



C.O.G. Operating LLC

Eddy County(NAD27)

Dodd Federal Unit #649

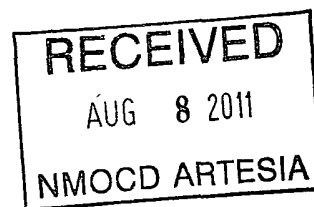
SHL:1435' FNL, 958' FEL, Sec 22, T17S, R29E, Unit H

BHL:1660' FNL, 380' FEL, Sec 22, T17S, R29E

Survey: MWD #1

Leam X&Y Report

29 June, 2011



30-015-38641



C.O.G. Operating LLC

Project: Eddy County(NAD27)

Site: Dodd Federal Unit #649

Well: SHL:1435' FNL, 958' FEL, Sec 22, T17S, R29E, Unit H

Wellbore: BHL:1660' FNL, 380' FEL, Sec 22, T17S, R29E



Azimuths to Grid North
True North: -0.15°
Magnetic North: 7.70°

Magnetic Field
Strength: 48920.6snT
Dip Angle: 60.66°
Date: 06/21/2011
Model: IGRF2010



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

SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect
900.0	1.37	121.46	899.9	-5.7	9.2	0.00	0.00	10.7
1150.0	1.37	121.46	1149.8	-8.8	14.3	0.00	0.00	16.6
1713.0	10.83	110.78	1709.0	-31.1	69.7	1.69	-12.20	76.2
4609.4	10.84	110.78	4553.7	-224.3	578.7	0.00	0.00	620.7

WELL DETAILS: SHL:1435' FNL, 958' FEL, Sec 22, T17S, R29E, Unit H

Ground Elevation:: 3571.0

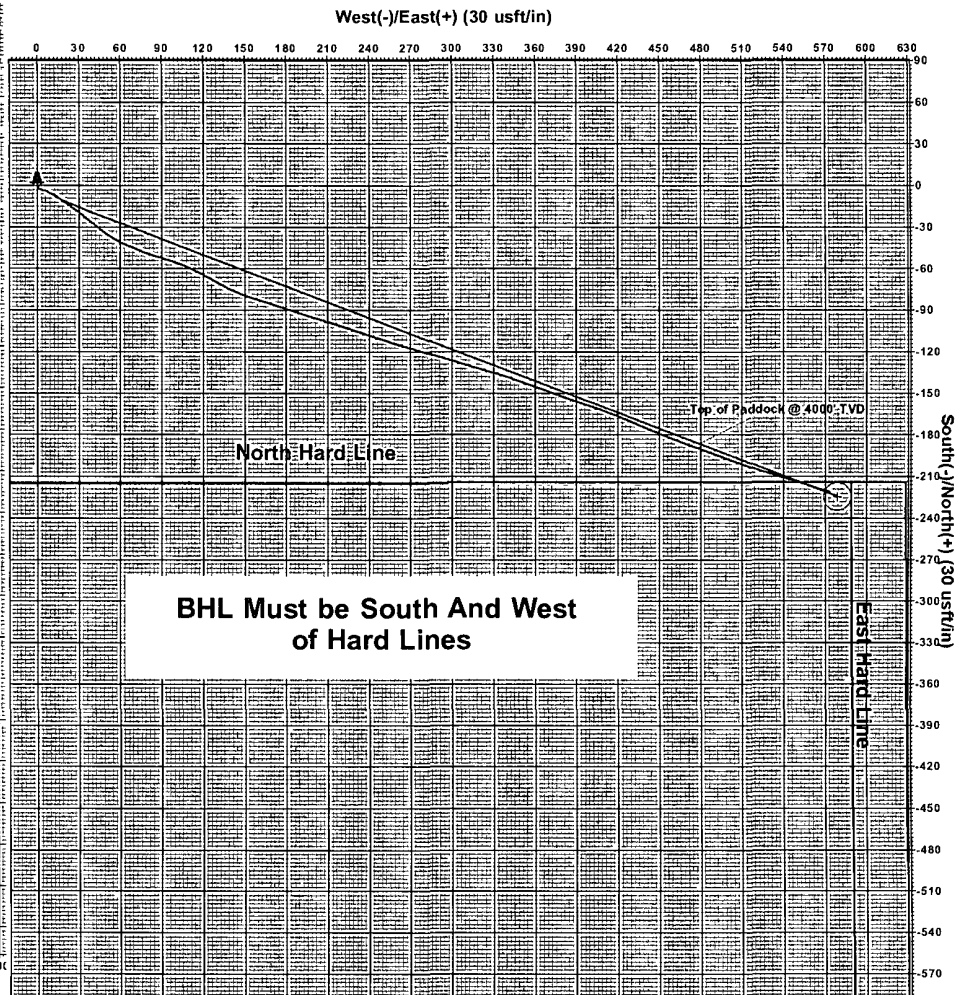
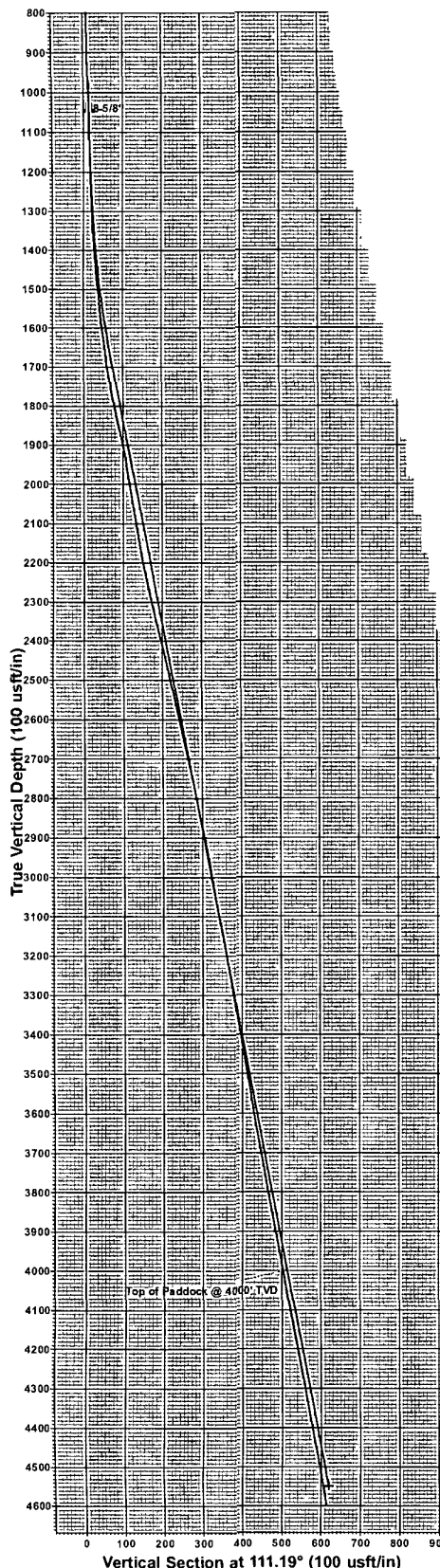
RKB Elevation: WELL @ 3583.0usft (Original Well Elev)

Rig Name: Original Well Elev.

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.0	0.0	663324.80	584993.10	32° 49' 23.741 N	104° 3' 23.966 W

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
PBHL(Dodd#649)	4550.0	-224.3	578.7	663100.50	585571.80	Circle (Radius: 10.0)



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

Created By: Nate Bingham Date: 7.55, June 29 2011



Leam Drilling Systems
Leam X&Y Report



Company:	C O G Operating LLC	Local Co-ordinate Reference:	Well SHL 1435' FNL, 958' FEL, Sec 22, T17S, R2
Project:	Eddy County(NAD27)	TVD Reference:	WELL @ 3583.0usft (Original Well Elev)
Site:	Dodd Federal Unit #649	MD Reference:	WELL @ 3583.0usft (Original Well Elev)
Well:	SHL 1435' FNL, 958' FEL, Sec 22, T17S, R29E	North Reference:	Grid
Wellbore:	BHL 1660' FNL, 380' FEL, Sec 22, T17S, R29E	Survey Calculation Method:	Minimum Curvature
Design:	BHL 1660' FNL, 380' FEL, Sec 22, T17S, R29E	Database:	Midland(Permian Basin) Database

Project	Eddy 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	Dodd Federal Unit #649		
Site Position:		Northing:	663,324.80 usft
From:	Map	Easting:	584,993.10 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 49' 23.741 N
		Longitude:	104° 3' 23.966 W
		Grid Convergence:	0.15 °

Well	SHL 1435' FNL, 958' FEL, Sec 22, T17S, R29E, Unit H					
Well Position	+N/-S	0 0 usft	Northing:	663,324 80 usft	Latitude:	32° 49' 23.741 N
	+E/-W	0.0 usft	Easting:	584,993 10 usft	Longitude:	104° 3' 23.966 W
Position Uncertainty		0 0 usft	Wellhead Elevation:	3,583 0 usft	Ground Level:	3,571 0 usft

Wellbore	BHL 1660' FNL, 380' FEL, Sec 22, T17S, R29E				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	06/21/11	7.85	60.66	48,921

Design	BHL 1660' FNL, 380' FEL, Sec 22, T17S, R29E			
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	111.19



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Design:	BHL 1660' FNL, 380' FEL, Sec 22, T17S, R29E	Database:	Midland(Permian Basin) Database

Survey Program		Date	06/29/11		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	900.0	GYRO (BHL 1660' FNL, 380' FEL, Sec 22	CB-GYRO-MS	Camera based gyro multishot	
963.0	4,655.0	MWD #1 (BHL 1660' FNL, 380' FEL, Sec 2	MWD	MWD - Standard	

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)
900.0	1.37	121.46	899.9	10.7	0.00	-5.7	9.2	663,319.10	585,002.34
963.0	1.14	113.55	962.9	12.0	0.46	-6.3	10.5	663,318.46	585,003.56
1,026.0	1.14	108.27	1,025.9	13.3	0.17	-6.8	11.6	663,318.01	585,004.73
1,090.0	1.14	120.58	1,089.9	14.6	0.38	-7.3	12.8	663,317.49	585,005.88
1,154.0	1.49	130.42	1,153.8	16.0	0.65	-8.2	14.0	663,316.62	585,007.07
1,218.0	2.20	127.26	1,217.8	17.9	1.12	-9.5	15.6	663,315.34	585,008.68
1,281.0	2.81	125.50	1,280.7	20.6	0.98	-11.1	17.8	663,313.71	585,010.90
1,345.0	4.04	122.51	1,344.6	24.3	1.94	-13.2	21.0	663,311.59	585,014.07
1,409.0	5.01	124.27	1,408.4	29.3	1.53	-16.0	25.2	663,308.80	585,018.29
1,472.0	5.54	127.26	1,471.2	34.9	0.95	-19.4	29.9	663,305.41	585,022.98
1,536.0	5.63	127.96	1,534.9	40.8	0.18	-23.2	34.8	663,301.61	585,027.91
1,599.0	6.60	128.14	1,597.5	47.3	1.54	-27.3	40.1	663,297.48	585,033.20
1,663.0	7.65	128.49	1,661.0	54.8	1.64	-32.2	46.3	663,292.55	585,039.42
1,726.0	9.41	121.63	1,723.3	63.9	3.22	-37.6	54.0	663,287.24	585,047.09
1,790.0	11.34	114.95	1,786.3	75.3	3.55	-43.0	64.2	663,281.84	585,057.25
1,854.0	12.13	110.91	1,848.9	88.3	1.78	-48.0	76.1	663,276.79	585,069.24
1,918.0	11.52	106.16	1,911.6	101.4	1.79	-52.2	88.6	663,272.61	585,081.66
1,981.0	9.76	107.75	1,973.5	113.0	2.83	-55.6	99.7	663,269.23	585,092.79
2,045.0	9.06	113.90	2,036.6	123.5	1.91	-59.3	109.5	663,265.53	585,102.56
2,109.0	9.23	119.00	2,099.8	133.6	1.29	-63.8	118.6	663,261.00	585,111.66
2,172.0	9.76	119.17	2,161.9	143.9	0.84	-68.8	127.6	663,255.95	585,120.74



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Site:	Dodd Federal Unit #649	MD Reference:	WELL @ 3583 0usft (Original Well Elev)
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Wellbore:	BHL 1660' FNL, 380' FEL, Sec 22, T17S, R29E	Survey Calculation Method:	Minimum Curvature
Design:	BHL 1660' FNL, 380' FEL, Sec 22, T17S, R29E	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)	
2,236.0	11 87	116.36	2,224.8	155.8	3.40	-74.4	138.3	663,250.39	585,131.38	
2,300.0	13 63	109.15	2,287.2	169.9	3.70	-79.8	151.3	663,244.99	585,144.40	
2,364.0	13 63	106.87	2,349.4	185.0	0.84	-84.5	165.6	663,240.33	585,158.74	
2,427.0	13 10	108.27	2,410.7	199.5	0.99	-88.9	179.5	663,235.93	585,172.62	
2,491.0	12 75	108.27	2,473.1	213.8	0.55	-93.4	193.1	663,231.45	585,186.22	
2,555.0	12 66	107.22	2,535.5	227.9	0.39	-97.6	206.5	663,227.16	585,199.62	
2,619.0	12 49	107.57	2,598.0	241.8	0.29	-101.8	219.8	663,222.99	585,212.92	
2,682.0	12 40	107.92	2,659.5	255.3	0.19	-105.9	232.7	663,218.85	585,225.85	
2,746.0	11 78	107.92	2,722.1	268.7	0.97	-110.1	245.5	663,214.73	585,238.60	
2,810.0	11 78	107.04	2,784.8	281.7	0.28	-114.0	258.0	663,210.80	585,251.07	
2,873.0	11 78	106.51	2,846.4	294.6	0.17	-117.7	270.3	663,207.09	585,263.38	
2,937.0	10 82	106.69	2,909.2	307.1	1.50	-121.3	282.3	663,203.51	585,275.40	
3,001.0	10 64	107.39	2,972.1	318.9	0.35	-124.8	293.7	663,200.02	585,286.79	
3,096.0	10 73	106.51	3,065.4	336.5	0.20	-129.9	310.5	663,194.88	585,303.64	
3,191.0	10 55	105.46	3,158.8	354.0	0.28	-134.7	327.4	663,190.05	585,320.50	
3,286.0	9 85	110.03	3,252.3	370.7	1.13	-139.8	343.4	663,184.95	585,336.52	
3,382.0	9 76	109.33	3,346.9	387.1	0.16	-145.4	358.8	663,179.45	585,351.91	
3,478.0	9 58	109.15	3,441.5	403.2	0.19	-150.7	374.0	663,174.13	585,367.13	
3,573.0	9 67	108.80	3,535.2	419.1	0.11	-155.8	389.1	663,168.97	585,382.16	
3,669.0	9 67	109.68	3,629.8	435.2	0.15	-161.1	404.3	663,163.65	585,397.38	
3,765.0	10 38	111.26	3,724.4	451.9	0.79	-167.0	419.9	663,157.80	585,413.03	
3,860.0	10 64	112.49	3,817.8	469.2	0.36	-173.5	436.0	663,151.34	585,429.11	
3,955.0	10 90	111.96	3,911.1	487.0	0.29	-180.2	452.4	663,144.63	585,445.54	
4,051.0	10 20	109.50	4,005.5	504.6	0.87	-186.4	468.9	663,138.40	585,461.98	
4,147.0	10 38	110.03	4,099.9	521.7	0.21	-192.2	485.0	663,132.60	585,478.11	
4,242.0	10 64	109.50	4,193.3	539.0	0.29	-198.1	501.3	663,126.74	585,494.42	
4,338.0	10 73	108.98	4,287.7	556.8	0.14	-203.9	518.1	663,120.87	585,511.23	



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Survey									
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4,433 0	10.55	107 04	4,381 0	574 3	0.42	-209.3	534.8	663,115 45	585,527 90
4,529 0	10.46	107 39	4,475 4	591.8	0 11	-214 5	551 5	663,110 27	585,544 62
4,601 0	10 46	107 27	4,546.2	604 8	0 03	-218 4	564 0	663,106 38	585,557.10
4,655 0	10 46	107.27	4,599.3	614 6	0 00	-221 3	573 4	663,103 47	585,566 46
BHL - 4655.0'MD, 10.46°INC, 107.27°AZI, 4599.3'TVD,-221.3°N,573.4°E									

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
4,655.0	4,599 3	-221.3	573 4	BHL - 4655 0'MD, 10 46°INC, 107 27°AZI, 4599 3'TVD,-221.3°N,573 4°E

Checked By: _____	Approved By: _____	Date: _____
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