

VES

VAUGHN ENERGY SERVICES

Company: Noble Energy
 Lease/Well: National Hog Farm / 31-21
 Location: S-21 T-5N R-63W

Rig Name: Production
 State/County: Colorado / Weld County

Latitude: 40.39, Longitude: -104.44
 GRID North is 0.69 Degrees East of True North
 VS-Azi: 0.00 Degrees

GTI

GYRO TECHNOLOGIES, INC.

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: 6/15/2011 / 14:26

Vaughn Energy Services
 Denver, CO
 720-215-1841
 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
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.54	207.59	100.00	-0.42	-0.22	-0.42	0.47	207.59	0.54
200.00	0.28	261.31	200.00	-0.88	-0.68	-0.88	1.11	217.83	0.44
300.00	0.54	220.27	299.99	-1.27	-1.23	-1.27	1.77	223.95	0.38
400.00	0.33	31.83	399.99	-1.39	-1.38	-1.39	1.96	224.82	0.87
500.00	0.58	317.21	499.99	-0.77	-1.57	-0.77	1.75	243.81	0.59
600.00	0.17	192.75	599.99	-0.54	-1.95	-0.54	2.02	254.44	0.69
700.00	0.44	6.26	699.99	-0.30	-1.94	-0.30	1.96	261.11	0.60
800.00	0.55	317.68	799.98	0.43	-2.22	0.43	2.26	280.97	0.42
900.00	0.26	37.65	899.98	0.96	-2.40	0.96	2.59	291.83	0.56
1000.00	0.45	19.77	999.98	1.51	-2.13	1.51	2.61	305.29	0.22
1100.00	0.56	15.39	1099.98	2.35	-1.87	2.35	3.01	321.51	0.12
1200.00	0.47	330.88	1199.97	3.18	-1.94	3.18	3.73	328.67	0.40
1300.00	0.41	328.90	1299.97	3.85	-2.32	3.85	4.49	328.89	0.06
1400.00	0.42	321.29	1399.97	4.44	-2.74	4.44	5.22	328.36	0.06
1500.00	0.19	3.21	1499.97	4.90	-2.96	4.90	5.72	328.87	0.31
1600.00	0.22	266.74	1599.97	5.05	-3.14	5.05	5.95	328.14	0.31
1700.00	0.21	260.22	1699.96	5.01	-3.51	5.01	6.12	324.96	0.03
1800.00	0.96	277.09	1799.96	5.08	-4.52	5.08	6.81	318.33	0.76
1900.00	1.19	275.29	1899.94	5.28	-6.39	5.28	8.29	309.57	0.24
2000.00	1.56	274.38	1999.91	5.48	-8.79	5.48	10.36	301.95	0.37
2100.00	1.49	263.76	2099.88	5.45	-11.44	5.45	12.67	295.45	0.29
2200.00	1.79	251.79	2199.84	4.82	-14.22	4.82	15.02	288.71	0.45
2300.00	1.41	241.90	2299.80	3.75	-16.79	3.75	17.20	282.59	0.47
2400.00	1.15	249.28	2399.77	2.82	-18.81	2.82	19.02	278.52	0.30
2500.00	1.40	245.25	2499.75	1.95	-20.86	1.95	20.95	275.34	0.26
2600.00	1.13	238.58	2599.72	0.93	-22.80	0.93	22.82	272.33	0.30
2700.00	1.01	291.33	2699.71	0.73	-24.47	0.73	24.48	271.72	0.96
2800.00	0.91	261.60	2799.69	0.94	-26.07	0.94	26.09	272.06	0.50
2900.00	0.64	315.26	2899.69	1.22	-27.24	1.22	27.27	272.57	0.74
3000.00	0.79	262.96	2999.68	1.53	-28.33	1.53	28.37	273.10	0.65
3100.00	0.95	255.27	3099.67	1.24	-29.82	1.24	29.85	272.38	0.20
3200.00	0.57	232.38	3199.66	0.72	-31.02	0.72	31.03	271.34	0.48
3300.00	0.94	258.61	3299.65	0.26	-32.21	0.26	32.22	270.46	0.50
3400.00	0.90	247.88	3399.64	-0.20	-33.74	-0.20	33.74	269.66	0.18

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	0.97	258.72	3499.62	-0.66	-35.30	-0.66	35.30	268.93	0.19
3600.00	0.80	266.46	3599.61	-0.87	-36.82	-0.87	36.83	268.65	0.20
3700.00	1.02	251.70	3699.60	-1.19	-38.37	-1.19	38.38	268.22	0.32
3800.00	1.22	256.65	3799.58	-1.72	-40.25	-1.72	40.28	267.56	0.22
3900.00	1.57	258.20	3899.55	-2.24	-42.63	-2.24	42.68	266.99	0.36
4000.00	2.05	254.64	3999.50	-3.00	-45.69	-3.00	45.79	266.25	0.49
4100.00	2.53	254.28	4099.42	-4.07	-49.54	-4.07	49.71	265.31	0.49
4200.00	2.78	261.66	4199.31	-5.02	-54.07	-5.02	54.30	264.70	0.42
4300.00	3.17	260.70	4299.18	-5.82	-59.19	-5.82	59.48	264.39	0.39
4400.00	3.48	257.58	4399.01	-6.92	-64.89	-6.92	65.26	263.92	0.36
4500.00	3.55	255.85	4498.82	-8.33	-70.86	-8.33	71.35	263.30	0.13
4600.00	3.78	254.35	4598.62	-9.97	-77.04	-9.97	77.68	262.62	0.25
4700.00	3.91	254.61	4698.39	-11.77	-83.50	-11.77	84.33	261.98	0.14
4800.00	3.76	246.37	4798.17	-13.99	-89.80	-13.99	90.88	261.15	0.57
4900.00	3.47	242.32	4897.97	-16.71	-95.48	-16.71	96.93	260.08	0.38
5000.00	2.55	239.88	4997.83	-19.23	-100.08	-19.23	101.91	259.12	0.93
5100.00	1.65	238.14	5097.76	-21.10	-103.23	-21.10	105.36	258.45	0.91
5200.00	0.83	239.67	5197.74	-22.23	-105.07	-22.23	107.40	258.06	0.82
5300.00	0.39	339.30	5297.73	-22.28	-105.81	-22.28	108.13	258.11	0.97
5400.00	0.59	1.83	5397.73	-21.45	-105.92	-21.45	108.07	258.55	0.27
5500.00	0.62	49.50	5497.73	-20.59	-105.49	-20.59	107.48	258.96	0.49
5600.00	0.72	40.50	5597.72	-19.76	-104.67	-19.76	106.52	259.31	0.15
5700.00	0.76	40.46	5697.71	-18.77	-103.83	-18.77	105.51	259.75	0.04
5800.00	0.76	40.66	5797.70	-17.77	-102.97	-17.77	104.49	260.21	0.01
5900.00	0.87	56.67	5897.69	-16.85	-101.90	-16.85	103.28	260.61	0.26
6000.00	0.90	44.82	5997.68	-15.87	-100.71	-15.87	101.95	261.04	0.19
6100.00	0.45	70.36	6097.67	-15.18	-99.78	-15.18	100.93	261.35	0.53
6200.00	0.68	86.26	6197.67	-15.01	-98.82	-15.01	99.95	261.36	0.28
6300.00	0.36	93.59	6297.66	-14.99	-97.91	-14.99	99.05	261.30	0.33
6400.00	0.95	78.26	6397.66	-14.84	-96.78	-14.84	97.92	261.28	0.62
6500.00	0.27	124.78	6497.65	-14.81	-95.77	-14.81	96.91	261.21	0.79

HORIZONTAL DISPLACEMENT IS
96.91 FEET AT 261.21 DEGREES