

Company: Anadarko Petroleum Corp.
 Well/API: Lorenz Federal 2-30/05-123-14413
 Tool Type: North Seeking Rate Gyro
 Rig Name: Production/CoreTech
 County/State: Weld/Colorado
 Latitude: 40.199, Longitude: -104.824
 Directions are relative to True North
 VS-Azi: 0.000 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : RKB = GL Elevation = 4802

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro.ut

Minimum Curvature Method

Report Date/Time: 12/2/2014 / 13:44

Lat/Long Obtained By Handheld GPS At Wellhead

Handheld GPS Reference: NAD83/Device Error: ±9 Feet

VES Survey International - Henderson CO

Justin Williams

303-853-4976

| 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 | 0.156 | 295.681 | 100.000 | 0.059 | -0.123 | 0.059 | 0.136 | 295.681 | 0.156 |
| 200.000 | 0.373 | 53.962 | 199.999 | 0.310 | 0.018 | 0.310 | 0.310 | 3.299 | 0.468 |
| 300.000 | 0.544 | 270.589 | 299.998 | 0.506 | -0.193 | 0.506 | 0.542 | 339.088 | 0.873 |
| 400.000 | 0.527 | 234.426 | 399.994 | 0.243 | -1.043 | 0.243 | 1.071 | 283.141 | 0.333 |
| 500.000 | 0.478 | 229.639 | 499.990 | -0.295 | -1.735 | -0.295 | 1.760 | 260.361 | 0.065 |
| 600.000 | 0.563 | 313.959 | 599.987 | -0.224 | -2.407 | -0.224 | 2.417 | 264.682 | 0.702 |
| 700.000 | 0.484 | 14.247 | 699.983 | 0.526 | -2.656 | 0.526 | 2.708 | 281.211 | 0.530 |
| 800.000 | 0.483 | 356.496 | 799.980 | 1.357 | -2.578 | 1.357 | 2.913 | 297.756 | 0.149 |
| 900.000 | 0.532 | 118.352 | 899.978 | 1.557 | -2.195 | 1.557 | 2.691 | 305.347 | 0.888 |
| 1000.000 | 0.490 | 346.981 | 999.976 | 1.753 | -1.882 | 1.753 | 2.572 | 312.959 | 0.932 |
| 1100.000 | 0.537 | 300.620 | 1099.973 | 2.408 | -2.382 | 2.408 | 3.387 | 315.314 | 0.406 |
| 1200.000 | 0.271 | 227.077 | 1199.971 | 2.486 | -2.958 | 2.486 | 3.863 | 310.042 | 0.528 |
| 1300.000 | 0.457 | 243.155 | 1299.969 | 2.145 | -3.486 | 2.145 | 4.093 | 301.599 | 0.210 |
| 1400.000 | 0.493 | 260.409 | 1399.965 | 1.893 | -4.266 | 1.893 | 4.667 | 293.932 | 0.147 |
| 1500.000 | 0.653 | 275.094 | 1499.960 | 1.872 | -5.258 | 1.872 | 5.581 | 289.600 | 0.216 |
| 1600.000 | 0.644 | 268.754 | 1599.954 | 1.911 | -6.388 | 1.911 | 6.667 | 286.652 | 0.072 |
| 1700.000 | 0.644 | 280.477 | 1699.948 | 2.000 | -7.503 | 2.000 | 7.765 | 284.930 | 0.132 |
| 1800.000 | 0.755 | 306.795 | 1799.940 | 2.497 | -8.583 | 2.497 | 8.939 | 286.222 | 0.336 |
| 1900.000 | 1.040 | 330.070 | 1899.928 | 3.678 | -9.563 | 3.678 | 10.246 | 291.039 | 0.458 |
| 2000.000 | 1.100 | 329.677 | 1999.911 | 5.293 | -10.501 | 5.293 | 11.759 | 296.753 | 0.060 |
| 2100.000 | 1.097 | 337.642 | 2099.893 | 7.007 | -11.349 | 7.007 | 13.338 | 301.691 | 0.153 |
| 2200.000 | 1.026 | 310.609 | 2199.876 | 8.475 | -12.393 | 8.475 | 15.013 | 304.366 | 0.501 |
| 2300.000 | 0.271 | 312.963 | 2299.869 | 9.219 | -13.246 | 9.219 | 16.138 | 304.837 | 0.755 |
| 2400.000 | 0.839 | 289.206 | 2399.864 | 9.621 | -14.111 | 9.621 | 17.079 | 304.287 | 0.601 |
| 2500.000 | 0.396 | 239.097 | 2499.858 | 9.685 | -15.099 | 9.685 | 17.938 | 302.677 | 0.660 |
| 2600.000 | 0.618 | 262.750 | 2599.855 | 9.439 | -15.930 | 9.439 | 18.517 | 300.649 | 0.301 |
| 2700.000 | 0.148 | 126.617 | 2699.853 | 9.294 | -16.361 | 9.294 | 18.817 | 299.599 | 0.732 |
| 2800.000 | 0.773 | 333.744 | 2799.850 | 9.822 | -16.556 | 9.822 | 19.251 | 300.680 | 0.907 |
| 2900.000 | 0.740 | 283.211 | 2899.843 | 10.575 | -17.484 | 10.575 | 20.433 | 301.168 | 0.647 |
| 3000.000 | 0.082 | 282.562 | 2999.839 | 10.739 | -18.183 | 10.739 | 21.117 | 300.566 | 0.658 |
| 3100.000 | 0.505 | 207.391 | 3099.838 | 10.363 | -18.456 | 10.363 | 21.166 | 299.315 | 0.490 |
| 3200.000 | 0.584 | 204.511 | 3199.833 | 9.508 | -18.870 | 9.508 | 21.130 | 296.744 | 0.083 |
| 3300.000 | 0.621 | 207.269 | 3299.828 | 8.563 | -19.329 | 8.563 | 21.141 | 293.894 | 0.047 |

| 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 |
|--|----------------------|---------------------------|-----------|-------------|-------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 3400.000 | 0.616 | 207.055 | 3399.822 | 7.602 | -19.822 | 7.602 | 21.230 | 290.983 | 0.005 |
| 3500.000 | 0.457 | 135.791 | 3499.819 | 6.838 | -19.789 | 6.838 | 20.937 | 289.061 | 0.639 |
| 3600.000 | 0.600 | 112.550 | 3599.815 | 6.351 | -19.028 | 6.351 | 20.060 | 288.458 | 0.255 |
| 3700.000 | 0.507 | 144.190 | 3699.810 | 5.792 | -18.285 | 5.792 | 19.181 | 287.575 | 0.315 |
| 3800.000 | 0.805 | 184.531 | 3799.804 | 4.733 | -18.082 | 4.733 | 18.691 | 284.667 | 0.532 |
| 3900.000 | 0.849 | 193.131 | 3899.794 | 3.311 | -18.306 | 3.311 | 18.603 | 280.254 | 0.132 |
| 4000.000 | 0.854 | 195.307 | 3999.782 | 1.872 | -18.671 | 1.872 | 18.764 | 275.724 | 0.033 |
| 4100.000 | 0.940 | 190.617 | 4099.770 | 0.347 | -19.018 | 0.347 | 19.021 | 271.045 | 0.113 |
| 4200.000 | 1.400 | 208.297 | 4199.749 | -1.535 | -19.749 | -1.535 | 19.808 | 265.555 | 0.580 |
| 4300.000 | 1.487 | 182.493 | 4299.719 | -3.907 | -20.384 | -3.907 | 20.755 | 259.150 | 0.650 |
| 4400.000 | 1.386 | 169.801 | 4399.688 | -6.393 | -20.227 | -6.393 | 21.213 | 252.459 | 0.333 |
| 4500.000 | 1.325 | 169.680 | 4499.660 | -8.721 | -19.805 | -8.721 | 21.641 | 246.234 | 0.060 |
| 4600.000 | 0.916 | 198.843 | 4599.641 | -10.616 | -19.856 | -10.616 | 22.516 | 241.870 | 0.689 |
| 4700.000 | 1.022 | 209.729 | 4699.627 | -12.147 | -20.557 | -12.147 | 23.878 | 239.421 | 0.212 |
| 4800.000 | 0.737 | 197.197 | 4799.615 | -13.536 | -21.190 | -13.536 | 25.144 | 237.429 | 0.343 |
| 4900.000 | 1.539 | 180.789 | 4899.595 | -15.494 | -21.398 | -15.494 | 26.418 | 234.093 | 0.858 |
| 5000.000 | 1.352 | 157.130 | 4999.564 | -17.924 | -20.958 | -17.924 | 27.577 | 229.463 | 0.620 |
| 5100.000 | 0.924 | 163.105 | 5099.544 | -19.782 | -20.265 | -19.782 | 28.320 | 225.691 | 0.443 |
| 5200.000 | 0.802 | 157.135 | 5199.532 | -21.198 | -19.759 | -21.198 | 28.979 | 222.987 | 0.152 |
| 5300.000 | 0.723 | 160.381 | 5299.524 | -22.438 | -19.275 | -22.438 | 29.580 | 220.665 | 0.089 |
| 5400.000 | 0.638 | 155.961 | 5399.516 | -23.541 | -18.836 | -23.541 | 30.150 | 218.665 | 0.100 |
| 5500.000 | 0.579 | 145.370 | 5499.511 | -24.466 | -18.322 | -24.466 | 30.566 | 216.829 | 0.127 |
| 5600.000 | 0.278 | 143.710 | 5599.508 | -25.077 | -17.891 | -25.077 | 30.805 | 215.506 | 0.302 |
| 5700.000 | 0.139 | 127.1 | 5699.508 | -25.151 | -17.745 | -25.151 | 30.781 | 215.205 | 0.397 |
| 5800.000 | 0.537 | 337.963 | 5799.506 | -24.595 | -17.919 | -24.595 | 30.430 | 216.075 | 0.413 |
| 5900.000 | 0.403 | 345.138 | 5899.502 | -23.820 | -18.185 | -23.820 | 29.968 | 217.358 | 0.147 |
| 6000.000 | 0.264 | 341.871 | 5999.501 | -23.262 | -18.346 | -23.262 | 29.626 | 218.262 | 0.140 |
| 6100.000 | 0.322 | 13.805 | 6099.499 | -22.771 | -18.351 | -22.771 | 29.245 | 218.865 | 0.171 |
| 6200.000 | 0.715 | 348.959 | 6199.495 | -21.886 | -18.403 | -21.886 | 28.595 | 220.060 | 0.444 |
| 6300.000 | 0.845 | 37.462 | 6299.487 | -20.688 | -18.074 | -20.688 | 27.472 | 221.142 | 0.651 |
| 6400.000 | 0.907 | 30.530 | 6399.475 | -19.421 | -17.224 | -19.421 | 25.959 | 221.568 | 0.123 |
| 6500.000 | 1.058 | 43.735 | 6499.461 | -18.073 | -16.184 | -18.073 | 24.260 | 221.844 | 0.271 |
| 6600.000 | 0.907 | 16.003 | 6599.447 | -16.645 | -15.328 | -16.645 | 22.628 | 222.640 | 0.493 |
| 6700.000 | 0.984 | 53.114 | 6699.434 | -15.369 | -14.423 | -15.369 | 21.076 | 223.181 | 0.606 |
| 6800.000 | 1.208 | 37.526 | 6799.416 | -14.017 | -13.093 | -14.017 | 19.181 | 223.049 | 0.371 |
| 6900.000 | 1.055 | 31.411 | 6899.396 | -12.395 | -11.971 | -12.395 | 17.232 | 224.004 | 0.195 |
| 7000.000 | 0.675 | 42.605 | 6999.385 | -11.175 | -11.092 | -11.175 | 15.746 | 224.787 | 0.414 |
| 7100.000 | 0.798 | 35.713 | 7099.376 | -10.176 | -10.287 | -10.176 | 14.470 | 225.311 | 0.151 |
| 7200.000 | 0.550 | 25.734 | 7199.369 | -9.178 | -9.672 | -9.178 | 13.333 | 226.501 | 0.273 |
| HORIZONTAL DISPLACEMENT IS 13.333 FEET AT 226.501 DEGREES | | | | | | | | | |