

VES

VAUGHN ENERGY SERVICES

Company: Noble Energy

Lease/Well: Patriot/B16-19

Location: S-16 T-5N R64W

Rig Name: Production

State/County: Colorado/Weld

Latitude: 40.40, Longitude: -104.56

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: 12/20/2010 / 16:55

Vaughn Energy Services

Rifle, Colorado

817-741-3610

Robert Davis

Patriot B16-19

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	0.30	283.78	100.00	0.06	-0.25	0.06	0.26	283.78	0.30
200.00	0.45	237.88	200.00	-0.09	-0.84	-0.09	0.84	264.19	0.32
300.00	0.57	280.84	299.99	-0.20	-1.66	-0.20	1.68	263.10	0.39
400.00	0.63	311.77	399.99	0.26	-2.56	0.26	2.58	275.80	0.33
500.00	1.01	359.03	499.98	1.51	-2.99	1.51	3.35	296.80	0.74
600.00	0.62	5.47	599.97	2.93	-2.96	2.93	4.16	314.77	0.40
700.00	1.02	353.15	699.96	4.35	-3.01	4.35	5.29	325.33	0.43
800.00	1.17	355.17	799.94	6.25	-3.20	6.25	7.02	332.87	0.15
900.00	1.17	348.67	899.92	8.26	-3.49	8.26	8.97	337.11	0.13
1000.00	1.01	37.86	999.90	9.96	-3.15	9.96	10.44	342.47	0.92
1100.00	0.93	353.88	1099.89	11.46	-2.69	11.46	11.78	346.80	0.73
1200.00	0.98	22.62	1199.88	13.06	-2.45	13.06	13.29	349.39	0.48
1300.00	0.65	17.18	1299.87	14.39	-1.95	14.39	14.52	352.29	0.34
1400.00	0.93	349.38	1399.86	15.73	-1.93	15.73	15.85	353.00	0.46
1500.00	0.57	11.02	1499.85	17.01	-1.98	17.01	17.13	353.35	0.45
1600.00	0.77	58.18	1599.84	17.85	-1.32	17.85	17.90	355.78	0.57
1700.00	1.17	78.41	1699.83	18.41	0.25	18.41	18.41	0.78	0.52
1800.00	1.06	76.67	1799.81	18.83	2.15	18.83	18.95	6.53	0.11
1900.00	0.98	81.20	1899.79	19.18	3.90	19.18	19.57	11.50	0.12
2000.00	0.80	89.83	1999.78	19.31	5.44	19.31	20.06	15.73	0.22
2100.00	0.68	132.01	2099.77	18.91	6.58	18.91	20.02	19.17	0.54
2200.00	0.86	179.70	2199.77	17.77	7.02	17.77	19.11	21.55	0.64
2300.00	1.00	179.69	2299.75	16.15	7.03	16.15	17.62	23.51	0.14
2400.00	1.20	150.23	2399.74	14.37	7.55	14.37	16.24	27.72	0.59
2500.00	1.43	147.24	2499.71	12.42	8.75	12.42	15.19	35.17	0.24
2600.00	1.76	151.24	2599.67	10.02	10.16	10.02	14.27	45.42	0.35
2700.00	1.94	143.28	2699.62	7.31	11.91	7.31	13.98	58.45	0.31
2800.00	1.89	147.78	2799.56	4.56	13.80	4.56	14.54	71.71	0.16
2900.00	1.71	162.82	2899.51	1.74	15.12	1.74	15.22	83.42	0.50
3000.00	1.97	159.24	2999.46	-1.28	16.17	-1.28	16.22	94.54	0.29
3100.00	1.82	169.66	3099.41	-4.45	17.06	-4.45	17.63	104.61	0.38
3200.00	1.63	189.25	3199.36	-7.41	17.12	-7.41	18.66	113.42	0.61
3300.00	1.65	199.23	3299.32	-10.18	16.42	-10.18	19.32	121.81	0.29

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	1.58	197.35	3399.28	-12.86	15.53	-12.86	20.16	129.62	0.09
3500.00	1.37	186.71	3499.25	-15.36	14.98	-15.36	21.45	135.71	0.34
3600.00	1.48	183.43	3599.22	-17.83	14.76	-17.83	23.15	140.37	0.14
3700.00	1.54	189.53	3699.18	-20.44	14.47	-20.44	25.04	144.71	0.17
3800.00	1.38	181.14	3799.15	-22.97	14.22	-22.97	27.01	148.24	0.26
3900.00	1.33	177.82	3899.12	-25.34	14.24	-25.34	29.06	150.66	0.09
4000.00	1.33	184.95	3999.10	-27.66	14.18	-27.66	31.08	152.85	0.17
4100.00	1.07	179.68	4099.08	-29.75	14.09	-29.75	32.92	154.66	0.29
4200.00	0.76	176.77	4199.06	-31.34	14.13	-31.34	34.38	155.73	0.31
4300.00	0.82	177.11	4299.05	-32.72	14.20	-32.72	35.67	156.53	0.06
4400.00	0.69	156.76	4399.04	-33.99	14.48	-33.99	36.94	156.93	0.29
4500.00	0.67	159.71	4499.04	-35.09	14.92	-35.09	38.13	156.97	0.04
4600.00	0.72	172.08	4599.03	-36.25	15.21	-36.25	39.31	157.24	0.16
4700.00	0.70	122.14	4699.02	-37.20	15.81	-37.20	40.42	156.97	0.60
4800.00	0.89	121.99	4799.01	-37.94	16.99	-37.94	41.57	155.87	0.19
4900.00	1.03	123.91	4899.00	-38.85	18.39	-38.85	42.98	154.66	0.14
5000.00	1.50	116.31	4998.98	-39.93	20.31	-39.93	44.80	153.04	0.50
5100.00	1.32	130.36	5098.95	-41.25	22.36	-41.25	46.92	151.54	0.39
5200.00	1.62	142.01	5198.91	-43.11	24.11	-43.11	49.39	150.79	0.42
5300.00	1.67	143.62	5298.87	-45.40	25.84	-45.40	52.24	150.35	0.07
5400.00	1.57	154.44	5398.83	-47.81	27.30	-47.81	55.06	150.27	0.32
5500.00	1.72	161.26	5498.79	-50.47	28.37	-50.47	57.90	150.66	0.25
5600.00	2.05	155.99	5598.74	-53.53	29.58	-53.53	61.16	151.07	0.37
5700.00	1.97	158.24	5698.67	-56.75	30.95	-56.75	64.64	151.40	0.11
5800.00	1.97	156.22	5798.62	-59.92	32.28	-59.92	68.06	151.69	0.07
5900.00	2.22	152.05	5898.55	-63.20	33.88	-63.20	71.71	151.81	0.29
6000.00	1.91	157.58	5998.48	-66.45	35.42	-66.45	75.30	151.94	0.37
6100.00	1.43	149.48	6098.44	-69.06	36.69	-69.06	78.20	152.02	0.54
6200.00	1.03	166.80	6198.42	-71.00	37.52	-71.00	80.31	152.15	0.54
6300.00	1.18	155.34	6298.40	-72.81	38.16	-72.81	82.20	152.34	0.27
6400.00	1.32	136.62	6398.38	-74.59	39.38	-74.59	84.34	152.17	0.43
6500.00	0.92	141.08	6498.36	-76.05	40.68	-76.05	86.25	151.86	0.41
6600.00	1.34	139.25	6598.34	-77.56	41.95	-77.56	88.18	151.60	0.42
6700.00	1.56	132.34	6698.31	-79.37	43.72	-79.37	90.61	151.15	0.29
HORIZONTAL DISPLACEMENT IS 90.61 FEET AT 151.15 DEGREES									