

**VES**

VAUGHN ENERGY SERVICES

Company: Noble Energy  
 Lease/Well: National Hog Farm / 33-21  
 Location: S-21 T-5N R-63W  
 Rig Name: Production  
 State/County: Colorado / Weld County  
 Latitude: 40.38, 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 / 13:59

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	0.72	350.95	100.00	0.62	-0.10	0.62	0.63	350.95	0.72
200.00	0.80	351.49	199.99	1.94	-0.30	1.94	1.96	351.14	0.08
300.00	0.99	317.83	299.98	3.27	-0.99	3.27	3.42	343.22	0.55
400.00	0.71	282.19	399.97	4.04	-2.17	4.04	4.59	331.74	0.59
500.00	0.69	332.77	499.96	4.71	-3.05	4.71	5.61	327.02	0.60
600.00	1.02	324.39	599.95	5.96	-3.85	5.96	7.09	327.17	0.35
700.00	0.75	324.93	699.94	7.22	-4.74	7.22	8.63	326.72	0.27
800.00	0.95	319.63	799.93	8.38	-5.65	8.38	10.11	326.02	0.22
900.00	1.28	297.57	899.91	9.53	-7.18	9.53	11.93	323.03	0.53
1000.00	1.00	314.43	999.89	10.66	-8.78	10.66	13.81	320.50	0.43
1100.00	1.13	314.05	1099.87	11.95	-10.12	11.95	15.66	319.76	0.14
1200.00	1.21	293.55	1199.85	13.06	-11.79	13.06	17.60	317.92	0.42
1300.00	1.06	296.06	1299.83	13.89	-13.59	13.89	19.44	315.62	0.16
1400.00	1.24	290.32	1399.81	14.67	-15.44	14.67	21.30	313.55	0.21
1500.00	0.87	305.05	1499.79	15.48	-17.07	15.48	23.04	312.21	0.45
1600.00	1.12	296.72	1599.78	16.35	-18.56	16.35	24.73	311.39	0.29
1700.00	0.57	294.36	1699.77	17.00	-19.88	17.00	26.15	310.53	0.55
1800.00	0.84	296.87	1799.76	17.53	-20.98	17.53	27.35	309.88	0.27
1900.00	0.91	286.27	1899.75	18.09	-22.40	18.09	28.79	308.92	0.18
2000.00	0.86	283.95	1999.74	18.49	-23.89	18.49	30.21	307.74	0.07
2100.00	0.65	252.14	2099.73	18.50	-25.16	18.50	31.23	306.32	0.46
2200.00	0.26	359.10	2199.73	18.55	-25.71	18.55	31.70	305.81	0.77
2300.00	0.61	149.35	2299.72	18.32	-25.44	18.32	31.35	305.76	0.84
2400.00	1.10	104.75	2399.71	17.62	-24.24	17.62	29.97	306.01	0.79
2500.00	0.83	133.57	2499.70	16.88	-22.79	16.88	28.36	306.52	0.55
2600.00	0.86	128.98	2599.69	15.90	-21.68	15.90	26.89	306.26	0.07
2700.00	1.27	120.60	2699.67	14.86	-20.14	14.86	25.03	306.43	0.44
2800.00	0.67	162.33	2799.66	13.74	-19.01	13.74	23.45	305.87	0.89
2900.00	0.42	219.15	2899.65	12.91	-19.06	12.91	23.02	304.10	0.56
3000.00	0.42	245.27	2999.65	12.47	-19.63	12.47	23.25	302.42	0.19
3100.00	1.31	229.52	3099.64	11.57	-20.83	11.57	23.83	299.05	0.91
3200.00	2.19	217.58	3199.59	9.31	-22.87	9.31	24.69	292.16	0.95
3300.00	3.03	213.62	3299.49	5.60	-25.50	5.60	26.10	282.38	0.85
3400.00	3.70	210.93	3399.31	0.63	-28.62	0.63	28.62	271.27	0.69

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	4.08	209.16	3499.08	-5.24	-32.01	-5.24	32.43	260.70	0.40
3600.00	4.14	196.00	3598.83	-11.82	-34.74	-11.82	36.69	251.21	0.94
3700.00	4.28	206.79	3698.56	-18.62	-37.41	-18.62	41.79	243.54	0.80
3800.00	3.54	208.96	3798.33	-24.65	-40.59	-24.65	47.49	238.73	0.75
3900.00	3.60	212.02	3898.13	-30.01	-43.75	-30.01	53.05	235.55	0.20
4000.00	2.83	214.77	3997.98	-34.70	-46.82	-34.70	58.28	233.46	0.78
4100.00	2.86	223.41	4097.85	-38.54	-49.94	-38.54	63.08	232.34	0.43
4200.00	2.19	221.28	4197.75	-41.79	-52.92	-41.79	67.43	231.70	0.68
4300.00	2.02	200.99	4297.69	-44.87	-54.81	-44.87	70.83	230.70	0.76
4400.00	1.99	198.30	4397.63	-48.17	-55.99	-48.17	73.85	229.29	0.10
4500.00	2.56	200.26	4497.55	-51.91	-57.31	-51.91	77.32	227.83	0.57
4600.00	2.74	193.65	4597.44	-56.33	-58.64	-56.33	81.31	226.15	0.36
4700.00	2.66	183.83	4697.33	-60.97	-59.36	-60.97	85.10	224.23	0.47
4800.00	2.71	177.79	4797.22	-65.66	-59.43	-65.66	88.56	222.15	0.29
4900.00	2.69	159.23	4897.11	-70.22	-58.50	-70.22	91.39	219.80	0.87
5000.00	1.93	163.70	4997.03	-74.03	-57.20	-74.03	93.55	217.69	0.79
5100.00	2.05	162.17	5096.97	-77.34	-56.18	-77.34	95.59	215.99	0.14
5200.00	1.50	176.72	5196.92	-80.36	-55.55	-80.36	97.69	214.66	0.71
5300.00	1.12	183.25	5296.89	-82.65	-55.53	-82.65	99.57	213.90	0.41
5400.00	0.72	185.75	5396.88	-84.25	-55.65	-84.25	100.97	213.45	0.40
5500.00	0.70	236.16	5496.87	-85.22	-56.23	-85.22	102.10	213.42	0.61
5600.00	0.69	270.11	5596.87	-85.56	-57.34	-85.56	103.00	213.83	0.41
5700.00	0.87	297.55	5696.86	-85.21	-58.62	-85.21	103.42	214.52	0.41
5800.00	0.74	334.34	5796.85	-84.28	-59.57	-84.28	103.20	215.25	0.52
5900.00	0.35	209.91	5896.85	-83.96	-60.00	-83.96	103.20	215.55	0.98
6000.00	0.44	54.43	5996.85	-84.00	-59.84	-84.00	103.14	215.47	0.77
6100.00	0.74	138.00	6096.84	-84.26	-59.10	-84.26	102.92	215.05	0.82
6200.00	1.62	118.00	6196.82	-85.40	-57.42	-85.40	102.91	213.91	0.96
6300.00	1.50	153.87	6296.79	-87.24	-55.59	-87.24	103.45	212.51	0.97
6400.00	1.64	158.04	6396.75	-89.75	-54.48	-89.75	104.99	211.26	0.18
6500.00	1.18	177.49	6496.72	-92.11	-53.90	-92.11	106.72	210.33	0.66
6600.00	0.82	215.88	6596.70	-93.72	-54.27	-93.72	108.30	210.08	0.74
6700.00	0.58	216.25	6696.70	-94.71	-54.99	-94.71	109.51	210.14	0.25
6800.00	0.81	250.86	6796.69	-95.34	-55.96	-95.34	110.55	210.41	0.47
6900.00	0.54	296.56	6896.68	-95.37	-57.05	-95.37	111.13	210.89	0.58

<div> HORIZONTAL DISPLACEMENT IS  111.13 FEET AT 210.89 DEGREES </div>
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