



Company: Noble Energy  
Well: Palmer X 20-20  
API: 05-123-30604  
Rig Name: Production/Lightning Wireline  
State/County: Colorado/ Weld  
Latitude: 40.124, Longitude: -104.692  
GRID North is 0.520 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: 11/15/2012 / 15:50

Vaughn Energy Services  
Henderson, Colorado  
866-835-8333  
Jason Kinchelow

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	0.619	266.732	99.998	-0.031	-0.539	-0.031	0.540	266.732	0.619
200.000	0.472	273.882	199.994	-0.034	-1.489	-0.034	1.489	268.704	0.162
300.000	0.521	185.221	299.991	-0.459	-1.941	-0.459	1.994	256.706	0.695
400.000	0.683	196.157	399.985	-1.484	-2.148	-1.484	2.611	235.368	0.198
500.000	0.627	195.282	499.979	-2.584	-2.458	-2.584	3.566	223.571	0.056
600.000	0.512	193.045	599.974	-3.547	-2.703	-3.547	4.460	217.311	0.118
700.000	0.412	196.302	699.971	-4.327	-2.905	-4.327	5.211	213.875	0.104
800.000	0.397	201.483	799.968	-4.993	-3.132	-4.993	5.895	212.099	0.039
900.000	0.156	101.591	899.967	-5.343	-3.125	-5.343	6.190	210.325	0.451
1000.000	0.265	63.400	999.967	-5.267	-2.785	-5.267	5.958	207.869	0.172
1100.000	0.349	68.397	1099.965	-5.051	-2.295	-5.051	5.549	204.438	0.088
1200.000	0.336	40.245	1199.964	-4.716	-1.823	-4.716	5.056	201.137	0.167
1300.000	0.175	81.486	1299.963	-4.470	-1.483	-4.470	4.709	198.357	0.234
1400.000	0.439	43.561	1399.961	-4.170	-1.069	-4.170	4.304	194.373	0.319
1500.000	0.268	30.982	1499.959	-3.692	-0.684	-3.692	3.755	190.501	0.186
1600.000	0.222	17.998	1599.958	-3.307	-0.504	-3.307	3.345	188.664	0.072
1700.000	0.119	61.847	1699.958	-3.073	-0.352	-3.073	3.093	186.535	0.159
1800.000	0.330	21.733	1799.957	-2.757	-0.154	-2.757	2.761	183.190	0.250
1900.000	0.093	20.496	1899.956	-2.413	-0.019	-2.413	2.413	180.442	0.236
2000.000	0.315	14.987	1999.956	-2.071	0.081	-2.071	2.073	177.763	0.222
2100.000	0.485	359.401	2099.953	-1.383	0.147	-1.383	1.391	173.912	0.201
2200.000	0.816	341.366	2199.947	-0.284	-0.085	-0.284	0.297	196.552	0.385
2300.000	1.477	354.258	2299.926	1.672	-0.441	1.672	1.730	345.230	0.705
2400.000	1.739	359.250	2399.887	4.472	-0.590	4.472	4.511	352.487	0.297
2500.000	1.895	2.372	2499.837	7.641	-0.541	7.641	7.660	355.949	0.184
2600.000	1.828	2.281	2599.784	10.887	-0.409	10.887	10.895	357.847	0.067
2700.000	1.966	347.327	2699.730	14.154	-0.722	14.154	14.173	357.080	0.512
2800.000	1.976	341.248	2799.671	17.461	-1.653	17.461	17.539	354.593	0.209
2900.000	1.981	339.715	2899.611	20.715	-2.806	20.715	20.904	352.285	0.053
3000.000	1.915	335.850	2999.553	23.860	-4.089	23.860	24.208	350.276	0.147
3100.000	1.923	337.170	3099.497	26.931	-5.423	26.931	27.472	348.614	0.045
3200.000	1.508	316.939	3199.453	29.439	-6.973	29.439	30.254	346.674	0.728
3300.000	1.042	285.418	3299.429	30.642	-8.748	30.642	31.867	344.067	0.825
3400.000	0.904	269.966	3399.415	30.884	-10.413	30.884	32.592	341.368	0.295

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	0.879	263.506	3499.403	30.796	-11.963	30.796	33.038	338.771	0.104
3600.000	1.011	265.527	3599.389	30.641	-13.604	30.641	33.525	336.059	0.137
3700.000	1.320	263.129	3699.368	30.434	-15.627	30.434	34.212	332.820	0.313
3800.000	2.188	275.624	3799.321	30.484	-18.671	30.484	35.747	328.513	0.944
3900.000	3.076	281.277	3899.215	31.195	-23.202	31.195	38.878	323.359	0.924
4000.000	3.400	294.836	3999.056	32.966	-28.525	32.966	43.593	319.131	0.829
4100.000	3.423	295.423	4098.879	35.493	-33.912	35.493	49.089	316.305	0.042
4200.000	3.416	296.076	4198.701	38.084	-39.284	38.084	54.714	314.111	0.040
4300.000	3.451	298.567	4298.522	40.832	-44.603	40.832	60.471	312.473	0.153
4400.000	3.833	302.908	4398.320	44.087	-50.052	44.087	66.700	311.374	0.471
4500.000	4.269	300.301	4498.070	47.781	-56.072	47.781	73.669	310.436	0.473
4600.000	4.374	299.867	4597.785	51.558	-62.592	51.558	81.092	309.479	0.111
4700.000	4.439	294.843	4697.490	55.083	-69.411	55.083	88.611	308.435	0.391
4800.000	4.343	295.767	4797.197	58.354	-76.332	58.354	96.082	307.397	0.119
4900.000	4.067	292.670	4896.928	61.367	-83.014	61.367	103.234	306.473	0.358
5000.000	3.563	281.521	4996.707	63.354	-89.331	63.354	109.516	305.345	0.894
5100.000	2.739	274.279	5096.555	64.153	-94.758	64.153	114.433	304.099	0.914
5200.000	2.668	279.360	5196.444	64.710	-99.437	64.710	118.639	303.055	0.250
5300.000	2.116	287.459	5296.357	65.643	-103.495	65.643	122.557	302.385	0.646
5400.000	1.387	309.004	5396.311	66.958	-106.197	66.958	125.544	302.232	0.971
5500.000	0.482	325.087	5496.296	68.065	-107.378	68.065	127.133	302.370	0.934
5600.000	0.288	57.820	5596.295	68.544	-107.405	68.544	127.413	302.545	0.573
5700.000	0.330	94.634	5696.293	68.654	-106.906	68.654	127.052	302.708	0.199
5800.000	0.201	25.325	5796.293	68.790	-106.544	68.790	126.821	302.848	0.320
5900.000	0.159	92.141	5896.292	68.943	-106.330	68.943	126.725	302.959	0.201
6000.000	0.298	149.983	5996.291	68.713	-106.060	68.713	126.374	302.938	0.252
6100.000	0.281	285.684	6096.291	68.554	-106.166	68.554	126.376	302.851	0.536
6200.000	0.285	288.329	6196.290	68.699	-106.639	68.699	126.852	302.790	0.014
6300.000	0.364	305.990	6296.288	68.964	-107.132	68.964	127.410	302.770	0.126
6400.000	0.362	311.401	6396.286	69.359	-107.626	69.359	128.040	302.800	0.034
6500.000	0.368	308.491	6496.284	69.768	-108.115	69.768	128.672	302.835	0.019
6600.000	0.378	298.931	6596.282	70.127	-108.655	70.127	129.320	302.839	0.063
6700.000	0.455	306.937	6696.279	70.525	-109.260	70.525	130.045	302.841	0.096
6800.000	0.414	304.171	6796.276	70.966	-109.876	70.966	130.801	302.857	0.046
6900.000	0.346	327.624	6896.274	71.424	-110.336	71.424	131.436	302.916	0.168
7000.000	0.282	344.239	6996.273	71.915	-110.564	71.915	131.895	303.042	0.110
7100.000	0.432	13.190	7096.271	72.519	-110.545	72.519	132.209	303.265	0.230
7200.000	0.197	70.980	7196.270	72.942	-110.297	72.942	132.234	303.477	0.367
7300.000	0.252	41.036	7296.269	73.164	-109.990	73.164	132.101	303.631	0.128
7400.000	0.272	80.476	7396.268	73.369	-109.611	73.369	131.900	303.797	0.178
7500.000	0.181	29.390	7496.267	73.546	-109.300	73.546	131.740	303.936	0.212
7600.000	0.161	29.146	7596.267	73.806	-109.154	73.806	131.764	304.065	0.020
7700.000	0.376	33.420	7696.266	74.203	-108.904	74.203	131.781	304.269	0.216
HORIZONTAL DISPLACEMENT IS 131.781 FEET AT 304.269 DEGREES									