

COG Operating LLC

Lea County, NM (NAD27 NME)

TigerCat Federal Com

4H

OH / 62736

Design: Surveys (Precision 595)

Standard Survey Report

16 May, 2018

HOBBS OCD

NOV 09 2018

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Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	RKB @ 3348.90usft (Precision 595)
Site:	Tigercat Federal Com	MD Reference:	RKB @ 3348.90usft (Precision 595)
Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	Database:	USA Compass

Project	Lea 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	Tigercat Federal Com		
Site Position:		Northing:	387,851.40 usft
From:	Map	Easting:	728,086.50 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 3' 51.04810 N
		Longitude:	103° 35' 49.39224 W
		Grid Convergence:	0.39 °

Well	4H		
Well Position	+N/-S	0.00 usft	Northing: 387,851.38 usft
	+E/-W	0.00 usft	Easting: 728,056.20 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft
		Latitude:	32° 3' 51.05000 N
		Longitude:	103° 35' 49.74433 W
		Ground Level:	3,323.90 usft

Wellbore	OH / 62736		
Magnetics	Model Name	Sample Date	Declination
			(°)
	MVHD	5/14/2018	6.75
			(°)
			59.75
			47,846.22753134

Design	Surveys (Precision 595)		
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
			179.57

Survey Program	Date 5/16/2018		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		
75.00	9,380.00	VES Gyro Surveys (OH / 62736)	NS-GYRO-MS
9,380.00	15,066.00	Phoenix MWD Surveys (OH / 62736)	MWD+HDGM
			North sensing gyrocompassing m/s
			OWSG Rev.2 MWD + HDGM

Survey									
Measured Depth	Inclination	Azimuth	Vertical Depth	+N/-S	+E/-W	Vertical Section	Dogleg Rate	Build Rate	Turn Rate
(usft)	(°)	(°)	(usft)	(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
75.00	0.22	8.01	75.00	0.14	0.02	-0.14	0.29	0.29	0.00
100.00	0.39	355.96	100.00	0.27	0.02	-0.27	0.72	0.68	-48.20
125.00	0.45	338.28	125.00	0.45	-0.02	-0.45	0.57	0.24	-70.72
150.00	0.62	322.23	150.00	0.65	-0.14	-0.65	0.90	0.68	-64.20
175.00	0.65	318.60	175.00	0.86	-0.32	-0.86	0.20	0.12	-14.52
200.00	0.69	317.39	199.99	1.08	-0.51	-1.08	0.17	0.16	-4.84
225.00	0.66	314.25	224.99	1.29	-0.72	-1.30	0.19	-0.12	-12.56
250.00	0.61	324.63	249.99	1.50	-0.90	-1.51	0.50	-0.20	41.52
275.00	0.73	320.81	274.99	1.73	-1.08	-1.74	0.51	0.48	-15.28

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Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	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	0.74	321.30	299.99	1.98	-1.28	-1.99	0.05	0.04	1.96
325.00	0.70	304.25	324.99	2.19	-1.50	-2.20	0.87	-0.16	-68.20
350.00	0.71	310.32	349.98	2.38	-1.75	-2.39	0.30	0.04	24.28
375.00	0.65	301.42	374.98	2.55	-1.99	-2.57	0.49	-0.24	-35.60
400.00	0.62	306.65	399.98	2.71	-2.22	-2.72	0.26	-0.12	20.92
425.00	0.53	303.22	424.98	2.85	-2.42	-2.87	0.39	-0.36	-13.72
450.00	0.58	314.48	449.98	3.00	-2.61	-3.02	0.48	0.20	45.04
475.00	0.72	301.33	474.98	3.17	-2.83	-3.20	0.81	0.56	-52.60
500.00	0.74	302.30	499.97	3.34	-3.10	-3.37	0.09	0.08	3.88
525.00	0.67	293.98	524.97	3.49	-3.38	-3.51	0.50	-0.28	-33.28
550.00	0.61	292.46	549.97	3.60	-3.63	-3.63	0.25	-0.24	-6.08
575.00	0.64	293.49	574.97	3.70	-3.88	-3.73	0.13	0.12	4.12
600.00	0.76	300.97	599.97	3.85	-4.15	-3.88	0.60	0.48	29.92
625.00	0.82	296.74	624.97	4.01	-4.45	-4.05	0.33	0.24	-16.92
650.00	0.75	291.82	649.96	4.15	-4.77	-4.19	0.39	-0.28	-19.68
675.00	0.80	288.87	674.96	4.27	-5.08	-4.31	0.26	0.20	-11.80
700.00	0.86	303.19	699.96	4.43	-5.41	-4.47	0.86	0.24	57.28
725.00	0.92	292.82	724.95	4.61	-5.75	-4.65	0.69	0.24	-41.48
750.00	0.99	292.76	749.95	4.77	-6.13	-4.82	0.28	0.28	-0.24
775.00	0.92	305.80	774.95	4.97	-6.49	-5.02	0.91	-0.28	52.16
800.00	0.99	296.93	799.94	5.19	-6.85	-5.24	0.65	0.28	-35.48
825.00	0.99	307.19	824.94	5.42	-7.21	-5.47	0.71	0.00	41.04
850.00	1.15	307.74	849.94	5.70	-7.58	-5.76	0.64	0.64	2.20
875.00	1.06	297.85	874.93	5.96	-7.99	-6.02	0.84	-0.36	-39.56
900.00	0.84	302.37	899.93	6.17	-8.35	-6.23	0.93	-0.88	18.08
925.00	0.83	297.38	924.93	6.35	-8.66	-6.41	0.29	-0.04	-19.96
950.00	0.88	303.86	949.92	6.54	-8.98	-6.61	0.44	0.20	25.92
975.00	0.96	298.48	974.92	6.75	-9.33	-6.82	0.47	0.32	-21.52
1,000.00	0.86	294.81	999.92	6.92	-9.68	-7.00	0.46	-0.40	-14.68
1,025.00	0.87	300.03	1,024.91	7.10	-10.01	-7.17	0.32	0.04	20.88
1,050.00	0.96	303.54	1,049.91	7.31	-10.35	-7.39	0.42	0.36	14.04
1,075.00	1.01	303.25	1,074.91	7.55	-10.71	-7.63	0.20	0.20	-1.16
1,100.00	1.07	306.09	1,099.90	7.80	-11.09	-7.89	0.32	0.24	11.36
1,125.00	1.44	298.96	1,124.90	8.09	-11.55	-8.18	1.60	1.48	-28.52
1,150.00	1.55	300.84	1,149.89	8.42	-12.11	-8.51	0.48	0.44	7.52
1,175.00	2.27	305.73	1,174.87	8.88	-12.81	-8.98	2.95	2.88	19.56
1,200.00	2.72	303.82	1,199.85	9.50	-13.70	-9.60	1.83	1.80	-7.64
1,225.00	3.19	300.80	1,224.82	10.19	-14.79	-10.30	1.98	1.88	-12.08
1,250.00	3.76	299.09	1,249.77	10.94	-16.10	-11.06	2.32	2.28	-6.84
1,275.00	4.55	300.51	1,274.71	11.84	-17.68	-11.98	3.19	3.16	5.68
1,300.00	4.78	299.17	1,299.62	12.85	-19.44	-13.00	1.02	0.92	-5.36
1,325.00	4.86	300.78	1,324.53	13.90	-21.26	-14.06	0.63	0.32	6.44
1,350.00	5.22	299.88	1,349.44	15.01	-23.15	-15.19	1.47	1.44	-3.60

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Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	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)
1,375.00	5.27	300.29	1,374.33	16.16	-25.13	-16.35	0.25	0.20	1.64
1,400.00	5.24	299.19	1,399.23	17.29	-27.12	-17.50	0.42	-0.12	-4.40
1,425.00	5.27	298.65	1,424.12	18.40	-29.12	-18.62	0.23	0.12	-2.16
1,450.00	5.18	298.85	1,449.02	19.50	-31.12	-19.73	0.37	-0.36	0.80
1,475.00	5.23	299.30	1,473.92	20.60	-33.10	-20.85	0.26	0.20	1.80
1,500.00	5.22	298.96	1,498.81	21.71	-35.09	-21.97	0.13	-0.04	-1.36
1,525.00	5.25	298.61	1,523.71	22.81	-37.09	-23.08	0.18	0.12	-1.40
1,550.00	5.26	298.99	1,548.60	23.91	-39.10	-24.20	0.14	0.04	1.52
1,575.00	5.38	300.10	1,573.49	25.05	-41.11	-25.36	0.63	0.48	4.44
1,600.00	5.38	298.94	1,598.38	26.21	-43.15	-26.53	0.44	0.00	-4.64
1,625.00	5.50	298.85	1,623.27	27.35	-45.23	-27.69	0.48	0.48	-0.36
1,650.00	5.58	298.69	1,648.15	28.51	-47.34	-28.87	0.33	0.32	-0.64
1,675.00	5.59	299.21	1,673.04	29.69	-49.47	-30.06	0.21	0.04	2.08
1,700.00	5.62	299.39	1,697.92	30.89	-51.60	-31.27	0.14	0.12	0.72
1,725.00	5.62	299.26	1,722.80	32.09	-53.74	-32.49	0.05	0.00	-0.52
1,750.00	5.69	300.93	1,747.67	33.32	-55.87	-33.74	0.72	0.28	6.68
1,775.00	5.77	300.63	1,772.55	34.60	-58.01	-35.03	0.34	0.32	-1.20
1,800.00	5.74	299.76	1,797.42	35.86	-60.18	-36.31	0.37	-0.12	-3.48
1,825.00	5.75	299.51	1,822.30	37.10	-62.35	-37.56	0.11	0.04	-1.00
1,850.00	5.89	301.13	1,847.17	38.38	-64.54	-38.86	0.86	0.56	6.48
1,875.00	6.01	300.71	1,872.03	39.71	-66.76	-40.21	0.51	0.48	-1.68
1,900.00	6.30	297.48	1,896.89	41.01	-69.11	-41.53	1.81	1.16	-12.92
1,925.00	6.41	296.81	1,921.74	42.27	-71.57	-42.81	0.53	0.44	-2.68
1,950.00	6.45	296.92	1,946.58	43.54	-74.07	-44.09	0.17	0.16	0.44
1,975.00	6.69	296.83	1,971.42	44.83	-76.62	-45.40	0.96	0.96	-0.36
2,000.00	6.61	296.73	1,996.25	46.13	-79.20	-46.73	0.32	-0.32	-0.40
2,025.00	6.74	298.07	2,021.08	47.47	-81.78	-48.08	0.81	0.52	5.36
2,050.00	6.83	297.97	2,045.90	48.86	-84.39	-49.49	0.36	0.36	-0.40
2,075.00	6.87	299.16	2,070.72	50.28	-87.01	-50.94	0.59	0.16	4.76
2,100.00	6.98	298.05	2,095.54	51.73	-89.65	-52.40	0.69	0.44	-4.44
2,125.00	7.01	298.86	2,120.36	53.18	-92.33	-53.87	0.41	0.12	-3.24
2,150.00	7.09	299.31	2,145.17	54.67	-95.01	-55.38	0.39	0.32	1.80
2,175.00	7.10	299.13	2,169.98	56.18	-97.71	-56.91	0.10	0.04	-0.72
2,200.00	7.13	299.39	2,194.78	57.69	-100.41	-58.44	0.18	0.12	1.04
2,225.00	7.16	299.15	2,219.59	59.21	-103.12	-59.98	0.17	0.12	-0.96
2,250.00	7.14	298.60	2,244.39	60.71	-105.85	-61.51	0.29	-0.08	-2.20
2,275.00	7.19	298.45	2,269.20	62.20	-108.59	-63.02	0.21	0.20	-0.60
2,300.00	7.18	298.34	2,294.00	63.69	-111.34	-64.52	0.07	-0.04	-0.44
2,325.00	7.21	298.81	2,318.81	65.19	-114.09	-66.04	0.26	0.12	1.88
2,350.00	7.23	298.29	2,343.61	66.69	-116.85	-67.56	0.27	0.08	-2.08
2,375.00	7.03	298.47	2,368.41	68.16	-119.58	-69.06	0.80	-0.80	0.72
2,400.00	6.87	298.23	2,393.23	69.60	-122.24	-70.52	0.65	-0.64	-0.96
2,425.00	6.70	297.89	2,418.06	70.99	-124.85	-71.92	0.70	-0.68	-1.36

Survey Report

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Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	Database:	USA Compass

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	6.62	298.15	2,442.89	72.35	-127.40	-73.31	0.34	-0.32	1.04
2,475.00	6.60	297.91	2,467.72	73.70	-129.94	-74.68	0.14	-0.08	-0.96
2,500.00	6.58	297.48	2,492.56	75.04	-132.49	-76.03	0.21	-0.08	-1.72
2,525.00	6.48	297.60	2,517.39	76.35	-135.01	-77.36	0.40	-0.40	0.48
2,550.00	6.47	297.95	2,542.23	77.67	-137.50	-78.70	0.16	-0.04	1.40
2,575.00	6.46	297.07	2,567.08	78.97	-140.00	-80.01	0.40	-0.04	-3.52
2,600.00	6.39	295.77	2,591.92	80.21	-142.50	-81.28	0.65	-0.28	-5.20
2,625.00	6.34	295.06	2,616.76	81.40	-145.01	-82.49	0.37	-0.20	-2.84
2,650.00	6.25	294.49	2,641.61	82.55	-147.49	-83.65	0.44	-0.36	-2.28
2,675.00	6.29	294.25	2,666.46	83.68	-149.98	-84.80	0.19	0.16	-0.96
2,700.00	6.21	294.31	2,691.32	84.80	-152.46	-85.94	0.32	-0.32	0.24
2,725.00	6.07	293.74	2,716.17	85.88	-154.90	-87.04	0.61	-0.56	-2.28
2,750.00	5.79	294.47	2,741.04	86.94	-157.26	-88.12	1.16	-1.12	2.92
2,775.00	5.49	294.91	2,765.92	87.96	-159.49	-89.16	1.21	-1.20	1.76
2,800.00	5.12	295.91	2,790.81	88.96	-161.58	-90.17	1.53	-1.48	4.00
2,825.00	4.99	296.56	2,815.71	89.93	-163.56	-91.15	0.57	-0.52	2.60
2,850.00	4.90	296.70	2,840.62	90.90	-165.49	-92.13	0.36	-0.36	0.56
2,875.00	4.93	296.98	2,865.53	91.86	-167.40	-93.12	0.15	0.12	1.12
2,900.00	4.89	297.52	2,890.44	92.84	-169.30	-94.11	0.24	-0.16	2.16
2,925.00	4.83	297.84	2,915.35	93.83	-171.17	-95.11	0.26	-0.24	1.28
2,950.00	4.83	298.74	2,940.26	94.82	-173.03	-96.12	0.30	0.00	3.60
2,975.00	4.95	298.99	2,965.17	95.85	-174.89	-97.16	0.49	0.48	1.00
3,000.00	4.90	300.16	2,990.07	96.91	-176.76	-98.24	0.45	-0.20	4.68
3,025.00	5.01	303.16	3,014.98	98.04	-178.60	-99.38	1.13	0.44	12.00
3,050.00	4.99	301.73	3,039.89	99.21	-180.44	-100.57	0.50	-0.08	-5.72
3,075.00	5.04	302.06	3,064.79	100.37	-182.29	-101.73	0.23	0.20	1.32
3,100.00	5.14	301.67	3,089.69	101.54	-184.18	-102.92	0.42	0.40	-1.56
3,125.00	5.34	300.35	3,114.59	102.72	-186.13	-104.11	0.93	0.80	-5.28
3,150.00	5.69	298.45	3,139.47	103.89	-188.23	-105.30	1.58	1.40	-7.60
3,175.00	5.78	297.70	3,164.35	105.07	-190.43	-106.50	0.47	0.36	-3.00
3,200.00	5.89	298.89	3,189.22	106.27	-192.67	-107.72	0.65	0.44	4.76
3,225.00	5.77	297.84	3,214.09	107.48	-194.90	-108.94	0.64	-0.48	-4.20
3,250.00	5.74	297.55	3,238.96	108.65	-197.12	-110.12	0.17	-0.12	-1.16
3,275.00	5.61	298.61	3,263.84	109.81	-199.30	-111.30	0.67	-0.52	4.24
3,300.00	5.68	298.31	3,288.72	110.98	-201.47	-112.49	0.30	0.28	-1.20
3,325.00	5.65	298.45	3,313.60	112.15	-203.64	-113.68	0.13	-0.12	0.56
3,350.00	5.68	298.90	3,338.47	113.34	-205.80	-114.88	0.21	0.12	1.80
3,375.00	5.71	297.89	3,363.35	114.52	-207.98	-116.08	0.42	0.12	-4.04
3,400.00	5.82	294.40	3,388.22	115.62	-210.24	-117.20	1.47	0.44	-13.96
3,425.00	6.00	291.65	3,413.09	116.63	-212.61	-118.22	1.34	0.72	-11.00
3,450.00	6.00	291.08	3,437.95	117.58	-215.04	-119.19	0.24	0.00	-2.28
3,475.00	6.01	290.93	3,462.82	118.52	-217.48	-120.15	0.07	0.04	-0.60
3,500.00	6.07	291.78	3,487.68	119.48	-219.93	-121.12	0.43	0.24	3.40
3,525.00	6.08	292.01	3,512.54	120.46	-222.39	-122.13	0.11	0.04	0.92

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	RKB @ 3348.90usft (Precision 595)
Site:	Tigercat Federal Com	MD Reference:	RKB @ 3348.90usft (Precision 595)
Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	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	6.11	292.82	3,537.40	121.47	-224.84	-123.16	0.36	0.12	3.24
3,575.00	6.08	296.74	3,562.25	122.59	-227.25	-124.29	1.67	-0.12	15.68
3,600.00	6.05	297.87	3,587.11	123.80	-229.60	-125.52	0.49	-0.12	4.52
3,625.00	6.04	299.80	3,611.98	125.07	-231.90	-126.80	0.81	-0.04	7.72
3,650.00	6.07	301.68	3,636.84	126.42	-234.17	-128.17	0.80	0.12	7.52
3,675.00	5.99	304.83	3,661.70	127.85	-236.36	-129.63	1.36	-0.32	12.60
3,700.00	6.08	305.34	3,686.56	129.37	-238.51	-131.15	0.42	0.36	2.04
3,725.00	6.00	305.22	3,711.42	130.89	-240.66	-132.69	0.32	-0.32	-0.48
3,750.00	6.07	303.92	3,736.28	132.38	-242.83	-134.19	0.61	0.28	-5.20
3,775.00	6.00	299.20	3,761.14	133.75	-245.06	-135.59	2.00	-0.28	-18.88
3,800.00	6.07	297.65	3,786.01	135.00	-247.37	-136.85	0.71	0.28	-6.20
3,825.00	6.09	297.07	3,810.86	136.22	-249.73	-138.09	0.26	0.08	-2.32
3,850.00	6.12	296.14	3,835.72	137.41	-252.10	-139.30	0.41	0.12	-3.72
3,875.00	6.21	296.17	3,860.58	138.59	-254.51	-140.50	0.36	0.36	0.12
3,900.00	6.07	296.77	3,885.43	139.78	-256.91	-141.71	0.62	-0.56	2.40
3,925.00	6.14	297.11	3,910.29	140.99	-259.28	-142.93	0.32	0.28	1.36
3,950.00	6.11	298.61	3,935.15	142.24	-261.64	-144.20	0.65	-0.12	6.00
3,975.00	6.15	299.51	3,960.01	143.53	-263.97	-145.51	0.42	0.16	3.60
4,000.00	6.11	299.04	3,984.86	144.84	-266.30	-146.83	0.26	-0.16	-1.88
4,025.00	6.10	298.24	4,009.72	146.11	-268.63	-148.12	0.34	-0.04	-3.20
4,050.00	6.08	297.19	4,034.58	147.35	-270.98	-149.38	0.45	-0.08	-4.20
4,075.00	6.13	297.22	4,059.44	148.56	-273.34	-150.61	0.20	0.20	0.12
4,100.00	6.20	296.65	4,084.30	149.78	-275.74	-151.84	0.37	0.28	-2.28
4,125.00	6.08	296.59	4,109.15	150.98	-278.13	-153.06	0.48	-0.48	-0.24
4,150.00	6.23	295.35	4,134.01	152.15	-280.54	-154.25	0.80	0.60	-4.96
4,175.00	6.21	297.02	4,158.86	153.34	-282.97	-155.46	0.73	-0.08	6.68
4,200.00	6.26	297.83	4,183.71	154.59	-285.38	-156.73	0.40	0.20	3.24
4,225.00	6.22	298.09	4,208.56	155.87	-287.78	-158.02	0.20	-0.16	1.04
4,250.00	6.43	298.73	4,233.41	157.18	-290.20	-159.35	0.89	0.84	2.56
4,275.00	6.36	298.88	4,258.26	158.52	-292.64	-160.71	0.29	-0.28	0.60
4,300.00	6.34	299.34	4,283.10	159.87	-295.06	-162.08	0.22	-0.08	1.84
4,325.00	6.40	298.80	4,307.95	161.21	-297.48	-163.44	0.34	0.24	-2.16
4,350.00	6.30	298.66	4,332.80	162.54	-299.90	-164.79	0.40	-0.40	-0.56
4,375.00	6.37	298.95	4,357.64	163.87	-302.32	-166.14	0.31	0.28	1.16
4,400.00	6.34	298.82	4,382.49	165.21	-304.74	-167.49	0.13	-0.12	-0.52
4,425.00	6.39	298.97	4,407.34	166.55	-307.17	-168.85	0.21	0.20	0.60
4,450.00	6.38	298.41	4,432.18	167.88	-309.61	-170.20	0.25	-0.04	-2.24
4,475.00	6.26	296.77	4,457.03	169.16	-312.05	-171.49	0.87	-0.48	-6.56
4,500.00	6.20	294.68	4,481.88	170.33	-314.49	-172.69	0.94	-0.24	-8.36
4,525.00	6.12	293.97	4,506.74	171.44	-316.94	-173.81	0.44	-0.32	-2.84
4,550.00	6.18	293.90	4,531.59	172.53	-319.38	-174.92	0.24	0.24	-0.28
4,575.00	5.98	290.52	4,556.45	173.53	-321.83	-175.94	1.64	-0.80	-13.52
4,600.00	6.04	290.59	4,581.31	174.45	-324.29	-176.88	0.24	0.24	0.28

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	RKB @ 3348.90usft (Precision 595)
Site:	Tigercat Federal Com	MD Reference:	RKB @ 3348.90usft (Precision 595)
Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	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	5.94	289.28	4,606.18	175.34	-326.74	-177.78	0.68	-0.40	-5.24
4,650.00	5.99	288.89	4,631.04	176.19	-329.19	-178.65	0.26	0.20	-1.56
4,675.00	6.01	288.46	4,655.91	177.02	-331.67	-179.51	0.20	0.08	-1.72
4,700.00	6.01	288.28	4,680.77	177.85	-334.15	-180.35	0.08	0.00	-0.72
4,725.00	6.06	288.11	4,705.63	178.67	-336.65	-181.19	0.21	0.20	-0.68
4,750.00	6.06	288.24	4,730.49	179.49	-339.16	-182.03	0.05	0.00	0.52
4,775.00	6.16	288.33	4,755.35	180.33	-341.68	-182.89	0.40	0.40	0.36
4,800.00	6.04	287.97	4,780.21	181.15	-344.21	-183.73	0.50	-0.48	-1.44
4,825.00	6.11	288.23	4,805.07	181.98	-346.72	-184.57	0.30	0.28	1.04
4,850.00	6.00	287.16	4,829.93	182.78	-349.24	-185.39	0.63	-0.44	-4.28
4,875.00	6.08	286.97	4,854.79	183.55	-351.75	-186.18	0.33	0.32	-0.76
4,900.00	6.05	287.22	4,879.65	184.33	-354.28	-186.98	0.16	-0.12	-1.00
4,925.00	6.14	287.29	4,904.51	185.11	-356.81	-187.79	0.36	0.36	0.28
4,950.00	6.11	287.12	4,929.36	185.90	-359.36	-188.59	0.14	-0.12	-0.68
4,975.00	6.13	287.11	4,954.22	186.69	-361.91	-189.40	0.08	0.08	-0.04
5,000.00	6.13	286.77	4,979.08	187.47	-364.46	-190.20	0.15	0.00	-1.36
5,025.00	5.94	286.88	5,003.94	188.23	-366.97	-190.97	0.76	-0.76	0.44
5,050.00	6.01	286.02	5,028.80	188.96	-369.47	-191.73	0.45	0.28	-3.44
5,075.00	5.95	286.22	5,053.67	189.69	-371.97	-192.47	0.25	-0.24	0.80
5,100.00	5.95	286.01	5,078.53	190.41	-374.46	-193.21	0.09	0.00	-0.84
5,125.00	5.80	285.88	5,103.40	191.11	-376.92	-193.93	0.60	-0.60	-0.52
5,150.00	5.78	286.16	5,128.27	191.80	-379.35	-194.65	0.14	-0.08	1.12
5,175.00	5.84	285.84	5,153.15	192.50	-381.78	-195.36	0.27	0.24	-1.28
5,200.00	5.65	286.50	5,178.02	193.20	-384.18	-196.08	0.80	-0.76	2.64
5,225.00	5.59	286.84	5,202.90	193.90	-386.53	-196.80	0.27	-0.24	1.36
5,250.00	5.11	288.08	5,227.79	194.60	-388.75	-197.51	1.97	-1.92	4.96
5,275.00	5.00	289.03	5,252.69	195.30	-390.84	-198.23	0.55	-0.44	3.80
5,300.00	4.83	288.68	5,277.60	195.99	-392.87	-198.93	0.69	-0.68	-1.40
5,325.00	4.52	289.66	5,302.52	196.66	-394.79	-199.62	1.28	-1.24	3.92
5,350.00	4.17	291.98	5,327.45	197.33	-396.56	-200.30	1.57	-1.40	9.28
5,375.00	4.06	294.70	5,352.38	198.04	-398.21	-201.03	0.90	-0.44	10.88
5,400.00	4.08	294.28	5,377.32	198.78	-399.82	-201.77	0.14	0.08	-1.68
5,425.00	3.96	293.71	5,402.26	199.49	-401.43	-202.50	0.51	-0.48	-2.28
5,450.00	4.21	297.55	5,427.19	200.26	-403.03	-203.28	1.48	1.00	15.36
5,475.00	4.75	306.95	5,452.12	201.31	-404.67	-204.34	3.64	2.16	37.60
5,500.00	5.25	307.36	5,477.02	202.63	-406.41	-205.67	2.01	2.00	1.64
5,525.00	5.63	307.18	5,501.91	204.06	-408.29	-207.12	1.52	1.52	-0.72
5,550.00	6.22	305.11	5,526.78	205.58	-410.38	-208.65	2.51	2.36	-8.28
5,575.00	6.76	304.48	5,551.62	207.19	-412.70	-210.28	2.18	2.16	-2.52
5,600.00	7.12	303.12	5,576.43	208.87	-415.21	-211.98	1.58	1.44	-5.44
5,625.00	7.27	302.63	5,601.24	210.57	-417.84	-213.70	0.65	0.60	-1.96
5,650.00	7.42	302.09	5,626.03	212.28	-420.54	-215.43	0.66	0.60	-2.16
5,675.00	7.42	300.91	5,650.82	213.97	-423.29	-217.14	0.61	0.00	-4.72

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	RKB @ 3348.90usft (Precision 595)
Site:	Tigercat Federal Com	MD Reference:	RKB @ 3348.90usft (Precision 595)
Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	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	7.38	299.66	5,675.61	215.59	-426.07	-218.78	0.66	-0.16	-5.00
5,725.00	7.41	298.68	5,700.41	217.16	-428.88	-220.37	0.52	0.12	-3.92
5,750.00	7.37	296.30	5,725.20	218.64	-431.73	-221.88	1.23	-0.16	-9.52
5,775.00	7.08	293.86	5,750.00	219.98	-434.58	-223.23	1.69	-1.16	-9.76
5,800.00	7.05	292.92	5,774.81	221.20	-437.40	-224.48	0.48	-0.12	-3.76
5,825.00	7.09	293.09	5,799.62	222.40	-440.23	-225.70	0.18	0.16	0.68
5,850.00	7.05	292.76	5,824.43	223.60	-443.07	-226.92	0.23	-0.16	-1.32
5,875.00	6.64	292.59	5,849.25	224.75	-445.82	-228.09	1.64	-1.64	-0.68
5,900.00	6.42	292.34	5,874.09	225.84	-448.44	-229.19	0.89	-0.88	-1.00
5,925.00	5.15	291.90	5,898.96	226.79	-450.78	-230.16	5.08	-5.08	-1.76
5,950.00	5.06	292.33	5,923.86	227.62	-452.84	-231.01	0.39	-0.36	1.72
5,975.00	4.91	292.99	5,948.77	228.46	-454.84	-231.87	0.64	-0.60	2.64
6,000.00	5.16	300.05	5,973.67	229.44	-456.80	-232.86	2.67	1.00	28.24
6,025.00	5.25	303.34	5,998.57	230.63	-458.73	-234.07	1.25	0.36	13.16
6,050.00	5.33	304.95	6,023.46	231.93	-460.64	-235.38	0.67	0.32	6.44
6,075.00	5.32	304.60	6,048.35	233.25	-462.54	-236.71	0.14	-0.04	-1.40
6,100.00	5.29	304.89	6,073.25	234.57	-464.44	-238.05	0.16	-0.12	1.16
6,125.00	5.40	306.76	6,098.14	235.93	-466.33	-239.42	0.82	0.44	7.48
6,150.00	5.35	305.41	6,123.03	237.31	-468.22	-240.82	0.54	-0.20	-5.40
6,175.00	5.39	305.55	6,147.92	238.67	-470.13	-242.19	0.17	0.16	0.56
6,200.00	5.35	304.89	6,172.81	240.02	-472.04	-243.55	0.29	-0.16	-2.64
6,225.00	5.56	300.62	6,197.70	241.30	-474.04	-244.85	1.83	0.84	-17.08
6,250.00	5.65	298.26	6,222.58	242.50	-476.16	-246.07	0.99	0.36	-9.44
6,275.00	5.62	296.53	6,247.46	243.63	-478.34	-247.21	0.69	-0.12	-6.92
6,300.00	5.73	293.75	6,272.33	244.68	-480.58	-248.28	1.18	0.44	-11.12
6,325.00	5.74	293.14	6,297.21	245.67	-482.87	-249.29	0.25	0.04	-2.44
6,350.00	5.79	293.65	6,322.08	246.67	-485.18	-250.30	0.29	0.20	2.04
6,375.00	5.75	292.20	6,346.96	247.65	-487.49	-251.30	0.60	-0.16	-5.80
6,400.00	5.76	293.01	6,371.83	248.61	-489.81	-252.28	0.33	0.04	3.24
6,425.00	5.70	292.98	6,396.70	249.59	-492.10	-253.27	0.24	-0.24	-0.12
6,450.00	5.77	293.00	6,421.58	250.56	-494.40	-254.27	0.28	0.28	0.08
6,475.00	5.89	292.86	6,446.45	251.55	-496.74	-255.27	0.48	0.48	-0.56
6,500.00	5.78	294.36	6,471.32	252.57	-499.07	-256.31	0.75	-0.44	6.00
6,525.00	5.89	294.61	6,496.19	253.62	-501.38	-257.38	0.45	0.44	1.00
6,550.00	5.87	296.12	6,521.06	254.72	-503.70	-258.49	0.62	-0.08	6.04
6,575.00	5.89	298.47	6,545.93	255.89	-505.97	-259.68	0.97	0.08	9.40
6,600.00	5.83	298.86	6,570.80	257.12	-508.21	-260.93	0.29	-0.24	1.56
6,625.00	5.73	299.22	6,595.67	258.34	-510.42	-262.16	0.43	-0.40	1.44
6,650.00	5.65	299.61	6,620.55	259.56	-512.57	-263.40	0.36	-0.32	1.56
6,675.00	5.59	300.23	6,645.43	260.78	-514.70	-264.63	0.34	-0.24	2.48
6,700.00	5.59	300.41	6,670.31	262.01	-516.80	-265.88	0.07	0.00	0.72
6,725.00	5.41	300.83	6,695.19	263.23	-518.86	-267.12	0.74	-0.72	1.68
6,750.00	5.43	301.82	6,720.08	264.46	-520.88	-268.36	0.38	0.08	3.96
6,775.00	5.39	302.81	6,744.97	265.72	-522.87	-269.63	0.41	-0.16	3.96

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	RKB @ 3348.90usft (Precision 595)
Site:	Tigercat Federal Com	MD Reference:	RKB @ 3348.90usft (Precision 595)
Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	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	5.38	303.35	6,769.86	267.00	-524.84	-270.93	0.21	-0.04	2.16
6,825.00	5.40	305.51	6,794.75	268.32	-526.77	-272.27	0.82	0.08	8.64
6,850.00	5.36	306.57	6,819.64	269.70	-528.67	-273.66	0.43	-0.16	4.24
6,875.00	5.40	307.16	6,844.53	271.11	-530.54	-275.08	0.27	0.16	2.36
6,900.00	5.31	307.26	6,869.42	272.52	-532.40	-276.51	0.36	-0.36	0.40
6,925.00	5.33	307.85	6,894.31	273.93	-534.24	-277.94	0.23	0.08	2.36
6,950.00	5.26	308.20	6,919.20	275.35	-536.06	-279.37	0.31	-0.28	1.40
6,975.00	5.12	308.37	6,944.10	276.76	-537.83	-280.78	0.56	-0.56	0.68
7,000.00	5.04	308.59	6,969.00	278.13	-539.56	-282.17	0.33	-0.32	0.88
7,025.00	4.89	308.27	6,993.91	279.48	-541.26	-283.53	0.61	-0.60	-1.28
7,050.00	4.82	308.01	7,018.82	280.78	-542.92	-284.85	0.29	-0.28	-1.04
7,075.00	4.73	307.98	7,043.73	282.07	-544.56	-286.14	0.36	-0.36	-0.12
7,100.00	4.63	308.04	7,068.65	283.32	-546.17	-287.41	0.40	-0.40	0.24
7,125.00	4.64	308.32	7,093.57	284.57	-547.76	-288.67	0.10	0.04	1.12
7,150.00	4.74	305.98	7,118.49	285.80	-549.39	-289.92	0.86	0.40	-9.36
7,175.00	5.04	303.36	7,143.39	287.02	-551.14	-291.14	1.50	1.20	-10.48
7,200.00	5.60	298.09	7,168.29	288.19	-553.13	-292.34	2.97	2.24	-21.08
7,225.00	5.88	297.09	7,193.16	289.35	-555.35	-293.51	1.19	1.12	-4.00
7,250.00	5.98	296.88	7,218.03	290.52	-557.65	-294.70	0.41	0.40	-0.84
7,275.00	5.83	296.40	7,242.89	291.68	-559.95	-295.87	0.63	-0.60	-1.92
7,300.00	5.60	296.09	7,267.77	292.78	-562.18	-296.99	0.93	-0.92	-1.24
7,325.00	5.44	294.80	7,292.65	293.81	-564.35	-298.04	0.81	-0.64	-5.16
7,350.00	5.47	294.91	7,317.54	294.81	-566.51	-299.05	0.13	0.12	0.44
7,375.00	5.49	293.97	7,342.43	295.80	-568.68	-300.06	0.37	0.08	-3.76
7,400.00	5.56	294.65	7,367.31	296.79	-570.88	-301.06	0.38	0.28	2.72
7,425.00	5.78	295.99	7,392.19	297.85	-573.11	-302.14	1.03	0.88	5.36
7,450.00	6.16	299.31	7,417.05	299.05	-575.41	-303.36	2.05	1.52	13.28
7,475.00	6.35	299.62	7,441.90	300.39	-577.78	-304.72	0.77	0.76	1.24
7,500.00	6.44	299.25	7,466.75	301.76	-580.21	-306.11	0.40	0.36	-1.48
7,525.00	6.48	299.83	7,491.59	303.15	-582.65	-307.51	0.31	0.16	2.32
7,550.00	6.40	300.03	7,516.43	304.55	-585.09	-308.93	0.33	-0.32	0.80
7,575.00	6.31	300.75	7,541.28	305.95	-587.47	-310.35	0.48	-0.36	2.88
7,600.00	6.26	301.31	7,566.13	307.36	-589.82	-311.78	0.32	-0.20	2.24
7,625.00	6.23	301.73	7,590.98	308.78	-592.14	-313.21	0.22	-0.12	1.68
7,650.00	6.14	302.56	7,615.83	310.21	-594.42	-314.66	0.51	-0.36	3.32
7,675.00	6.01	302.23	7,640.69	311.63	-596.65	-316.10	0.54	-0.52	-1.32
7,700.00	5.94	302.27	7,665.56	313.02	-598.85	-317.50	0.28	-0.28	0.16
7,725.00	5.76	302.38	7,690.43	314.38	-601.00	-318.88	0.72	-0.72	0.44
7,750.00	5.59	302.09	7,715.31	315.70	-603.10	-320.22	0.69	-0.68	-1.16
7,775.00	5.45	303.90	7,740.19	317.01	-605.11	-321.54	0.89	-0.56	7.24
7,800.00	5.31	303.61	7,765.08	318.31	-607.06	-322.86	0.57	-0.56	-1.16
7,825.00	5.16	303.77	7,789.97	319.58	-608.96	-324.14	0.60	-0.60	0.64
7,850.00	5.03	303.23	7,814.88	320.80	-610.81	-325.38	0.55	-0.52	-2.16

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	RKB @ 3348.90usft (Precision 595)
Site:	Tigercat Federal Com	MD Reference:	RKB @ 3348.90usft (Precision 595)
Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	Database:	USA Compass

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Builde Rate (°/100usft)	Turn Rate (°/100usft)	
7,875.00	4.82	304.77	7,839.78	322.00	-612.59	-326.59	0.99	-0.84	6.16	
7,900.00	4.91	304.78	7,864.69	323.21	-614.33	-327.81	0.36	0.36	0.04	
7,925.00	4.77	304.37	7,889.60	324.41	-616.07	-329.02	0.58	-0.56	-1.64	
7,950.00	4.78	306.72	7,914.52	325.62	-617.76	-330.24	0.78	0.04	9.40	
7,975.00	4.75	305.23	7,939.43	326.84	-619.44	-331.48	0.51	-0.12	-5.96	
8,000.00	4.66	305.23	7,964.35	328.02	-621.12	-332.67	0.36	-0.36	0.00	
8,025.00	4.61	305.62	7,989.27	329.19	-622.76	-333.86	0.24	-0.20	1.56	
8,050.00	4.46	305.40	8,014.19	330.34	-624.37	-335.02	0.60	-0.60	-0.88	
8,075.00	4.41	306.09	8,039.11	331.47	-625.94	-336.16	0.29	-0.20	2.76	
8,100.00	4.25	306.38	8,064.04	332.58	-627.46	-337.28	0.65	-0.64	1.16	
8,125.00	4.31	305.64	8,088.97	333.68	-628.97	-338.39	0.33	0.24	-2.96	
8,150.00	4.23	299.50	8,113.90	334.68	-630.54	-339.41	1.86	-0.32	-24.56	
8,175.00	4.25	296.57	8,138.83	335.55	-632.17	-340.29	0.87	0.08	-11.72	
8,200.00	4.24	296.67	8,163.77	336.38	-633.82	-341.13	0.05	-0.04	0.40	
8,225.00	3.81	291.25	8,188.70	337.10	-635.42	-341.86	2.29	-1.72	-21.68	
8,250.00	3.18	281.17	8,213.66	337.53	-636.88	-342.30	3.51	-2.52	-40.32	
8,275.00	2.95	276.15	8,238.62	337.74	-638.20	-342.52	1.41	-0.92	-20.08	
8,300.00	2.97	269.36	8,263.59	337.80	-639.49	-342.59	1.40	0.08	-27.16	
8,325.00	2.76	270.20	8,288.56	337.79	-640.73	-342.59	0.86	-0.84	3.36	
8,350.00	2.86	271.11	8,313.53	337.81	-641.96	-342.61	0.44	0.40	3.64	
8,375.00	2.73	269.24	8,338.50	337.81	-643.18	-342.63	0.64	-0.52	-7.48	
8,400.00	2.74	269.90	8,363.47	337.80	-644.37	-342.63	0.13	0.04	2.64	
8,425.00	2.09	265.62	8,388.45	337.77	-645.42	-342.60	2.70	-2.60	-17.12	
8,450.00	1.19	244.79	8,413.44	337.62	-646.11	-342.46	4.26	-3.60	-83.32	
8,475.00	0.78	215.61	8,438.43	337.37	-646.45	-342.21	2.54	-1.64	-116.72	
8,500.00	0.68	215.00	8,463.43	337.11	-646.63	-341.95	0.40	-0.40	-2.44	
8,525.00	0.79	208.75	8,488.43	336.84	-646.80	-341.68	0.54	0.44	-25.00	
8,550.00	0.75	214.66	8,513.43	336.55	-646.98	-341.40	0.36	-0.16	23.64	
8,575.00	0.98	213.70	8,538.42	336.24	-647.19	-341.09	0.92	0.92	-3.84	
8,600.00	0.72	212.28	8,563.42	335.93	-647.39	-340.78	1.04	-1.04	-5.68	
8,625.00	0.72	218.33	8,588.42	335.67	-647.57	-340.52	0.30	0.00	24.20	
8,650.00	0.70	212.95	8,613.42	335.42	-647.75	-340.27	0.28	-0.08	-21.52	
8,675.00	0.77	210.79	8,638.41	335.15	-647.92	-340.00	0.30	0.28	-8.64	
8,700.00	0.65	213.15	8,663.41	334.89	-648.08	-339.74	0.49	-0.48	9.44	
8,725.00	0.71	209.08	8,688.41	334.63	-648.24	-339.49	0.31	0.24	-16.28	
8,750.00	0.93	205.74	8,713.41	334.31	-648.40	-339.17	0.90	0.88	-13.36	
8,775.00	0.80	214.15	8,738.41	333.99	-648.59	-338.85	0.73	-0.52	33.64	
8,800.00	0.86	213.17	8,763.40	333.69	-648.79	-338.55	0.25	0.24	-3.92	
8,825.00	0.65	205.27	8,788.40	333.40	-648.95	-338.26	0.94	-0.84	-31.60	
8,850.00	0.65	205.44	8,813.40	333.14	-649.07	-338.01	0.01	0.00	0.68	
8,875.00	0.55	207.36	8,838.40	332.91	-649.19	-337.77	0.41	-0.40	7.68	
8,900.00	0.56	209.04	8,863.40	332.70	-649.30	-337.56	0.08	0.04	6.72	
8,925.00	0.53	202.50	8,888.40	332.48	-649.41	-337.35	0.28	-0.12	-26.16	

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	RKB @ 3348.90usft (Precision 595)
Site:	Tigercat Federal Com	MD Reference:	RKB @ 3348.90usft (Precision 595)
Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	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)	
8,950.00	0.51	198.95	8,913.39	332.27	-649.49	-337.14	0.15	-0.08	-14.20	
8,975.00	0.52	202.05	8,938.39	332.06	-649.56	-336.93	0.12	0.04	12.40	
9,000.00	0.47	206.38	8,963.39	331.86	-649.65	-336.73	0.25	-0.20	17.32	
9,025.00	0.59	211.62	8,988.39	331.66	-649.77	-336.53	0.52	0.48	20.96	
9,050.00	0.48	223.29	9,013.39	331.48	-649.91	-336.34	0.62	-0.44	46.68	
9,075.00	0.62	228.67	9,038.39	331.31	-650.08	-336.18	0.60	0.56	21.52	
9,100.00	0.55	212.22	9,063.39	331.12	-650.24	-335.99	0.72	-0.28	-65.80	
9,125.00	0.56	225.84	9,088.39	330.93	-650.40	-335.80	0.53	0.04	54.48	
9,150.00	0.61	222.16	9,113.39	330.75	-650.57	-335.62	0.25	0.20	-14.72	
9,175.00	0.66	212.07	9,138.38	330.53	-650.74	-335.40	0.49	0.20	-40.36	
9,200.00	0.64	227.14	9,163.38	330.31	-650.92	-335.19	0.69	-0.08	60.28	
9,225.00	0.53	231.73	9,188.38	330.14	-651.11	-335.02	0.48	-0.44	18.36	
9,250.00	0.62	238.80	9,213.38	330.00	-651.32	-334.88	0.46	0.36	28.28	
9,275.00	0.60	225.80	9,238.38	329.84	-651.53	-334.72	0.56	-0.08	-52.00	
9,300.00	0.58	227.97	9,263.38	329.67	-651.71	-334.55	0.12	-0.08	8.68	
9,325.00	0.55	227.91	9,288.38	329.50	-651.90	-334.38	0.12	-0.12	-0.24	
9,350.00	0.73	235.28	9,313.37	329.33	-652.12	-334.21	0.79	0.72	29.48	
9,375.00	0.87	230.24	9,338.37	329.12	-652.39	-334.00	0.63	0.56	-20.16	
9,380.00	0.98	230.20	9,343.37	329.07	-652.46	-333.95	2.20	2.20	-0.80	
Tie In										
9,477.00	1.18	223.29	9,440.35	327.81	-653.78	-332.71	0.25	0.21	-7.12	
First Phoenix MWD Survey										
9,537.00	2.78	188.20	9,500.32	325.92	-654.41	-330.82	3.23	2.67	-58.48	
9,567.00	5.57	182.75	9,530.24	323.74	-654.58	-328.65	9.38	9.30	-18.17	
9,597.00	9.33	179.24	9,559.98	319.86	-654.62	-324.76	12.62	12.53	-11.70	
9,627.00	12.61	178.66	9,589.42	314.15	-654.51	-319.05	10.94	10.93	-1.93	
9,656.00	14.59	180.10	9,617.61	307.33	-654.44	-312.23	6.93	6.83	4.97	
9,701.00	14.99	200.13	9,661.15	296.19	-656.46	-301.11	11.34	0.89	44.51	
9,746.00	14.84	218.14	9,704.66	286.19	-662.02	-291.15	10.27	-0.33	40.02	
9,779.00	13.68	232.70	9,736.65	280.50	-667.74	-285.50	11.39	-3.52	44.12	
9,804.00	12.95	236.95	9,760.98	277.18	-672.44	-282.22	4.88	-2.92	17.00	
9,834.00	12.99	228.03	9,790.21	273.09	-677.76	-278.17	6.67	0.13	-29.73	
9,864.00	14.47	218.27	9,819.36	267.89	-682.59	-273.01	9.15	4.93	-32.53	
9,894.00	17.17	213.96	9,848.22	261.28	-687.39	-266.43	9.81	9.00	-14.37	
9,923.00	19.20	210.50	9,875.77	253.62	-692.20	-258.80	7.93	7.00	-11.93	
9,953.00	22.17	208.58	9,903.84	244.39	-697.41	-249.62	10.15	9.90	-6.40	
9,983.00	24.74	206.98	9,931.36	233.83	-702.97	-239.10	8.83	8.57	-5.33	
10,013.00	27.65	204.43	9,958.27	221.89	-708.70	-227.20	10.40	9.70	-8.50	
10,043.00	30.67	202.68	9,984.47	208.49	-714.53	-213.85	10.46	10.07	-5.83	
10,073.00	33.68	200.54	10,009.86	193.64	-720.40	-199.04	10.73	10.03	-7.13	
10,102.00	36.32	199.30	10,033.61	178.00	-726.06	-183.44	9.43	9.10	-4.28	
10,131.00	39.20	198.99	10,056.54	161.22	-731.88	-166.71	9.95	9.93	-1.07	
10,161.00	42.47	197.17	10,079.23	142.58	-737.96	-148.11	11.60	10.90	-6.07	
10,191.00	45.46	193.74	10,100.83	122.51	-743.49	-128.08	12.74	9.97	-11.43	

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	RKB @ 3348.90usft (Precision 595)
Site:	Tigercat Federal Com	MD Reference:	RKB @ 3348.90usft (Precision 595)
Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	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)
10,221.00	48.93	189.29	10,121.21	100.95	-747.86	-106.56	15.88	11.57	-14.83
10,251.00	52.90	186.09	10,140.13	77.88	-750.96	-83.51	15.61	13.23	-10.67
10,280.00	56.80	183.45	10,156.82	54.26	-752.91	-59.91	15.37	13.45	-9.10
10,310.00	61.47	180.52	10,172.21	28.53	-753.79	-34.19	17.68	15.57	-9.77
10,311.45	61.70	180.39	10,172.90	27.26	-753.80	-32.91	17.90	16.16	-8.75
FTP									
10,340.00	66.34	178.00	10,185.40	1.60	-753.43	-7.26	17.90	16.24	-8.38
10,370.00	69.88	174.96	10,196.59	-26.17	-751.71	20.53	15.09	11.80	-10.13
10,398.00	71.61	170.75	10,205.83	-52.39	-748.42	46.77	15.48	6.18	-15.04
10,428.00	75.14	168.45	10,214.41	-80.66	-743.23	75.08	13.87	11.77	-7.67
10,458.00	78.28	167.56	10,221.30	-109.21	-737.16	103.68	10.86	10.47	-2.97
10,488.00	81.40	168.11	10,226.60	-138.08	-730.94	132.59	10.56	10.40	1.83
10,518.00	85.49	168.72	10,230.02	-167.27	-724.95	161.82	13.78	13.63	2.03
10,548.00	89.39	168.84	10,231.36	-196.66	-719.12	191.26	13.01	13.00	0.40
10,577.00	91.96	169.52	10,231.02	-225.14	-713.68	219.78	9.17	8.86	2.34
10,666.00	90.14	169.88	10,229.39	-312.68	-697.77	307.44	2.08	-2.04	0.40
10,756.00	91.51	171.45	10,228.09	-401.48	-683.17	396.34	2.32	1.52	1.74
10,846.00	89.81	171.78	10,227.05	-490.51	-670.05	485.46	1.92	-1.89	0.37
10,935.00	90.25	172.09	10,227.01	-578.63	-657.56	573.68	0.60	0.49	0.35
11,025.00	90.06	174.40	10,226.76	-668.00	-646.98	663.12	2.58	-0.21	2.57
11,114.00	91.20	177.26	10,225.79	-756.74	-640.51	751.92	3.46	1.28	3.21
11,204.00	90.11	180.48	10,224.76	-846.71	-638.73	841.89	3.78	-1.21	3.58
11,293.00	90.39	181.43	10,224.37	-935.69	-640.22	930.86	1.11	0.31	1.07
11,383.00	91.09	181.80	10,223.21	-1,025.65	-642.75	1,020.80	0.88	0.78	0.41
11,473.00	90.14	181.73	10,222.24	-1,115.60	-645.52	1,110.72	1.06	-1.06	-0.08
11,562.00	87.93	181.02	10,223.74	-1,204.56	-647.66	1,199.66	2.61	-2.48	-0.80
11,652.00	88.29	181.06	10,226.71	-1,294.49	-649.29	1,289.58	0.40	0.40	0.04
11,742.00	87.62	179.59	10,229.92	-1,384.43	-649.80	1,379.51	1.79	-0.74	-1.63
11,831.00	88.12	177.21	10,233.23	-1,473.33	-647.32	1,468.43	2.73	0.56	-2.67
11,921.00	89.13	177.79	10,235.39	-1,563.21	-643.40	1,558.34	1.29	1.12	0.64
12,011.00	89.11	177.97	10,236.77	-1,653.14	-640.07	1,648.29	0.20	-0.02	0.20
12,100.00	89.05	178.34	10,238.20	-1,742.08	-637.20	1,737.25	0.42	-0.07	0.42
12,190.00	89.16	178.96	10,239.60	-1,832.05	-635.08	1,827.23	0.70	0.12	0.69
12,279.00	89.13	179.29	10,240.93	-1,921.03	-633.72	1,916.22	0.37	-0.03	0.37
12,369.00	89.13	179.70	10,242.30	-2,011.01	-632.93	2,006.21	0.46	0.00	0.46
12,458.00	89.27	180.15	10,243.54	-2,100.00	-632.81	2,095.20	0.53	0.16	0.51
12,548.00	89.44	180.69	10,244.55	-2,190.00	-633.47	2,185.18	0.63	0.19	0.60
12,638.00	89.39	180.98	10,245.47	-2,279.98	-634.78	2,275.15	0.33	-0.06	0.32
12,727.00	89.11	181.17	10,246.64	-2,368.96	-636.45	2,364.11	0.38	-0.31	0.21
12,817.00	89.69	181.39	10,247.58	-2,458.93	-638.46	2,454.07	0.69	0.64	0.24
12,907.00	89.27	180.26	10,248.40	-2,548.92	-639.76	2,544.04	1.34	-0.47	-1.26
12,996.00	88.82	178.73	10,249.88	-2,637.90	-638.98	2,633.03	1.79	-0.51	-1.72
13,086.00	88.57	178.62	10,251.93	-2,727.85	-636.89	2,722.99	0.30	-0.28	-0.12

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	RKB @ 3348.90usft (Precision 595)
Site:	Tigercat Federal Com	MD Reference:	RKB @ 3348.90usft (Precision 595)
Well:	4H	North Reference:	Grid
Wellbore:	OH / 62736	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Precision 595)	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)	
13,175.00	88.66	179.21	10,254.08	-2,816.81	-635.21	2,811.96	0.67	0.10	0.66	
13,265.00	88.12	179.16	10,256.61	-2,906.76	-633.93	2,901.92	0.60	-0.60	-0.06	
13,354.00	88.49	179.06	10,259.24	-2,995.71	-632.55	2,990.88	0.43	0.42	-0.11	
13,444.00	89.30	179.94	10,260.98	-3,085.69	-631.76	3,080.86	1.33	0.90	0.98	
13,533.00	89.30	179.88	10,262.07	-3,174.68	-631.62	3,169.85	0.07	0.00	-0.07	
13,623.00	90.00	180.42	10,262.62	-3,264.68	-631.86	3,259.85	0.98	0.78	0.60	
13,713.00	89.78	180.00	10,262.79	-3,354.68	-632.19	3,349.84	0.53	-0.24	-0.47	
13,802.00	89.78	179.76	10,263.13	-3,443.68	-632.00	3,438.84	0.27	0.00	-0.27	
13,892.00	90.53	179.59	10,262.89	-3,533.68	-631.49	3,528.84	0.85	0.83	-0.19	
13,982.00	87.96	178.78	10,264.07	-3,623.65	-630.21	3,618.82	2.99	-2.86	-0.90	
14,071.00	87.50	178.28	10,267.60	-3,712.55	-627.93	3,707.73	0.76	-0.52	-0.56	
14,161.00	87.71	178.49	10,271.36	-3,802.44	-625.40	3,797.64	0.33	0.23	0.23	
14,251.00	87.90	178.65	10,274.81	-3,892.34	-623.15	3,887.56	0.28	0.21	0.18	
14,340.00	87.62	178.97	10,278.28	-3,981.26	-621.31	3,976.48	0.48	-0.31	0.36	
14,430.00	87.14	179.27	10,282.40	-4,071.15	-619.92	4,066.38	0.63	-0.53	0.33	
14,520.00	86.97	179.48	10,287.02	-4,161.03	-618.94	4,156.26	0.30	-0.19	0.23	
14,609.00	88.32	180.05	10,290.68	-4,249.95	-618.58	4,245.19	1.65	1.52	0.64	
14,699.00	88.32	179.78	10,293.32	-4,339.91	-618.45	4,335.15	0.30	0.00	-0.30	
14,788.00	88.63	179.51	10,295.69	-4,428.88	-617.90	4,424.11	0.46	0.35	-0.30	
14,878.00	88.15	179.76	10,298.21	-4,518.84	-617.32	4,514.08	0.60	-0.53	0.28	
14,951.26	88.00	180.09	10,300.68	-4,592.06	-617.23	4,587.29	0.50	-0.21	0.46	
LTP										
14,968.00	87.96	180.17	10,301.27	-4,608.79	-617.27	4,604.02	0.50	-0.21	0.46	
15,007.00	89.11	180.53	10,302.27	-4,647.77	-617.51	4,643.01	3.09	2.95	0.92	
Final Phoenix MWD Survey										
15,066.00	89.11	180.53	10,303.18	-4,706.76	-618.05	4,701.99	0.00	0.00	0.00	
Projection to TD										

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
9,380.00	9,343.37	329.07	-652.46	Tie In	
9,477.00	9,440.35	327.81	-653.78	First Phoenix MWD Survey	
10,311.45	10,172.90	27.26	-753.80	FTP	
14,951.26	10,300.68	-4,592.06	-617.23	LTP	
15,007.00	10,302.27	-4,647.77	-617.51	Final Phoenix MWD Survey	
15,066.00	10,303.18	-4,706.76	-618.05	Projection to TD	