Company: Noble Energy
Well: Alles 3
API: 05-123-12246
Rig Name: Production/Lightning
Location: Weld County, Colorado
Latitude: 40.358, Longitude: -104.670
GRID North is 0.540 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: msgyro_run02-01-de_01.ut
Minimum Curvature Method
Report Date/Time: 2/5/2013 / 10:26

Vaughn Energy Services
Henderson, CO.
Justin Williams
303-853-4976
RKB = Ground Level

| 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 | 0.641 | 281.407 | 99.998 | 0.111 | -0.549 | 0.111 | 0.560 | 281.407 | 0.641 |
| 200.000 | 0.221 | 358.268 | 199.995 | 0.414 | -1.103 | 0.414 | 1.178 | 290.577 | 0.629 |
| 300.000 | 0.471 | 229.539 | 299.994 | 0.340 | -1.422 | 0.340 | 1.462 | 283.444 | 0.634 |
| 400.000 | 0.458 | 291.143 | 399.992 | 0.217 | -2.108 | 0.217 | 2.119 | 275.884 | 0.476 |
| 500.000 | 0.163 | 127.970 | 499.991 | 0.274 | -2.369 | 0.274 | 2.385 | 276.593 | 0.617 |
| 600.000 | 0.311 | 42.001 | 599.990 | 0.388 | -2.075 | 0.388 | 2.111 | 280.588 | 0.341 |
| 700.000 | 0.088 | 264.085 | 699.990 | 0.582 | -1.969 | 0.582 | 2.054 | 286.456 | 0.381 |
| 800.000 | 0.588 | 306.588 | 799.988 | 0.880 | -2.458 | 0.880 | 2.611 | 289.693 | 0.527 |
| 900.000 | 0.717 | 289.733 | 899.981 | 1.397 | -3.459 | 1.397 | 3.731 | 291.990 | 0.230 |
| 1000.000 | 0.717 | 280.732 | 999.974 | 1.725 | -4.663 | 1.725 | 4.971 | 290.299 | 0.112 |
| 1100.000 | 0.761 | 313.157 | 1099.966 | 2.295 | -5.762 | 2.295 | 6.202 | 291.723 | 0.415 |
| 1200.000 | 0.675 | 298.871 | 1199.958 | 3.034 | -6.762 | 3.034 | 7.411 | 294.167 | 0.198 |
| 1300.000 | 0.195 | 303.498 | 1299.955 | 3.413 | -7.420 | 3.413 | 8.167 | 294.700 | 0.481 |
| 1400.000 | 0.206 | 349.189 | 1399.954 | 3.683 | -7.595 | 3.683 | 8.441 | 295.870 | 0.156 |
| 1500.000 | 0.407 | 285.181 | 1499.953 | 3.953 | -7.972 | 3.953 | 8.898 | 296.375 | 0.367 |
| 1600.000 | 0.190 | 185.516 | 1599.952 | 3.881 | -8.331 | 3.881 | 9.190 | 294.980 | 0.477 |
| 1700.000 | 0.347 | 125.789 | 1699.951 | 3.539 | -8.101 | 3.539 | 8.840 | 293.599 | 0.300 |
| 1800.000 | 0.678 | 154.515 | 1799.947 | 2.828 | -7.600 | 2.828 | 8.110 | 290.409 | 0.409 |
| 1900.000 | 0.435 | 177.822 | 1899.942 | 1.914 | -7.332 | 1.914 | 7.577 | 284.634 | 0.327 |
| 2000.000 | 0.509 | 181.877 | 1999.939 | 1.091 | -7.332 | 1.091 | 7.412 | 278.462 | 0.081 |
| 2100.000 | 0.498 | 188.770 | 2099.935 | 0.217 | -7.413 | 0.217 | 7.416 | 271.678 | 0.062 |
| 2200.000 | 0.671 | 147.645 | 2199.930 | -0.707 | -7.165 | -0.707 | 7.200 | 264.362 | 0.442 |
| 2300.000 | 0.460 | 148.230 | 2299.925 | -1.544 | -6.640 | -1.544 | 6.817 | 256.914 | 0.212 |
| 2400.000 | 0.664 | 205.108 | 2399.921 | -2.410 | -6.675 | -2.410 | 7.097 | 250.150 | 0.565 |
| 2500.000 | 0.347 | 193.138 | 2499.917 | -3.229 | -6.990 | -3.229 | 7.700 | 245.204 | 0.333 |
| 2600.000 | 0.637 | 146.474 | 2599.914 | -3.987 | -6.751 | -3.987 | 7.841 | 239.434 | 0.472 |
| 2700.000 | 0.802 | 184.157 | 2699.906 | -5.149 | -6.495 | -5.149 | 8.288 | 231.593 | 0.490 |
| 2800.000 | 0.393 | 203.660 | 2799.901 | -6.161 | -6.683 | -6.161 | 9.090 | 227.326 | 0.452 |
| 2900.000 | 0.676 | 185.027 | 2899.896 | -7.063 | -6.872 | -7.063 | 9.855 | 224.216 | 0.329 |
| 3000.000 | 0.022 | 81.677 | 2999.894 | -7.648 | -6.905 | -7.648 | 10.304 | 222.078 | 0.681 |
| 3100.000 | 0.455 | 13.482 | 3099.893 | -7.259 | -6.794 | -7.259 | 9.943 | 223.103 | 0.447 |
| 3200.000 | 0.233 | 32.788 | 3199.891 | -6.703 | -6.591 | -6.703 | 9.401 | 224.521 | 0.248 |
| 3300.000 | 0.246 | 38.174 | 3299.890 | -6.363 | -6.349 | -6.363 | 8.989 | 224.935 | 0.026 |
| 3400.000 | 0.140 | 234.756 | 3399.890 | -6.266 | -6.317 | -6.266 | 8.897 | 225.232 | 0.382 |

| 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 | 0.458 | 199.979 | 3499.889 | -6.712 | -6.553 | -6.712 | 9.381 | 224.314 | 0.352 |
| 3600.000 | 0.587 | 238.795 | 3599.885 | -7.353 | -7.128 | -7.353 | 10.241 | 224.109 | 0.368 |
| 3700.000 | 0.438 | 239.800 | 3699.881 | -7.811 | -7.897 | -7.811 | 11.107 | 225.313 | 0.149 |
| 3800.000 | 0.436 | 215.426 | 3799.878 | -8.314 | -8.448 | -8.314 | 11.853 | 225.459 | 0.185 |
| 3900.000 | 0.719 | 242.636 | 3899.873 | -8.913 | -9.226 | -8.913 | 12.828 | 225.990 | 0.386 |
| 4000.000 | 0.749 | 250.406 | 3999.865 | -9.420 | -10.399 | -9.420 | 14.031 | 227.828 | 0.104 |
| 4100.000 | 0.839 | 238.630 | 4099.855 | -10.020 | -11.640 | -10.020 | 15.359 | 229.276 | 0.186 |
| 4200.000 | 0.536 | 242.513 | 4199.848 | -10.617 | -12.679 | -10.617 | 16.537 | 230.059 | 0.306 |
| 4300.000 | 0.909 | 212.939 | 4299.840 | -11.498 | -13.525 | -11.498 | 17.752 | 229.631 | 0.516 |
| 4400.000 | 0.906 | 243.059 | 4399.828 | -12.522 | -14.661 | -12.522 | 19.280 | 229.500 | 0.471 |
| 4500.000 | 0.621 | 231.028 | 4499.819 | -13.221 | -15.787 | -13.221 | 20.592 | 230.056 | 0.325 |
| 4600.000 | 1.301 | 229.766 | 4599.805 | -14.295 | -17.075 | -14.295 | 22.269 | 230.065 | 0.680 |
| 4700.000 | 1.008 | 241.372 | 4699.784 | -15.450 | -18.714 | -15.450 | 24.268 | 230.458 | 0.374 |
| 4800.000 | 1.430 | 249.770 | 4799.761 | -16.303 | -20.657 | -16.303 | 26.315 | 231.719 | 0.458 |
| 4900.000 | 1.755 | 256.972 | 4899.723 | -17.079 | -23.319 | -17.079 | 28.905 | 233.780 | 0.381 |
| 5000.000 | 1.438 | 247.694 | 4999.684 | -17.901 | -25.972 | -17.901 | 31.543 | 235.424 | 0.407 |
| 5100.000 | 0.919 | 268.257 | 5099.663 | -18.401 | -27.934 | -18.401 | 33.450 | 236.625 | 0.662 |
| 5200.000 | 1.086 | 269.290 | 5199.648 | -18.438 | -29.683 | -18.438 | 34.943 | 238.153 | 0.168 |
| 5300.000 | 0.911 | 265.988 | 5299.632 | -18.505 | -31.423 | -18.505 | 36.467 | 239.506 | 0.184 |
| 5400.000 | 1.208 | 301.309 | 5399.616 | -18.013 | -33.116 | -18.013 | 37.698 | 241.457 | 0.702 |
| 5500.000 | 1.561 | 264.633 | 5499.589 | -17.593 | -35.373 | -17.593 | 39.506 | 243.556 | 0.933 |
| 5600.000 | 2.233 | 247.098 | 5599.534 | -18.478 | -38.524 | -18.478 | 42.726 | 244.375 | 0.881 |
| 5700.000 | 3.089 | 244.870 | 5699.426 | -20.381 | -42.758 | -20.381 | 47.367 | 244.515 | 0.862 |
| 5800.000 | 3.257 | 234.542 | 5799.273 | -23.173 | -47.511 | -23.173 | 52.861 | 244.000 | 0.595 |
| 5900.000 | 2.866 | 238.207 | 5899.130 | -26.138 | -51.950 | -26.138 | 58.155 | 243.291 | 0.436 |
| 6000.000 | 2.176 | 244.487 | 5999.033 | -28.273 | -55.789 | -28.273 | 62.544 | 243.124 | 0.743 |
| 6100.000 | 1.521 | 263.761 | 6098.981 | -29.235 | -58.821 | -29.235 | 65.686 | 243.572 | 0.894 |
| 6200.000 | 0.970 | 274.562 | 6198.957 | -29.312 | -60.984 | -29.312 | 67.663 | 244.329 | 0.596 |
| 6300.000 | 0.927 | 301.238 | 6298.944 | -28.825 | -62.520 | -28.825 | 68.845 | 245.248 | 0.440 |
| 6400.000 | 0.506 | 10.005 | 6398.938 | -27.971 | -63.135 | -27.971 | 69.054 | 246.105 | 0.880 |
| 6500.000 | 0.309 | 43.472 | 6498.935 | -27.341 | -62.872 | -27.341 | 68.560 | 246.498 | 0.301 |
| 6600.000 | 0.601 | 83.236 | 6598.932 | -27.083 | -62.166 | -27.083 | 67.809 | 246.459 | 0.414 |
| 6700.000 | 0.895 | 101.944 | 6698.924 | -27.183 | -60.880 | -27.183 | 66.673 | 245.939 | 0.379 |
| 6800.000 | 1.308 | 130.224 | 6798.906 | -28.082 | -59.244 | -28.082 | 65.563 | 244.639 | 0.671 |
| 6900.000 | 1.404 | 117.622 | 6898.878 | -29.387 | -57.287 | -29.387 | 64.385 | 242.843 | 0.313 |
| 7000.000 | 1.454 | 141.168 | 6998.848 | -30.944 | -55.406 | -30.944 | 63.461 | 240.817 | 0.585 |

**HORIZONTAL DISPLACEMENT IS**
**63.461 FEET AT 240.817 DEGREES**