



Company: Noble Energy
Rig: Production/Coretech
API # 05-123-13128
Date: 10/14/13
Surveyor: Levi Sheldon
VS: 0.000
Lat : 40.339
Long: -104.619

Well: Muirhead 01-03
Location: Weld County, Colorado
North Reference: GRID
Convergence: GRID North is 0.570 Degrees East
Declination: 8.47
Depth Reference: Ground Level
Elevation: 4,737 Feet
Total Depth as Drilled: 7,160 Feet

Lat & Long obtained by handheld GPS at wellhead

MS Gyro Survey Calculations

| Depth | Inc | AzG | N/-S | E/-W | TVD | DL | VS | CD | Cbrg |
|----------|-------|---------|--------|---------|----------|-------|--------|--------|---------|
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | **** | 0.000 | 0.000 | 0.000 |
| 100.000 | 0.223 | 150.002 | -0.168 | 0.097 | 100.000 | 0.223 | -0.168 | 0.194 | 150.002 |
| 200.000 | 0.392 | 148.505 | -0.629 | 0.373 | 199.998 | 0.170 | -0.629 | 0.731 | 149.301 |
| 300.000 | 0.381 | 287.577 | -0.820 | 0.235 | 299.997 | 0.724 | -0.820 | 0.853 | 163.986 |
| 400.000 | 0.070 | 203.353 | -0.776 | -0.106 | 399.997 | 0.380 | -0.776 | 0.783 | 187.747 |
| 500.000 | 0.238 | 302.366 | -0.721 | -0.306 | 499.996 | 0.259 | -0.721 | 0.783 | 202.972 |
| 600.000 | 0.800 | 264.503 | -0.677 | -1.176 | 599.992 | 0.629 | -0.677 | 1.357 | 240.089 |
| 700.000 | 0.764 | 250.484 | -0.966 | -2.500 | 699.983 | 0.194 | -0.966 | 2.680 | 248.864 |
| 800.000 | 0.450 | 190.762 | -1.575 | -3.201 | 799.978 | 0.663 | -1.575 | 3.568 | 243.804 |
| 900.000 | 0.210 | 260.960 | -1.990 | -3.456 | 899.976 | 0.427 | -1.990 | 3.988 | 240.070 |
| 1000.000 | 0.176 | 216.715 | -2.141 | -3.729 | 999.976 | 0.149 | -2.141 | 4.300 | 240.133 |
| 1100.000 | 0.841 | 257.568 | -2.422 | -4.537 | 1099.972 | 0.718 | -2.422 | 5.143 | 241.905 |
| 1200.000 | 0.768 | 265.604 | -2.632 | -5.922 | 1199.962 | 0.134 | -2.632 | 6.481 | 246.042 |
| 1300.000 | 0.779 | 275.542 | -2.617 | -7.267 | 1299.953 | 0.135 | -2.617 | 7.724 | 250.194 |
| 1400.000 | 0.510 | 222.902 | -2.878 | -8.247 | 1399.947 | 0.621 | -2.878 | 8.735 | 250.765 |
| 1500.000 | 0.680 | 288.516 | -3.015 | -9.113 | 1499.943 | 0.661 | -3.015 | 9.599 | 251.692 |
| 1600.000 | 0.274 | 237.212 | -2.956 | -9.878 | 1599.939 | 0.552 | -2.956 | 10.310 | 253.338 |
| 1700.000 | 0.405 | 305.658 | -2.880 | -10.366 | 1699.938 | 0.397 | -2.880 | 10.759 | 254.475 |
| 1800.000 | 0.783 | 305.340 | -2.278 | -11.211 | 1799.932 | 0.378 | -2.278 | 11.440 | 258.513 |
| 1900.000 | 0.689 | 321.388 | -1.413 | -12.144 | 1899.924 | 0.226 | -1.413 | 12.226 | 263.364 |
| 2000.000 | 1.038 | 312.766 | -0.328 | -13.184 | 1999.913 | 0.371 | -0.328 | 13.188 | 268.575 |
| 2100.000 | 0.874 | 291.733 | 0.569 | -14.557 | 2099.899 | 0.384 | 0.569 | 14.568 | 272.240 |
| 2200.000 | 0.737 | 306.568 | 1.235 | -15.783 | 2199.889 | 0.248 | 1.235 | 15.831 | 274.475 |
| 2300.000 | 1.333 | 316.706 | 2.465 | -17.097 | 2299.873 | 0.621 | 2.465 | 17.274 | 278.205 |
| 2400.000 | 1.001 | 298.112 | 3.724 | -18.665 | 2399.852 | 0.500 | 3.724 | 19.033 | 281.282 |
| 2500.000 | 0.548 | 284.567 | 4.256 | -19.899 | 2499.843 | 0.486 | 4.256 | 20.349 | 282.071 |
| 2600.000 | 0.894 | 299.738 | 4.763 | -21.038 | 2599.835 | 0.392 | 4.763 | 21.571 | 282.755 |
| 2700.000 | 0.611 | 274.149 | 5.188 | -22.247 | 2699.826 | 0.433 | 5.188 | 22.844 | 283.127 |
| 2800.000 | 0.761 | 296.743 | 5.525 | -23.371 | 2799.819 | 0.307 | 5.525 | 24.016 | 283.301 |
| 2900.000 | 0.782 | 320.074 | 6.347 | -24.402 | 2899.810 | 0.313 | 6.347 | 25.214 | 284.580 |
| 3000.000 | 0.238 | 7.465 | 7.076 | -24.813 | 2999.806 | 0.645 | 7.076 | 25.803 | 285.917 |
| 3100.000 | 0.025 | 89.051 | 7.282 | -24.765 | 3099.806 | 0.235 | 7.282 | 25.813 | 286.387 |
| 3200.000 | 0.072 | 30.009 | 7.337 | -24.711 | 3199.806 | 0.063 | 7.337 | 25.778 | 286.537 |
| 3300.000 | 0.516 | 345.325 | 7.828 | -24.794 | 3299.805 | 0.468 | 7.828 | 26.000 | 287.521 |
| 3400.000 | 0.127 | 279.236 | 8.281 | -25.017 | 3399.803 | 0.479 | 8.281 | 26.352 | 288.316 |
| 3500.000 | 0.779 | 263.923 | 8.227 | -25.802 | 3499.799 | 0.657 | 8.227 | 27.082 | 287.685 |

| | | | | | | | | | |
|----------|-------|---------|--------|---------|----------|-------|--------|--------|---------|
| 3600.000 | 0.765 | 266.000 | 8.109 | -27.143 | 3599.790 | 0.031 | 8.109 | 28.329 | 286.633 |
| 3700.000 | 0.286 | 333.531 | 8.285 | -27.920 | 3699.787 | 0.707 | 8.285 | 29.123 | 286.528 |
| 3800.000 | 0.475 | 311.015 | 8.780 | -28.344 | 3799.784 | 0.238 | 8.780 | 29.673 | 287.212 |
| 3900.000 | 0.031 | 134.973 | 9.034 | -28.638 | 3899.783 | 0.506 | 9.034 | 30.029 | 287.507 |
| 4000.000 | 0.406 | 10.376 | 9.363 | -28.555 | 3999.782 | 0.424 | 9.363 | 30.051 | 288.154 |
| 4100.000 | 0.473 | 8.368 | 10.120 | -28.431 | 4099.780 | 0.069 | 10.120 | 30.179 | 289.594 |
| 4200.000 | 0.591 | 21.982 | 11.007 | -28.178 | 4199.775 | 0.172 | 11.007 | 30.251 | 291.337 |
| 4300.000 | 0.125 | 320.471 | 11.569 | -28.055 | 4299.773 | 0.542 | 11.569 | 30.347 | 292.411 |
| 4400.000 | 0.328 | 86.613 | 11.671 | -27.839 | 4399.773 | 0.414 | 11.671 | 30.186 | 292.745 |
| 4500.000 | 0.510 | 68.341 | 11.852 | -27.139 | 4499.770 | 0.224 | 11.852 | 29.615 | 293.591 |
| 4600.000 | 0.634 | 182.904 | 11.464 | -26.754 | 4599.767 | 0.965 | 11.464 | 29.106 | 293.194 |
| 4700.000 | 0.340 | 242.397 | 10.774 | -27.045 | 4699.764 | 0.547 | 10.774 | 29.111 | 291.721 |
| 4800.000 | 0.537 | 93.670 | 10.606 | -26.840 | 4799.763 | 0.845 | 10.606 | 28.860 | 291.562 |
| 4900.000 | 0.584 | 109.303 | 10.408 | -25.892 | 4899.758 | 0.159 | 10.408 | 27.905 | 291.899 |
| 5000.000 | 0.121 | 231.984 | 10.175 | -25.494 | 4999.757 | 0.657 | 10.175 | 27.449 | 291.757 |
| 5100.000 | 0.496 | 86.972 | 10.133 | -25.144 | 5099.755 | 0.599 | 10.133 | 27.109 | 291.948 |
| 5200.000 | 0.507 | 62.515 | 10.360 | -24.320 | 5199.752 | 0.213 | 10.360 | 26.434 | 293.073 |
| 5300.000 | 0.286 | 109.033 | 10.482 | -23.692 | 5299.750 | 0.373 | 10.482 | 25.907 | 293.867 |
| 5400.000 | 0.378 | 91.421 | 10.393 | -23.127 | 5399.748 | 0.136 | 10.393 | 25.355 | 294.199 |
| 5500.000 | 0.143 | 175.438 | 10.260 | -22.787 | 5499.747 | 0.390 | 10.260 | 24.991 | 294.239 |
| 5600.000 | 0.445 | 39.175 | 10.436 | -22.532 | 5599.746 | 0.557 | 10.436 | 24.832 | 294.852 |
| 5700.000 | 0.238 | 137.243 | 10.584 | -22.146 | 5699.745 | 0.533 | 10.584 | 24.545 | 295.545 |
| 5800.000 | 0.489 | 50.747 | 10.702 | -21.674 | 5799.743 | 0.531 | 10.702 | 24.172 | 296.279 |
| 5900.000 | 0.052 | 272.074 | 10.974 | -21.389 | 5899.742 | 0.530 | 10.974 | 24.040 | 297.160 |
| 6000.000 | 0.850 | 45.634 | 11.494 | -20.905 | 5999.739 | 0.887 | 11.494 | 23.856 | 298.804 |
| 6100.000 | 0.424 | 81.432 | 12.068 | -20.009 | 6099.733 | 0.563 | 12.068 | 23.366 | 301.095 |
| 6200.000 | 0.754 | 89.441 | 12.129 | -18.985 | 6199.727 | 0.339 | 12.129 | 22.529 | 302.574 |
| 6300.000 | 0.758 | 86.244 | 12.179 | -17.667 | 6299.719 | 0.042 | 12.179 | 21.458 | 304.581 |
| 6400.000 | 0.736 | 107.725 | 12.027 | -16.395 | 6399.710 | 0.279 | 12.027 | 20.333 | 306.262 |
| 6500.000 | 0.640 | 75.480 | 11.971 | -15.243 | 6499.703 | 0.393 | 11.971 | 19.382 | 308.145 |
| 6600.000 | 0.747 | 164.158 | 11.484 | -14.525 | 6599.698 | 0.972 | 11.484 | 18.516 | 308.332 |
| 6700.000 | 1.054 | 118.719 | 10.415 | -13.540 | 6699.687 | 0.751 | 10.415 | 17.082 | 307.568 |
| 6800.000 | 0.637 | 173.374 | 9.421 | -12.670 | 6799.678 | 0.860 | 9.421 | 15.789 | 306.636 |
| 6900.000 | 1.251 | 124.386 | 8.253 | -11.704 | 6899.665 | 0.962 | 8.253 | 14.322 | 305.188 |

of True North