

**VES**

VAUGHN ENERGY SERVICES

Company: Noble Energy  
 Lease/Well: Herbst / 22-16  
 Location: S-22 T-4N R-64W  
 Rig Name: Production  
 State/County: Colorado / Weld County  
 Latitude: 40.29, Longitude: -104.53  
 GRID North is 0.63 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: 2/22/2011 / 10:14

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	0.29	173.83	100.00	-0.25	0.03	-0.25	0.25	173.83	0.29
200.00	0.29	146.51	200.00	-0.71	0.19	-0.71	0.74	164.78	0.14
300.00	0.35	154.79	300.00	-1.20	0.46	-1.20	1.29	158.89	0.07
400.00	0.16	159.45	400.00	-1.60	0.64	-1.60	1.73	158.22	0.19
500.00	0.21	154.95	500.00	-1.90	0.77	-1.90	2.05	158.01	0.05
600.00	0.29	167.18	599.99	-2.31	0.90	-2.31	2.48	158.71	0.09
700.00	0.10	201.58	699.99	-2.65	0.92	-2.65	2.80	160.73	0.21
800.00	0.22	159.29	799.99	-2.91	0.96	-2.91	3.06	161.75	0.16
900.00	0.24	156.94	899.99	-3.28	1.11	-3.28	3.46	161.32	0.02
1000.00	0.22	150.62	999.99	-3.64	1.28	-3.64	3.86	160.56	0.03
1100.00	0.23	140.02	1099.99	-3.96	1.51	-3.96	4.24	159.15	0.04
1200.00	0.15	136.85	1199.99	-4.21	1.73	-4.21	4.55	157.68	0.08
1300.00	0.05	256.92	1299.99	-4.32	1.78	-4.32	4.67	157.64	0.18
1400.00	0.19	23.99	1399.99	-4.18	1.80	-4.18	4.55	156.70	0.22
1500.00	0.24	336.66	1499.99	-3.84	1.78	-3.84	4.23	155.06	0.18
1600.00	0.44	286.75	1599.99	-3.54	1.34	-3.54	3.78	159.31	0.34
1700.00	0.82	318.94	1699.98	-2.88	0.50	-2.88	2.93	170.24	0.51
1800.00	1.06	300.95	1799.97	-1.86	-0.77	-1.86	2.02	202.48	0.38
1900.00	1.07	305.44	1899.95	-0.85	-2.32	-0.85	2.47	249.93	0.08
2000.00	0.91	279.94	1999.94	-0.17	-3.87	-0.17	3.87	267.46	0.46
2100.00	0.82	312.07	2099.93	0.45	-5.18	0.45	5.20	274.92	0.49
2200.00	0.92	349.96	2199.92	1.71	-5.86	1.71	6.10	286.32	0.57
2300.00	1.13	1.67	2299.90	3.48	-5.97	3.48	6.91	300.28	0.29
2400.00	1.50	12.06	2399.87	5.75	-5.66	5.75	8.07	315.43	0.45
2500.00	1.79	36.99	2499.83	8.28	-4.45	8.28	9.40	331.75	0.76
2600.00	1.77	38.92	2599.78	10.73	-2.54	10.73	11.03	346.69	0.06
2700.00	1.70	24.80	2699.74	13.28	-0.95	13.28	13.31	355.91	0.43
2800.00	1.52	28.33	2799.70	15.79	0.30	15.79	15.79	1.10	0.20
2900.00	1.34	44.81	2899.67	17.79	1.76	17.79	17.87	5.64	0.45
3000.00	1.19	79.45	2999.65	18.81	3.61	18.81	19.15	10.86	0.77
3100.00	0.93	80.04	3099.63	19.14	5.43	19.14	19.89	15.84	0.27
3200.00	0.83	99.94	3199.62	19.15	6.94	19.15	20.37	19.91	0.32
3300.00	0.77	99.86	3299.61	18.91	8.31	18.91	20.66	23.72	0.05
3400.00	0.69	93.75	3399.60	18.76	9.57	18.76	21.06	27.04	0.12

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	0.60	103.79	3499.59	18.60	10.68	18.60	21.44	29.86	0.14
3600.00	0.37	89.84	3599.59	18.47	11.50	18.47	21.76	31.91	0.25
3700.00	0.40	88.77	3699.59	18.48	12.18	18.48	22.13	33.38	0.04
3800.00	0.34	110.82	3799.59	18.38	12.81	18.38	22.40	34.87	0.15
3900.00	0.18	127.86	3899.58	18.18	13.21	18.18	22.47	36.02	0.18
4000.00	0.25	162.97	3999.58	17.87	13.40	17.87	22.34	36.87	0.14
4100.00	0.32	165.40	4099.58	17.39	13.54	17.39	22.04	37.90	0.07
4200.00	0.37	191.05	4199.58	16.80	13.55	16.80	21.58	38.88	0.16
4300.00	0.37	221.78	4299.58	16.24	13.27	16.24	20.97	39.25	0.20
4400.00	0.77	259.29	4399.57	15.87	12.39	15.87	20.14	37.98	0.53
4500.00	1.35	270.62	4499.56	15.76	10.55	15.76	18.97	33.81	0.61
4600.00	1.11	277.89	4599.53	15.90	8.42	15.90	17.99	27.89	0.29
4700.00	0.55	329.63	4699.52	16.45	7.22	16.45	17.96	23.69	0.88
4800.00	0.17	283.77	4799.52	16.90	6.83	16.90	18.23	22.01	0.45
4900.00	0.39	302.03	4899.52	17.11	6.40	17.11	18.27	20.50	0.24
5000.00	0.58	349.92	4999.52	17.79	6.02	17.79	18.79	18.70	0.43
5100.00	0.30	338.20	5099.51	18.53	5.84	18.53	19.43	17.48	0.30
5200.00	0.27	342.91	5199.51	19.00	5.67	19.00	19.83	16.62	0.03
5300.00	0.43	343.36	5299.51	19.59	5.49	19.59	20.34	15.67	0.16
5400.00	0.68	357.28	5399.51	20.54	5.36	20.54	21.23	14.62	0.28
5500.00	0.45	328.15	5499.50	21.47	5.12	21.47	22.07	13.42	0.36
5600.00	0.40	315.90	5599.50	22.05	4.67	22.05	22.54	11.95	0.10
5700.00	0.56	323.90	5699.49	22.70	4.14	22.70	23.08	10.32	0.17
5800.00	0.72	333.43	5799.49	23.66	3.57	23.66	23.93	8.57	0.19
5900.00	0.60	322.89	5899.48	24.64	2.97	24.64	24.82	6.87	0.17
6000.00	0.35	316.68	5999.48	25.28	2.44	25.28	25.40	5.52	0.26
6100.00	0.35	300.10	6099.48	25.65	1.97	25.65	25.73	4.39	0.10
6200.00	0.59	252.96	6199.47	25.66	1.21	25.66	25.69	2.71	0.43
6300.00	0.48	243.64	6299.47	25.32	0.34	25.32	25.32	0.78	0.13
6400.00	0.63	203.02	6399.46	24.63	-0.25	24.63	24.63	359.42	0.41
6500.00	0.73	179.74	6499.46	23.48	-0.46	23.48	23.49	358.87	0.29
6600.00	0.32	183.36	6599.45	22.57	-0.48	22.57	22.58	358.79	0.42
6700.00	0.76	149.81	6699.45	21.72	-0.16	21.72	21.72	359.58	0.53
6800.00	0.23	132.75	6799.45	21.01	0.33	21.01	21.01	0.89	0.54
6900.00	0.55	157.82	6899.44	20.43	0.66	20.43	20.44	1.84	0.35

<div> HORIZONTAL DISPLACEMENT IS  20.44 FEET AT 1.84 DEGREES </div>
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