



Company: Noble Energy
Well: Barnard 4-23
API #: 05-123-18550
Rig Name: Production / Lightning Wireline
Location: Weld County, Colorado
Latitude: 40.344, Longitude: -104.675
GRID North is 0.530 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: inrun_ed.ut

Minimum Curvature Method

Report Date/Time: 12/1/2011 / 22:40

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 | 0.034 | 198.357 | 100.000 | -0.028 | -0.009 | -0.028 | 0.030 | 198.357 | 0.034 |
| 200.000 | 0.100 | 74.121 | 200.000 | -0.032 | 0.065 | -0.032 | 0.073 | 116.447 | 0.122 |
| 300.000 | 0.205 | 149.849 | 300.000 | -0.163 | 0.239 | -0.163 | 0.289 | 124.391 | 0.205 |
| 400.000 | 0.272 | 139.097 | 399.999 | -0.498 | 0.484 | -0.498 | 0.694 | 135.791 | 0.080 |
| 500.000 | 0.321 | 205.272 | 499.998 | -0.930 | 0.520 | -0.930 | 1.066 | 150.782 | 0.326 |
| 600.000 | 0.249 | 150.436 | 599.997 | -1.372 | 0.508 | -1.372 | 1.463 | 159.682 | 0.270 |
| 700.000 | 0.300 | 150.531 | 699.995 | -1.789 | 0.744 | -1.789 | 1.938 | 157.417 | 0.051 |
| 800.000 | 0.464 | 174.946 | 799.993 | -2.421 | 0.909 | -2.421 | 2.586 | 159.422 | 0.227 |
| 900.000 | 0.470 | 170.138 | 899.990 | -3.228 | 1.015 | -3.228 | 3.384 | 162.550 | 0.040 |
| 1000.000 | 0.379 | 196.439 | 999.987 | -3.950 | 0.991 | -3.950 | 4.072 | 165.911 | 0.213 |
| 1100.000 | 0.291 | 168.914 | 1099.986 | -4.517 | 0.947 | -4.517 | 4.615 | 168.164 | 0.181 |
| 1200.000 | 0.295 | 166.115 | 1199.984 | -5.016 | 1.057 | -5.016 | 5.126 | 168.098 | 0.015 |
| 1300.000 | 0.297 | 162.653 | 1299.983 | -5.513 | 1.196 | -5.513 | 5.642 | 167.758 | 0.018 |
| 1400.000 | 0.201 | 164.479 | 1399.982 | -5.931 | 1.321 | -5.931 | 6.076 | 167.445 | 0.096 |
| 1500.000 | 0.217 | 161.618 | 1499.981 | -6.279 | 1.427 | -6.279 | 6.439 | 167.193 | 0.018 |
| 1600.000 | 0.113 | 208.975 | 1599.981 | -6.545 | 1.439 | -6.545 | 6.701 | 167.598 | 0.163 |
| 1700.000 | 0.186 | 181.898 | 1699.981 | -6.793 | 1.386 | -6.793 | 6.933 | 168.467 | 0.100 |
| 1800.000 | 0.185 | 188.969 | 1799.980 | -7.115 | 1.356 | -7.115 | 7.243 | 169.214 | 0.023 |
| 1900.000 | 0.171 | 179.017 | 1899.980 | -7.424 | 1.333 | -7.424 | 7.543 | 169.822 | 0.034 |
| 2000.000 | 0.287 | 175.152 | 1999.979 | -7.822 | 1.357 | -7.822 | 7.939 | 170.161 | 0.117 |
| 2100.000 | 0.399 | 152.358 | 2099.977 | -8.381 | 1.539 | -8.381 | 8.521 | 169.591 | 0.175 |
| 2200.000 | 0.410 | 132.628 | 2199.975 | -8.932 | 1.965 | -8.932 | 9.145 | 167.594 | 0.139 |
| 2300.000 | 0.389 | 111.976 | 2299.972 | -9.302 | 2.543 | -9.302 | 9.643 | 164.709 | 0.145 |
| 2400.000 | 0.442 | 105.569 | 2399.970 | -9.532 | 3.229 | -9.532 | 10.064 | 161.285 | 0.070 |
| 2500.000 | 0.658 | 109.946 | 2499.965 | -9.831 | 4.140 | -9.831 | 10.668 | 157.162 | 0.220 |
| 2600.000 | 0.480 | 96.505 | 2599.960 | -10.075 | 5.096 | -10.075 | 11.290 | 153.167 | 0.221 |
| 2700.000 | 0.151 | 74.475 | 2699.958 | -10.087 | 5.639 | -10.087 | 11.556 | 150.792 | 0.345 |
| 2800.000 | 0.264 | 56.856 | 2799.958 | -9.926 | 5.959 | -9.926 | 11.577 | 149.023 | 0.129 |
| 2900.000 | 0.186 | 95.733 | 2899.957 | -9.816 | 6.313 | -9.816 | 11.671 | 147.253 | 0.167 |
| 3000.000 | 0.215 | 61.197 | 2999.956 | -9.742 | 6.639 | -9.742 | 11.789 | 145.726 | 0.122 |
| 3100.000 | 0.090 | 63.923 | 3099.956 | -9.617 | 6.874 | -9.617 | 11.821 | 144.443 | 0.124 |
| 3200.000 | 0.278 | 160.045 | 3199.956 | -9.810 | 7.028 | -9.810 | 12.068 | 144.383 | 0.301 |
| 3300.000 | 0.604 | 161.141 | 3299.953 | -10.537 | 7.281 | -10.537 | 12.808 | 145.356 | 0.326 |
| 3400.000 | 0.970 | 150.061 | 3399.943 | -11.770 | 7.874 | -11.770 | 14.161 | 146.217 | 0.395 |

| 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 |
|--|----------------------|---------------------------|-----------|------------|------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 3500.000 | 1.345 | 154.409 | 3499.922 | -13.562 | 8.804 | -13.562 | 16.169 | 147.011 | 0.385 |
| 3600.000 | 1.764 | 170.600 | 3599.886 | -16.139 | 9.562 | -16.139 | 18.759 | 149.354 | 0.603 |
| 3700.000 | 1.769 | 155.900 | 3699.839 | -19.067 | 10.444 | -19.067 | 21.740 | 151.289 | 0.452 |
| 3800.000 | 1.704 | 149.849 | 3799.793 | -21.761 | 11.821 | -21.761 | 24.765 | 151.489 | 0.194 |
| 3900.000 | 1.671 | 144.490 | 3899.750 | -24.234 | 13.415 | -24.234 | 27.699 | 151.034 | 0.161 |
| 4000.000 | 1.684 | 145.000 | 3999.707 | -26.625 | 15.104 | -26.625 | 30.611 | 150.434 | 0.019 |
| 4100.000 | 2.150 | 133.797 | 4099.651 | -29.127 | 17.301 | -29.127 | 33.878 | 149.290 | 0.596 |
| 4200.000 | 2.247 | 118.820 | 4199.578 | -31.371 | 20.373 | -31.371 | 37.406 | 146.999 | 0.581 |
| 4300.000 | 2.599 | 127.222 | 4299.489 | -33.687 | 23.897 | -33.687 | 41.302 | 144.649 | 0.499 |
| 4400.000 | 2.127 | 121.973 | 4399.404 | -36.041 | 27.276 | -36.041 | 45.199 | 142.881 | 0.519 |
| 4500.000 | 2.011 | 118.989 | 4499.338 | -37.874 | 30.385 | -37.874 | 48.557 | 141.261 | 0.158 |
| 4600.000 | 2.069 | 127.191 | 4599.275 | -39.816 | 33.358 | -39.816 | 51.943 | 140.043 | 0.297 |
| 4700.000 | 2.633 | 125.341 | 4699.191 | -42.235 | 36.669 | -42.235 | 55.932 | 139.035 | 0.569 |
| 4800.000 | 2.575 | 124.882 | 4799.088 | -44.848 | 40.385 | -44.848 | 60.351 | 137.997 | 0.061 |
| 4900.000 | 2.203 | 119.988 | 4899.001 | -47.093 | 43.892 | -47.093 | 64.376 | 137.015 | 0.424 |
| 5000.000 | 1.671 | 115.259 | 4998.943 | -48.676 | 46.875 | -48.676 | 67.577 | 136.079 | 0.555 |
| 5100.000 | 1.074 | 119.187 | 5098.914 | -49.755 | 49.012 | -49.755 | 69.841 | 135.431 | 0.604 |
| 5200.000 | 0.462 | 79.085 | 5198.905 | -50.136 | 50.226 | -50.136 | 70.966 | 134.949 | 0.780 |
| 5300.000 | 0.377 | 62.961 | 5298.903 | -49.910 | 50.914 | -49.910 | 71.297 | 134.429 | 0.145 |
| 5400.000 | 0.556 | 10.532 | 5398.900 | -49.283 | 51.295 | -49.283 | 71.134 | 133.854 | 0.443 |
| 5500.000 | 0.899 | 344.701 | 5498.892 | -48.049 | 51.177 | -48.049 | 70.199 | 133.194 | 0.466 |
| 5600.000 | 1.053 | 341.089 | 5598.877 | -46.423 | 50.672 | -46.423 | 68.723 | 132.494 | 0.166 |
| 5700.000 | 0.402 | 326.205 | 5698.869 | -45.262 | 50.179 | -45.262 | 67.577 | 132.051 | 0.673 |
| 5800.000 | 0.292 | 97.468 | 5798.868 | -45.004 | 50.237 | -45.004 | 67.447 | 131.855 | 0.634 |
| 5900.000 | 0.673 | 116.081 | 5898.864 | -45.295 | 51.018 | -45.295 | 68.224 | 131.600 | 0.407 |
| 6000.000 | 0.812 | 101.165 | 5998.856 | -45.691 | 52.240 | -45.691 | 69.403 | 131.174 | 0.237 |
| 6100.000 | 0.996 | 127.279 | 6098.844 | -46.355 | 53.627 | -46.355 | 70.884 | 130.840 | 0.446 |
| 6200.000 | 0.858 | 118.153 | 6198.831 | -47.234 | 54.979 | -47.234 | 72.483 | 130.667 | 0.201 |
| 6300.000 | 0.576 | 99.022 | 6298.823 | -47.667 | 56.136 | -47.667 | 73.644 | 130.335 | 0.367 |
| 6400.000 | 0.734 | 124.075 | 6398.816 | -48.104 | 57.163 | -48.104 | 74.710 | 130.082 | 0.323 |
| 6500.000 | 0.718 | 98.476 | 6498.809 | -48.556 | 58.313 | -48.556 | 75.882 | 129.783 | 0.322 |
| 6600.000 | 0.609 | 121.708 | 6598.802 | -48.927 | 59.385 | -48.927 | 76.944 | 129.485 | 0.288 |
| 6700.000 | 0.288 | 91.024 | 6698.799 | -49.211 | 60.088 | -49.211 | 77.668 | 129.317 | 0.390 |
| 6800.000 | 0.297 | 125.774 | 6798.798 | -49.367 | 60.550 | -49.367 | 78.125 | 129.191 | 0.175 |
| 6900.000 | 0.496 | 119.269 | 6898.795 | -49.731 | 61.139 | -49.731 | 78.810 | 129.125 | 0.204 |
| 7000.000 | 0.132 | 346.984 | 6998.794 | -49.830 | 61.491 | -49.830 | 79.146 | 129.020 | 0.593 |
| <div> <div>HORIZONTAL DISPLACEMENT IS</div> <div>79.146 FEET AT 129.020 DEGREES</div> </div> | | | | | | | | | |