

VES

VAUGHN ENERGY SERVICES

Company: Noble Energy
 Lease/Well: Patriot/B16-20
 Location: S-16 T-5N R-65W
 Rig Name: Production
 State/County: Colorado/Weld
 Latitude: 40.40, Longitude: -104.55
 GRID North is 0.61 Degrees East of True North
 VS-Azi: 0.00 Degrees

GTI

GYRO TECHNOLOGIES, INC

FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : Ground Level

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro_run01-01_ed.ut

Minimum Curvature Method

Report Date/Time: 12/21/2010 / 18:23

Vaughn Energy Services

Rifle, Colorado

817-741-3610

Robert Davis

Patriot B16-20

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	0.35	203.71	100.00	-0.28	-0.12	-0.28	0.31	203.71	0.35
200.00	0.45	228.67	200.00	-0.82	-0.54	-0.82	0.99	213.34	0.20
300.00	0.41	241.32	299.99	-1.25	-1.15	-1.25	1.70	222.51	0.10
400.00	0.66	283.88	399.99	-1.29	-2.02	-1.29	2.39	237.45	0.45
500.00	0.84	287.51	499.98	-0.93	-3.27	-0.93	3.40	254.14	0.19
600.00	1.00	312.86	599.97	-0.11	-4.61	-0.11	4.61	268.60	0.44
700.00	1.07	310.92	699.95	1.09	-5.96	1.09	6.06	280.40	0.07
800.00	0.85	326.16	799.94	2.32	-7.08	2.32	7.45	288.16	0.33
900.00	0.86	328.67	899.93	3.58	-7.88	3.58	8.66	294.43	0.04
1000.00	0.97	332.21	999.91	4.97	-8.67	4.97	9.99	299.83	0.12
1100.00	0.79	337.08	1099.90	6.35	-9.33	6.35	11.28	304.25	0.19
1200.00	0.86	340.44	1199.89	7.69	-9.85	7.69	12.49	307.99	0.08
1300.00	0.73	348.25	1299.88	9.02	-10.23	9.02	13.63	311.40	0.17
1400.00	0.67	339.75	1399.88	10.19	-10.56	10.19	14.67	313.98	0.12
1500.00	0.14	324.94	1499.87	10.85	-10.83	10.85	15.33	315.03	0.54
1600.00	0.48	193.08	1599.87	10.54	-11.00	10.54	15.23	313.77	0.58
1700.00	0.91	185.56	1699.86	9.34	-11.17	9.34	14.56	309.91	0.44
1800.00	1.55	194.19	1799.84	7.24	-11.58	7.24	13.66	302.02	0.67
1900.00	2.06	204.70	1899.79	4.30	-12.66	4.30	13.37	288.74	0.60
2000.00	2.09	195.02	1999.73	0.90	-13.89	0.90	13.92	273.71	0.35
2100.00	2.08	196.22	2099.66	-2.60	-14.87	-2.60	15.09	260.07	0.05
2200.00	2.21	195.27	2199.59	-6.21	-15.88	-6.21	17.05	248.65	0.14
2300.00	2.16	191.69	2299.52	-9.91	-16.77	-9.91	19.48	239.41	0.15
2400.00	1.97	184.66	2399.45	-13.47	-17.29	-13.47	21.92	232.09	0.32
2500.00	1.48	180.84	2499.41	-16.47	-17.45	-16.47	23.99	226.66	0.50
2600.00	1.62	176.62	2599.37	-19.17	-17.39	-19.17	25.88	222.21	0.19
2700.00	1.70	183.39	2699.33	-22.07	-17.39	-22.07	28.10	218.24	0.21
2800.00	1.84	167.19	2799.28	-25.12	-17.12	-25.12	30.40	214.28	0.52
2900.00	1.87	172.60	2899.23	-28.30	-16.56	-28.30	32.79	210.33	0.18
3000.00	1.69	173.10	2999.18	-31.37	-16.17	-31.37	35.30	207.27	0.18
3100.00	1.03	183.41	3099.15	-33.73	-16.05	-33.73	37.35	205.44	0.70
3200.00	0.83	163.12	3199.14	-35.32	-15.89	-35.32	38.73	204.23	0.38
3300.00	0.63	242.08	3299.13	-36.27	-16.17	-36.27	39.71	204.03	0.94

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
3400.00	0.95	289.10	3399.12	-36.25	-17.44	-36.25	40.23	205.69	0.70
3500.00	0.72	263.48	3499.11	-36.05	-18.85	-36.05	40.68	207.61	0.43
3600.00	0.93	213.66	3599.10	-36.80	-19.93	-36.80	41.85	208.44	0.72
3700.00	1.46	182.52	3699.08	-38.74	-20.43	-38.74	43.80	207.81	0.82
3800.00	1.69	178.46	3799.05	-41.49	-20.45	-41.49	46.26	206.24	0.26
3900.00	1.82	175.24	3899.00	-44.55	-20.28	-44.55	48.95	204.47	0.16
4000.00	1.60	158.78	3998.95	-47.44	-19.64	-47.44	51.34	202.49	0.54
4100.00	1.43	158.37	4098.92	-49.90	-18.67	-49.90	53.28	200.52	0.17
4200.00	1.28	169.53	4198.89	-52.15	-18.01	-52.15	55.18	199.05	0.30
4300.00	1.20	175.30	4298.87	-54.30	-17.72	-54.30	57.11	198.08	0.15
4400.00	1.23	180.30	4398.85	-56.41	-17.64	-56.41	59.11	197.37	0.11
4500.00	0.95	175.68	4498.83	-58.31	-17.58	-58.31	60.90	196.78	0.29
4600.00	0.97	164.70	4598.81	-59.95	-17.30	-59.95	62.40	196.09	0.19
4700.00	1.09	145.94	4698.80	-61.56	-16.54	-61.56	63.74	195.04	0.35
4800.00	1.31	157.91	4798.78	-63.40	-15.59	-63.40	65.28	193.81	0.33
4900.00	0.97	142.42	4898.76	-65.13	-14.64	-65.13	66.75	192.67	0.45
5000.00	0.90	169.79	4998.74	-66.58	-13.98	-66.58	68.03	191.86	0.45
5100.00	0.68	153.80	5098.73	-67.88	-13.58	-67.88	69.23	191.31	0.32
5200.00	0.30	56.06	5198.73	-68.27	-13.10	-68.27	69.51	190.86	0.78
5300.00	0.96	141.49	5298.73	-68.77	-12.36	-68.77	69.87	190.19	0.98
5400.00	1.72	135.53	5398.70	-70.49	-10.79	-70.49	71.32	188.71	0.77
5500.00	1.42	149.15	5498.66	-72.62	-9.11	-72.62	73.19	187.15	0.48
5600.00	0.95	166.47	5598.64	-74.49	-8.28	-74.49	74.95	186.35	0.58
5700.00	0.67	187.98	5698.63	-75.88	-8.17	-75.88	76.31	186.15	0.41
5800.00	0.94	211.24	5798.62	-77.16	-8.68	-77.16	77.65	186.42	0.42
5900.00	1.08	216.33	5898.61	-78.62	-9.66	-78.62	79.21	187.01	0.16
6000.00	0.85	205.95	5998.59	-80.04	-10.54	-80.04	80.73	187.50	0.29
6100.00	0.34	216.37	6098.59	-80.95	-11.04	-80.95	81.70	187.77	0.51
6200.00	0.19	255.50	6198.58	-81.23	-11.38	-81.23	82.02	187.97	0.23
6300.00	0.28	253.39	6298.58	-81.34	-11.77	-81.34	82.18	188.23	0.09
6400.00	0.56	229.21	6398.58	-81.73	-12.37	-81.73	82.66	188.61	0.33
6500.00	0.47	270.22	6498.58	-82.05	-13.15	-82.05	83.10	189.11	0.37
6600.00	0.19	249.54	6598.58	-82.10	-13.72	-82.10	83.24	189.49	0.30
6700.00	0.64	201.45	6698.57	-82.68	-14.08	-82.68	83.87	189.67	0.53
HORIZONTAL DISPLACEMENT IS 83.87 FEET AT 189.67 DEGREES									