



Company/Rig: NOBLE ENERGY/ CORETECH
WELL/API#: LEONARD 1/05-123-11313
DECLINATION: 8.23 DEGREES
TD AS DRILLED: 8015 FEET
COUNTY/STATE: WELD/COLORADO
Latitude: 40.292, Longitude: -104.554
GRID North is 0.610 Degrees East of True North
VS-Azi: 0.000 Degrees



DEPTH REFERENCE : RKB=SURFACE ELEVATION=4715 FEET

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro_run01-01-de_01.ut

Minimum Curvature Method

Report Date/Time: 4/21/2015 / 14:47

LAT & LONG OBTAINED BY HANDHELD GPS AT WELLHEAD

NORTH REFERENCE: GRID

HENDERSON, COLORADO

303-853-4976

Surveyor: KEVIN MCDOWELL

| 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 | 0.389 | 8.596 | 99.999 | 0.335 | 0.051 | 0.335 | 0.339 | 8.596 | 0.389 |
| 200.000 | 0.215 | 12.248 | 199.998 | 0.854 | 0.141 | 0.854 | 0.866 | 9.387 | 0.175 |
| 300.000 | 0.034 | 61.309 | 299.998 | 1.051 | 0.207 | 1.051 | 1.072 | 11.129 | 0.195 |
| 400.000 | 0.253 | 22.125 | 399.997 | 1.270 | 0.316 | 1.270 | 1.309 | 13.964 | 0.228 |
| 500.000 | 0.091 | 114.698 | 499.997 | 1.441 | 0.471 | 1.441 | 1.516 | 18.091 | 0.272 |
| 600.000 | 0.077 | 102.824 | 599.997 | 1.393 | 0.608 | 1.393 | 1.520 | 23.583 | 0.022 |
| 700.000 | 0.148 | 125.398 | 699.997 | 1.303 | 0.779 | 1.303 | 1.519 | 30.871 | 0.083 |
| 800.000 | 0.201 | 67.580 | 799.996 | 1.296 | 1.047 | 1.296 | 1.666 | 38.951 | 0.175 |
| 900.000 | 0.189 | 328.018 | 899.996 | 1.502 | 1.122 | 1.502 | 1.875 | 36.762 | 0.298 |
| 1000.000 | 0.167 | 315.778 | 999.995 | 1.747 | 0.933 | 1.747 | 1.981 | 28.108 | 0.044 |
| 1100.000 | 0.112 | 306.915 | 1099.995 | 1.910 | 0.753 | 1.910 | 2.053 | 21.523 | 0.060 |
| 1200.000 | 0.290 | 337.291 | 1199.994 | 2.202 | 0.578 | 2.202 | 2.277 | 14.703 | 0.202 |
| 1300.000 | 0.311 | 350.993 | 1299.993 | 2.703 | 0.438 | 2.703 | 2.739 | 9.197 | 0.075 |
| 1400.000 | 0.112 | 15.493 | 1399.992 | 3.065 | 0.421 | 3.065 | 3.094 | 7.826 | 0.214 |
| 1500.000 | 0.167 | 88.541 | 1499.992 | 3.163 | 0.593 | 3.163 | 3.218 | 10.615 | 0.171 |
| 1600.000 | 0.157 | 72.577 | 1599.992 | 3.207 | 0.869 | 3.207 | 3.323 | 15.156 | 0.046 |
| 1700.000 | 0.214 | 54.731 | 1699.991 | 3.356 | 1.152 | 3.356 | 3.549 | 18.946 | 0.081 |
| 1800.000 | 0.313 | 68.383 | 1799.990 | 3.565 | 1.559 | 3.565 | 3.891 | 23.619 | 0.116 |
| 1900.000 | 0.482 | 92.336 | 1899.988 | 3.649 | 2.234 | 3.649 | 4.278 | 31.473 | 0.234 |

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|-------------------------|----------------------|---------------------------|-----------|-------------|-------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 2000.000 | 0.514 | 60.348 | 1999.984 | 3.853 | 3.044 | 3.853 | 4.911 | 38.307 | 0.276 |
| 2100.000 | 0.666 | 75.266 | 2099.979 | 4.223 | 3.996 | 4.223 | 5.814 | 43.416 | 0.215 |
| 2200.000 | 0.852 | 70.626 | 2199.970 | 4.618 | 5.259 | 4.618 | 6.999 | 48.717 | 0.196 |
| 2300.000 | 1.049 | 91.028 | 2299.956 | 4.848 | 6.876 | 4.848 | 8.413 | 54.815 | 0.389 |
| 2400.000 | 0.983 | 84.153 | 2399.941 | 4.919 | 8.645 | 4.919 | 9.946 | 60.360 | 0.139 |
| 2500.000 | 0.667 | 95.723 | 2499.930 | 4.948 | 10.077 | 4.948 | 11.226 | 63.848 | 0.356 |
| 2600.000 | 0.316 | 105.944 | 2599.927 | 4.814 | 10.921 | 4.814 | 11.935 | 66.211 | 0.361 |
| 2700.000 | 0.525 | 111.432 | 2699.924 | 4.571 | 11.612 | 4.571 | 12.480 | 68.512 | 0.212 |
| 2800.000 | 0.474 | 129.995 | 2799.920 | 4.138 | 12.355 | 4.138 | 13.030 | 71.481 | 0.169 |
| 2900.000 | 0.551 | 150.758 | 2899.916 | 3.453 | 12.907 | 3.453 | 13.361 | 75.023 | 0.200 |
| 3000.000 | 0.437 | 179.947 | 2999.913 | 2.651 | 13.142 | 2.651 | 13.407 | 78.594 | 0.272 |
| 3100.000 | 0.408 | 181.120 | 3099.910 | 1.914 | 13.136 | 1.914 | 13.274 | 81.711 | 0.031 |
| 3200.000 | 0.177 | 110.380 | 3199.909 | 1.504 | 13.273 | 1.504 | 13.358 | 83.534 | 0.387 |
| 3300.000 | 0.310 | 283.437 | 3299.908 | 1.513 | 13.155 | 1.513 | 13.242 | 83.437 | 0.486 |
| 3400.000 | 0.131 | 191.815 | 3399.908 | 1.464 | 12.869 | 1.464 | 12.952 | 83.508 | 0.340 |
| 3500.000 | 0.688 | 255.769 | 3499.905 | 1.205 | 12.264 | 1.205 | 12.323 | 84.388 | 0.641 |
| 3600.000 | 0.659 | 288.320 | 3599.899 | 1.238 | 11.136 | 1.238 | 11.204 | 83.654 | 0.378 |
| 3700.000 | 0.646 | 305.164 | 3699.892 | 1.744 | 10.128 | 1.744 | 10.278 | 80.229 | 0.192 |
| 3800.000 | 0.256 | 253.623 | 3799.889 | 2.006 | 9.453 | 2.006 | 9.663 | 78.019 | 0.527 |
| 3900.000 | 0.101 | 343.680 | 3899.889 | 2.027 | 9.214 | 2.027 | 9.434 | 77.590 | 0.275 |
| 4000.000 | 0.545 | 285.192 | 3999.887 | 2.236 | 8.730 | 2.236 | 9.012 | 75.631 | 0.500 |
| 4100.000 | 0.118 | 302.945 | 4099.885 | 2.417 | 8.185 | 2.417 | 8.534 | 73.548 | 0.435 |
| 4200.000 | 0.587 | 295.440 | 4199.883 | 2.693 | 7.636 | 2.693 | 8.097 | 70.577 | 0.470 |
| 4300.000 | 0.638 | 330.129 | 4299.878 | 3.395 | 6.897 | 3.395 | 7.687 | 63.788 | 0.368 |
| 4400.000 | 0.679 | 322.444 | 4399.871 | 4.348 | 6.258 | 4.348 | 7.620 | 55.212 | 0.097 |
| 4500.000 | 0.573 | 307.693 | 4499.865 | 5.123 | 5.502 | 5.123 | 7.518 | 47.044 | 0.192 |
| 4600.000 | 0.641 | 346.651 | 4599.860 | 5.973 | 4.977 | 5.973 | 7.775 | 39.804 | 0.410 |
| 4700.000 | 0.436 | 354.271 | 4699.856 | 6.896 | 4.810 | 6.896 | 8.408 | 34.897 | 0.217 |
| 4800.000 | 0.590 | 262.160 | 4799.853 | 7.204 | 4.262 | 7.204 | 8.370 | 30.608 | 0.747 |
| 4900.000 | 0.408 | 288.994 | 4899.849 | 7.249 | 3.415 | 7.249 | 8.013 | 25.223 | 0.292 |
| 5000.000 | 0.205 | 317.508 | 4999.848 | 7.497 | 2.958 | 7.497 | 8.059 | 21.530 | 0.248 |
| 5100.000 | 0.090 | 56.129 | 5099.847 | 7.672 | 2.902 | 7.672 | 8.203 | 20.720 | 0.235 |
| 5200.000 | 0.295 | 315.049 | 5199.847 | 7.898 | 2.786 | 7.898 | 8.375 | 19.428 | 0.324 |
| 5300.000 | 0.214 | 126.994 | 5299.847 | 7.967 | 2.753 | 7.967 | 8.430 | 19.065 | 0.508 |
| 5400.000 | 0.311 | 82.833 | 5399.846 | 7.889 | 3.172 | 7.889 | 8.503 | 21.907 | 0.217 |
| 5500.000 | 0.355 | 189.487 | 5499.845 | 7.617 | 3.391 | 7.617 | 8.337 | 23.996 | 0.535 |
| 5600.000 | 1.183 | 172.914 | 5599.835 | 6.286 | 3.467 | 6.286 | 7.179 | 28.876 | 0.849 |
| 5700.000 | 1.740 | 180.509 | 5699.802 | 3.744 | 3.581 | 3.744 | 5.181 | 43.723 | 0.588 |
| 5800.000 | 2.275 | 189.576 | 5799.741 | 0.269 | 3.237 | 0.269 | 3.248 | 85.247 | 0.621 |
| 5900.000 | 2.924 | 202.169 | 5899.638 | -4.049 | 1.945 | -4.049 | 4.492 | 154.348 | 0.861 |

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|-------------------------|----------------------|---------------------------|-----------|-------------|-------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 6000.000 | 3.687 | 212.118 | 5999.472 | -9.134 | -0.727 | -9.134 | 9.163 | 184.550 | 0.952 |
| 6100.000 | 3.866 | 212.103 | 6099.255 | -14.713 | -4.228 | -14.713 | 15.308 | 196.032 | 0.180 |
| 6200.000 | 3.194 | 207.242 | 6199.065 | -20.046 | -7.295 | -20.046 | 21.332 | 199.997 | 0.735 |
| 6300.000 | 2.483 | 205.817 | 6298.941 | -24.473 | -9.514 | -24.473 | 26.257 | 201.243 | 0.714 |
| 6400.000 | 1.717 | 198.064 | 6398.873 | -27.847 | -10.922 | -27.847 | 29.912 | 201.415 | 0.816 |
| 6500.000 | 1.483 | 189.451 | 6498.835 | -30.548 | -11.598 | -30.548 | 32.675 | 200.791 | 0.335 |
| 6600.000 | 1.697 | 201.361 | 6598.796 | -33.203 | -12.350 | -33.203 | 35.425 | 200.403 | 0.393 |
| 6700.000 | 1.511 | 213.500 | 6698.757 | -35.682 | -13.618 | -35.682 | 38.192 | 200.889 | 0.386 |
| 6800.000 | 1.073 | 226.572 | 6798.732 | -37.425 | -15.025 | -37.425 | 40.328 | 201.874 | 0.526 |