	173.139	3399.899	5.535	8.937	5.535	10.512	58.231	0.962

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
3500.000	1.229	180.738	3499.884	3.789	9.004	3.789	9.769	67.179	0.471
3600.000	1.169	176.990	3599.862	1.698	9.044	1.698	9.202	79.369	0.099
3700.000	1.318	180.722	3699.838	-0.471	9.083	-0.471	9.095	92.970	0.170
3800.000	1.277	163.719	3799.813	-2.691	9.381	-2.691	9.759	106.007	0.386
3900.000	1.121	161.622	3899.791	-4.689	10.002	-4.689	11.046	115.117	0.162
4000.000	1.343	163.028	3999.768	-6.737	10.652	-6.737	12.604	122.313	0.224
4100.000	1.290	166.116	4099.742	-8.950	11.264	-8.950	14.387	128.470	0.089
4200.000	1.381	163.523	4199.714	-11.198	11.876	-11.198	16.323	133.317	0.109
4300.000	1.289	165.359	4299.687	-13.442	12.502	-13.442	18.357	137.075	0.101
4400.000	1.252	165.324	4399.663	-15.587	13.063	-15.587	20.338	140.035	0.037
4500.000	0.947	171.586	4499.644	-17.462	13.461	-17.462	22.048	142.373	0.328
4600.000	0.727	167.244	4599.633	-18.899	13.722	-18.899	23.355	144.017	0.229
4700.000	0.608	156.173	4699.627	-20.002	14.076	-20.002	24.459	144.865	0.175
4800.000	0.718	117.628	4799.621	-20.778	14.846	-20.778	25.537	144.454	0.450
4900.000	0.800	108.905	4899.612	-21.295	16.062	-21.295	26.673	142.974	0.141
5000.000	0.716	110.418	4999.603	-21.739	17.308	-21.739	27.788	141.474	0.087
5100.000	0.724	103.291	5099.595	-22.102	18.509	-22.102	28.828	140.057	0.090
5200.000	0.845	82.600	5199.586	-22.153	19.855	-22.153	29.748	138.131	0.306
5300.000	0.904	77.759	5299.574	-21.890	21.358	-21.890	30.583	135.706	0.094
5400.000	1.009	83.863	5399.560	-21.629	23.004	-21.629	31.575	133.236	0.146
5500.000	1.165	88.510	5499.542	-21.508	24.896	-21.508	32.900	130.825	0.179
5600.000	1.194	80.029	5599.521	-21.302	26.938	-21.302	34.343	128.335	0.177
5700.000	1.060	78.676	5699.502	-20.940	28.871	-20.940	35.665	125.953	0.136
5800.000	1.161	70.223	5799.483	-20.415	30.732	-20.415	36.895	123.596	0.192
5900.000	1.234	63.981	5899.461	-19.600	32.653	-19.600	38.084	120.974	0.149
6000.000	1.215	73.155	5999.439	-18.820	34.635	-18.820	39.418	118.519	0.197
6100.000	0.987	55.659	6099.420	-18.027	36.362	-18.027	40.585	116.371	0.403
6200.000	1.060	77.461	6199.405	-17.340	37.976	-17.340	41.747	114.542	0.394
6300.000	0.806	98.047	6299.392	-17.238	39.575	-17.238	43.166	113.537	0.416
6400.000	1.116	139.657	6399.379	-18.079	40.903	-18.079	44.720	113.845	0.742
6500.000	0.772	162.618	6499.365	-19.464	41.734	-19.464	46.050	115.003	0.505
6600.000	0.255	202.361	6599.361	-20.313	41.851	-20.313	46.520	115.890	0.598
6700.000	0.464	165.197	6699.359	-20.911	41.869	-20.911	46.801	116.539	0.303
6709.000	0.311	169.188	6708.359	-20.970	41.883	-20.970	46.840	116.596	1.725
HORIZONTAL DISPLACEMENT IS 46.840 FEET AT 116.596 DEGREES									