

Results of Directional Survey

API number:	30-005-29119		
OGRID:		Operator:	COG OPERATING LLC
		Property:	LEO 3 FEDERAL COM # 1H

surface	ULSTR:	P	03	T 15S	R 31E
				660 FSL	430 FEL

BH Loc	ULSTR:	M	03	T 15S	R 31E
12998	MD	8713.3	TVD	619 FSL	4951 FEL
					319 FWL

Top Perf/OH	ULSTR:	P	03	T 15S	R 31E
9190	MD	8723.5	TVD	662 FSL	1148 FEL

Bot Perf/OH	ULSTR:	M	03	T 15S	R 31E
12616	MD	8699.7	TVD	619 FSL	4570 FEL
					710 FWL

	MD	N/S	E/W	VD
	9135	3.60	-662.80	8722.8
TOP PERFS/OH	9190	1.54	-717.71	8723.49
	9199	1.20	-726.70	8723.60
	12581	-41.20	-4104.50	8699.60
BOT PERFS/OH	12616	-40.65	-4139.50	8699.71
	12645	-40.20	-4168.50	8699.80

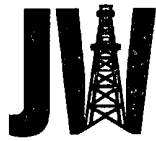
NEXT TO LAST	12836	-36.20	-4359.40	8705.40
LAST READING	12928	-38.80	-4451.20	8709.90
TD	12998	-40.78	-4521.05	8713.32

Surface Location	660 FS	430 FE
Projected BHL	619 FS	4951 FE
Location of		
Top Perfs/OH	662 FS	1148 FE
Bottom Perfs/OH	619 FS	4570 FE

SUMMARY of Subsurface Locations

Surface Location	P-03-15S-31E	660 FS	430 FE	Vert. Depth
Top Perfs/OH	P-03-15S-31E	662 FS	1148 FE	8723.49
Bottom Perfs/OH	M-03-15S-31E	619 FS	4570 FE	8699.71
Projected TD	M-03-15S-31E	619 FS	4951 FE	8713.32

OCT 25 2011



DRILLING INC. Oil Well Drilling Contractor

Post Office Box 160 Artesia, New Mexico 88211-0160 Office (575) 748-8704 Fax (575) 748-8719

HOBBS OCD

May 26, 2011

OCT 04 2011

RECEIVED

COG Operating, LLC
500 W. Texas, Suite 1300
Midland, Texas 79701

Re: Leo 3 Federal Com # 1H
Sec. 3, T-15-S, R-31-E
Chaves County, New Mexico

Attn: John Coffman

The following is a Deviation Survey on the referenced well in Chaves County, New Mexico:

189' - 1°	2623' - 1°	5294' - 0.75°	8509' - 1°
373' - 1.5°	3059' - 0.25°	6511' - 0.5°	8797' - 0.75°
690' - 1°	3525' - 0.5°	6948' - 0.75°	
1188' - 1.5°	3935' - 0.5°	7414' - 0.75°	
1687' - 1°	4362' - 1°	7943' - 0.75°	
2153' - 0.25°	4795' - 0.75°	8191' - 0.5°	

SUR: P-03-15s-31e, 660/S & 430/E
BHL: M-03-15s-31e, 619/S & 4951/E
API # 30-005-29119

Sincerely,

Gary W. Chappell
Contracts Manager

STATE OF NEW MEXICO)
COUNTY OF EDDY)

The foregoing was acknowledged before me this 26th day of May, 2011 by Gary W. Chappell.



OFFICIAL SEAL
Crisha Morgan
NOTARY PUBLIC-STATE OF NEW MEXICO

My commission expires: 10/28/2014

NOTARY PUBLIC



C.O.G. Operating LLC

Chaves County

Leo "3" Federal Com

#1H

OH

Survey: Leam MWD

Leam X&Y Report

02 June, 2011

SUR: P-03-15s-31e, 660/S & 430/E
BHL: M-03-15s-31e, 619/S & 4951/E
API # 30-005-29119

HOBBS OCD
OCT 04 2011
RECEIVED





Leam Drilling Systems

Leam X&Y Report



Company:	C.O.G. Operating LLC	Local Co-ordinate Reference:	Well #1H
Project:	Chaves County	TVD Reference:	WELL @ 4424 0usft (Original Well Elev)
Site:	Leo "3" Federal Com	MD Reference:	WELL @ 4424 0usft (Original Well Elev)
Well:	#1H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Midland(Permian Basin) Database

Project		Chaves County	
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site		Leo "3" Federal Com			
Site Position:		Northing:	742,321 68 usft	Latitude:	33° 2' 22 229 N
From:	Map	Easting:	704,057 39 usft	Longitude:	103° 48' 8 407 W
Position Uncertainty:	0.0 usft	Slot Radius:	6-1/8 "	Grid Convergence:	0 29 °

Well	#1H					
Well Position	+N/-S	0 0 usft	Northing:	742,321 68 usft	Latitude:	33° 2' 22 229 N
	+E/-W	0 0 usft	Easting:	704,057 39 usft	Longitude:	103° 48' 8 407 W
Position Uncertainty	0.0 usft		Wellhead Elevation:	0 0 usft	Ground Level:	4,405 0 usft

Wellbore		OH			
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	05/02/11	7 77	60 90	49,087

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	269 49	



Leam Drilling Systems
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Well:	#1H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Midland(Permian Basin) Database

Survey Program		Date 06/02/11			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100 0	8,100 0	Pilot Hole (OH)	CB-GYRO-MS	Camera based gyro multishot	
8,100 0	12,998.0	Leam MWD (OH)	MWD	MWD - Standard	

Survey									
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)
8,100 0	0.23	77.86	8,099 6	19 6	0 00	12 5	-19.7	742,334 21	704,037 73
8,148.0	0 44	102 75	8,147.6	19.3	0 52	12 5	-19 4	742,334 19	704,038 00
8,180 0	0 26	116 29	8,179 6	19.1	0.62	12 5	-19 2	742,334.13	704,038.18
8,210 0	1 23	265.70	8,209 6	19 4	4.87	12.4	-19.5	742,334.08	704,037 92
8,242 0	4 66	265 70	8,241 5	21 0	10 72	12 3	-21.1	742,333 96	704,036 28
8,274 0	8.27	266 23	8,273.3	24 6	11 28	12 0	-24 7	742,333 71	704,032 69
8,306 0	11.43	271 86	8,304 8	30.1	10 31	12 0	-30 2	742,333 66	704,027 22
8,337 0	15 48	274.84	8,335 0	37 2	13.25	12 4	-37 4	742,334 11	704,020 03
8,369 0	18 47	273 26	8,365 6	46 6	9 45	13.1	-46 7	742,334.76	704,010.71
8,400 0	21.63	271 68	8,394 7	57 2	10 34	13 5	-57.3	742,335 20	704,000 09
8,432 0	25 76	270 62	8,424 0	70 0	12 97	13 8	-70 1	742,335 45	703,987 24
8,464.0	30 43	269 92	8,452 2	85 1	14 63	13 8	-85 2	742,335 52	703,972 17
8,496.0	34 82	269 22	8,479.1	102.3	13 77	13 7	-102 5	742,335 38	703,954 93
8,528.0	39.75	269 57	8,504.6	121 7	15 42	13 5	-121 8	742,335 18	703,935 55
8,560.0	42 74	270 10	8,528.7	142 8	9 41	13 4	-142 9	742,335 12	703,914 46
8,592 0	45 99	270.27	8,551 5	165.2	10 16	13 5	-165 3	742,335 19	703,892 08
8,624 0	49 15	269.92	8,573 1	188.8	9 91	13 6	-188 9	742,335 23	703,868 47
8,656.0	51 70	269 75	8,593.5	213 5	7 98	13 5	-213 6	742,335 16	703,843 80
8,688 0	53 73	270 27	8,612 9	238 9	6 47	13.5	-239.0	742,335 17	703,818.35
8,720.0	56 98	270 27	8,631 1	265 2	10 16	13 6	-265.4	742,335 29	703,792 02
8,752 0	60 15	269 57	8,647 8	292 5	10.08	13 6	-292 7	742,335 25	703,764.72



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Well:	#1H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Midland(Permian Basin) Database

Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)	
8,784.0	63.66	269.57	8,662.8	320.8	10.97	13.4	-320.9	742,335.04	703,736.50	
8,816.0	66.13	268.87	8,676.4	349.7	7.97	13.0	-349.9	742,334.64	703,707.53	
8,848.0	70.00	268.69	8,688.4	379.4	12.11	12.3	-379.5	742,334.01	703,677.86	
8,880.0	73.86	268.52	8,698.3	409.8	12.07	11.6	-409.9	742,333.27	703,647.45	
8,911.0	77.73	268.69	8,705.9	439.9	12.50	10.9	-440.0	742,332.54	703,617.41	
8,943.0	80.64	268.16	8,711.9	471.3	9.24	10.0	-471.4	742,331.67	703,586.00	
8,975.0	83.36	268.52	8,716.3	503.0	8.57	9.1	-503.1	742,330.75	703,554.32	
9,007.0	86.00	268.52	8,719.3	534.8	8.25	8.3	-534.9	742,329.93	703,522.48	
9,071.0	89.60	267.81	8,721.8	598.7	5.73	6.2	-598.8	742,327.88	703,458.57	
9,103.0	88.72	267.64	8,722.2	630.7	2.80	4.9	-630.8	742,326.61	703,426.58	
9,135.0	89.25	267.64	8,722.8	662.7	1.66	3.6	-662.8	742,325.30	703,394.63	
9,199.0	89.25	267.99	8,723.6	726.7	0.55	1.2	-726.7	742,322.86	703,330.68	
9,294.0	91.89	269.22	8,722.7	821.6	3.07	-1.1	-821.7	742,320.54	703,235.72	
9,390.0	90.13	270.10	8,721.0	917.6	2.05	-1.7	-917.6	742,319.97	703,139.74	
9,454.0	91.19	270.62	8,720.3	981.6	1.84	-1.3	-981.6	742,320.38	703,075.75	
9,518.0	90.04	270.45	8,719.6	1,045.6	1.82	-0.7	-1,045.6	742,320.97	703,011.76	
9,581.0	89.78	269.39	8,719.7	1,108.6	1.73	-0.8	-1,108.6	742,320.89	702,948.76	
9,645.0	88.72	268.34	8,720.5	1,172.6	2.33	-2.1	-1,172.6	742,319.62	702,884.78	
9,709.0	87.93	267.81	8,722.4	1,236.5	1.49	-4.2	-1,236.5	742,317.47	702,820.84	
9,773.0	87.93	267.99	8,724.7	1,300.5	0.28	-6.6	-1,300.5	742,315.13	702,756.93	
9,837.0	88.20	268.52	8,726.9	1,364.4	0.93	-8.5	-1,364.4	742,313.18	702,693.00	
9,901.0	88.64	269.04	8,728.6	1,428.4	1.06	-9.9	-1,428.4	742,311.82	702,629.04	
9,963.0	89.43	269.75	8,729.7	1,490.4	1.71	-10.5	-1,490.3	742,311.16	702,567.05	
10,027.0	91.45	271.33	8,729.2	1,554.4	4.01	-9.9	-1,554.3	742,311.76	702,503.06	
10,091.0	92.07	272.91	8,727.2	1,618.3	2.65	-7.5	-1,618.3	742,314.13	702,439.14	
10,155.0	90.48	273.09	8,725.8	1,682.1	2.50	-4.2	-1,682.1	742,317.48	702,375.24	
10,219.0	89.25	272.91	8,725.9	1,746.0	1.94	-0.8	-1,746.1	742,320.83	702,311.33	



Leam Drilling Systems
Leam X&Y Report



Company:	C.O G. Operating LLC	Local Co-ordinate Reference:	Well #1H
Project:	Chaves County	TVD Reference:	WELL @ 4424.0usft (Original Well Elev)
Site:	Leo "3" Federal Com	MD Reference:	WELL @ 4424.0usft (Original Well Elev)
Well:	#1H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Midland(Permian Basin) Database

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)
10,283.0	88 81	271.86	8,727 0	1,809 9	1 78	1 8	-1,810.0	742,323 49	702,247 40
10,347.0	88 55	270.80	8,728 5	1,873 9	1 70	3 3	-1,874 0	742,324 98	702,183 43
10,411.0	87 85	269.39	8,730 5	1,937 8	2 46	3 4	-1,937 9	742,325 08	702,119 47
10,475 0	87 23	268.34	8,733.3	2,001 8	1 90	2.1	-2,001.8	742,323 82	702,055 54
10,539 0	86.97	266 93	8,736.5	2,065.6	2.24	-0.5	-2,065.7	742,321 18	701,991.68
10,603 0	87 14	267 46	8,739 8	2,129 5	0 87	-3 6	-2,129 6	742,318 05	701,927.84
10,667.0	87 76	269 04	8,742 6	2,193 4	2 65	-5 6	-2,193 5	742,316 10	701,863 93
10,731 0	88 72	270.80	8,744 6	2,257 4	3.13	-5.7	-2,257.4	742,316 01	701,799 97
10,795 0	89 08	270 62	8,745.8	2,321 4	0.63	-4.9	-2,321 4	742,316 80	701,735 98
10,859 0	88 64	269 75	8,747.1	2,385.3	1 52	-4.7	-2,385.4	742,317 01	701,672 00
10,923 0	88 55	268 69	8,748.7	2,449.3	1 66	-5 5	-2,449 4	742,316 14	701,608.02
10,987 0	90.75	269 57	8,749 1	2,513 3	3 70	-6 5	-2,513 4	742,315 17	701,544 04
11,050.0	91 28	269 04	8,747 9	2,576 3	1 19	-7 3	-2,576 3	742,314.40	701,481 05
11,114 0	91 36	267 46	8,746.5	2,640 3	2.47	-9.2	-2,640 3	742,312 45	701,417 10
11,178 0	91 28	266.41	8,745.0	2,704.2	1.64	-12.7	-2,704.2	742,309 03	701,353 21
11,242 0	91.19	265 70	8,743.6	2,768.1	1.12	-17.1	-2,768.0	742,304.63	701,289 38
11,305 0	90 84	267 11	8,742 5	2,830.9	2 31	-21.0	-2,830.9	742,300 68	701,226 51
11,369 0	90 57	268 34	8,741.7	2,894.9	1 97	-23.5	-2,894 8	742,298 14	701,162 57
11,433 0	90 13	269.57	8,741.3	2,958 9	2 04	-24 7	-2,958 8	742,296 97	701,098 58
11,497 0	89.52	270 98	8,741 5	3,022 9	2 40	-24 4	-3,022 8	742,297 28	701,034.59
11,561.0	89 60	269 75	8,742 0	3,086 9	1 93	-24.0	-3,086 8	742,297 68	700,970 59
11,625 0	89.96	269.04	8,742 3	3,150 9	1 24	-24 7	-3,150 8	742,297 01	700,906 60
11,689 0	90 31	268 16	8,742.1	3,214 9	1 48	-26 2	-3,214 8	742,295 44	700,842 62
11,752.0	91 98	267 11	8,740 8	3,277.8	3 13	-28 8	-3,277 7	742,292 84	700,779 69
11,816 0	93.39	266.23	8,737 8	3,341 7	2 60	-32 5	-3,341 5	742,289 13	700,715 87
11,880 0	94.35	266 76	8,733 5	3,405 4	1 71	-36.5	-3,405 3	742,285.23	700,652 13
11,944.0	95 67	267 99	8,727 9	3,469 2	2.81	-39 4	-3,468.9	742,282 31	700,588 45



Leam Drilling Systems
Leam X&Y Report



Company: C.O.G. Operating LLC
Project: Chaves County
Site: Leo "3" Federal Com
Well: #1H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #1H
TVD Reference: WELL @ 4424 0usft (Original Well Elev)
MD Reference: WELL @ 4424 0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Midland(Permian Basin) Database

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)
12,007 0	96 20	269.39	8,721 4	3,531 8	2 36	-40 8	-3,531 6	742,280 87	700,525.80
12,071 0	95 58	270.98	8,714 9	3,595 5	2 65	-40 6	-3,595 2	742,281 08	700,462 14
12,135 0	94 09	272.73	8,709 5	3,659 2	3 58	-38 5	-3,659 0	742,283 15	700,398.41
12,199 0	92 95	272.38	8,705 5	3,723 0	1.86	-35 7	-3,722 8	742,285 99	700,334.60
12,263 0	91 98	270 80	8,702 8	3,786 9	2.89	-33 9	-3,786 7	742,287 77	700,270.68
12,326.0	90 66	269 22	8,701.3	3,849.8	3 27	-33 9	-3,849 7	742,287 78	700,207.70
12,390 0	90 31	267 11	8,700 8	3,913 8	3 34	-35.9	-3,913 6	742,285 73	700,143 74
12,454 0	90.57	267 64	8,700 3	3,977 8	0.92	-38 9	-3,977 6	742,282.80	700,079 81
12,517 0	90 31	268.87	8,699.8	4,040.7	2 00	-40 8	-4,040 5	742,280 88	700,016 84
12,581.0	90 13	270.45	8,699.6	4,104.7	2 48	-41 2	-4,104.5	742,280 50	699,952.85
12,645.0	89 43	271.33	8,699.8	4,168.7	1 76	-40 2	-4,168.5	742,281 49	699,888.86
12,709.0	88 55	272.21	8,700 9	4,232.7	1 94	-38 2	-4,232.5	742,283 47	699,824 90
12,772 0	87 85	270 98	8,702 9	4,295 6	2 25	-36 5	-4,295 4	742,285 22	699,761 96
12,836 0	87.76	269 39	8,705 4	4,359 5	2 49	-36.2	-4,359 4	742,285 43	699,698 00
12,928 0	86.61	267 46	8,709.9	4,451 4	2.44	-38.8	-4,451 2	742,282 90	699,606 16
12,998 0	86 61	267.46	8,714.0	4,521 3	0.00	-41 9	-4,521 1	742,279 81	699,536 32

Survey Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
12,998 0	8,714 0	-41 9	-4,521 1	BHL - 12998 0'MD, 86 61°INC, 267 46°AZI, 8714 0'TVD, -41 9°N, -4521 1'E

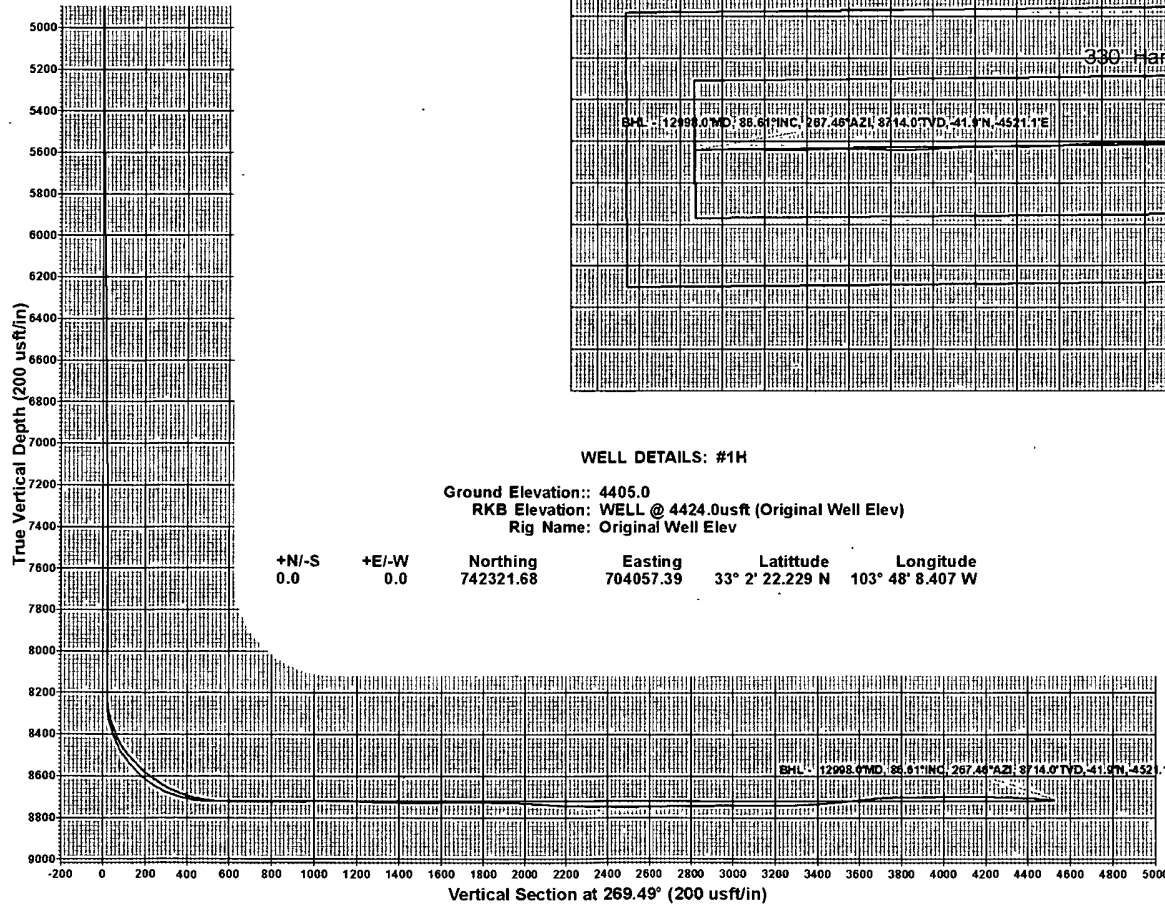
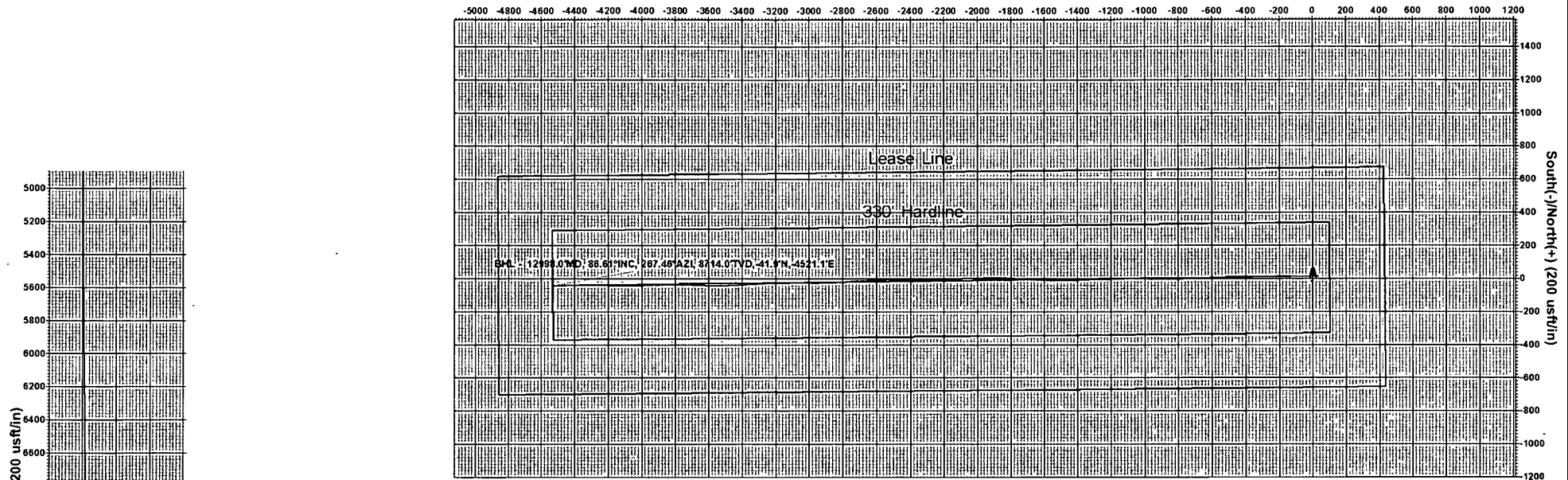
Checked By: _____ Approved By: _____ Date: _____

C.O.G. Operating LLC
 Project: Chaves County
 Site: Leo "3" Federal Com
 Well: #1H
 Wellbore: OH
 Plan: Plan #2 (#1H/OH)



Azimuths to Grid North
 True North: -0.29°
 Magnetic North: 7.48°

Magnetic Field
 Strength: 49086.8snT
 Dip Angle: 60.90°
 Date: 05/02/2011
 Model: IGRF2010



WELL DETAILS: #1H
 Ground Elevation: 4405.0
 RKB Elevation: WELL @ 4424.0usft (Original Well Elev)
 Rig Name: Original Well Elev

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.0	0.0	742321.68	704057.39	33° 2' 22.229 N	103° 48' 8.407 W

SECTION DETAILS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Target
8239.5	0.42	79.59	8239.1	12.7	-18.9	0.00	0.00	18.8	
8993.0	90.00	269.32	8720.0	7.6	-496.3	12.00	-170.27	496.2	
13019.2	90.00	269.32	8720.0	-40.2	-4522.3	0.00	0.00	4522.4	PBHL(Leo3FC#1)

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
PBHL(Leo3FC#1)	8720.0	-40.2	-4522.3	742281.48	699535.12	Point

PROJECT DETAILS: Chaves County
 Geodetic System: US State Plane 1983
 Datum: North American Datum 1983
 Ellipsoid: GRS 1980
 Zone: New Mexico Eastern Zone
 System Datum: Mean Sea Level
 Local North: Grid



LEAM DRILLING SYSTEMS, INC.
 4906 West Highway 80 Midland, Texas 79707
 Phone: 432-697-1490

Plan: Plan #2 (#1H/OH)
 Created By: Nate Bingham Date: 13:29, June 02 2011