

Company: Noble Energy

Lease/Well: Sandau Bartels / 25-11 F

API: 05-123-16275

Rig Name: Production / Lightning Wireline

State/County: Colorado / Weld

Latitude: 40.281, Longitude: -104.727

GRID North is 0.500 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: 3/16/2012 / 17:43

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	0.440	142.304	99.999	-0.304	0.235	-0.304	0.384	142.304	0.440
200.000	0.532	115.886	199.996	-0.810	0.887	-0.810	1.202	132.402	0.240
300.000	0.505	119.575	299.991	-1.230	1.688	-1.230	2.089	126.086	0.043
400.000	0.673	110.162	399.986	-1.650	2.623	-1.650	3.099	122.179	0.194
500.000	0.145	69.687	499.983	-1.809	3.293	-1.809	3.757	118.779	0.571
600.000	0.421	260.538	599.983	-1.825	3.050	-1.825	3.554	120.899	0.564
700.000	0.410	281.801	699.980	-1.812	2.337	-1.812	2.958	127.790	0.154
800.000	0.481	264.887	799.977	-1.777	1.569	-1.777	2.371	138.543	0.148
900.000	0.278	293.783	899.975	-1.716	0.930	-1.716	1.952	151.556	0.273
1000.000	0.541	273.907	999.972	-1.586	0.236	-1.586	1.604	171.531	0.295
1100.000	0.514	282.586	1099.968	-1.456	-0.673	-1.456	1.604	204.804	0.084
1200.000	0.539	290.466	1199.964	-1.194	-1.551	-1.194	1.958	232.414	0.076
1300.000	0.600	304.757	1299.959	-0.731	-2.422	-0.731	2.530	253.203	0.154
1400.000	0.715	303.664	1399.952	-0.087	-3.371	-0.087	3.372	268.525	0.115
1500.000	0.907	316.933	1499.942	0.837	-4.431	0.837	4.509	280.700	0.268
1600.000	0.945	302.169	1599.930	1.855	-5.670	1.855	5.965	288.114	0.241
1700.000	0.917	314.613	1699.916	2.856	-6.938	2.856	7.502	292.375	0.204
1800.000	0.865	295.807	1799.905	3.747	-8.187	3.747	9.004	294.591	0.296
1900.000	0.938	301.776	1899.892	4.506	-9.562	4.506	10.571	295.232	0.119
2000.000	0.789	295.736	1999.881	5.236	-10.878	5.236	12.073	295.704	0.174
2100.000	0.727	296.096	2099.872	5.814	-12.069	5.814	13.396	295.724	0.062
2200.000	0.468	307.542	2199.867	6.343	-12.963	6.343	14.431	296.073	0.284
2300.000	0.578	293.406	2299.862	6.792	-13.749	6.792	15.336	296.289	0.168
2400.000	0.709	321.772	2399.856	7.478	-14.595	7.478	16.399	297.130	0.340
2500.000	0.594	338.412	2499.850	8.446	-15.169	8.446	17.362	299.110	0.220
2600.000	0.497	299.265	2599.846	9.140	-15.738	9.140	18.199	300.147	0.377
2700.000	0.698	318.271	2699.840	9.807	-16.521	9.807	19.213	300.693	0.280
2800.000	0.542	317.007	2799.834	10.607	-17.249	10.607	20.250	301.589	0.157
2900.000	0.624	336.825	2899.829	11.454	-17.786	11.454	21.155	302.781	0.216
3000.000	0.613	324.395	2999.824	12.390	-18.312	12.390	22.110	304.082	0.134
3100.000	0.600	335.963	3099.818	13.303	-18.837	13.303	23.061	305.231	0.123
3200.000	0.642	333.165	3199.812	14.281	-19.303	14.281	24.012	306.496	0.052
3300.000	0.756	308.561	3299.805	15.192	-20.072	15.192	25.173	307.122	0.318
3400.000	1.014	307.512	3399.793	16.142	-21.289	16.142	26.717	307.171	0.258

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	1.569	316.447	3499.767	17.673	-22.934	17.673	28.954	307.618	0.589
3600.000	2.038	319.007	3599.717	20.007	-25.044	20.007	32.054	308.621	0.476
3700.000	2.603	316.044	3699.635	22.983	-27.786	22.983	36.060	309.596	0.578
3800.000	3.147	330.365	3799.510	27.004	-30.719	27.004	40.901	311.317	0.897
3900.000	3.341	325.571	3899.350	31.793	-33.724	31.793	46.348	313.312	0.334
4000.000	3.392	322.845	3999.177	36.555	-37.159	36.555	52.125	314.531	0.168
4100.000	3.225	329.753	4099.011	41.343	-40.363	41.343	57.779	315.688	0.432
4200.000	2.787	340.469	4198.874	46.065	-42.593	46.065	62.738	317.243	0.711
4300.000	2.458	329.806	4298.770	50.210	-44.484	50.210	67.081	318.460	0.587
4400.000	2.451	328.569	4398.678	53.887	-46.677	53.887	71.292	319.101	0.053
4500.000	2.134	318.575	4498.598	57.107	-49.024	57.107	75.263	319.356	0.509
4600.000	2.160	331.405	4598.529	60.157	-51.157	60.157	78.968	319.622	0.480
4700.000	2.197	340.173	4698.457	63.615	-52.709	63.615	82.615	320.356	0.335
4800.000	2.401	349.977	4798.377	67.482	-53.724	67.482	86.256	321.476	0.442
4900.000	2.741	350.481	4898.276	71.902	-54.484	71.902	90.214	322.847	0.340
5000.000	2.671	355.504	4998.164	76.584	-55.062	76.584	94.323	324.285	0.247
5100.000	2.217	355.850	5098.073	80.836	-55.385	80.836	97.989	325.583	0.455
5200.000	1.798	355.631	5198.012	84.329	-55.644	84.329	101.033	326.581	0.418
5300.000	1.779	352.699	5297.963	87.433	-55.961	87.433	103.809	327.379	0.094
5400.000	1.545	353.799	5397.921	90.313	-56.304	90.313	106.426	328.059	0.236
5500.000	1.333	357.385	5497.889	92.815	-56.503	92.815	108.661	328.668	0.230
5600.000	1.070	5.283	5597.867	94.906	-56.470	94.906	110.436	329.247	0.310
5700.000	1.062	333.105	5697.851	96.662	-56.803	96.662	112.116	329.560	0.591
5800.000	0.836	334.584	5797.837	98.147	-57.535	98.147	113.768	329.621	0.228
5900.000	1.085	329.939	5897.823	99.625	-58.322	99.625	115.441	329.654	0.261
6000.000	0.950	318.566	5997.807	101.065	-59.345	101.065	117.201	329.579	0.242
6100.000	1.129	286.953	6097.792	101.974	-60.836	101.974	118.742	329.180	0.592
6200.000	1.131	298.463	6197.772	102.732	-62.646	102.732	120.326	328.625	0.227
6300.000	1.072	247.440	6297.756	102.843	-64.378	102.843	121.331	327.954	0.950
6400.000	1.442	204.787	6397.734	101.342	-65.769	101.342	120.813	327.017	0.977
6500.000	2.488	198.374	6497.674	98.139	-66.981	98.139	118.818	325.686	1.067
6600.000	2.705	184.218	6597.572	93.725	-67.839	93.725	115.700	324.103	0.675
6700.000	2.286	187.342	6697.477	89.393	-68.268	89.393	112.479	322.632	0.440
6800.000	1.851	190.796	6797.412	85.828	-68.825	85.828	110.015	321.274	0.452
6900.000	1.387	195.947	6897.371	83.078	-69.460	83.078	108.290	320.101	0.486
7000.000	0.537	217.020	6997.357	81.540	-70.075	81.540	107.514	319.324	0.907
7100.000	0.466	169.090	7097.353	80.766	-70.280	80.766	107.063	318.971	0.413
7200.000	0.684	158.390	7197.348	79.812	-69.984	79.812	106.149	318.754	0.242

HORIZONTAL DISPLACEMENT IS
106.149 FEET AT 318.754 DEGREES