



COMPANY/RIG: Noble Energy/Production/CoreTech  
 WELL/API: Herbster F 35-27/05-123-30703  
 DECLINATION: 8.22 Degrees  
 TD AS DRILLED: 7160 Feet  
 COUNTY/STATE: Weld/Colorado  
 VS-Azi: 0.000 Degrees  
 Latitude: 40.36411, Longitude: -104.62632  
 Grid North = True North -0.56 degs (NAD 27)  
 Grid Correction Applied = -0.56 degs



DEPTH REFERENCE : RKB = GL Elevation = 4650

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyrosurvey.ut  
 Minimum Curvature Method  
 Report Date/Time: 8/2/2016 / 09:05

LAT & LONG OBTAINED BY HANDHELD GPS AT WELLHEAD

NORTH REFERENCE: GRID  
 HENDERSON, COLORADO  
 303-853-4976

Surveyor: JUSTIN WILLIAMS / Herbster F 35-27

| 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           | 0.271          | 0.274               | 100.000  | 0.236    | 0.001    | 0.236               | 0.236               | 0.274                 | 0.271                   |
| 200.000           | 0.198          | 9.970               | 199.999  | 0.643    | 0.032    | 0.643               | 0.644               | 2.865                 | 0.083                   |
| 300.000           | 0.233          | 351.653             | 299.998  | 1.015    | 0.033    | 1.015               | 1.015               | 1.840                 | 0.077                   |
| 400.000           | 0.232          | 340.577             | 399.997  | 1.407    | -0.064   | 1.407               | 1.408               | 357.383               | 0.045                   |
| 500.000           | 0.227          | 352.420             | 499.996  | 1.794    | -0.158   | 1.794               | 1.801               | 354.973               | 0.048                   |
| 600.000           | 0.237          | 13.807              | 599.996  | 2.192    | -0.135   | 2.192               | 2.196               | 356.484               | 0.087                   |
| 700.000           | 0.107          | 344.036             | 699.995  | 2.482    | -0.111   | 2.482               | 2.485               | 357.439               | 0.153                   |
| 800.000           | 0.177          | 21.090              | 799.995  | 2.716    | -0.081   | 2.716               | 2.717               | 358.289               | 0.112                   |
| 900.000           | 0.142          | 12.061              | 899.995  | 2.982    | 0.000    | 2.982               | 2.982               | 0.008                 | 0.043                   |
| 1000.000          | 0.084          | 143.800             | 999.994  | 3.044    | 0.069    | 3.044               | 3.045               | 1.306                 | 0.208                   |
| 1100.000          | 0.159          | 190.323             | 1099.994 | 2.849    | 0.088    | 2.849               | 2.850               | 1.761                 | 0.118                   |
| 1200.000          | 0.159          | 212.075             | 1199.994 | 2.595    | -0.011   | 2.595               | 2.595               | 359.761               | 0.060                   |
| 1300.000          | 0.189          | 215.817             | 1299.993 | 2.344    | -0.181   | 2.344               | 2.351               | 355.584               | 0.033                   |
| 1400.000          | 0.213          | 217.401             | 1399.993 | 2.062    | -0.390   | 2.062               | 2.099               | 349.282               | 0.024                   |
| 1500.000          | 0.375          | 200.146             | 1499.991 | 1.608    | -0.616   | 1.608               | 1.722               | 339.047               | 0.183                   |
| 1600.000          | 0.369          | 229.421             | 1599.989 | 1.091    | -0.973   | 1.091               | 1.462               | 318.275               | 0.188                   |

| Measured<br>Depth<br>FT | Incl<br>Angle<br>Deg | Drift<br>Direction<br>Deg | TVD<br>FT | +N/-S<br>FT | +E/-W<br>FT | Vertical<br>Section<br>FT | Closure<br>Distance<br>FT | Closure<br>Direction<br>Deg | Dogleg<br>Severity<br>Deg/100 |
|-------------------------|----------------------|---------------------------|-----------|-------------|-------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 1700.000                | 0.540                | 273.949                   | 1699.987  | 0.914       | -1.688      | 0.914                     | 1.920                     | 298.433                     | 0.379                         |
| 1800.000                | 0.515                | 285.195                   | 1799.982  | 1.064       | -2.592      | 1.064                     | 2.802                     | 292.322                     | 0.106                         |
| 1900.000                | 0.158                | 327.263                   | 1899.981  | 1.298       | -3.101      | 1.298                     | 3.361                     | 292.718                     | 0.412                         |
| 2000.000                | 0.193                | 41.921                    | 1999.980  | 1.540       | -3.062      | 1.540                     | 3.428                     | 296.689                     | 0.215                         |
| 2100.000                | 0.471                | 49.363                    | 2099.978  | 1.933       | -2.638      | 1.933                     | 3.270                     | 306.232                     | 0.281                         |
| 2200.000                | 0.558                | 52.020                    | 2199.974  | 2.500       | -1.942      | 2.500                     | 3.166                     | 322.159                     | 0.089                         |
| 2300.000                | 0.858                | 61.270                    | 2299.967  | 3.159       | -0.902      | 3.159                     | 3.286                     | 344.061                     | 0.320                         |
| 2400.000                | 0.827                | 59.512                    | 2399.956  | 3.885       | 0.376       | 3.885                     | 3.904                     | 5.530                       | 0.040                         |
| 2500.000                | 1.236                | 78.202                    | 2499.940  | 4.472       | 2.054       | 4.472                     | 4.921                     | 24.672                      | 0.525                         |
| 2600.000                | 1.164                | 81.026                    | 2599.918  | 4.851       | 4.114       | 4.851                     | 6.361                     | 40.298                      | 0.093                         |
| 2700.000                | 1.092                | 88.058                    | 2699.898  | 5.042       | 6.069       | 5.042                     | 7.890                     | 50.282                      | 0.156                         |
| 2800.000                | 0.865                | 87.907                    | 2799.884  | 5.102       | 7.776       | 5.102                     | 9.300                     | 56.730                      | 0.226                         |
| 2900.000                | 0.845                | 94.282                    | 2899.873  | 5.074       | 9.266       | 5.074                     | 10.564                    | 61.293                      | 0.097                         |
| 3000.000                | 0.807                | 101.692                   | 2999.862  | 4.877       | 10.691      | 4.877                     | 11.751                    | 65.481                      | 0.113                         |
| 3100.000                | 1.198                | 114.068                   | 3099.847  | 4.307       | 12.336      | 4.307                     | 13.066                    | 70.752                      | 0.445                         |
| 3200.000                | 2.005                | 106.795                   | 3199.807  | 3.375       | 14.965      | 3.375                     | 15.341                    | 77.290                      | 0.831                         |
| 3300.000                | 1.309                | 98.022                    | 3299.765  | 2.710       | 17.771      | 2.710                     | 17.977                    | 81.328                      | 0.739                         |
| 3400.000                | 1.134                | 82.640                    | 3399.742  | 2.678       | 19.884      | 2.678                     | 20.064                    | 82.330                      | 0.370                         |
| 3500.000                | 1.237                | 55.585                    | 3499.722  | 3.414       | 21.756      | 3.414                     | 22.023                    | 81.081                      | 0.563                         |
| 3600.000                | 1.474                | 38.282                    | 3599.694  | 5.034       | 23.443      | 5.034                     | 23.977                    | 77.881                      | 0.470                         |
| 3700.000                | 1.599                | 28.898                    | 3699.658  | 7.265       | 24.914      | 7.265                     | 25.951                    | 73.744                      | 0.280                         |
| 3800.000                | 1.773                | 35.279                    | 3799.615  | 9.749       | 26.482      | 9.749                     | 28.219                    | 69.790                      | 0.256                         |
| 3900.000                | 1.953                | 54.157                    | 3899.563  | 12.009      | 28.756      | 12.009                    | 31.163                    | 67.333                      | 0.636                         |
| 4000.000                | 1.950                | 75.900                    | 3999.506  | 13.422      | 31.788      | 13.422                    | 34.506                    | 67.109                      | 0.736                         |
| 4100.000                | 2.283                | 90.828                    | 4099.439  | 13.808      | 35.430      | 13.808                    | 38.026                    | 68.708                      | 0.641                         |
| 4200.000                | 2.448                | 100.011                   | 4199.354  | 13.408      | 39.525      | 13.408                    | 41.737                    | 71.262                      | 0.413                         |
| 4300.000                | 2.418                | 101.551                   | 4299.264  | 12.614      | 43.695      | 12.614                    | 45.480                    | 73.898                      | 0.072                         |
| 4400.000                | 2.182                | 105.940                   | 4399.183  | 11.668      | 47.593      | 11.668                    | 49.003                    | 76.224                      | 0.294                         |
| 4500.000                | 2.000                | 112.106                   | 4499.117  | 10.489      | 51.041      | 10.489                    | 52.108                    | 78.388                      | 0.289                         |
| 4600.000                | 1.494                | 130.613                   | 4599.071  | 8.983       | 53.648      | 8.983                     | 54.395                    | 80.494                      | 0.752                         |
| 4700.000                | 2.043                | 144.194                   | 4699.023  | 6.688       | 55.681      | 6.688                     | 56.081                    | 83.150                      | 0.687                         |
| 4800.000                | 2.565                | 150.418                   | 4798.942  | 3.297       | 57.829      | 3.297                     | 57.922                    | 86.737                      | 0.578                         |
| 4900.000                | 2.641                | 151.334                   | 4898.839  | -0.671      | 60.038      | -0.671                    | 60.042                    | 90.640                      | 0.087                         |
| 5000.000                | 2.621                | 151.691                   | 4998.733  | -4.705      | 62.228      | -4.705                    | 62.406                    | 94.324                      | 0.026                         |
| 5100.000                | 2.369                | 160.719                   | 5098.639  | -8.669      | 63.994      | -8.669                    | 64.579                    | 97.714                      | 0.466                         |
| 5200.000                | 1.963                | 155.659                   | 5198.567  | -12.179     | 65.383      | -12.179                   | 66.507                    | 100.552                     | 0.448                         |
| 5300.000                | 1.578                | 149.745                   | 5298.520  | -14.929     | 66.782      | -14.929                   | 68.431                    | 102.601                     | 0.425                         |
| 5400.000                | 1.390                | 149.773                   | 5398.486  | -17.167     | 68.087      | -17.167                   | 70.217                    | 104.151                     | 0.188                         |
| 5500.000                | 1.453                | 148.299                   | 5498.455  | -19.294     | 69.364      | -19.294                   | 71.997                    | 105.544                     | 0.073                         |

| Measured<br>Depth<br>FT | Incl<br>Angle<br>Deg | Drift<br>Direction<br>Deg | TVD<br>FT | +N/-S<br>FT | +E/-W<br>FT | Vertical<br>Section<br>FT | Closure<br>Distance<br>FT | Closure<br>Direction<br>Deg | Dogleg<br>Severity<br>Deg/100 |
|-------------------------|----------------------|---------------------------|-----------|-------------|-------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 5600.000                | 1.322                | 148.377                   | 5598.426  | -21.355     | 70.635      | -21.355                   | 73.792                    | 106.821                     | 0.131                         |
| 5700.000                | 1.081                | 147.882                   | 5698.404  | -23.136     | 71.741      | -23.136                   | 75.380                    | 107.874                     | 0.241                         |
| 5800.000                | 1.109                | 146.853                   | 5798.385  | -24.745     | 72.772      | -24.745                   | 76.864                    | 108.780                     | 0.034                         |
| 5900.000                | 1.210                | 154.097                   | 5898.365  | -26.506     | 73.762      | -26.506                   | 78.380                    | 109.765                     | 0.178                         |
| 6000.000                | 1.320                | 151.933                   | 5998.341  | -28.472     | 74.766      | -28.472                   | 80.004                    | 110.848                     | 0.120                         |
| 6100.000                | 1.469                | 159.803                   | 6098.311  | -30.692     | 75.750      | -30.692                   | 81.732                    | 112.056                     | 0.242                         |
| 6200.000                | 1.850                | 155.672                   | 6198.269  | -33.365     | 76.858      | -33.365                   | 83.788                    | 113.466                     | 0.399                         |
| 6300.000                | 1.894                | 155.824                   | 6298.216  | -36.343     | 78.200      | -36.343                   | 86.232                    | 114.927                     | 0.044                         |
| 6400.000                | 2.053                | 157.963                   | 6398.156  | -39.512     | 79.548      | -39.512                   | 88.821                    | 116.413                     | 0.175                         |
| 6500.000                | 2.018                | 152.968                   | 6498.093  | -42.740     | 81.021      | -42.740                   | 91.603                    | 117.813                     | 0.181                         |
| 6600.000                | 2.208                | 154.696                   | 6598.025  | -46.050     | 82.644      | -46.050                   | 94.608                    | 119.127                     | 0.200                         |
| 6700.000                | 2.231                | 151.298                   | 6697.950  | -49.498     | 84.402      | -49.498                   | 97.846                    | 120.390                     | 0.134                         |
| 6800.000                | 2.213                | 149.040                   | 6797.875  | -52.861     | 86.330      | -52.861                   | 101.228                   | 121.480                     | 0.089                         |
| 6900.000                | 2.405                | 155.609                   | 6897.794  | -56.428     | 88.190      | -56.428                   | 104.697                   | 122.613                     | 0.327                         |