



## **COG Operating LLC**

**Eddy County, NM (NAN27 NME)**

**Skelly Unit #603 (1003)**

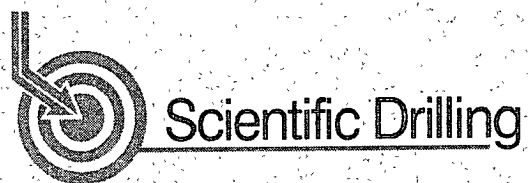
**Skelly Unit #603**

**OH**

**Survey: MWD Survey**

## **Standard Survey Report**

**22 August, 2009**





# Scientific Drilling Survey Report



Company: COG Operating LLC  
Project: Eddy County, NM (NAN27, NME)  
Site: Skelly Unit #603 (1003)  
Well: Skelly Unit #603  
Wellbore: OH  
Design: Actual

Local Co-ordinate Reference: Site Skelly Unit #603 (1003)  
TVD Reference: Ground Elev @ 3866 00ft (Silver Oak #1)  
MD Reference: Ground Elev @ 3866 00ft (Silver Oak #1)  
North Reference: Grid  
Survey Calculation Method: Minimum Curvature  
Database: EDM 5000.1 Single User Db

Project: Eddy County, NM (NAN27, NME)

Map System: US State Plane 1927 (Exact solution)  
Geo Datum: NAD 1927 (NADCON CONUS)  
Map Zone: New Mexico East 3001

System Datum: Mean Sea Level

Site: Skelly Unit #603 (1003)

Site Position: Northing: 666,825 10 ft Latitude: 32° 49' 56.303 N  
From: Map Easting: 644,331 10 ft Longitude: 103° 51' 48 418 W  
Position Uncertainty: 0 00 ft Slot Radius: 0 " Grid Convergence: 0 25 °

Well: Skelly Unit #603

Well Position: +N/-S 0 00 ft Northing: 666,825 10 ft Latitude: 32° 49' 56 303 N  
+E/-W 0 00 ft Easting: 644,331 10 ft Longitude: 103° 51' 48 418 W  
Position Uncertainty: 0 00 ft Wellhead Elevation: ft Ground Level: 3,866.00 ft

Wellbore: OH

| Magnetics | Model Name | Sample Date | Declination<br>(°) | Dip Angle<br>(°) | Field Strength<br>(nT) |
|-----------|------------|-------------|--------------------|------------------|------------------------|
|           | IGRF200510 | 2009/08/21  | 7 97               | 60 76            | 49,159                 |

Design: Actual

Audit Notes:

Version: 1 0 Phase: ACTUAL Tie On Depth: 0 00

| Vertical Section: | Depth From (TVD)<br>(ft) | +N/-S<br>(ft) | +E/-W<br>(ft) | Direction<br>(°) |
|-------------------|--------------------------|---------------|---------------|------------------|
|                   | 0 00                     | 0 00          | 0 00          | 325 04           |

Survey Program: Date: 2009/08/22

| From<br>(ft) | To<br>(ft) | Survey (Wellbore) | Tool Name | Description                        |
|--------------|------------|-------------------|-----------|------------------------------------|
| 100 00       | 1,768 00   | Gyro Survey (OH)  | Keeper    | Standard Wireline Keeper ver 1.0.2 |
| 1,840 00     | 6,753 00   | MWD Survey (OH)   | MWD       | MWD - Standard                     |

Survey

| Measured<br>Depth<br>(ft) | Inclination<br>(°) | Azimuth<br>(°) | Vertical<br>Depth<br>(ft) | +N/-S<br>(ft) | +E/-W<br>(ft) | Vertical<br>Section<br>(ft) | Dogleg<br>Rate<br>(°/100ft) | Build<br>Rate<br>(°/100ft) | Turn<br>Rate<br>(°/100ft) |
|---------------------------|--------------------|----------------|---------------------------|---------------|---------------|-----------------------------|-----------------------------|----------------------------|---------------------------|
| 1,768 00                  | 1 04               | 30 09          | 1,767.77                  | 14 43         | -10 07        | 17.59                       | 0 00                        | 0 00                       | 0.00                      |
| Gyro Tie-in               |                    |                |                           |               |               |                             |                             |                            |                           |
| 1,840 00                  | 1 01               | 42 89          | 1,839.75                  | 15 46         | -9 31         | 18 00                       | 0 32                        | -0 04                      | 17 78                     |
| 1,934 00                  | 2 54               | 343 77         | 1,933.71                  | 18.06         | -9 33         | 20 15                       | 2 34                        | 1 63                       | -62.89                    |
| 2,027 00                  | 4 77               | 331 57         | 2,026.52                  | 23 44         | -11 75        | 25 94                       | 2 53                        | 2 40                       | -13 12                    |
| 2,121 00                  | 6 65               | 330.48         | 2,120.05                  | 31 62         | -16 29        | 35.25                       | 2 00                        | 2.00                       | -1 16                     |
| 2,215 00                  | 8 14               | 324 00         | 2,213.27                  | 41 74         | -22 88        | 47 32                       | 1 81                        | 1.59                       | -6 89                     |
| 2,309 00                  | 7 22               | 323 62         | 2,306.42                  | 51 88         | -30 30        | 59 88                       | 0 98                        | -0 98                      | -0.40                     |
| 2,402 00                  | 6 43               | 322 11         | 2,398.76                  | 60 69         | -36 96        | 70 92                       | 0 87                        | -0 85                      | -1 62                     |
| 2,496 00                  | 5 30               | 321 24         | 2,492.27                  | 68 23         | -42 91        | 80 51                       | 1.21                        | -1 20                      | -0 93                     |



# Scientific Drilling

## Survey Report



Company: COG Operating LLC  
Project: Eddy County, NM (NAN27 NME)  
Site: Skelly Unit #603 (1003)  
Well: Skelly Unit #603  
Wellbore: OH  
Design: Actual

Local Co-ordinate Reference: Site Skelly Unit #603 (1003)  
TVD Reference: Ground Elev. @ 3866 00ft (Silver Oak #1)  
MD Reference: Ground Elev. @ 3866 00ft (Silver Oak #1)  
North Reference: Grd  
Survey Calculation Method: Minimum Curvature  
Database: EDM 5000 1 Single User Db

| Survey              |                 |             |                     |            |            |                       |                       |                      |                     |
|---------------------|-----------------|-------------|---------------------|------------|------------|-----------------------|-----------------------|----------------------|---------------------|
| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Turn Rate (°/100ft) |
| 2,597.00            | 6.88            | 326.66      | 2,592.70            | 76.92      | -49.16     | 91.21                 | 1.66                  | 1.56                 | 5.37                |
| 2,691.00            | 8.55            | 326.07      | 2,685.84            | 87.43      | -56.16     | 103.83                | 1.78                  | 1.78                 | -0.63               |
| 2,784.00            | 7.61            | 328.15      | 2,777.92            | 98.39      | -63.26     | 116.89                | 1.06                  | -1.01                | 2.24                |
| 2,878.00            | 8.39            | 325.82      | 2,871.00            | 109.35     | -70.40     | 129.96                | 0.90                  | 0.83                 | -2.48               |
| 2,972.00            | 7.80            | 325.12      | 2,964.06            | 120.26     | -77.90     | 143.20                | 0.64                  | -0.63                | -0.74               |
| 3,067.00            | 7.42            | 328.85      | 3,058.23            | 130.80     | -84.76     | 155.76                | 0.66                  | -0.40                | 3.93                |
| 3,161.00            | 7.11            | 327.52      | 3,151.47            | 140.90     | -91.02     | 167.63                | 0.38                  | -0.33                | -1.41               |
| 3,255.00            | 8.69            | 324.97      | 3,244.58            | 151.62     | -98.23     | 180.55                | 1.72                  | 1.68                 | -2.71               |
| 3,348.00            | 7.95            | 325.44      | 3,336.60            | 162.67     | -105.91    | 194.00                | 0.80                  | -0.80                | 0.51                |
| 3,441.00            | 8.16            | 327.48      | 3,428.68            | 173.53     | -113.10    | 207.03                | 0.38                  | 0.23                 | 2.19                |
| 3,536.00            | 7.91            | 325.35      | 3,522.75            | 184.60     | -120.44    | 220.30                | 0.41                  | -0.26                | -2.24               |
| 3,630.00            | 7.42            | 325.07      | 3,615.91            | 194.89     | -127.60    | 232.84                | 0.52                  | -0.52                | -0.30               |
| 3,724.00            | 9.11            | 323.03      | 3,708.93            | 205.82     | -135.55    | 246.35                | 1.82                  | 1.80                 | -2.17               |
| 3,818.00            | 8.98            | 322.00      | 3,801.76            | 217.54     | -144.54    | 261.11                | 0.22                  | -0.14                | -1.10               |
| 3,911.00            | 8.82            | 321.67      | 3,893.64            | 228.86     | -153.43    | 275.48                | 0.18                  | -0.17                | -0.35               |
| 4,006.00            | 8.38            | 318.82      | 3,987.57            | 239.78     | -162.51    | 289.63                | 0.64                  | -0.46                | -3.00               |
| 4,100.00            | 8.02            | 319.02      | 4,080.61            | 249.89     | -171.32    | 302.96                | 0.38                  | -0.38                | 0.21                |
| 4,194.00            | 7.81            | 317.42      | 4,173.72            | 259.54     | -179.94    | 315.81                | 0.32                  | -0.22                | -1.70               |
| 4,287.00            | 7.52            | 318.86      | 4,265.89            | 268.77     | -188.22    | 328.12                | 0.37                  | -0.31                | 1.55                |
| 4,381.00            | 7.72            | 319.94      | 4,359.06            | 278.24     | -196.33    | 340.53                | 0.26                  | 0.21                 | 1.15                |
| 4,476.00            | 7.65            | 318.58      | 4,453.20            | 287.86     | -204.62    | 353.17                | 0.21                  | -0.07                | -1.43               |
| 4,570.00            | 8.78            | 325.77      | 4,546.24            | 298.49     | -212.79    | 366.56                | 1.62                  | 1.20                 | 7.65                |
| 4,663.00            | 8.53            | 324.66      | 4,638.18            | 309.98     | -220.77    | 380.55                | 0.32                  | -0.27                | -1.19               |
| 4,757.00            | 8.40            | 324.98      | 4,731.16            | 321.29     | -228.75    | 394.39                | 0.15                  | -0.14                | 0.34                |
| 4,851.00            | 8.32            | 326.81      | 4,824.16            | 332.61     | -236.41    | 408.05                | 0.30                  | -0.09                | 1.95                |
| 4,945.00            | 6.51            | 329.77      | 4,917.37            | 342.90     | -242.82    | 420.16                | 1.97                  | -1.93                | 3.15                |
| 5,039.00            | 6.55            | 329.21      | 5,010.76            | 352.11     | -248.24    | 430.82                | 0.08                  | 0.04                 | -0.60               |
| 5,133.00            | 4.76            | 326.66      | 5,104.30            | 359.98     | -253.13    | 440.07                | 1.92                  | -1.90                | -2.71               |
| 5,227.00            | 3.55            | 326.96      | 5,198.05            | 365.68     | -256.86    | 446.87                | 1.29                  | -1.29                | 0.32                |
| 5,321.00            | 3.51            | 324.98      | 5,291.87            | 370.47     | -260.10    | 452.66                | 0.14                  | -0.04                | -2.11               |
| 5,415.00            | 3.46            | 326.87      | 5,385.70            | 375.20     | -263.30    | 458.37                | 0.13                  | -0.05                | 2.01                |
| 5,509.00            | 3.27            | 322.86      | 5,479.53            | 379.72     | -266.47    | 463.89                | 0.32                  | -0.20                | -4.27               |
| 5,603.00            | 3.27            | 323.43      | 5,573.38            | 384.01     | -269.69    | 469.25                | 0.03                  | 0.00                 | 0.61                |
| 5,697.00            | 3.29            | 325.36      | 5,667.23            | 388.38     | -272.82    | 474.62                | 0.12                  | 0.02                 | 2.05                |
| 5,791.00            | 3.18            | 321.84      | 5,761.08            | 392.65     | -275.96    | 479.92                | 0.24                  | -0.12                | -3.74               |
| 5,885.00            | 3.12            | 319.72      | 5,854.94            | 396.65     | -279.23    | 485.07                | 0.14                  | -0.06                | -2.26               |
| 5,979.00            | 3.19            | 318.91      | 5,948.79            | 400.57     | -282.60    | 490.22                | 0.09                  | 0.07                 | -0.86               |
| 6,072.00            | 3.30            | 319.32      | 6,041.64            | 404.55     | -286.04    | 495.46                | 0.12                  | 0.12                 | 0.44                |
| 6,166.00            | 3.31            | 323.37      | 6,135.49            | 408.78     | -289.43    | 500.86                | 0.25                  | 0.01                 | 4.31                |
| 6,260.00            | 3.16            | 337.59      | 6,229.34            | 413.36     | -292.03    | 506.10                | 0.87                  | -0.16                | 15.13               |
| 6,354.00            | 2.99            | 338.95      | 6,323.20            | 418.04     | -293.90    | 511.01                | 0.20                  | -0.18                | 1.45                |
| 6,447.00            | 2.91            | 337.94      | 6,416.08            | 422.49     | -295.66    | 515.67                | 0.10                  | -0.09                | -1.09               |
| 6,541.00            | 2.69            | 332.83      | 6,509.97            | 426.66     | -297.56    | 520.18                | 0.35                  | -0.23                | -5.44               |



## Scientific Drilling

### Survey Report



**Company:** COG Operating LLC  
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**Well:** Skelly Unit #603  
**Wellbore:** OH  
**Design:** Actual

**Local Co-ordinate Reference:** Site Skelly Unit #603 (1003)  
**TVD Reference:** Ground Elev @ 3866 00ft (Silver Oak #1)  
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**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** EDM 5000 1 Single User Db

#### Survey

| Measured Depth (ft)      | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Turn Rate (°/100ft) |
|--------------------------|-----------------|-------------|---------------------|------------|------------|-----------------------|-----------------------|----------------------|---------------------|
| 6,635 00                 | 2 33            | 334 25      | 6,603 88            | 430.35     | -299 40    | 524 25                | 0 39                  | -0 38                | 1 51                |
| 6,707 00                 | 2 16            | 336 01      | 6,675 82            | 432.90     | -300 59    | 527 03                | 0 25                  | -0 24                | 2 44                |
| <b>MWD Survey</b>        |                 |             |                     |            |            |                       |                       |                      |                     |
| 6,753 00                 | 2 16            | 336 01      | 6,721 79            | 434 49     | -301 29    | 528 73                | 0 00                  | 0 00                 | 0 00                |
| <b>Projection to Bit</b> |                 |             |                     |            |            |                       |                       |                      |                     |

#### Survey Annotations

| Measured Depth (ft) | Vertical Depth (ft) | Local Coordinates |            | Comment           |
|---------------------|---------------------|-------------------|------------|-------------------|
|                     |                     | +N/-S (ft)        | +E/-W (ft) |                   |
| 1,768 00            | 1,767 77            | 14 43             | -10 07     | Gyro Tie-in       |
| 6,707 00            | 6,675 82            | 432 90            | -300 59    | MWD Survey        |
| 6,753 00            | 6,721 79            | 434.49            | -301 29    | Projection to Bit |

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_