



COMPANY/RIG: Noble Energy/Production/CoreTech  
WELL/API: Klein B19-19/05-123-24370  
DECLINATION: 8.17 Degrees  
TD AS DRILLED: 7038 Feet  
COUNTY/STATE: Weld/Colorado  
VS-Azi: 0.000 Degrees  
Latitude: 40.38826, Longitude: -104.59717  
Grid North = True North -0.58 degs (NAD 27)  
Grid Correction Applied = -0.58 degs



DEPTH REFERENCE : RKB = GL Elevation = 4623

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyrosurvey.ut

Minimum Curvature Method

Report Date/Time: 12/27/2016 / 15:31

LAT & LONG OBTAINED BY HANDHELD GPS AT WELLHEAD

NORTH REFERENCE: GRID

HENDERSON, COLORADO

303-853-4976

Surveyor: JUSTIN WILLIAMS / Klein B 19-19

| 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 |
|-------------------------|----------------------|---------------------------|-----------|-------------|-------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 0.000                   | 0.000                | 0.000                     | 0.000     | 0.000       | 0.000       | 0.000                     | 0.000                     | 0.000                       | ****                          |
| 100.000                 | 0.094                | 253.903                   | 100.000   | -0.023      | -0.079      | -0.023                    | 0.082                     | 253.903                     | 0.094                         |
| 200.000                 | 0.083                | 222.592                   | 200.000   | -0.099      | -0.207      | -0.099                    | 0.230                     | 244.433                     | 0.049                         |
| 300.000                 | 0.042                | 180.686                   | 300.000   | -0.190      | -0.257      | -0.190                    | 0.319                     | 233.571                     | 0.059                         |
| 400.000                 | 0.040                | 75.534                    | 400.000   | -0.218      | -0.224      | -0.218                    | 0.313                     | 225.782                     | 0.065                         |
| 500.000                 | 0.073                | 302.659                   | 500.000   | -0.175      | -0.244      | -0.175                    | 0.300                     | 234.307                     | 0.104                         |
| 600.000                 | 0.078                | 213.329                   | 600.000   | -0.198      | -0.334      | -0.198                    | 0.388                     | 239.420                     | 0.106                         |
| 700.000                 | 0.042                | 242.716                   | 700.000   | -0.271      | -0.404      | -0.271                    | 0.486                     | 236.156                     | 0.046                         |
| 800.000                 | 0.088                | 274.288                   | 800.000   | -0.282      | -0.513      | -0.282                    | 0.585                     | 241.230                     | 0.057                         |
| 900.000                 | 0.156                | 269.859                   | 899.999   | -0.276      | -0.726      | -0.276                    | 0.777                     | 249.177                     | 0.069                         |
| 1000.000                | 0.064                | 280.750                   | 999.999   | -0.266      | -0.918      | -0.266                    | 0.955                     | 253.832                     | 0.094                         |
| 1100.000                | 0.013                | 349.255                   | 1099.999  | -0.244      | -0.975      | -0.244                    | 1.005                     | 255.928                     | 0.061                         |
| 1200.000                | 0.117                | 76.651                    | 1199.999  | -0.210      | -0.878      | -0.210                    | 0.903                     | 256.568                     | 0.117                         |
| 1300.000                | 0.050                | 60.961                    | 1299.999  | -0.165      | -0.741      | -0.165                    | 0.759                     | 257.441                     | 0.070                         |
| 1400.000                | 0.060                | 69.479                    | 1399.999  | -0.126      | -0.654      | -0.126                    | 0.666                     | 259.127                     | 0.013                         |
| 1500.000                | 0.114                | 69.260                    | 1499.999  | -0.072      | -0.512      | -0.072                    | 0.517                     | 261.980                     | 0.054                         |
| 1600.000                | 0.108                | 83.743                    | 1599.999  | -0.027      | -0.326      | -0.027                    | 0.327                     | 265.296                     | 0.028                         |

| 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                | 0.238                | 74.329                    | 1699.998  | 0.039       | -0.033      | 0.039                     | 0.051                     | 320.270                     | 0.133                         |
| 1800.000                | 0.437                | 59.764                    | 1799.996  | 0.288       | 0.497       | 0.288                     | 0.574                     | 59.921                      | 0.215                         |
| 1900.000                | 0.497                | 70.131                    | 1899.993  | 0.627       | 1.234       | 0.627                     | 1.384                     | 63.060                      | 0.103                         |
| 2000.000                | 0.632                | 71.383                    | 1999.988  | 0.951       | 2.164       | 0.951                     | 2.364                     | 66.289                      | 0.136                         |
| 2100.000                | 0.540                | 78.290                    | 2099.983  | 1.222       | 3.148       | 1.222                     | 3.377                     | 68.782                      | 0.116                         |
| 2200.000                | 0.376                | 66.657                    | 2199.980  | 1.448       | 3.910       | 1.448                     | 4.170                     | 69.683                      | 0.187                         |
| 2300.000                | 0.395                | 58.347                    | 2299.977  | 1.759       | 4.505       | 1.759                     | 4.836                     | 68.676                      | 0.059                         |
| 2400.000                | 0.560                | 27.719                    | 2399.974  | 2.372       | 5.025       | 2.372                     | 5.557                     | 64.735                      | 0.298                         |
| 2500.000                | 0.798                | 22.254                    | 2499.967  | 3.449       | 5.516       | 3.449                     | 6.505                     | 57.987                      | 0.247                         |
| 2600.000                | 1.029                | 16.360                    | 2599.954  | 4.955       | 6.033       | 4.955                     | 7.807                     | 50.603                      | 0.249                         |
| 2700.000                | 1.175                | 21.339                    | 2699.936  | 6.772       | 6.659       | 6.772                     | 9.497                     | 44.519                      | 0.175                         |
| 2800.000                | 1.141                | 17.710                    | 2799.915  | 8.675       | 7.335       | 8.675                     | 11.361                    | 40.214                      | 0.081                         |
| 2900.000                | 1.208                | 20.386                    | 2899.894  | 10.612      | 8.005       | 10.612                    | 13.292                    | 37.029                      | 0.086                         |
| 3000.000                | 0.860                | 18.232                    | 2999.878  | 12.312      | 8.607       | 12.312                    | 15.022                    | 34.955                      | 0.350                         |
| 3100.000                | 0.408                | 20.533                    | 3099.872  | 13.358      | 8.966       | 13.358                    | 16.089                    | 33.870                      | 0.452                         |
| 3200.000                | 0.310                | 338.150                   | 3199.870  | 13.943      | 8.991       | 13.943                    | 16.590                    | 32.816                      | 0.275                         |
| 3300.000                | 0.390                | 329.085                   | 3299.868  | 14.485      | 8.715       | 14.485                    | 16.905                    | 31.034                      | 0.097                         |
| 3400.000                | 0.476                | 325.175                   | 3399.865  | 15.118      | 8.303       | 15.118                    | 17.248                    | 28.777                      | 0.091                         |
| 3500.000                | 0.319                | 327.720                   | 3499.863  | 15.694      | 7.918       | 15.694                    | 17.578                    | 26.770                      | 0.158                         |
| 3600.000                | 0.419                | 350.756                   | 3599.861  | 16.291      | 7.710       | 16.291                    | 18.023                    | 25.327                      | 0.177                         |
| 3700.000                | 0.438                | 5.768                     | 3699.858  | 17.032      | 7.690       | 17.032                    | 18.688                    | 24.298                      | 0.113                         |
| 3800.000                | 0.498                | 352.215                   | 3799.854  | 17.843      | 7.669       | 17.843                    | 19.421                    | 23.259                      | 0.126                         |
| 3900.000                | 0.551                | 356.149                   | 3899.850  | 18.753      | 7.578       | 18.753                    | 20.226                    | 22.004                      | 0.064                         |
| 4000.000                | 0.694                | 298.527                   | 3999.845  | 19.522      | 7.014       | 19.522                    | 20.743                    | 19.762                      | 0.613                         |
| 4100.000                | 1.010                | 291.245                   | 4099.834  | 20.130      | 5.660       | 20.130                    | 20.911                    | 15.704                      | 0.333                         |
| 4200.000                | 1.667                | 277.204                   | 4199.807  | 20.632      | 3.395       | 20.632                    | 20.910                    | 9.345                       | 0.730                         |
| 4300.000                | 1.659                | 267.941                   | 4299.765  | 20.763      | 0.505       | 20.763                    | 20.769                    | 1.395                       | 0.269                         |
| 4400.000                | 1.611                | 269.068                   | 4399.724  | 20.688      | -2.347      | 20.688                    | 20.820                    | 353.528                     | 0.058                         |
| 4500.000                | 1.025                | 289.279                   | 4499.697  | 20.960      | -4.597      | 20.960                    | 21.458                    | 347.629                     | 0.739                         |
| 4600.000                | 0.737                | 302.388                   | 4599.686  | 21.600      | -5.985      | 21.600                    | 22.414                    | 344.513                     | 0.350                         |
| 4700.000                | 0.283                | 328.548                   | 4699.682  | 22.156      | -6.657      | 22.156                    | 23.134                    | 343.275                     | 0.499                         |
| 4800.000                | 0.865                | 53.839                    | 4799.677  | 22.812      | -6.177      | 22.812                    | 23.633                    | 344.849                     | 0.888                         |
| 4900.000                | 0.929                | 79.999                    | 4899.665  | 23.398      | -4.770      | 23.398                    | 23.879                    | 348.478                     | 0.411                         |
| 5000.000                | 0.832                | 63.534                    | 4999.654  | 23.862      | -3.321      | 23.862                    | 24.092                    | 352.076                     | 0.270                         |
| 5100.000                | 0.726                | 78.063                    | 5099.645  | 24.317      | -2.051      | 24.317                    | 24.403                    | 355.179                     | 0.223                         |
| 5200.000                | 0.746                | 55.434                    | 5199.637  | 24.818      | -0.895      | 24.818                    | 24.834                    | 357.935                     | 0.290                         |
| 5300.000                | 0.706                | 66.241                    | 5299.629  | 25.435      | 0.205       | 25.435                    | 25.436                    | 0.463                       | 0.142                         |
| 5400.000                | 0.713                | 68.261                    | 5399.621  | 25.914      | 1.348       | 25.914                    | 25.949                    | 2.977                       | 0.026                         |
| 5500.000                | 0.741                | 96.639                    | 5499.613  | 26.070      | 2.568       | 26.070                    | 26.196                    | 5.626                       | 0.357                         |

| 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                | 0.776                | 110.838                   | 5599.604  | 25.754      | 3.843       | 25.754                    | 26.039                    | 8.488                       | 0.191                         |
| 5700.000                | 0.304                | 81.801                    | 5699.600  | 25.551      | 4.739       | 25.551                    | 25.987                    | 10.507                      | 0.531                         |
| 5800.000                | 0.352                | 42.227                    | 5799.598  | 25.816      | 5.208       | 25.816                    | 26.336                    | 11.404                      | 0.227                         |
| 5900.000                | 0.397                | 50.249                    | 5899.596  | 26.265      | 5.680       | 26.265                    | 26.872                    | 12.203                      | 0.069                         |
| 6000.000                | 0.583                | 44.430                    | 5999.593  | 26.850      | 6.303       | 26.850                    | 27.580                    | 13.210                      | 0.193                         |
| 6100.000                | 0.542                | 60.072                    | 6099.588  | 27.449      | 7.069       | 27.449                    | 28.345                    | 14.441                      | 0.159                         |
| 6200.000                | 0.342                | 71.505                    | 6199.585  | 27.780      | 7.761       | 27.780                    | 28.844                    | 15.610                      | 0.217                         |
| 6300.000                | 0.380                | 70.518                    | 6299.583  | 27.985      | 8.357       | 27.985                    | 29.206                    | 16.627                      | 0.039                         |
| 6400.000                | 0.287                | 94.632                    | 6399.581  | 28.076      | 8.920       | 28.076                    | 29.459                    | 17.625                      | 0.167                         |
| 6500.000                | 0.253                | 59.922                    | 6499.580  | 28.166      | 9.360       | 28.166                    | 29.681                    | 18.383                      | 0.164                         |
| 6600.000                | 0.330                | 99.752                    | 6599.579  | 28.228      | 9.835       | 28.228                    | 29.892                    | 19.209                      | 0.211                         |
| 6700.000                | 0.520                | 80.937                    | 6699.576  | 28.250      | 10.567      | 28.250                    | 30.162                    | 20.508                      | 0.233                         |
| 6800.000                | 0.515                | 40.823                    | 6799.572  | 28.662      | 11.309      | 28.662                    | 30.812                    | 21.532                      | 0.355                         |