

Company: Anadarko Petroleum Corp.  
Lease/Well: Soco / 20-1K  
API#: 05-123-15496  
Rig Name: Production / V.E.S.  
State/County: Colorado / Weld County  
Latitude: 40.215, Longitude: -104.794  
Directions are relative to True North  
VS-Azi: 0.000 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : RKB = Ground Level

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: hgyro-de\_01.ut  
Minimum Curvature Method  
Report Date/Time: 2/10/2014 / 09:39

Vaughn Energy Services  
Henderson CO.  
303-853-4976  
Norman Cowan

| 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                 | 0.289                | 53.667                    | 100.000   | 0.150      | 0.203      | 0.150                     | 0.252                     | 53.667                      | 0.289                         |
| 200.000                 | 0.252                | 104.451                   | 199.999   | 0.244      | 0.619      | 0.244                     | 0.666                     | 68.475                      | 0.234                         |
| 300.000                 | 0.258                | 36.709                    | 299.998   | 0.370      | 0.967      | 0.370                     | 1.035                     | 69.061                      | 0.284                         |
| 400.000                 | 0.256                | 65.268                    | 399.997   | 0.644      | 1.304      | 0.644                     | 1.454                     | 63.728                      | 0.127                         |
| 500.000                 | 0.190                | 38.010                    | 499.996   | 0.868      | 1.609      | 0.868                     | 1.828                     | 61.654                      | 0.123                         |
| 600.000                 | 0.357                | 23.419                    | 599.995   | 1.285      | 1.835      | 1.285                     | 2.240                     | 55.000                      | 0.179                         |
| 700.000                 | 0.596                | 330.954                   | 699.992   | 2.025      | 1.706      | 2.025                     | 2.648                     | 40.116                      | 0.472                         |
| 800.000                 | 0.762                | 299.079                   | 799.985   | 2.803      | 0.873      | 2.803                     | 2.935                     | 17.299                      | 0.406                         |
| 900.000                 | 0.682                | 298.288                   | 899.977   | 3.408      | -0.233     | 3.408                     | 3.416                     | 356.097                     | 0.080                         |
| 1000.000                | 1.058                | 297.025                   | 999.965   | 4.110      | -1.579     | 4.110                     | 4.402                     | 338.983                     | 0.376                         |
| 1100.000                | 1.278                | 302.065                   | 1099.945  | 5.121      | -3.346     | 5.121                     | 6.117                     | 326.839                     | 0.243                         |
| 1200.000                | 1.428                | 305.267                   | 1199.917  | 6.432      | -5.308     | 6.432                     | 8.340                     | 320.469                     | 0.168                         |
| 1300.000                | 1.642                | 309.759                   | 1299.881  | 8.068      | -7.427     | 8.068                     | 10.966                    | 317.369                     | 0.245                         |
| 1400.000                | 2.177                | 309.473                   | 1399.825  | 10.192     | -9.995     | 10.192                    | 14.275                    | 315.560                     | 0.536                         |
| 1500.000                | 2.341                | 309.528                   | 1499.747  | 12.699     | -13.036    | 12.699                    | 18.199                    | 314.250                     | 0.163                         |
| 1600.000                | 2.387                | 310.342                   | 1599.662  | 15.347     | -16.199    | 15.347                    | 22.314                    | 313.454                     | 0.057                         |
| 1700.000                | 2.206                | 314.049                   | 1699.582  | 18.033     | -19.169    | 18.033                    | 26.318                    | 313.251                     | 0.234                         |
| 1800.000                | 2.116                | 313.528                   | 1799.511  | 20.642     | -21.891    | 20.642                    | 30.088                    | 313.319                     | 0.092                         |
| 1900.000                | 2.150                | 315.846                   | 1899.441  | 23.259     | -24.535    | 23.259                    | 33.808                    | 313.471                     | 0.093                         |
| 2000.000                | 1.698                | 323.744                   | 1999.385  | 25.799     | -26.718    | 25.799                    | 37.141                    | 313.998                     | 0.523                         |
| 2100.000                | 1.583                | 327.644                   | 2099.344  | 28.161     | -28.333    | 28.161                    | 39.948                    | 314.825                     | 0.160                         |
| 2200.000                | 1.335                | 331.356                   | 2199.312  | 30.350     | -29.631    | 30.350                    | 42.416                    | 315.687                     | 0.266                         |
| 2300.000                | 1.663                | 330.387                   | 2299.277  | 32.634     | -30.906    | 32.634                    | 44.946                    | 316.557                     | 0.330                         |
| 2400.000                | 1.591                | 328.540                   | 2399.237  | 35.080     | -32.348    | 35.080                    | 47.718                    | 317.320                     | 0.089                         |
| 2500.000                | 1.827                | 339.139                   | 2499.193  | 37.754     | -33.640    | 37.754                    | 50.567                    | 318.298                     | 0.393                         |
| 2600.000                | 1.942                | 343.128                   | 2599.139  | 40.865     | -34.700    | 40.865                    | 53.610                    | 319.664                     | 0.174                         |
| 2700.000                | 2.057                | 354.774                   | 2699.078  | 44.273     | -35.355    | 44.273                    | 56.657                    | 321.390                     | 0.422                         |
| 2800.000                | 2.268                | 354.365                   | 2799.007  | 48.030     | -35.713    | 48.030                    | 59.852                    | 323.367                     | 0.212                         |
| 2900.000                | 2.297                | 2.553                     | 2898.928  | 52.002     | -35.818    | 52.002                    | 63.143                    | 325.442                     | 0.327                         |
| 3000.000                | 2.481                | 2.527                     | 2998.841  | 56.166     | -35.633    | 56.166                    | 66.515                    | 327.608                     | 0.183                         |
| 3100.000                | 2.482                | 5.289                     | 3098.747  | 60.483     | -35.338    | 60.483                    | 70.050                    | 329.704                     | 0.120                         |
| 3200.000                | 2.595                | 8.248                     | 3198.649  | 64.879     | -34.814    | 64.879                    | 73.630                    | 331.782                     | 0.173                         |
| 3300.000                | 2.484                | 8.754                     | 3298.551  | 69.262     | -34.159    | 69.262                    | 77.227                    | 333.748                     | 0.113                         |
| 3400.000                | 2.232                | 10.458                    | 3398.466  | 73.318     | -33.476    | 73.318                    | 80.599                    | 335.459                     | 0.262                         |

| 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 |
|---|----------------------|---------------------------|-----------|------------|------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 3500.000  | 1.612                | 9.295                     | 3498.409  | 76.621     | -32.895    | 76.621                    | 83.384                    | 336.765                     | 0.621                         |
| 3600.000  | 1.276                | 15.784                    | 3598.377  | 79.081     | -32.365    | 79.081                    | 85.447                    | 337.742                     | 0.373                         |
| 3700.000  | 0.658                | 352.988                   | 3698.363  | 80.722     | -32.132    | 80.722                    | 86.882                    | 338.294                     | 0.717                         |
| 3800.000  | 0.691                | 353.969                   | 3798.356  | 81.891     | -32.266    | 81.891                    | 88.019                    | 338.495                     | 0.036                         |
| 3900.000  | 0.810                | 325.250                   | 3898.348  | 83.072     | -32.732    | 83.072                    | 89.288                    | 338.495                     | 0.389                         |
| 4000.000  | 0.980                | 309.052                   | 3998.336  | 84.191     | -33.798    | 84.191                    | 90.722                    | 338.127                     | 0.303                         |
| 4100.000  | 1.147                | 292.785                   | 4098.319  | 85.117     | -35.385    | 85.117                    | 92.180                    | 337.426                     | 0.343                         |
| 4200.000  | 1.292                | 280.949                   | 4198.296  | 85.719     | -37.415    | 85.719                    | 93.529                    | 336.420                     | 0.290                         |
| 4300.000  | 1.470                | 260.271                   | 4298.268  | 85.717     | -39.786    | 85.717                    | 94.500                    | 335.101                     | 0.525                         |
| 4400.000  | 1.897                | 253.966                   | 4398.224  | 85.043     | -42.641    | 85.043                    | 95.134                    | 333.371                     | 0.466                         |
| 4500.000  | 1.845                | 270.523                   | 4498.172  | 84.600     | -45.841    | 84.600                    | 96.222                    | 331.549                     | 0.541                         |
| 4600.000  | 1.798                | 267.845                   | 4598.121  | 84.556     | -49.018    | 84.556                    | 97.737                    | 329.898                     | 0.097                         |
| 4700.000  | 1.861                | 276.743                   | 4698.071  | 84.687     | -52.198    | 84.687                    | 99.482                    | 328.352                     | 0.291                         |
| 4800.000  | 1.831                | 289.532                   | 4798.019  | 85.412     | -55.316    | 85.412                    | 101.760                   | 327.071                     | 0.412                         |
| 4900.000  | 1.527                | 301.830                   | 4897.976  | 86.649     | -57.954    | 86.649                    | 104.244                   | 326.224                     | 0.470                         |
| 5000.000  | 1.445                | 312.747                   | 4997.943  | 88.208     | -60.013    | 88.208                    | 106.687                   | 325.770                     | 0.294                         |
| 5100.000  | 1.112                | 302.300                   | 5097.918  | 89.582     | -61.759    | 89.582                    | 108.808                   | 325.417                     | 0.406                         |
| 5200.000  | 0.903                | 304.083                   | 5197.903  | 90.542     | -63.232    | 90.542                    | 110.436                   | 325.071                     | 0.211                         |
| 5300.000  | 0.585                | 306.027                   | 5297.894  | 91.284     | -64.297    | 91.284                    | 111.656                   | 324.841                     | 0.319                         |
| 5400.000  | 0.351                | 259.141                   | 5397.891  | 91.527     | -65.011    | 91.527                    | 112.266                   | 324.614                     | 0.430                         |
| 5500.000  | 0.404                | 279.374                   | 5497.889  | 91.527     | -65.660    | 91.527                    | 112.643                   | 324.345                     | 0.143                         |
| 5600.000  | 0.276                | 211.597                   | 5597.887  | 91.379     | -66.134    | 91.379                    | 112.800                   | 324.106                     | 0.394                         |
| 5700.000  | 0.522                | 177.055                   | 5697.885  | 90.719     | -66.236    | 90.719                    | 112.327                   | 323.866                     | 0.334                         |
| 5800.000  | 1.001                | 149.259                   | 5797.876  | 89.514     | -65.767    | 89.514                    | 111.077                   | 323.695                     | 0.591                         |
| 5900.000  | 1.369                | 148.287                   | 5897.855  | 87.747     | -64.693    | 87.747                    | 109.017                   | 323.600                     | 0.369                         |
| 6000.000  | 2.277                | 135.224                   | 5997.803  | 85.321     | -62.666    | 85.321                    | 105.862                   | 323.704                     | 0.993                         |
| 6100.000  | 2.382                | 135.929                   | 6097.721  | 82.418     | -59.821    | 82.418                    | 101.839                   | 324.027                     | 0.109                         |
| 6200.000  | 1.550                | 131.342                   | 6197.661  | 80.031     | -57.360    | 80.031                    | 98.464                    | 324.370                     | 0.846                         |
| 6300.000  | 1.405                | 152.071                   | 6297.628  | 78.055     | -55.770    | 78.055                    | 95.932                    | 324.454                     | 0.550                         |
| 6400.000  | 1.577                | 187.617                   | 6397.597  | 75.607     | -55.379    | 75.607                    | 93.719                    | 323.779                     | 0.925                         |
| 6500.000  | 1.501                | 203.246                   | 6497.561  | 73.039     | -56.078    | 73.039                    | 92.084                    | 322.484                     | 0.425                         |
| 6600.000  | 1.579                | 224.025                   | 6597.526  | 70.845     | -57.552    | 70.845                    | 91.276                    | 320.911                     | 0.561                         |
| 6700.000  | 1.551                | 235.272                   | 6697.489  | 69.084     | -59.622    | 69.084                    | 91.254                    | 319.205                     | 0.308                         |
| 6800.000  | 1.838                | 250.881                   | 6797.445  | 67.788     | -62.249    | 67.788                    | 92.033                    | 317.439                     | 0.541                         |
| 6900.000  | 2.106                | 256.331                   | 6897.386  | 66.829     | -65.549    | 66.829                    | 93.610                    | 315.554                     | 0.327                         |
| 7000.000  | 2.348                | 260.448                   | 6997.311  | 66.054     | -69.355    | 66.054                    | 95.777                    | 313.604                     | 0.291                         |
| 7100.000  | 2.339                | 265.503                   | 7097.227  | 65.554     | -73.410    | 65.554                    | 98.419                    | 311.765                     | 0.207                         |
| 7200.000  | 1.529                | 261.755                   | 7197.169  | 65.203     | -76.764    | 65.203                    | 100.718                   | 310.344                     | 0.820                         |
| 7275.000  | 1.532                | 247.297                   | 7272.143  | 64.673     | -78.679    | 64.673                    | 101.848                   | 309.420                     | 0.513                         |
| HORIZONTAL DISPLACEMENT IS<br>101.848 FEET AT 309.420 DEGREES |                      |                           |           |            |            |                           |                           |                             |                               |