



Company: Noble Energy
 Lease/Well: Patriot/B16-21
 Location: S-16 T-5N R-64W
 Rig Name: Production
 State/County: Colorado/Weld
 Latitude: 40.41
 GRID North is 0.53 Degrees East of True North
 VS-Azi: 0.00 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro_run01-01_ed.ut

Minimum Curvature Method

Report Date/Time: 12/23/2010 / 21:39

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
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.43	173.55	100.00	-0.37	0.04	-0.37	0.37	173.55	0.43
200.00	0.44	152.83	200.00	-1.08	0.26	-1.08	1.11	166.57	0.16
300.00	0.52	176.18	299.99	-1.87	0.46	-1.87	1.93	166.16	0.21
400.00	0.69	217.72	399.99	-2.81	0.12	-2.81	2.81	177.47	0.46
500.00	1.16	222.97	499.97	-4.02	-0.93	-4.02	4.13	193.04	0.47
600.00	1.67	217.73	599.94	-5.91	-2.51	-5.91	6.42	203.00	0.53
700.00	1.63	228.57	699.90	-8.00	-4.46	-8.00	9.16	209.16	0.31
800.00	1.68	224.33	799.86	-9.98	-6.55	-9.98	11.94	213.26	0.13
900.00	1.66	226.72	899.82	-12.03	-8.63	-12.03	14.80	215.66	0.07
1000.00	1.63	224.59	999.78	-14.04	-10.69	-14.04	17.64	217.28	0.07
1100.00	1.40	234.89	1099.74	-15.75	-12.68	-15.75	20.22	218.84	0.36
1200.00	1.32	233.24	1199.71	-17.14	-14.61	-17.14	22.52	220.43	0.09
1300.00	1.19	235.34	1299.69	-18.43	-16.39	-18.43	24.66	221.65	0.14
1400.00	0.95	230.31	1399.67	-19.55	-17.88	-19.55	26.49	222.45	0.26
1500.00	0.66	223.07	1499.66	-20.50	-18.92	-20.50	27.90	222.70	0.31
1600.00	0.74	207.25	1599.66	-21.50	-19.61	-21.50	29.10	222.37	0.21
1700.00	0.85	197.96	1699.65	-22.78	-20.13	-22.78	30.40	221.47	0.17
1800.00	0.98	190.46	1799.63	-24.33	-20.52	-24.33	31.83	220.14	0.18
1900.00	0.91	168.03	1899.62	-25.96	-20.51	-25.96	33.08	218.31	0.38
2000.00	0.88	162.42	1999.61	-27.47	-20.11	-27.47	34.04	216.21	0.09
2100.00	0.77	181.26	2099.60	-28.87	-19.89	-28.87	35.06	214.57	0.29
2200.00	0.73	195.23	2199.59	-30.16	-20.08	-30.16	36.23	213.65	0.19
2300.00	0.69	204.08	2299.58	-31.33	-20.49	-31.33	37.43	213.19	0.12
2400.00	0.49	176.78	2399.58	-32.30	-20.71	-32.30	38.37	212.66	0.34
2500.00	0.53	134.27	2499.57	-33.06	-20.36	-33.06	38.82	211.62	0.37
2600.00	0.54	139.16	2599.57	-33.74	-19.71	-33.74	39.08	210.30	0.05
2700.00	0.55	127.64	2699.56	-34.39	-19.02	-34.39	39.30	208.95	0.11
2800.00	0.58	124.76	2799.56	-34.97	-18.23	-34.97	39.44	207.54	0.04
2900.00	0.45	140.82	2899.55	-35.56	-17.57	-35.56	39.66	206.30	0.19
3000.00	0.49	135.85	2999.55	-36.17	-17.03	-36.17	39.98	205.21	0.06
3100.00	0.20	103.22	3099.55	-36.51	-16.56	-36.51	40.09	204.40	0.34
3200.00	0.80	316.83	3199.55	-36.04	-16.87	-36.04	39.80	205.08	0.97
3300.00	1.75	327.49	3299.52	-34.24	-18.17	-34.24	38.77	207.95	0.97
3400.00	2.66	324.26	3399.45	-31.07	-20.35	-31.07	37.14	213.22	0.92

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
3500.00	2.72	314.54	3499.34	-27.52	-23.40	-27.52	36.12	220.38	0.46
3600.00	2.58	319.64	3599.23	-24.14	-26.55	-24.14	35.88	227.73	0.27
3700.00	2.84	326.11	3699.12	-20.37	-29.39	-20.37	35.76	235.28	0.40
3800.00	2.09	319.62	3799.02	-16.92	-31.95	-16.92	36.15	242.09	0.80
3900.00	1.18	320.37	3898.98	-14.74	-33.79	-14.74	36.86	246.42	0.91
4000.00	0.72	325.31	3998.97	-13.44	-34.80	-13.44	37.30	248.89	0.46
4100.00	0.32	295.44	4098.96	-12.80	-35.41	-12.80	37.65	250.12	0.47
4200.00	0.42	179.24	4198.96	-13.05	-35.65	-13.05	37.97	249.90	0.63
4300.00	0.90	163.56	4298.96	-14.18	-35.43	-14.18	38.16	248.19	0.51
4400.00	1.45	141.68	4398.94	-15.92	-34.42	-15.92	37.92	245.18	0.69
4500.00	1.63	131.50	4498.90	-17.86	-32.57	-17.86	37.14	241.26	0.33
4600.00	1.77	126.30	4598.86	-19.72	-30.26	-19.72	36.11	236.91	0.21
4700.00	1.72	118.73	4698.81	-21.35	-27.69	-21.35	34.97	232.37	0.24
4800.00	1.30	123.04	4798.77	-22.69	-25.43	-22.69	34.08	228.25	0.43
4900.00	1.02	131.21	4898.75	-23.90	-23.80	-23.90	33.73	224.88	0.32
5000.00	1.10	128.49	4998.74	-25.09	-22.38	-25.09	33.62	221.73	0.09
5100.00	0.89	155.90	5098.72	-26.39	-21.31	-26.39	33.92	218.91	0.52
5200.00	0.73	192.44	5198.71	-27.73	-21.13	-27.73	34.86	217.31	0.53
5300.00	0.52	241.05	5298.71	-28.57	-21.67	-28.57	35.86	217.17	0.55
5400.00	0.43	292.52	5398.70	-28.65	-22.41	-28.65	36.37	218.03	0.42
5500.00	0.12	349.70	5498.70	-28.40	-22.78	-28.40	36.41	218.73	0.38
5600.00	0.54	68.05	5598.70	-28.12	-22.36	-28.12	35.93	218.49	0.53
5700.00	0.90	67.06	5698.69	-27.64	-21.21	-27.64	34.84	217.50	0.36
5800.00	1.23	72.91	5798.68	-27.02	-19.46	-27.02	33.30	215.77	0.35
5900.00	1.22	75.40	5898.65	-26.44	-17.41	-26.44	31.65	213.37	0.05
6000.00	1.60	76.39	5998.62	-25.84	-15.02	-25.84	29.89	210.17	0.37
6100.00	1.75	94.97	6098.58	-25.64	-12.15	-25.64	28.38	205.34	0.56
6200.00	1.76	118.98	6198.53	-26.52	-9.27	-26.52	28.10	199.27	0.73
6300.00	1.37	149.36	6298.50	-28.30	-7.32	-28.30	29.23	194.50	0.90
6400.00	0.88	189.23	6398.48	-30.09	-6.83	-30.09	30.85	192.79	0.90
6500.00	0.81	202.53	6498.47	-31.49	-7.22	-31.49	32.31	192.91	0.21
6600.00	0.86	228.73	6598.46	-32.64	-8.05	-32.64	33.62	193.86	0.38
6700.00	0.37	231.72	6698.45	-33.33	-8.87	-33.33	34.49	194.90	0.49
HORIZONTAL DISPLACEMENT IS 34.49 FEET AT 194.90 DEGREES									