

NM OIL CONSERVATION

ARTESIA DISTRICT

DEC 12 2018

RECEIVED

COG Operating LLC

Eddy County, NM (NAD27 NME)

Roadrunner Federal Com

13Y

30-015 44993

OH / 62824

Survey: Phoenix MWD Surveys

Standard Survey Report

21 June, 2018

Survey Report

Company: COG Operating LLC	Local Co-ordinate Reference: Well 13Y
Project: Eddy County, NM (NAD27 NME)	TVD Reference: RKB @ 3268.10usft (McVay 8)
Site: Roadrunner Federal Com	MD Reference: RKB @ 3268.10usft (McVay 8)
Well: 13Y	North Reference: Grid
Wellbore: OH / 62824	Survey Calculation Method: Minimum Curvature
Design: Surveys (McVay 8)	Database: USA Compass

Project Eddy County, NM (NAD27 NME)	
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 Roadrunner Federal Com			
Site Position:	Northing:	397,906.10 usft	Latitude: 32° 5' 38.12810 N
From: Map	Easting:	529,306.00 usft	Longitude: 104° 14' 19.31875 W
Position Uncertainty: 0.00 usft	Slot Radius: 13-3/16 "		Grid Convergence: 0.05 °

Well 13Y			
Well Position	Northing:	397,902.50 usft	Latitude: 32° 5' 38.11620 N
+N/-S 0.00 usft	Easting:	526,433.20 usft	Longitude: 104° 14' 52.71496 W
+E/-W 0.00 usft	Wellhead Elevation:	usft	Ground Level: 3,242.10 usft
Position Uncertainty 0.00 usft			

Wellbore OH / 62824					
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	MVHD	6/18/2018	7.34	59.78	47,928.71233511

Design Surveys (McVay 8)					
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	359.09	

Survey Program		Date 6/21/2018
From (usft)	To (usft)	Survey (Wellbore)
100.00	6,958.00	Scientific Gyro Surveys (OH / 62824)
7,078.00	17,664.00	Phoenix MWD Surveys (OH / 62824)
		Tool Name
		NS-GYRO-MS
		MWD+HDGM
		Description
		North sensing gyrocompassing m/s
		OWSG Rev.2 MWD + HDGM

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)
6,958.00	1.37	50.39	6,956.90	-12.87	17.26	-13.14	0.00	0.00	0.00
Tie In									
7,078.00	0.24	342.79	7,076.89	-11.72	18.29	-12.00	1.08	-0.94	-56.33
First Phoenix MWD Survey									
7,125.00	4.24	349.85	7,123.84	-9.91	17.96	-10.19	8.51	8.51	15.02
7,172.00	8.96	353.46	7,170.52	-4.56	17.23	-4.83	10.08	10.04	7.68
7,220.00	13.08	354.72	7,217.62	4.57	16.31	4.31	8.60	8.58	2.63
7,267.00	17.40	350.98	7,262.96	16.81	14.71	16.57	9.42	9.19	-7.96
7,314.00	21.27	347.85	7,307.30	32.09	11.82	31.90	8.52	8.23	-6.66

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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)
7,361.00	25.46	348.64	7,350.44	50.33	8.03	50.20	8.94	8.91	1.68
7,407.00	29.99	347.40	7,391.15	71.26	3.57	71.19	9.93	9.85	-2.70
7,454.00	34.01	346.34	7,431.00	95.51	-2.10	95.53	8.64	8.55	-2.26
7,502.00	38.95	346.01	7,469.58	123.21	-8.92	123.33	10.30	10.29	-0.69
7,544.00	43.90	345.33	7,501.06	150.12	-15.80	150.35	11.83	11.79	-1.61
FTP: 7544' MD, 330' FSL & 628' FEL									
7,549.00	44.49	345.26	7,504.65	153.49	-16.69	153.74	11.83	11.79	-1.45
7,596.00	48.82	344.98	7,536.90	186.52	-25.46	186.90	9.22	9.21	-0.60
7,643.00	52.36	344.64	7,566.74	221.56	-34.98	222.08	7.55	7.53	-0.72
7,689.00	56.73	344.86	7,593.41	257.70	-44.83	258.38	9.51	9.50	0.48
7,736.00	59.33	345.61	7,618.30	296.25	-54.99	297.09	5.70	5.53	1.60
7,784.00	63.33	347.09	7,641.32	337.17	-64.91	338.16	8.76	8.33	3.08
7,831.00	69.26	347.79	7,660.21	379.15	-74.26	380.29	12.69	12.62	1.49
7,880.00	75.09	347.74	7,675.20	424.72	-84.14	426.01	11.90	11.90	-0.10
7,936.00	80.30	348.06	7,687.13	478.20	-95.61	479.66	9.32	9.30	0.57
8,031.00	80.77	357.12	7,702.79	571.03	-107.67	572.66	9.42	0.49	9.54
8,125.00	89.58	357.98	7,710.68	664.51	-111.67	666.20	9.42	9.37	0.91
8,220.00	96.59	356.70	7,705.57	759.21	-116.07	760.96	7.50	7.38	-1.35
8,315.00	97.98	357.86	7,693.53	853.34	-120.54	855.14	1.90	1.46	1.22
8,409.00	93.12	358.04	7,684.44	946.81	-123.88	948.65	5.17	-5.17	0.19
8,503.00	85.60	358.78	7,685.49	1,040.70	-126.49	1,042.57	8.04	-8.00	0.79
8,598.00	87.91	359.20	7,690.87	1,135.52	-128.16	1,137.41	2.47	2.43	0.44
8,692.00	87.79	1.65	7,694.39	1,229.45	-127.47	1,231.32	2.61	-0.13	2.61
8,787.00	84.84	2.18	7,700.50	1,324.19	-124.30	1,325.99	3.15	-3.11	0.56
8,882.00	86.82	2.32	7,707.41	1,418.86	-120.58	1,420.59	2.09	2.08	0.15
8,977.00	86.68	359.28	7,712.79	1,513.68	-119.25	1,515.39	3.20	-0.15	-3.20
9,073.00	89.05	358.10	7,716.37	1,609.58	-121.45	1,611.31	2.76	2.47	-1.23
9,168.00	89.64	358.83	7,717.46	1,704.54	-123.99	1,706.30	0.99	0.62	0.77
9,263.00	87.45	358.77	7,719.87	1,799.49	-125.98	1,801.26	2.31	-2.31	-0.06
9,358.00	88.25	358.78	7,723.43	1,894.40	-128.01	1,896.19	0.84	0.84	0.01
9,453.00	91.04	359.00	7,724.02	1,989.37	-129.85	1,991.18	2.95	2.94	0.23
9,548.00	89.27	358.82	7,723.76	2,084.35	-131.66	2,086.17	1.87	-1.86	-0.19
9,644.00	87.85	358.52	7,726.18	2,180.29	-133.89	2,182.14	1.51	-1.48	-0.31
9,739.00	90.22	358.70	7,727.78	2,275.24	-136.19	2,277.11	2.50	2.49	0.19
9,835.00	90.02	358.71	7,727.57	2,371.21	-138.36	2,373.11	0.21	-0.21	0.01
9,930.00	89.62	359.58	7,727.87	2,466.20	-139.78	2,468.11	1.01	-0.42	0.92
10,026.00	91.70	359.65	7,726.77	2,562.19	-140.42	2,564.09	2.17	2.17	0.07
10,121.00	89.64	358.96	7,725.66	2,657.17	-141.57	2,659.08	2.29	-2.17	-0.73
10,217.00	91.69	358.19	7,724.54	2,753.13	-143.96	2,755.07	2.28	2.14	-0.80
10,311.00	91.24	359.59	7,722.14	2,847.08	-145.78	2,849.03	1.56	-0.48	1.49
10,407.00	90.16	359.37	7,720.97	2,943.06	-146.65	2,945.02	1.15	-1.13	-0.23
10,502.00	87.03	359.30	7,723.29	3,038.02	-147.75	3,039.98	3.30	-3.29	-0.07
10,597.00	88.96	359.94	7,726.62	3,132.95	-148.38	3,134.91	2.14	2.03	0.67
10,693.00	91.41	0.33	7,726.31	3,228.94	-148.16	3,230.89	2.58	2.55	0.41

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10,788.00	92.04	358.91	7,723.45	3,323.90	-148.79	3,325.84	1.63	0.66	-1.49
10,880.00	88.08	357.51	7,723.35	3,415.83	-151.66	3,417.81	4.57	-4.30	-1.52
10,972.00	88.87	357.36	7,725.80	3,507.70	-155.78	3,509.74	0.87	0.86	-0.16
11,065.00	88.00	358.47	7,728.34	3,600.61	-159.16	3,602.68	1.52	-0.94	1.19
11,158.00	88.51	358.43	7,731.17	3,693.53	-161.67	3,695.63	0.55	0.55	-0.04
11,250.00	90.50	358.40	7,731.97	3,785.49	-164.22	3,787.61	2.16	2.16	-0.03
11,342.00	89.71	358.54	7,731.80	3,877.45	-166.67	3,879.61	0.87	-0.86	0.15
11,434.00	90.16	358.58	7,731.90	3,969.42	-168.99	3,971.60	0.49	0.49	0.04
11,527.00	90.21	358.74	7,731.60	4,062.40	-171.16	4,064.60	0.18	0.05	0.17
11,619.00	89.24	359.75	7,732.04	4,154.38	-172.37	4,156.60	1.52	-1.05	1.10
11,711.00	91.29	359.75	7,731.62	4,246.38	-172.77	4,248.59	2.23	2.23	0.00
11,802.00	91.90	1.80	7,729.09	4,337.33	-171.54	4,339.51	2.35	0.67	2.25
11,898.00	89.67	2.52	7,727.77	4,433.25	-167.93	4,435.35	2.44	-2.32	0.75
11,993.00	88.28	1.72	7,729.47	4,528.16	-164.41	4,530.20	1.69	-1.46	-0.84
12,088.00	90.73	1.67	7,730.29	4,623.11	-161.60	4,625.09	2.58	2.58	-0.05
12,184.00	90.30	1.58	7,729.43	4,719.07	-158.88	4,720.99	0.46	-0.45	-0.09
12,280.00	89.27	0.17	7,729.79	4,815.05	-157.41	4,816.94	1.82	-1.07	-1.47
12,375.00	88.71	359.23	7,731.46	4,910.03	-157.91	4,911.92	1.15	-0.59	-0.99
12,470.00	88.31	358.66	7,733.93	5,004.99	-159.66	5,006.89	0.73	-0.42	-0.60
12,565.00	90.19	358.68	7,735.18	5,099.95	-161.87	5,101.87	1.98	1.98	0.02
12,660.00	90.69	359.14	7,734.45	5,194.93	-163.67	5,196.87	0.72	0.53	0.48
12,754.00	88.17	359.77	7,735.38	5,288.91	-164.57	5,290.86	2.76	-2.68	0.67
12,847.00	87.77	359.69	7,738.68	5,381.85	-165.00	5,383.79	0.44	-0.43	-0.09
12,942.00	89.41	359.79	7,741.01	5,476.82	-165.44	5,478.75	1.73	1.73	0.11
13,037.00	90.10	0.92	7,741.42	5,571.81	-164.85	5,573.73	1.39	0.73	1.19
13,132.00	88.10	0.90	7,742.91	5,666.78	-163.34	5,668.66	2.11	-2.11	-0.02
13,227.00	89.82	1.29	7,744.64	5,761.75	-161.52	5,763.58	1.86	1.81	0.41
13,322.00	89.39	1.55	7,745.29	5,856.72	-159.17	5,858.50	0.53	-0.45	0.27
13,416.00	90.72	1.50	7,745.20	5,950.68	-156.67	5,952.42	1.42	1.41	-0.05
13,512.00	91.73	1.62	7,743.15	6,046.62	-154.05	6,048.30	1.06	1.05	0.13
13,607.00	89.45	2.23	7,742.17	6,141.56	-150.86	6,143.18	2.48	-2.40	0.64
13,703.00	88.10	2.27	7,744.22	6,237.46	-147.10	6,239.01	1.41	-1.41	0.04
13,798.00	90.62	3.06	7,745.28	6,332.34	-142.68	6,333.81	2.78	2.65	0.83
13,893.00	90.70	4.15	7,744.19	6,427.14	-136.71	6,428.50	1.15	0.08	1.15
13,989.00	90.69	3.27	7,743.02	6,522.94	-130.49	6,524.19	0.92	-0.01	-0.92
14,084.00	91.21	2.20	7,741.45	6,617.81	-125.96	6,618.98	1.25	0.55	-1.13
14,179.00	89.47	0.05	7,740.89	6,712.78	-124.10	6,713.91	2.91	-1.83	-2.26
14,274.00	89.65	359.52	7,741.62	6,807.78	-124.45	6,808.90	0.59	0.19	-0.56
14,369.00	87.82	357.92	7,743.71	6,902.73	-126.58	6,903.87	2.56	-1.93	-1.68
14,464.00	89.22	358.40	7,746.17	6,997.64	-129.62	6,998.82	1.56	1.47	0.51
14,560.00	90.75	358.63	7,746.19	7,093.61	-132.11	7,094.81	1.61	1.59	0.24
14,655.00	90.67	358.61	7,745.01	7,188.57	-134.40	7,189.80	0.09	-0.08	-0.02
14,749.00	86.79	358.69	7,747.10	7,282.51	-136.61	7,283.76	4.13	-4.13	0.09

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14,844.00	82.23	358.79	7,756.18	7,377.02	-138.69	7,378.29	4.80	-4.80	0.11
14,940.00	82.84	358.67	7,768.66	7,472.18	-140.80	7,473.48	0.65	0.64	-0.13
15,035.00	83.86	358.85	7,779.66	7,566.52	-142.84	7,567.84	1.09	1.07	0.19
15,131.00	85.55	359.20	7,788.52	7,662.09	-144.47	7,663.42	1.80	1.76	0.36
15,226.00	87.88	359.61	7,793.96	7,756.93	-145.45	7,758.26	2.49	2.45	0.43
15,321.00	89.75	359.64	7,795.92	7,851.90	-146.08	7,853.23	1.97	1.97	0.03
15,403.00	90.45	359.16	7,795.78	7,933.89	-146.94	7,935.23	1.04	0.85	-0.59
15,498.00	92.44	359.30	7,793.39	8,028.85	-148.21	8,030.19	2.10	2.09	0.15
15,594.00	93.57	359.34	7,788.35	8,124.71	-149.35	8,126.06	1.18	1.18	0.04
15,689.00	92.29	357.80	7,783.50	8,219.55	-151.72	8,220.92	2.11	-1.35	-1.62
15,784.00	92.35	357.73	7,779.65	8,314.40	-155.42	8,315.82	0.10	0.06	-0.07
15,879.00	92.86	357.68	7,775.33	8,409.23	-159.22	8,410.70	0.54	0.54	-0.05
15,974.00	91.22	359.38	7,771.95	8,504.13	-161.65	8,505.62	2.49	-1.73	1.79
16,068.00	90.38	0.54	7,770.64	8,598.12	-161.72	8,599.60	1.52	-0.89	1.23
16,163.00	90.86	0.96	7,769.61	8,693.10	-160.48	8,694.56	0.67	0.51	0.44
16,257.00	91.38	1.03	7,767.77	8,787.07	-158.84	8,788.49	0.56	0.55	0.07
16,351.00	90.86	359.15	7,765.94	8,881.05	-158.70	8,882.45	2.07	-0.55	-2.00
16,444.00	91.59	359.18	7,763.95	8,974.02	-160.05	8,975.43	0.79	0.78	0.03
16,538.00	89.48	359.76	7,763.07	9,068.00	-160.92	9,069.41	2.33	-2.24	0.62
16,631.00	88.30	0.04	7,764.87	9,160.98	-161.08	9,162.39	1.30	-1.27	0.30
16,727.00	89.05	0.10	7,767.09	9,256.96	-160.97	9,258.35	0.78	0.78	0.06
16,821.00	89.90	0.33	7,767.95	9,350.95	-160.61	9,352.32	0.94	0.90	0.24
16,916.00	91.04	0.76	7,767.17	9,445.94	-159.71	9,447.29	1.28	1.20	0.45
17,009.00	89.07	0.33	7,767.08	9,538.93	-158.83	9,540.25	2.17	-2.12	-0.46
17,104.00	88.25	0.37	7,769.31	9,633.90	-158.25	9,635.20	0.86	-0.86	0.04
17,199.00	89.25	0.61	7,771.38	9,728.88	-157.43	9,730.15	1.08	1.05	0.25
17,294.00	89.88	0.78	7,772.10	9,823.87	-156.28	9,825.11	0.69	0.66	0.18
17,388.00	90.52	1.11	7,771.77	9,917.85	-154.73	9,919.06	0.77	0.68	0.35
17,483.00	90.92	1.29	7,770.58	10,012.82	-152.74	10,013.99	0.46	0.42	0.19
17,554.50	91.43	1.62	7,769.11	10,084.29	-150.93	10,085.41	0.84	0.71	0.46
LTP: 17554.50' MD, 330' FNL & 550' FWL									
17,596.00	91.72	1.81	7,767.97	10,125.75	-149.69	10,126.85	0.84	0.71	0.46
Final Phoenix MWD Survey									
17,664.00	91.72	1.81	7,765.93	10,193.69	-147.54	10,194.74	0.00	0.00	0.00
Projection to TD									

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Database: USA Compass

Survey Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
6,958.00	6,956.90	-12.87	17.26	Tie In
7,078.00	7,076.89	-11.72	18.29	First Phoenix MWD Survey
7,544.00	7,501.06	150.12	-15.80	FTP: 7544' MD, 330' FSL & 628' FEL
17,554.50	7,769.11	10,084.29	-150.93	LTP: 17554.50' MD, 330' FNL & 550' FWL
17,596.00	7,767.97	10,125.75	-149.69	Final Phoenix MWD Survey
17,664.00	7,765.93	10,193.69	-147.54	Projection to TD