



PO Box 1370
Artesia, NM 88211-1370
(575) 748-1288

NM OIL CONSERVATION
ARTESIA DISTRICT

FEB 01 2016

RECEIVED

November 16, 2015

COG, LLC
One Concho Center
600 W. Illinois Ave.
Midland, TX 79701

15 43397

RE: Grave Digger St Com 8H
170' FSL & 1610' FWL
Sec. 2, T20S, R25E
Eddy County, New Mexico

Dear Sir,

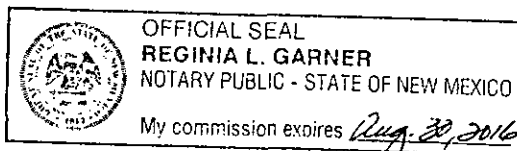
The attached is the Deviation Survey for the above captioned well.

Very truly yours,

Chris Graham
Drilling Superintendent

State of New Mexico }
County of Eddy }

The foregoing was acknowledged before me this 16th day of November, 2015.

Notary Public



12/12/15

State of New Mexico
County of Eddy

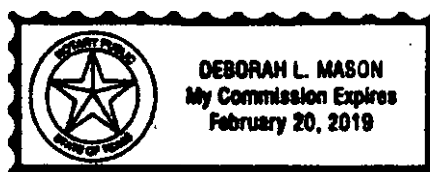
I, Donald D. Mason, certify that: I am employed by Terra Directional Services LLC; that I did on the day(s) of 11/06/2015 through 11/14/2015 conduct or supervise the taking of a MWD survey from a depth of 120 feet to a depth of 7532 feet; that the data is true, correct, complete and within the limitations of the tool as set forth by Terra Directional Services LLC; that I am authorized and qualified to make this report; that this survey was conducted at the request of COG Operating LLC for the Grave Digger State Com #8H Well API 30-015-43397 in Eddy County, New Mexico; and that I have reviewed this report and find that it conforms to the principles and procedures as set forth by Terra Directional Services LLC.

A handwritten signature of Donald D. Mason in black ink.

Donald D. Mason
President

State of Texas
County of Burnet

Before me, a notary public, on this day personally appeared Donald D. Mason, known to me to be the person whose name is subscribed to the foregoing document and, being by me first duly sworn, declared that the statements therein contained are true and correct.



A handwritten signature of Deborah L. Mason in black ink.
Notary Public's Signature



NM OIL CONSERVATION
ARTESIA DISTRICT

FEB 01 2016

RECEIVED

COG Operating LLC

Eddy County, NM (NAD-27 2015)

Grave Digger State Com #8H

SHL: 170' FSL, 1610' FWL, Sec 2, T20S, R25E, Unit N
30-015-43397

BHL: 350' FNL, 1550' FWL, Sec 2, T20S, R25E, Lot 3

Design: BHL: 350' FNL, 1550' FWL, Sec 2, T20S, R25E, Lot 3

Standard Survey Report

16 November, 2015





TDS
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 170' FSL, 1610' FWL, Sec 2, T20S, R25E, Unit N
Project:	Eddy County, NM (NAD-27 2015)	TVD Reference:	KB @ 3405.00usft (Silver Oak 3)
Site:	Grave Digger State Corn #8H	MD Reference:	KB @ 3405.00usft (Silver Oak 3)
Well:	SHL: 170' FSL, 1610' FWL, Sec 2, T20S, R25E, Unit N	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 1550' FWL, Sec 2, T20S, R25E, Lot 3	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 1550' FWL, Sec 2, T20S, R25E, Lot 3	Database:	EDM 5000.1 Single User Db

Project	Eddy County, NM (NAD-27 2015)		
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 State Corn #8H		
Site Position:	From: Map	Northing: 580,432.60 usft	Latitude: 32° 35' 44.349 N
		Easting: 461,497.80 usft	Longitude: 104° 27' 30.064 W
Position Uncertainty:	0.00 usft	Slot Radius: 13.20 in	Grid Convergence: -0.07 °

Well	SHL: 170' FSL, 1610' FWL, Sec 2, T20S, R25E, Unit N		
Well Position	+N/-S 0.00 usft	Northing: 580,432.60 usft	Latitude: 32° 35' 44.349 N
	+E/-W 0.00 usft	Easting: 461,497.80 usft	Longitude: 104° 27' 30.064 W
Position Uncertainty	0.00 usft	Wellhead Elevation: 0.00 usft	Ground Level: 3,387.00 usft

Wellbore	BHL: 350' FNL, 1550' FWL, Sec 2, T20S, R25E, Lot 3				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	10/29/2015	7.56	60.28	48,230

Design	BHL: 350' FNL, 1550' FWL, Sec 2, T20S, R25E, Lot 3				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	358.50	

Survey Program		Date 11/16/2015		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
120.00	7,532.00	TDS MWD #1 (BHL: 350' FNL, 1550' FWL	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)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
120.00	1.20	210.70	119.99	-1.08	-0.64	-1.06	1.00	1.00	0.00	
151.00	1.90	207.60	150.98	-1.82	-1.05	-1.79	2.27	2.26	-10.00	
242.00	2.80	195.50	241.90	-5.29	-2.34	-5.23	1.12	0.99	-13.30	
330.00	4.70	193.80	329.71	-10.87	-3.77	-10.76	2.16	2.16	-1.93	
417.00	5.50	193.40	416.37	-18.38	-5.59	-18.23	0.92	0.92	-0.46	
506.00	3.80	188.20	505.07	-25.45	-7.00	-25.26	1.97	-1.91	-5.84	
598.00	3.70	185.40	596.87	-31.43	-7.71	-31.21	0.23	-0.11	-3.04	



TDS
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 170' FSL, 1610' FWL, Sec 2, T20S, R25E, Unit N
Project:	Eddy County, NM (NAD-27 2015)	TVD Reference:	KB @ 3405.00usft (Silver Oak 3)
Site:	Grave Digger State Corn #8H	MD Reference:	KB @ 3405.00usft (Silver Oak 3)
Well:	SHL: 170' FSL, 1610' FWL, Sec 2, T20S, R25E, Unit N	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 1550' FWL, Sec 2, T20S, R25E, Lot 3	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 1550' FWL, Sec 2, T20S, R25E, Lot 3	Database:	EDM 5000.1 Single User Db

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)
689.00	4.00	184.80	687.67	-37.51	-8.25	-37.28	0.33	0.33	-0.66
750.00	4.10	187.50	748.51	-41.79	-8.72	-41.55	0.35	0.16	4.43
813.00	4.50	180.20	811.34	-46.50	-9.02	-46.25	1.07	0.63	-11.59
907.00	5.20	173.80	905.00	-54.42	-8.57	-54.18	0.94	0.74	-6.81
1,002.00	5.90	178.20	999.56	-63.58	-7.95	-63.35	0.86	0.74	4.63
1,065.00	6.00	174.50	1,062.22	-70.09	-7.54	-69.87	0.63	0.16	-5.87
1,127.00	5.70	172.20	1,123.89	-76.37	-6.81	-76.17	0.61	-0.48	-3.71
1,222.00	5.50	170.80	1,218.44	-85.54	-5.44	-85.37	0.25	-0.21	-1.47
1,315.00	4.90	163.90	1,311.06	-93.75	-3.63	-93.63	0.93	-0.65	-7.42
1,410.00	4.60	164.10	1,405.73	-101.32	-1.46	-101.24	0.32	-0.32	0.21
1,505.00	4.70	164.60	1,500.42	-108.73	0.62	-108.71	0.11	0.11	0.53
1,600.00	3.70	173.70	1,595.16	-115.53	1.99	-115.54	1.26	-1.05	9.58
1,694.00	3.50	172.40	1,688.98	-121.39	2.70	-121.42	0.23	-0.21	-1.38
1,789.00	3.50	173.80	1,783.80	-127.15	3.40	-127.19	0.09	0.00	1.47
1,884.00	3.50	172.20	1,878.62	-132.90	4.11	-132.97	0.10	0.00	-1.68
1,978.00	3.50	172.20	1,972.45	-138.59	4.88	-138.67	0.00	0.00	0.00
2,072.00	3.60	170.60	2,066.27	-144.34	5.76	-144.44	0.15	0.11	-1.70
2,165.00	3.50	171.80	2,159.09	-150.03	6.64	-150.16	0.13	-0.11	1.29
2,260.00	3.30	173.00	2,253.92	-155.62	7.38	-155.76	0.22	-0.21	1.26
2,323.00	1.40	161.60	2,316.87	-158.15	7.85	-158.30	3.09	-3.02	-18.10
2,354.00	2.10	12.50	2,347.86	-157.95	8.09	-158.11	10.90	2.26	-480.97
2,386.00	5.50	4.60	2,379.79	-155.85	8.34	-156.02	10.73	10.63	-24.69
2,417.00	8.90	359.50	2,410.54	-151.97	8.44	-152.14	11.15	10.97	-16.45
2,448.00	12.40	356.20	2,441.00	-146.25	8.20	-146.41	11.46	11.29	-10.65
2,480.00	15.80	355.50	2,472.03	-138.48	7.63	-138.63	10.64	10.63	-2.19
2,511.00	18.90	356.50	2,501.62	-129.26	6.99	-129.39	10.05	10.00	3.23
2,543.00	22.00	357.50	2,531.60	-118.09	6.41	-118.22	9.75	9.69	3.13
2,574.00	25.30	358.10	2,559.99	-105.67	5.94	-105.79	10.67	10.65	1.94
2,606.00	28.40	358.20	2,588.54	-91.22	5.47	-91.34	9.69	9.69	0.31
2,637.00	31.50	358.30	2,615.39	-75.76	5.00	-75.86	10.00	10.00	0.32
2,668.00	34.60	358.30	2,641.37	-58.86	4.50	-58.96	10.00	10.00	0.00
2,700.00	37.80	358.40	2,667.19	-39.97	3.96	-40.06	10.00	10.00	0.31
2,731.00	40.70	358.50	2,691.20	-20.37	3.43	-20.45	9.36	9.35	0.32
2,763.00	43.30	357.30	2,714.98	1.03	2.64	0.96	8.50	8.13	-3.75
2,794.00	46.40	356.60	2,736.95	22.86	1.47	22.81	10.13	10.00	-2.26
2,826.00	49.50	355.60	2,758.38	46.56	-0.15	46.55	9.96	9.69	-3.13
2,857.00	52.50	354.90	2,777.89	70.57	-2.15	70.60	9.84	9.68	-2.26
2,889.00	55.30	354.40	2,796.74	96.31	-4.56	96.39	8.84	8.75	-1.56
2,920.00	57.70	353.50	2,813.85	122.01	-7.29	122.16	8.11	7.74	-2.90
2,952.00	60.60	352.60	2,830.26	149.28	-10.62	149.50	9.38	9.06	-2.81
2,982.00	63.30	351.80	2,844.36	175.51	-14.21	175.82	9.30	9.00	-2.67



TDS
Survey Report



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Survey										
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3,014.00	66.10	350.80	2,858.04	204.10	-18.59	204.52	9.19	8.75	-3.13	
3,045.00	68.80	349.70	2,869.92	232.31	-23.44	232.85	9.31	8.71	-3.55	
3,077.00	71.50	349.00	2,880.79	261.89	-29.00	262.56	8.68	8.44	-2.19	
3,109.00	74.30	348.10	2,890.20	291.66	-35.08	292.68	9.15	8.75	-2.81	
3,140.00	77.20	347.20	2,897.83	321.21	-41.50	322.19	9.77	9.35	-2.90	
3,171.00	80.30	346.00	2,903.88	350.78	-48.55	351.93	10.70	10.00	-3.87	
3,203.00	83.40	345.20	2,908.41	381.46	-56.43	382.81	10.00	9.69	-2.50	
3,234.00	86.50	345.40	2,911.14	411.32	-64.26	412.87	10.02	10.00	0.65	
3,266.00	88.00	346.60	2,912.68	442.34	-71.99	444.07	6.00	4.69	3.75	
3,297.00	88.30	348.30	2,913.68	472.58	-78.73	474.48	5.57	0.97	5.48	
3,391.00	89.60	351.20	2,915.40	565.05	-95.45	567.36	3.38	1.38	3.09	
3,485.00	91.10	353.60	2,914.82	658.21	-107.88	660.81	3.01	1.60	2.55	
3,580.00	91.30	353.20	2,912.84	752.56	-118.80	755.42	0.47	0.21	-0.42	
3,674.00	89.80	356.30	2,911.93	846.15	-127.39	849.20	3.66	-1.60	3.30	
3,769.00	90.00	357.50	2,912.10	941.01	-132.53	944.16	1.28	0.21	1.26	
3,864.00	89.50	359.80	2,912.51	1,035.98	-134.77	1,039.15	2.48	-0.53	2.42	
3,957.00	89.00	358.50	2,913.73	1,128.97	-135.34	1,132.12	0.63	-0.54	-0.32	
4,051.00	90.20	359.60	2,914.39	1,222.96	-136.08	1,226.10	1.28	1.28	0.11	
4,146.00	90.70	0.20	2,913.64	1,317.96	-136.24	1,321.07	0.82	0.53	0.63	
4,241.00	90.60	359.80	2,912.56	1,412.95	-136.24	1,416.03	0.43	-0.11	-0.42	
4,302.00	90.30	0.00	2,912.08	1,473.95	-136.35	1,477.01	0.59	-0.49	0.33	
4,365.00	90.20	359.70	2,911.81	1,536.95	-136.51	1,539.99	0.50	-0.16	-0.48	
4,459.00	90.10	0.00	2,911.56	1,630.95	-136.76	1,633.97	0.34	-0.11	0.32	
4,554.00	91.40	0.60	2,910.32	1,725.93	-136.26	1,728.91	1.51	1.37	0.63	
4,649.00	91.50	0.70	2,907.92	1,820.90	-135.19	1,823.81	0.15	0.11	0.11	
4,742.00	91.90	0.80	2,905.16	1,913.85	-133.97	1,916.70	0.44	0.43	0.11	
4,837.00	90.90	1.60	2,902.84	2,008.80	-131.98	2,011.56	1.35	-1.05	0.84	
4,932.00	90.90	1.70	2,901.34	2,103.75	-129.24	2,106.41	0.11	0.00	0.11	
5,025.00	90.50	1.00	2,900.21	2,196.71	-127.05	2,199.29	0.87	-0.43	-0.75	
5,120.00	90.90	0.70	2,899.05	2,291.69	-125.64	2,294.20	0.53	0.42	-0.32	
5,214.00	91.30	0.60	2,897.24	2,385.67	-124.58	2,388.11	0.44	0.43	-0.11	
5,309.00	90.50	0.30	2,895.75	2,480.66	-123.83	2,483.05	0.90	-0.84	-0.32	
5,404.00	90.70	0.30	2,894.75	2,575.65	-123.33	2,577.99	0.21	0.21	0.00	
5,498.00	90.80	0.30	2,893.52	2,669.64	-122.84	2,671.94	0.11	0.11	0.00	
5,593.00	90.70	0.20	2,892.28	2,764.63	-122.43	2,766.89	0.15	-0.11	-0.11	
5,688.00	90.90	0.20	2,890.95	2,859.62	-122.10	2,861.84	0.21	0.21	0.00	
5,783.00	89.60	0.30	2,890.54	2,954.62	-121.68	2,956.79	1.37	-1.37	0.11	
5,875.00	89.50	0.20	2,891.26	3,046.61	-121.28	3,048.74	0.15	-0.11	-0.11	
5,969.00	89.70	0.10	2,891.92	3,140.61	-121.03	3,142.70	0.24	0.21	-0.11	
6,064.00	89.60	0.20	2,892.50	3,235.61	-120.79	3,237.66	0.15	-0.11	0.11	
6,158.00	89.70	359.90	2,893.07	3,329.61	-120.70	3,331.62	0.34	0.11	-0.32	



TDS
Survey Report



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Wellbore: BHL: 350' FNL, 1550' FWL, Sec 2, T20S, R25E, Lot 3 Survey Calculation Method: Minimum Curvature
Design: BHL: 350' FNL, 1550' FWL, Sec 2, T20S, R25E, Lot 3 Database: EDM 5000.1 Single User Db

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)
6,253.00	89.50	359.50	2,893.74	3,424.60	-121.20	3,426.60	0.47	-0.21	-0.42
6,346.00	90.70	359.80	2,893.57	3,517.60	-121.93	3,519.58	1.29	1.29	0.11
6,441.00	90.90	359.30	2,892.25	3,612.58	-122.84	3,614.56	0.38	0.21	-0.32
6,538.00	91.00	358.90	2,890.67	3,707.56	-124.34	3,709.54	0.43	0.11	-0.42
6,630.00	91.00	358.90	2,889.03	3,801.53	-126.14	3,803.53	0.00	0.00	0.00
6,724.00	90.80	359.80	2,887.56	3,895.51	-127.21	3,897.50	0.98	-0.21	0.96
6,820.00	90.60	359.20	2,886.38	3,991.50	-128.04	3,993.48	0.66	-0.21	-0.63
6,915.00	90.50	358.80	2,885.47	4,086.48	-129.70	4,088.47	0.43	-0.11	-0.42
7,009.00	90.60	359.80	2,884.57	4,180.47	-130.85	4,182.46	1.07	0.11	1.06
7,103.00	90.50	0.60	2,883.67	4,274.46	-130.52	4,276.41	0.86	-0.11	0.85
7,196.00	90.10	359.90	2,883.18	4,367.46	-130.12	4,369.37	0.87	-0.43	-0.75
7,291.00	91.90	0.60	2,881.52	4,462.44	-129.70	4,464.30	2.03	1.89	0.74
7,386.00	91.80	0.90	2,878.45	4,557.38	-128.46	4,559.18	0.33	-0.11	0.32
7,480.00	91.20	1.00	2,875.99	4,651.33	-126.90	4,653.06	0.65	-0.64	0.11
Final MWD Survey									
7,532.00	91.20	1.00	2,874.90	4,703.31	-125.99	4,705.00	0.00	0.00	0.00
Projection to Bit/TD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
7,480.00	2,875.99	4,651.33	-126.90	Final MWD Survey
7,532.00	2,874.90	4,703.31	-125.99	Projection to Bit/TD

Checked By:

Deborah L. Mason

Approved By:

Paul D.

Date:

12/12/2015

