



Company: Noble Energy
Well: Nakagawa PMB 13-10
API #: 05-123-14157
Rig Name: Production/Lightning
State/County: Colorado/Weld
Latitude: 40.397, Longitude: -104.496
GRID North is 0.650 Degrees East of True North
VS-Azi: 0.000 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : Ground Level

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro to 6550-de_01.ut

Minimum Curvature Method

Report Date/Time: 2/6/2013 / 13:20

Vaughn Energy Services
Henderson, Colorado
866-835-8333
Randy Holcomb
RKB=Ground Level

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	0.340	121.650	99.999	-0.156	0.253	-0.156	0.297	121.650	0.340
200.000	0.365	163.964	199.998	-0.617	0.593	-0.617	0.856	136.139	0.255
300.000	0.528	194.850	299.995	-1.369	0.563	-1.369	1.480	157.642	0.285
400.000	0.661	193.602	399.989	-2.375	0.309	-2.375	2.395	172.580	0.133
500.000	0.673	192.513	499.983	-3.509	0.046	-3.509	3.509	179.241	0.018
600.000	0.691	203.189	599.976	-4.637	-0.318	-4.637	4.648	183.927	0.128
700.000	0.765	204.961	699.967	-5.796	-0.837	-5.796	5.856	188.221	0.077
800.000	0.784	222.257	799.958	-6.908	-1.579	-6.908	7.086	192.877	0.234
900.000	0.948	240.988	899.947	-7.815	-2.763	-7.815	8.289	199.468	0.325
1000.000	1.152	246.956	999.930	-8.610	-4.411	-8.610	9.674	207.129	0.231
1100.000	1.289	250.182	1099.908	-9.385	-6.395	-9.385	11.357	214.270	0.153
1200.000	1.338	263.904	1199.882	-9.890	-8.614	-9.890	13.116	221.054	0.318
1300.000	1.488	268.537	1299.851	-10.048	-11.073	-10.048	14.952	227.780	0.188
1400.000	1.696	292.386	1399.814	-9.517	-13.739	-9.517	16.713	235.289	0.688
1500.000	1.683	296.968	1499.770	-8.288	-16.415	-8.288	18.389	243.211	0.136
1600.000	1.722	306.159	1599.726	-6.735	-18.937	-6.735	20.100	250.421	0.276
1700.000	1.814	311.161	1699.679	-4.807	-21.343	-4.807	21.877	257.308	0.180
1800.000	1.515	311.249	1799.636	-2.893	-23.529	-2.893	23.706	262.991	0.299
1900.000	1.253	279.152	1899.609	-1.847	-25.603	-1.847	25.669	265.874	0.806
2000.000	1.166	251.307	1999.587	-1.999	-27.646	-1.999	27.718	265.864	0.588
2100.000	1.370	248.494	2099.563	-2.763	-29.722	-2.763	29.850	264.688	0.213
2200.000	1.207	237.293	2199.537	-3.771	-31.720	-3.771	31.944	263.221	0.299
2300.000	0.920	221.585	2299.520	-4.941	-33.139	-4.941	33.506	261.521	0.406
2400.000	0.976	195.869	2399.507	-6.361	-33.906	-6.361	34.497	259.375	0.426
2500.000	1.070	178.426	2499.491	-8.114	-34.113	-8.114	35.065	256.620	0.324
2600.000	1.213	179.904	2599.472	-10.106	-34.085	-10.106	35.552	253.486	0.145
2700.000	1.327	183.620	2699.447	-12.320	-34.157	-12.320	36.311	250.166	0.141
2800.000	1.365	177.844	2799.419	-14.666	-34.185	-14.666	37.198	246.780	0.141
2900.000	1.473	192.229	2899.389	-17.113	-34.413	-17.113	38.433	243.560	0.371
3000.000	1.281	220.229	2999.361	-19.222	-35.407	-19.222	40.288	241.502	0.692
3100.000	1.218	242.874	3099.338	-20.560	-37.074	-20.560	42.393	240.989	0.494
3200.000	0.999	260.703	3199.320	-21.185	-38.880	-21.185	44.277	241.415	0.405
3300.000	0.697	296.595	3299.309	-21.053	-40.285	-21.053	45.455	242.408	0.597
3400.000	0.591	290.808	3399.303	-20.598	-41.311	-20.598	46.162	243.499	0.124

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	0.714	315.138	3499.297	-19.973	-42.233	-19.973	46.718	244.690	0.300
3600.000	0.619	333.909	3599.290	-19.046	-42.910	-19.046	46.947	246.066	0.237
3700.000	0.595	312.291	3699.284	-18.211	-43.532	-18.211	47.188	247.299	0.229
3800.000	0.548	327.248	3799.279	-17.459	-44.175	-17.459	47.500	248.435	0.156
3900.000	0.588	331.559	3899.275	-16.606	-44.679	-16.606	47.665	249.611	0.058
4000.000	0.605	346.485	3999.269	-15.641	-45.046	-15.641	47.685	250.852	0.156
4100.000	0.517	349.710	4099.264	-14.684	-45.250	-14.684	47.573	252.021	0.094
4200.000	0.622	353.418	4199.259	-13.701	-45.393	-13.701	47.416	253.204	0.112
4300.000	0.581	332.569	4299.254	-12.712	-45.689	-12.712	47.424	254.452	0.221
4400.000	0.415	340.715	4399.250	-11.920	-46.042	-11.920	47.560	255.485	0.181
4500.000	0.320	354.669	4499.248	-11.300	-46.188	-11.300	47.550	256.252	0.130
4600.000	0.742	129.611	4599.246	-11.435	-45.715	-11.435	47.123	255.956	0.994
4700.000	1.048	130.570	4699.233	-12.443	-44.521	-12.443	46.227	254.385	0.306
4800.000	1.064	119.150	4799.217	-13.490	-43.015	-13.490	45.081	252.588	0.211
4900.000	0.939	143.744	4899.202	-14.603	-41.720	-14.603	44.202	250.709	0.444
5000.000	0.818	163.766	4999.190	-15.949	-41.036	-15.949	44.026	248.761	0.328
5100.000	1.068	174.591	5099.177	-17.562	-40.748	-17.562	44.372	246.685	0.306
5200.000	0.475	179.428	5199.167	-18.903	-40.656	-18.903	44.836	245.064	0.596
5300.000	0.790	248.397	5299.162	-19.572	-41.294	-19.572	45.697	244.641	0.762
5400.000	0.139	305.605	5399.159	-19.755	-42.034	-19.755	46.445	244.828	0.725
5500.000	1.025	231.970	5499.153	-20.235	-42.837	-20.235	47.376	244.715	0.995
5600.000	0.729	259.566	5599.142	-20.901	-44.168	-20.901	48.864	244.675	0.507
5700.000	0.680	253.088	5699.134	-21.189	-45.362	-21.189	50.067	244.962	0.094
5800.000	0.582	244.488	5799.128	-21.581	-46.388	-21.581	51.162	245.051	0.136
5900.000	0.748	267.932	5899.121	-21.823	-47.498	-21.823	52.272	245.324	0.315
6000.000	0.670	272.088	5999.114	-21.825	-48.735	-21.825	53.399	245.876	0.093
6100.000	0.825	282.102	6099.105	-21.653	-50.023	-21.653	54.508	246.594	0.202
6200.000	0.841	272.908	6199.095	-21.465	-51.460	-21.465	55.757	247.358	0.134
6300.000	0.993	274.889	6299.082	-21.354	-53.056	-21.354	57.192	248.076	0.155
6400.000	0.612	290.912	6399.072	-21.089	-54.418	-21.089	58.361	248.816	0.439
6500.000	0.349	243.579	6499.069	-21.034	-55.189	-21.034	59.061	249.136	0.455
6550.000	0.329	223.321	6549.068	-21.206	-55.423	-21.206	59.342	249.062	0.241
HORIZONTAL DISPLACEMENT IS 59.342 FEET AT 249.062 DEGREES									