



Company: Noble Energy
 Well: Booth 41-31
 API#: 05-123-23017
 Rig Name: Production / Lightning
 Location: Weld County, Colorado
 Latitude: 40.274, Longitude: -104.474
 GRID North is 0.660 Degrees East of True North
 VS-Azi: 0.000 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : RKB = Ground Level

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: booth 41-31_ed.ut
 Minimum Curvature Method
 Report Date/Time: 3/30/2012 / 13:20

Vaughn Energy Services
 Henderson, CO
 303-853-4976
 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 |
|-------------------------|----------------------|---------------------------|-----------|------------|------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | **** |
| 100.000 | 0.620 | 355.277 | 99.998 | 0.540 | -0.045 | 0.540 | 0.541 | 355.277 | 0.620 |
| 200.000 | 0.359 | 10.772 | 199.994 | 1.387 | -0.031 | 1.387 | 1.388 | 358.737 | 0.291 |
| 300.000 | 0.277 | 18.933 | 299.993 | 1.924 | 0.107 | 1.924 | 1.927 | 3.169 | 0.093 |
| 400.000 | 0.323 | 336.981 | 399.992 | 2.412 | 0.075 | 2.412 | 2.413 | 1.780 | 0.219 |
| 500.000 | 0.346 | 346.311 | 499.990 | 2.965 | -0.107 | 2.965 | 2.967 | 357.940 | 0.059 |
| 600.000 | 0.019 | 273.106 | 599.989 | 3.259 | -0.194 | 3.259 | 3.265 | 356.586 | 0.341 |
| 700.000 | 0.412 | 262.294 | 699.988 | 3.212 | -0.567 | 3.212 | 3.262 | 349.993 | 0.393 |
| 800.000 | 0.166 | 234.633 | 799.987 | 3.080 | -1.041 | 3.080 | 3.251 | 341.333 | 0.276 |
| 900.000 | 0.438 | 305.838 | 899.986 | 3.220 | -1.468 | 3.220 | 3.539 | 335.490 | 0.415 |
| 1000.000 | 0.265 | 332.366 | 999.984 | 3.649 | -1.885 | 3.649 | 4.107 | 332.675 | 0.233 |
| 1100.000 | 0.228 | 160.454 | 1099.984 | 3.666 | -1.926 | 3.666 | 4.141 | 332.285 | 0.492 |
| 1200.000 | 0.329 | 208.410 | 1199.983 | 3.226 | -1.996 | 3.226 | 3.794 | 328.251 | 0.245 |
| 1300.000 | 0.330 | 220.816 | 1299.981 | 2.755 | -2.321 | 2.755 | 3.603 | 319.889 | 0.071 |
| 1400.000 | 0.147 | 173.852 | 1399.980 | 2.409 | -2.495 | 2.409 | 3.469 | 313.995 | 0.253 |
| 1500.000 | 0.264 | 232.812 | 1499.980 | 2.142 | -2.665 | 2.142 | 3.419 | 308.798 | 0.226 |
| 1600.000 | 0.384 | 217.972 | 1599.978 | 1.739 | -3.054 | 1.739 | 3.515 | 299.655 | 0.146 |
| 1700.000 | 0.358 | 235.692 | 1699.976 | 1.299 | -3.519 | 1.299 | 3.751 | 290.260 | 0.117 |
| 1800.000 | 0.114 | 184.370 | 1799.975 | 1.023 | -3.784 | 1.023 | 3.920 | 285.133 | 0.300 |
| 1900.000 | 0.084 | 100.473 | 1899.975 | 0.910 | -3.719 | 0.910 | 3.829 | 283.753 | 0.135 |
| 2000.000 | 0.207 | 179.101 | 1999.975 | 0.716 | -3.644 | 0.716 | 3.714 | 281.116 | 0.208 |
| 2100.000 | 0.218 | 67.179 | 2099.974 | 0.609 | -3.466 | 0.609 | 3.519 | 279.965 | 0.353 |
| 2200.000 | 0.265 | 79.051 | 2199.973 | 0.727 | -3.064 | 0.727 | 3.149 | 283.342 | 0.068 |
| 2300.000 | 0.368 | 45.455 | 2299.972 | 0.996 | -2.608 | 0.996 | 2.792 | 290.901 | 0.208 |
| 2400.000 | 0.363 | 69.595 | 2399.970 | 1.332 | -2.082 | 1.332 | 2.471 | 302.608 | 0.153 |
| 2500.000 | 0.265 | 54.865 | 2499.968 | 1.575 | -1.596 | 1.575 | 2.243 | 314.625 | 0.126 |
| 2600.000 | 0.176 | 178.698 | 2599.968 | 1.555 | -1.404 | 1.555 | 2.095 | 317.926 | 0.391 |
| 2700.000 | 0.247 | 179.910 | 2699.967 | 1.186 | -1.400 | 1.186 | 1.834 | 310.270 | 0.071 |
| 2800.000 | 0.257 | 134.801 | 2799.966 | 0.812 | -1.240 | 0.812 | 1.483 | 303.224 | 0.193 |
| 2900.000 | 0.283 | 161.944 | 2899.965 | 0.419 | -1.005 | 0.419 | 1.089 | 292.654 | 0.129 |
| 3000.000 | 0.248 | 147.706 | 2999.964 | 0.001 | -0.812 | 0.001 | 0.812 | 270.091 | 0.075 |
| 3100.000 | 0.386 | 80.160 | 3099.963 | -0.124 | -0.365 | -0.124 | 0.385 | 251.228 | 0.371 |
| 3200.000 | 0.488 | 97.411 | 3199.960 | -0.121 | 0.390 | -0.121 | 0.408 | 107.283 | 0.165 |
| 3300.000 | 0.362 | 109.509 | 3299.957 | -0.282 | 1.109 | -0.282 | 1.144 | 104.241 | 0.154 |
| 3400.000 | 0.861 | 30.300 | 3399.953 | 0.262 | 1.786 | 0.262 | 1.805 | 81.656 | 0.869 |

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|-------------------------|----------------------|---------------------------|-----------|-------------|-------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 3500.000 | 1.217 | 9.264 | 3499.936 | 1.959 | 2.336 | 1.959 | 3.048 | 50.022 | 0.516 |
| 3600.000 | 2.054 | 5.904 | 3599.895 | 4.789 | 2.691 | 4.789 | 5.493 | 29.333 | 0.843 |
| 3700.000 | 2.329 | 5.726 | 3699.822 | 8.594 | 3.078 | 8.594 | 9.128 | 19.707 | 0.275 |
| 3800.000 | 2.624 | 10.891 | 3799.728 | 12.863 | 3.713 | 12.863 | 13.389 | 16.103 | 0.369 |
| 3900.000 | 2.591 | 359.644 | 3899.625 | 17.371 | 4.132 | 17.371 | 17.856 | 13.379 | 0.512 |
| 4000.000 | 2.298 | 355.356 | 3999.534 | 21.630 | 3.955 | 21.630 | 21.988 | 10.363 | 0.346 |
| 4100.000 | 2.296 | 347.380 | 4099.454 | 25.582 | 3.356 | 25.582 | 25.802 | 7.473 | 0.319 |
| 4200.000 | 2.341 | 340.136 | 4199.373 | 29.458 | 2.224 | 29.458 | 29.542 | 4.317 | 0.296 |
| 4300.000 | 2.487 | 346.794 | 4299.284 | 33.491 | 1.034 | 33.491 | 33.507 | 1.769 | 0.316 |
| 4400.000 | 2.599 | 340.859 | 4399.186 | 37.745 | -0.205 | 37.745 | 37.746 | 359.689 | 0.286 |
| 4500.000 | 2.438 | 348.570 | 4499.089 | 41.972 | -1.370 | 41.972 | 41.995 | 358.131 | 0.375 |
| 4600.000 | 2.351 | 9.860 | 4599.004 | 46.078 | -1.440 | 46.078 | 46.100 | 358.210 | 0.889 |
| 4700.000 | 2.430 | 28.825 | 4698.919 | 49.956 | -0.067 | 49.956 | 49.956 | 359.923 | 0.791 |
| 4800.000 | 2.515 | 37.890 | 4798.826 | 53.545 | 2.303 | 53.545 | 53.595 | 2.463 | 0.400 |
| 4900.000 | 2.267 | 60.682 | 4898.741 | 56.246 | 5.376 | 56.246 | 56.502 | 5.459 | 0.976 |
| 5000.000 | 1.732 | 80.288 | 4998.681 | 57.469 | 8.590 | 57.469 | 58.108 | 8.501 | 0.861 |
| 5100.000 | 0.936 | 91.460 | 5098.653 | 57.703 | 10.895 | 57.703 | 58.723 | 10.693 | 0.833 |
| 5200.000 | 0.092 | 197.085 | 5198.649 | 57.605 | 11.688 | 57.605 | 58.779 | 11.470 | 0.965 |
| 5300.000 | 0.902 | 279.373 | 5298.645 | 57.657 | 10.888 | 57.657 | 58.676 | 10.694 | 0.894 |
| 5400.000 | 1.544 | 251.551 | 5398.622 | 57.358 | 8.833 | 57.358 | 58.034 | 8.755 | 0.857 |
| 5500.000 | 1.296 | 250.843 | 5498.591 | 56.561 | 6.487 | 56.561 | 56.931 | 6.542 | 0.249 |
| 5600.000 | 1.050 | 244.261 | 5598.570 | 55.792 | 4.593 | 55.792 | 55.980 | 4.706 | 0.280 |
| 5700.000 | 1.176 | 246.478 | 5698.551 | 54.984 | 2.827 | 54.984 | 55.057 | 2.943 | 0.133 |
| 5800.000 | 0.717 | 254.758 | 5798.537 | 54.410 | 1.283 | 54.410 | 54.425 | 1.351 | 0.478 |
| 5900.000 | 0.303 | 276.850 | 5898.533 | 54.277 | 0.417 | 54.277 | 54.279 | 0.440 | 0.450 |
| 6000.000 | 0.348 | 300.256 | 5998.532 | 54.462 | -0.108 | 54.462 | 54.462 | 359.886 | 0.139 |
| 6100.000 | 0.430 | 272.139 | 6098.530 | 54.629 | -0.746 | 54.629 | 54.634 | 359.218 | 0.205 |
| 6200.000 | 0.212 | 359.372 | 6198.528 | 54.828 | -1.123 | 54.828 | 54.839 | 358.826 | 0.470 |
| 6300.000 | 0.403 | 310.437 | 6298.527 | 55.241 | -1.393 | 55.241 | 55.258 | 358.555 | 0.309 |
| 6400.000 | 0.393 | 329.489 | 6398.525 | 55.765 | -1.836 | 55.765 | 55.795 | 358.115 | 0.132 |
| 6500.000 | 0.383 | 325.357 | 6498.522 | 56.335 | -2.200 | 56.335 | 56.378 | 357.764 | 0.030 |
| 6600.000 | 0.411 | 272.754 | 6598.520 | 56.628 | -2.748 | 56.628 | 56.694 | 357.222 | 0.353 |

HORIZONTAL DISPLACEMENT IS
56.694 FEET AT 357.222 DEGREES