



30-015-39152

C.O.G. Operating LLC

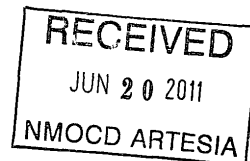
Eddy County(NAD27)

Grave Digger

#4H

OH

Plan: Design #1



Leam X&Y Report

16 June, 2011





Leam Drilling Systems
Leam X&Y Report



Company:	C O G. Operating LLC	Local Co-ordinate Reference:	Well #4H
Project:	Eddy County(NAD27)	TVD Reference:	WELL @ 3456 5usft (Original Well Elev)
Site:	Grave Digger	MD Reference:	WELL @ 3456 5usft (Original Well Elev)
Well:	#4H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Design #1	Database:	Midland(Permian Basin) Database

Project	Eddy County(NAD27)
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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	Grave Digger
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Site Position:		Northing:	585,189 40 usft	Latitude:	32° 36' 31 458 N
From:	Map	Easting:	464,810 20 usft	Longitude:	104° 26' 51 404 W
Position Uncertainty:	0 0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-0 06 °

Well	#4H
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Well Position	+N/-S	0 0 usft	Northing:	585,189 40 usft	Latitude:	32° 36' 31.458 N
	+E/-W	0 0 usft	Easting:	464,810 20 usft	Longitude:	104° 26' 51.404 W
Position Uncertainty		0 0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	3,438 0 usft

Wellbore	OH
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	06/15/11	8.01	60.39	48,749

Design	Design #1
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Audit Notes:					
Version:	Phase:	PLAN	Tie On Depth:	0 0	
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0 0	0.0	0 0	180 14	

Survey Tool Program	Date	06/16/11
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From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0 0	7,187 2	Design #1 (OH)	MWD	MWD - Standard



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Well:	#4H	North Reference:	Grd
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Design #1	Database:	Midland(Permian Basin) Database

Planned Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)	
0 0	0.00	0.00	0.0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
100 0	0.00	0.00	100 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
200 0	0.00	0.00	200 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
300 0	0.00	0.00	300 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
400 0	0.00	0.00	400 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
500 0	0.00	0.00	500 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
600 0	0.00	0.00	600 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
700 0	0.00	0.00	700 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
800 0	0.00	0.00	800 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
900 0	0.00	0.00	900 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
1,000 0	0.00	0.00	1,000 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
1,100 0	0.00	0.00	1,100 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
1,200 0	0.00	0.00	1,200 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
1,300 0	0.00	0.00	1,300 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
1,400 0	0.00	0.00	1,400 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
1,500 0	0.00	0.00	1,500 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
1,600 0	0.00	0.00	1,600 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
1,700 0	0.00	0.00	1,700 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
1,800 0	0.00	0.00	1,800 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
1,900 0	0.00	0.00	1,900 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
2,000 0	0.00	0.00	2,000 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
2,100 0	0.00	0.00	2,100 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
2,200 0	0.00	0.00	2,200 0	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
2,297 5	0.00	0.00	2,297 5	0.0	0.00	0.0	0.0	0.0	585,189.40	464,810.20
2,300 0	0.30	180.14	2,300 0	0.0	12.00	0.0	0.0	0.0	585,189.39	464,810.20
2,325 0	3.30	180.14	2,325 0	0.8	12.00	-0.8	0.0	0.0	585,188.61	464,810.20
2,350 0	6.30	180.14	2,349 9	2.9	12.00	-2.9	0.0	0.0	585,186.52	464,810.19

Company:	C.O.G. Operating LLC	Local Co-ordinate Reference:	Well #4H
Project:	Eddy County(NAD27)	TVD Reference:	WELL @ 3456 5usft (Original Well Elev)
Site:	Grave Digger	MD Reference:	WELL @ 3456 5usft (Original Well Elev)
Well:	#4H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Design #1	Database:	Midland(Permian Basin) Database

Planned Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)	
2,375.0	9.30	180.14	2,374.7	6.3	12.00	-6.3	0.0	585,183.12	464,810.18	
2,400.0	12.30	180.14	2,399.2	11.0	12.00	-11.0	0.0	585,178.44	464,810.17	
2,425.0	15.30	180.14	2,423.5	16.9	12.00	-16.9	0.0	585,172.48	464,810.16	
2,450.0	18.30	180.14	2,447.4	24.1	12.00	-24.1	-0.1	585,165.26	464,810.14	
2,475.0	21.30	180.14	2,470.9	32.6	12.00	-32.6	-0.1	585,156.79	464,810.12	
2,500.0	24.30	180.14	2,494.0	42.3	12.00	-42.3	-0.1	585,147.10	464,810.10	
2,525.0	27.30	180.14	2,516.5	53.2	12.00	-53.2	-0.1	585,136.22	464,810.07	
2,550.0	30.30	180.14	2,538.4	65.2	12.00	-65.2	-0.2	585,124.18	464,810.04	
2,575.0	33.30	180.14	2,559.6	78.4	12.00	-78.4	-0.2	585,111.01	464,810.01	
2,600.0	36.30	180.14	2,580.2	92.7	12.00	-92.7	-0.2	585,096.75	464,809.97	
2,625.0	39.30	180.14	2,599.9	108.0	12.00	-108.0	-0.3	585,081.43	464,809.94	
2,650.0	42.30	180.14	2,618.8	124.3	12.00	-124.3	-0.3	585,065.10	464,809.90	
2,675.0	45.30	180.14	2,636.9	141.6	12.00	-141.6	-0.3	585,047.80	464,809.85	
2,700.0	48.29	180.14	2,654.0	159.8	12.00	-159.8	-0.4	585,029.58	464,809.81	
2,725.0	51.29	180.14	2,670.1	178.9	12.00	-178.9	-0.4	585,010.48	464,809.76	
2,750.0	54.29	180.14	2,685.3	198.8	12.00	-198.8	-0.5	584,990.57	464,809.71	
2,775.0	57.29	180.14	2,699.3	219.5	12.00	-219.5	-0.5	584,969.90	464,809.66	
2,800.0	60.29	180.14	2,712.3	240.9	12.00	-240.9	-0.6	584,948.52	464,809.61	
2,825.0	63.29	180.14	2,724.1	262.9	12.00	-262.9	-0.6	584,926.49	464,809.56	
2,850.0	66.29	180.14	2,734.7	285.5	12.00	-285.5	-0.7	584,903.88	464,809.50	
2,875.0	69.29	180.14	2,744.2	308.7	12.00	-308.7	-0.8	584,880.73	464,809.45	
2,900.0	72.29	180.14	2,752.4	332.3	12.00	-332.3	-0.8	584,857.13	464,809.39	
2,925.0	75.29	180.14	2,759.4	356.3	12.00	-356.3	-0.9	584,833.12	464,809.33	
2,950.0	78.29	180.14	2,765.1	380.6	12.00	-380.6	-0.9	584,808.79	464,809.27	
2,975.0	81.29	180.14	2,769.5	405.2	12.00	-405.2	-1.0	584,784.19	464,809.21	
3,000.0	84.29	180.14	2,772.6	430.0	12.00	-430.0	-1.1	584,759.39	464,809.15	
3,025.0	87.29	180.14	2,774.5	454.9	12.00	-454.9	-1.1	584,734.46	464,809.09	



Leam Drilling Systems
Leam X&Y Report



Company:	C O G Operating LLC	Local Co-ordinate Reference:	Well #4H
Project:	Eddy County(NAD27)	TVD Reference:	WELL @ 3456 5usft (Original Well-Elev)
Site:	Grave Digger	MD Reference:	WELL @ 3456 5usft (Original Well Elev)
Well:	#4H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Design #1	Database:	Midland(Permian Basin) Database

Planned Survey									
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)
3,043.6	89.52	180.14	2,775.0	473.5	12.00	-473.5	-1.2	584,715.89	464,809.04
3,100.0	89.51	180.14	2,775.5	529.9	0.01	-529.9	-1.3	584,659.47	464,808.90
3,148.5	89.51	180.14	2,775.9	578.5	0.01	-578.4	-1.4	584,610.95	464,808.78
3,200.0	89.51	180.14	2,776.3	629.9	0.00	-629.9	-1.5	584,559.47	464,808.66
3,300.0	89.51	180.14	2,777.2	729.9	0.00	-729.9	-1.8	584,459.48	464,808.41
3,400.0	89.51	180.14	2,778.0	829.9	0.00	-829.9	-2.0	584,359.48	464,808.16
3,500.0	89.51	180.14	2,778.9	929.9	0.00	-929.9	-2.3	584,259.48	464,807.91
3,600.0	89.51	180.14	2,779.7	1,029.9	0.00	-1,029.9	-2.5	584,159.49	464,807.66
3,700.0	89.51	180.14	2,780.6	1,129.9	0.00	-1,129.9	-2.8	584,059.49	464,807.41
3,800.0	89.51	180.14	2,781.5	1,229.9	0.00	-1,229.9	-3.0	583,959.50	464,807.16
3,900.0	89.51	180.14	2,782.3	1,329.9	0.00	-1,329.9	-3.3	583,859.50	464,806.91
4,000.0	89.51	180.14	2,783.2	1,429.9	0.00	-1,429.9	-3.5	583,759.50	464,806.66
4,100.0	89.51	180.14	2,784.0	1,529.9	0.00	-1,529.9	-3.8	583,659.51	464,806.41
4,200.0	89.51	180.14	2,784.9	1,629.9	0.00	-1,629.9	-4.0	583,559.51	464,806.16
4,300.0	89.51	180.14	2,785.7	1,729.9	0.00	-1,729.9	-4.3	583,459.52	464,805.91
4,400.0	89.51	180.14	2,786.6	1,829.9	0.00	-1,829.9	-4.5	583,359.52	464,805.66
4,500.0	89.51	180.14	2,787.4	1,929.9	0.00	-1,929.9	-4.8	583,259.52	464,805.41
4,600.0	89.51	180.14	2,788.3	2,029.9	0.00	-2,029.9	-5.0	583,159.53	464,805.16
4,700.0	89.51	180.14	2,789.2	2,129.9	0.00	-2,129.9	-5.3	583,059.53	464,804.91
4,800.0	89.51	180.14	2,790.0	2,229.9	0.00	-2,229.9	-5.5	582,959.54	464,804.66
4,900.0	89.51	180.14	2,790.9	2,329.9	0.00	-2,329.9	-5.8	582,859.54	464,804.41
5,000.0	89.51	180.14	2,791.7	2,429.9	0.00	-2,429.9	-6.0	582,759.54	464,804.16
5,100.0	89.51	180.14	2,792.6	2,529.9	0.00	-2,529.9	-6.3	582,659.55	464,803.91
5,200.0	89.51	180.14	2,793.4	2,629.9	0.00	-2,629.8	-6.5	582,559.55	464,803.66
5,300.0	89.51	180.14	2,794.3	2,729.9	0.00	-2,729.8	-6.8	582,459.56	464,803.41
5,400.0	89.51	180.14	2,795.1	2,829.8	0.00	-2,829.8	-7.0	582,359.56	464,803.16
5,500.0	89.51	180.14	2,796.0	2,929.8	0.00	-2,929.8	-7.3	582,259.56	464,802.91



Leam Drilling Systems
Leam X&Y Report

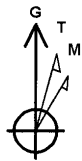


Company:	C.O.G. Operating LLC	Local Co-ordinate Reference:	Well #4H
Project:	Eddy County(NAD27)	TVD Reference:	WELL @ 3456 5usft (Original Well Elev)
Site:	Grave Digger	MD Reference:	WELL @ 3456 5usft (Original Well Elev)
Well:	#4H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Design #1	Database:	Midland(Permian Basin) Database

Planned Survey									
MD (usft)	Inc. (°)	Azi (azimuth) (°)	TVD (usft)	V..Sec (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)
5,600.0	89.51	180.14	2,796.9	3,029.8	0.00	-3,029.8	-7.5	582,159.57	464,802.66
5,700.0	89.51	180.14	2,797.7	3,129.8	0.00	-3,129.8	-7.8	582,059.57	464,802.41
5,800.0	89.51	180.14	2,798.6	3,229.8	0.00	-3,229.8	-8.0	581,959.58	464,802.16
5,900.0	89.51	180.14	2,799.4	3,329.8	0.00	-3,329.8	-8.3	581,859.58	464,801.91
6,000.0	89.51	180.14	2,800.3	3,429.8	0.00	-3,429.8	-8.5	581,759.58	464,801.66
6,100.0	89.51	180.14	2,801.1	3,529.8	0.00	-3,529.8	-8.8	581,659.59	464,801.41
6,200.0	89.51	180.14	2,802.0	3,629.8	0.00	-3,629.8	-9.0	581,559.59	464,801.16
6,300.0	89.51	180.14	2,802.8	3,729.8	0.00	-3,729.8	-9.3	581,459.60	464,800.92
6,400.0	89.51	180.14	2,803.7	3,829.8	0.00	-3,829.8	-9.5	581,359.60	464,800.67
6,500.0	89.51	180.14	2,804.6	3,929.8	0.00	-3,929.8	-9.8	581,259.60	464,800.42
6,600.0	89.51	180.14	2,805.4	4,029.8	0.00	-4,029.8	-10.0	581,159.61	464,800.17
6,700.0	89.51	180.14	2,806.3	4,129.8	0.00	-4,129.8	-10.3	581,059.61	464,799.92
6,800.0	89.51	180.14	2,807.1	4,229.8	0.00	-4,229.8	-10.5	580,959.62	464,799.67
6,900.0	89.51	180.14	2,808.0	4,329.8	0.00	-4,329.8	-10.8	580,859.62	464,799.42
7,000.0	89.51	180.14	2,808.8	4,429.8	0.00	-4,429.8	-11.0	580,759.62	464,799.17
7,100.0	89.51	180.14	2,809.7	4,529.8	0.00	-4,529.8	-11.3	580,659.63	464,798.92
7,187.2	89.51	180.14	2,810.4	4,617.0	0.00	-4,617.0	-11.5	580,572.40	464,798.70

Checked By: _____	Approved By: _____	Date: _____
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C.O.G. Operating LLC
 Project: Eddy County(NAD27)
 Site: Grave Digger
 Well: #4H
 Wellbore: OH
 Plan: Design #1 (#4H/OH)



Azimuths to Grid North
 True North: 0.06°
 Magnetic North: 8.08°

Magnetic Field
 Strength: 48748.6snT
 Dip Angle: 60.39°
 Date: 06/15/2011
 Model: IGRF2010



West(-)/East(+) (200 usft/in)

WELL DETAILS: #4H

Ground Elevation:: 3438.0
 RKB Elevation: WELL @ 3456.5usft (Original Well Elev)
 Rig Name: Original Well Elev

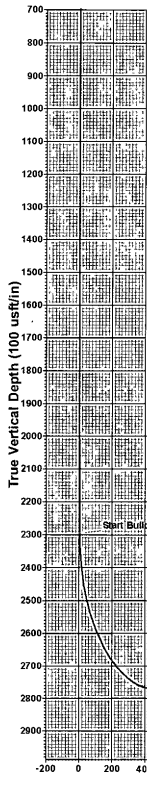
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.0	0.0	585189.40	464810.20	32° 36' 31.458 N	104° 26' 51.404 W

SECTION DETAILS

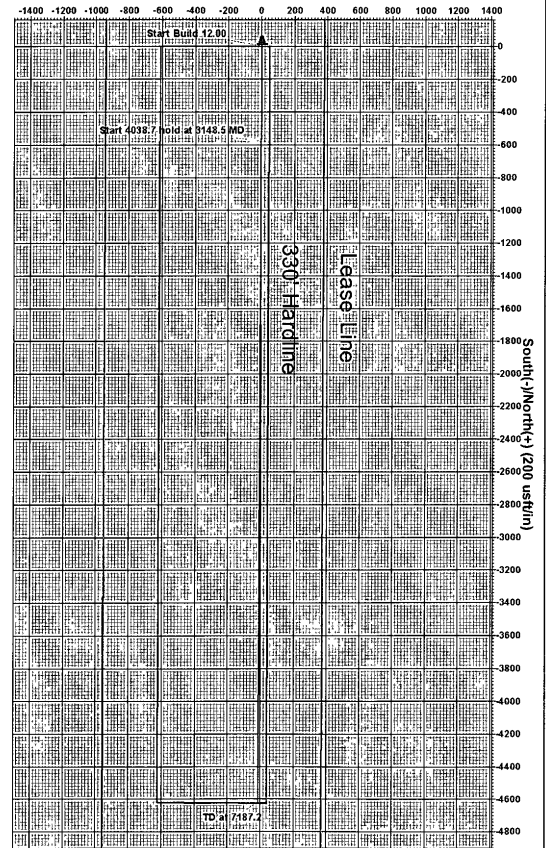
MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
2297.5	0.00	0.00	2297.5	0.0	0.0	0.00	0.00	0.0	
3043.6	89.52	180.14	2775.0	-473.5	-1.2	12.00	180.14	473.5	
3148.5	89.51	180.14	2775.9	-578.4	-1.4	0.01	163.04	578.5	
7187.2	89.51	180.14	2810.4	-4617.0	-11.5	0.00	0.00	4617.0	PBHL(GD#4)

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
PBHL(GD#4)	2810.4	-4617.0	-11.5	580572.40	464798.70	Point



Vertical Section at 180.14° (200 usft/in)



PROJECT DETAILS: Eddy 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



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

Plan: Design #1 (#4H/OH)
 Created By Nate Bingham Date 11.19, June 16 2011