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EMNRD-OCDARTESIA

COG Operating LLC

Eddy County, NM (NAD27 NME)

Quien Sabe Fed Com

603H

OH \ 65012

Design: Surveys (Ensign 155)

Standard Survey Report

02 October, 2019





Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 603H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RKB @ 3147.90usft (Ensign 155)
Site:	Quien Sabe Fed Com	MD Reference:	RKB @ 3147.90usft (Ensign 155)
Well:	603H	North Reference:	Grid
Wellbore:	OH \ 65012	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	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	Quien Sabe Fed Com		
Site Position:		Northing:	439,517.00 usft
From:	Map	Easting:	559,042.60 usft
Position Uncertainty:	1.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 12' 29.538766 N
		Longitude:	104° 8' 32.775379 W
		Grid Convergence:	0.10 °

Well	603H		
Well Position	+N/-S	0.00 usft	Northing:
	+E/-W	0.00 usft	Easting:
Position Uncertainty	1.00 usft	Wellhead Elevation:	usft
		Latitude:	32° 12' 29.538766 N
		Longitude:	104° 8' 32.775379 W
		Ground Level:	3,123.90 usft

Wellbore	OH \ 65012		
Magnetics	Model Name	Sample Date	Declination
			(°)
	MVHD	9/12/2019	7.11
			Dip Angle
			(°)
			59.92
			Field Strength
			(nT)
			47,853.36009984

Design	Surveys (Ensign 155)		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.00	0.00	0.00
			Direction
			(°)
			179.95

Survey Program	Date 10/2/2019		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		
100.00	8,385.00	SDI Gyro Surveys (OH \ 65012)	Scientific Gyro
8,567.00	10,596.00	Phoenix MWD Surveys - FDIR Corrections	MWD+IFR1+FDIR
10,711.00	19,149.00	Phoenix MWD Surveys (OH \ 65012)	MWD+IFR1
			Description
			Scientific Drilling Intl. Standard Wireline Keeper
			OWSG MWD + IFR1 + FDIR Correction
			OWSG Rev.2 MWD + IFR1

Survey									
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn
Depth	(°)	(°)	Depth	(usft)	(usft)	Section	Rate	Rate	Rate
(usft)			(usft)			(usft)	(°/100usft)	(°/100usft)	(°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.57	45.39	100.00	0.35	0.35	-0.35	0.57	0.57	0.00
125.00	0.74	57.08	125.00	0.52	0.58	-0.52	0.86	0.68	46.76
150.00	0.58	46.44	150.00	0.70	0.81	-0.70	0.80	-0.64	-42.56
175.00	0.62	45.26	174.99	0.88	0.99	-0.88	0.17	0.16	-4.72
200.00	0.67	38.93	199.99	1.09	1.18	-1.09	0.35	0.20	-25.32
225.00	0.73	28.70	224.99	1.34	1.35	-1.34	0.55	0.24	-40.92
250.00	0.77	13.08	249.99	1.65	1.46	-1.65	0.83	0.16	-62.48
275.00	0.98	2.27	274.99	2.02	1.51	-2.02	1.06	0.84	-43.24



Survey Report



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Site:	Quien Sabe Fed Com	MD Reference:	RKB @ 3147.90usft (Ensign 155)
Well:	603H	North Reference:	Grid
Wellbore:	OH \ 65012	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass

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)	
300.00	1.28	352.98	299.98	2.52	1.48	-2.51	1.40	1.20	-37.16	
325.00	1.38	345.62	324.97	3.08	1.38	-3.08	0.79	0.40	-29.44	
350.00	1.43	344.36	349.97	3.68	1.22	-3.68	0.24	0.20	-5.04	
375.00	1.72	341.17	374.96	4.33	1.01	-4.33	1.21	1.16	-12.76	
400.00	2.14	334.56	399.94	5.11	0.69	-5.11	1.90	1.68	-26.44	
425.00	2.74	326.51	424.92	6.03	0.16	-6.03	2.76	2.40	-32.20	
450.00	3.63	321.24	449.88	7.14	-0.67	-7.14	3.74	3.56	-21.08	
475.00	3.78	321.35	474.83	8.40	-1.68	-8.41	0.60	0.60	0.44	
500.00	3.78	321.54	499.77	9.69	-2.70	-9.70	0.05	0.00	0.76	
525.00	3.70	319.44	524.72	10.95	-3.74	-10.95	0.63	-0.32	-8.40	
550.00	3.57	318.64	549.67	12.15	-4.78	-12.15	0.56	-0.52	-3.20	
575.00	3.46	317.11	574.62	13.29	-5.81	-13.29	0.58	-0.44	-6.12	
600.00	3.13	321.62	599.58	14.37	-6.74	-14.38	1.68	-1.32	18.04	
625.00	2.83	324.38	624.55	15.41	-7.53	-15.42	1.33	-1.20	11.04	
650.00	2.47	326.00	649.52	16.36	-8.19	-16.37	1.47	-1.44	6.48	
675.00	2.15	330.55	674.50	17.21	-8.72	-17.22	1.47	-1.28	18.20	
700.00	2.01	334.08	699.49	18.02	-9.14	-18.02	0.76	-0.56	14.12	
725.00	1.93	334.89	724.47	18.79	-9.51	-18.80	0.34	-0.32	3.24	
750.00	2.02	333.44	749.46	19.57	-9.89	-19.58	0.41	0.36	-5.80	
775.00	1.99	336.15	774.44	20.36	-10.26	-20.37	0.40	-0.12	10.84	
800.00	2.06	333.37	799.42	21.16	-10.64	-21.17	0.48	0.28	-11.12	
825.00	2.05	335.93	824.41	21.97	-11.02	-21.98	0.37	-0.04	10.24	
850.00	1.91	334.89	849.39	22.75	-11.38	-22.76	0.58	-0.56	-4.16	
875.00	1.28	329.61	874.38	23.37	-11.70	-23.38	2.59	-2.52	-21.12	
900.00	0.73	334.58	899.38	23.75	-11.91	-23.76	2.23	-2.20	19.88	
925.00	0.48	314.83	924.38	23.97	-12.05	-23.98	1.29	-1.00	-79.00	
950.00	0.26	274.46	949.38	24.05	-12.18	-24.06	1.31	-0.88	-161.48	
975.00	0.06	274.91	974.38	24.06	-12.25	-24.07	0.80	-0.80	1.80	
1,000.00	0.19	256.46	999.38	24.05	-12.30	-24.06	0.54	0.52	-73.80	
1,025.00	0.17	269.00	1,024.38	24.04	-12.38	-24.05	0.18	-0.08	50.16	
1,050.00	0.15	258.41	1,049.38	24.03	-12.45	-24.04	0.14	-0.08	-42.36	
1,075.00	0.27	283.63	1,074.38	24.04	-12.54	-24.05	0.59	0.48	100.88	
1,100.00	0.10	220.33	1,099.38	24.03	-12.61	-24.05	0.97	-0.68	-253.20	
1,125.00	0.13	254.98	1,124.38	24.01	-12.65	-24.02	0.30	0.12	138.60	
1,150.00	0.17	281.27	1,149.38	24.01	-12.72	-24.02	0.31	0.16	105.16	
1,175.00	0.17	284.84	1,174.38	24.03	-12.79	-24.04	0.04	0.00	14.28	
1,200.00	0.23	297.61	1,199.38	24.06	-12.87	-24.07	0.30	0.24	51.08	
1,225.00	0.23	294.81	1,224.38	24.10	-12.96	-24.12	0.04	0.00	-11.20	
1,250.00	0.32	310.52	1,249.38	24.17	-13.06	-24.18	0.47	0.36	62.84	
1,275.00	0.28	314.15	1,274.38	24.26	-13.15	-24.27	0.18	-0.16	14.52	
1,300.00	0.39	307.49	1,299.38	24.35	-13.27	-24.36	0.47	0.44	-26.64	
1,325.00	0.36	312.59	1,324.38	24.46	-13.39	-24.47	0.18	-0.12	20.40	
1,350.00	0.47	304.57	1,349.37	24.57	-13.53	-24.58	0.50	0.44	-32.08	

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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)
1,375.00	0.53	309.14	1,374.37	24.70	-13.71	-24.71	0.29	0.24	18.28
1,400.00	0.61	310.07	1,399.37	24.86	-13.90	-24.87	0.32	0.32	3.72
1,425.00	0.53	314.62	1,424.37	25.03	-14.08	-25.04	0.37	-0.32	18.20
1,450.00	0.64	308.06	1,449.37	25.19	-14.28	-25.21	0.51	0.44	-26.24
1,475.00	0.72	312.04	1,474.37	25.38	-14.50	-25.40	0.37	0.32	15.92
1,500.00	0.56	306.80	1,499.37	25.56	-14.72	-25.58	0.68	-0.64	-20.96
1,525.00	0.53	319.31	1,524.37	25.72	-14.89	-25.74	0.49	-0.12	50.04
1,550.00	0.58	302.38	1,549.36	25.88	-15.07	-25.89	0.68	0.20	-67.72
1,575.00	0.40	285.49	1,574.36	25.97	-15.26	-25.98	0.92	-0.72	-67.56
1,600.00	0.42	246.97	1,599.36	25.96	-15.43	-25.97	1.08	0.08	-154.08
1,625.00	0.54	235.30	1,624.36	25.85	-15.61	-25.87	0.62	0.48	-46.68
1,650.00	0.55	214.35	1,649.36	25.69	-15.78	-25.70	0.79	0.04	-83.80
1,675.00	0.59	187.21	1,674.36	25.46	-15.86	-25.48	1.08	0.16	-108.56
1,700.00	0.70	162.22	1,699.36	25.19	-15.83	-25.20	1.20	0.44	-99.96
1,725.00	0.94	132.60	1,724.36	24.90	-15.63	-24.92	1.92	0.96	-118.48
1,750.00	1.16	125.52	1,749.35	24.62	-15.28	-24.63	1.02	0.88	-28.32
1,775.00	1.39	125.51	1,774.34	24.30	-14.82	-24.31	0.92	0.92	-0.04
1,800.00	1.46	122.32	1,799.34	23.95	-14.31	-23.96	0.42	0.28	-12.76
1,825.00	1.29	119.20	1,824.33	23.64	-13.79	-23.65	0.74	-0.68	-12.48
1,850.00	1.43	121.56	1,849.32	23.34	-13.28	-23.35	0.60	0.56	9.44
1,875.00	1.42	120.38	1,874.32	23.02	-12.75	-23.03	0.12	-0.04	-4.72
1,900.00	1.54	116.77	1,899.31	22.71	-12.18	-22.72	0.61	0.48	-14.44
1,925.00	1.64	121.42	1,924.30	22.38	-11.58	-22.39	0.65	0.40	18.60
1,950.00	1.63	120.81	1,949.29	22.01	-10.96	-22.02	0.08	-0.04	-2.44
1,975.00	1.86	119.64	1,974.28	21.62	-10.31	-21.63	0.93	0.92	-4.68
2,000.00	2.20	120.22	1,999.26	21.18	-9.54	-21.19	1.36	1.36	2.32
2,025.00	2.48	118.31	2,024.24	20.68	-8.65	-20.69	1.16	1.12	-7.64
2,050.00	2.73	118.15	2,049.21	20.15	-7.65	-20.15	1.00	1.00	-0.64
2,075.00	2.92	118.16	2,074.18	19.56	-6.56	-19.57	0.76	0.76	0.04
2,100.00	2.94	118.41	2,099.15	18.96	-5.44	-18.96	0.09	0.08	1.00
2,125.00	2.88	119.09	2,124.12	18.35	-4.32	-18.35	0.28	-0.24	2.72
2,150.00	2.86	117.70	2,149.09	17.75	-3.22	-17.76	0.29	-0.08	-5.56
2,175.00	2.49	119.10	2,174.06	17.20	-2.20	-17.20	1.50	-1.48	5.60
2,200.00	2.34	120.08	2,199.04	16.68	-1.28	-16.68	0.62	-0.60	3.92
2,225.00	2.18	121.26	2,224.02	16.18	-0.43	-16.18	0.67	-0.64	4.72
2,250.00	1.90	123.75	2,249.00	15.70	0.32	-15.70	1.17	-1.12	9.96
2,275.00	1.47	127.54	2,273.99	15.27	0.92	-15.27	1.78	-1.72	15.16
2,300.00	0.92	154.90	2,298.99	14.90	1.26	-14.90	3.11	-2.20	109.44
2,325.00	0.83	183.84	2,323.98	14.53	1.33	-14.53	1.78	-0.36	115.76
2,350.00	0.81	206.28	2,348.98	14.20	1.24	-14.19	1.28	-0.08	89.76
2,375.00	0.83	200.28	2,373.98	13.87	1.10	-13.87	0.35	0.08	-24.00
2,400.00	0.85	203.32	2,398.97	13.53	0.96	-13.53	0.20	0.08	12.16
2,425.00	0.81	203.15	2,423.97	13.19	0.82	-13.19	0.16	-0.16	-0.68



Survey Report



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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)
2,450.00	0.85	210.76	2,448.97	12.87	0.66	-12.87	0.47	0.16	30.44
2,475.00	0.88	208.15	2,473.97	12.54	0.47	-12.54	0.20	0.12	-10.44
2,500.00	0.85	207.86	2,498.96	12.21	0.29	-12.21	0.12	-0.12	-1.16
2,525.00	0.71	206.07	2,523.96	11.91	0.14	-11.91	0.57	-0.56	-7.16
2,550.00	0.35	226.63	2,548.96	11.72	0.02	-11.72	1.61	-1.44	82.24
2,575.00	0.60	342.09	2,573.96	11.79	-0.08	-11.79	3.26	1.00	461.84
2,600.00	1.03	3.13	2,598.96	12.14	-0.11	-12.14	2.07	1.72	84.16
2,625.00	1.32	3.89	2,623.95	12.65	-0.08	-12.65	1.16	1.16	3.04
2,650.00	1.48	359.40	2,648.94	13.26	-0.06	-13.26	0.78	0.64	-17.96
2,675.00	1.54	359.15	2,673.94	13.92	-0.07	-13.92	0.24	0.24	-1.00
2,700.00	1.46	0.72	2,698.93	14.57	-0.07	-14.57	0.36	-0.32	6.28
2,725.00	1.56	358.11	2,723.92	15.23	-0.08	-15.23	0.49	0.40	-10.44
2,750.00	1.55	357.85	2,748.91	15.91	-0.10	-15.91	0.05	-0.04	-1.04
2,775.00	1.69	356.98	2,773.90	16.61	-0.13	-16.61	0.57	0.56	-3.48
2,800.00	2.06	352.44	2,798.89	17.43	-0.21	-17.43	1.59	1.48	-18.16
2,825.00	2.12	350.45	2,823.87	18.33	-0.35	-18.33	0.38	0.24	-7.96
2,850.00	2.30	346.42	2,848.85	19.27	-0.54	-19.27	0.95	0.72	-16.12
2,875.00	2.47	344.13	2,873.83	20.28	-0.81	-20.28	0.78	0.68	-9.16
2,900.00	2.58	345.00	2,898.80	21.34	-1.10	-21.34	0.47	0.44	3.48
2,925.00	2.62	346.25	2,923.78	22.44	-1.38	-22.44	0.28	0.16	5.00
2,950.00	2.57	346.07	2,948.75	23.54	-1.65	-23.54	0.20	-0.20	-0.72
2,975.00	2.64	345.14	2,973.73	24.64	-1.93	-24.64	0.33	0.28	-3.72
3,000.00	2.72	345.96	2,998.70	25.77	-2.23	-25.77	0.35	0.32	3.28
3,025.00	2.84	342.52	3,023.67	26.94	-2.56	-26.94	0.82	0.48	-13.76
3,050.00	2.77	344.26	3,048.64	28.11	-2.91	-28.11	0.44	-0.28	6.96
3,075.00	2.86	344.26	3,073.61	29.29	-3.24	-29.29	0.36	0.36	0.00
3,100.00	2.91	344.05	3,098.58	30.50	-3.58	-30.50	0.20	0.20	-0.84
3,125.00	2.90	343.83	3,123.55	31.72	-3.93	-31.72	0.06	-0.04	-0.88
3,150.00	2.96	342.58	3,148.51	32.94	-4.30	-32.95	0.35	0.24	-5.00
3,175.00	3.05	343.10	3,173.48	34.19	-4.69	-34.20	0.38	0.36	2.08
3,200.00	3.19	340.00	3,198.44	35.48	-5.12	-35.49	0.88	0.56	-12.40
3,225.00	3.20	340.62	3,223.40	36.80	-5.59	-36.80	0.14	0.04	2.48
3,250.00	3.11	343.78	3,248.37	38.11	-6.01	-38.11	0.78	-0.36	12.64
3,275.00	3.31	339.17	3,273.33	39.43	-6.46	-39.44	1.31	0.80	-18.44
3,300.00	3.26	339.52	3,298.29	40.77	-6.96	-40.78	0.22	-0.20	1.40
3,325.00	3.30	338.10	3,323.25	42.11	-7.48	-42.11	0.36	0.16	-5.68
3,350.00	3.29	339.06	3,348.20	43.44	-8.00	-43.45	0.22	-0.04	3.84
3,375.00	3.40	339.55	3,373.16	44.81	-8.52	-44.82	0.45	0.44	1.96
3,400.00	3.37	340.84	3,398.12	46.20	-9.02	-46.20	0.33	-0.12	5.16
3,425.00	3.40	341.88	3,423.07	47.60	-9.49	-47.60	0.27	0.12	4.16
3,450.00	3.36	340.29	3,448.03	48.99	-9.97	-49.00	0.41	-0.16	-6.36
3,475.00	3.31	339.75	3,472.99	50.36	-10.47	-50.37	0.24	-0.20	-2.16
3,500.00	3.36	339.11	3,497.95	51.72	-10.98	-51.73	0.25	0.20	-2.56
3,525.00	3.45	336.94	3,522.90	53.09	-11.53	-53.10	0.63	0.36	-8.68



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 603H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RKB @ 3147.90usft (Ensign 155)
Site:	Quien Sabe Fed Com	MD Reference:	RKB @ 3147.90usft (Ensign 155)
Well:	603H	North Reference:	Grid
Wellbore:	OH \ 65012	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass

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)
3,550.00	3.40	337.35	3,547.86	54.47	-12.11	-54.48	0.22	-0.20	1.64
3,575.00	3.40	338.29	3,572.81	55.84	-12.67	-55.85	0.22	0.00	3.76
3,600.00	3.52	337.89	3,597.77	57.24	-13.24	-57.25	0.49	0.48	-1.60
3,625.00	3.56	337.79	3,622.72	58.67	-13.82	-58.68	0.16	0.16	-0.40
3,650.00	3.32	338.43	3,647.67	60.06	-14.38	-60.08	0.97	-0.96	2.56
3,675.00	2.54	328.66	3,672.64	61.21	-14.93	-61.22	3.69	-3.12	-39.08
3,700.00	2.19	326.06	3,697.62	62.08	-15.49	-62.09	1.46	-1.40	-10.40
3,725.00	2.05	329.59	3,722.60	62.86	-15.98	-62.88	0.77	-0.56	14.12
3,750.00	2.18	323.27	3,747.59	63.63	-16.49	-63.64	1.07	0.52	-25.28
3,775.00	2.08	324.59	3,772.57	64.38	-17.04	-64.39	0.45	-0.40	5.28
3,800.00	2.16	322.79	3,797.55	65.12	-17.59	-65.14	0.42	0.32	-7.20
3,825.00	2.12	326.72	3,822.53	65.89	-18.12	-65.90	0.61	-0.16	15.72
3,850.00	2.19	324.23	3,847.52	66.66	-18.66	-66.68	0.47	0.28	-9.96
3,875.00	2.12	325.17	3,872.50	67.43	-19.20	-67.44	0.31	-0.28	3.76
3,900.00	2.14	325.74	3,897.48	68.19	-19.73	-68.21	0.12	0.08	2.28
3,925.00	1.98	335.52	3,922.47	68.97	-20.17	-68.99	1.54	-0.64	39.12
3,950.00	1.64	352.53	3,947.45	69.72	-20.39	-69.74	2.53	-1.36	68.04
3,975.00	1.65	3.72	3,972.44	70.43	-20.42	-70.45	1.28	0.04	44.76
4,000.00	1.71	10.05	3,997.43	71.16	-20.33	-71.18	0.78	0.24	25.32
4,025.00	1.74	14.10	4,022.42	71.90	-20.17	-71.91	0.50	0.12	16.20
4,050.00	1.76	12.35	4,047.41	72.64	-20.00	-72.66	0.23	0.08	-7.00
4,075.00	1.76	16.54	4,072.40	73.38	-19.81	-73.40	0.51	0.00	16.76
4,100.00	1.77	17.89	4,097.39	74.12	-19.58	-74.13	0.17	0.04	5.40
4,125.00	1.73	20.09	4,122.37	74.84	-19.33	-74.86	0.31	-0.16	8.80
4,150.00	1.90	18.14	4,147.36	75.59	-19.07	-75.60	0.72	0.68	-7.80
4,175.00	1.98	18.40	4,172.35	76.39	-18.81	-76.41	0.32	0.32	1.04
4,200.00	2.01	26.30	4,197.33	77.19	-18.47	-77.21	1.11	0.12	31.60
4,225.00	2.14	17.77	4,222.32	78.03	-18.14	-78.05	1.34	0.52	-34.12
4,250.00	2.16	19.32	4,247.30	78.92	-17.84	-78.94	0.25	0.08	6.20
4,275.00	2.25	19.78	4,272.28	79.83	-17.52	-79.84	0.37	0.36	1.84
4,300.00	2.34	20.23	4,297.26	80.77	-17.18	-80.78	0.37	0.36	1.80
4,325.00	2.31	20.30	4,322.24	81.72	-16.82	-81.73	0.12	-0.12	0.28
4,350.00	2.46	21.45	4,347.22	82.69	-16.45	-82.71	0.63	0.60	4.60
4,375.00	2.47	22.88	4,372.19	83.69	-16.05	-83.70	0.25	0.04	5.72
4,400.00	2.53	22.41	4,397.17	84.69	-15.63	-84.71	0.25	0.24	-1.88
4,425.00	2.58	23.01	4,422.15	85.72	-15.20	-85.73	0.23	0.20	2.40
4,450.00	2.62	24.40	4,447.12	86.76	-14.74	-86.77	0.30	0.16	5.56
4,475.00	2.46	17.17	4,472.10	87.79	-14.35	-87.80	1.43	-0.64	-28.92
4,500.00	2.51	17.99	4,497.07	88.83	-14.02	-88.84	0.25	0.20	3.28
4,525.00	2.51	26.61	4,522.05	89.84	-13.60	-89.85	1.51	0.00	34.48
4,550.00	2.42	32.03	4,547.03	90.77	-13.08	-90.78	1.00	-0.36	21.68
4,575.00	2.78	22.75	4,572.00	91.78	-12.57	-91.79	2.21	1.44	-37.12
4,600.00	3.42	18.78	4,596.96	93.04	-12.09	-93.05	2.70	2.56	-15.88



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 603H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RKB @ 3147.90usft (Ensign 155)
Site:	Quien Sabe Fed Com	MD Reference:	RKB @ 3147.90usft (Ensign 155)
Well:	603H	North Reference:	Grid
Wellbore:	OH \ 65012	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass

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)
4,625.00	3.87	14.03	4,621.91	94.57	-11.65	-94.58	2.17	1.80	-19.00
4,650.00	3.98	11.77	4,646.85	96.24	-11.26	-96.25	0.76	0.44	-9.04
4,675.00	4.11	10.69	4,671.79	97.97	-10.92	-97.98	0.60	0.52	-4.32
4,700.00	4.24	10.03	4,696.72	99.76	-10.59	-99.77	0.55	0.52	-2.64
4,725.00	4.15	9.54	4,721.66	101.56	-10.28	-101.57	0.39	-0.36	-1.96
4,750.00	4.13	7.65	4,746.59	103.34	-10.01	-103.35	0.55	-0.08	-7.56
4,775.00	4.36	9.22	4,771.52	105.17	-9.74	-105.18	1.03	0.92	6.28
4,800.00	4.34	7.21	4,796.45	107.05	-9.47	-107.06	0.62	-0.08	-8.04
4,825.00	4.42	7.34	4,821.38	108.94	-9.23	-108.95	0.32	0.32	0.52
4,850.00	4.29	7.74	4,846.31	110.83	-8.98	-110.83	0.53	-0.52	1.60
4,875.00	4.48	7.24	4,871.23	112.72	-8.73	-112.73	0.78	0.76	-2.00
4,900.00	4.39	6.81	4,896.16	114.64	-8.49	-114.65	0.38	-0.36	-1.72
4,925.00	4.52	4.43	4,921.08	116.57	-8.30	-116.58	0.90	0.52	-9.52
4,950.00	4.83	6.25	4,946.00	118.60	-8.11	-118.61	1.37	1.24	7.28
4,975.00	4.62	4.51	4,970.92	120.65	-7.92	-120.66	1.02	-0.84	-6.96
5,000.00	4.93	3.07	4,995.83	122.73	-7.78	-122.73	1.33	1.24	-5.76
5,025.00	4.92	2.19	5,020.74	124.87	-7.69	-124.88	0.30	-0.04	-3.52
5,050.00	5.01	0.71	5,045.64	127.03	-7.63	-127.04	0.63	0.36	-5.92
5,075.00	5.17	359.50	5,070.54	129.25	-7.63	-129.26	0.77	0.64	-4.84
5,100.00	5.23	359.24	5,095.44	131.52	-7.65	-131.52	0.26	0.24	-1.04
5,125.00	5.33	359.56	5,120.33	133.82	-7.68	-133.82	0.42	0.40	1.28
5,150.00	5.52	359.46	5,145.22	136.18	-7.70	-136.19	0.76	0.76	-0.40
5,175.00	5.55	358.17	5,170.11	138.59	-7.75	-138.60	0.51	0.12	-5.16
5,200.00	5.87	358.08	5,194.98	141.08	-7.83	-141.08	1.28	1.28	-0.36
5,225.00	5.98	357.65	5,219.85	143.66	-7.92	-143.66	0.47	0.44	-1.72
5,250.00	5.96	356.38	5,244.71	146.25	-8.06	-146.26	0.53	-0.08	-5.08
5,275.00	6.10	356.55	5,269.57	148.87	-8.22	-148.88	0.56	0.56	0.68
5,300.00	6.12	356.91	5,294.43	151.53	-8.37	-151.54	0.17	0.08	1.44
5,325.00	6.25	356.44	5,319.29	154.22	-8.53	-154.23	0.56	0.52	-1.88
5,350.00	6.21	356.77	5,344.14	156.93	-8.69	-156.94	0.21	-0.16	1.32
5,375.00	6.49	354.68	5,368.99	159.68	-8.90	-159.69	1.45	1.12	-8.36
5,400.00	6.53	354.48	5,393.82	162.51	-9.16	-162.51	0.18	0.16	-0.80
5,425.00	6.74	355.27	5,418.66	165.38	-9.42	-165.39	0.92	0.84	3.16
5,450.00	6.68	352.75	5,443.49	168.29	-9.73	-168.30	1.20	-0.24	-10.08
5,475.00	6.87	355.15	5,468.31	171.22	-10.04	-171.23	1.36	0.76	9.60
5,500.00	6.86	355.22	5,493.13	174.20	-10.29	-174.21	0.05	-0.04	0.28
5,525.00	7.06	354.21	5,517.95	177.21	-10.57	-177.22	0.94	0.80	-4.04
5,550.00	7.11	355.03	5,542.76	180.28	-10.86	-180.29	0.45	0.20	3.28
5,575.00	7.27	354.63	5,567.56	183.40	-11.14	-183.41	0.67	0.64	-1.60
5,600.00	7.38	355.14	5,592.36	186.58	-11.42	-186.58	0.51	0.44	2.04
5,625.00	7.60	354.88	5,617.14	189.82	-11.71	-189.83	0.89	0.88	-1.04
5,650.00	7.69	355.65	5,641.92	193.14	-11.98	-193.15	0.55	0.36	3.08
5,675.00	7.80	355.42	5,666.69	196.49	-12.24	-196.51	0.46	0.44	-0.92



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 603H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RKB @ 3147.90usft (Ensign 155)
Site:	Quien Sabe Fed Com	MD Reference:	RKB @ 3147.90usft (Ensign 155)
Well:	603H	North Reference:	Grid
Wellbore:	OH \ 65012	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass

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)
5,700.00	8.11	356.50	5,691.45	199.95	-12.49	-199.96	1.38	1.24	4.32
5,725.00	8.07	355.90	5,716.20	203.46	-12.72	-203.47	0.37	-0.16	-2.40
5,750.00	8.20	355.60	5,740.95	206.98	-12.98	-207.00	0.55	0.52	-1.20
5,775.00	8.14	355.14	5,765.70	210.53	-13.27	-210.54	0.35	-0.24	-1.84
5,800.00	8.18	355.40	5,790.45	214.06	-13.56	-214.07	0.22	0.16	1.04
5,825.00	8.08	353.67	5,815.19	217.58	-13.90	-217.59	1.06	-0.40	-6.92
5,850.00	8.15	353.23	5,839.94	221.09	-14.30	-221.10	0.37	0.28	-1.76
5,875.00	7.97	351.95	5,864.70	224.56	-14.75	-224.58	1.02	-0.72	-5.12
5,900.00	7.73	350.86	5,889.46	227.94	-15.26	-227.95	1.13	-0.96	-4.36
5,925.00	7.77	350.19	5,914.23	231.26	-15.82	-231.28	0.40	0.16	-2.68
5,950.00	7.70	349.88	5,939.01	234.58	-16.40	-234.59	0.33	-0.28	-1.24
5,975.00	7.74	349.33	5,963.78	237.88	-17.00	-237.90	0.34	0.16	-2.20
6,000.00	7.52	348.22	5,988.56	241.14	-17.65	-241.15	1.06	-0.88	-4.44
6,025.00	6.84	345.24	6,013.36	244.18	-18.36	-244.19	3.10	-2.72	-11.92
6,050.00	6.87	346.05	6,038.18	247.07	-19.10	-247.09	0.40	0.12	3.24
6,075.00	6.54	343.97	6,063.01	249.89	-19.86	-249.91	1.64	-1.32	-8.32
6,100.00	6.39	343.87	6,087.85	252.59	-20.64	-252.61	0.60	-0.60	-0.40
6,125.00	6.19	344.13	6,112.70	255.23	-21.39	-255.24	0.81	-0.80	1.04
6,150.00	6.22	344.51	6,137.56	257.83	-22.12	-257.85	0.20	0.12	1.52
6,175.00	6.12	344.63	6,162.41	260.42	-22.84	-260.44	0.40	-0.40	0.48
6,200.00	5.62	344.54	6,187.28	262.88	-23.52	-262.90	2.00	-2.00	-0.36
6,225.00	5.36	346.58	6,212.17	265.20	-24.11	-265.22	1.30	-1.04	8.16
6,250.00	5.08	347.95	6,237.06	267.42	-24.62	-267.44	1.23	-1.12	5.48
6,275.00	4.88	347.86	6,261.97	269.54	-25.07	-269.56	0.80	-0.80	-0.36
6,300.00	4.83	349.25	6,286.88	271.61	-25.49	-271.63	0.51	-0.20	5.56
6,325.00	4.76	350.14	6,311.79	273.67	-25.86	-273.69	0.41	-0.28	3.56
6,350.00	4.76	351.06	6,336.71	275.71	-26.20	-275.74	0.31	0.00	3.68
6,375.00	4.65	351.55	6,361.62	277.74	-26.51	-277.76	0.47	-0.44	1.96
6,400.00	4.73	351.67	6,386.54	279.76	-26.81	-279.79	0.32	0.32	0.48
6,425.00	4.69	352.73	6,411.45	281.80	-27.09	-281.82	0.38	-0.16	4.24
6,450.00	4.75	354.83	6,436.37	283.84	-27.31	-283.87	0.73	0.24	8.40
6,475.00	4.76	356.24	6,461.28	285.91	-27.47	-285.93	0.47	0.04	5.64
6,500.00	4.82	358.12	6,486.19	287.99	-27.58	-288.02	0.67	0.24	7.52
6,525.00	5.05	0.82	6,511.10	290.14	-27.59	-290.17	1.31	0.92	10.80
6,550.00	5.19	0.48	6,536.00	292.37	-27.57	-292.40	0.57	0.56	-1.36
6,575.00	5.19	2.79	6,560.90	294.63	-27.50	-294.66	0.84	0.00	9.24
6,600.00	5.37	3.05	6,585.79	296.93	-27.39	-296.96	0.73	0.72	1.04
6,625.00	5.43	2.04	6,610.68	299.28	-27.28	-299.31	0.45	0.24	-4.04
6,650.00	5.51	3.56	6,635.57	301.66	-27.17	-301.69	0.66	0.32	6.08
6,675.00	5.72	4.10	6,660.45	304.10	-27.00	-304.13	0.87	0.84	2.16
6,700.00	5.91	2.49	6,685.32	306.63	-26.86	-306.65	1.00	0.76	-6.44
6,725.00	6.00	3.80	6,710.19	309.22	-26.72	-309.24	0.65	0.36	5.24
6,750.00	6.04	4.35	6,735.05	311.84	-26.53	-311.86	0.28	0.16	2.20
6,775.00	5.94	4.05	6,759.91	314.44	-26.34	-314.46	0.42	-0.40	-1.20

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 603H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RKB @ 3147.90usft (Ensign 155)
Site:	Quien Sabe Fed Com	MD Reference:	RKB @ 3147.90usft (Ensign 155)
Well:	603H	North Reference:	Grid
Wellbore:	OH \ 65012	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass

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)
6,800.00	5.97	3.62	6,784.78	317.03	-26.16	-317.05	0.22	0.12	-1.72
6,825.00	6.10	4.47	6,809.64	319.65	-25.98	-319.67	0.63	0.52	3.40
6,850.00	6.12	4.36	6,834.50	322.30	-25.77	-322.32	0.09	0.08	-0.44
6,875.00	6.22	4.87	6,859.35	324.98	-25.56	-325.00	0.46	0.40	2.04
6,900.00	6.26	3.84	6,884.20	327.69	-25.35	-327.71	0.48	0.16	-4.12
6,925.00	6.19	4.43	6,909.06	330.39	-25.16	-330.41	0.38	-0.28	2.36
6,950.00	6.22	4.93	6,933.91	333.08	-24.94	-333.11	0.25	0.12	2.00
6,975.00	6.01	5.21	6,958.77	335.74	-24.70	-335.76	0.85	-0.84	1.12
7,000.00	5.99	5.58	6,983.63	338.34	-24.45	-338.36	0.17	-0.08	1.48
7,025.00	6.00	5.08	7,008.49	340.94	-24.21	-340.96	0.21	0.04	-2.00
7,050.00	6.04	4.47	7,033.35	343.55	-23.99	-343.57	0.30	0.16	-2.44
7,075.00	6.11	5.32	7,058.21	346.19	-23.77	-346.21	0.46	0.28	3.40
7,100.00	5.90	5.77	7,083.08	348.79	-23.52	-348.81	0.86	-0.84	1.80
7,125.00	6.04	5.17	7,107.94	351.38	-23.27	-351.40	0.61	0.56	-2.40
7,150.00	5.70	3.92	7,132.81	353.93	-23.06	-353.95	1.45	-1.36	-5.00
7,175.00	5.52	3.25	7,157.69	356.37	-22.91	-356.39	0.77	-0.72	-2.68
7,200.00	5.54	2.35	7,182.57	358.77	-22.79	-358.79	0.36	0.08	-3.60
7,225.00	5.46	2.15	7,207.46	361.17	-22.70	-361.19	0.33	-0.32	-0.80
7,250.00	5.52	2.76	7,232.34	363.56	-22.60	-363.58	0.33	0.24	2.44
7,275.00	5.60	1.86	7,257.23	365.98	-22.50	-366.00	0.47	0.32	-3.60
7,300.00	5.59	359.64	7,282.11	368.41	-22.47	-368.43	0.87	-0.04	-8.88
7,325.00	5.57	358.78	7,306.99	370.84	-22.50	-370.86	0.34	-0.08	-3.44
7,350.00	5.68	359.87	7,331.87	373.29	-22.53	-373.31	0.61	0.44	4.36
7,375.00	5.53	1.37	7,356.75	375.74	-22.50	-375.76	0.84	-0.60	6.00
7,400.00	6.00	358.49	7,381.62	378.25	-22.51	-378.27	2.21	1.88	-11.52
7,425.00	5.85	0.02	7,406.49	380.83	-22.54	-380.85	0.87	-0.60	6.12
7,450.00	5.47	357.86	7,431.37	383.29	-22.59	-383.31	1.74	-1.52	-8.64
7,475.00	5.63	4.83	7,456.25	385.70	-22.53	-385.72	2.77	0.64	27.88
7,500.00	5.42	358.74	7,481.13	388.11	-22.45	-388.13	2.49	-0.84	-24.36
7,525.00	5.22	359.48	7,506.03	390.42	-22.49	-390.44	0.85	-0.80	2.96
7,550.00	5.10	0.44	7,530.93	392.67	-22.49	-392.69	0.59	-0.48	3.84
7,575.00	5.09	0.06	7,555.83	394.89	-22.48	-394.91	0.14	-0.04	-1.52
7,600.00	4.82	0.04	7,580.73	397.05	-22.48	-397.07	1.08	-1.08	-0.08
7,625.00	4.36	358.91	7,605.65	399.05	-22.50	-399.07	1.88	-1.84	-4.52
7,650.00	4.23	358.08	7,630.58	400.92	-22.54	-400.94	0.58	-0.52	-3.32
7,675.00	4.04	357.22	7,655.52	402.72	-22.62	-402.74	0.80	-0.76	-3.44
7,700.00	4.00	356.51	7,680.46	404.47	-22.71	-404.49	0.26	-0.16	-2.84
7,725.00	3.89	356.38	7,705.40	406.19	-22.82	-406.21	0.44	-0.44	-0.52
7,750.00	3.90	356.33	7,730.34	407.89	-22.93	-407.91	0.04	0.04	-0.20
7,775.00	3.83	355.23	7,755.28	409.57	-23.05	-409.59	0.41	-0.28	-4.40
7,800.00	3.83	356.09	7,780.23	411.23	-23.18	-411.25	0.23	0.00	3.44
7,825.00	3.82	355.02	7,805.17	412.89	-23.31	-412.91	0.29	-0.04	-4.28
7,850.00	3.83	355.40	7,830.12	414.56	-23.45	-414.58	0.11	0.04	1.52



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 603H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RKB @ 3147.90usft (Ensign 155)
Site:	Quien Sabe Fed Com	MD Reference:	RKB @ 3147.90usft (Ensign 155)
Well:	603H	North Reference:	Grid
Wellbore:	OH \ 65012	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass

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)
7,875.00	3.67	354.85	7,855.06	416.19	-23.59	-416.21	0.66	-0.64	-2.20
7,900.00	3.44	353.76	7,880.01	417.73	-23.74	-417.75	0.96	-0.92	-4.36
7,925.00	3.40	354.09	7,904.97	419.21	-23.90	-419.23	0.18	-0.16	1.32
7,950.00	3.23	350.74	7,929.93	420.64	-24.09	-420.66	1.03	-0.68	-13.40
7,975.00	3.16	350.88	7,954.89	422.02	-24.31	-422.04	0.28	-0.28	0.56
8,000.00	3.13	350.04	7,979.85	423.37	-24.54	-423.39	0.22	-0.12	-3.36
8,025.00	3.04	348.10	8,004.81	424.69	-24.79	-424.71	0.55	-0.36	-7.76
8,050.00	3.04	347.80	8,029.78	425.99	-25.07	-426.01	0.06	0.00	-1.20
8,075.00	3.02	345.44	8,054.74	427.27	-25.37	-427.30	0.51	-0.08	-9.44
8,100.00	3.02	342.82	8,079.71	428.54	-25.73	-428.56	0.55	0.00	-10.48
8,125.00	3.00	343.01	8,104.68	429.80	-26.12	-429.82	0.09	-0.08	0.76
8,150.00	3.08	341.31	8,129.64	431.06	-26.53	-431.08	0.48	0.32	-6.80
8,175.00	2.89	339.70	8,154.61	432.29	-26.96	-432.31	0.83	-0.76	-6.44
8,200.00	2.77	339.91	8,179.58	433.44	-27.39	-433.47	0.48	-0.48	0.84
8,225.00	2.75	338.29	8,204.55	434.57	-27.82	-434.59	0.32	-0.08	-6.48
8,250.00	2.76	339.01	8,229.52	435.69	-28.25	-435.71	0.14	0.04	2.88
8,275.00	2.78	338.97	8,254.49	436.82	-28.69	-436.84	0.08	0.08	-0.16
8,300.00	2.64	339.44	8,279.46	437.92	-29.11	-437.95	0.57	-0.56	1.88
8,325.00	2.64	339.40	8,304.43	439.00	-29.51	-439.02	0.01	0.00	-0.16
8,350.00	2.62	337.99	8,329.41	440.07	-29.93	-440.09	0.27	-0.08	-5.64
8,375.00	2.75	336.92	8,354.38	441.15	-30.38	-441.17	0.56	0.52	-4.28
8,385.00	2.42	337.05	8,364.37	441.56	-30.55	-441.59	3.30	-3.30	1.30
Tie In - Tie In									
8,567.00	1.87	342.03	8,546.24	447.93	-32.97	-447.95	0.32	-0.30	2.74
First Phoenix MWD Survey									
8,591.00	1.87	340.70	8,570.23	448.67	-33.22	-448.70	0.18	0.00	-5.54
8,623.00	0.35	327.89	8,602.22	449.24	-33.44	-449.27	4.78	-4.75	-40.03
8,654.00	2.68	169.32	8,633.21	448.61	-33.36	-448.64	9.70	7.52	-511.52
8,685.00	5.66	170.71	8,664.13	446.39	-32.98	-446.42	9.62	9.61	4.48
8,716.00	8.83	173.19	8,694.88	442.52	-32.45	-442.55	10.27	10.23	8.00
8,747.00	12.37	175.25	8,725.34	436.84	-31.89	-436.87	11.48	11.42	6.65
8,779.00	16.63	177.08	8,756.32	428.85	-31.37	-428.88	13.39	13.31	5.72
8,811.00	20.12	178.68	8,786.68	418.77	-31.01	-418.80	11.02	10.91	5.00
8,842.00	23.30	178.84	8,815.48	407.31	-30.77	-407.34	10.26	10.26	0.52
8,874.00	25.83	177.46	8,844.58	394.02	-30.33	-394.04	8.11	7.91	-4.31
8,905.00	29.00	176.93	8,872.09	379.76	-29.63	-379.79	10.26	10.23	-1.71
8,935.00	32.11	176.90	8,897.93	364.54	-28.81	-364.56	10.35	10.35	-0.10
FTP: 8935' MD									
8,936.00	32.21	176.90	8,898.77	364.00	-28.78	-364.03	10.35	10.35	-0.09
8,967.00	35.73	177.05	8,924.48	346.71	-27.86	-346.73	11.36	11.35	0.48
8,999.00	39.01	176.99	8,949.90	327.32	-26.85	-327.34	10.25	10.25	-0.19
9,030.00	42.22	176.68	8,973.43	307.17	-25.74	-307.19	10.38	10.35	-1.00
9,061.00	45.05	177.18	8,995.87	285.81	-24.60	-285.83	9.20	9.13	1.61
9,093.00	48.00	177.96	9,017.88	262.61	-23.61	-262.63	9.39	9.22	2.44



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 603H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RKB @ 3147.90usft (Ensign 155)
Site:	Quien Sabe Fed Com	MD Reference:	RKB @ 3147.90usft (Ensign 155)
Well:	603H	North Reference:	Grid
Wellbore:	OH \ 65012	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass

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)
9,124.00	50.84	178.82	9,038.05	239.08	-22.96	-239.10	9.40	9.16	2.77
9,156.00	53.12	179.01	9,057.76	213.88	-22.48	-213.90	7.14	7.13	0.59
9,187.00	55.09	179.11	9,075.93	188.77	-22.07	-188.79	6.36	6.35	0.32
9,218.00	57.78	179.16	9,093.07	162.94	-21.68	-162.96	8.68	8.68	0.16
9,249.00	60.20	179.37	9,109.04	136.38	-21.34	-136.40	7.83	7.81	0.68
9,281.00	61.87	179.59	9,124.53	108.38	-21.09	-108.40	5.25	5.22	0.69
9,312.00	63.22	179.55	9,138.83	80.88	-20.88	-80.89	4.36	4.35	-0.13
9,343.00	64.45	179.23	9,152.50	53.05	-20.58	-53.07	4.07	3.97	-1.03
9,375.00	66.29	178.29	9,165.83	23.97	-19.95	-23.99	6.34	5.75	-2.94
9,406.00	68.61	177.52	9,177.72	-4.63	-18.90	4.62	7.83	7.48	-2.48
9,436.00	70.48	177.04	9,188.20	-32.71	-17.57	32.69	6.41	6.23	-1.60
9,467.00	72.64	177.17	9,198.01	-62.08	-16.08	62.06	6.98	6.97	0.42
9,499.00	74.55	177.23	9,207.04	-92.74	-14.58	92.73	5.97	5.97	0.19
9,530.00	76.23	177.53	9,214.86	-122.70	-13.21	122.69	5.50	5.42	0.97
9,561.00	78.28	178.10	9,221.70	-152.92	-12.06	152.91	6.85	6.61	1.84
9,593.00	81.38	178.60	9,227.35	-184.40	-11.15	184.39	9.81	9.69	1.56
9,624.00	83.53	179.05	9,231.42	-215.12	-10.52	215.11	7.08	6.94	1.45
9,655.00	85.14	177.95	9,234.48	-245.96	-9.72	245.95	6.28	5.19	-3.55
9,686.00	86.57	177.75	9,236.72	-276.85	-8.56	276.84	4.66	4.61	-0.65
9,718.00	88.74	177.66	9,238.03	-308.80	-7.28	308.79	6.79	6.78	-0.28
9,749.00	88.70	177.39	9,238.72	-339.76	-5.94	339.76	0.88	-0.13	-0.87
9,843.00	89.57	178.27	9,240.14	-433.68	-2.38	433.68	1.32	0.93	0.94
9,937.00	90.25	178.30	9,240.29	-527.64	0.43	527.64	0.72	0.72	0.03
10,031.00	90.37	179.27	9,239.78	-621.61	2.43	621.62	1.04	0.13	1.03
10,124.00	89.09	179.46	9,240.22	-714.61	3.46	714.61	1.39	-1.38	0.20
10,218.00	90.08	179.43	9,240.90	-808.60	4.37	808.60	1.05	1.05	-0.03
10,313.00	88.61	180.72	9,241.99	-903.59	4.24	903.59	2.06	-1.55	1.36
10,407.00	89.51	180.78	9,243.53	-997.57	3.01	997.57	0.96	0.96	0.06
10,502.00	89.66	182.20	9,244.22	-1,092.53	0.54	1,092.53	1.50	0.16	1.49
10,596.00	89.60	181.30	9,244.83	-1,186.48	-2.33	1,186.48	0.96	-0.06	-0.96
10,711.00	86.65	177.49	9,248.59	-1,301.38	-1.12	1,301.38	4.19	-2.57	-3.31
10,805.00	86.47	177.08	9,254.23	-1,395.10	3.33	1,395.11	0.48	-0.19	-0.44
10,899.00	87.23	177.64	9,259.39	-1,488.86	7.65	1,488.87	1.00	0.81	0.60
10,991.00	87.53	178.11	9,263.60	-1,580.70	11.06	1,580.71	0.61	0.33	0.51
11,086.00	90.70	180.86	9,265.07	-1,675.67	11.91	1,675.68	4.42	3.34	2.89
11,180.00	86.60	180.33	9,267.28	-1,769.61	10.93	1,769.62	4.40	-4.36	-0.56
11,275.00	86.77	179.48	9,272.78	-1,864.45	11.09	1,864.46	0.91	0.18	-0.89
11,369.00	88.84	179.29	9,276.38	-1,958.37	12.10	1,958.38	2.21	2.20	-0.20
11,463.00	91.94	179.73	9,275.74	-2,052.36	12.90	2,052.37	3.33	3.30	0.47
11,557.00	90.45	180.07	9,273.78	-2,146.33	13.07	2,146.34	1.63	-1.59	0.36
11,651.00	90.33	179.46	9,273.14	-2,240.33	13.45	2,240.34	0.66	-0.13	-0.65
11,745.00	88.58	177.53	9,274.03	-2,334.29	15.92	2,334.30	2.77	-1.86	-2.05
11,839.00	88.11	177.85	9,276.74	-2,428.17	19.71	2,428.19	0.60	-0.50	0.34



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 603H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RKB @ 3147.90usft (Ensign 155)
Site:	Quien Sabe Fed Com	MD Reference:	RKB @ 3147.90usft (Ensign 155)
Well:	603H	North Reference:	Grid
Wellbore:	OH \ 65012	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass

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)	
11,934.00	89.74	179.21	9,278.53	-2,523.12	22.15	2,523.13	2.23	1.72	1.43	
12,029.00	90.90	180.69	9,278.00	-2,618.11	22.23	2,618.13	1.98	1.22	1.56	
12,123.00	89.22	180.96	9,277.90	-2,712.10	20.87	2,712.11	1.81	-1.79	0.29	
12,217.00	89.21	180.45	9,279.19	-2,806.08	19.72	2,806.10	0.54	-0.01	-0.54	
12,311.00	91.66	181.13	9,278.47	-2,900.06	18.42	2,900.08	2.70	2.61	0.72	
12,405.00	91.23	181.03	9,276.10	-2,994.02	16.65	2,994.03	0.47	-0.46	-0.11	
12,498.00	90.03	181.03	9,275.08	-3,086.99	14.98	3,087.00	1.29	-1.29	0.00	
12,592.00	89.52	180.55	9,275.45	-3,180.98	13.68	3,180.99	0.75	-0.54	-0.51	
12,686.00	89.82	180.16	9,275.99	-3,274.98	13.10	3,274.99	0.52	0.32	-0.41	
12,780.00	86.72	178.42	9,278.83	-3,368.91	14.26	3,368.92	3.78	-3.30	-1.85	
12,875.00	87.43	179.59	9,283.68	-3,463.77	15.91	3,463.79	1.44	0.75	1.23	
12,969.00	88.01	179.12	9,287.41	-3,557.69	16.97	3,557.71	0.79	0.62	-0.50	
13,064.00	88.17	179.08	9,290.58	-3,652.63	18.46	3,652.64	0.17	0.17	-0.04	
13,158.00	90.50	180.09	9,291.67	-3,746.61	19.14	3,746.63	2.70	2.48	1.07	
13,252.00	89.71	178.86	9,291.50	-3,840.60	20.00	3,840.62	1.56	-0.84	-1.31	
13,346.00	91.53	180.28	9,290.48	-3,934.59	20.71	3,934.61	2.46	1.94	1.51	
13,441.00	90.49	179.28	9,288.81	-4,029.57	21.07	4,029.59	1.52	-1.09	-1.05	
13,535.00	91.95	180.91	9,286.81	-4,123.55	20.92	4,123.56	2.33	1.55	1.73	
13,629.00	91.16	181.07	9,284.26	-4,217.50	19.29	4,217.51	0.86	-0.84	0.17	
13,722.00	91.97	180.76	9,281.72	-4,310.45	17.81	4,310.46	0.93	0.87	-0.33	
13,817.00	91.00	180.38	9,279.25	-4,405.41	16.86	4,405.42	1.10	-1.02	-0.40	
13,911.00	90.01	179.54	9,278.43	-4,499.40	16.93	4,499.42	1.38	-1.05	-0.89	
14,006.00	90.61	179.51	9,277.91	-4,594.40	17.72	4,594.41	0.63	0.63	-0.03	
14,100.00	90.30	180.90	9,277.16	-4,688.39	17.38	4,688.41	1.52	-0.33	1.48	
14,193.00	87.57	183.04	9,278.89	-4,781.31	14.19	4,781.32	3.73	-2.94	2.30	
14,288.00	87.06	182.98	9,283.34	-4,876.07	9.20	4,876.08	0.54	-0.54	-0.06	
14,381.00	89.02	182.55	9,286.52	-4,968.91	4.72	4,968.91	2.16	2.11	-0.46	
14,475.00	88.08	181.86	9,288.90	-5,062.80	1.10	5,062.80	1.24	-1.00	-0.73	
14,569.00	87.67	180.86	9,292.39	-5,156.71	-1.13	5,156.71	1.15	-0.44	-1.06	
14,663.00	87.45	180.31	9,296.39	-5,250.62	-2.08	5,250.62	0.63	-0.23	-0.59	
14,758.00	89.21	179.85	9,299.16	-5,345.58	-2.22	5,345.57	1.91	1.85	-0.48	
14,852.00	90.05	179.37	9,299.77	-5,439.57	-1.58	5,439.57	1.03	0.89	-0.51	
14,946.00	89.68	178.16	9,299.99	-5,533.55	0.45	5,533.55	1.35	-0.39	-1.29	
15,040.00	88.60	176.23	9,301.40	-5,627.42	5.05	5,627.42	2.35	-1.15	-2.05	
15,134.00	89.36	175.45	9,303.07	-5,721.15	11.87	5,721.16	1.16	0.81	-0.83	
15,228.00	91.10	178.17	9,302.69	-5,815.00	17.10	5,815.01	3.43	1.85	2.89	
15,324.00	91.78	181.42	9,300.28	-5,910.95	17.44	5,910.96	3.46	0.71	3.39	
15,418.00	91.86	181.98	9,297.30	-6,004.86	14.65	6,004.87	0.60	0.09	0.60	
15,511.00	91.54	181.06	9,294.54	-6,097.79	12.19	6,097.80	1.05	-0.34	-0.99	
15,605.00	90.68	179.98	9,292.72	-6,191.76	11.33	6,191.77	1.47	-0.91	-1.15	
15,700.00	90.60	179.34	9,291.65	-6,286.76	11.90	6,286.76	0.68	-0.08	-0.67	
15,794.00	91.01	178.99	9,290.33	-6,380.74	13.27	6,380.75	0.57	0.44	-0.37	
15,888.00	90.10	180.54	9,289.42	-6,474.73	13.65	6,474.74	1.91	-0.97	1.65	
15,982.00	88.43	181.79	9,290.63	-6,568.69	11.74	6,568.70	2.22	-1.78	1.33	



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 603H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RKB @ 3147.90usft (Ensign 155)
Site:	Quien Sabe Fed Com	MD Reference:	RKB @ 3147.90usft (Ensign 155)
Well:	603H	North Reference:	Grid
Wellbore:	OH \ 65012	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass

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)
16,076.00	88.86	181.10	9,292.85	-6,662.64	9.37	6,662.64	0.86	0.46	-0.73
16,169.00	87.77	180.35	9,295.59	-6,755.59	8.20	6,755.59	1.42	-1.17	-0.81
16,263.00	87.23	179.78	9,299.69	-6,849.50	8.09	6,849.50	0.83	-0.57	-0.61
16,357.00	88.59	179.97	9,303.12	-6,943.43	8.29	6,943.44	1.46	1.45	0.20
16,452.00	90.08	179.94	9,304.22	-7,038.42	8.37	7,038.43	1.57	1.57	-0.03
16,545.00	90.07	179.49	9,304.10	-7,131.42	8.83	7,131.43	0.48	-0.01	-0.48
16,640.00	89.80	178.89	9,304.20	-7,226.41	10.17	7,226.42	0.69	-0.28	-0.63
16,733.00	88.99	178.05	9,305.19	-7,319.37	12.66	7,319.38	1.25	-0.87	-0.90
16,828.00	90.26	179.73	9,305.81	-7,414.35	14.50	7,414.36	2.22	1.34	1.77
16,922.00	90.99	180.62	9,304.78	-7,508.34	14.21	7,508.35	1.22	0.78	0.95
17,016.00	90.89	180.72	9,303.24	-7,602.32	13.11	7,602.33	0.15	-0.11	0.11
17,111.00	91.07	179.74	9,301.62	-7,697.30	12.73	7,697.31	1.05	0.19	-1.03
17,204.00	91.61	179.40	9,299.44	-7,790.28	13.43	7,790.28	0.69	0.58	-0.37
17,298.00	92.64	179.02	9,295.95	-7,884.20	14.72	7,884.21	1.17	1.10	-0.40
17,393.00	91.56	180.12	9,292.47	-7,979.13	15.43	7,979.14	1.62	-1.14	1.16
17,485.00	91.08	180.81	9,290.35	-8,071.10	14.69	8,071.11	0.91	-0.52	0.75
17,580.00	89.42	180.59	9,289.94	-8,166.09	13.53	8,166.10	1.76	-1.75	-0.23
17,674.00	88.86	181.14	9,291.35	-8,260.07	12.11	8,260.08	0.83	-0.60	0.59
17,768.00	88.56	180.42	9,293.47	-8,354.04	10.83	8,354.04	0.83	-0.32	-0.77
17,863.00	88.67	179.61	9,295.76	-8,449.01	10.80	8,449.01	0.86	0.12	-0.85
17,955.00	88.89	179.58	9,297.72	-8,540.98	11.45	8,540.99	0.24	0.24	-0.03
18,050.00	89.24	179.42	9,299.27	-8,635.97	12.28	8,635.98	0.41	0.37	-0.17
18,144.00	88.07	178.57	9,301.48	-8,729.93	13.93	8,729.93	1.54	-1.24	-0.90
18,238.00	88.90	179.19	9,303.96	-8,823.87	15.77	8,823.88	1.10	0.88	0.66
18,332.00	91.56	179.59	9,303.59	-8,917.86	16.77	8,917.87	2.86	2.83	0.43
18,427.00	91.44	180.23	9,301.10	-9,012.83	16.92	9,012.84	0.69	-0.13	0.67
18,521.00	89.75	179.28	9,300.12	-9,106.81	17.32	9,106.83	2.06	-1.80	-1.01
18,615.00	91.72	179.54	9,298.92	-9,200.80	18.29	9,200.81	2.11	2.10	0.28
18,710.00	92.25	179.36	9,295.63	-9,295.74	19.20	9,295.75	0.59	0.56	-0.19
18,804.00	92.23	179.12	9,291.95	-9,389.66	20.45	9,389.67	0.26	-0.02	-0.26
18,898.00	94.65	179.90	9,286.31	-9,483.48	21.25	9,483.49	2.70	2.57	0.83
18,992.00	89.98	179.61	9,282.52	-9,577.37	21.65	9,577.39	4.98	-4.97	-0.31
19,019.00	90.19	179.66	9,282.48	-9,604.37	21.82	9,604.39	0.81	0.79	0.20
LTP: 19019' MD									
19,082.00	90.69	179.79	9,281.99	-9,667.38	22.12	9,667.38	0.81	0.79	0.20
Final Phoenix MWD Survey									
19,149.00	90.69	179.79	9,281.19	-9,734.37	22.37	9,734.37	0.00	0.00	0.00
Projection to TD									



Survey Report



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Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RKB @ 3147.90usft (Ensign 155)
Site:	Quien Sabe Fed Com	MD Reference:	RKB @ 3147.90usft (Ensign 155)
Well:	603H	North Reference:	Grid
Wellbore:	OH \ 65012	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
8,385.00	8,364.37	441.56	-30.55	Tie In
8,385.00	8,364.37	441.56	-30.55	Tie In
8,567.00	8,546.24	447.93	-32.97	First Phoenix MWD Survey
8,935.00	8,897.93	364.54	-28.81	FTP: 8935' MD
19,019.00	9,282.48	-9,604.37	21.82	LTP: 19019' MD
19,082.00	9,281.99	-9,667.36	22.12	Final Phoenix MWD Survey
19,149.00	9,281.19	-9,734.36	22.37	Projection to TD