30-015-40415

CRESCENT DIRECTIONAL DRILLING

COG Operating LLC

Eddy County, NM
Hogan State Com
#4H

OH

Design: OH

Survey Report - Geographic

29 October, 2012

CONCHO

Company:	COG Operating LLC	**Local Co-ordinate Reference:**	Well #4H
Project:	Eddy County, NM	**TVD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Site:	Hogan State Com	**MD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Well:	#4H	**North Reference:**	Grid
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Houston R5000 Database

Project Eddy 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 Hogan State Com

Site Position:		**Northing:**	675,652.30 usft	**Latitude:**	32° 51' 25.567 N
From:	Map	**Easting:**	590,870.40 usft	**Longitude:**	104° 2' 14.686 W
Position Uncertainty:	2.0 usft	**Slot Radius:**	8-3/4 "	**Grid Convergence:**	0.16 °

Well #4H

Well Position	**+N/-S**	0.0 usft	**Northing:**	675,652.30 usft	**Latitude:**	32° 51' 25.567 N
	+E/-W	0.0 usft	**Easting:**	590,870.40 usft	**Longitude:**	104° 2' 14.686 W
Position Uncertainty		0.0 usft	**Wellhead Elevation:**	usft	**Ground Level:**	3,661.0 usft

Wellbore OH

Magnetics	**Model Name**	**Sample Date**	**Declination (°)**	**Dip Angle (°)**	**Field Strength (nT)**
	IGRF2010	10/3/2012	7.69	60.66	48,814

Design OH

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	270.71

Survey Program **Date** 10/29/2012

From (usft)	**To (usft)**	**Survey (Wellbore)**	**Tool Name**	**Description**
100.0	4,540.0	Survey #1 - VES1 (OH)	CB-GYRO-MS	Camera based gyro multishot
4,610.0	9,521.0	Survey #2 - Crescent1 (OH)	MWD	MWD - Standard
9,576.0	9,576.0	Survey #3 - PTB (OH)	MWD	MWD - Standard

Survey

Measured Depth (usft)	**Inclination (°)**	**Azimuth (°)**	**Vertical Depth (usft)**	**+N/-S (usft)**	**+E/-W (usft)**	**Map Northing (usft)**	**Map Easting (usft)**	**Latitude**	**Longitude**
0.0	0.00	0.00	0.0	0.0	0.0	675,652.30	590,870.40	32° 51' 25.567 N	104° 2' 14.686 W
100.0	0.11	255.43	100.0	0.0	-0.1	675,652.27	590,870.31	32° 51' 25.567 N	104° 2' 14.687 W
200.0	0.72	33.43	200.0	0.5	0.2	675,652.77	590,870.56	32° 51' 25.572 N	104° 2' 14.684 W
300.0	1.26	52.71	300.0	1.7	1.4	675,653.96	590,871.78	32° 51' 25.584 N	104° 2' 14.670 W
400.0	1.58	90.87	400.0	2.3	3.6	675,654.61	590,874.04	32° 51' 25.590 N	104° 2' 14.644 W
500.0	1.56	105.27	499.9	1.9	6.3	675,654.23	590,876.73	32° 51' 25.586 N	104° 2' 14.612 W
600.0	1.44	109.50	599.9	1.2	8.8	675,653.45	590,879.23	32° 51' 25.578 N	104° 2' 14.583 W
700.0	1.55	112.33	699.8	0.2	11.3	675,652.52	590,881.66	32° 51' 25.569 N	104° 2' 14.554 W
800.0	1.60	76.06	799.8	0.0	13.9	675,652.34	590,884.27	32° 51' 25.567 N	104° 2' 14.524 W
900.0	1.49	64.34	899.8	0.9	16.4	675,653.24	590,886.80	32° 51' 25.576 N	104° 2' 14.494 W

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Well:	#4H	**North Reference:**	Grid
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Houston R5000 Database

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,000.0	1.47	66.25	999.7	2.0	18.7	675,654.32	590,889.14	32° 51' 25.587 N	104° 2' 14.466 W
1,100.0	0.93	68.70	1,099.7	2.8	20.7	675,655.13	590,891.07	32° 51' 25.595 N	104° 2' 14.444 W
1,200.0	0.73	74.34	1,199.7	3.3	22.0	675,655.60	590,892.44	32° 51' 25.599 N	104° 2' 14.428 W
1,300.0	0.51	76.54	1,299.7	3.6	23.1	675,655.87	590,893.49	32° 51' 25.602 N	104° 2' 14.415 W
1,400.0	0.26	83.05	1,399.7	3.7	23.7	675,656.00	590,894.15	32° 51' 25.603 N	104° 2' 14.408 W
1,500.0	0.05	87.23	1,499.7	3.7	24.0	675,656.03	590,894.41	32° 51' 25.603 N	104° 2' 14.405 W
1,600.0	0.11	307.92	1,599.7	3.8	24.0	675,656.09	590,894.38	32° 51' 25.604 N	104° 2' 14.405 W
1,700.0	0.21	299.28	1,699.7	3.9	23.7	675,656.24	590,894.15	32° 51' 25.606 N	104° 2' 14.408 W
1,800.0	0.30	279.63	1,799.7	4.1	23.3	675,656.38	590,893.73	32° 51' 25.607 N	104° 2' 14.413 W
1,900.0	0.43	276.80	1,899.7	4.2	22.7	675,656.46	590,893.10	32° 51' 25.608 N	104° 2' 14.420 W
2,000.0	0.38	287.70	1,999.7	4.3	22.0	675,656.61	590,892.41	32° 51' 25.609 N	104° 2' 14.428 W
2,100.0	0.38	282.42	2,099.7	4.5	21.4	675,656.78	590,891.77	32° 51' 25.611 N	104° 2' 14.436 W
2,200.0	0.44	275.34	2,199.7	4.6	20.7	675,656.89	590,891.06	32° 51' 25.612 N	104° 2' 14.444 W
2,300.0	0.74	283.20	2,299.7	4.8	19.6	675,657.07	590,890.05	32° 51' 25.614 N	104° 2' 14.456 W
2,400.0	0.78	289.81	2,399.7	5.2	18.4	675,657.45	590,888.78	32° 51' 25.618 N	104° 2' 14.471 W
2,500.0	0.80	292.85	2,499.7	5.7	17.1	675,657.95	590,887.50	32° 51' 25.623 N	104° 2' 14.486 W
2,600.0	0.58	285.38	2,599.7	6.1	16.0	675,658.36	590,886.37	32° 51' 25.627 N	104° 2' 14.499 W
2,700.0	0.76	279.50	2,699.7	6.3	14.8	675,658.60	590,885.23	32° 51' 25.629 N	104° 2' 14.512 W
2,800.0	0.23	270.76	2,799.6	6.4	14.0	675,658.71	590,884.37	32° 51' 25.630 N	104° 2' 14.522 W
2,900.0	0.20	301.82	2,899.6	6.5	13.6	675,658.81	590,884.02	32° 51' 25.631 N	104° 2' 14.526 W
3,000.0	0.27	13.76	2,999.6	6.8	13.5	675,659.13	590,883.93	32° 51' 25.634 N	104° 2' 14.527 W
3,100.0	0.10	36.02	3,099.6	7.1	13.6	675,659.43	590,884.04	32° 51' 25.637 N	104° 2' 14.526 W
3,200.0	0.01	109.78	3,199.6	7.2	13.7	675,659.49	590,884.10	32° 51' 25.638 N	104° 2' 14.525 W
3,300.0	0.09	116.46	3,299.6	7.2	13.8	675,659.46	590,884.18	32° 51' 25.638 N	104° 2' 14.525 W
3,400.0	0.07	118.07	3,399.6	7.1	13.9	675,659.39	590,884.30	32° 51' 25.637 N	104° 2' 14.523 W
3,500.0	0.20	121.65	3,499.6	7.0	14.1	675,659.27	590,884.50	32° 51' 25.636 N	104° 2' 14.521 W
3,600.0	0.23	137.63	3,599.6	6.7	14.4	675,659.03	590,884.79	32° 51' 25.633 N	104° 2' 14.517 W
3,700.0	0.16	127.60	3,699.6	6.5	14.6	675,658.80	590,885.03	32° 51' 25.631 N	104° 2' 14.514 W
3,800.0	0.16	124.41	3,799.6	6.3	14.9	675,658.64	590,885.26	32° 51' 25.629 N	104° 2' 14.512 W
3,900.0	0.03	115.44	3,899.6	6.2	15.0	675,658.54	590,885.40	32° 51' 25.629 N	104° 2' 14.510 W
4,000.0	0.09	306.88	3,999.6	6.3	15.0	675,658.58	590,885.36	32° 51' 25.629 N	104° 2' 14.511 W
4,100.0	0.22	180.18	4,099.6	6.1	14.9	675,658.44	590,885.29	32° 51' 25.628 N	104° 2' 14.511 W
4,200.0	0.13	201.48	4,199.6	5.8	14.8	675,658.14	590,885.25	32° 51' 25.625 N	104° 2' 14.512 W
4,300.0	0.23	279.95	4,299.6	5.8	14.6	675,658.07	590,885.01	32° 51' 25.624 N	104° 2' 14.515 W
4,400.0	0.26	276.99	4,399.6	5.8	14.2	675,658.13	590,884.59	32° 51' 25.625 N	104° 2' 14.520 W
4,500.0	0.44	228.21	4,499.6	5.6	13.7	675,657.90	590,884.08	32° 51' 25.622 N	104° 2' 14.526 W
4,540.0	0.14	282.52	4,539.6	5.5	13.5	675,657.81	590,883.92	32° 51' 25.621 N	104° 2' 14.528 W
Tie into Gyro @ 4540' MD									
4,610.0	0.40	290.40	4,609.6	5.6	13.2	675,657.91	590,883.60	32° 51' 25.622 N	104° 2' 14.531 W
4,642.0	2.20	272.10	4,641.6	5.7	12.5	675,657.97	590,882.88	32° 51' 25.623 N	104° 2' 14.540 W
KOP - 4642.0' MD, 4641.6' TVD, 2.20° INC, 272.10° AZI, -12.4' VS									
4,674.0	5.70	270.70	4,673.5	5.7	10.3	675,658.02	590,880.68	32° 51' 25.624 N	104° 2' 14.566 W
4,705.0	9.10	273.80	4,704.3	5.9	6.3	675,658.20	590,876.69	32° 51' 25.625 N	104° 2' 14.612 W
4,737.0	12.60	276.20	4,735.7	6.4	0.3	675,658.74	590,870.70	32° 51' 25.631 N	104° 2' 14.683 W
4,739.0	12.82	276.18	4,737.7	6.5	-0.1	675,658.79	590,870.26	32° 51' 25.631 N	104° 2' 14.688 W
PP - 4739.0' MD, 4737.7' TVD, 12.82° INC, 0.2' VS									
4,769.0	16.20	275.90	4,766.7	7.3	-7.6	675,659.58	590,862.79	32° 51' 25.639 N	104° 2' 14.775 W
4,800.0	19.80	276.30	4,796.2	8.3	-17.1	675,660.60	590,853.26	32° 51' 25.650 N	104° 2' 14.887 W
4,832.0	23.10	275.40	4,826.0	9.5	-28.8	675,661.79	590,841.62	32° 51' 25.662 N	104° 2' 15.023 W
4,864.0	26.60	274.40	4,855.0	10.6	-42.2	675,662.93	590,828.23	32° 51' 25.674 N	104° 2' 15.180 W
4,895.0	29.50	273.00	4,882.3	11.6	-56.7	675,663.86	590,813.68	32° 51' 25.683 N	104° 2' 15.351 W
4,927.0	32.90	271.60	4,909.7	12.2	-73.3	675,664.51	590,797.12	32° 51' 25.690 N	104° 2' 15.545 W
4,958.0	35.40	271.90	4,935.4	12.8	-90.7	675,665.05	590,779.73	32° 51' 25.696 N	104° 2' 15.749 W
4,990.0	37.60	273.10	4,961.1	13.6	-109.7	675,665.88	590,760.71	32° 51' 25.705 N	104° 2' 15.972 W
5,022.0	39.60	273.50	4,986.1	14.7	-129.6	675,667.03	590,740.78	32° 51' 25.717 N	104° 2' 16.205 W

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Well:	#4H	**North Reference:**	Grid
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Houston R5000 Database

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,053.0	41.90	273.30	5,009.6	15.9	-149.8	675,668.23	590,720.58	32° 51' 25.729 N	104° 2' 16.442 W
5,085.0	45.50	272.80	5,032.7	17.1	-171.9	675,669.41	590,698.51	32° 51' 25.741 N	104° 2' 16.701 W
5,117.0	49.20	272.40	5,054.4	18.2	-195.4	675,670.47	590,675.00	32° 51' 25.752 N	104° 2' 16.976 W
5,149.0	52.50	273.10	5,074.6	19.4	-220.2	675,671.66	590,650.22	32° 51' 25.765 N	104° 2' 17.267 W
5,180.0	55.80	274.50	5,092.7	21.0	-245.3	675,673.34	590,625.15	32° 51' 25.782 N	104° 2' 17.561 W
5,212.0	58.70	275.90	5,110.1	23.5	-272.0	675,675.78	590,598.35	32° 51' 25.807 N	104° 2' 17.875 W
5,244.0	61.90	277.00	5,125.9	26.6	-299.7	675,678.91	590,570.74	32° 51' 25.839 N	104° 2' 18.198 W
5,276.0	65.50	277.00	5,140.1	30.1	-328.1	675,682.40	590,542.27	32° 51' 25.874 N	104° 2' 18.532 W
5,307.0	68.90	276.30	5,152.1	33.4	-356.5	675,685.71	590,513.89	32° 51' 25.908 N	104° 2' 18.865 W
5,339.0	71.90	275.20	5,162.8	36.4	-386.5	675,688.73	590,483.90	32° 51' 25.938 N	104° 2' 19.216 W
5,371.0	75.00	274.50	5,171.9	39.0	-417.1	675,691.32	590,453.34	32° 51' 25.965 N	104° 2' 19.574 W
5,402.0	78.30	274.00	5,179.1	41.3	-447.1	675,693.55	590,423.26	32° 51' 25.988 N	104° 2' 19.927 W
5,434.0	81.00	273.30	5,184.8	43.3	-478.6	675,695.55	590,391.85	32° 51' 26.008 N	104° 2' 20.295 W
5,466.0	83.00	272.80	5,189.3	44.9	-510.2	675,697.24	590,360.21	32° 51' 26.026 N	104° 2' 20.666 W
5,498.0	85.50	272.30	5,192.5	46.4	-542.0	675,698.66	590,328.40	32° 51' 26.041 N	104° 2' 21.039 W
5,529.0	87.40	269.30	5,194.4	46.8	-572.9	675,699.09	590,297.47	32° 51' 26.046 N	104° 2' 21.401 W
5,561.0	88.40	269.20	5,195.6	46.4	-604.9	675,698.67	590,265.50	32° 51' 26.043 N	104° 2' 21.776 W
5,592.0	88.60	269.20	5,196.4	45.9	-635.9	675,698.24	590,234.51	32° 51' 26.039 N	104° 2' 22.139 W
5,688.0	90.00	269.70	5,197.6	45.0	-731.9	675,697.31	590,138.52	32° 51' 26.033 N	104° 2' 23.265 W
5,784.0	90.40	270.90	5,197.2	45.5	-827.9	675,697.82	590,042.53	32° 51' 26.040 N	104° 2' 24.390 W
5,855.0	91.00	270.90	5,196.4	46.6	-898.9	675,698.93	589,971.54	32° 51' 26.053 N	104° 2' 25.222 W
EOC - 5855.0' MD, 5196.4' TVD, 91.00° INC, 270.90° AZI, 899.4' VS									
5,879.0	91.20	270.90	5,195.9	47.0	-922.9	675,699.31	589,947.55	32° 51' 26.058 N	104° 2' 25.504 W
5,974.0	92.00	270.80	5,193.3	48.4	-1,017.8	675,700.72	589,852.60	32° 51' 26.074 N	104° 2' 26.617 W
6,069.0	91.60	271.60	5,190.3	50.4	-1,112.7	675,702.71	589,757.67	32° 51' 26.097 N	104° 2' 27.730 W
6,164.0	90.80	271.60	5,188.3	53.1	-1,207.7	675,705.36	589,662.72	32° 51' 26.126 N	104° 2' 28.842 W
6,259.0	91.40	271.40	5,186.5	55.5	-1,302.6	675,707.84	589,567.78	32° 51' 26.153 N	104° 2' 29.956 W
6,355.0	90.80	270.80	5,184.6	57.4	-1,398.6	675,709.69	589,471.81	32° 51' 26.174 N	104° 2' 31.080 W
6,450.0	91.70	270.00	5,182.6	58.1	-1,493.6	675,710.35	589,376.84	32° 51' 26.183 N	104° 2' 32.194 W
6,545.0	91.10	270.60	5,180.2	58.6	-1,588.5	675,710.85	589,281.87	32° 51' 26.190 N	104° 2' 33.307 W
6,640.0	90.00	270.90	5,179.3	59.8	-1,683.5	675,712.09	589,186.88	32° 51' 26.205 N	104° 2' 34.421 W
6,735.0	90.80	270.90	5,178.7	61.3	-1,778.5	675,713.58	589,091.90	32° 51' 26.222 N	104° 2' 35.534 W
6,831.0	91.60	270.90	5,176.6	62.8	-1,874.5	675,715.09	588,995.93	32° 51' 26.240 N	104° 2' 36.659 W
6,926.0	90.20	269.90	5,175.2	63.5	-1,969.5	675,715.75	588,900.95	32° 51' 26.249 N	104° 2' 37.773 W
7,021.0	90.70	269.60	5,174.4	63.0	-2,064.5	675,715.34	588,805.95	32° 51' 26.248 N	104° 2' 38.886 W
7,116.0	91.60	269.70	5,172.5	62.5	-2,159.4	675,714.76	588,710.97	32° 51' 26.244 N	104° 2' 40.000 W
7,211.0	90.70	269.70	5,170.6	62.0	-2,254.4	675,714.26	588,616.00	32° 51' 26.242 N	104° 2' 41.113 W
7,306.0	91.50	269.80	5,168.8	61.6	-2,349.4	675,713.85	588,521.02	32° 51' 26.241 N	104° 2' 42.227 W
7,402.0	90.70	269.40	5,166.9	60.9	-2,445.4	675,713.18	588,425.04	32° 51' 26.237 N	104° 2' 43.352 W
7,497.0	91.40	269.50	5,165.2	60.0	-2,540.3	675,712.27	588,330.06	32° 51' 26.230 N	104° 2' 44.466 W
7,592.0	90.40	269.90	5,163.7	59.5	-2,635.3	675,711.77	588,235.07	32° 51' 26.228 N	104° 2' 45.579 W
7,687.0	91.20	270.20	5,162.4	59.6	-2,730.3	675,711.85	588,140.08	32° 51' 26.231 N	104° 2' 46.693 W
7,782.0	92.00	270.30	5,159.7	60.0	-2,825.3	675,712.27	588,045.12	32° 51' 26.238 N	104° 2' 47.806 W
7,877.0	91.00	270.10	5,157.2	60.3	-2,920.2	675,712.60	587,950.16	32° 51' 26.244 N	104° 2' 48.919 W
7,972.0	91.50	270.00	5,155.2	60.4	-3,015.2	675,712.68	587,855.18	32° 51' 26.247 N	104° 2' 50.033 W
8,067.0	90.30	269.40	5,153.7	59.9	-3,110.2	675,712.18	587,760.19	32° 51' 26.245 N	104° 2' 51.146 W
8,162.0	90.70	269.00	5,152.8	58.6	-3,205.2	675,710.86	587,665.21	32° 51' 26.234 N	104° 2' 52.260 W
8,258.0	91.70	269.20	5,150.8	57.1	-3,301.2	675,709.35	587,569.24	32° 51' 26.222 N	104° 2' 53.385 W
8,353.0	91.50	269.90	5,148.2	56.3	-3,396.1	675,708.60	587,474.28	32° 51' 26.217 N	104° 2' 54.498 W
8,448.0	90.60	269.70	5,146.4	56.0	-3,491.1	675,708.27	587,379.30	32° 51' 26.216 N	104° 2' 55.612 W
8,543.0	91.40	269.60	5,144.8	55.4	-3,586.1	675,707.69	587,284.32	32° 51' 26.213 N	104° 2' 56.725 W
8,638.0	90.70	270.20	5,143.0	55.2	-3,681.1	675,707.53	587,189.33	32° 51' 26.214 N	104° 2' 57.839 W
8,733.0	90.80	269.90	5,141.8	55.3	-3,776.1	675,707.61	587,094.34	32° 51' 26.217 N	104° 2' 58.952 W
8,829.0	91.10	269.40	5,140.2	54.7	-3,872.0	675,707.02	586,998.36	32° 51' 26.214 N	104° 3' 0.078 W
8,923.0	91.00	270.10	5,138.5	54.3	-3,966.0	675,706.61	586,904.37	32° 51' 26.212 N	104° 3' 1.179 W

Company:	COG Operating LLC	**Local Co-ordinate Reference:**	Well #4H
Project:	Eddy County, NM	**TVD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Site:	Hogan State Com	**MD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Well:	#4H	**North Reference:**	Grid
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Houston R5000 Database

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
9,019.0	91.80	270.40	5,136.1	54.7	-4,062.0	675,707.03	586,808.40	32° 51' 26.219 N	104° 3' 2.305 W
9,114.0	90.70	270.70	5,134.1	55.6	-4,157.0	675,707.94	586,713.43	32° 51' 26.230 N	104° 3' 3.418 W
9,209.0	91.40	270.50	5,132.3	56.6	-4,251.9	675,708.94	586,618.45	32° 51' 26.243 N	104° 3' 4.531 W
9,304.0	90.30	271.00	5,130.9	57.9	-4,346.9	675,710.18	586,523.48	32° 51' 26.258 N	104° 3' 5.645 W
9,399.0	91.10	270.90	5,129.7	59.5	-4,441.9	675,711.75	586,428.50	32° 51' 26.276 N	104° 3' 6.758 W
9,495.0	91.90	270.90	5,127.2	61.0	-4,537.9	675,713.26	586,332.54	32° 51' 26.293 N	104° 3' 7.883 W
9,521.0	92.20	270.90	5,126.3	61.4	-4,563.8	675,713.67	586,306.56	32° 51' 26.298 N	104° 3' 8.188 W
9,576.0	92.20	270.90	5,124.2	62.2	-4,618.8	675,714.53	586,251.61	32° 51' 26.308 N	104° 3' 8.832 W

BHL - 9576.0' MD, 5124.2' TVD, 92.20° INC, 270.90° AZI, 62.2' N, -4618.8' E, 4619.2' VS

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
4,540.0	4,539.6	5.5	13.5	Tie into Gyro @ 4540' MD
4,642.0	4,641.6	5.7	12.5	KOP - 4642.0' MD, 4641.6' TVD, 2.20° INC, 272.10° AZI, -12.4' VS
4,739.0	4,737.7	6.5	-0.1	PP - 4739.0' MD, 4737.7' TVD, 12.82° INC, 0.2' VS
5,855.0	5,196.4	46.6	-898.9	EOC - 5855.0' MD, 5196.4' TVD, 91.00° INC, 270.90° AZI, 899.4' VS
9,576.0	5,124.2	62.2	-4,618.8	BHL - 9576.0' MD, 5124.2' TVD, 92.20° INC, 270.90° AZI, 62.2' N, -4618.8' E, 4

Checked By: _____ Approved By: _____ Date: _____

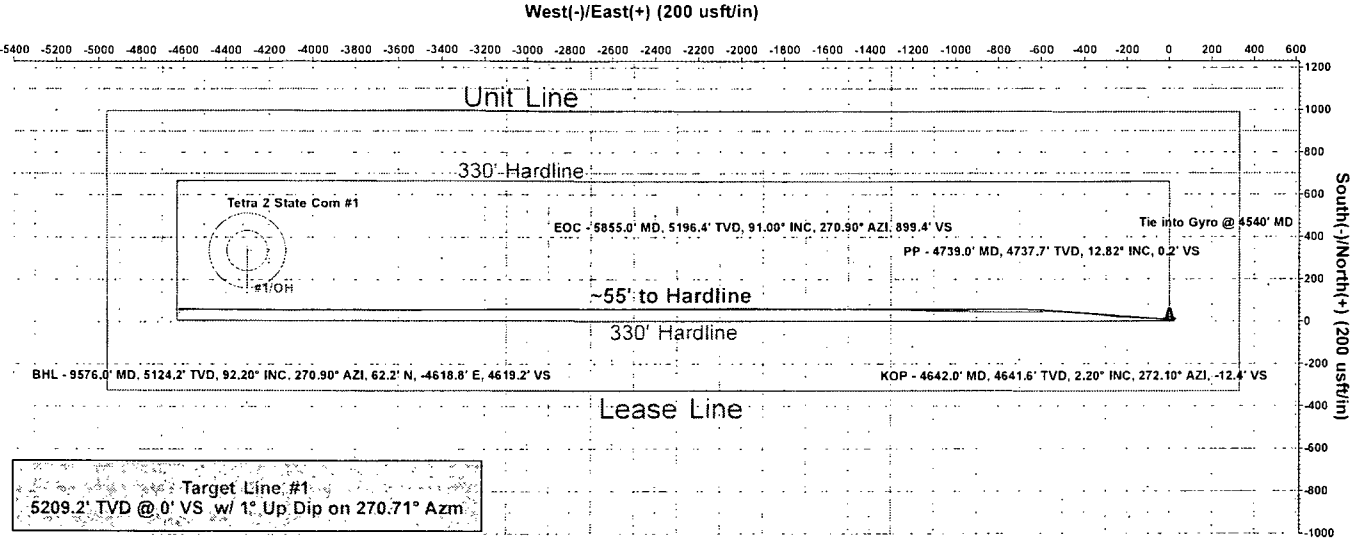
COG Operating LLC
Project: Eddy County, NM
Site: Hogan State Com
Well: #4H
Wellbore: OH
Plan: Plan #2 (#4H/OH)

CONCHO

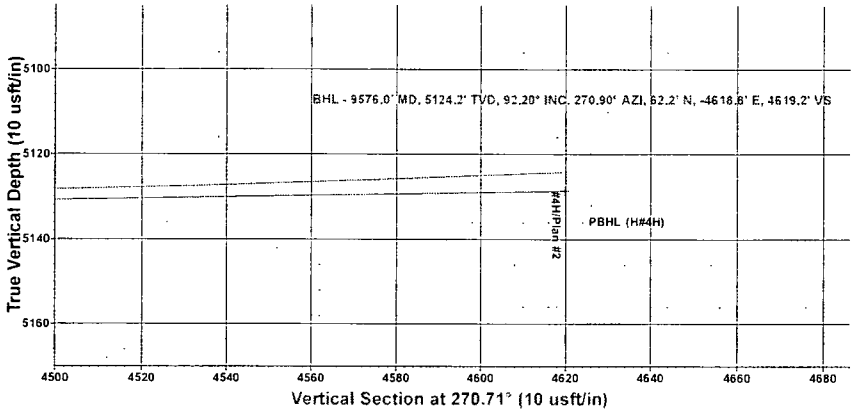
Azimuths to Grid North
True North: -0.16°
Magnetic North: 7.53°

Magnetic Field
Strength: 48813.6snT
Dip Angle: 60.66°
Date: 10/3/2012
Model: IGRF2010

PROJECT DETAILS: Eddy County, NM
Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level
Local North: Grid

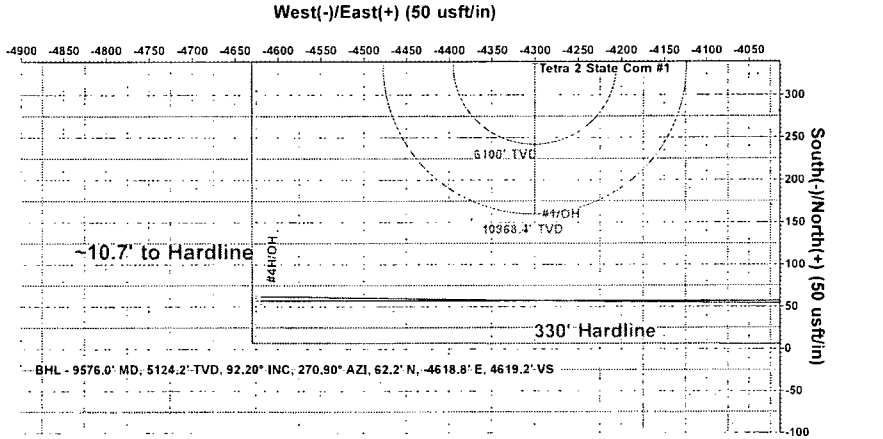


Target Line #1
5209.2' TVD @ 0' VS w/ 1° Up Dip on 270.71° Azm



Section Details

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target
1	4540.0	0.14	282.52	4539.6	5.5	13.5	0.00	0.00	-13.4	
2	4680.8	0.14	282.52	4680.4	5.6	13.2	0.00	0.00	-13.1	
3	5506.8	91.00	274.58	5200.0	48.1	-515.1	11.00	-7.94	515.6	
4	5735.9	91.00	270.00	5196.0	57.2	-743.8	2.00	-90.01	744.5	
5	9612.1	91.00	270.00	5128.6	57.1	-4619.5	0.00	0.00	4619.8	PBHL (H#4H)



WELL DETAILS: #4H

Ground Elevation:: 3661.0
RKB Elevation: WELL @ 3675.0usft (UDI #40 - 14' KB)
Rig Name: UDI #40 - 14' KB

Surface Hole Location

Northing	Easting	Latitude	Longitude
675652.30	590870.40	32° 51' 25.567 N	104° 2' 14.686 W

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting
PBHL (H#4H)	5128.6	57.1	-4619.5	675709.41	586250.92
T2#1 @ 6100 TVD	6100.0	336.7	-4300.6	675988.96	586569.76
Tetra 2 State Com #10968.4		336.7	-4300.6	675988.96	586569.76

CRESCENT DIRECTIONAL DRILLING
Crescent Directional Drilling
7715 West Industrial Ave. Midland, Tx 79706
Phone: 432-618-1135

Plan: Plan #2 (#4H/OH)
Created By: Matt Higgins Date: 10:12, October 29 2012

CRESCENT
DIRECTIONAL DRILLING

COG Operating LLC

Eddy County, NM
Hogan State Com
#4H

OH

Design: OH

Standard Survey Report

29 October, 2012

CONCHO

Company:	COG Operating LLC	**Local Co-ordinate Reference:**	Well #4H
Project:	Eddy County, NM	**TVD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Site:	Hogan State Com	**MD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Well:	#4H	**North Reference:**	Grid
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Houston R5000 Database

Project Eddy 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 Hogan State Com

Site Position:		**Northing:**	675,652.30 usft	**Latitude:**	32° 51' 25.567 N
From:	Map	**Easting:**	590,870.40 usft	**Longitude:**	104° 2' 14.686 W
Position Uncertainty:	2.0 usft	**Slot Radius:**	8-3/4 "	**Grid Convergence:**	0.16 °

Well #4H

Well Position	**+N/-S**	0.0 usft	**Northing:**	675,652.30 usft	**Latitude:**	32° 51' 25.567 N
	+E/-W	0.0 usft	**Easting:**	590,870.40 usft	**Longitude:**	104° 2' 14.686 W
Position Uncertainty		0.0 usft	**Wellhead Elevation:**	usft	**Ground Level:**	3,661.0 usft

Wellbore OH

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	10/3/2012	7.69	60.66	48,814

Design OH

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	270.71

Survey Program **Date** 10/29/2012

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.0	4,540.0	Survey #1 - VES1 (OH)	CB-GYRO-MS	Camera based gyro multishot
4,610.0	9,521.0	Survey #2 - Crescent1 (OH)	MWD	MWD - Standard
9,576.0	9,576.0	Survey #3 - PTB (OH)	MWD	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)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.11	255.43	100.0	0.0	-0.1	0.1	0.11	0.11	0.00
200.0	0.72	33.43	200.0	0.5	0.2	-0.2	0.81	0.61	138.00
300.0	1.26	52.71	300.0	1.7	1.4	-1.4	0.63	0.54	19.28
400.0	1.58	90.87	400.0	2.3	3.6	-3.6	0.98	0.32	38.16
500.0	1.56	105.27	499.9	1.9	6.3	-6.3	0.39	-0.02	14.40
600.0	1.44	109.50	599.9	1.2	8.8	-8.8	0.16	-0.12	4.23
700.0	1.55	112.33	699.8	0.2	11.3	-11.3	0.13	0.11	2.83
800.0	1.60	76.06	799.8	0.0	13.9	-13.9	0.98	0.05	-36.27

Company:	COG Operating LLC	**Local Co-ordinate Reference:**	Well #4H
Project:	Eddy County, NM	**TVD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Site:	Hogan State Com	**MD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Well:	#4H	**North Reference:**	Grid
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Houston R5000 Database

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)
900.0	1.49	64.34	899.8	0.9	16.4	-16.4	0.33	-0.11	-11.72
1,000.0	1.47	66.25	999.7	2.0	18.7	-18.7	0.05	-0.02	1.91
1,100.0	0.93	68.70	1,099.7	2.8	20.7	-20.6	0.54	-0.54	2.45
1,200.0	0.73	74.34	1,199.7	3.3	22.0	-22.0	0.22	-0.20	5.64
1,300.0	0.51	76.54	1,299.7	3.6	23.1	-23.0	0.22	-0.22	2.20
1,400.0	0.26	83.05	1,399.7	3.7	23.7	-23.7	0.25	-0.25	6.51
1,500.0	0.05	87.23	1,499.7	3.7	24.0	-24.0	0.21	-0.21	4.18
1,600.0	0.11	307.92	1,599.7	3.8	24.0	-23.9	0.15	0.06	-139.31
1,700.0	0.21	299.28	1,699.7	3.9	23.7	-23.7	0.10	0.10	-8.64
1,800.0	0.30	279.63	1,799.7	4.1	23.3	-23.3	0.12	0.09	-19.65
1,900.0	0.43	276.80	1,899.7	4.2	22.7	-22.6	0.13	0.13	-2.83
2,000.0	0.38	287.70	1,999.7	4.3	22.0	-22.0	0.09	-0.05	10.90
2,100.0	0.38	282.42	2,099.7	4.5	21.4	-21.3	0.04	0.00	-5.28
2,200.0	0.44	275.34	2,199.7	4.6	20.7	-20.6	0.08	0.06	-7.08
2,300.0	0.74	283.20	2,299.7	4.8	19.6	-19.6	0.31	0.30	7.86
2,400.0	0.78	289.81	2,399.7	5.2	18.4	-18.3	0.10	0.04	6.61
2,500.0	0.80	292.85	2,499.7	5.7	17.1	-17.0	0.05	0.02	3.04
2,600.0	0.58	285.38	2,599.7	6.1	16.0	-15.9	0.24	-0.22	-7.47
2,700.0	0.76	279.50	2,699.7	6.3	14.8	-14.7	0.19	0.18	-5.88
2,800.0	0.23	270.76	2,799.6	6.4	14.0	-13.9	0.53	-0.53	-8.74
2,900.0	0.20	301.82	2,899.6	6.5	13.6	-13.5	0.12	-0.03	31.06
3,000.0	0.27	13.76	2,999.6	6.8	13.5	-13.4	0.28	0.07	71.94
3,100.0	0.10	36.02	3,099.6	7.1	13.6	-13.5	0.18	-0.17	22.26
3,200.0	0.01	109.78	3,199.6	7.2	13.7	-13.6	0.10	-0.09	73.76
3,300.0	0.09	116.46	3,299.6	7.2	13.8	-13.7	0.08	0.08	6.68
3,400.0	0.07	118.07	3,399.6	7.1	13.9	-13.8	0.02	-0.02	1.61
3,500.0	0.20	121.65	3,499.6	7.0	14.1	-14.0	0.13	0.13	3.58
3,600.0	0.23	137.63	3,599.6	6.7	14.4	-14.3	0.07	0.03	15.98
3,700.0	0.16	127.60	3,699.6	6.5	14.6	-14.5	0.08	-0.07	-10.03
3,800.0	0.16	124.41	3,799.6	6.3	14.9	-14.8	0.01	0.00	-3.19
3,900.0	0.03	115.44	3,899.6	6.2	15.0	-14.9	0.13	-0.13	-8.97
4,000.0	0.09	306.88	3,999.6	6.3	15.0	-14.9	0.12	0.06	-168.56
4,100.0	0.22	180.18	4,099.6	6.1	14.9	-14.8	0.28	0.13	-126.70
4,200.0	0.13	201.48	4,199.6	5.8	14.8	-14.8	0.11	-0.09	21.30
4,300.0	0.23	279.95	4,299.6	5.8	14.6	-14.5	0.24	0.10	78.47
4,400.0	0.26	276.99	4,399.6	5.8	14.2	-14.1	0.03	0.03	-2.96
4,500.0	0.44	228.21	4,499.6	5.6	13.7	-13.6	0.33	0.18	-48.78
4,540.0	0.14	282.52	4,539.6	5.5	13.5	-13.4	0.94	-0.75	135.78
Tie into Gyro @ 4540' MD									
4,610.0	0.40	290.40	4,609.6	5.6	13.2	-13.1	0.37	0.37	11.26
4,642.0	2.20	272.10	4,641.6	5.7	12.5	-12.4	5.70	5.63	-57.19
KOP - 4642.0' MD, 4641.6' TVD, 2.20° INC, 272.10° AZI, -12.4' VS									
4,674.0	5.70	270.70	4,673.5	5.7	10.3	-10.2	10.94	10.94	-4.38

Company:	COG Operating LLC	**Local Co-ordinate Reference:**	Well #4H
Project:	Eddy County, NM	**TVD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Site:	Hogan State Com	**MD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Well:	#4H	**North Reference:**	Grid
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Houston R5000 Database

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)
4,705.0	9.10	273.80	4,704.3	5.9	6.3	-6.2	11.04	10.97	10.00
4,737.0	12.60	276.20	4,735.7	6.4	0.3	-0.2	11.03	10.94	7.50
4,739.0	12.82	276.18	4,737.7	6.5	-0.1	0.2	11.25	11.25	-1.18
PP - 4739.0' MD, 4737.7' TVD, 12.82° INC, 0.2' VS									
4,769.0	16.20	275.90	4,766.7	7.3	-7.6	7.7	11.25	11.25	-0.92
4,800.0	19.80	276.30	4,796.2	8.3	-17.1	17.2	11.62	11.61	1.29
4,832.0	23.10	275.40	4,826.0	9.5	-28.8	28.9	10.36	10.31	-2.81
4,864.0	26.60	274.40	4,855.0	10.6	-42.2	42.3	11.02	10.94	-3.13
4,895.0	29.50	273.00	4,882.3	11.6	-56.7	56.9	9.59	9.35	-4.52
4,927.0	32.90	271.60	4,909.7	12.2	-73.3	73.4	10.86	10.63	-4.38
4,958.0	35.40	271.90	4,935.4	12.8	-90.7	90.8	8.08	8.06	0.97
4,990.0	37.60	273.10	4,961.1	13.6	-109.7	109.9	7.23	6.88	3.75
5,022.0	39.60	273.50	4,986.1	14.7	-129.6	129.8	6.30	6.25	1.25
5,053.0	41.90	273.30	5,009.6	15.9	-149.8	150.0	7.43	7.42	-0.65
5,085.0	45.50	272.80	5,032.7	17.1	-171.9	172.1	11.30	11.25	-1.56
5,117.0	49.20	272.40	5,054.4	18.2	-195.4	195.6	11.60	11.56	-1.25
5,149.0	52.50	273.10	5,074.6	19.4	-220.2	220.4	10.45	10.31	2.19
5,180.0	55.80	274.50	5,092.7	21.0	-245.3	245.5	11.26	10.65	4.52
5,212.0	58.70	275.90	5,110.1	23.5	-272.0	272.3	9.78	9.06	4.38
5,244.0	61.90	277.00	5,125.9	26.6	-299.7	300.0	10.44	10.00	3.44
5,276.0	65.50	277.00	5,140.1	30.1	-328.1	328.5	11.25	11.25	0.00
5,307.0	68.90	276.30	5,152.1	33.4	-356.5	356.9	11.16	10.97	-2.26
5,339.0	71.90	275.20	5,162.8	36.4	-386.5	386.9	9.92	9.38	-3.44
5,371.0	75.00	274.50	5,171.9	39.0	-417.1	417.5	9.91	9.69	-2.19
5,402.0	78.30	274.00	5,179.1	41.3	-447.1	447.6	10.76	10.65	-1.61
5,434.0	81.00	273.30	5,184.8	43.3	-478.6	479.1	8.71	8.44	-2.19
5,466.0	83.00	272.80	5,189.3	44.9	-510.2	510.7	6.44	6.25	-1.56
5,498.0	85.50	272.30	5,192.5	46.4	-542.0	542.5	7.97	7.81	-1.56
5,529.0	87.40	269.30	5,194.4	46.8	-572.9	573.5	11.44	6.13	-9.68
5,561.0	88.40	269.20	5,195.6	46.4	-604.9	605.4	3.14	3.13	-0.31
5,592.0	88.60	269.20	5,196.4	45.9	-635.9	636.4	0.65	0.65	0.00
5,688.0	90.00	269.70	5,197.6	45.0	-731.9	732.4	1.55	1.46	0.52
5,784.0	90.40	270.90	5,197.2	45.5	-827.9	828.4	1.32	0.42	1.25
5,855.0	91.00	270.90	5,196.4	46.6	-898.9	899.4	0.84	0.84	0.00
EOC - 5855.0' MD, 5196.4' TVD, 91.00° INC, 270.90° AZI, 899.4' VS									
5,879.0	91.20	270.90	5,195.9	47.0	-922.9	923.4	0.84	0.84	0.00
5,974.0	92.00	270.80	5,193.3	48.4	-1,017.8	1,018.3	0.85	0.84	-0.11
6,069.0	91.60	271.60	5,190.3	50.4	-1,112.7	1,113.3	0.94	-0.42	0.84
6,164.0	90.80	271.60	5,188.3	53.1	-1,207.7	1,208.2	0.84	-0.84	0.00
6,259.0	91.40	271.40	5,186.5	55.5	-1,302.6	1,303.2	0.67	0.63	-0.21
6,355.0	90.80	270.80	5,184.6	57.4	-1,398.6	1,399.2	0.88	-0.63	-0.63
6,450.0	91.70	270.00	5,182.6	58.1	-1,493.6	1,494.2	1.27	0.95	-0.84
6,545.0	91.10	270.60	5,180.2	58.6	-1,588.5	1,589.1	0.89	-0.63	0.63
6,640.0	90.00	270.90	5,179.3	59.8	-1,683.5	1,684.1	1.20	-1.16	0.32

Company:	COG Operating LLC	**Local Co-ordinate Reference:**	Well #4H
Project:	Eddy County, NM	**TVD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Site:	Hogan State Com	**MD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Well:	#4H	**North Reference:**	Grid
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Houston R5000 Database

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)
6,735.0	90.80	270.90	5,178.7	61.3	-1,778.5	1,779.1	0.84	0.84	0.00
6,831.0	91.60	270.90	5,176.6	62.8	-1,874.5	1,875.1	0.83	0.83	0.00
6,926.0	90.20	269.90	5,175.2	63.5	-1,969.5	1,970.1	1.81	-1.47	-1.05
7,021.0	90.70	269.60	5,174.4	63.0	-2,064.5	2,065.1	0.61	0.53	-0.32
7,116.0	91.60	269.70	5,172.5	62.5	-2,159.4	2,160.0	0.95	0.95	0.11
7,211.0	90.70	269.70	5,170.6	62.0	-2,254.4	2,255.0	0.95	-0.95	0.00
7,306.0	91.50	269.80	5,168.8	61.6	-2,349.4	2,350.0	0.85	0.84	0.11
7,402.0	90.70	269.40	5,166.9	60.9	-2,445.4	2,445.9	0.93	-0.83	-0.42
7,497.0	91.40	269.50	5,165.2	60.0	-2,540.3	2,540.9	0.74	0.74	0.11
7,592.0	90.40	269.90	5,163.7	59.5	-2,635.3	2,635.9	1.13	-1.05	0.42
7,687.0	91.20	270.20	5,162.4	59.6	-2,730.3	2,730.8	0.90	0.84	0.32
7,782.0	92.00	270.30	5,159.7	60.0	-2,825.3	2,825.8	0.85	0.84	0.11
7,877.0	91.00	270.10	5,157.2	60.3	-2,920.2	2,920.8	1.07	-1.05	-0.21
7,972.0	91.50	270.00	5,155.2	60.4	-3,015.2	3,015.7	0.54	0.53	-0.11
8,067.0	90.30	269.40	5,153.7	59.9	-3,110.2	3,110.7	1.41	-1.26	-0.63
8,162.0	90.70	269.00	5,152.8	58.6	-3,205.2	3,205.7	0.60	0.42	-0.42
8,258.0	91.70	269.20	5,150.8	57.1	-3,301.2	3,301.6	1.06	1.04	0.21
8,353.0	91.50	269.90	5,148.2	56.3	-3,396.1	3,396.6	0.77	-0.21	0.74
8,448.0	90.60	269.70	5,146.4	56.0	-3,491.1	3,491.5	0.97	-0.95	-0.21
8,543.0	91.40	269.60	5,144.8	55.4	-3,586.1	3,586.5	0.85	0.84	-0.11
8,638.0	90.70	270.20	5,143.0	55.2	-3,681.1	3,681.5	0.97	-0.74	0.63
8,733.0	90.80	269.90	5,141.8	55.3	-3,776.1	3,776.5	0.33	0.11	-0.32
8,829.0	91.10	269.40	5,140.2	54.7	-3,872.0	3,872.4	0.61	0.31	-0.52
8,923.0	91.00	270.10	5,138.5	54.3	-3,966.0	3,966.4	0.75	-0.11	0.74
9,019.0	91.80	270.40	5,136.1	54.7	-4,062.0	4,062.4	0.89	0.83	0.31
9,114.0	90.70	270.70	5,134.1	55.6	-4,157.0	4,157.3	1.20	-1.16	0.32
9,209.0	91.40	270.50	5,132.3	56.6	-4,251.9	4,252.3	0.77	0.74	-0.21
9,304.0	90.30	271.00	5,130.9	57.9	-4,346.9	4,347.3	1.27	-1.16	0.53
9,399.0	91.10	270.90	5,129.7	59.5	-4,441.9	4,442.3	0.85	0.84	-0.11
9,495.0	91.90	270.90	5,127.2	61.0	-4,537.9	4,538.3	0.83	0.83	0.00
9,521.0	92.20	270.90	5,126.3	61.4	-4,563.8	4,564.3	1.15	1.15	0.00
9,576.0	92.20	270.90	5,124.2	62.2	-4,618.8	4,619.2	0.00	0.00	0.00

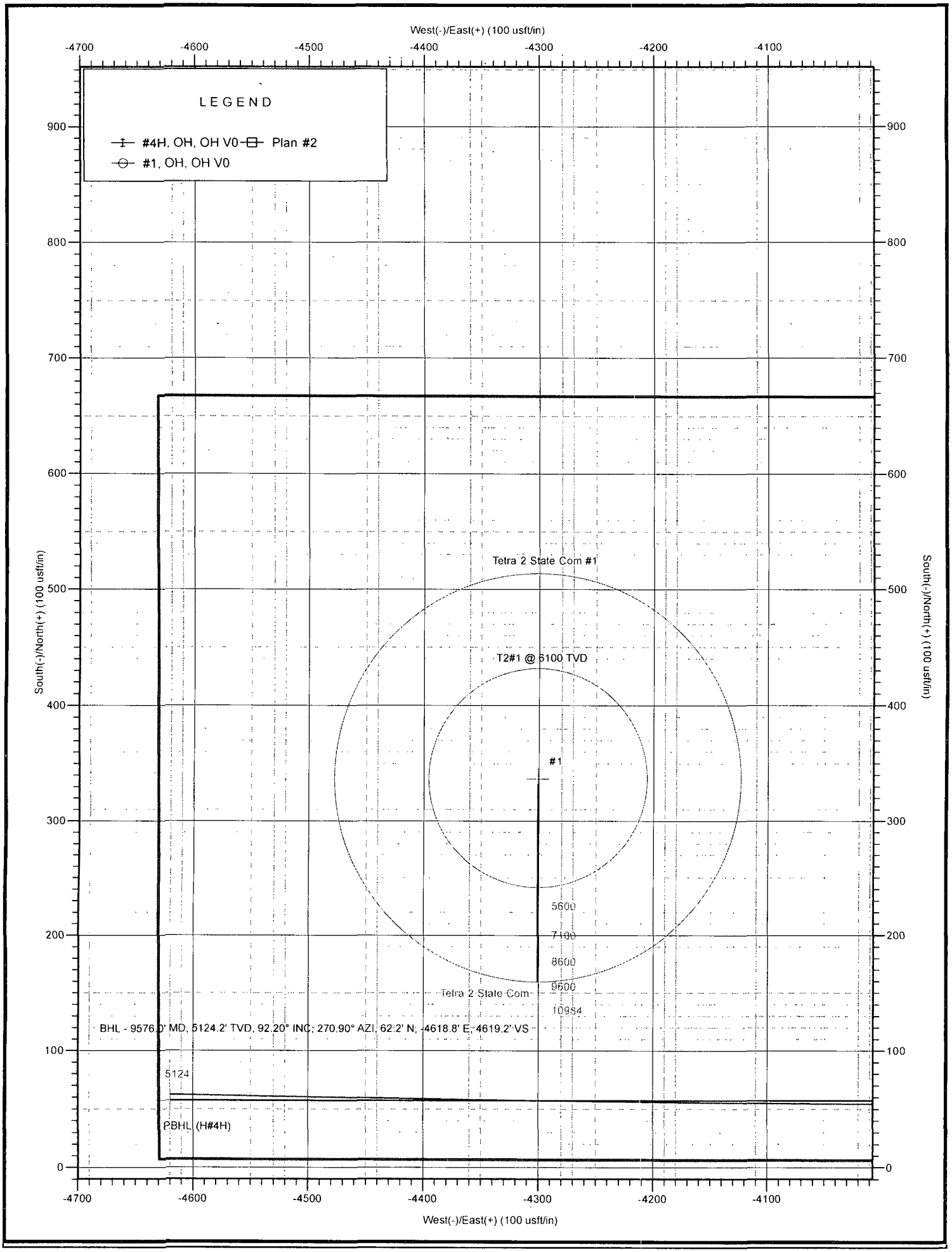
BHL - 9576.0' MD, 5124.2' TVD, 92.20° INC, 270.90° AZI, 62.2' N, -4618.8' E, 4619.2' VS

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
4,540.0	4,539.6	5.5	13.5	Tie into Gyro @ 4540' MD
4,642.0	4,641.6	5.7	12.5	KOP - 4642.0' MD, 4641.6' TVD, 2.20° INC, 272.10° AZI, -12.4' VS
4,739.0	4,737.7	6.5	-0.1	PP - 4739.0' MD, 4737.7' TVD, 12.82° INC, 0.2' VS
5,855.0	5,196.4	46.6	-898.9	EOC - 5855.0' MD, 5196.4' TVD, 91.00° INC, 270.90° AZI, 899.4' VS
9,576.0	5,124.2	62.2	-4,618.8	BHL - 9576.0' MD, 5124.2' TVD, 92.20° INC, 270.90° AZI, 62.2' N, -4618.8' E, 4

Company:	COG Operating LLC	**Local Co-ordinate Reference:**	Well #4H
Project:	Eddy County, NM	**TVD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Site:	Hogan State Com	**MD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Well:	#4H	**North Reference:**	Grid
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Houston R5000 Database

Checked By: _____ Approved By: _____ Date: _____


West(-)/East(+) (100 usft/in)
-4700
-4600
-4500
-4400
-4300
-4200
-4100
LEGEND
#4H, OH, OH V0
Plan #2
#1, OH, OH V0
900
800
700
600
500
400
300
200
100
0
South(-)/North(+) (100 usft/in)
Tetra 2 State Com #1
T2#1 @ 6100 TVD
#1
5600
7100
8600
9600
10984
Tetra 2 State Com
BHL - 9576.0' MD, 5124.2' TVD, 92.20° INC, 270.90° AZI, 62.2' N, -4618.8' E, 4619.2' VS
5124
PBHL (H#4H)

Company:	COG Operating LLC	**Local Co-ordinate Reference:**	Well #4H
Project:	Eddy County, NM	**TVD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Reference Site:	Hogan State Com	**MD Reference:**	WELL @ 3675.0usft (UDI #40 - 14' KB)
Site Error:	2.0 usft	**North Reference:**	Grid
Reference Well:	#4H	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0 usft	**Output errors are at**	2.00 sigma
Reference Wellbore	OH	**Database:**	Houston R5000 Database
Reference Design:	OH	**Offset TVD Reference:**	Offset Datum

Reference OH

Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	**Error Model:**	ISCWSA
Depth Range:	Unlimited	**Scan Method:**	Closest Approach 3D
Results Limited by:	Maximum separation factor of 10.00	**Error Surface:**	Elliptical Conic
Warning Levels Evaluated at:	2.00 **Sigma**	**Casing Method:**	Not applied

Survey Program **Date** 10/29/2012

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.0	4,540.0	Survey #1 - VES1 (OH)	CB-GYRO-MS	Camera based gyro multishot
4,610.0	9,521.0	Survey #2 - Crescent1 (OH)	MWD	MWD - Standard
9,576.0	9,576.0	Survey #3 - PTB (OH)	MWD	MWD - Standard

Summary

Site Name Offset Well - Wellbore - Design	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Tetra 2 State Com						
#1 - OH - OH	9,260.3	5,118.3	196.6	62.6	1.467	Level 3, CC, ES, SF

Offset Design Tetra 2 State Com - #1 - OH - OH — Offset Site Error: 2.0 usft

Survey Program: 350-MWD — Offset Well Error: 0.0 usft

Reference Measured Depth (usft)	Reference Vertical Depth (usft)	Offset Measured Depth (usft)	Offset Vertical Depth (usft)	Semi Major Axis Reference (usft)	Semi Major Axis Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
8,258.0	5,150.8	5,137.8	5,137.1	97.7	10.7	98.60	253.5	-4,300.6	1,018.6	911.5	107.14	9.507	
8,353.0	5,148.2	5,135.2	5,134.4	100.1	10.7	97.43	253.6	-4,300.6	925.8	816.0	109.83	8.429	
8,448.0	5,146.4	5,133.5	5,132.7	102.5	10.7	93.04	253.6	-4,300.6	833.3	720.4	112.94	7.378	
8,543.0	5,144.8	5,131.8	5,131.0	104.9	10.7	95.53	253.6	-4,300.6	741.5	626.5	114.99	6.449	
8,638.0	5,143.0	5,130.1	5,129.3	107.4	10.7	92.87	253.6	-4,300.6	650.6	532.8	117.79	5.523	
8,733.0	5,141.8	5,128.8	5,128.1	109.8	10.7	92.75	253.6	-4,300.6	560.8	440.6	120.23	4.665	
8,829.0	5,140.2	5,127.2	5,126.5	112.3	10.7	92.94	253.7	-4,300.6	472.5	349.9	122.65	3.853	
8,923.0	5,138.5	5,125.5	5,124.7	114.7	10.7	92.34	253.7	-4,300.6	389.5	264.4	125.14	3.112	
9,019.0	5,136.1	5,123.1	5,122.4	117.2	10.6	92.84	253.7	-4,300.6	310.7	183.1	127.58	2.435	
9,114.0	5,134.1	5,121.1	5,120.3	119.6	10.6	91.17	253.7	-4,300.6	244.7	114.5	130.16	1.880	
9,209.0	5,132.3	5,119.3	5,118.5	122.1	10.6	91.01	253.7	-4,300.6	203.0	70.4	132.64	1.531	
9,260.3	5,131.3	5,118.3	5,117.5	123.4	10.6	90.65	253.8	-4,300.6	196.6	62.6	133.98	1.467	Level 3, CC, ES, SF
9,304.0	5,130.9	5,117.9	5,117.1	124.6	10.6	90.58	253.8	-4,300.6	201.3	66.2	135.12	1.490	Level 3
9,399.0	5,129.7	5,116.7	5,115.9	127.1	10.6	89.86	253.8	-4,300.6	240.2	102.6	137.61	1.746	
9,495.0	5,127.2	5,114.2	5,113.4	129.6	10.6	88.37	253.8	-4,300.6	305.7	165.6	140.07	2.183	
9,521.0	5,126.3	5,113.2	5,112.5	130.3	10.6	87.72	253.8	-4,300.6	326.1	185.4	140.70	2.317	
9,576.0	5,124.2	5,111.1	5,110.3	131.2	10.6	87.10	253.8	-4,300.6	371.4	229.8	141.56	2.624	