## Results of Directional Survey

| | | | | |
|---|---|---|---|---|
| API number: | 30-025-41080 | | | |
| OGRID: | | Operator: | COG OPERATING LLC | |
| | | Property: | CROCKETT STATE | # 2H |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| surface | ULSTR: | H | 20 | T | 21S | R | 33E |
| | | | | 2310 | FNL | 190 | FEL |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BH Loc | ULSTR: | E | 20 | T | 21S | R | 33E |
| 16290 | MD | 11778.0 | TVD | 2298 | FNL | 337 | FWL |
| | | | | | | 4943 | FEL |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Top Perf/OH | ULSTR: | H | 20 | T | 21S | R | 33E |
| 12044 | MD | 11827.5 | TVD | 2272 | FNL | 704 | FEL |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bot Perf/OH | ULSTR: | E | 20 | T | 21S | R | 33E |
| 16210 | MD | 11778.8 | TVD | 2295 | FNL | 417 | FWL |
| | | | | | | 4863 | FEL |

| | MD | N/S | E/W | VD |
|---|---|---|---|---|
| | 12013 | 35.80 | -483.80 | 11819.00 |
| TOP PERFS/OH | **12044** | 37.70 | -513.50 | 11827.50 |
| | 12044 | 37.70 | -513.50 | 11827.50 |
| | 16156 | 17.40 | -4619.20 | 11779.20 |
| BOT PERFS/OH | **16210** | 15.28 | -4673.14 | 11778.78 |
| | 16245 | 13.90 | -4708.10 | 11778.50 |

| | | | | |
|---|---|---|---|---|
| NEXT TO LAST | 16245 | 13.90 | -4708.10 | 11778.50 |
| LAST READING | 16290 | 12.00 | -4753.10 | 11778.00 |
| TD | **16290** | 12.00 | -4753.10 | 11778.00 |

| | | | | |
|---|---|---|---|---|
| Surface Location | 2310 | FN | 190 | FE |
| Projected BHL | 2298 | FN | 4943 | FE |
| Location of | | | | |
| Top Perfs/OH | 2272 | FN | 704 | FE |
| Bottom Perfs/OH | 2295 | FN | 4863 | FE |

SUMMARY of Subsurface Locations

| | | | | | | |
|---|---|---|---|---|---|---|
| **Surface Location** | H-20-21S-33E | 2310 | FN | 190 | FE | Vert. Depth |
| | | | | | | |
| **Top Perfs/OH** | H-20-21S-33E | 2272 | FN | 704 | FE | 11827.50 |
| **Bottom Perfs/OH** | E-20-21S-33E | 2295 | FN | 4863 | FE | 11778.78 |
| | | | | | | |
| **Projected TD** | E-20-21S-33E | 2298 | FN | 4943 | FE | 11778.00 |

VAUGHN ENERGY SERVICES
A GYRO TECHNOLOGIES INC. COMPANY

PO Box 261021
Corpus Christi, Texas 78426
(361) 767-0602 • (800) 606-GYRO • Fax (361) 767-0612

HOBBS OCD

SEP 17 2013

RECEIVED

May 30, 2013

COG Operating LLC (Concho)
One Concho Center
600 W. Illinois Avenue
Midland, TX 79701

Attn: Kanicia Castillo

Re: **Crockett State No 002H**

Please find enclosed a copy of the survey from 0' to 12,179' ran on the above referenced well.

If I can be of any further service, please do not hesitate to call me at 800-606-4976.

Sincerely,

Keith Havelka
Operations

STATE OF TEXAS §
§
COUNTY OF NUECES §

This instrument was acknowledged before me on the 30th day of May, A.D., 2013, by Keith Havelka.

Laura Ballew
Notary Public, State of Texas

LAURA BALLEW
Notary Public, State of Texas
My Commission Expires
January 28, 2014

Company: COG Operating LLC (Concho)
Lease/Well: Crockett State/No 002H

Rig Name: Precision 105
State/County: New Mexico/Lea
Latitude: 32.47, Longitude: -103.59
GRID North is 0.40 Degrees East of True North
VS-Azi: 0.00 Degrees

HOBBS OCD

SEP 17 2013

RECEIVED

Depth Reference : RKB= 25'

DRILLOG HA GYRO SURVEY CALCULATIONS
Filename: gyro survey.ut
Minimum Curvature Method
Report Date/Time: 5/30/2013 / 10:55

Vaughn Energy Services
Midland, Texas
432-563-5444
Surveyor: Tim Dillon
Crockett State No 002H / API 30-025-41080

| Measured Depth FT | Incl Angle Deg | Drift Direction Deg | TVD FT | +N/-S FT | +E/-W FT | Closure Distance FT | Closure Direction Deg | Dogleg Severity Deg/100 |
|---|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | **** |
| 100.00 | 0.44 | 309.57 | 100.00 | 0.25 | -0.30 | 0.39 | 309.57 | 0.44 |
| 200.00 | 0.57 | 314.75 | 200.00 | 0.84 | -0.95 | 1.27 | 311.59 | 0.13 |
| 300.00 | 0.70 | 314.47 | 299.99 | 1.62 | -1.73 | 2.37 | 313.00 | 0.13 |
| 400.00 | 0.80 | 314.03 | 399.98 | 2.53 | -2.67 | 3.68 | 313.44 | 0.10 |
| 500.00 | 0.91 | 316.32 | 499.97 | 3.58 | -3.72 | 5.16 | 313.96 | 0.12 |
| 600.00 | 1.62 | 292.68 | 599.94 | 4.70 | -5.57 | 7.29 | 310.17 | 0.87 |
| 700.00 | 1.63 | 294.06 | 699.90 | 5.83 | -8.17 | 10.04 | 305.49 | 0.04 |
| 800.00 | 1.56 | 289.15 | 799.87 | 6.85 | -10.75 | 12.75 | 302.51 | 0.15 |
| 900.00 | 1.86 | 292.30 | 899.82 | 7.92 | -13.54 | 15.69 | 300.31 | 0.32 |
| 1000.00 | 2.42 | 291.24 | 999.75 | 9.30 | -17.02 | 19.39 | 298.65 | 0.56 |
| 1100.00 | 2.76 | 294.71 | 1099.65 | 11.07 | -21.17 | 23.89 | 297.60 | 0.38 |
| 1200.00 | 3.05 | 284.85 | 1199.52 | 12.76 | -25.93 | 28.90 | 296.19 | 0.58 |
| 1300.00 | 3.39 | 285.19 | 1299.36 | 14.22 | -31.36 | 34.44 | 294.38 | 0.34 |
| 1400.00 | 3.46 | 288.88 | 1399.18 | 15.97 | -37.08 | 40.37 | 293.30 | 0.23 |
| 1500.00 | 2.37 | 287.90 | 1499.05 | 17.58 | -41.90 | 45.44 | 292.76 | 1.09 |
| 1600.00 | 2.24 | 279.35 | 1598.97 | 18.54 | -45.80 | 49.41 | 292.03 | 0.37 |
| 1700.00 | 2.52 | 271.77 | 1698.89 | 18.92 | -49.94 | 53.40 | 290.75 | 0.42 |
| 1800.00 | 2.81 | 272.47 | 1798.78 | 19.10 | -54.58 | 57.82 | 289.28 | 0.28 |


VES Survey Date: 05/18/2013

| Measured Depth FT | Incl Angle Deg | Drift Direction Deg | TVD FT | +N/-S FT | +E/-W FT | Closure Distance FT | Closure Direction Deg | Dogleg Severity Deg/100 |
|---|---|---|---|---|---|---|---|---|
| 1900.00 | 3.72 | 276.57 | 1898.61 | 19.57 | -60.25 | 63.35 | 288.00 | 0.95 |
| 2000.00 | 2.95 | 281.18 | 1998.44 | 20.44 | -66.00 | 69.10 | 287.21 | 0.81 |
| 2100.00 | 2.82 | 298.00 | 2098.32 | 22.10 | -70.70 | 74.07 | 287.36 | 0.85 |
| 2200.00 | 0.86 | 298.85 | 2198.26 | 23.61 | -73.52 | 77.22 | 287.80 | 1.96 |
| 2300.00 | 0.57 | 297.83 | 2298.25 | 24.20 | -74.62 | 78.45 | 287.97 | 0.29 |
| 2400.00 | 0.80 | 319.50 | 2398.25 | 24.97 | -75.52 | 79.54 | 288.30 | 0.34 |
| 2500.00 | 1.20 | 324.67 | 2498.23 | 26.36 | -76.58 | 80.99 | 288.99 | 0.41 |
| 2600.00 | 1.78 | 328.33 | 2598.20 | 28.54 | -78.01 | 83.06 | 290.10 | 0.59 |
| 2700.00 | 2.61 | 334.87 | 2698.12 | 31.92 | -79.79 | 85.94 | 291.81 | 0.86 |
| 2800.00 | 3.28 | 338.91 | 2797.99 | 36.65 | -81.78 | 89.62 | 294.14 | 0.71 |
| 2900.00 | 2.96 | 351.87 | 2897.84 | 41.88 | -83.18 | 93.13 | 296.73 | 0.77 |
| 3000.00 | 2.79 | 1.28 | 2997.72 | 46.87 | -83.49 | 95.75 | 299.31 | 0.50 |
| 3100.00 | 1.64 | 8.35 | 3097.64 | 50.72 | -83.23 | 97.46 | 301.36 | 1.18 |
| 3200.00 | 2.51 | 16.10 | 3197.58 | 54.24 | -82.41 | 98.66 | 303.35 | 0.91 |
| 3300.00 | 0.94 | 359.80 | 3297.53 | 57.16 | -81.81 | 99.80 | 304.94 | 1.62 |
| 3400.00 | 1.45 | 356.32 | 3397.51 | 59.24 | -81.89 | 101.08 | 305.88 | 0.51 |
| 3500.00 | 0.76 | 352.89 | 3497.49 | 61.16 | -82.06 | 102.34 | 306.70 | 0.69 |
| 3600.00 | 0.78 | 321.46 | 3597.48 | 62.35 | -82.56 | 103.46 | 307.06 | 0.42 |
| 3700.00 | 0.76 | 310.01 | 3697.47 | 63.31 | -83.49 | 104.78 | 307.17 | 0.15 |
| 3800.00 | 0.82 | 312.19 | 3797.46 | 64.21 | -84.53 | 106.15 | 307.22 | 0.07 |
| 3900.00 | 1.42 | 300.72 | 3897.44 | 65.33 | -86.12 | 108.10 | 307.18 | 0.64 |
| 4000.00 | 1.93 | 324.65 | 3997.40 | 67.33 | -88.16 | 110.93 | 307.37 | 0.85 |
| 4100.00 | 1.21 | 349.84 | 4097.36 | 69.74 | -89.32 | 113.32 | 307.98 | 0.98 |
| 4200.00 | 1.20 | 36.56 | 4197.34 | 71.63 | -88.88 | 114.15 | 308.86 | 0.96 |
| 4300.00 | 0.77 | 91.84 | 4297.33 | 72.45 | -87.59 | 113.67 | 309.59 | 0.99 |
| 4400.00 | 0.90 | 92.70 | 4397.32 | 72.39 | -86.14 | 112.52 | 310.04 | 0.13 |
| 4500.00 | 0.76 | 47.34 | 4497.31 | 72.80 | -84.87 | 111.81 | 310.62 | 0.65 |
| 4600.00 | 0.77 | 29.96 | 4597.30 | 73.83 | -84.04 | 111.87 | 311.30 | 0.23 |
| 4700.00 | 0.79 | 27.68 | 4697.29 | 75.03 | -83.39 | 112.17 | 311.98 | 0.04 |
| 4800.00 | 0.76 | 26.09 | 4797.28 | 76.23 | -82.77 | 112.53 | 312.64 | 0.04 |
| 4900.00 | 0.74 | 13.17 | 4897.27 | 77.46 | -82.34 | 113.04 | 313.25 | 0.17 |
| 5000.00 | 0.68 | 356.38 | 4997.27 | 78.68 | -82.23 | 113.81 | 313.74 | 0.22 |
| 5100.00 | 0.67 | 355.32 | 5097.26 | 79.86 | -82.31 | 114.68 | 314.13 | 0.01 |
| 5200.00 | 0.89 | 353.62 | 5197.25 | 81.22 | -82.45 | 115.73 | 314.57 | 0.22 |
| 5300.00 | 0.66 | 342.28 | 5297.24 | 82.54 | -82.71 | 116.85 | 314.94 | 0.28 |
| 5400.00 | 0.60 | 346.72 | 5397.23 | 83.60 | -83.00 | 117.80 | 315.20 | 0.08 |
| 5500.00 | 0.46 | 13.11 | 5497.23 | 84.50 | -83.03 | 118.46 | 315.50 | 0.28 |
| 5600.00 | 0.34 | 15.10 | 5597.23 | 85.18 | -82.86 | 118.83 | 315.79 | 0.12 |
| 5700.00 | 0.39 | 71.89 | 5697.23 | 85.57 | -82.46 | 118.84 | 316.06 | 0.35 |



VES Survey Date: 05/18/2013

| Measured Depth FT | Incl Angle Deg | Drift Direction Deg | TVD FT | +N/-S FT | +E/-W FT | Closure Distance FT | Closure Direction Deg | Dogleg Severity Deg/100 |
|---|---|---|---|---|---|---|---|---|
| 5800.00 | 0.74 | 107.74 | 5797.22 | 85.48 | -81.53 | 118.13 | 316.35 | 0.48 |
| 5900.00 | 1.04 | 102.06 | 5897.21 | 85.09 | -80.03 | 116.82 | 316.76 | 0.31 |
| 6000.00 | 1.23 | 104.64 | 5997.19 | 84.63 | -78.11 | 115.17 | 317.30 | 0.19 |
| 6100.00 | 1.18 | 100.81 | 6097.17 | 84.17 | -76.06 | 113.45 | 317.90 | 0.09 |
| 6200.00 | 1.07 | 88.34 | 6197.15 | 84.00 | -74.12 | 112.03 | 318.58 | 0.27 |
| 6300.00 | 1.31 | 99.15 | 6297.13 | 83.85 | -72.06 | 110.56 | 319.33 | 0.33 |
| 6400.00 | 1.12 | 93.68 | 6397.10 | 83.60 | -69.95 | 109.01 | 320.08 | 0.22 |
| 6500.00 | 1.03 | 94.84 | 6497.09 | 83.47 | -68.08 | 107.71 | 320.80 | 0.10 |
| 6600.00 | 0.98 | 79.84 | 6597.07 | 83.54 | -66.35 | 106.68 | 321.54 | 0.27 |
| 6700.00 | 0.98 | 75.19 | 6697.06 | 83.91 | -64.68 | 105.95 | 322.37 | 0.08 |
| 6800.00 | 0.94 | 81.46 | 6797.04 | 84.25 | -63.05 | 105.23 | 323.19 | 0.11 |
| 6900.00 | 1.00 | 76.06 | 6897.03 | 84.58 | -61.39 | 104.51 | 324.03 | 0.11 |
| 7000.00 | 1.05 | 107.71 | 6997.01 | 84.51 | -59.67 | 103.45 | 324.78 | 0.56 |
| 7100.00 | 1.21 | 124.17 | 7096.99 | 83.64 | -57.92 | 101.74 | 325.30 | 0.36 |
| 7200.00 | 1.20 | 134.21 | 7196.97 | 82.32 | -56.30 | 99.73 | 325.63 | 0.21 |
| 7300.00 | 1.15 | 139.28 | 7296.95 | 80.83 | -54.89 | 97.71 | 325.82 | 0.11 |
| 7400.00 | 1.21 | 136.33 | 7396.93 | 79.30 | -53.51 | 95.67 | 325.99 | 0.09 |
| 7500.00 | 1.27 | 150.51 | 7496.91 | 77.57 | -52.23 | 93.52 | 326.05 | 0.31 |
| 7600.00 | 1.32 | 155.92 | 7596.88 | 75.56 | -51.21 | 91.28 | 325.87 | 0.13 |
| 7700.00 | 0.85 | 154.61 | 7696.86 | 73.84 | -50.43 | 89.42 | 325.67 | 0.47 |
| 7800.00 | 0.74 | 168.78 | 7796.85 | 72.54 | -49.98 | 88.09 | 325.43 | 0.22 |
| 7900.00 | 0.92 | 163.66 | 7896.84 | 71.13 | -49.63 | 86.73 | 325.09 | 0.19 |
| 8000.00 | 0.91 | 183.21 | 7996.83 | 69.56 | -49.45 | 85.35 | 324.59 | 0.31 |
| 8100.00 | 1.19 | 185.61 | 8096.81 | 67.73 | -49.60 | 83.95 | 323.79 | 0.27 |
| 8200.00 | 1.16 | 186.16 | 8196.79 | 65.70 | -49.81 | 82.44 | 322.83 | 0.03 |
| 8300.00 | 1.01 | 172.88 | 8296.77 | 63.82 | -49.80 | 80.95 | 322.03 | 0.29 |
| 8400.00 | 1.17 | 183.54 | 8396.76 | 61.92 | -49.76 | 79.44 | 321.22 | 0.26 |
| 8500.00 | 0.96 | 193.06 | 8496.74 | 60.08 | -50.01 | 78.17 | 320.23 | 0.27 |
| 8600.00 | 0.97 | 204.27 | 8596.73 | 58.49 | -50.55 | 77.31 | 319.17 | 0.19 |
| 8700.00 | 0.87 | 196.62 | 8696.71 | 57.00 | -51.11 | 76.56 | 318.12 | 0.16 |
| 8800.00 | 1.23 | 199.26 | 8796.70 | 55.26 | -51.68 | 75.66 | 316.91 | 0.37 |
| 8900.00 | 1.71 | 197.63 | 8896.66 | 52.82 | -52.49 | 74.47 | 315.18 | 0.48 |
| 9000.00 | 1.48 | 164.44 | 8996.63 | 50.15 | -52.60 | 72.67 | 313.63 | 0.94 |
| 9100.00 | 1.59 | 163.27 | 9096.59 | 47.57 | -51.85 | 70.36 | 312.53 | 0.12 |
| 9200.00 | 1.13 | 177.22 | 9196.56 | 45.25 | -51.40 | 68.48 | 311.36 | 0.57 |
| 9300.00 | 1.87 | 202.28 | 9296.53 | 42.76 | -51.97 | 67.30 | 309.44 | 0.97 |
| 9400.00 | 1.60 | 219.15 | 9396.48 | 40.17 | -53.47 | 66.88 | 306.91 | 0.58 |
| 9500.00 | 1.67 | 235.37 | 9496.44 | 38.26 | -55.55 | 67.45 | 304.55 | 0.47 |
| 9600.00 | 1.78 | 242.14 | 9596.40 | 36.70 | -58.13 | 68.74 | 302.27 | 0.23 |

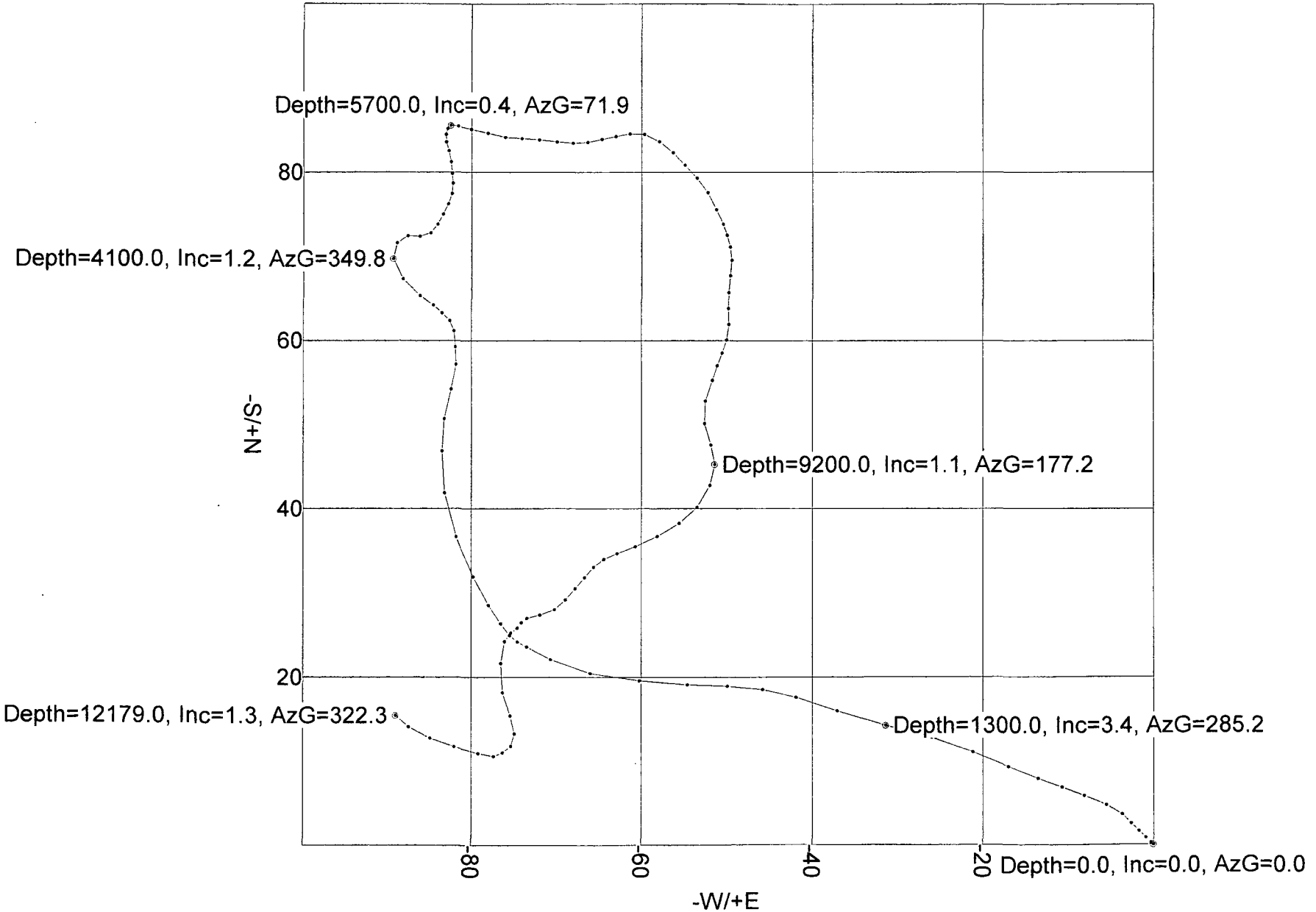


VES Survey Date: 05/18/2013

| Measured Depth FT | Incl Angle Deg | Drift Direction Deg | TVD FT | +N/-S FT | +E/-W FT | Closure Distance FT | Closure Direction Deg | Dogleg Severity Deg/100 |
|---|---|---|---|---|---|---|---|---|
| 9700.00 | 1.50 | 248.72 | 9696.36 | 35.50 | -60.72 | 70.34 | 300.31 | 0.34 |
| 9800.00 | 1.14 | 248.21 | 9796.33 | 34.66 | -62.86 | 71.78 | 298.87 | 0.36 |
| 9900.00 | 0.82 | 244.01 | 9896.31 | 33.97 | -64.42 | 72.83 | 297.81 | 0.33 |
| 10000.00 | 0.92 | 222.15 | 9996.30 | 33.07 | -65.60 | 73.47 | 296.75 | 0.34 |
| 10100.00 | 0.97 | 218.72 | 10096.29 | 31.82 | -66.67 | 73.87 | 295.51 | 0.08 |
| 10200.00 | 1.02 | 221.63 | 10196.27 | 30.49 | -67.79 | 74.33 | 294.22 | 0.07 |
| 10300.00 | 0.99 | 221.76 | 10296.26 | 29.18 | -68.95 | 74.87 | 292.94 | 0.03 |
| 10400.00 | 0.99 | 233.11 | 10396.24 | 28.03 | -70.21 | 75.60 | 291.76 | 0.19 |
| 10500.00 | 1.24 | 263.27 | 10496.23 | 27.38 | -71.97 | 77.01 | 290.83 | 0.63 |
| 10600.00 | 0.59 | 240.78 | 10596.21 | 27.01 | -73.49 | 78.30 | 290.18 | 0.73 |
| 10700.00 | 0.39 | 214.30 | 10696.21 | 26.47 | -74.13 | 78.72 | 289.65 | 0.29 |
| 10800.00 | 0.53 | 220.52 | 10796.21 | 25.84 | -74.63 | 78.97 | 289.10 | 0.15 |
| 10900.00 | 0.58 | 244.68 | 10896.20 | 25.28 | -75.38 | 79.50 | 288.54 | 0.24 |
| 11000.00 | 0.98 | 198.38 | 10996.19 | 24.25 | -76.10 | 79.87 | 287.67 | 0.72 |
| 11100.00 | 2.04 | 185.95 | 11096.16 | 21.66 | -76.56 | 79.57 | 285.80 | 1.10 |
| 11200.00 | 2.00 | 167.14 | 11196.10 | 18.19 | -76.36 | 78.49 | 283.40 | 0.66 |
| 11300.00 | 1.35 | 154.46 | 11296.05 | 15.42 | -75.46 | 77.02 | 281.55 | 0.75 |
| 11400.00 | 1.24 | 179.96 | 11396.03 | 13.28 | -74.95 | 76.12 | 280.05 | 0.58 |
| 11500.00 | 0.67 | 227.63 | 11496.02 | 11.81 | -75.38 | 76.30 | 278.90 | 0.93 |
| 11600.00 | 0.78 | 233.22 | 11596.01 | 11.01 | -76.35 | 77.14 | 278.20 | 0.13 |
| 11700.00 | 0.59 | 268.56 | 11696.00 | 10.59 | -77.41 | 78.13 | 277.79 | 0.45 |
| 11800.00 | 1.52 | 285.56 | 11795.98 | 10.93 | -79.20 | 79.95 | 277.86 | 0.97 |
| 11900.00 | 1.84 | 286.09 | 11895.94 | 11.73 | -82.02 | 82.86 | 278.14 | 0.33 |
| 12000.00 | 1.64 | 292.94 | 11995.89 | 12.73 | -84.88 | 85.83 | 278.53 | 0.29 |
| 12100.00 | 1.69 | 302.56 | 12095.85 | 14.08 | -87.44 | 88.57 | 279.15 | 0.28 |
| 12179.00 | 1.34 | 322.25 | 12174.82 | 15.44 | -88.99 | 90.31 | 279.84 | 0.78 |


VES Survey Date: 05/18/2013

Vaughn Energy Services
Midland, Texas
432-563-5444
Surveyor: Tim Dillon
Crockett State No 002H / API 30-025-41080




VES Survey Date: 05/18/2013

CONCHO

# COG Operating, LLC

**Lea County, NM**
**Sec 20, T21-S, R33-E (New SHL)**
**Crockett State #2H**

**Wellbore #1**



**Survey: MWD**

# DDC Survey Report

**30 May, 2013**

DDC
The DIRECTIONAL DRILLING COMPANY

The DIRECTIONAL DRILLING COMPANY

# Survey Certification Sheet

| COG Operating, LLC | WT-13413 | 5/30/13 |
|---|---|---|
| Company | Job Number | Date |

| Sec20, T21S, R33E | Crockett State # 2H | Lea, NM |
|---|---|---|
| Lease | Well Name | County & State |

API: 30-025-41080

Surveyed from a depth of: 11300 feet to 16290 feet MD

Type of Survey: MWD

Directional Supervisor/Surveyor: Clayton Keck

The data and calculations for this survey have been checked by me and conform to the standards and procedures set forth by **The Directional Drilling Company (DDC)**. This report represents a true and correct Directional survey of this well based on the original data obtained at the well site. Wellbore Coordinates are calculated using minimum curvature.

Digitally signed by Larry Wright
DN: cn=Larry Wright, o=The Directional Drilling Company, ou=GM of Guidance Services, email=larryw@directionaldrillers.com, c=US
Date: 2013.06.13 16:14:01 -05'00'

Larry Wright
MWD General Manager

• 11390 FM 830 • Willis, Texas 77318 •
• PH 936-856-4332 • FAX 936-856-8678 •

| | | | |
|---|---|---|---|
| **Company:** | COG Operating, LLC | **Local Co-ordinate Reference:** | Well Crockett State #2H |
| **Project:** | Lea County, NM | **TVD Reference:** | WELL @ 3751.0usft (Precision #105) |
| **Site:** | Sec 20, T21-S, R33-E (New SHL) | **MD Reference:** | WELL @ 3751.0usft (Precision #105) |
| **Well:** | Crockett State #2H | **North Reference:** | Grid |
| **Wellbore:** | Wellbore #1 | **Survey Calculation Method:** | Minimum Curvature |
| **Design:** | Wellbore #1 | **Database:** | EDM 5000.1 Single User Db |

**Project** Lea County, NM

| | | | |
|---|---|---|---|
| **Map System:** | US State Plane 1927 (Exact solution) | **System Datum:** | Mean Sea Level |
| **Geo Datum:** | NAD 1927 (NADCON CONUS) | | |
| **Map Zone:** | New Mexico East 3001 | | |

**Site** Sec 20, T21-S, R33-E (New SHL)

| | | | | | |
|---|---|---|---|---|---|
| **Site Position:** | | **Northing:** | 533,743.00 usft | **Latitude:** | 32° 27' 54.555 N |
| **From:** | Map | **Easting:** | 730,442.00 usft | **Longitude:** | 103° 35' 10.219 W |
| **Position Uncertainty:** | 0.0 usft | **Slot Radius:** | 13-3/16 " | **Grid Convergence:** | 0.40 ° |

**Well** Crockett State #2H

| | | | | | | |
|---|---|---|---|---|---|---|
| **Well Position** | **+N/-S** | 0.0 usft | **Northing:** | 533,743.00 usft | **Latitude:** | 32° 27' 54.555 N |
| | **+E/-W** | 0.0 usft | **Easting:** | 730,442.00 usft | **Longitude:** | 103° 35' 10.219 W |
| **Position Uncertainty** | | 0.0 usft | **Wellhead Elevation:** | usft | **Ground Level:** | 3,725.0 usft |

**Wellbore** Wellbore #1

| Magnetics | Model Name | Sample Date | Declination (°) | Dip Angle (°) | Field Strength (nT) |
|---|---|---|---|---|---|
| | IGRF2010 | 3/8/2013 | 7.40 | 60.36 | 48,585 |

**Design** Wellbore #1

**Audit Notes:**

| | | | | | |
|---|---|---|---|---|---|
| **Version:** | 1.0 | **Phase:** | ACTUAL | **Tie On Depth:** | 0.0 |

| Vertical Section: | Depth From (TVD) (usft) | +N/-S (usft) | +E/-W (usft) | Direction (°) |
|---|---|---|---|---|
| | 0.0 | 0.0 | 0.0 | 270.31 |

**Survey Program** **Date** 5/29/2013

| From (usft) | To (usft) | Survey (Wellbore) | Tool Name | Description |
|---|---|---|---|---|
| 100.0 | 11,300.0 | GYRO (Wellbore #1) | Good_gyro | Good Gyro |
| 11,318.0 | 16,290.0 | MWD (Wellbore #1) | MWD default | MWD - Standard |

**Survey**

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|---|---|---|---|---|---|---|---|---|---|
| **TIE IN @ 11300' MD / 11296.1' TVD** | | | | | | | | | |
| 11,300.0 | 1.35 | 154.46 | 11,296.1 | 15.4 | -75.4 | 75.5 | 0.00 | 0.00 | 0.00 |
| 11,318.0 | 1.70 | 210.40 | 11,314.0 | 15.0 | -75.5 | 75.6 | 8.13 | 1.94 | 310.78 |
| 11,350.0 | 4.80 | 257.90 | 11,346.0 | 14.3 | -77.0 | 77.1 | 12.06 | 9.69 | 148.44 |
| 11,381.0 | 9.60 | 268.90 | 11,376.7 | 14.0 | -80.9 | 81.0 | 16.04 | 15.48 | 35.48 |
| 11,413.0 | 13.40 | 278.80 | 11,408.1 | 14.5 | -87.2 | 87.3 | 13.34 | 11.88 | 30.94 |
| 11,444.0 | 17.90 | 278.60 | 11,437.9 | 15.8 | -95.5 | 95.6 | 14.52 | 14.52 | -0.65 |
| 11,476.0 | 22.90 | 274.00 | 11,467.9 | 16.9 | -106.6 | 106.7 | 16.40 | 15.63 | -14.38 |
| 11,507.0 | 25.90 | 271.20 | 11,496.2 | 17.5 | -119.4 | 119.5 | 10.37 | 9.68 | -9.03 |
| 11,539.0 | 26.60 | 268.40 | 11,524.9 | 17.4 | -133.5 | 133.6 | 4.44 | 2.19 | -8.75 |

| | | | |
|---|---|---|---|
| **Company:** | COG Operating, LLC | **Local Co-ordinate Reference:** | Well Crockett State #2H |
| **Project:** | Lea County, NM | **TVD Reference:** | WELL @ 3751.0usft (Precision #105) |
| **Site:** | Sec 20, T21-S, R33-E (New SHL) | **MD Reference:** | WELL @ 3751.0usft (Precision #105) |
| **Well:** | Crockett State #2H | **North Reference:** | Grid |
| **Wellbore:** | Wellbore #1 | **Survey Calculation Method:** | Minimum Curvature |
| **Design:** | Wellbore #1 | **Database:** | EDM 5000.1 Single User Db |

**Survey**

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|---|---|---|---|---|---|---|---|---|---|
| 11,571.0 | 27.90 | 268.80 | 11,553.3 | 17.1 | -148.2 | 148.2 | 4.10 | 4.06 | 1.25 |
| 11,602.0 | 30.90 | 268.40 | 11,580.3 | 16.7 | -163.4 | 163.5 | 9.70 | 9.68 | -1.29 |
| 11,634.0 | 34.60 | 268.20 | 11,607.2 | 16.2 | -180.7 | 180.8 | 11.57 | 11.56 | -0.63 |
| 11,665.0 | 38.10 | 268.60 | 11,632.2 | 15.7 | -199.0 | 199.1 | 11.32 | 11.29 | 1.29 |
| 11,697.0 | 40.60 | 271.60 | 11,656.9 | 15.7 | -219.3 | 219.4 | 9.81 | 7.81 | 9.38 |
| 11,728.0 | 43.30 | 275.40 | 11,680.0 | 17.0 | -240.0 | 240.1 | 11.96 | 8.71 | 12.26 |
| 11,760.0 | 45.60 | 277.20 | 11,702.8 | 19.5 | -262.3 | 262.4 | 8.20 | 7.19 | 5.63 |
| 11,791.0 | 50.00 | 277.00 | 11,723.6 | 22.3 | -285.0 | 285.2 | 14.20 | 14.19 | -0.65 |
| 11,823.0 | 56.50 | 274.60 | 11,742.8 | 24.9 | -310.5 | 310.7 | 21.18 | 20.31 | -7.50 |
| 11,854.0 | 63.10 | 272.80 | 11,758.4 | 26.6 | -337.3 | 337.4 | 21.87 | 21.29 | -5.81 |
| 11,886.0 | 65.20 | 273.50 | 11,772.3 | 28.2 | -366.0 | 366.2 | 6.85 | 6.56 | 2.19 |
| 11,918.0 | 66.20 | 274.20 | 11,785.5 | 30.1 | -395.1 | 395.3 | 3.71 | 3.13 | 2.19 |
| 11,949.0 | 68.20 | 274.00 | 11,797.5 | 32.2 | -423.6 | 423.8 | 6.48 | 6.45 | -0.65 |
| 11,981.0 | 70.30 | 273.30 | 11,808.8 | 34.1 | -453.5 | 453.7 | 6.87 | 6.56 | -2.19 |
| 12,013.0 | 72.70 | 273.10 | 11,819.0 | 35.8 | -483.8 | 484.0 | 7.52 | 7.50 | -0.63 |
| 12,044.0 | 75.60 | 274.20 | 11,827.5 | 37.7 | -513.5 | 513.7 | 9.96 | 9.35 | 3.55 |
| 12,076.0 | 78.00 | 274.70 | 11,834.8 | 40.1 | -544.6 | 544.8 | 7.65 | 7.50 | 1.56 |
| 12,107.0 | 78.00 | 275.10 | 11,841.2 | 42.7 | -574.8 | 575.0 | 1.26 | 0.00 | 1.29 |
| 12,139.0 | 77.30 | 275.10 | 11,848.1 | 45.5 | -605.9 | 606.2 | 2.19 | -2.19 | 0.00 |
| 12,171.0 | 79.60 | 274.00 | 11,854.5 | 48.0 | -637.2 | 637.4 | 7.94 | 7.19 | -3.44 |
| 12,202.0 | 82.50 | 271.40 | 11,859.3 | 49.4 | -667.8 | 668.0 | 12.50 | 9.35 | -8.39 |
| 12,235.0 | 84.90 | 270.70 | 11,862.9 | 50.0 | -700.6 | 700.8 | 7.57 | 7.27 | -2.12 |
| 12,267.0 | 85.50 | 270.30 | 11,865.6 | 50.3 | -732.4 | 732.7 | 2.25 | 1.88 | -1.25 |
| 12,299.0 | 87.40 | 270.90 | 11,867.6 | 50.6 | -764.4 | 764.6 | 6.23 | 5.94 | 1.88 |
| 12,362.0 | 90.80 | 270.70 | 11,868.6 | 51.5 | -827.4 | 827.6 | 5.41 | 5.40 | -0.32 |
| 12,457.0 | 91.30 | 270.50 | 11,866.8 | 52.5 | -922.3 | 922.6 | 0.57 | 0.53 | -0.21 |
| 12,552.0 | 91.20 | 270.00 | 11,864.7 | 52.9 | -1,017.3 | 1,017.6 | 0.54 | -0.11 | -0.53 |
| 12,647.0 | 91.40 | 269.80 | 11,862.6 | 52.7 | -1,112.3 | 1,112.6 | 0.30 | 0.21 | -0.21 |
| 12,742.0 | 92.00 | 269.60 | 11,859.8 | 52.2 | -1,207.2 | 1,207.5 | 0.67 | 0.63 | -0.21 |
| 12,837.0 | 91.60 | 269.60 | 11,856.8 | 51.6 | -1,302.2 | 1,302.5 | 0.42 | -0.42 | 0.00 |
| 12,931.0 | 90.80 | 269.50 | 11,854.8 | 50.8 | -1,396.2 | 1,396.4 | 0.86 | -0.85 | -0.11 |
| 13,026.0 | 91.10 | 269.10 | 11,853.2 | 49.7 | -1,491.1 | 1,491.4 | 0.53 | 0.32 | -0.42 |
| 13,120.0 | 92.10 | 268.80 | 11,850.6 | 47.9 | -1,585.1 | 1,585.3 | 1.11 | 1.06 | -0.32 |
| 13,216.0 | 90.80 | 269.80 | 11,848.2 | 46.8 | -1,681.1 | 1,681.3 | 1.71 | -1.35 | 1.04 |
| 13,310.0 | 89.20 | 269.30 | 11,848.2 | 46.0 | -1,775.0 | 1,775.3 | 1.78 | -1.70 | -0.53 |
| 13,405.0 | 89.90 | 269.50 | 11,848.9 | 45.0 | -1,870.0 | 1,870.3 | 0.77 | 0.74 | 0.21 |
| 13,501.0 | 90.20 | 269.80 | 11,848.8 | 44.5 | -1,966.0 | 1,966.2 | 0.44 | 0.31 | 0.31 |
| 13,595.0 | 91.00 | 270.50 | 11,847.9 | 44.7 | -2,060.0 | 2,060.2 | 1.13 | 0.85 | 0.74 |
| 13,690.0 | 91.10 | 270.00 | 11,846.1 | 45.1 | -2,155.0 | 2,155.2 | 0.54 | 0.11 | -0.53 |
| 13,785.0 | 91.40 | 269.60 | 11,844.1 | 44.8 | -2,250.0 | 2,250.2 | 0.53 | 0.32 | -0.42 |
| 13,880.0 | 91.40 | 269.80 | 11,841.7 | 44.3 | -2,345.0 | 2,345.2 | 0.21 | 0.00 | 0.21 |
| 13,975.0 | 91.90 | 269.30 | 11,839.0 | 43.5 | -2,439.9 | 2,440.1 | 0.74 | 0.53 | -0.53 |
| 14,070.0 | 92.20 | 268.80 | 11,835.6 | 42.0 | -2,534.8 | 2,535.0 | 0.61 | 0.32 | -0.53 |

| | | | |
|---|---|---|---|
| **Company:** | COG Operating, LLC | **Local Co-ordinate Reference:** | Well Crockett State #2H |
| **Project:** | Lea County, NM | **TVD Reference:** | WELL @ 3751.0usft (Precision #105) |
| **Site:** | Sec 20, T21-S, R33-E (New SHL) | **MD Reference:** | WELL @ 3751.0usft (Precision #105) |
| **Well:** | Crockett State #2H | **North Reference:** | Grid |
| **Wellbore:** | Wellbore #1 | **Survey Calculation Method:** | Minimum Curvature |
| **Design:** | Wellbore #1 | **Database:** | EDM 5000.1 Single User Db |

**Survey**

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|---|---|---|---|---|---|---|---|---|---|
| 14,165.0 | 91.30 | 268.80 | 11,832.7 | 40.0 | -2,629.8 | 2,630.0 | 0.95 | -0.95 | 0.00 |
| 14,260.0 | 90.80 | 268.20 | 11,831.0 | 37.5 | -2,724.7 | 2,724.9 | 0.82 | -0.53 | -0.63 |
| 14,355.0 | 90.90 | 269.30 | 11,829.5 | 35.4 | -2,819.7 | 2,819.8 | 1.16 | 0.11 | 1.16 |
| 14,450.0 | 91.30 | 268.90 | 11,827.7 | 33.9 | -2,914.7 | 2,914.8 | 0.60 | 0.42 | -0.42 |
| 14,544.0 | 91.70 | 268.80 | 11,825.3 | 32.0 | -3,008.6 | 3,008.7 | 0.44 | 0.43 | -0.11 |
| 14,639.0 | 90.50 | 267.90 | 11,823.4 | 29.3 | -3,103.6 | 3,103.7 | 1.58 | -1.26 | -0.95 |
| 14,735.0 | 89.80 | 268.80 | 11,823.2 | 26.5 | -3,199.5 | 3,199.6 | 1.19 | -0.73 | 0.94 |
| 14,830.0 | 90.50 | 270.20 | 11,822.9 | 25.7 | -3,294.5 | 3,294.6 | 1.65 | 0.74 | 1.47 |
| 14,924.0 | 90.10 | 269.80 | 11,822.4 | 25.7 | -3,388.5 | 3,388.6 | 0.60 | -0.43 | -0.43 |
| 15,019.0 | 90.20 | 270.90 | 11,822.2 | 26.3 | -3,483.5 | 3,483.6 | 1.16 | 0.11 | 1.16 |
| 15,114.0 | 92.20 | 270.70 | 11,820.2 | 27.6 | -3,578.5 | 3,578.6 | 2.12 | 2.11 | -0.21 |
| 15,209.0 | 93.10 | 270.70 | 11,815.8 | 28.8 | -3,673.4 | 3,673.5 | 0.95 | 0.95 | 0.00 |
| 15,303.0 | 93.70 | 270.00 | 11,810.2 | 29.4 | -3,767.2 | 3,767.3 | 0.98 | 0.64 | -0.74 |
| 15,398.0 | 94.20 | 270.00 | 11,803.7 | 29.4 | -3,862.0 | 3,862.1 | 0.53 | 0.53 | 0.00 |
| 15,492.0 | 93.40 | 269.80 | 11,797.5 | 29.2 | -3,955.8 | 3,955.9 | 0.88 | -0.85 | -0.21 |
| 15,587.0 | 93.80 | 269.80 | 11,791.5 | 28.9 | -4,050.6 | 4,050.7 | 0.42 | 0.42 | 0.00 |
| 15,682.0 | 92.80 | 268.90 | 11,786.0 | 27.8 | -4,145.4 | 4,145.5 | 1.42 | -1.05 | -0.95 |
| 15,777.0 | 91.10 | 268.90 | 11,782.8 | 26.0 | -4,240.3 | 4,240.4 | 1.79 | -1.79 | 0.00 |
| 15,871.0 | 90.40 | 269.10 | 11,781.6 | 24.3 | -4,334.3 | 4,334.4 | 0.77 | -0.74 | 0.21 |
| 15,966.0 | 90.50 | 268.90 | 11,780.8 | 22.7 | -4,429.3 | 4,429.3 | 0.24 | 0.11 | -0.21 |
| 16,061.0 | 90.50 | 268.40 | 11,780.0 | 20.4 | -4,524.3 | 4,524.3 | 0.53 | 0.00 | -0.53 |
| 16,156.0 | 90.40 | 268.00 | 11,779.2 | 17.4 | -4,619.2 | 4,619.2 | 0.43 | -0.11 | -0.42 |
| 16,245.0 | 90.60 | 267.50 | 11,778.5 | 13.9 | -4,708.1 | 4,708.1 | 0.61 | 0.22 | -0.56 |
| **TD @ 16290' MD / 11778' TVD** | | | | | | | | | |
| 16,290.0 | 90.60 | 267.50 | 11,778.0 | 12.0 | -4,753.1 | 4,753.1 | 0.00 | 0.00 | 0.00 |

**Survey Annotations**

| Measured Depth (usft) | Vertical Depth (usft) | Local Coordinates +N/-S (usft) | Local Coordinates +E/-W (usft) | Comment |
|---|---|---|---|---|
| 11,300.0 | 11,296.1 | 15.4 | -75.4 | TIE IN @ 11300' MD / 11296.1' TVD |
| 16,290.0 | 11,778.0 | 12.0 | -4,753.1 | TD @ 16290' MD / 11778' TVD |

Checked By: _____ Approved By: _____ Date: _____