



Company: Noble Energy
Lease / Well: Richter / 23-27
API#: 05-123-22990

Rig Name: Production / Lightning Wireline
State / County: Colorado / Weld County
Latitude: 40.542, Longitude: -104.539
GRID North is 0.620 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: inrun_ed.ut
Minimum Curvature Method
Report Date/Time: 8/28/2011 / 11:20

Vaughn Energy Services
Henderson, CO
303-853-4976
Robert Davis

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	0.868	249.591	99.996	-0.264	-0.710	-0.264	0.758	249.591	0.868
200.000	0.411	255.660	199.990	-0.617	-1.768	-0.617	1.872	250.750	0.462
300.000	0.281	198.826	299.988	-0.938	-2.194	-0.938	2.386	246.852	0.348
400.000	0.021	70.001	399.988	-1.163	-2.255	-1.163	2.538	242.714	0.294
500.000	0.073	230.326	499.988	-1.198	-2.287	-1.198	2.582	242.359	0.093
600.000	0.048	274.325	599.988	-1.235	-2.378	-1.235	2.680	242.552	0.051
700.000	0.295	135.028	699.987	-1.414	-2.238	-1.414	2.647	237.706	0.333
800.000	0.233	102.999	799.986	-1.643	-1.857	-1.643	2.479	228.510	0.158
900.000	0.505	156.443	899.984	-2.093	-1.483	-2.093	2.565	215.315	0.412
1000.000	0.501	130.609	999.981	-2.781	-0.975	-2.781	2.947	199.311	0.225
1100.000	0.734	142.358	1099.975	-3.573	-0.252	-3.573	3.582	184.028	0.265
1200.000	0.595	139.043	1199.968	-4.472	0.480	-4.472	4.498	173.875	0.145
1300.000	0.646	138.135	1299.962	-5.284	1.196	-5.284	5.418	167.242	0.053
1400.000	0.519	132.556	1399.957	-6.011	1.907	-6.011	6.306	162.400	0.139
1500.000	0.525	128.083	1499.953	-6.600	2.601	-6.600	7.094	158.489	0.041
1600.000	0.507	126.483	1599.949	-7.146	3.317	-7.146	7.878	155.097	0.023
1700.000	0.529	125.444	1699.945	-7.676	4.049	-7.676	8.678	152.191	0.024
1800.000	0.479	125.576	1799.941	-8.187	4.764	-8.187	9.472	149.802	0.050
1900.000	0.470	118.291	1899.937	-8.624	5.466	-8.624	10.210	147.636	0.061
2000.000	0.386	120.813	1999.935	-8.991	6.116	-8.991	10.874	145.775	0.087
2100.000	0.450	102.886	2099.932	-9.251	6.788	-9.251	11.474	143.731	0.145
2200.000	0.369	102.766	2199.929	-9.410	7.484	-9.410	12.023	141.502	0.081
2300.000	0.500	82.885	2299.927	-9.427	8.231	-9.427	12.515	138.873	0.198
2400.000	0.321	27.698	2399.924	-9.125	8.794	-9.125	12.673	136.057	0.412
2500.000	0.670	355.467	2499.921	-8.295	8.878	-8.295	12.150	133.054	0.434
2600.000	0.868	20.098	2599.912	-7.001	9.092	-7.001	11.475	127.595	0.381
2700.000	0.879	13.383	2699.900	-5.543	9.530	-5.543	11.025	120.185	0.103
2800.000	0.906	9.110	2799.888	-4.016	9.833	-4.016	10.621	112.218	0.072
2900.000	0.774	356.230	2899.877	-2.562	9.914	-2.562	10.239	104.489	0.230
3000.000	0.799	338.675	2999.868	-1.239	9.616	-1.239	9.695	97.342	0.241
3100.000	0.687	354.735	3099.860	0.007	9.307	0.007	9.307	89.959	0.235
3200.000	0.870	359.366	3199.851	1.363	9.244	1.363	9.344	81.614	0.194
3300.000	0.841	344.076	3299.840	2.828	9.034	2.828	9.467	72.618	0.229
3400.000	0.951	356.011	3399.827	4.362	8.775	4.362	9.799	63.571	0.216

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	0.873	17.535	3499.815	5.915	8.947	5.915	10.725	56.529	0.349
3600.000	0.638	67.954	3599.807	6.850	9.692	6.850	11.869	54.748	0.677
3700.000	0.855	92.731	3699.799	7.024	10.954	7.024	13.012	57.332	0.384
3800.000	0.770	99.123	3799.789	6.882	12.363	6.882	14.149	60.899	0.124
3900.000	0.935	92.317	3899.778	6.742	13.841	6.742	15.396	64.030	0.193
4000.000	1.211	91.933	3999.760	6.673	15.713	6.673	17.071	66.988	0.277
4100.000	1.726	95.541	4099.727	6.492	18.268	6.492	19.388	70.435	0.523
4200.000	1.833	88.594	4199.679	6.386	21.366	6.386	22.300	73.359	0.240
4300.000	1.797	96.155	4299.629	6.257	24.524	6.257	25.310	75.686	0.242
4400.000	1.437	110.348	4399.589	5.653	27.258	5.653	27.838	78.283	0.536
4500.000	1.278	125.657	4499.562	4.568	29.339	4.568	29.693	81.151	0.394
4600.000	1.358	161.853	4599.537	2.792	30.614	2.792	30.741	84.789	0.822
4700.000	1.759	169.741	4699.500	0.156	31.256	0.156	31.257	89.715	0.455
4800.000	2.198	170.999	4799.440	-3.249	31.830	-3.249	31.995	95.828	0.441
4900.000	1.969	167.519	4899.374	-6.821	32.501	-6.821	33.209	101.852	0.261
5000.000	1.723	149.858	4999.323	-9.798	33.627	-9.798	35.026	106.245	0.617
5100.000	1.270	147.477	5099.288	-12.033	34.978	-12.033	36.990	108.984	0.457
5200.000	1.197	146.228	5199.265	-13.836	36.155	-13.836	38.712	110.941	0.078
5300.000	0.897	148.554	5299.248	-15.371	37.143	-15.371	40.198	112.482	0.303
5400.000	0.416	140.266	5399.241	-16.318	37.784	-16.318	41.157	113.358	0.489
5500.000	0.291	28.890	5499.240	-16.374	38.139	-16.374	41.505	113.236	0.588
5600.000	0.299	62.195	5599.239	-16.030	38.492	-16.030	41.697	112.609	0.169
5700.000	0.243	300.748	5699.238	-15.800	38.541	-15.800	41.654	112.292	0.473
5800.000	0.148	316.138	5799.238	-15.599	38.270	-15.599	41.327	112.176	0.108
5900.000	0.467	7.927	5899.236	-15.103	38.237	-15.103	41.111	111.553	0.393
6000.000	0.498	10.609	5999.233	-14.272	38.373	-14.272	40.941	110.402	0.038
6100.000	0.456	18.993	6099.229	-13.469	38.582	-13.469	40.866	109.244	0.081
6200.000	0.144	352.671	6199.228	-12.968	38.696	-12.968	40.811	108.527	0.333
6300.000	0.298	315.693	6299.227	-12.657	38.498	-12.657	40.525	108.199	0.202
6400.000	0.235	318.403	6399.226	-12.318	38.181	-12.318	40.118	107.881	0.064
6500.000	0.433	39.275	6499.225	-11.872	38.284	-11.872	40.082	107.229	0.459
6600.000	1.070	100.747	6599.217	-11.754	39.440	-11.754	41.154	106.595	0.943
6700.000	1.807	126.894	6699.186	-12.874	41.618	-12.874	43.564	107.189	0.969
6800.000	2.583	126.618	6799.112	-15.165	44.688	-15.165	47.191	108.745	0.776
6900.000	3.053	128.936	6898.990	-18.183	48.568	-18.183	51.860	110.525	0.484
7000.000	2.960	131.613	6998.853	-21.571	52.570	-21.571	56.823	112.310	0.168
HORIZONTAL DISPLACEMENT IS 56.823 FEET AT 112.310 DEGREES									