Scientific Drilling

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# COG RESOURCES

**Field:** Maljamar
**Site:** Lea County, NM
**Well:** GC Federal #23
**Wellpath:** DH - Job #32D0410228
**Survey:** 04/02/10-04/09/10

SUR: K-20-17s-32e, 2030/S & 1975/W
BHL: K-20-17s-32e, 1665/S & 2306/W
API # 30-025-39269

**This survey is correct to the best of my knowledge and is supported by actual field data.**

**Company Representative**

**Notarized this date** 1st **of** May **, 2010.**

**Notary Signature**
**Couty of Midland**
**State of Texas**

NOTARY PUBLIC STATE OF TEXAS
CARRIE REED
My Commission Expires
October 4, 2011

Scientific Drilling

# Scientific Drilling International, Inc.
## Survey Report

| | | | | | |
|---|---|---|---|---|---|
| **Company:** | COG RESOURCES | **Date:** 4/8/2010 | **Time:** 22:27:49 | **Page:** | 1 |
| **Field:** | Maljamar | **Co-ordinate(NE) Reference:** | Site: Lea County, NM, True North | | |
| **Site:** | Lea County, NM | **Vertical (TVD) Reference:** | SITE 0.0 | | |
| **Well:** | GC Federal #23 | **Section (VS) Reference:** | Well (0.00N,0.00E,138.39Azi) | | |
| **Wellpath:** | VH - Job #32K0410230 | **Survey Calculation Method:** | Minimum Curvature | **Db:** | Sybase |

| | | | |
|---|---|---|---|
| **Survey:** | 04/01/10<br>KSRG 0'-2023' | **Start Date:** | 4/1/2010 |
| **Company:** | Scientific Drilling Internatio | **Engineer:** | Garza/Rowe/Renteria |
| **Tool:** | Keeper,Keeper Gyro | **Tied-to:** | From Surface |

**Survey**

| MD<br>ft | Incl.<br>deg | Azim<br>deg | TVD<br>ft | VS<br>ft | N/S<br>ft | E/W<br>ft | DLS<br>deg/100ft | ClsD<br>ft | ClsA<br>deg |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.00 | 359.71 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 | 0.00 |
| 100.0 | 0.28 | 123.07 | 100.0 | 0 2 | -0.1 | 0.2 | 0.28 | 0.2 | 123.07 |
| 200.0 | 0 63 | 137 06 | 200 0 | 1.0 | -0.7 | 0.8 | 0.36 | 1.0 | 130.48 |
| 300.0 | 0.77 | 133.40 | 300.0 | 2.2 | -1.5 | 1.6 | 0.15 | 2.3 | 132.96 |
| 400.0 | 1 04 | 124.89 | 400.0 | 3.8 | -2.5 | 2.9 | 0.30 | 3.8 | 131.12 |
| 500.0 | 1.15 | 115.83 | 500.0 | 5.6 | -3.5 | 4.5 | 0.20 | 5.7 | 127.47 |
| 600.0 | 1.27 | 113.07 | 599.9 | 7.5 | -4.3 | 6.4 | 0.13 | 7.8 | 123.95 |
| 700.0 | 1.28 | 112.66 | 699.9 | 9.5 | -5.2 | 8.5 | 0.01 | 10.0 | 121.49 |
| 800.0 | 1.06 | 111 68 | 799.9 | 11.4 | -6.0 | 10 4 | 0.22 | 12.0 | 119.92 |
| 900.0 | 1.14 | 109.28 | 899 9 | 13 1 | -6 6 | 12.2 | 0.09 | 13.9 | 118 61 |
| 1000.0 | 1.01 | 114.20 | 999.9 | 14.7 | -7.3 | 13.9 | 0.16 | 15.7 | 117.78 |
| 1100 0 | 0.99 | 108.89 | 1099.8 | 16.3 | -8.0 | 15.6 | 0.09 | 17.5 | 117.16 |
| 1200 0 | 0.95 | 91.16 | 1199.8 | 17.6 | -8.3 | 17.2 | 0.30 | 19.1 | 115.70 |
| 1300.0 | 0.78 | 94.04 | 1299.8 | 18.7 | -8.3 | 18.7 | 0.18 | 20.5 | 114.03 |
| 1400.0 | 1.16 | 95.12 | 1399.8 | 19.9 | -8.5 | 20.4 | 0.38 | 22.1 | 112.57 |
| 1500.0 | 1.35 | 88.58 | 1499.8 | 21.4 | -8.5 | 22 6 | 0.24 | 24.1 | 110.72 |
| 1600.0 | 1.45 | 78.00 | 1599.7 | 22.8 | -8.2 | 25.0 | 0.28 | 26.3 | 108.26 |
| 1700.0 | 1.73 | 63 96 | 1699.7 | 23.8 | -7.3 | 27.6 | 0.48 | 28.5 | 104.86 |
| 1800.0 | 2.03 | 66.64 | 1799.7 | 24.8 | -6.0 | 30.6 | 0.31 | 31.1 | 101.03 |
| 1900.0 | 2.15 | 61 81 | 1899.6 | 25.7 | -4.4 | 33.9 | 0.21 | 34.1 | 97.35 |
| 2000.0 | 1.98 | 58.43 | 1999.5 | 26.5 | -2.6 | 37.0 | 0.21 | 37.1 | 93.99 |
| 2023.0 | 1.90 | 58.56 | 2022.5 | 26.6 | -2.2 | 37.6 | 0.35 | 37.7 | 93.30 |

Scientific Drilling

# Scientific Drilling International, Inc.

## Survey Report

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|---|---|---|---|---|---|
| **Company:** | COG RESOURCES | **Date:** 4/19/2010 | **Time:** 21:09:03 | **Page:** | 1 |
| **Field:** | Maljamar | **Co-ordinate(NE) Reference:** | Site: Lea County, NM, True North | | |
| **Site:** | Lea County, NM | **Vertical (TVD) Reference:** | SITE 0.0 | | |
| **Well:** | GC Federal #23 | **Section (VS) Reference:** | Well (0.00N,0.00E,138.39Azi) | | |
| **Wellpath:** | DH - Job #32D0410228 | **Survey Calculation Method:** | Minimum Curvature | **Db:** | Sybase |

| | | | |
|---|---|---|---|
| **Survey:** | 04/02/10-04/09/10<br>MWD 2119'-6957' | **Start Date:** | 4/2/2010 |
| **Company:** | Scientific Drilling Internatio | **Engineer:** | Orozco/Becker/Burnett |
| **Tool:** | MWD,MWD | **Tied-to:** | From: Definitive Path |

**Survey**

| MD<br>ft | Incl<br>deg | Azim<br>deg | TVD<br>ft | VS<br>ft | N/S<br>ft | E/W<br>ft | DLS<br>deg/100ft | ClsD<br>ft | ClsA<br>deg |
|---|---|---|---|---|---|---|---|---|---|
| 2023.0 | 1.90 | 58.56 | 2022.5 | 26.6 | -2.2 | 37.6 | 0.00 | 37.7 | 93.30 |
| 2119.0 | 1.71 | 64.93 | 2118.5 | 27.3 | -0.7 | 40.3 | 0.29 | 40.3 | 91.04 |
| 2212.0 | 1.76 | 76.40 | 2211.4 | 28.4 | 0.2 | 42.9 | 0.38 | 42.9 | 89.75 |
| 2305.0 | 2.44 | 117.77 | 2304.4 | 30.9 | -0.4 | 46.1 | 1.74 | 46.1 | 90.49 |
| 2399.0 | 3.49 | 139.07 | 2398.2 | 35.6 | -3.5 | 49.7 | 1.60 | 49.8 | 94.02 |
| 2493.0 | 5.09 | 142.81 | 2492.0 | 42.6 | -9.0 | 54.1 | 1.73 | 54.9 | 99.42 |
| 2587.0 | 6.64 | 149.72 | 2585.5 | 52.1 | -17.0 | 59.4 | 1.81 | 61.8 | 105.97 |
| 2681.0 | 5.87 | 147.82 | 2678.9 | 62.2 | -25.8 | 64.7 | 0.85 | 69.6 | 111.71 |
| 2774.0 | 8.11 | 151.44 | 2771.2 | 73.3 | -35.5 | 70.4 | 2.45 | 78.8 | 116.80 |
| 2868.0 | 7.01 | 151.28 | 2864.4 | 85.3 | -46.4 | 76.3 | 1.17 | 89.3 | 121.31 |
| 2962.0 | 7.90 | 150.72 | 2957.6 | 97.2 | -57.1 | 82.2 | 0.95 | 100.1 | 124.77 |
| 3055.0 | 9.05 | 143.87 | 3049.6 | 110.8 | -68.5 | 89.6 | 1.64 | 112.8 | 127.41 |
| 3118.0 | 8.26 | 143.97 | 3111.9 | 120.2 | -76.2 | 95.2 | 1.25 | 122.0 | 128.67 |
| 3243.0 | 7.56 | 139.74 | 3235.7 | 137.4 | -89.7 | 105.8 | 0.73 | 138.7 | 130.30 |
| 3337.0 | 7.16 | 138.14 | 3328.9 | 149.4 | -98.8 | 113.7 | 0.48 | 150.7 | 130.99 |
| 3430 0 | 6.64 | 139.31 | 3421.2 | 160.6 | -107.2 | 121.1 | 0.58 | 161.7 | 131.52 |
| 3524.0 | 7.14 | 135.30 | 3514.6 | 171.8 | -115.5 | 128.7 | 0.74 | 173.0 | 131.89 |
| 3617.0 | 7.77 | 133.69 | 3606.8 | 183.9 | -123.9 | 137.4 | 0.71 | 185.0 | 132.06 |
| 3711.0 | 7.76 | 135.00 | 3699.9 | 196.5 | -132.8 | 146.4 | 0.19 | 197.7 | 132.21 |
| 3804.0 | 8.28 | 135.75 | 3792.0 | 209.5 | -142.1 | 155.5 | 0.57 | 210.7 | 132.40 |
| 3898.0 | 7.64 | 150.65 | 3885.1 | 222.4 | -152.3 | 163.3 | 2.29 | 223.4 | 133.01 |
| 3929.0 | 7.44 | 145.34 | 3915.8 | 226.4 | -155.8 | 165.5 | 2.34 | 227.3 | 133.27 |
| 3997.0 | 7.15 | 146.64 | 3983.3 | 234.9 | -163.0 | 170.3 | 0.49 | 235.7 | 133.73 |
| 4091.0 | 7.17 | 150.50 | 4076.6 | 246.5 | -172.9 | 176.4 | 0.51 | 247.1 | 134.43 |
| 4185.0 | 7.39 | 143.41 | 4169.8 | 258.2 | -182.9 | 182.9 | 0.98 | 258.7 | 135.00 |
| 4278.0 | 7.00 | 141.61 | 4262.1 | 269.8 | -192.1 | 190.0 | 0.48 | 270.2 | 135.32 |
| 4372.0 | 7.19 | 139.79 | 4355.3 | 281.4 | -201.1 | 197.4 | 0.31 | 281.8 | 135 54 |
| 4466.0 | 7.50 | 139.71 | 4448.6 | 293.5 | -210.3 | 205.1 | 0.33 | 293.8 | 135.71 |
| 4560.0 | 7 51 | 138.70 | 4541.8 | 305.7 | -219.6 | 213.1 | 0.14 | 306.0 | 135.85 |
| 4654.0 | 7.20 | 138.73 | 4635.0 | 317.8 | -228.6 | 221.1 | 0.33 | 318.0 | 135.96 |
| 4747.0 | 6.94 | 141.08 | 4727.3 | 329.2 | -237.4 | 228.5 | 0.42 | 329.5 | 136.10 |
| 4841.0 | 6.95 | 140.65 | 4820.6 | 340.6 | -246.2 | 235.6 | 0.06 | 340.8 | 136.26 |
| 4935.0 | 7.15 | 139.79 | 4913.9 | 352.1 | -255.1 | 243.0 | 0.24 | 352.3 | 136.39 |
| 5029.0 | 6.18 | 139.88 | 5007.2 | 363.0 | -263.4 | 250.0 | 1.03 | 363.2 | 136.49 |
| 5122.0 | 6.35 | 139.87 | 5099.7 | 373.1 | -271.2 | 256.6 | 0.18 | 373.3 | 136.58 |
| 5217.0 | 5 88 | 142.88 | 5194.2 | 383.2 | -279.1 | 262.9 | 0.60 | 383.4 | 136.71 |
| 5311.0 | 5.03 | 149.09 | 5287.7 | 392.1 | -286.4 | 267.9 | 1.10 | 392.2 | 136.91 |
| 5404.0 | 3.62 | 139.46 | 5380.5 | 399.0 | -292.2 | 271.9 | 1.70 | 399.1 | 137.05 |
| 5466.0 | 3.77 | 137.83 | 5442.3 | 403.0 | -295.2 | 274.6 | 0.30 | 403.1 | 137.07 |
| 5559.0 | 2.98 | 130.31 | 5535.2 | 408.5 | -299.0 | 278.5 | 0.97 | 408.6 | 137.04 |
| 5650.0 | 4.31 | 133.85 | 5626.0 | 414.2 | -302.9 | 282.7 | 1.48 | 414.4 | 136.97 |
| 5743.0 | 4.93 | 132.01 | 5718.7 | 421.7 | -308.0 | 288.2 | 0.69 | 421.8 | 136.90 |
| 5838.0 | 4.89 | 146.80 | 5813.3 | 429.7 | -314 1 | 293.5 | 1.33 | 429.9 | 136.94 |
| 5930.0 | 3.24 | 157.47 | 5905.1 | 436.1 | -319.8 | 296.6 | 1.97 | 436.2 | 137.15 |
| 6023.0 | 2.62 | 167.30 | 5998.0 | 440.4 | -324.3 | 298.1 | 0.86 | 440.5 | 137.41 |
| 6117.0 | 2.44 | 166.89 | 6091.9 | 444.1 | -328.3 | 299.0 | 0.19 | 444.1 | 137.68 |
| 6209.0 | 2.68 | 161.69 | 6183.8 | 447.8 | -332.3 | 300.1 | 0.36 | 447.8 | 137.91 |
| 6303.0 | 2.71 | 162.33 | 6277.7 | 451.8 | -336.5 | 301.5 | 0.05 | 451.8 | 138.14 |
| 6397.0 | 1.86 | 134.04 | 6371.6 | 455.4 | -339.7 | 303.3 | 1.48 | 455.4 | 138.24 |

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## Survey Report

| | | | |
|---|---|---|---|
| **Company:** | COG RESOURCES | **Date:** 4/19/2010 **Time:** 21:09:03 | **Page:** 2 |
| **Field:** | Maljamar | **Co-ordinate(NE) Reference:** | Site: Lea County, NM, True North |
| **Site:** | Lea County, NM | **Vertical (TVD) Reference:** | SITE 0.0 |
| **Well:** | GC Federal #23 | **Section (VS) Reference:** | Well (0.00N,0.00E,138.39Azi) |
| **Wellpath:** | DH - Job #32D0410228 | **Survey Calculation Method:** | Minimum Curvature **Db:** Sybase |

**Survey**

| MD ft | Incl deg | Azim deg | TVD ft | VS ft | N/S ft | E/W ft | DLS deg/100ft | ClsD ft | ClsA deg |
|---|---|---|---|---|---|---|---|---|---|
| 6491.0 | 3.16 | 123.81 | 6465.5 | 459.4 | -342.2 | 306.5 | 1.46 | 459.4 | 138.14 |
| 6584.0 | 2.89 | 127.42 | 6558.4 | 464.2 | -345.0 | 310.5 | 0.36 | 464.2 | 138.01 |
| 6677.0 | 3.60 | 127.56 | 6651.3 | 469.3 | -348.2 | 314.7 | 0.76 | 469.4 | 137 90 |
| 6769.0 | 3.70 | 139.40 | 6743.1 | 475.2 | -352.2 | 318.9 | 0.82 | 475.2 | 137.84 |
| 6863.0 | 3.86 | 134.40 | 6836.9 | 481.3 | -356.8 | 323.2 | 0.39 | 481.4 | 137.83 |
| 6957.0 | 3.36 | 139.39 | 6930.7 | 487.3 | -361.1 | 327.2 | 0.63 | 487.3 | 137.82 |