

Results of Directional Survey

API number:	30-025-40863		
OGRID:		Operator:	COG OPERATING LLC
		Property:	LUSK DEEP UNIT A # 24H

surface	ULSTR:	D	19	T 19S	R 32E
				330 FNL	660 FWL

BH Loc	ULSTR:	M	19	T 19S	R 32E
13660	MD	9276.4	TVD	352 FSL	704 FWL
				4928 FNL	

Top Perf/OH	ULSTR:	D	19	T 19S	R 32E
9400	MD	9227.9	TVD	672 FNL	683 FWL

Bot Perf/OH	ULSTR:	M	19	T 19S	R 32E
13570	MD	9273.6	TVD	442 FSL	705 FWL
				4838 FNL	

	MD	N/S	E/W	VD
	9369	-312.80	22.70	9218.2
TOP PERFS/OH	9400	-342.20	23.30	9227.90
	9400	-342.20	23.30	9227.90
	13547	-4485.00	45.40	9272.90
BOT PERFS/OH	13570	-4508.00	45.07	9273.61
	13660	-4598.00	43.80	9276.40

NEXT TO LAST	13547	-4485.00	45.40	9272.90
LAST READING	13660	-4598.00	43.80	9276.40
TD	13660	-4598.00	43.80	9276.40

Surface Location	330	FN	660	FW
Projected BHL	4928	FN	704	FW
Location of				
Top Perfs/OH	672	FN	683	FW
Bottom Perfs/OH	4838	FN	705	FW

SUMMARY of Subsurface Locations

Surface Location	D-19-19S-32E	330	FN	660	FW	Vert. Depth
Top Perfs/OH	D-19-19S-32E	672	FN	683	FW	9227.90
Bottom Perfs/OH	M-19-19S-32E	4838	FN	705	FW	9273.61
Projected TD	M-19-19S-32E	4928	FN	704	FW	9276.40

APR 30 2013

HOBBS OCD

APR 05 2013

RECEIVED

OPERATOR: COG Operating, LLC
WELL/LEASE: Lusk Deep Unit A # 24 H
COUNTY: Lea Co., New Mexico
Sec. 19, T19S, R32E

SUR: D-19-19s-32e, 330/N & 660/W
BHL: M-19-19s-32e, 4928/N & 704/W
API # 30-025-40863

STATE OF NEW MEXICO
DEVIATION REPORT

<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
227	1	3,290	1
490	1/2	3,358	1
920	1 1/4	3,480	1
1,015	1 1/4	3,573	1 1/4
1,111	1 3/4	3,668	1 1/2
1,205	1 3/4	3,763	1 1/2
1,299	2	3,857	1 1/2
1,489	1 3/4	3,925	1 1/2
1,583	1 3/4	4,047	1 3/4
1,678	1 1/4	4,142	1 3/4
1,773	2	4,236	2 1/4
1,868	2 3/4	4,331	2 3/4
1,965	3	4,717	1 3/4
2,247	2 1/4	5,086	3/4
2,342	2	5,465	1
2,437	1 3/4	5,972	2
2,532	1 3/4	6,416	1 1/4
2,626	1 3/4	6,890	3/4
2,721	1 3/4	7,239	1
2,910	1 3/4	7,586	1
3,005	2 1/2	7,840	1
3,100	1 1/2	8,248	2 1/2
3,195	1	8,704	2 1/4

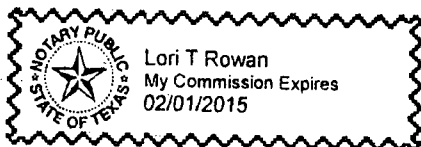
Patriot Drilling, LLC

Daniel Cahell for
M. Leroy Peterson, Executive Vice-
President

The foregoing instrument was acknowledged before me on this 8th day of January, 2013 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling, LLC.

My Commission Expires: 02/01/2015

Lori T. Rowan
Lori T. Rowan
Notary Public for Ector Co., Texas





A GYRO TECHNOLOGIES INC. COMPANY

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

January 8, 2013

Concho Resources, Inc.
One Concho Center
600 W. Illinois Avenue
Midland, Texas 79701

Attn: Kanicia Castillo

SUR: D-19-19s-32e, 330/N & 660/W
BHL: M-19-19s-32e, 4928/N & 704/W
API # 30-025-40863

RE: **Lusk Deep Unit A No. 024H**

Please find enclosed a copy of the survey from 0:00' to 8610:00' ran on the above referenced well.

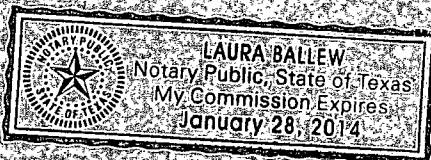
Sincerely,


Keith Havelka
Operations

STATE OF TEXAS §

COUNTY OF NUECES §

This instrument was acknowledged before me on the 8th day of January,
A.D., 2013, by Keith Havelka.




Laura Ballew
Notary Public, State of Texas

Company: COG Operating LLC (Concho)

Lease/Well: Lusk Deep Unit A / No. 024H



Rig Name: Patriot 6

State/County: New Mexico / Lea

Latitude: 32.65, Longitude: -103.81

GRID North is 0.28 Degrees East of True North

VS-Azi: 179.60 Degrees



Depth Reference : RKB = 18'

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: gyro survey.ut

Minimum Curvature Method

Report Date/Time: 1/8/2013 / 09:53

Vaughn Energy Services

Gardendale, TX

432-563-5444

Surveyor: Colby Ware

Lusk Deep Unit A No. 024H / API 30-025-40863

HOBBS OCD
APR 05 2013
RECEIVED

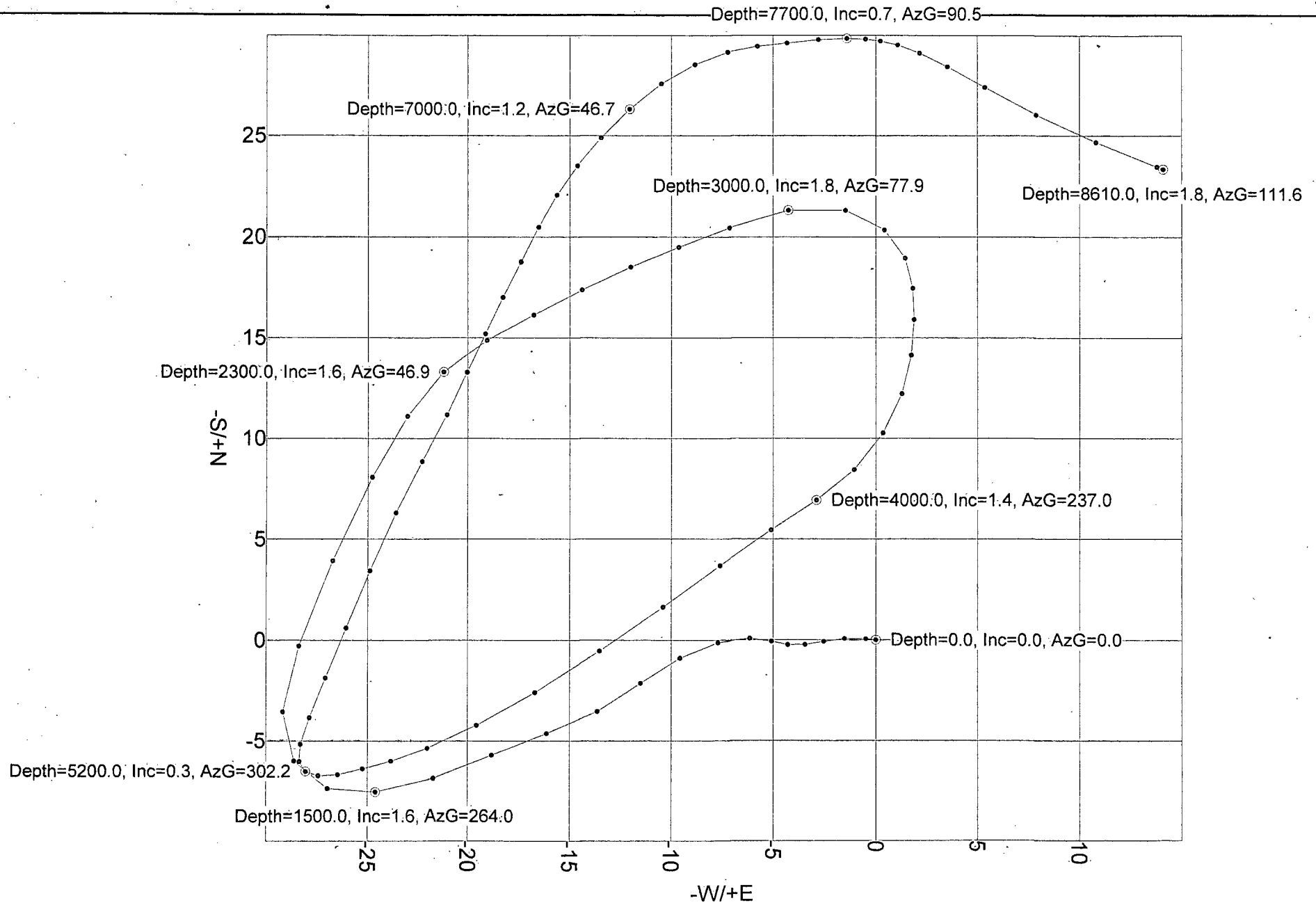
Measured Depth FT	Incl. Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.57	276.82	100.00	0.06	-0.49	0.50	276.82	0.57
200.00	0.63	265.20	199.99	0.07	-1.53	1.53	272.70	0.13
300.00	0.56	258.35	299.99	-0.07	-2.55	2.56	268.38	0.10
400.00	0.49	261.50	399.98	-0.23	-3.46	3.47	266.12	0.07
500.00	0.48	278.25	499.98	-0.24	-4.30	4.30	266.82	0.14
600.00	0.46	285.01	599.98	-0.08	-5.09	5.09	269.15	0.06
700.00	0.76	274.41	699.97	0.08	-6.14	6.14	270.73	0.33
800.00	1.07	253.82	799.96	-0.13	-7.71	7.71	269.03	0.45
900.00	1.24	242.89	899.94	-0.89	-9.57	9.61	264.71	0.28
1000.00	1.42	231.95	999.91	-2.14	-11.51	11.71	259.46	0.31
1100.00	1.51	241.34	1099.88	-3.54	-13.64	14.09	255.47	0.26
1200.00	1.61	250.73	1199.84	-4.63	-16.12	16.77	253.97	0.27
1300.00	1.72	245.58	1299.80	-5.72	-18.81	19.66	253.10	0.19
1400.00	1.87	250.43	1399.75	-6.88	-21.72	22.79	252.42	0.22
1500.00	1.55	264.00	1499.71	-7.57	-24.61	25.75	252.90	0.52
1600.00	1.23	287.56	1599.68	-7.39	-26.98	27.97	254.68	0.65
1700.00	1.42	328.88	1699.65	-6.01	-28.64	29.26	258.15	0.95
1800.00	1.61	4.20	1799.62	-3.55	-29.18	29.39	263.06	0.93

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	2.27	19.64	1899.56	-0.29	-28.41	28.41	269.42	0.84
2000.00	2.94	23.09	1999.46	3.93	-26.74	27.03	278.36	0.68
2100.00	2.32	28.03	2099.35	8.07	-24.78	26.07	288.04	0.66
2200.00	1.70	32.97	2199.29	11.10	-23.03	25.56	295.75	0.64
2300.00	1.59	46.88	2299.25	13.30	-21.20	25.03	302.10	0.41
2400.00	1.48	60.79	2399.22	14.88	-19.06	24.18	307.97	0.39
2500.00	1.53	61.88	2499.18	16.14	-16.76	23.27	313.92	0.06
2600.00	1.54	62.96	2599.14	17.38	-14.39	22.56	320.38	0.03
2700.00	1.49	66.07	2699.11	18.51	-12.00	22.06	327.04	0.10
2800.00	1.44	69.19	2799.08	19.49	-9.64	21.74	333.68	0.09
2900.00	1.63	68.53	2899.04	20.45	-7.14	21.67	340.75	0.19
3000.00	1.82	77.88	2999.00	21.31	-4.27	21.73	348.67	0.34
3100.00	1.45	105.00	3098.96	21.31	-1.49	21.37	355.99	0.85
3200.00	1.08	132.12	3198.93	20.35	0.43	20.36	1.21	0.69
3300.00	0.95	158.24	3298.92	18.95	1.44	19.00	4.34	0.48
3400.00	0.82	174.37	3398.91	17.46	1.82	17.55	5.94	0.28
3500.00	0.95	180.92	3498.89	15.91	1.87	16.02	6.72	0.17
3600.00	1.09	187.47	3598.88	14.14	1.74	14.25	7.01	0.18
3700.00	1.19	199.26	3698.86	12.22	1.27	12.28	5.94	0.26
3800.00	1.30	211.05	3798.84	10.27	0.34	10.27	1.92	0.28
3900.00	1.35	224.03	3898.81	8.45	-1.06	8.51	352.84	0.30
4000.00	1.41	237.01	3998.78	6.93	-2.91	7.52	337.22	0.32
4100.00	1.62	235.49	4098.74	5.46	-5.11	7.48	316.89	0.22
4200.00	1.88	233.98	4198.70	3.69	-7.61	8.45	295.87	0.26
4300.00	2.09	233.95	4298.64	1.65	-10.41	10.54	279.02	0.20
4400.00	2.29	235.93	4398.56	-0.54	-13.53	13.54	267.73	0.22
4500.00	2.03	238.34	4498.49	-2.59	-16.69	16.89	261.20	0.27
4600.00	1.77	242.75	4598.44	-4.22	-19.57	20.02	257.83	0.30
4700.00	1.33	248.14	4698.40	-5.36	-22.02	22.66	256.32	0.46
4800.00	0.89	253.54	4798.38	-6.01	-23.84	24.59	255.85	0.45
4900.00	0.79	255.48	4898.37	-6.40	-25.25	26.05	255.77	0.10
5000.00	0.65	257.42	4998.36	-6.70	-26.47	27.31	255.80	0.14
5100.00	0.47	279.83	5098.36	-6.75	-27.43	28.25	256.17	0.28
5200.00	0.30	302.24	5198.36	-6.55	-28.06	28.81	256.87	0.23
5300.00	0.44	346.01	5298.36	-6.03	-28.37	29.01	257.99	0.31
5400.00	0.59	15.78	5398.35	-5.17	-28.32	28.79	259.66	0.30
5500.00	1.01	20.32	5498.34	-3.85	-27.88	28.14	262.14	0.43
5600.00	1.43	22.86	5598.32	-1.87	-27.09	27.16	266.04	0.42
5700.00	1.65	21.69	5698.28	0.61	-26.07	26.08	271.35	0.22

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	1.87	23.53	5798.24	3.45	-24.89	25.13	277.88	0.23
5900.00	1.72	25.01	5898.19	6.30	-23.60	24.43	284.96	0.16
6000.00	1.57	29.50	5998.15	8.86	-22.29	23.99	291.68	0.20
6100.00	1.43	26.95	6098.11	11.17	-21.05	23.83	297.96	0.16
6200.00	1.25	24.40	6198.08	13.28	-20.03	24.03	303.55	0.19
6300.00	1.17	25.29	6298.06	15.20	-19.14	24.44	308.45	0.08
6400.00	1.13	26.19	6398.04	17.01	-18.27	24.96	312.96	0.04
6500.00	1.12	26.73	6498.02	18.77	-17.39	25.59	317.19	0.01
6600.00	1.08	27.28	6598.00	20.49	-16.52	26.32	321.12	0.05
6700.00	1.01	32.30	6697.99	22.07	-15.62	27.04	324.71	0.11
6800.00	0.99	37.33	6797.97	23.50	-14.62	27.68	328.12	0.09
6900.00	1.09	42.03	6897.95	24.90	-13.46	28.30	331.61	0.13
7000.00	1.19	46.74	6997.93	26.32	-12.06	28.95	335.39	0.14
7100.00	1.13	55.56	7097.91	27.59	-10.49	29.52	339.19	0.19
7200.00	1.06	64.38	7197.90	28.55	-8.85	29.89	342.78	0.18
7300.00	0.93	74.60	7297.88	29.16	-7.23	30.05	346.07	0.22
7400.00	0.80	84.83	7397.87	29.44	-5.76	30.00	348.93	0.20
7500.00	0.85	81.61	7497.86	29.61	-4.33	29.93	351.68	0.07
7600.00	0.91	85.40	7597.85	29.78	-2.80	29.92	354.62	0.08
7700.00	0.67	90.53	7697.84	29.84	-1.42	29.88	357.27	0.25
7800.00	0.38	94.66	7797.83	29.81	-0.50	29.81	359.03	0.30
7900.00	0.46	99.85	7897.83	29.71	0.22	29.71	0.43	0.09
8000.00	0.55	106.03	7997.83	29.51	1.08	29.53	2.10	0.10
8100.00	0.77	112.77	8097.82	29.12	2.16	29.20	4.24	0.23
8200.00	0.99	118.51	8197.81	28.45	3.54	28.67	7.08	0.24
8300.00	1.42	119.98	8297.79	27.42	5.37	27.94	11.08	0.43
8400.00	1.86	117.46	8397.74	26.05	7.88	27.22	16.83	0.44
8500.00	1.85	112.69	8497.69	24.68	10.81	26.94	23.65	0.15
8600.00	1.84	111.92	8597.64	23.46	13.79	27.21	30.45	0.03
8610.00	1.83	111.64	8607.64	23.34	14.09	27.26	31.11	0.13



Vaughn Energy Services
Gardendale, TX
432-563-5444
Surveyor: Colby Ware
Lusk Deep Unit A No: 024H / API 30-025-40863



VES Survey Date: 12/30/2012



A Schlumberger Company

COG Operating LLC

Lea County(NAD27)

Lusk Deep Unit A

#24H

OH

Design: OH

Pathfinder X&Y Report

07 January, 2013





A Schlumberger Company

Pathfinder
Pathfinder X&Y Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #24H
Project:	Lea County (NAD27)	TVD Reference:	KB = 18' @ 3587.0usft
Site:	Lusk Deep Unit A	MD Reference:	KB = 18' @ 3587.0usft
Well:	#24H	North Reference:	Grid:
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Single User Db

Project		Lea County(NAD27)	
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		Lusk Deep Unit A							
Site Position:		Northing:		599,927.400	usft	Latitude:		32.648150	
From:	Map	Easting:		665,577.000	usft	Longitude:		-103.795390	
Position Uncertainty:		0.0	usft	Slot Radius:		13-3/16	"	Grid Convergence:	0.29 °

Well:		#24H				
Well Position	+N/-S	0.0 usft	Northing:	601,385.700 usft	Latitude:	32.652226
	+E/-W	0.0 usft	Easting:	660,585.500 usft	Longitude:	-103.811583
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft	Ground Level:	3,569.0 usft	

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF200510	7/12/2012	7.59	60.54	48,779

Design:		OH		
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth: 0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction:
	(usft)	(usft)	(usft)	(°)
	0.0	0.0	0.0	179.60



A Schlumberger Company

Pathfinder Pathfinder X&Y Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #24H
Project:	Lea County(NAD27)	TVD Reference:	KB = 18' @ 3587.0usft
Site:	Lusk Deep Unit A	MD Reference:	KB = 18' @ 3587.0usft
Well:	#24H	North Reference:	Grid
Wellbore:	OH	Survey/Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Single User Db

Survey Program:	Date: 1/7/2013			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.0	8,610.0	Gyro #1 (OH)	NS-GYRO-MS	North sensing gyrocompassing m/s
8,672.0	13,660.0	MWD #2 (OH)	MWD	MWD - Standard

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
0.0	0.00	0.00	0.0	-3,587.0	0.0	0.0	0.0	0.00	601,385.70	660,585.50
100.0	0.57	276.82	100.0	-3,487.0	0.1	-0.5	-0.1	0.57	601,385.76	660,585.01
200.0	0.63	265.20	200.0	-3,387.0	0.1	-1.5	-0.1	0.14	601,385.77	660,583.96
300.0	0.56	258.35	300.0	-3,287.0	-0.1	-2.6	0.1	0.10	601,385.63	660,582.94
400.0	0.49	261.50	400.0	-3,187.0	-0.2	-3.5	0.2	0.08	601,385.47	660,582.04
500.0	0.48	278.25	500.0	-3,087.0	-0.2	-4.3	0.2	0.14	601,385.46	660,581.20
600.0	0.46	285.01	600.0	-2,987.0	-0.1	-5.1	0.0	0.06	601,385.63	660,580.40
700.0	0.76	274.41	700.0	-2,887.0	0.1	-6.2	-0.1	0.32	601,385.78	660,579.35
800.0	1.07	253.82	800.0	-2,787.0	-0.1	-7.7	0.1	0.45	601,385.57	660,577.79
900.0	1.24	242.89	899.9	-2,687.1	-0.9	-9.6	0.8	0.28	601,384.82	660,575.93
1,000.0	1.42	231.95	999.9	-2,587.1	-2.1	-11.5	2.1	0.31	601,383.56	660,573.99
1,100.0	1.51	241.34	1,099.9	-2,487.1	-3.5	-13.6	3.4	0.26	601,382.17	660,571.86
1,200.0	1.61	250.73	1,199.8	-2,387.2	-4.6	-16.1	4.5	0.27	601,381.07	660,569.38
1,300.0	1.72	245.58	1,299.8	-2,287.2	-5.7	-18.8	5.6	0.19	601,379.99	660,566.68
1,400.0	1.87	250.43	1,399.8	-2,187.2	-6.9	-21.7	6.7	0.21	601,378.82	660,563.78
1,500.0	1.55	264.00	1,499.7	-2,087.3	-7.6	-24.6	7.4	0.51	601,378.13	660,560.90
1,600.0	1.23	287.56	1,599.7	-1,987.3	-7.4	-27.0	7.2	0.65	601,378.31	660,558.53
1,700.0	1.42	328.88	1,699.7	-1,887.3	-6.0	-28.6	5.8	0.95	601,379.70	660,556.87
1,800.0	1.61	4.20	1,799.6	-1,787.4	-3.5	-29.2	3.3	0.94	601,382.16	660,556.33
1,900.0	2.27	19.64	1,899.6	-1,687.4	-0.3	-28.4	0.1	0.84	601,385.43	660,557.10
2,000.0	2.94	23.09	1,999.5	-1,587.5	4.0	-26.7	-4.1	0.69	601,389.65	660,558.77

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #24H
Project:	Lea County (NAD27)	TVD Reference:	KB = 18' @ 3587.0usft
Site:	Lusk Deep Unit A	MD Reference:	KB = 18' @ 3587.0usft
Well:	#24H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (%/100usft)	Northing (usft)	Easting (usft)	
2,100.0	2.32	28.03	2,099.4	-1,487.6	8.1	-24.8	-8.3	0.66	601,393.80	660,560.73	
2,200.0	1.70	32.97	2,199.3	-1,387.7	11.1	-23.0	-11.3	0.64	601,396.83	660,562.48	
2,300.0	1.59	46.88	2,299.3	-1,287.7	13.3	-21.2	-13.5	0.41	601,399.02	660,564.30	
2,400.0	1.48	60.79	2,399.2	-1,187.8	14.9	-19.1	-15.0	0.39	601,400.60	660,566.44	
2,500.0	1.53	61.88	2,499.2	-1,087.8	16.2	-16.8	-16.3	0.06	601,401.86	660,568.75	
2,600.0	1.54	62.96	2,599.1	-987.9	17.4	-14.4	-17.5	0.03	601,403.10	660,571.12	
2,700.0	1.49	66.07	2,699.1	-887.9	18.5	-12.0	-18.6	0.10	601,404.24	660,573.51	
2,800.0	1.44	69.19	2,799.1	-787.9	19.5	-9.6	-19.6	0.09	601,405.21	660,575.87	
2,900.0	1.63	68.53	2,899.0	-688.0	20.5	-7.1	-20.5	0.19	601,406.18	660,578.37	
3,000.0	1.82	77.88	2,999.0	-588.0	21.3	-4.3	-21.4	0.34	601,407.03	660,581.24	
3,100.0	1.45	105.00	3,099.0	-488.0	21.3	-1.5	-21.3	0.85	601,407.04	660,584.02	
3,200.0	1.08	132.12	3,198.9	-388.1	20.4	0.4	-20.4	0.69	601,406.08	660,585.94	
3,300.0	0.95	158.24	3,298.9	-288.1	19.0	1.4	-19.0	0.48	601,404.68	660,586.95	
3,400.0	0.82	174.37	3,398.9	-188.1	17.5	1.8	-17.5	0.28	601,403.19	660,587.32	
3,500.0	0.95	180.92	3,498.9	-88.1	16.0	1.9	-15.9	0.16	601,401.65	660,587.38	
3,600.0	1.09	187.47	3,598.9	11.9	14.2	1.7	-14.2	0.18	601,399.88	660,587.24	
3,700.0	1.19	199.26	3,698.9	111.9	12.3	1.3	-12.2	0.25	601,397.96	660,586.78	
3,800.0	1.30	211.05	3,798.8	211.8	10.3	0.4	-10.3	0.28	601,396.01	660,585.85	
3,900.0	1.35	224.03	3,898.8	311.8	8.5	-1.1	-8.5	0.30	601,394.19	660,584.45	
4,000.0	1.41	237.01	3,998.8	411.8	7.0	-2.9	-7.0	0.32	601,392.67	660,582.60	
4,100.0	1.62	235.49	4,098.7	511.7	5.5	-5.1	-5.5	0.21	601,391.20	660,580.40	
4,200.0	1.88	233.98	4,198.7	611.7	3.7	-7.6	-3.8	0.26	601,389.43	660,577.91	
4,300.0	2.09	233.95	4,298.6	711.6	1.7	-10.4	-1.8	0.21	601,387.40	660,575.11	
4,400.0	2.29	235.93	4,398.6	811.6	-0.5	-13.5	0.4	0.21	601,385.20	660,571.98	
4,500.0	2.03	238.34	4,498.5	911.5	-2.5	-16.7	2.4	0.28	601,383.16	660,568.82	
4,600.0	1.77	242.75	4,598.4	1,011.4	-4.2	-19.6	4.0	0.30	601,381.52	660,565.93	
4,700.0	1.33	248.14	4,698.4	1,111.4	-5.3	-22.0	5.2	0.46	601,380.38	660,563.48	

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #24H
Project:	Lea County (NAD27)	TVD Reference:	KB = 18' @ 3587.0usft
Site:	Lusk Deep Unit A	MD Reference:	KB = 18' @ 3587.0usft
Well:	#24H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
4,800.0	0.89	253.54	4,798.4	1,211.4	-6.0	-23.8	5.8	0.45	601,379.73	660,561.66	
4,900.0	0.79	255.48	4,898.4	1,311.4	-6.4	-25.2	6.2	0.10	601,379.33	660,560.25	
5,000.0	0.65	257.42	4,998.4	1,411.4	-6.7	-26.5	6.5	0.14	601,379.04	660,559.03	
5,100.0	0.47	279.83	5,098.4	1,511.4	-6.7	-27.4	6.5	0.28	601,378.98	660,558.07	
5,200.0	0.30	302.24	5,198.4	1,611.4	-6.5	-28.1	6.3	0.22	601,379.19	660,557.45	
5,300.0	0.44	346.01	5,298.4	1,711.4	-6.0	-28.4	5.8	0.30	601,379.71	660,557.13	
5,400.0	0.59	15.78	5,398.4	1,811.4	-5.1	-28.3	4.9	0.30	601,380.57	660,557.18	
5,500.0	1.01	20.32	5,498.3	1,911.3	-3.8	-27.9	3.6	0.42	601,381.90	660,557.63	
5,600.0	1.43	22.86	5,598.3	2,011.3	-1.8	-27.1	1.6	0.42	601,383.87	660,558.42	
5,700.0	1.65	21.69	5,698.3	2,111.3	0.7	-26.1	-0.8	0.22	601,386.36	660,559.43	
5,800.0	1.87	23.53	5,798.2	2,211.2	3.5	-24.9	-3.7	0.23	601,389.19	660,560.62	
5,900.0	1.72	25.01	5,898.2	2,311.2	6.3	-23.6	-6.5	0.16	601,392.05	660,561.90	
6,000.0	1.57	29.50	5,998.1	2,411.1	8.9	-22.3	-9.1	0.20	601,394.60	660,563.21	
6,100.0	1.43	26.95	6,098.1	2,511.1	11.2	-21.0	-11.4	0.16	601,396.91	660,564.45	
6,200.0	1.25	24.40	6,198.1	2,611.1	13.3	-20.0	-13.5	0.19	601,399.01	660,565.47	
6,300.0	1.17	25.29	6,298.1	2,711.1	15.2	-19.1	-15.4	0.08	601,400.93	660,566.35	
6,400.0	1.13	26.19	6,398.0	2,811.0	17.0	-18.3	-17.2	0.04	601,402.74	660,567.23	
6,500.0	1.12	26.73	6,498.0	2,911.0	18.8	-17.4	-18.9	0.01	601,404.49	660,568.10	
6,600.0	1.08	27.28	6,598.0	3,011.0	20.5	-16.5	-20.6	0.04	601,406.20	660,568.97	
6,700.0	1.01	32.30	6,698.0	3,111.0	22.1	-15.6	-22.2	0.12	601,407.79	660,569.87	
6,800.0	0.99	37.33	6,798.0	3,211.0	23.5	-14.6	-23.6	0.09	601,409.22	660,570.87	
6,900.0	1.09	42.03	6,898.0	3,311.0	24.9	-13.5	-25.0	0.13	601,410.61	660,572.03	
7,000.0	1.19	46.74	6,997.9	3,410.9	26.3	-12.1	-26.4	0.14	601,412.03	660,573.42	
7,100.0	1.13	55.56	7,097.9	3,510.9	27.6	-10.5	-27.7	0.19	601,413.30	660,574.99	
7,200.0	1.06	64.38	7,197.9	3,610.9	28.6	-8.9	-28.6	0.18	601,414.26	660,576.64	
7,300.0	0.93	74.60	7,297.9	3,710.9	29.2	-7.2	-29.2	0.22	601,414.87	660,578.26	
7,400.0	0.80	84.83	7,397.9	3,810.9	29.5	-5.8	-29.5	0.20	601,415.15	660,579.73	



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Pathfinder Pathfinder X&Y Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well #24H
Project:	Lea County(NAD27)	TVD Reference:	KB = 18' @ 3587.0usft
Site:	Lusk, Deep Unit A	MD Reference:	KB = 18' @ 3587.0usft
Well:	#24H	North Reference:	Grid
Wellbore:	OH	Survey/Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
7,500.0	0.85	81.61	7,497.9	3,910.9	29.6	-4.3	-29.7	0.07	601,415.32	660,581.16	
7,600.0	0.91	85.40	7,597.8	4,010.8	29.8	-2.8	-29.8	0.08	601,415.49	660,582.69	
7,700.0	0.67	90.53	7,697.8	4,110.8	29.9	-1.4	-29.9	0.25	601,415.55	660,584.06	
7,800.0	0.38	94.66	7,797.8	4,210.8	29.8	-0.5	-29.8	0.29	601,415.52	660,584.98	
7,900.0	0.46	99.85	7,897.8	4,310.8	29.7	0.2	-29.7	0.09	601,415.43	660,585.71	
8,000.0	0.55	106.03	7,997.8	4,410.8	29.5	1.1	-29.5	0.11	601,415.22	660,586.56	
8,100.0	0.77	112.77	8,097.8	4,510.8	29.1	2.1	-29.1	0.23	601,414.83	660,587.64	
8,200.0	0.99	118.51	8,197.8	4,610.8	28.5	3.5	-28.4	0.24	601,414.16	660,589.02	
8,300.0	1.42	119.98	8,297.8	4,710.8	27.4	5.4	-27.4	0.43	601,413.13	660,590.85	
8,400.0	1.86	117.46	8,397.7	4,810.7	26.1	7.9	-26.0	0.45	601,411.76	660,593.37	
8,500.0	1.85	112.69	8,497.7	4,910.7	24.7	10.8	-24.6	0.15	601,410.39	660,596.30	
8,600.0	1.84	111.92	8,597.6	5,010.6	23.5	13.8	-23.4	0.03	601,409.17	660,599.28	
8,610.0	1.83	111.64	8,607.6	5,020.6	23.3	14.1	-23.3	0.13	601,409.05	660,599.57	
8,672.0	1.67	120.21	8,669.6	5,082.6	22.5	15.8	-22.4	0.49	601,408.23	660,601.27	
KOP - 8672.0 'MD, 8669.6 'TVD, 22.5 'N, 15.8 'E											
8,704.0	2.20	132.16	8,701.6	5,114.6	21.9	16.6	-21.8	2.07	601,407.58	660,602.13	
8,735.0	3.96	169.43	8,732.5	5,145.5	20.4	17.3	-20.3	8.32	601,406.13	660,602.77	
8,767.0	4.66	186.74	8,764.5	5,177.5	18.1	17.3	-17.9	4.59	601,403.75	660,602.82	
8,799.0	7.56	184.37	8,796.3	5,209.3	14.7	17.0	-14.5	9.09	601,400.36	660,602.51	
8,832.0	9.58	187.18	8,828.9	5,241.9	9.8	16.5	-9.7	6.25	601,395.47	660,602.00	
8,862.0	9.32	182.70	8,858.5	5,271.5	4.9	16.1	-4.8	2.60	601,390.57	660,601.57	
8,893.0	12.22	180.18	8,888.9	5,301.9	-0.9	15.9	1.0	9.48	601,384.78	660,601.44	
8,925.0	16.09	180.55	8,920.0	5,333.0	-8.7	15.9	8.9	12.10	601,376.96	660,601.39	
8,957.0	20.93	181.24	8,950.3	5,363.3	-18.9	15.7	19.0	15.14	601,366.80	660,601.22	
8,988.0	25.68	179.25	8,978.8	5,391.8	-31.2	15.7	31.3	15.53	601,354.54	660,601.19	
9,020.0	29.90	177.00	9,007.1	5,420.1	-46.1	16.2	46.2	13.59	601,339.64	660,601.70	
9,051.0	33.41	176.25	9,033.5	5,446.5	-62.3	17.2	62.4	11.39	601,323.40	660,602.66	



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Pathfinder Pathfinder X&Y Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #24H
Project:	Lea County (NAD27)	TVD Reference:	KB = 18' @ 3587.0usft
Site:	Lusk Deep Unit A	MD Reference:	KB = 18' @ 3587.0usft
Well:	#24H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM/5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	D Leg (°/100usft)	Northing (usft)	Easting (usft)	
9,083.0	36.58	176.58	9,059.7	5,472.7	-80.6	18.3	80.7	9.92	601,305.09	660,603.81	
9,115.0	40.89	177.17	9,084.6	5,497.6	-100.6	19.4	100.7	13.52	601,285.10	660,604.89	
9,146.0	45.20	178.09	9,107.3	5,520.3	-121.7	20.3	121.9	14.05	601,263.96	660,605.76	
9,178.0	49.42	179.54	9,129.0	5,542.0	-145.2	20.7	145.4	13.60	601,240.45	660,606.24	
9,210.0	53.99	179.74	9,148.8	5,561.8	-170.4	20.9	170.5	14.29	601,215.34	660,606.40	
9,242.0	59.00	179.45	9,166.4	5,579.4	-197.0	21.1	197.2	15.67	601,188.67	660,606.59	
9,274.0	63.66	179.36	9,181.8	5,594.8	-225.1	21.4	225.2	14.56	601,160.60	660,606.88	
9,305.0	66.74	179.27	9,194.8	5,607.8	-253.2	21.7	253.4	9.94	601,132.47	660,607.21	
9,337.0	68.68	179.01	9,206.9	5,619.9	-282.8	22.2	283.0	6.11	601,102.86	660,607.66	
9,369.0	70.26	178.83	9,218.2	5,631.2	-312.8	22.7	312.9	4.97	601,072.90	660,608.22	
9,400.0	72.98	178.74	9,227.9	5,640.9	-342.2	23.3	342.4	8.78	601,043.49	660,608.85	
9,432.0	76.24	179.01	9,236.4	5,649.4	-373.1	24.0	373.2	10.22	601,012.65	660,609.45	
9,464.0	79.58	179.18	9,243.1	5,656.1	-404.3	24.4	404.5	10.45	600,981.37	660,609.95	
9,495.0	82.66	179.10	9,247.9	5,660.9	-435.0	24.9	435.1	9.94	600,950.75	660,610.41	
9,527.0	85.91	179.18	9,251.1	5,664.1	-466.8	25.4	467.0	10.16	600,918.91	660,610.88	
9,559.0	88.81	179.71	9,252.6	5,665.6	-498.7	25.7	498.9	9.21	600,886.95	660,611.19	
LP - 9559.0 MD, 9252.6 TVD, -498.7 N, 25.7 E											
9,653.0	89.60	180.06	9,253.9	5,666.9	-592.7	25.9	592.9	0.92	600,792.96	660,611.38	
9,748.0	88.99	180.76	9,255.0	5,668.0	-687.7	25.2	687.9	0.98	600,697.97	660,610.70	
9,842.0	89.69	180.41	9,256.1	5,669.1	-781.7	24.2	781.9	0.83	600,603.99	660,609.74	
9,938.0	91.36	179.10	9,255.2	5,668.2	-877.7	24.7	877.9	2.21	600,508.00	660,610.15	
10,032.0	92.07	179.45	9,252.4	5,665.4	-971.7	25.8	971.8	0.84	600,414.05	660,611.34	
10,127.0	90.84	179.36	9,250.0	5,663.0	-1,066.6	26.8	1,066.8	1.30	600,319.08	660,612.33	
10,222.0	90.84	179.62	9,248.6	5,661.6	-1,161.6	27.7	1,161.8	0.27	600,224.10	660,613.17	
10,317.0	88.99	178.30	9,248.8	5,661.8	-1,256.6	29.4	1,256.8	2.39	600,129.12	660,614.90	
10,412.0	89.08	175.76	9,250.4	5,663.4	-1,351.4	34.3	1,351.6	2.67	600,034.27	660,619.82	
10,507.0	88.72	176.81	9,252.2	5,665.2	-1,446.2	40.5	1,446.5	1.17	599,939.49	660,625.97	



A Schlumberger Company

Pathfinder

Pathfinder X&Y Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #24H
Project:	Lea County (NAD27)	TVD Reference:	KB = 18' @ 3587.0usft
Site:	Lusk Deep Unit A	MD Reference:	KB = 18' @ 3587.0usft
Well:	#24H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	D Leg (%/100usft)	Northing (usft)	Easting (usft)	
10,602.0	89.43	176.90	9,253.7	5,666.7	-1,541.1	45.7	1,541.3	0.75	599,844.64	660,631.19	
10,697.0	90.48	178.48	9,253.8	5,666.8	-1,636.0	49.5	1,636.3	2.00	599,749.72	660,635.01	
10,792.0	90.84	178.13	9,252.7	5,665.7	-1,730.9	52.3	1,731.2	0.53	599,654.77	660,637.82	
10,887.0	91.45	177.25	9,250.8	5,663.8	-1,825.8	56.2	1,826.2	1.13	599,559.87	660,641.65	
10,982.0	90.66	179.86	9,249.1	5,662.1	-1,920.8	58.5	1,921.1	2.87	599,464.93	660,644.05	
11,077.0	91.01	178.65	9,247.7	5,660.7	-2,015.8	59.8	2,016.1	1.33	599,369.95	660,645.28	
11,172.0	90.84	179.18	9,246.1	5,659.1	-2,110.7	61.6	2,111.1	0.59	599,274.98	660,647.08	
11,266.0	90.75	178.57	9,244.8	5,657.8	-2,204.7	63.4	2,205.1	0.66	599,181.00	660,648.93	
11,361.0	88.11	181.20	9,245.8	5,658.8	-2,299.7	63.6	2,300.1	3.92	599,086.02	660,649.12	
11,456.0	87.85	180.50	9,249.1	5,662.1	-2,394.6	62.2	2,395.0	0.79	598,991.09	660,647.71	
11,551.0	88.72	179.71	9,252.0	5,665.0	-2,489.6	62.0	2,489.9	1.24	598,896.14	660,647.53	
11,646.0	89.60	179.45	9,253.4	5,666.4	-2,584.5	62.7	2,584.9	0.97	598,801.15	660,648.23	
11,741.0	90.22	180.50	9,253.5	5,666.5	-2,679.5	62.8	2,679.9	1.28	598,706.15	660,648.27	
11,836.0	90.31	181.91	9,253.1	5,666.1	-2,774.5	60.8	2,774.9	1.49	598,611.18	660,646.27	
11,931.0	90.84	180.59	9,252.1	5,665.1	-2,869.5	58.7	2,869.8	1.50	598,516.21	660,644.20	
12,026.0	90.92	181.36	9,250.7	5,663.7	-2,964.5	57.1	2,964.8	0.81	598,421.23	660,642.59	
12,121.0	88.20	181.18	9,251.4	5,664.4	-3,059.4	55.0	3,059.7	2.87	598,326.27	660,640.48	
12,216.0	88.02	180.83	9,254.5	5,667.5	-3,154.4	53.3	3,154.7	0.41	598,231.34	660,638.82	
12,311.0	87.41	180.73	9,258.3	5,671.3	-3,249.3	52.0	3,249.6	0.65	598,136.42	660,637.52	
12,406.0	88.99	180.27	9,261.3	5,674.3	-3,344.2	51.2	3,344.5	1.73	598,041.47	660,636.69	
12,501.0	87.85	180.72	9,263.9	5,676.9	-3,439.2	50.4	3,439.5	1.29	597,946.52	660,635.87	
12,597.0	89.52	180.38	9,266.1	5,679.1	-3,535.2	49.5	3,535.4	1.78	597,850.55	660,634.95	
12,723.0	90.84	180.55	9,265.7	5,678.7	-3,661.1	48.4	3,661.4	1.06	597,724.56	660,633.93	
12,787.0	90.57	179.90	9,264.9	5,677.9	-3,725.1	48.2	3,725.4	1.10	597,660.56	660,633.68	
12,882.0	90.04	179.83	9,264.4	5,677.4	-3,820.1	48.4	3,820.4	0.56	597,565.56	660,633.90	
12,977.0	89.96	179.93	9,264.4	5,677.4	-3,915.1	48.6	3,915.4	0.13	597,470.57	660,634.10	
13,072.0	89.43	179.60	9,264.9	5,677.9	-4,010.1	49.0	4,010.4	0.66	597,375.57	660,634.49	



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Pathfinder Pathfinder X&Y Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well #24H
Project:	Lea County (NAD27)	TVD Reference:	KB = 18' @ 3587.0usft
Site:	Lusk Deep Unit A	MD Reference:	KB = 18' @ 3587.0usft
Well:	#24H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	D Leg (%/100usft)	Northing (usft)	Easting (usft)	
13,167.0	89.52	180.80	9,265.8	5,678.8	-4,105.1	48.7	4,105.4	1.27	597,280.57	660,634.16	
13,262.0	89.69	180.50	9,266.5	5,679.5	-4,200.1	47.6	4,200.3	0.36	597,185.58	660,633.08	
13,357.0	88.64	180.25	9,267.8	5,680.8	-4,295.1	47.0	4,295.3	1.14	597,090.60	660,632.46	
13,452.0	88.55	180.43	9,270.2	5,683.2	-4,390.1	46.4	4,390.3	0.21	596,995.63	660,631.90	
13,547.0	88.20	180.79	9,272.9	5,685.9	-4,485.0	45.4	4,485.2	0.53	596,900.67	660,630.89	
13,660.0	88.20	180.79	9,276.4	5,689.4	-4,598.0	43.8	4,598.2	0.00	596,787.74	660,629.33	
PROJECTED BHL - 13660.0 'MD, 9276.4 'TVD, -4598.0 'N, 43.8 'E - PBHL (#24H)											

Design/Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
8,672.0	8,669.6	22.5	15.8	KOP - 8672.0 'MD, 8669.6 'TVD, 22.5 'N, 15.8 'E	
9,559.0	9,252.6	-498.7	25.7	LP - 9559.0 'MD, 9252.6 'TVD, -498.7 'N, 25.7 'E	
13,660.0	9,276.4	-4,598.0	43.8	PROJECTED BHL - 13660.0 'MD, 9276.4 'TVD, -4598.0 'N, 43.8 'E	

Checked By: _____ Approved By: _____ Date: _____



Project: Lea County(NAD27)
 Site: Lusk Deep Unit A
 Well: #24H
 Wellbore: OH
 Plan: Post Gyro Plan #5 (#24H/OH)



Azimuths to Grid North
 True North: -0.28°
 Magnetic North: 7.31°
 Magnetic Field
 Strength: 48779.2snT
 Dip Angle: 60.54°
 Date: 7/12/2012
 Model: IGRF200510

PATHFINDER

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PROJECT DETAILS: Lea County(NAD27)
 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

EOW

WELL DETAILS: #24H

Ground Elevation: 3569.0
 RKB Elevation: KB = 18' @ 3587.0usft
 Rig Name:

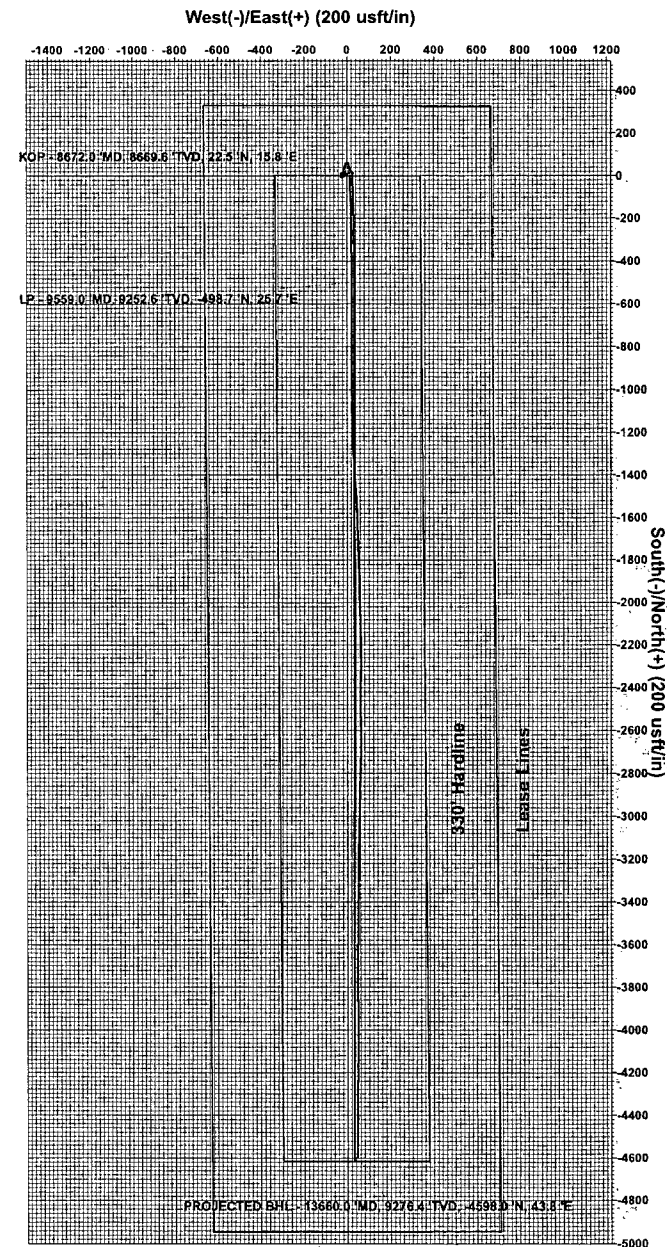
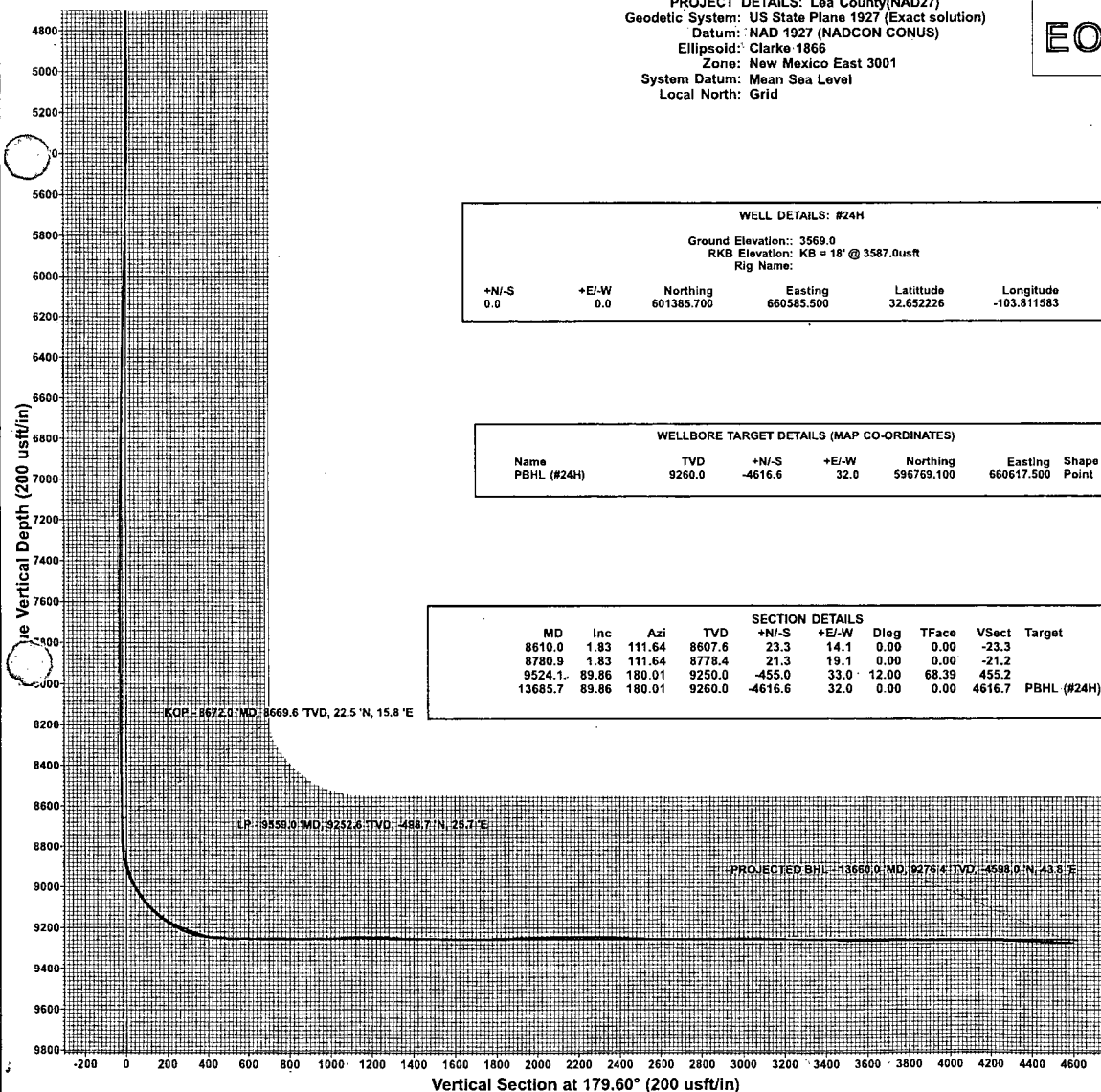
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	601385.700	660585.500	32.652226	-103.811583	

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
PBHL (#24H)	9260.0	-4616.6	32.0	596769.100	660617.500	Point

SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dlog	TFace	VFace	Target
8610.0	1.83	111.64	8607.6	23.3	14.1	0.00	0.00	-23.3	
8780.9	1.83	111.64	8778.4	21.3	19.1	0.00	0.00	-21.2	
9524.1	89.86	180.01	9250.0	-455.0	33.0	12.00	68.39	455.2	
13685.7	89.86	180.01	9260.0	-4616.6	32.0	0.00	0.00	4616.7	PBHL (#24H)



Plan: Post Gyro Plan #5 (#24H/OH)

Created By: Michael Trout Date: 8:54, January 07 2013

Checked: _____ Date: _____

COO Operating LLC
 Lea County(NAD27)
 Lusk Deep Unit A
 #24H
 OH
 Post Gyro Plan #5