



15-43131

COG Operating, LLC

Eddy County, NM (NAD 27)

Sec 24, T26S, R25E

Glacier Federal Com #1H

Wellbore #1

Survey: MWD

NM OIL CONSERVATION
ARTESIA DISTRICT

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Survey Report - Geographic

02 September, 2015





HP
Survey Report - Geographic



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Glacier Federal Com #1H
Project:	Eddy County, NM (NAD 27)	TVD Reference:	Well @ 3571.0usft (Scandrill Freedom)
Site:	Sec 24, T26S, R25E	MD Reference:	Well @ 3571.0usft (Scandrill Freedom)
Well:	Glacier Federal Com #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Project	Eddy County, NM (NAD 27)		
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	Sec 24, T26S, R25E		
Site Position:	Map	Northing:	376,145.00 usft
From:		Easting:	497,293.00 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 2' 2.893 N
		Longitude:	104° 20' 31.448 W
		Grid Convergence:	0.00 °

Well	Glacier Federal Com #1H		
Well Position	+N/-S	0.0 usft	Northing:
	+E/-W	0.0 usft	Easting:
Position Uncertainty	0.0 usft	Wellhead Elevation:	0.0 usft
		Latitude:	32° 2' 2.893 N
		Longitude:	104° 20' 31.448 W
		Ground Level:	3,545.0 usft

Wellbore	Wellbore #1		
Magnetics	Model Name	Sample Date	Declination
			(°)
	IGRF2015	7/30/2015	7.49
			Dip Angle
			(°)
			59.78
			Field Strength
			(nT)
			47,933

Design	Wellbore #1		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.0	0.0	0.0
			Direction
			(°)
			359.14

Survey Program	Date 8/26/2015		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		Description
153.0	18,266.0	MWD (Wellbore #1)	MWD default
			MWD - Standard

Survey			
Measured	Inclination	Azimuth	Vertical
Depth	(°)	(°)	Depth
(usft)			(usft)
			+N/-S
			(usft)
			+E/-W
			(usft)
			Map
			Northing
			(usft)
			Map
			Easting
			(usft)
			Latitude
			Longitude
0.0	0.00	0.00	0.0
			0.0
153.0	0.30	264.10	153.0
			0.0
			-0.4
			376,145.00
			497,293.00
			32° 2' 2.893 N
			104° 20' 31.448 W
			32° 2' 2.892 N
			104° 20' 31.453 W
Tie-in @ 153' MD / 153' TVD			
244.0	0.30	173.30	244.0
			-0.3
			-0.6
			376,144.70
			497,292.39
			32° 2' 2.890 N
			104° 20' 31.455 W
375.0	0.70	175.70	375.0
			-1.4
			-0.5
			376,143.56
			497,292.49
			32° 2' 2.878 N
			104° 20' 31.454 W
487.0	0.70	187.90	487.0
			-2.8
			-0.6
			376,142.20
			497,292.45
			32° 2' 2.865 N
			104° 20' 31.455 W
579.0	0.90	206.50	579.0
			-4.0
			-0.9
			376,140.99
			497,292.05
			32° 2' 2.853 N
			104° 20' 31.459 W
637.0	1.00	189.10	637.0
			-4.9
			-1.2
			376,140.09
			497,291.77
			32° 2' 2.844 N
			104° 20' 31.463 W
698.0	1.10	196.10	698.0
			-6.0
			-1.5
			376,139.00
			497,291.52
			32° 2' 2.833 N
			104° 20' 31.466 W
791.0	1.10	186.80	790.9
			-7.7
			-1.8
			376,137.25
			497,291.17
			32° 2' 2.816 N
			104° 20' 31.470 W
883.0	1.20	186.80	882.9
			-9.6
			-2.1
			376,135.42
			497,290.95
			32° 2' 2.798 N
			104° 20' 31.472 W
975.0	1.40	206.30	974.9
			-11.5
			-2.7
			376,133.46
			497,290.34
			32° 2' 2.778 N
			104° 20' 31.479 W



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Site:	Sec 24, T26S, R25E	MD Reference:	Well @ 3571.0usft (Scandril Freedom)
Well:	Glacier Federal Com #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,067.0	0.30	95.40	1,066.9	-12.6	-2.9	376,132.43	497,290.08	32° 2' 2.768 N	104° 20' 31.482 W
1,160.0	0.90	57.40	1,159.9	-12.2	-2.1	376,132.80	497,290.94	32° 2' 2.772 N	104° 20' 31.472 W
1,252.0	1.40	63.20	1,251.9	-11.3	-0.5	376,133.69	497,292.55	32° 2' 2.781 N	104° 20' 31.454 W
1,344.0	0.40	70.60	1,343.9	-10.7	0.9	376,134.31	497,293.85	32° 2' 2.787 N	104° 20' 31.438 W
1,436.0	0.30	19.60	1,435.9	-10.4	1.2	376,134.64	497,294.24	32° 2' 2.790 N	104° 20' 31.434 W
1,495.0	0.30	61.30	1,494.9	-10.1	1.4	376,134.86	497,294.43	32° 2' 2.792 N	104° 20' 31.432 W
1,602.0	1.80	30.00	1,601.8	-8.5	2.5	376,136.45	497,295.51	32° 2' 2.808 N	104° 20' 31.419 W
1,697.0	1.10	246.20	1,696.8	-7.6	2.4	376,137.37	497,295.42	32° 2' 2.817 N	104° 20' 31.420 W
1,792.0	1.10	243.40	1,791.8	-8.4	0.8	376,136.60	497,293.77	32° 2' 2.809 N	104° 20' 31.439 W
1,887.0	1.10	241.10	1,886.8	-9.2	-0.8	376,135.75	497,292.16	32° 2' 2.801 N	104° 20' 31.458 W
1,982.0	1.40	248.00	1,981.8	-10.1	-2.7	376,134.87	497,290.29	32° 2' 2.792 N	104° 20' 31.480 W
2,077.0	1.40	248.30	2,076.7	-11.0	-4.9	376,134.01	497,288.13	32° 2' 2.784 N	104° 20' 31.505 W
2,171.0	1.50	240.40	2,170.7	-12.0	-7.0	376,132.98	497,285.99	32° 2' 2.774 N	104° 20' 31.530 W
2,266.0	1.70	237.30	2,265.7	-13.4	-9.3	376,131.60	497,283.73	32° 2' 2.760 N	104° 20' 31.556 W
2,360.0	0.60	204.90	2,359.6	-14.6	-10.7	376,130.40	497,282.35	32° 2' 2.748 N	104° 20' 31.572 W
2,455.0	0.50	222.50	2,454.6	-15.4	-11.1	376,129.65	497,281.86	32° 2' 2.741 N	104° 20' 31.578 W
2,551.0	0.70	217.20	2,550.6	-16.1	-11.8	376,128.87	497,281.22	32° 2' 2.733 N	104° 20' 31.585 W
2,646.0	0.80	218.60	2,645.6	-17.1	-12.5	376,127.89	497,280.46	32° 2' 2.723 N	104° 20' 31.594 W
2,740.0	0.60	207.00	2,739.6	-18.1	-13.2	376,126.94	497,279.82	32° 2' 2.714 N	104° 20' 31.601 W
2,835.0	0.60	224.20	2,834.6	-18.9	-13.8	376,126.14	497,279.25	32° 2' 2.706 N	104° 20' 31.608 W
2,930.0	0.50	208.80	2,929.6	-19.6	-14.3	376,125.42	497,278.70	32° 2' 2.699 N	104° 20' 31.614 W
3,025.0	0.70	222.50	3,024.6	-20.4	-14.9	376,124.63	497,278.11	32° 2' 2.691 N	104° 20' 31.621 W
3,120.0	0.90	195.90	3,119.6	-21.5	-15.5	376,123.48	497,277.52	32° 2' 2.680 N	104° 20' 31.628 W
3,214.0	1.10	223.70	3,213.6	-22.9	-16.3	376,122.12	497,276.69	32° 2' 2.666 N	104° 20' 31.638 W
3,309.0	1.30	215.30	3,308.6	-24.4	-17.6	376,120.58	497,275.44	32° 2' 2.651 N	104° 20' 31.652 W
3,404.0	1.10	205.40	3,403.5	-26.1	-18.6	376,118.88	497,274.42	32° 2' 2.634 N	104° 20' 31.664 W
3,499.0	1.20	207.20	3,498.5	-27.8	-19.4	376,117.17	497,273.58	32° 2' 2.617 N	104° 20' 31.674 W
3,593.0	1.10	210.70	3,592.5	-29.5	-20.3	376,115.52	497,272.67	32° 2' 2.601 N	104° 20' 31.685 W
3,687.0	1.40	221.10	3,686.5	-31.1	-21.5	376,113.88	497,271.45	32° 2' 2.585 N	104° 20' 31.699 W
3,780.0	0.30	59.00	3,779.5	-31.9	-22.1	376,113.15	497,270.91	32° 2' 2.577 N	104° 20' 31.705 W
3,875.0	0.40	73.10	3,874.5	-31.6	-21.6	376,113.37	497,271.44	32° 2' 2.580 N	104° 20' 31.699 W
3,968.0	0.30	128.30	3,967.5	-31.7	-21.1	376,113.31	497,271.95	32° 2' 2.579 N	104° 20' 31.693 W
4,062.0	0.30	87.30	4,061.5	-31.8	-20.6	376,113.17	497,272.38	32° 2' 2.578 N	104° 20' 31.688 W
4,157.0	0.20	132.10	4,156.5	-31.9	-20.2	376,113.07	497,272.76	32° 2' 2.577 N	104° 20' 31.683 W
4,251.0	0.30	157.40	4,250.5	-32.3	-20.0	376,112.74	497,272.97	32° 2' 2.573 N	104° 20' 31.681 W
4,346.0	0.60	207.50	4,345.5	-32.9	-20.2	376,112.07	497,272.84	32° 2' 2.567 N	104° 20' 31.683 W
4,440.0	0.50	212.80	4,439.5	-33.7	-20.6	376,111.28	497,272.39	32° 2' 2.559 N	104° 20' 31.688 W
4,535.0	0.50	196.80	4,534.5	-34.5	-21.0	376,110.54	497,272.04	32° 2' 2.552 N	104° 20' 31.692 W
4,628.0	0.70	197.50	4,627.5	-35.4	-21.2	376,109.61	497,271.76	32° 2' 2.542 N	104° 20' 31.695 W
4,722.0	1.10	202.30	4,721.4	-36.8	-21.8	376,108.23	497,271.24	32° 2' 2.529 N	104° 20' 31.701 W
4,815.0	1.00	195.60	4,814.4	-38.4	-22.3	376,106.62	497,270.68	32° 2' 2.513 N	104° 20' 31.708 W
4,909.0	1.10	201.00	4,908.4	-40.0	-22.9	376,104.99	497,270.14	32° 2' 2.497 N	104° 20' 31.714 W
5,004.0	1.00	203.70	5,003.4	-41.6	-23.5	376,103.38	497,269.48	32° 2' 2.481 N	104° 20' 31.722 W
5,098.0	1.30	210.20	5,097.4	-43.3	-24.4	376,101.70	497,268.61	32° 2' 2.464 N	104° 20' 31.732 W
5,193.0	1.30	236.20	5,192.3	-44.8	-25.8	376,100.17	497,267.18	32° 2' 2.449 N	104° 20' 31.748 W
5,286.0	0.90	256.40	5,285.3	-45.6	-27.4	376,099.41	497,265.59	32° 2' 2.441 N	104° 20' 31.767 W
5,382.0	1.70	265.70	5,381.3	-45.9	-29.6	376,099.13	497,263.44	32° 2' 2.439 N	104° 20' 31.792 W
5,477.0	3.20	280.50	5,476.2	-45.5	-33.6	376,099.51	497,259.42	32° 2' 2.442 N	104° 20' 31.838 W
5,507.0	2.80	279.60	5,506.2	-45.2	-35.1	376,099.78	497,257.88	32° 2' 2.445 N	104° 20' 31.856 W
5,520.0	2.40	280.80	5,519.2	-45.1	-35.7	376,099.89	497,257.30	32° 2' 2.446 N	104° 20' 31.863 W
5,539.0	1.90	283.80	5,538.1	-45.0	-36.4	376,100.04	497,256.60	32° 2' 2.448 N	104° 20' 31.871 W
5,570.0	0.90	268.00	5,569.1	-44.8	-37.1	376,100.15	497,255.86	32° 2' 2.449 N	104° 20' 31.880 W
5,665.0	1.10	281.20	5,664.1	-44.7	-38.8	376,100.30	497,254.22	32° 2' 2.450 N	104° 20' 31.899 W
5,759.0	1.50	282.10	5,758.1	-44.3	-40.9	376,100.73	497,252.13	32° 2' 2.454 N	104° 20' 31.923 W
5,853.0	0.30	158.30	5,852.1	-44.2	-42.0	376,100.76	497,251.02	32° 2' 2.455 N	104° 20' 31.936 W



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Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Glacier Federal Com #1H
Project:	Eddy County, NM (NAD 27)	TVD Reference:	Well @ 3571.0usft (Scandril Freedom)
Site:	Sec 24, T26S, R25E	MD Reference:	Well @ 3571.0usft (Scandril Freedom)
Well:	Glacier Federal Com #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,948.0	0.30	120.20	5,947.1	-44.6	-41.7	376,100.41	497,251.33	32° 2' 2.451 N	104° 20' 31.932 W
6,043.0	0.10	142.30	6,042.1	-44.8	-41.4	376,100.22	497,251.59	32° 2' 2.449 N	104° 20' 31.929 W
6,138.0	0.40	329.90	6,137.1	-44.6	-41.5	376,100.44	497,251.48	32° 2' 2.452 N	104° 20' 31.931 W
6,232.0	0.80	339.70	6,231.1	-43.7	-41.9	376,101.34	497,251.08	32° 2' 2.460 N	104° 20' 31.935 W
6,328.0	0.90	319.20	6,327.1	-42.5	-42.6	376,102.54	497,250.36	32° 2' 2.472 N	104° 20' 31.944 W
6,421.0	0.50	291.40	6,420.1	-41.8	-43.5	376,103.24	497,249.50	32° 2' 2.479 N	104° 20' 31.954 W
6,516.0	0.40	259.00	6,515.1	-41.7	-44.2	376,103.32	497,248.79	32° 2' 2.480 N	104° 20' 31.962 W
6,611.0	0.90	199.60	6,610.1	-42.4	-44.8	376,102.56	497,248.22	32° 2' 2.473 N	104° 20' 31.969 W
6,706.0	2.20	162.20	6,705.0	-44.9	-44.5	376,100.12	497,248.52	32° 2' 2.448 N	104° 20' 31.965 W
6,801.0	1.00	145.70	6,800.0	-47.3	-43.5	376,097.70	497,249.55	32° 2' 2.424 N	104° 20' 31.953 W
6,896.0	1.00	164.60	6,895.0	-48.8	-42.8	376,096.21	497,250.24	32° 2' 2.410 N	104° 20' 31.945 W
6,991.0	1.60	168.90	6,989.9	-50.9	-42.3	376,094.11	497,250.71	32° 2' 2.389 N	104° 20' 31.940 W
7,083.0	1.40	217.20	7,081.9	-53.0	-42.7	376,091.96	497,250.28	32° 2' 2.368 N	104° 20' 31.945 W
7,178.0	0.20	352.70	7,176.9	-53.8	-43.4	376,091.20	497,249.56	32° 2' 2.360 N	104° 20' 31.953 W
7,272.0	0.80	180.10	7,270.9	-54.3	-43.5	376,090.70	497,249.53	32° 2' 2.355 N	104° 20' 31.953 W
7,367.0	1.50	194.90	7,365.9	-56.2	-43.8	376,088.84	497,249.21	32° 2' 2.337 N	104° 20' 31.957 W
7,462.0	0.30	168.70	7,460.9	-57.6	-44.1	376,087.39	497,248.94	32° 2' 2.322 N	104° 20' 31.960 W
7,484.0	0.30	195.40	7,482.9	-57.7	-44.1	376,087.28	497,248.94	32° 2' 2.321 N	104° 20' 31.960 W
7,516.0	0.60	318.60	7,514.9	-57.7	-44.2	376,087.33	497,248.80	32° 2' 2.322 N	104° 20' 31.962 W
7,547.0	3.90	330.40	7,545.8	-56.6	-44.8	376,088.37	497,248.18	32° 2' 2.332 N	104° 20' 31.969 W
7,578.0	6.90	331.30	7,576.7	-54.1	-46.2	376,090.92	497,246.76	32° 2' 2.357 N	104° 20' 31.985 W
7,610.0	8.40	335.30	7,608.4	-50.3	-48.1	376,094.73	497,244.86	32° 2' 2.395 N	104° 20' 32.008 W
7,641.0	10.50	343.40	7,639.0	-45.5	-49.9	376,099.49	497,243.11	32° 2' 2.442 N	104° 20' 32.028 W
7,673.0	12.20	348.90	7,670.4	-39.4	-51.4	376,105.60	497,241.62	32° 2' 2.503 N	104° 20' 32.045 W
7,704.0	14.10	352.90	7,700.6	-32.4	-52.5	376,112.57	497,240.53	32° 2' 2.572 N	104° 20' 32.058 W
7,736.0	16.50	352.60	7,731.4	-24.1	-53.5	376,120.94	497,239.46	32° 2' 2.654 N	104° 20' 32.070 W
7,767.0	18.70	349.40	7,761.0	-14.8	-55.0	376,130.19	497,237.98	32° 2' 2.746 N	104° 20' 32.088 W
7,799.0	21.80	350.80	7,791.0	-3.9	-56.9	376,141.10	497,236.08	32° 2' 2.854 N	104° 20' 32.110 W
7,831.0	25.30	347.60	7,820.3	8.7	-59.3	376,153.65	497,233.66	32° 2' 2.978 N	104° 20' 32.138 W
7,862.0	28.40	345.40	7,848.0	22.3	-62.6	376,167.26	497,230.38	32° 2' 3.113 N	104° 20' 32.176 W
7,893.0	32.50	344.00	7,874.7	37.4	-66.8	376,182.41	497,226.23	32° 2' 3.263 N	104° 20' 32.224 W
7,925.0	35.90	344.00	7,901.2	54.7	-71.7	376,199.69	497,221.27	32° 2' 3.434 N	104° 20' 32.282 W
7,957.0	39.20	344.00	7,926.5	73.4	-77.1	376,218.44	497,215.90	32° 2' 3.619 N	104° 20' 32.344 W
7,989.0	42.80	344.10	7,950.7	93.6	-82.9	376,238.62	497,210.13	32° 2' 3.819 N	104° 20' 32.411 W
8,020.0	46.20	345.50	7,972.8	114.6	-88.6	376,259.59	497,204.44	32° 2' 4.027 N	104° 20' 32.477 W
8,051.0	49.70	346.00	7,993.5	136.9	-94.2	376,281.89	497,198.78	32° 2' 4.247 N	104° 20' 32.543 W
8,082.0	53.50	346.80	8,012.8	160.5	-99.9	376,305.50	497,193.07	32° 2' 4.481 N	104° 20' 32.609 W
8,114.0	57.70	346.20	8,030.9	186.2	-106.1	376,331.17	497,186.90	32° 2' 4.735 N	104° 20' 32.681 W
8,146.0	61.10	345.90	8,047.2	212.9	-112.7	376,357.90	497,180.26	32° 2' 4.999 N	104° 20' 32.758 W
8,177.0	64.60	345.00	8,061.3	239.6	-119.7	376,384.59	497,173.33	32° 2' 5.264 N	104° 20' 32.839 W
8,209.0	68.50	345.90	8,074.0	268.0	-127.0	376,413.00	497,165.96	32° 2' 5.545 N	104° 20' 32.924 W
8,240.0	72.20	347.50	8,084.5	296.4	-133.7	376,441.41	497,159.25	32° 2' 5.826 N	104° 20' 33.002 W
8,272.0	74.80	349.00	8,093.5	326.4	-140.0	376,471.45	497,153.01	32° 2' 6.123 N	104° 20' 33.075 W
8,275.7	75.27	349.23	8,094.5	330.0	-140.7	376,474.96	497,152.33	32° 2' 6.158 N	104° 20' 33.083 W
Crossed Lease Line @ 8276' MD / 8095' TVD									
8,304.0	78.90	351.00	8,100.8	357.1	-145.4	376,502.13	497,147.60	32° 2' 6.427 N	104° 20' 33.138 W
8,335.0	81.90	352.20	8,106.0	387.4	-149.9	376,532.36	497,143.14	32° 2' 6.726 N	104° 20' 33.190 W
8,367.0	86.40	354.10	8,109.2	419.0	-153.7	376,563.96	497,139.34	32° 2' 7.039 N	104° 20' 33.234 W
8,436.0	92.10	357.00	8,110.2	487.7	-159.0	376,632.71	497,134.00	32° 2' 7.719 N	104° 20' 33.296 W
8,531.0	90.10	358.90	8,108.3	582.6	-162.4	376,727.62	497,130.60	32° 2' 8.658 N	104° 20' 33.336 W
8,626.0	89.00	1.70	8,109.1	677.6	-161.9	376,822.60	497,131.10	32° 2' 9.598 N	104° 20' 33.330 W
8,721.0	89.30	2.20	8,110.5	772.5	-158.7	376,917.54	497,134.33	32° 2' 10.538 N	104° 20' 33.292 W
8,815.0	87.00	1.70	8,113.5	866.4	-155.5	377,011.43	497,137.52	32° 2' 11.467 N	104° 20' 33.255 W
8,910.0	87.30	2.00	8,118.2	961.3	-152.4	377,106.26	497,140.59	32° 2' 12.406 N	104° 20' 33.220 W



HP
Survey Report - Geographic



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Glacier Federal Com #1H
Project:	Eddy County, NM (NAD 27)	TVD Reference:	Well @ 3571.0usft (Scandril Freedom)
Site:	Sec 24, T26S, R25E	MD Reference:	Well @ 3571.0usft (Scandril Freedom)
Well:	Glacier Federal Com #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
8,938.8	87.27	2.18	8,119.6	990.0	-151.4	377,135.01	497,141.64	32° 2' 12.690 N	104° 20' 33.208 W
Crossed 660' Hard Line @ 8939' MD / 8120' TVD									
9,005.0	87.20	2.60	8,122.8	1,056.1	-148.6	377,201.08	497,144.40	32° 2' 13.344 N	104° 20' 33.176 W
9,100.0	86.70	0.30	8,127.9	1,150.9	-146.2	377,295.90	497,146.80	32° 2' 14.283 N	104° 20' 33.148 W
9,194.0	88.30	0.30	8,132.0	1,244.8	-145.7	377,389.81	497,147.29	32° 2' 15.212 N	104° 20' 33.142 W
9,288.0	88.60	0.50	8,134.5	1,338.8	-145.1	377,483.77	497,147.94	32° 2' 16.142 N	104° 20' 33.135 W
9,383.0	88.80	0.60	8,136.7	1,433.7	-144.1	377,578.74	497,148.86	32° 2' 17.082 N	104° 20' 33.124 W
9,478.0	89.10	1.50	8,138.4	1,528.7	-142.4	377,673.71	497,150.60	32° 2' 18.022 N	104° 20' 33.104 W
9,572.0	89.30	359.90	8,139.7	1,622.7	-141.3	377,767.69	497,151.75	32° 2' 18.952 N	104° 20' 33.091 W
9,667.0	89.80	0.10	8,140.5	1,717.7	-141.3	377,862.69	497,151.75	32° 2' 19.892 N	104° 20' 33.091 W
9,761.0	89.70	0.50	8,140.9	1,811.7	-140.8	377,956.69	497,152.24	32° 2' 20.822 N	104° 20' 33.085 W
9,854.0	88.60	359.20	8,142.2	1,904.7	-141.0	378,049.67	497,151.99	32° 2' 21.742 N	104° 20' 33.088 W
9,949.0	88.90	359.40	8,144.3	1,999.6	-142.2	378,144.64	497,150.83	32° 2' 22.682 N	104° 20' 33.102 W
10,044.0	89.30	359.20	8,145.8	2,094.6	-143.3	378,239.62	497,149.67	32° 2' 23.622 N	104° 20' 33.115 W
10,138.0	89.30	359.40	8,147.0	2,188.6	-144.5	378,333.61	497,148.52	32° 2' 24.552 N	104° 20' 33.129 W
10,232.0	88.60	359.80	8,148.7	2,282.6	-145.1	378,427.59	497,147.87	32° 2' 25.483 N	104° 20' 33.137 W
10,328.0	89.30	0.30	8,150.4	2,378.6	-145.0	378,523.57	497,147.95	32° 2' 26.432 N	104° 20' 33.136 W
10,422.0	89.50	0.30	8,151.4	2,472.6	-144.6	378,617.57	497,148.44	32° 2' 27.363 N	104° 20' 33.130 W
10,518.0	87.60	359.90	8,153.9	2,568.5	-144.4	378,713.53	497,148.61	32° 2' 28.312 N	104° 20' 33.128 W
10,612.0	87.80	359.80	8,157.6	2,662.5	-144.6	378,807.46	497,148.37	32° 2' 29.242 N	104° 20' 33.131 W
10,707.0	88.10	0.30	8,161.0	2,757.4	-144.6	378,902.39	497,148.45	32° 2' 30.182 N	104° 20' 33.130 W
10,800.0	88.70	1.00	8,163.6	2,850.4	-143.5	378,995.35	497,149.50	32° 2' 31.101 N	104° 20' 33.118 W
10,895.0	89.10	1.20	8,165.4	2,945.3	-141.7	379,090.32	497,151.33	32° 2' 32.041 N	104° 20' 33.097 W
10,990.0	89.30	359.80	8,166.8	3,040.3	-140.8	379,185.30	497,152.16	32° 2' 32.981 N	104° 20' 33.088 W
11,086.0	89.80	0.10	8,167.5	3,136.3	-140.9	379,281.30	497,152.07	32° 2' 33.931 N	104° 20' 33.089 W
11,180.0	90.40	0.50	8,167.4	3,230.3	-140.4	379,375.29	497,152.56	32° 2' 34.862 N	104° 20' 33.083 W
11,274.0	88.80	359.40	8,168.0	3,324.3	-140.5	379,469.29	497,152.48	32° 2' 35.792 N	104° 20' 33.084 W
11,369.0	89.10	359.60	8,169.8	3,419.3	-141.3	379,564.27	497,151.65	32° 2' 36.732 N	104° 20' 33.094 W
11,462.0	89.60	359.80	8,170.8	3,512.3	-141.8	379,657.26	497,151.17	32° 2' 37.652 N	104° 20' 33.100 W
11,557.0	87.80	359.40	8,173.0	3,607.2	-142.5	379,752.23	497,150.50	32° 2' 38.592 N	104° 20' 33.107 W
11,652.0	88.40	359.90	8,176.1	3,702.2	-143.1	379,847.17	497,149.92	32° 2' 39.532 N	104° 20' 33.114 W
11,747.0	88.70	0.50	8,178.5	3,797.1	-142.7	379,942.14	497,150.26	32° 2' 40.472 N	104° 20' 33.110 W
11,843.0	87.30	359.20	8,181.9	3,893.1	-143.0	380,038.08	497,150.00	32° 2' 41.421 N	104° 20' 33.113 W
11,938.0	87.50	359.40	8,186.2	3,988.0	-144.2	380,132.98	497,148.85	32° 2' 42.360 N	104° 20' 33.127 W
12,033.0	87.50	359.90	8,190.3	4,082.9	-144.7	380,227.88	497,148.27	32° 2' 43.299 N	104° 20' 33.134 W
12,128.0	88.50	359.40	8,193.6	4,177.8	-145.3	380,322.82	497,147.69	32° 2' 44.239 N	104° 20' 33.141 W
12,223.0	89.60	359.40	8,195.2	4,272.8	-146.3	380,417.80	497,146.69	32° 2' 45.179 N	104° 20' 33.152 W
12,317.0	89.80	359.60	8,195.7	4,366.8	-147.1	380,511.80	497,145.87	32° 2' 46.109 N	104° 20' 33.162 W
12,413.0	90.10	359.90	8,195.8	4,462.8	-147.5	380,607.80	497,145.45	32° 2' 47.059 N	104° 20' 33.167 W
12,508.0	90.00	359.90	8,195.7	4,557.8	-147.7	380,702.80	497,145.29	32° 2' 47.999 N	104° 20' 33.169 W
12,603.0	88.60	359.40	8,196.9	4,652.8	-148.3	380,797.78	497,144.71	32° 2' 48.940 N	104° 20' 33.176 W
12,698.0	88.60	359.60	8,199.2	4,747.8	-149.1	380,892.75	497,143.88	32° 2' 49.879 N	104° 20' 33.185 W
12,793.0	86.20	358.90	8,203.5	4,842.6	-150.4	380,987.64	497,142.64	32° 2' 50.818 N	104° 20' 33.200 W
12,888.0	84.70	359.10	8,211.0	4,937.3	-152.0	381,082.32	497,140.98	32° 2' 51.756 N	104° 20' 33.219 W
12,983.0	85.40	358.20	8,219.2	5,031.9	-154.2	381,176.94	497,138.75	32° 2' 52.692 N	104° 20' 33.245 W
13,078.0	86.90	358.00	8,225.6	5,126.7	-157.4	381,271.67	497,135.61	32° 2' 53.629 N	104° 20' 33.282 W
13,173.0	87.70	358.40	8,230.1	5,221.5	-160.4	381,366.52	497,132.63	32° 2' 54.568 N	104° 20' 33.317 W
13,268.0	89.30	358.90	8,232.6	5,316.5	-162.6	381,461.45	497,130.39	32° 2' 55.508 N	104° 20' 33.343 W
13,363.0	89.60	359.60	8,233.5	5,411.4	-163.9	381,556.44	497,129.15	32° 2' 56.448 N	104° 20' 33.357 W
13,458.0	89.30	359.80	8,234.4	5,506.4	-164.3	381,651.44	497,128.65	32° 2' 57.388 N	104° 20' 33.363 W
13,552.0	88.70	359.90	8,236.0	5,600.4	-164.6	381,745.42	497,128.41	32° 2' 58.318 N	104° 20' 33.366 W
13,646.0	88.30	0.50	8,238.5	5,694.4	-164.3	381,839.39	497,128.73	32° 2' 59.248 N	104° 20' 33.362 W
13,743.0	88.00	0.50	8,239.4	5,721.4	-164.0	381,866.37	497,128.97	32° 2' 59.515 N	104° 20' 33.360 W
13,767.0	89.40	0.80	8,241.5	5,815.3	-163.0	381,960.34	497,130.03	32° 3' 0.445 N	104° 20' 33.347 W
13,862.0	90.00	0.80	8,242.0	5,910.3	-161.6	382,055.33	497,131.36	32° 3' 1.385 N	104° 20' 33.332 W



HP
Survey Report - Geographic



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Glacier Federal Com #1H
Project:	Eddy County, NM (NAD 27)	TVD Reference:	Well @ 3571.0usft (Scandril Freedom)
Site:	Sec 24, T26S, R25E	MD Reference:	Well @ 3571.0usft (Scandril Freedom)
Well:	Glacier Federal Com #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
13,956.0	87.80	0.30	8,243.8	6,004.3	-160.7	382,149.30	497,132.26	32° 3' 2.315 N	104° 20' 33.322 W	
14,050.0	88.00	0.50	8,247.2	6,098.2	-160.1	382,243.24	497,132.92	32° 3' 3.245 N	104° 20' 33.314 W	
14,143.0	87.60	0.50	8,250.8	6,191.2	-159.3	382,336.16	497,133.73	32° 3' 4.164 N	104° 20' 33.305 W	
14,238.0	87.90	0.80	8,254.5	6,286.1	-158.2	382,431.08	497,134.81	32° 3' 5.104 N	104° 20' 33.292 W	
14,332.0	86.60	0.30	8,259.1	6,380.0	-157.3	382,524.97	497,135.71	32° 3' 6.033 N	104° 20' 33.282 W	
14,427.0	86.60	0.50	8,264.7	6,474.8	-156.6	382,619.80	497,136.37	32° 3' 6.971 N	104° 20' 33.274 W	
14,522.0	86.40	0.50	8,270.5	6,569.6	-155.8	382,714.62	497,137.20	32° 3' 7.910 N	104° 20' 33.265 W	
14,618.0	87.70	359.80	8,275.4	6,665.5	-155.6	382,810.49	497,137.45	32° 3' 8.859 N	104° 20' 33.262 W	
14,712.0	89.20	359.20	8,278.0	6,759.4	-156.4	382,904.45	497,136.63	32° 3' 9.788 N	104° 20' 33.272 W	
14,806.0	89.40	358.90	8,279.1	6,853.4	-157.9	382,998.43	497,135.07	32° 3' 10.719 N	104° 20' 33.290 W	
14,900.0	89.10	358.90	8,280.4	6,947.4	-159.7	383,092.40	497,133.27	32° 3' 11.649 N	104° 20' 33.311 W	
14,996.0	89.40	359.20	8,281.6	7,043.4	-161.3	383,188.38	497,131.67	32° 3' 12.598 N	104° 20' 33.330 W	
15,091.0	89.30	359.40	8,282.7	7,138.4	-162.5	383,283.37	497,130.51	32° 3' 13.539 N	104° 20' 33.343 W	
15,186.0	87.20	359.90	8,285.6	7,233.3	-163.1	383,378.31	497,129.93	32° 3' 14.478 N	104° 20' 33.350 W	
15,281.0	87.10	359.90	8,290.3	7,328.2	-163.2	383,473.20	497,129.77	32° 3' 15.417 N	104° 20' 33.352 W	
15,375.0	88.70	359.90	8,293.8	7,422.1	-163.4	383,567.13	497,129.60	32° 3' 16.347 N	104° 20' 33.354 W	
15,470.0	88.60	0.30	8,296.0	7,517.1	-163.2	383,662.10	497,129.77	32° 3' 17.287 N	104° 20' 33.352 W	
15,565.0	88.80	0.60	8,298.1	7,612.1	-162.5	383,757.08	497,130.52	32° 3' 18.227 N	104° 20' 33.344 W	
15,659.0	88.60	0.60	8,300.3	7,706.0	-161.5	383,851.05	497,131.50	32° 3' 19.157 N	104° 20' 33.332 W	
15,753.0	88.60	1.00	8,302.6	7,800.0	-160.2	383,945.01	497,132.81	32° 3' 20.087 N	104° 20' 33.317 W	
15,848.0	88.60	0.80	8,304.9	7,895.0	-158.7	384,039.97	497,134.30	32° 3' 21.026 N	104° 20' 33.300 W	
15,942.0	88.50	1.00	8,307.3	7,988.9	-157.2	384,133.93	497,135.78	32° 3' 21.956 N	104° 20' 33.283 W	
16,036.0	88.50	1.00	8,309.7	8,082.9	-155.6	384,227.88	497,137.42	32° 3' 22.886 N	104° 20' 33.264 W	
16,130.0	88.60	1.20	8,312.1	8,176.8	-153.8	384,321.83	497,139.22	32° 3' 23.816 N	104° 20' 33.243 W	
16,224.0	88.40	1.20	8,314.6	8,270.8	-151.8	384,415.78	497,141.19	32° 3' 24.746 N	104° 20' 33.220 W	
16,319.0	88.00	1.40	8,317.6	8,365.7	-149.7	384,510.71	497,143.35	32° 3' 25.685 N	104° 20' 33.195 W	
16,414.0	87.60	1.50	8,321.2	8,460.6	-147.3	384,605.61	497,145.75	32° 3' 26.624 N	104° 20' 33.167 W	
16,507.0	87.70	359.40	8,325.0	8,553.5	-146.5	384,698.52	497,146.48	32° 3' 27.544 N	104° 20' 33.159 W	
16,601.0	88.90	359.10	8,327.8	8,647.5	-147.8	384,792.47	497,145.25	32° 3' 28.474 N	104° 20' 33.173 W	
16,695.0	88.40	359.20	8,330.0	8,741.4	-149.1	384,886.43	497,143.85	32° 3' 29.404 N	104° 20' 33.190 W	
16,789.0	89.60	358.70	8,331.7	8,835.4	-150.9	384,980.40	497,142.13	32° 3' 30.333 N	104° 20' 33.210 W	
16,884.0	89.20	358.90	8,332.7	8,930.4	-152.9	385,075.38	497,140.14	32° 3' 31.273 N	104° 20' 33.233 W	
16,978.0	88.60	358.70	8,334.5	9,024.3	-154.8	385,169.34	497,138.17	32° 3' 32.203 N	104° 20' 33.256 W	
17,072.0	89.70	358.90	8,335.9	9,118.3	-156.8	385,263.31	497,136.21	32° 3' 33.133 N	104° 20' 33.279 W	
17,166.0	88.60	359.10	8,337.3	9,212.3	-158.4	385,357.28	497,134.56	32° 3' 34.063 N	104° 20' 33.298 W	
17,260.0	89.30	358.50	8,339.0	9,306.2	-160.4	385,451.24	497,132.60	32° 3' 34.993 N	104° 20' 33.321 W	
17,354.0	89.80	359.10	8,339.7	9,400.2	-162.4	385,545.22	497,130.63	32° 3' 35.923 N	104° 20' 33.344 W	
17,448.0	90.50	0.50	8,339.5	9,494.2	-162.7	385,639.21	497,130.30	32° 3' 36.853 N	104° 20' 33.348 W	
17,542.0	88.60	1.00	8,340.2	9,588.2	-161.5	385,733.20	497,131.53	32° 3' 37.784 N	104° 20' 33.334 W	
17,636.0	87.80	0.80	8,343.2	9,682.1	-160.0	385,827.14	497,133.01	32° 3' 38.713 N	104° 20' 33.317 W	
17,730.0	87.90	1.90	8,346.7	9,776.0	-157.8	385,921.05	497,135.22	32° 3' 39.643 N	104° 20' 33.291 W	
17,824.0	88.10	359.80	8,350.0	9,870.0	-156.4	386,014.97	497,136.61	32° 3' 40.572 N	104° 20' 33.275 W	
17,918.0	90.00	359.60	8,351.5	9,964.0	-156.9	386,108.95	497,136.12	32° 3' 41.502 N	104° 20' 33.281 W	
18,013.0	89.60	359.60	8,351.9	10,059.0	-157.5	386,203.95	497,135.46	32° 3' 42.442 N	104° 20' 33.289 W	
18,108.0	89.40	0.60	8,352.7	10,153.9	-157.4	386,298.95	497,135.62	32° 3' 43.383 N	104° 20' 33.287 W	
18,201.0	89.00	1.20	8,354.0	10,246.9	-155.9	386,391.92	497,137.08	32° 3' 44.303 N	104° 20' 33.270 W	
18,266.0	89.00	1.20	8,355.1	10,311.9	-154.6	386,456.90	497,138.44	32° 3' 44.946 N	104° 20' 33.254 W	
TD @ 18266' MD / 8355' TVD										



HP
Survey Report - Geographic



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Glacier Federal Com #1H
Project:	Eddy County, NM (NAD 27)	TVD Reference:	Well @ 3571.0usft (Scandriill Freedom)
Site:	Sec 24, T26S, R25E	MD Reference:	Well @ 3571.0usft (Scandriill Freedom)
Well:	Glacier Federal Com #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
153.0	153.0	0.0	-0.4	Tie-in @ 153' MD / 153' TVD
8,275.7	8,094.5	330.0	-140.7	Crossed Lease Line @ 8276' MD / 8095' TVD
8,938.8	8,119.6	990.0	-151.4	Crossed 660' Hard Line @ 8939' MD / 8120' TVD
18,266.0	8,355.1	10,311.9	-154.6	TD @ 18266' MD / 8355' TVD

Checked By: _____ Approved By: _____ Date: _____