



COG Operating, LLC

Lea County, NM

Sec 32, T24-S, R32E

Azores Federal #12H

Wellbore #1

Plan: Plan #1

QES Well Planning Report

14 July, 2016





QES Directional Drilling, LLC
Well Planning Report



Database:	EDM5002	Local Co-ordinate Reference:	Well Azores Federal #12H
Company:	COG Operating, LLC	TVD Reference:	Well @ 3522.0usft (McVay 8)
Project:	Lea County, NM	MD Reference:	Well @ 3522.0usft (McVay 8)
Site:	Sec 32, T24-S, R32E	North Reference:	Grid
Well:	Azores Federal #12H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Project	Lea County, NM		
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 32, T24-S, R32E			
Site Position:		Northing:	429,960.20 usft	Latitude:	32° 10' 49.697 N
From:	Map	Easting:	697,210.20 usft	Longitude:	103° 41' 45.292 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.34 °

Well	Azores Federal #12H					
Well Position	+N/-S	408.3 usft	Northing:	430,368.50 usft	Latitude:	32° 10' 53.799 N
	+E/-W	-1,054.7 usft	Easting:	696,155.50 usft	Longitude:	103° 41' 57.536 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	3,522.0 usft	Ground Level:	3,496.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	7/14/2016	7.11	60.01	47,994

Design	Plan #1			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	351.80

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.00	0.00	0.00	0.00	
1,253.2	5.06	255.57	1,252.9	-2.8	-10.8	2.00	2.00	0.00	255.57	
8,687.5	5.06	255.57	8,658.2	-166.3	-646.3	0.00	0.00	0.00	0.00	
9,452.8	90.61	359.63	9,144.0	315.9	-691.7	12.00	11.18	13.60	103.95	
14,149.6	90.61	359.63	9,094.0	5,012.3	-722.0	0.00	0.00	0.00	0.00	PBHL Azores Federal



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Company: COG Operating, LLC
Project: Lea County, NM
Site: Sec 32, T24-S, R32E
Well: Azores Federal #12H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	0.00
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	0.00
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	0.00
700.0	0.00	0.00	700.0	0.0	0.0	0.0	0.00	0.00	0.00
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	0.00
900.0	0.00	0.00	900.0	0.0	0.0	0.0	0.00	0.00	0.00
Build 2°/100'									
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	0.00
1,100.0	2.00	255.57	1,100.0	-0.4	-1.7	-0.2	2.00	2.00	0.00
1,200.0	4.00	255.57	1,199.8	-1.7	-6.8	-0.8	2.00	2.00	0.00
EOB / 5.06° Inc / 255.57° Azm									
1,253.2	5.06	255.57	1,252.9	-2.8	-10.8	-1.2	2.00	2.00	0.00
1,300.0	5.06	255.57	1,299.5	-3.8	-14.8	-1.7	0.00	0.00	0.00
1,400.0	5.06	255.57	1,399.1	-6.0	-23.4	-2.6	0.00	0.00	0.00
1,500.0	5.06	255.57	1,498.7	-8.2	-31.9	-3.6	0.00	0.00	0.00
1,600.0	5.06	255.57	1,598.3	-10.4	-40.5	-4.5	0.00	0.00	0.00
1,700.0	5.06	255.57	1,697.9	-12.6	-49.0	-5.5	0.00	0.00	0.00
1,800.0	5.06	255.57	1,797.5	-14.8	-57.6	-6.5	0.00	0.00	0.00
1,900.0	5.06	255.57	1,897.1	-17.0	-66.1	-7.4	0.00	0.00	0.00
2,000.0	5.06	255.57	1,996.8	-19.2	-74.7	-8.4	0.00	0.00	0.00
2,100.0	5.06	255.57	2,096.4	-21.4	-83.2	-9.3	0.00	0.00	0.00
2,200.0	5.06	255.57	2,196.0	-23.6	-91.8	-10.3	0.00	0.00	0.00
2,300.0	5.06	255.57	2,295.6	-25.8	-100.3	-11.2	0.00	0.00	0.00
2,400.0	5.06	255.57	2,395.2	-28.0	-108.9	-12.2	0.00	0.00	0.00
2,500.0	5.06	255.57	2,494.8	-30.2	-117.4	-13.2	0.00	0.00	0.00
2,600.0	5.06	255.57	2,594.4	-32.4	-126.0	-14.1	0.00	0.00	0.00
2,700.0	5.06	255.57	2,694.0	-34.6	-134.5	-15.1	0.00	0.00	0.00
2,800.0	5.06	255.57	2,793.6	-36.8	-143.1	-16.0	0.00	0.00	0.00
2,900.0	5.06	255.57	2,893.2	-39.0	-151.6	-17.0	0.00	0.00	0.00
3,000.0	5.06	255.57	2,992.9	-41.2	-160.2	-17.9	0.00	0.00	0.00
3,100.0	5.06	255.57	3,092.5	-43.4	-168.7	-18.9	0.00	0.00	0.00
3,200.0	5.06	255.57	3,192.1	-45.6	-177.2	-19.9	0.00	0.00	0.00
3,300.0	5.06	255.57	3,291.7	-47.8	-185.8	-20.8	0.00	0.00	0.00
3,400.0	5.06	255.57	3,391.3	-50.0	-194.3	-21.8	0.00	0.00	0.00
3,500.0	5.06	255.57	3,490.9	-52.2	-202.9	-22.7	0.00	0.00	0.00
3,600.0	5.06	255.57	3,590.5	-54.4	-211.4	-23.7	0.00	0.00	0.00
3,700.0	5.06	255.57	3,690.1	-56.6	-220.0	-24.6	0.00	0.00	0.00
3,800.0	5.06	255.57	3,789.7	-58.8	-228.5	-25.6	0.00	0.00	0.00
3,900.0	5.06	255.57	3,889.3	-61.0	-237.1	-26.6	0.00	0.00	0.00
4,000.0	5.06	255.57	3,988.9	-63.2	-245.6	-27.5	0.00	0.00	0.00
4,100.0	5.06	255.57	4,088.6	-65.4	-254.2	-28.5	0.00	0.00	0.00
4,200.0	5.06	255.57	4,188.2	-67.6	-262.7	-29.4	0.00	0.00	0.00
4,300.0	5.06	255.57	4,287.8	-69.8	-271.3	-30.4	0.00	0.00	0.00
4,400.0	5.06	255.57	4,387.4	-72.0	-279.8	-31.4	0.00	0.00	0.00
4,500.0	5.06	255.57	4,487.0	-74.2	-288.4	-32.3	0.00	0.00	0.00
4,600.0	5.06	255.57	4,586.6	-76.4	-296.9	-33.3	0.00	0.00	0.00
4,700.0	5.06	255.57	4,686.2	-78.6	-305.5	-34.2	0.00	0.00	0.00
4,800.0	5.06	255.57	4,785.8	-80.8	-314.0	-35.2	0.00	0.00	0.00
4,900.0	5.06	255.57	4,885.4	-83.0	-322.6	-36.1	0.00	0.00	0.00
5,000.0	5.06	255.57	4,985.0	-85.2	-331.1	-37.1	0.00	0.00	0.00



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Wellbore:	Wellbore #1		
Design:	Plan #1		

Planned 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)
5,100.0	5.06	255.57	5,084.7	-87.4	-339.7	-38.1	0.00	0.00	0.00
5,200.0	5.06	255.57	5,184.3	-89.6	-348.2	-39.0	0.00	0.00	0.00
5,300.0	5.06	255.57	5,283.9	-91.8	-356.8	-40.0	0.00	0.00	0.00
5,400.0	5.06	255.57	5,383.5	-94.0	-365.3	-40.9	0.00	0.00	0.00
5,500.0	5.06	255.57	5,483.1	-96.2	-373.9	-41.9	0.00	0.00	0.00
5,600.0	5.06	255.57	5,582.7	-98.4	-382.4	-42.8	0.00	0.00	0.00
5,700.0	5.06	255.57	5,682.3	-100.6	-391.0	-43.8	0.00	0.00	0.00
5,800.0	5.06	255.57	5,781.9	-102.8	-399.5	-44.8	0.00	0.00	0.00
5,900.0	5.06	255.57	5,881.5	-105.0	-408.1	-45.7	0.00	0.00	0.00
6,000.0	5.06	255.57	5,981.1	-107.2	-416.6	-46.7	0.00	0.00	0.00
6,100.0	5.06	255.57	6,080.8	-109.4	-425.2	-47.6	0.00	0.00	0.00
6,200.0	5.06	255.57	6,180.4	-111.6	-433.7	-48.6	0.00	0.00	0.00
6,300.0	5.06	255.57	6,280.0	-113.8	-442.2	-49.6	0.00	0.00	0.00
6,400.0	5.06	255.57	6,379.6	-116.0	-450.8	-50.5	0.00	0.00	0.00
6,500.0	5.06	255.57	6,479.2	-118.2	-459.3	-51.5	0.00	0.00	0.00
6,600.0	5.06	255.57	6,578.8	-120.4	-467.9	-52.4	0.00	0.00	0.00
6,700.0	5.06	255.57	6,678.4	-122.6	-476.4	-53.4	0.00	0.00	0.00
6,800.0	5.06	255.57	6,778.0	-124.8	-485.0	-54.3	0.00	0.00	0.00
6,900.0	5.06	255.57	6,877.6	-127.0	-493.5	-55.3	0.00	0.00	0.00
7,000.0	5.06	255.57	6,977.2	-129.2	-502.1	-56.3	0.00	0.00	0.00
7,100.0	5.06	255.57	7,076.8	-131.4	-510.6	-57.2	0.00	0.00	0.00
7,200.0	5.06	255.57	7,176.5	-133.6	-519.2	-58.2	0.00	0.00	0.00
7,300.0	5.06	255.57	7,276.1	-135.8	-527.7	-59.1	0.00	0.00	0.00
7,400.0	5.06	255.57	7,375.7	-138.0	-536.3	-60.1	0.00	0.00	0.00
7,500.0	5.06	255.57	7,475.3	-140.2	-544.8	-61.0	0.00	0.00	0.00
7,600.0	5.06	255.57	7,574.9	-142.4	-553.4	-62.0	0.00	0.00	0.00
7,700.0	5.06	255.57	7,674.5	-144.6	-561.9	-63.0	0.00	0.00	0.00
7,800.0	5.06	255.57	7,774.1	-146.8	-570.5	-63.9	0.00	0.00	0.00
7,900.0	5.06	255.57	7,873.7	-149.0	-579.0	-64.9	0.00	0.00	0.00
8,000.0	5.06	255.57	7,973.3	-151.2	-587.6	-65.8	0.00	0.00	0.00
8,100.0	5.06	255.57	8,072.9	-153.4	-596.1	-66.8	0.00	0.00	0.00
8,200.0	5.06	255.57	8,172.6	-155.6	-604.7	-67.8	0.00	0.00	0.00
8,300.0	5.06	255.57	8,272.2	-157.8	-613.2	-68.7	0.00	0.00	0.00
8,400.0	5.06	255.57	8,371.8	-160.0	-621.8	-69.7	0.00	0.00	0.00
8,500.0	5.06	255.57	8,471.4	-162.1	-630.3	-70.6	0.00	0.00	0.00
8,600.0	5.06	255.57	8,571.0	-164.3	-638.9	-71.6	0.00	0.00	0.00
Build 12°/100'									
8,687.5	5.06	255.57	8,658.2	-166.3	-646.3	-72.4	0.00	0.00	0.00
8,700.0	4.92	272.79	8,670.6	-166.4	-647.4	-72.4	12.00	-1.14	137.79
8,725.0	5.90	303.32	8,695.5	-165.6	-649.6	-71.3	12.00	3.93	122.14
8,750.0	7.96	321.66	8,720.3	-163.6	-651.7	-69.0	12.00	8.24	73.35
8,775.0	10.49	331.90	8,745.0	-160.2	-653.9	-65.3	12.00	10.09	40.96
8,800.0	13.21	338.09	8,769.5	-155.5	-656.0	-60.4	12.00	10.89	24.76
8,825.0	16.03	342.16	8,793.6	-149.6	-658.1	-54.2	12.00	11.28	16.30
8,850.0	18.90	345.04	8,817.5	-142.4	-660.2	-46.8	12.00	11.50	11.49
8,875.0	21.81	347.17	8,840.9	-134.0	-662.3	-38.2	12.00	11.63	8.54
8,900.0	24.74	348.82	8,863.9	-124.3	-664.3	-28.3	12.00	11.71	6.61
8,925.0	27.68	350.14	8,886.3	-113.4	-666.4	-17.3	12.00	11.77	5.29
8,950.0	30.63	351.23	8,908.2	-101.4	-668.3	-5.1	12.00	11.81	4.34
8,975.0	33.59	352.14	8,929.3	-88.3	-670.2	8.2	12.00	11.84	3.64
9,000.0	36.56	352.92	8,949.8	-74.0	-672.1	22.6	12.00	11.87	3.12
9,025.0	39.53	353.60	8,969.5	-58.7	-673.9	38.0	12.00	11.88	2.71
9,050.0	42.51	354.19	8,988.3	-42.4	-675.6	54.3	12.00	11.90	2.39
9,075.0	45.48	354.73	9,006.3	-25.1	-677.3	71.7	12.00	11.91	2.13

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Planned 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)	
9,100.0	48.46	355.21	9,023.4	-6.9	-678.9	89.9	12.00	11.92	1.93	
9,125.0	51.44	355.65	9,039.5	12.1	-680.4	109.0	12.00	11.92	1.76	
9,150.0	54.43	356.05	9,054.5	32.0	-681.9	128.9	12.00	11.93	1.62	
9,175.0	57.41	356.43	9,068.5	52.7	-683.2	149.6	12.00	11.94	1.50	
9,200.0	60.40	356.78	9,081.4	74.1	-684.5	170.9	12.00	11.94	1.40	
9,225.0	63.38	357.11	9,093.2	96.1	-685.7	192.9	12.00	11.94	1.32	
9,250.0	66.37	357.42	9,103.8	118.7	-686.8	215.4	12.00	11.95	1.25	
9,275.0	69.35	357.72	9,113.2	141.8	-687.7	238.4	12.00	11.95	1.20	
9,300.0	72.34	358.01	9,121.4	165.4	-688.6	261.9	12.00	11.95	1.15	
9,325.0	75.33	358.29	9,128.4	189.4	-689.4	285.8	12.00	11.95	1.11	
9,350.0	78.32	358.56	9,134.1	213.7	-690.1	309.9	12.00	11.95	1.08	
9,375.0	81.31	358.82	9,138.5	238.3	-690.6	334.4	12.00	11.95	1.06	
9,400.0	84.30	359.09	9,141.7	263.1	-691.1	359.0	12.00	11.96	1.04	
9,425.0	87.29	359.34	9,143.5	288.1	-691.4	383.7	12.00	11.96	1.03	
9,450.0	90.27	359.60	9,144.0	313.1	-691.7	408.5	12.00	11.96	1.03	
EOC / 90.61° Inc / 359.63° Azm / 9144' TVD										
9,452.8	90.61	359.63	9,144.0	315.9	-691.7	411.3	12.00	11.96	1.03	
9,500.0	90.61	359.63	9,143.5	363.1	-692.0	458.0	0.00	0.00	0.00	
9,600.0	90.61	359.63	9,142.4	463.0	-692.6	557.1	0.00	0.00	0.00	
9,700.0	90.61	359.63	9,141.4	563.0	-693.3	656.1	0.00	0.00	0.00	
9,800.0	90.61	359.63	9,140.3	663.0	-693.9	755.2	0.00	0.00	0.00	
9,900.0	90.61	359.63	9,139.2	763.0	-694.6	854.3	0.00	0.00	0.00	
10,000.0	90.61	359.63	9,138.2	863.0	-695.2	953.3	0.00	0.00	0.00	
10,100.0	90.61	359.63	9,137.1	963.0	-695.9	1,052.4	0.00	0.00	0.00	
10,200.0	90.61	359.63	9,136.0	1,063.0	-696.5	1,151.4	0.00	0.00	0.00	
10,300.0	90.61	359.63	9,135.0	1,163.0	-697.1	1,250.5	0.00	0.00	0.00	
10,400.0	90.61	359.63	9,133.9	1,263.0	-697.8	1,349.6	0.00	0.00	0.00	
10,500.0	90.61	359.63	9,132.9	1,363.0	-698.4	1,448.6	0.00	0.00	0.00	
10,600.0	90.61	359.63	9,131.8	1,463.0	-699.1	1,547.7	0.00	0.00	0.00	
10,700.0	90.61	359.63	9,130.7	1,563.0	-699.7	1,646.8	0.00	0.00	0.00	
10,800.0	90.61	359.63	9,129.7	1,663.0	-700.4	1,745.8	0.00	0.00	0.00	
10,900.0	90.61	359.63	9,128.6	1,762.9	-701.0	1,844.9	0.00	0.00	0.00	
11,000.0	90.61	359.63	9,127.5	1,862.9	-701.7	1,943.9	0.00	0.00	0.00	
11,100.0	90.61	359.63	9,126.5	1,962.9	-702.3	2,043.0	0.00	0.00	0.00	
11,200.0	90.61	359.63	9,125.4	2,062.9	-703.0	2,142.1	0.00	0.00	0.00	
11,300.0	90.61	359.63	9,124.3	2,162.9	-703.6	2,241.1	0.00	0.00	0.00	
11,400.0	90.61	359.63	9,123.3	2,262.9	-704.2	2,340.2	0.00	0.00	0.00	
11,500.0	90.61	359.63	9,122.2	2,362.9	-704.9	2,439.3	0.00	0.00	0.00	
11,600.0	90.61	359.63	9,121.1	2,462.9	-705.5	2,538.3	0.00	0.00	0.00	
11,700.0	90.61	359.63	9,120.1	2,562.9	-706.2	2,637.4	0.00	0.00	0.00	
11,800.0	90.61	359.63	9,119.0	2,662.9	-706.8	2,736.4	0.00	0.00	0.00	
11,900.0	90.61	359.63	9,117.9	2,762.9	-707.5	2,835.5	0.00	0.00	0.00	
12,000.0	90.61	359.63	9,116.9	2,862.9	-708.1	2,934.6	0.00	0.00	0.00	
12,100.0	90.61	359.63	9,115.8	2,962.9	-708.8	3,033.6	0.00	0.00	0.00	
12,200.0	90.61	359.63	9,114.8	3,062.8	-709.4	3,132.7	0.00	0.00	0.00	
12,300.0	90.61	359.63	9,113.7	3,162.8	-710.1	3,231.8	0.00	0.00	0.00	
12,400.0	90.61	359.63	9,112.6	3,262.8	-710.7	3,330.8	0.00	0.00	0.00	
12,500.0	90.61	359.63	9,111.6	3,362.8	-711.3	3,429.9	0.00	0.00	0.00	
12,600.0	90.61	359.63	9,110.5	3,462.8	-712.0	3,528.9	0.00	0.00	0.00	
12,700.0	90.61	359.63	9,109.4	3,562.8	-712.6	3,628.0	0.00	0.00	0.00	
12,800.0	90.61	359.63	9,108.4	3,662.8	-713.3	3,727.1	0.00	0.00	0.00	
12,900.0	90.61	359.63	9,107.3	3,762.8	-713.9	3,826.1	0.00	0.00	0.00	
13,000.0	90.61	359.63	9,106.2	3,862.8	-714.6	3,925.2	0.00	0.00	0.00	

Database:	EDM5002	Local Co-ordinate Reference:	Well Azores Federal #12H
Company:	COG Operating, LLC	TVD Reference:	Well @ 3522.0usft (McVay 8)
Project:	Lea County, NM	MD Reference:	Well @ 3522.0usft (McVay 8)
Site:	Sec 32, T24-S, R32E	North Reference:	Grid
Well:	Azores Federal #12H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Planned 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)	
13,100.0	90.61	359.63	9,105.2	3,962.8	-715.2	4,024.3	0.00	0.00	0.00	
13,200.0	90.61	359.63	9,104.1	4,062.8	-715.9	4,123.3	0.00	0.00	0.00	
13,300.0	90.61	359.63	9,103.0	4,162.8	-716.5	4,222.4	0.00	0.00	0.00	
13,400.0	90.61	359.63	9,102.0	4,262.7	-717.2	4,321.5	0.00	0.00	0.00	
13,500.0	90.61	359.63	9,100.9	4,362.7	-717.8	4,420.5	0.00	0.00	0.00	
13,600.0	90.61	359.63	9,099.9	4,462.7	-718.5	4,519.6	0.00	0.00	0.00	
13,700.0	90.61	359.63	9,098.8	4,562.7	-719.1	4,618.6	0.00	0.00	0.00	
13,800.0	90.61	359.63	9,097.7	4,662.7	-719.7	4,717.7	0.00	0.00	0.00	
13,900.0	90.61	359.63	9,096.7	4,762.7	-720.4	4,816.8	0.00	0.00	0.00	
14,000.0	90.61	359.63	9,095.6	4,862.7	-721.0	4,915.8	0.00	0.00	0.00	
14,100.0	90.61	359.63	9,094.5	4,962.7	-721.7	5,014.9	0.00	0.00	0.00	
TD @ 14150' MD / 9094' TVD										
14,149.6	90.61	359.63	9,094.0	5,012.3	-722.0	5,064.0	0.00	0.00	0.00	

Design Targets										
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude	
- hit/miss target										
- Shape										
PBHL Azores Federal #1	0.00	0.00	9,094.0	5,012.3	-722.0	435,380.80	695,433.50	32° 11' 43.442 N	103° 42' 5.594 W	
- plan hits target center										
- Point										

Plan Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
1,000.0	1,000.0	0.0	0.0	Build 2°/100'	
1,253.2	1,252.9	-2.8	-10.8	EOB / 5.06° Inc / 255.57° Azm	
8,687.5	8,658.2	-166.3	-646.3	Build 12°/100'	
9,452.8	9,144.0	315.9	-691.7	EOC / 90.61° Inc / 359.63° Azm / 9144' TVD	
14,149.6	9,094.0	5,012.3	-722.0	TD @ 14150' MD / 9094' TVD	

Company Name: COG Operating, LLC
 Azores Federal #12H
 Lea County, NM
 Rig: McVay 8
 Created By: Sam Hays
 Date: 7/14/2016

Azores Federal #12H
 Lea County, NM
 Q160*** & WT-160***
 Plan #1



DIRECTIONAL DRILLING



Azimuths to Grid North
 Magnetic North: 6.77°
 Magnetic Field
 Strength: 47993.9snT
 Dip Angle: 60.01°
 Date: 7/14/2016
 Model: IGRF2015

PROJECT DETAILS: Lea County, NM

Geodetic System: US State Plane 1927 (Exact solution)
 Datum: NAD 1927 (NADCON CONUS)
 Ellipsoid: Clarke 1866
 Zone: New Mexico East 3001
 System Datum: Mean Sea Level

WELL DETAILS: Azores Federal #12H

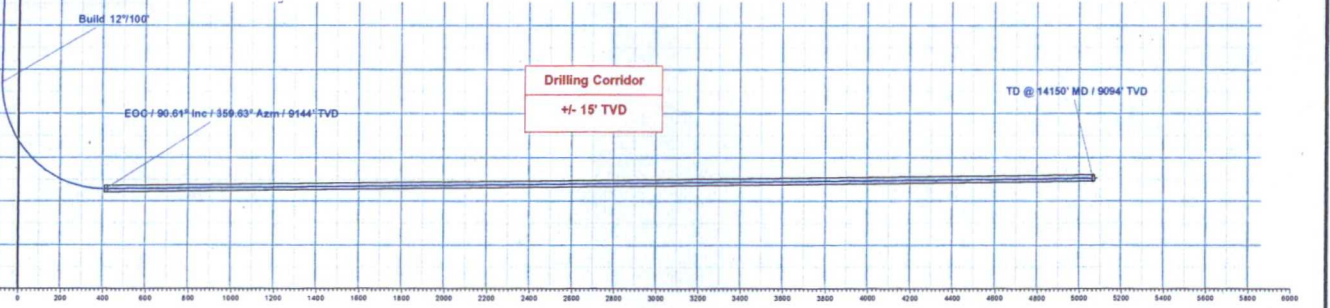
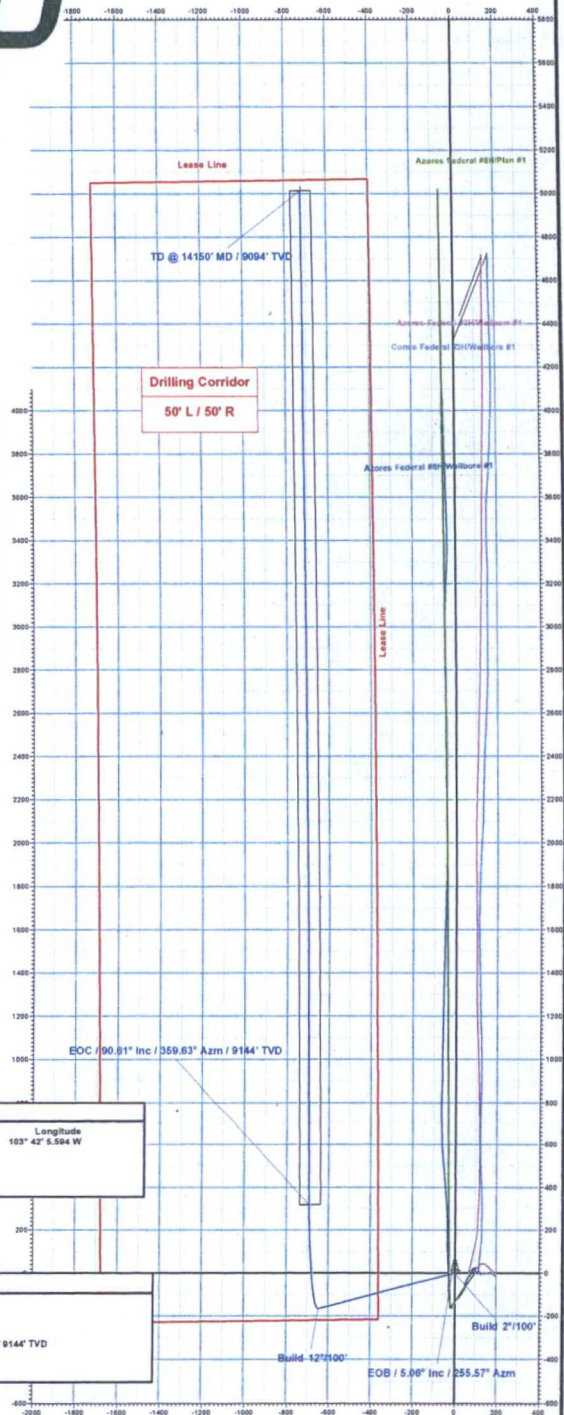
+N-S	+E-W	Ground Level	3486.0	
0.0	0.0	Northing	Easting	Longitude
0.0	0.0	430368.50	896155.5032° 10' 53.790 MD 3° 41' 57.536 W	

DESIGN TARGET DETAILS

Name	TVD	+N-S	+E-W	Northing	Easting	Latitude	Longitude
PDHL Azores Federal #12H - plan hits target center	9094.0	5012.3	-722.0	435380.80	895433.50	32° 11' 43.442 N	103° 42' 5.594 W

ANNOTATIONS

MD	Inc	Azi	TVD	+N-S	+E-W	Vsect	Departure	Annotation
1090.0	0.00	0.00	1090.0	0.0	0.0	0.0	0.0	Build 27'100'
1253.2	5.00	255.57	1252.9	-2.8	-10.8	-1.2	11.2	EOB / 5.00° Inc / 255.57° Azm
8887.5	5.00	255.57	8886.2	-186.3	-646.3	-72.4	667.4	Build 12'100'
9452.8	90.81	359.63	9144.0	315.9	-891.7	411.3	1183.4	EOC / 90.81° Inc / 359.63° Azm / 9144° TVD
14149.0	90.81	359.63	9094.0	5012.3	-722.0	5064.0	5879.9	TD @ 14150' MD / 9094° TVD



Vertical Section at 351.80° (200 usft/in)



COG Operating, LLC

Lea County, NM

Sec 32, T24-S, R32E

Azores Federal #12H

Wellbore #1

Plan #1

QES Anticollision Report

14 July, 2016





QES Directional Drilling, LLC
Anticollision Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Azores Federal #12H
Project:	Lea County, NM	TVD Reference:	Well @ 3522.0usft (McVay 8)
Reference Site:	Sec 32, T24-S, R32E	MD Reference:	Well @ 3522.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Azores Federal #12H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Plan #1	Offset TVD Reference:	Offset Datum

Reference	Plan #1		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 10,000.0 usft	Error Surface:	Elliptical Conic
Warning Levels Evaluated at:	2.00 Sigma		

Survey Tool Program		Date	7/14/2016		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
0.0	14,149.6	Plan #1 (Wellbore #1)	MWD default	MWD - Standard	

Summary						
Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
Sec 32, T24-S, R32E						
Azores Federal #11H - Wellbore #1 - Wellbore #1	353.5	347.0	1,204.3	1,203.0	963.667	CC, ES
Azores Federal #11H - Wellbore #1 - Wellbore #1	14,149.6	14,396.0	1,977.3	1,788.0	10.444	SF
Azores Federal #3H - Wellbore #1 - Wellbore #1	1,043.2	1,036.7	193.5	190.7	70.201	CC, ES
Azores Federal #3H - Wellbore #1 - Wellbore #1	14,149.6	15,098.0	1,748.8	1,639.2	15.961	SF
Azores Federal #7H - Wellbore #1 - Wellbore #1	425.6	420.7	1,130.6	1,129.6	1,106.321	CC
Azores Federal #7H - Wellbore #1 - Wellbore #1	14,149.6	14,450.0	1,282.3	1,089.9	6.663	ES, SF
Azores Federal #8H - Wellbore #1 - Plan #1	1,000.0	999.0	100.0	95.8	23.755	CC, ES
Azores Federal #8H - Wellbore #1 - Plan #1	14,149.6	14,079.0	660.1	471.4	3.498	SF
Azores Federal #8H - Wellbore #1 - Wellbore #1	1,025.8	1,025.9	98.9	94.1	20.550	CC, ES
Azores Federal #8H - Wellbore #1 - Wellbore #1	13,300.0	13,125.0	668.1	516.2	4.400	SF
Convo Federal #2H - Wellbore #1 - Wellbore #1	0.0	0.0	1,293.5			
Convo Federal #2H - Wellbore #1 - Wellbore #1	200.0	179.9	1,293.9	1,293.3	2,231.534	ES
Convo Federal #2H - Wellbore #1 - Wellbore #1	14,149.6	13,321.0	2,240.8	2,064.0	12.673	SF
Convo Federal #3H - Wellbore #1 - Wellbore #1	1,039.7	1,032.7	184.9	180.7	43.577	CC, ES
Convo Federal #3H - Wellbore #1 - Wellbore #1	14,000.0	12,907.0	1,104.1	957.6	7.537	SF

Offset Design Sec 32, T24-S, R32E - Azores Federal #11H - Wellbore #1 - Wellbore #1											Offset Site Error: 0.0 usft	
Survey Program: 100-MWD default, 4730-MWD default											Offset Well Error: 0.0 usft	
Reference	Vertical	Offset	Vertical	Semi Major Axis		Highside Toolface	Offset Wellbore Centre		Distance		Separation Factor	Warning
Measured Depth (usft)	Depth (usft)	Measured Depth (usft)	Depth (usft)	Reference	Offset		+N-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)		
0.0	0.0	0.0	0.0	0.0	0.0	109.75	-407.4	1,134.7	1,205.6			
100.0	100.0	99.6	99.6	0.1	0.1	109.73	-407.0	1,134.7	1,205.5	1,205.3	7,238.510	
191.7	191.7	187.7	187.7	0.3	0.3	109.71	-406.5	1,134.7	1,205.3	1,204.8	2,177.363	
200.0	200.0	195.7	195.7	0.3	0.3	109.71	-406.5	1,134.7	1,205.3	1,204.8	2,047.099	
300.0	300.0	300.0	300.0	0.5	0.5	109.67	-405.5	1,134.3	1,204.6	1,203.6	1,168.721	
353.5	353.5	347.0	347.0	0.7	0.6	109.65	-405.0	1,134.1	1,204.3	1,203.0	963.667	CC, ES
400.0	400.0	379.0	379.0	0.8	0.7	109.64	-404.8	1,134.5	1,204.7	1,203.2	847.627	
500.0	500.0	471.7	471.6	1.0	0.9	109.60	-404.6	1,136.6	1,206.7	1,204.8	655.007	
600.0	600.0	568.8	568.7	1.2	1.1	109.51	-403.7	1,139.0	1,208.7	1,206.5	531.664	
700.0	700.0	672.9	672.8	1.4	1.3	109.48	-403.7	1,141.4	1,211.0	1,208.2	445.746	
800.0	800.0	769.1	769.0	1.7	1.5	109.53	-405.4	1,142.8	1,212.9	1,209.8	385.868	
900.0	900.0	864.9	864.7	1.9	1.7	109.45	-404.6	1,145.6	1,215.4	1,211.8	340.098	
1,000.0	1,000.0	963.8	963.6	2.1	1.9	109.35	-403.4	1,148.8	1,218.0	1,214.0	303.755	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design												Sec 32, T24-S, R32E - Azores Federal #11H - Wellbore #1 - Wellbore #1		Offset Site Error: 0.0 usft	
Survey Program: 100-MWD default, 4730-MWD default												Offset Well Error: 0.0 usft			
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Separation Factor	Warning					
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Between Centres (usft)	Between Ellipses (usft)							
1,100.0	1,100.0	1,063.6	1,063.3	2.3	2.1	-146.32	-402.4	1,152.0	1,222.1	1,217.7	276.258				
1,200.0	1,199.8	1,163.8	1,163.4	2.5	2.3	-146.46	-401.5	1,155.1	1,229.1	1,224.3	254.791				
1,253.2	1,252.9	1,217.3	1,216.9	2.6	2.4	-146.56	-401.0	1,156.7	1,234.0	1,229.0	244.852				
1,300.0	1,299.5	1,264.7	1,264.3	2.7	2.6	-146.71	-400.6	1,158.2	1,238.7	1,233.4	236.543				
1,400.0	1,399.1	1,364.9	1,364.4	2.9	2.8	-147.02	-399.6	1,161.1	1,248.5	1,242.9	220.566				
1,500.0	1,498.7	1,464.3	1,463.8	3.2	3.0	-147.33	-398.6	1,164.0	1,258.4	1,252.3	206.628				
1,600.0	1,598.3	1,567.0	1,566.4	3.4	3.2	-147.64	-397.5	1,166.9	1,268.2	1,261.7	194.174				
1,700.0	1,697.9	1,668.6	1,668.0	3.7	3.4	-147.93	-396.5	1,169.4	1,277.8	1,270.8	183.286				
1,800.0	1,797.5	1,771.6	1,771.0	3.9	3.6	-148.22	-395.6	1,171.8	1,287.2	1,279.8	173.544				
1,900.0	1,897.1	1,906.2	1,905.6	4.2	3.9	-148.54	-394.9	1,172.8	1,295.3	1,287.4	163.324				
2,000.0	1,996.8	2,004.5	2,003.8	4.4	4.1	-148.70	-395.3	1,171.7	1,302.0	1,293.6	155.632				
2,100.0	2,096.4	2,100.0	2,099.4	4.7	4.3	-148.86	-396.0	1,170.9	1,308.9	1,300.1	148.852				
2,200.0	2,196.0	2,193.4	2,192.8	4.9	4.5	-149.02	-396.6	1,170.5	1,316.2	1,307.0	142.784				
2,300.0	2,295.6	2,286.3	2,285.7	5.2	4.7	-149.18	-397.0	1,170.6	1,324.0	1,314.3	137.271				
2,400.0	2,395.2	2,380.7	2,380.1	5.5	4.9	-149.35	-397.4	1,171.1	1,332.2	1,322.1	132.210				
2,500.0	2,494.8	2,473.9	2,473.2	5.7	5.1	-149.52	-398.1	1,171.9	1,340.9	1,330.4	127.620				
2,600.0	2,594.4	2,575.7	2,575.1	6.0	5.3	-149.69	-399.0	1,173.0	1,349.8	1,338.9	123.212				
2,700.0	2,694.0	2,683.9	2,683.2	6.3	5.5	-149.86	-400.0	1,173.7	1,358.3	1,346.9	118.977				
2,800.0	2,793.6	2,775.7	2,775.0	6.5	5.7	-149.99	-401.0	1,174.1	1,366.6	1,354.8	115.377				
2,900.0	2,893.2	2,874.2	2,873.5	6.8	5.9	-150.15	-402.0	1,175.0	1,375.5	1,363.2	111.941				
3,000.0	2,992.9	2,981.4	2,980.7	7.1	6.2	-150.33	-402.5	1,175.9	1,384.1	1,371.3	108.565				
3,100.0	3,092.5	3,087.3	3,086.6	7.3	6.4	-150.52	-402.7	1,176.2	1,392.1	1,378.9	105.402				
3,200.0	3,192.1	3,179.9	3,179.3	7.6	6.6	-150.67	-403.0	1,176.5	1,400.1	1,386.5	102.660				
3,300.0	3,291.7	3,290.6	3,289.9	7.9	6.8	-150.86	-403.3	1,176.8	1,408.2	1,394.1	99.830				
3,400.0	3,391.3	3,395.4	3,394.7	8.1	7.0	-151.03	-403.6	1,176.3	1,415.6	1,401.0	97.202				
3,500.0	3,490.9	3,500.8	3,500.1	8.4	7.2	-151.21	-403.4	1,175.6	1,422.6	1,407.6	94.698				
3,600.0	3,590.5	3,612.8	3,612.1	8.7	7.5	-151.38	-403.4	1,174.0	1,428.9	1,413.4	92.222				
3,700.0	3,690.1	3,709.4	3,708.7	9.0	7.7	-151.50	-404.2	1,172.1	1,435.0	1,419.1	90.066				
3,800.0	3,789.7	3,806.7	3,805.9	9.2	7.9	-151.60	-405.3	1,170.3	1,441.3	1,424.9	88.034				
3,900.0	3,889.3	3,900.0	3,899.2	9.5	8.1	-151.74	-405.4	1,169.2	1,447.9	1,431.1	86.169				
4,000.0	3,988.9	3,999.8	3,999.1	9.8	8.3	-151.91	-405.0	1,168.3	1,454.8	1,437.5	84.343				
4,100.0	4,088.6	4,092.4	4,091.6	10.1	8.5	-152.05	-405.1	1,167.6	1,461.8	1,444.2	82.693				
4,200.0	4,188.2	4,192.9	4,192.1	10.3	8.7	-152.21	-405.2	1,167.1	1,469.2	1,451.0	81.064				
4,300.0	4,287.8	4,295.1	4,294.3	10.6	8.9	-152.37	-405.1	1,166.5	1,476.4	1,457.8	79.489				
4,400.0	4,387.4	4,390.2	4,389.4	10.9	9.1	-152.53	-404.7	1,166.0	1,483.6	1,464.6	78.054				
4,500.0	4,487.0	4,478.8	4,478.1	11.1	9.3	-152.69	-404.3	1,166.0	1,491.4	1,472.0	76.756				
4,600.0	4,586.6	4,575.3	4,574.5	11.4	9.5	-152.79	-405.5	1,166.3	1,499.8	1,479.9	75.513				
4,700.0	4,686.2	4,676.5	4,675.7	11.7	9.6	-152.91	-406.7	1,166.5	1,508.1	1,487.9	74.631				
4,800.0	4,785.8	4,777.0	4,776.2	12.0	9.6	-153.02	-407.9	1,166.6	1,516.4	1,495.9	73.940				
4,900.0	4,885.4	4,876.6	4,875.8	12.2	9.6	-153.12	-409.3	1,166.7	1,524.6	1,503.9	73.449				
5,000.0	4,985.0	4,977.5	4,976.7	12.5	9.6	-153.21	-410.8	1,166.7	1,532.8	1,511.8	72.952				
5,100.0	5,084.7	5,079.4	5,078.6	12.8	9.7	-153.31	-412.2	1,166.6	1,540.9	1,519.7	72.449				
5,200.0	5,184.3	5,180.3	5,179.5	13.1	9.7	-153.41	-413.5	1,166.4	1,548.9	1,527.4	71.931				
5,300.0	5,283.9	5,280.8	5,279.9	13.3	9.7	-153.50	-414.9	1,166.2	1,556.8	1,535.0	71.415				
5,400.0	5,383.5	5,382.1	5,381.2	13.6	9.7	-153.59	-416.5	1,165.8	1,564.7	1,542.6	70.878				
5,500.0	5,483.1	5,483.6	5,482.7	13.9	9.8	-153.67	-418.3	1,165.2	1,572.4	1,550.1	70.344				
5,600.0	5,582.7	5,583.0	5,582.1	14.2	9.8	-153.74	-420.0	1,164.6	1,580.1	1,557.5	69.805				
5,700.0	5,682.3	5,682.3	5,681.4	14.4	9.9	-153.83	-421.6	1,164.1	1,587.9	1,564.9	69.280				
5,800.0	5,781.9	5,780.6	5,779.7	14.7	9.9	-153.91	-422.9	1,163.7	1,595.6	1,572.4	68.760				
5,900.0	5,881.5	5,879.1	5,878.1	15.0	10.0	-154.00	-424.2	1,163.4	1,603.5	1,580.0	68.251				
6,000.0	5,981.1	5,978.1	5,977.2	15.3	10.0	-154.09	-425.5	1,163.1	1,611.4	1,587.6	67.733				
6,100.0	6,080.8	6,078.9	6,077.9	15.5	10.1	-154.18	-427.0	1,162.8	1,619.4	1,595.3	67.217				

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference:
TVD Reference:
MD Reference:
North Reference:
Survey Calculation Method:
Output errors are at
Database:
Offset TVD Reference:

Well Azores Federal #12H
Well @ 3522.0usft (McVay 8)
Well @ 3522.0usft (McVay 8)
Grid
Minimum Curvature
2.00 sigma
EDM5002
Offset Datum

Offset Design												Offset Site Error:	0.0 usft
Sec 32, T24-S, R32E - Azores Federal #11H - Wellbore #1 - Wellbore #1												Offset Well Error:	0.0 usft
Survey Program: 100-MWD default, 4730-MWD default													
Reference	Vertical	Offset	Semi Major Axis	Highside	Offset Wellbore Centre	Distance	Separation	Warning					
Measured Depth (usft)	Depth (usft)	Measured Depth (usft)	Reference Offset (usft)	Toolface (°)	+N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Factor				
6,200.0	6,180.4	6,184.1	6,183.2	15.8	10.2	-154.25	-428.7	1,162.1	1,627.1	1,602.7	66.674		
6,300.0	6,280.0	6,284.4	6,283.4	16.1	10.2	-154.32	-430.6	1,161.3	1,634.5	1,609.8	66.136		
6,400.0	6,379.6	6,378.9	6,377.9	16.4	10.3	-154.38	-432.3	1,160.6	1,642.2	1,617.2	65.622		
6,500.0	6,479.2	6,474.7	6,473.7	16.6	10.4	-154.45	-434.1	1,160.3	1,650.2	1,624.8	65.127		
6,600.0	6,578.8	6,571.9	6,570.9	16.9	10.4	-154.52	-435.8	1,160.1	1,658.3	1,632.6	64.642		
6,700.0	6,678.4	6,672.9	6,671.9	17.2	10.5	-154.59	-437.4	1,160.1	1,666.5	1,640.5	64.155		
6,800.0	6,778.0	6,777.4	6,776.3	17.5	10.6	-154.67	-439.0	1,159.8	1,674.5	1,648.2	63.654		
6,900.0	6,877.6	6,876.3	6,875.2	17.8	10.7	-154.75	-440.4	1,159.3	1,682.3	1,655.7	63.159		
7,000.0	6,977.2	6,973.1	6,972.0	18.0	10.8	-154.83	-441.7	1,159.1	1,690.3	1,663.3	62.683		
7,100.0	7,076.8	7,071.2	7,070.1	18.3	10.9	-154.91	-442.9	1,159.0	1,698.4	1,671.1	62.213		
7,200.0	7,176.5	7,169.6	7,168.5	18.6	11.0	-155.00	-444.1	1,158.9	1,706.6	1,679.0	61.754		
7,300.0	7,276.1	7,268.1	7,267.0	18.9	11.1	-155.08	-445.3	1,159.0	1,714.9	1,686.9	61.297		
7,400.0	7,375.7	7,366.5	7,365.4	19.1	11.2	-155.17	-446.5	1,159.1	1,723.2	1,694.9	60.851		
7,500.0	7,475.3	7,463.7	7,462.6	19.4	11.3	-155.25	-447.7	1,159.3	1,731.7	1,703.0	60.409		
7,600.0	7,574.9	7,562.0	7,560.9	19.7	11.4	-155.33	-448.8	1,159.7	1,740.3	1,711.3	59.980		
7,700.0	7,674.5	7,656.8	7,655.7	20.0	11.5	-155.42	-449.9	1,160.2	1,749.1	1,719.7	59.564		
7,800.0	7,774.1	7,752.8	7,751.6	20.2	11.6	-155.50	-451.2	1,160.9	1,758.0	1,728.3	59.161		
7,900.0	7,873.7	7,850.3	7,849.2	20.5	11.8	-155.57	-452.6	1,161.8	1,767.2	1,737.1	58.759		
8,000.0	7,973.3	7,948.0	7,946.8	20.8	11.9	-155.64	-454.3	1,162.7	1,776.4	1,746.0	58.369		
8,100.0	8,072.9	8,046.8	8,045.6	21.1	12.0	-155.70	-456.3	1,163.6	1,785.8	1,755.0	57.978		
8,200.0	8,172.6	8,146.4	8,145.2	21.3	12.1	-155.75	-458.4	1,164.6	1,795.1	1,764.0	57.595		
8,300.0	8,272.2	8,249.5	8,248.2	21.6	12.3	-155.80	-460.8	1,165.4	1,804.4	1,772.9	57.204		
8,400.0	8,371.8	8,351.9	8,350.6	21.9	12.4	-155.84	-463.2	1,166.1	1,813.5	1,781.5	56.816		
8,500.0	8,471.4	8,453.1	8,451.8	22.2	12.5	-155.89	-465.6	1,166.6	1,822.4	1,790.1	56.433		
8,600.0	8,571.0	8,553.9	8,552.6	22.4	12.7	-155.94	-467.8	1,167.1	1,831.3	1,798.6	56.057		
8,687.5	8,658.2	8,630.9	8,629.5	22.7	12.8	-156.04	-467.4	1,167.8	1,839.1	1,806.2	55.768		
8,700.0	8,670.6	8,639.3	8,637.9	22.7	12.8	-173.35	-466.9	1,168.0	1,840.3	1,807.3	55.763		
8,725.0	8,695.5	8,656.7	8,655.3	22.8	12.8	155.88	-465.5	1,168.5	1,843.0	1,810.0	55.776		
8,750.0	8,720.3	8,680.7	8,679.0	22.8	12.8	137.28	-462.6	1,169.5	1,846.0	1,812.9	55.800		
8,775.0	8,745.0	8,821.7	8,813.9	22.9	13.0	126.15	-423.0	1,174.8	1,848.9	1,815.6	55.640		
8,800.0	8,769.5	8,844.0	8,833.9	22.9	13.0	119.69	-413.4	1,175.3	1,850.7	1,817.4	55.643		
8,825.0	8,793.6	8,844.0	8,833.9	23.0	13.0	115.48	-413.4	1,175.3	1,852.9	1,819.6	55.701		
8,850.0	8,817.5	8,844.0	8,833.9	23.0	13.0	112.42	-413.4	1,175.3	1,855.6	1,822.3	55.781		
8,875.0	8,840.9	8,865.6	8,853.0	23.0	13.0	109.95	-403.3	1,176.3	1,858.3	1,825.0	55.818		
8,900.0	8,863.9	8,872.3	8,858.8	23.1	13.1	108.00	-400.1	1,176.8	1,861.7	1,828.4	55.905		
8,925.0	8,886.3	8,891.0	8,874.9	23.1	13.1	106.31	-390.6	1,178.5	1,865.5	1,832.2	55.975		
8,950.0	8,908.2	8,891.0	8,874.9	23.1	13.1	104.88	-390.6	1,178.5	1,869.5	1,836.2	56.087		
8,975.0	8,929.3	8,891.0	8,874.9	23.2	13.1	103.57	-390.6	1,178.5	1,873.9	1,840.6	56.204		
9,000.0	8,949.8	8,891.0	8,874.9	23.2	13.1	102.34	-390.6	1,178.5	1,878.8	1,845.4	56.323		
9,025.0	8,969.5	8,912.0	8,892.4	23.2	13.1	101.23	-379.4	1,180.9	1,883.7	1,850.3	56.376		
9,050.0	8,988.3	8,921.6	8,900.3	23.2	13.1	100.15	-374.0	1,182.2	1,889.1	1,855.6	56.459		
9,075.0	9,006.3	9,101.0	9,021.6	23.2	13.7	98.86	-245.2	1,202.8	1,893.0	1,859.0	55.684		
9,100.0	9,023.4	9,117.1	9,029.8	23.3	13.7	97.98	-231.5	1,204.4	1,896.6	1,862.5	55.611		
9,125.0	9,039.5	9,127.0	9,034.6	23.3	13.8	97.18	-222.8	1,205.4	1,900.4	1,866.2	55.575		
9,150.0	9,054.5	9,141.4	9,041.3	23.3	13.9	96.38	-210.1	1,207.0	1,904.3	1,870.0	55.483		
9,175.0	9,068.5	9,151.9	9,046.0	23.3	13.9	95.62	-200.8	1,208.2	1,908.5	1,874.0	55.420		
9,200.0	9,081.4	9,175.0	9,055.8	23.3	14.0	94.85	-180.2	1,211.3	1,912.9	1,878.2	55.255		
9,225.0	9,093.2	9,175.0	9,055.8	23.4	14.0	94.16	-180.2	1,211.3	1,917.2	1,882.6	55.265		
9,250.0	9,103.8	9,175.0	9,055.8	23.4	14.0	93.45	-180.2	1,211.3	1,921.9	1,887.1	55.274		
9,275.0	9,113.2	9,192.0	9,062.6	23.4	14.1	92.76	-164.8	1,213.8	1,926.7	1,891.7	55.125		
9,300.0	9,121.4	9,201.4	9,066.2	23.5	14.2	92.08	-156.2	1,215.3	1,931.6	1,896.5	55.045		
9,325.0	9,128.4	9,222.0	9,073.7	23.5	14.3	91.45	-137.4	1,218.9	1,936.7	1,901.4	54.866		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design												Offset Site Error:	0.0 usft
Sec 32, T24-S, R32E - Azores Federal #11H - Wellbore #1 - Wellbore #1												Offset Well Error:	0.0 usft
Survey Program: 100-MWD default, 4730-MWD default													
Reference	Vertical	Offset	Semi Major Axis	Highside	Offset Wellbore Centre	Distance	Separation	Warning					
Measured Depth (usft)	Depth (usft)	Measured Depth (usft)	Reference (usft)	Offset (usft)	+N-S (usft)	Between Centres (usft)	Factor						
					+E-W (usft)	Between Ellipses (usft)							
9,350.0	9,134.1	9,222.0	9,073.7	23.6	14.3	90.77	-137.4	1,218.9	1,941.8	1,906.4	54.869		
9,375.0	9,138.5	9,231.7	9,077.0	23.6	14.4	90.13	-128.5	1,220.6	1,947.0	1,911.5	54.777		
9,400.0	9,141.7	9,248.0	9,082.2	23.7	14.5	89.56	-113.3	1,223.8	1,952.3	1,916.6	54.619		
9,425.0	9,143.5	9,523.8	9,119.3	23.8	17.0	89.62	155.8	1,259.2	1,955.2	1,917.0	51.079		
9,450.0	9,144.0	9,538.6	9,119.7	23.8	17.1	89.38	170.5	1,260.3	1,957.2	1,918.7	50.773		
9,452.8	9,144.0	9,540.2	9,119.7	23.9	17.1	89.36	172.2	1,260.4	1,957.4	1,918.9	50.739		
9,500.0	9,143.5	9,579.0	9,120.6	24.0	17.5	89.39	210.8	1,263.5	1,961.5	1,922.2	49.978		
9,600.0	9,142.4	9,640.0	9,121.7	24.6	18.2	89.45	271.5	1,269.1	1,971.1	1,930.6	48.557		
9,700.0	9,141.4	9,721.2	9,122.6	25.3	19.2	89.50	352.4	1,277.5	1,982.0	1,939.7	46.801		
9,800.0	9,140.3	9,982.8	9,128.2	26.1	22.5	89.75	613.2	1,294.3	1,988.9	1,942.3	42.721		
9,900.0	9,139.2	10,085.0	9,129.2	27.0	23.9	89.81	715.3	1,296.8	1,991.9	1,942.9	40.649		
10,000.0	9,138.2	10,175.9	9,128.2	28.0	25.3	89.81	806.2	1,299.1	1,995.1	1,943.7	38.773		
10,100.0	9,137.1	10,371.8	9,126.0	29.1	28.2	89.80	1,002.0	1,301.1	1,997.4	1,941.8	35.953		
10,200.0	9,136.0	10,465.7	9,125.3	30.3	29.6	89.81	1,095.9	1,299.2	1,996.0	1,937.7	34.278		
10,289.9	9,135.1	10,535.5	9,123.9	31.4	30.7	89.79	1,165.7	1,298.4	1,995.6	1,935.1	32.984		
10,300.0	9,135.0	10,544.9	9,123.6	31.6	30.9	89.79	1,175.1	1,298.4	1,995.6	1,934.8	32.831		
10,400.0	9,133.9	10,660.0	9,119.3	32.8	32.7	89.70	1,290.1	1,297.7	1,995.7	1,931.7	31.196		
10,500.0	9,132.9	10,790.5	9,115.7	34.2	34.8	89.64	1,420.6	1,294.4	1,993.8	1,926.3	29.576		
10,600.0	9,131.8	10,876.4	9,113.8	35.6	36.1	89.61	1,506.3	1,292.2	1,991.8	1,921.6	28.382		
10,700.0	9,130.7	10,960.3	9,114.0	37.0	37.4	89.64	1,590.2	1,290.7	1,990.7	1,917.7	27.303		
10,800.0	9,129.7	11,058.7	9,114.7	38.5	38.8	89.69	1,688.6	1,289.5	1,990.1	1,914.2	26.217		
10,900.0	9,128.6	11,155.9	9,115.5	39.9	40.4	89.74	1,785.9	1,288.3	1,989.5	1,910.5	25.184		
11,000.0	9,127.5	11,253.8	9,115.6	41.5	42.0	89.77	1,883.7	1,287.2	1,989.0	1,906.8	24.200		
11,100.0	9,126.5	11,366.7	9,113.7	43.0	43.9	89.75	1,996.6	1,285.8	1,988.4	1,902.7	23.207		
11,192.6	9,125.5	11,438.4	9,112.0	44.4	45.1	89.73	2,068.3	1,284.9	1,987.9	1,899.5	22.508		
11,200.0	9,125.4	11,444.0	9,112.0	44.5	45.2	89.73	2,073.8	1,284.9	1,987.9	1,899.3	22.455		
11,300.0	9,124.3	11,516.4	9,111.4	46.1	46.3	89.73	2,146.2	1,284.9	1,988.6	1,897.3	21.781		
11,400.0	9,123.3	11,616.6	9,110.4	47.7	48.0	89.73	2,246.5	1,286.2	1,990.6	1,896.0	21.052		
11,500.0	9,122.2	11,724.6	9,111.6	49.3	49.7	89.80	2,354.5	1,286.6	1,991.5	1,893.6	20.338		
11,600.0	9,121.1	11,828.5	9,113.8	51.0	51.4	89.90	2,458.3	1,287.0	1,992.6	1,891.3	19.679		
11,700.0	9,120.1	11,908.4	9,115.0	52.6	52.7	89.96	2,538.2	1,287.5	1,993.9	1,889.6	19.123		
11,800.0	9,119.0	11,978.0	9,115.3	54.2	53.9	89.99	2,607.8	1,288.9	1,996.5	1,889.3	18.636		
11,900.0	9,117.9	12,049.4	9,114.5	55.9	55.1	89.99	2,679.1	1,291.5	2,000.7	1,890.7	18.182		
12,000.0	9,116.9	12,169.2	9,111.0	57.6	57.1	89.92	2,798.8	1,296.3	2,005.4	1,891.7	17.628		
12,100.0	9,115.8	12,311.4	9,112.2	59.2	59.5	90.00	2,941.0	1,299.0	2,007.9	1,890.1	17.047		
12,200.0	9,114.8	12,405.6	9,113.6	60.9	61.1	90.07	3,035.2	1,300.1	2,009.7	1,888.6	16.598		
12,300.0	9,113.7	12,498.7	9,113.8	62.6	62.7	90.10	3,128.2	1,301.5	2,011.9	1,887.5	16.171		
12,400.0	9,112.6	12,678.6	9,118.3	64.3	65.7	90.29	3,308.1	1,299.6	2,010.9	1,881.7	15.571		
12,500.0	9,111.6	12,778.5	9,122.3	66.0	67.3	90.43	3,407.8	1,297.4	2,009.3	1,876.7	15.159		
12,600.0	9,110.5	12,909.1	9,127.7	67.7	69.5	90.62	3,538.2	1,293.8	2,007.3	1,870.8	14.706		
12,700.0	9,109.4	13,066.5	9,126.9	69.5	72.2	90.65	3,695.3	1,284.9	2,002.0	1,861.1	14.206		
12,800.0	9,108.4	13,160.8	9,123.2	71.2	73.9	90.58	3,789.4	1,278.8	1,996.2	1,851.9	13.832		
12,900.0	9,107.3	13,260.0	9,117.9	72.9	75.6	90.46	3,888.3	1,272.6	1,990.5	1,842.7	13.467		
13,000.0	9,106.2	13,331.4	9,114.1	74.7	76.8	90.37	3,959.4	1,268.6	1,985.6	1,834.8	13.171		
13,100.0	9,105.2	13,392.5	9,111.9	76.4	77.8	90.32	4,020.5	1,266.2	1,982.2	1,828.7	12.913		
13,200.0	9,104.1	13,449.0	9,111.2	78.1	78.7	90.32	4,076.9	1,265.1	1,981.1	1,824.9	12.685		
13,214.1	9,104.0	13,461.9	9,111.2	78.4	78.9	90.32	4,089.8	1,265.0	1,981.1	1,824.4	12.647		
13,300.0	9,103.0	13,544.0	9,110.6	79.9	80.3	90.33	4,171.9	1,264.6	1,981.2	1,821.7	12.418		
13,400.0	9,102.0	13,626.8	9,109.2	81.6	81.8	90.32	4,254.7	1,264.7	1,981.9	1,819.1	12.177		
13,500.0	9,100.9	13,739.6	9,108.3	83.4	83.7	90.33	4,367.5	1,264.9	1,982.7	1,816.3	11.913		
13,600.0	9,099.9	13,853.5	9,109.6	85.1	85.6	90.40	4,481.4	1,264.0	1,982.6	1,812.5	11.655		
13,700.0	9,098.8	13,962.0	9,110.5	86.9	87.5	90.46	4,589.9	1,263.1	1,982.4	1,808.6	11.409		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design												Offset Site Error:	0.0 usft
Sec 32, T24-S, R32E - Azores Federal #11H - Wellbore #1 - Wellbore #1												Offset Well Error:	0.0 usft
Survey Program: 100-MWD default, 4730-MWD default													
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference Offset (usft) (usft)		Highside Toolface (°)	Offset Wellbore Centre +N-S (usft) +E-W (usft)		Distance Between Centres (usft) Between Ellipses (usft)		Separation Factor	Warning	
13,800.0	9,097.7	14,073.6	9,110.9	88.7	89.4	90.51	4,701.4	1,260.9	1,981.1	1,803.6	11.164		
13,900.0	9,096.7	14,169.7	9,109.7	90.4	91.1	90.50	4,797.5	1,259.1	1,979.9	1,799.0	10.944		
14,000.0	9,095.6	14,269.7	9,108.3	92.2	92.8	90.49	4,897.5	1,257.4	1,978.8	1,794.4	10.729		
14,100.0	9,094.5	14,369.7	9,106.9	93.9	94.6	90.48	4,997.4	1,255.7	1,977.7	1,789.7	10.521		
14,148.1	9,094.0	14,396.0	9,106.6	94.8	95.1	90.48	5,023.8	1,255.2	1,977.3	1,788.0	10.445		
14,149.6	9,094.0	14,396.0	9,106.6	94.8	95.1	90.48	5,023.8	1,255.2	1,977.3	1,788.0	10.444 SF		



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference:
TVD Reference: Well Azores Federal #12H
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Well @ 3522.0usft (McVay 8)
Survey Calculation Method: Grid
Output errors are at: Minimum Curvature
Database: 2.00 sigma
EDM5002
Offset TVD Reference: Offset Datum

Offset Design												Sec 32, T24-S, R32E - Azores Federal #3H - Wellbore #1 - Wellbore #1		Offset Site Error: 0.0 usft	
Survey Program: 100-Good_gyro, 10100-MWD default												Offset Well Error: 0.0 usft			
Reference		Offset		Semi Major Axis		Distance									
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning			
0.0	0.0	0.0	0.0	0.0	0.0	95.05	-17.7	200.1	201.1						
100.0	100.0	90.7	90.7	0.1	0.0	95.10	-17.9	200.0	200.8	200.7	1,644.220				
200.0	200.0	190.9	190.9	0.3	0.1	95.17	-18.1	199.8	200.6	200.2	503.393				
300.0	300.0	292.3	292.3	0.5	0.1	95.03	-17.5	199.3	200.0	199.4	295.503				
400.0	400.0	392.4	392.4	0.8	0.2	94.68	-16.2	198.3	199.0	198.1	208.373				
500.0	500.0	492.2	492.1	1.0	0.3	94.23	-14.6	197.5	198.1	196.8	160.600				
600.0	600.0	592.2	592.2	1.2	0.3	93.69	-12.7	196.8	197.2	195.7	130.417				
700.0	700.0	692.6	692.5	1.4	0.4	93.07	-10.5	195.9	196.2	194.4	109.541				
800.0	800.0	792.2	792.1	1.7	0.4	92.35	-8.0	195.0	195.2	193.1	94.305				
900.0	900.0	891.4	891.3	1.9	0.5	91.47	-5.0	194.5	194.5	192.2	82.845				
1,000.0	1,000.0	993.0	992.8	2.1	0.5	90.49	-1.7	193.7	193.8	191.1	73.693				
1,043.2	1,043.2	1,036.7	1,036.4	2.2	0.6	-165.54	-0.2	193.1	193.5	190.7	70.201	CC, ES			
1,100.0	1,100.0	1,093.9	1,093.7	2.3	0.6	-166.19	1.7	192.2	194.0	191.1	66.725				
1,200.0	1,199.8	1,194.8	1,194.4	2.5	0.7	-167.37	4.5	190.3	197.2	194.0	62.489				
1,253.2	1,252.9	1,247.4	1,247.0	2.6	0.7	-167.95	5.6	189.2	200.2	196.9	60.906				
1,300.0	1,299.5	1,293.6	1,293.2	2.7	0.7	-168.43	6.4	188.3	203.4	200.0	59.714				
1,400.0	1,399.1	1,393.5	1,393.1	2.9	0.8	-169.34	7.9	186.6	210.5	206.8	57.399				
1,500.0	1,498.7	1,494.5	1,494.0	3.2	0.8	-170.18	9.3	184.5	217.2	213.2	55.246				
1,600.0	1,598.3	1,593.6	1,593.1	3.4	0.9	-171.00	10.8	182.2	223.7	219.5	53.282				
1,700.0	1,697.9	1,695.0	1,694.5	3.7	0.9	-171.83	12.5	179.7	230.2	225.7	51.484				
1,800.0	1,797.5	1,793.5	1,792.9	3.9	1.0	-172.62	14.3	177.1	236.5	231.8	49.850				
1,900.0	1,897.1	1,892.5	1,891.9	4.2	1.1	-173.41	16.2	174.9	243.3	238.3	48.479				
2,000.0	1,996.8	1,992.0	1,991.4	4.4	1.1	-174.14	18.1	172.9	250.4	245.1	47.275				
2,100.0	2,096.4	2,092.6	2,091.9	4.7	1.2	-174.87	20.2	170.7	257.4	251.8	46.155				
2,200.0	2,196.0	2,192.2	2,191.5	4.9	1.2	-175.60	22.4	168.3	264.2	258.3	45.108				
2,300.0	2,295.6	2,289.5	2,288.7	5.2	1.3	-176.25	24.6	166.5	271.5	265.4	44.251				
2,400.0	2,395.2	2,388.4	2,387.6	5.5	1.3	-176.81	26.5	165.3	279.5	273.1	43.565				
2,500.0	2,494.8	2,489.1	2,488.3	5.7	1.4	-177.32	28.4	164.0	287.5	280.8	42.924				
2,600.0	2,594.4	2,588.8	2,588.0	6.0	1.5	-177.74	29.8	162.6	295.2	288.2	42.308				
2,700.0	2,694.0	2,688.7	2,687.9	6.3	1.5	-178.05	30.9	161.3	302.9	295.7	41.745				
2,800.0	2,793.6	2,787.8	2,786.9	6.5	1.6	-178.19	31.1	160.1	310.7	303.2	41.248				
2,900.0	2,893.2	2,886.9	2,886.0	6.8	1.6	-178.24	30.9	159.3	318.7	310.9	40.806				
3,000.0	2,992.9	2,989.7	2,988.8	7.1	1.7	-178.44	31.5	158.0	326.4	318.3	40.322				
3,100.0	3,092.5	3,087.7	3,086.8	7.3	1.7	-178.85	33.3	156.0	333.7	325.3	39.822				
3,200.0	3,192.1	3,188.4	3,187.4	7.6	1.8	-179.37	35.8	154.2	341.3	332.6	39.378				
3,300.0	3,291.7	3,288.3	3,287.3	7.9	1.8	-179.86	38.2	152.0	348.6	339.7	38.934				
3,400.0	3,391.3	3,388.1	3,387.0	8.1	1.9	179.70	40.5	149.9	356.0	346.7	38.522				
3,500.0	3,490.9	3,488.0	3,486.9	8.4	2.0	179.35	42.3	147.8	363.3	353.8	38.134				
3,600.0	3,590.5	3,591.8	3,590.6	8.7	2.0	179.04	43.8	145.3	370.1	360.3	37.712				
3,700.0	3,690.1	3,695.3	3,694.1	9.0	2.1	178.79	44.6	141.7	375.8	365.7	37.207				
3,800.0	3,789.7	3,795.0	3,793.7	9.2	2.1	178.62	45.0	137.8	381.0	370.7	36.692				
3,900.0	3,889.3	3,893.0	3,891.6	9.5	2.2	178.53	44.8	134.5	386.5	375.9	36.243				
4,000.0	3,988.9	3,992.7	3,991.3	9.8	2.2	178.51	44.3	131.5	392.3	381.4	35.839				
4,100.0	4,088.6	4,092.2	4,090.8	10.1	2.3	178.48	43.9	128.5	398.2	386.9	35.458				
4,200.0	4,188.2	4,189.9	4,188.4	10.3	2.3	178.49	43.3	125.9	404.3	392.8	35.129				
4,300.0	4,287.8	4,288.3	4,286.7	10.6	2.4	178.63	42.0	124.0	410.9	399.1	34.865				
4,400.0	4,387.4	4,387.8	4,386.3	10.9	2.4	178.92	39.6	122.6	417.7	405.6	34.631				
4,500.0	4,487.0	4,486.2	4,484.6	11.1	2.5	179.22	37.2	121.3	424.6	412.3	34.420				
4,600.0	4,586.6	4,583.9	4,582.3	11.4	2.5	179.46	35.1	120.4	432.0	419.4	34.248				
4,700.0	4,686.2	4,681.5	4,679.9	11.7	2.6	179.66	33.5	119.8	439.8	426.9	34.118				
4,800.0	4,785.8	4,781.7	4,780.1	12.0	2.6	179.82	32.1	119.4	447.9	434.7	34.008				
4,900.0	4,885.4	4,880.7	4,879.0	12.2	2.7	-179.99	30.5	119.0	455.9	442.5	33.898				

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Azores Federal #12H
Project:	Lea County, NM	TVD Reference:	Well @ 3522.0usft (McVay 8)
Reference Site:	Sec 32, T24-S, R32E	MD Reference:	Well @ 3522.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Azores Federal #12H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Plan #1	Offset TVD Reference:	Offset Datum

Offset Design												Offset Site Error:	0.0 usft
Sec 32, T24-S, R32E - Azores Federal #3H - Wellbore #1 - Wellbore #1												Offset Well Error:	0.0 usft
Survey Program: 100-Good_gyro, 10100-MWD default													
Reference Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning	
5,000.0	4,985.0	4,979.3	4,977.6	12.5	2.7	-179.84	29.2	118.7	464.2	450.4	33.808		
5,100.0	5,084.7	5,078.2	5,076.5	12.8	2.8	-179.73	28.2	118.6	472.6	458.6	33.733		
5,200.0	5,184.3	5,177.7	5,176.0	13.1	2.8	-179.66	27.6	118.5	481.2	466.9	33.666		
5,300.0	5,283.9	5,277.0	5,275.3	13.3	2.9	-179.62	27.1	118.3	489.7	475.2	33.604		
5,400.0	5,383.5	5,376.8	5,375.1	13.6	2.9	-179.56	26.5	118.3	498.4	483.5	33.546		
5,500.0	5,483.1	5,477.3	5,475.6	13.9	3.0	-179.49	25.7	118.1	506.9	491.7	33.483		
5,600.0	5,582.7	5,576.6	5,574.9	14.2	3.0	-179.43	25.1	117.9	515.3	499.9	33.415		
5,700.0	5,682.3	5,676.3	5,674.6	14.4	3.1	-179.41	24.7	117.6	523.8	508.1	33.353		
5,800.0	5,781.9	5,776.0	5,774.3	14.7	3.1	-179.40	24.5	117.3	532.2	516.2	33.291		
5,900.0	5,881.5	5,876.8	5,875.1	15.0	3.2	-179.41	24.3	116.9	540.6	524.3	33.225		
6,000.0	5,981.1	5,976.7	5,974.9	15.3	3.2	-179.43	24.2	116.2	548.8	532.2	33.150		
6,100.0	6,080.8	6,075.7	6,074.0	15.5	3.3	-179.45	24.2	115.6	557.1	540.2	33.082		
6,200.0	6,180.4	6,175.7	6,174.0	15.8	3.3	-179.47	24.3	115.1	565.4	548.3	33.019		
6,300.0	6,280.0	6,277.4	6,275.7	16.1	3.4	-179.51	24.4	114.3	573.5	556.1	32.943		
6,400.0	6,379.6	6,376.0	6,374.3	16.4	3.4	-179.57	24.7	113.3	581.4	563.7	32.861		
6,500.0	6,479.2	6,475.9	6,474.2	16.6	3.5	-179.64	25.2	112.5	589.5	571.5	32.792		
6,600.0	6,578.8	6,576.5	6,574.7	16.9	3.5	-179.71	25.5	111.5	597.5	579.2	32.717		
6,700.0	6,678.4	6,676.9	6,675.1	17.2	3.6	-179.76	25.7	110.4	605.3	586.8	32.637		
6,800.0	6,778.0	6,775.4	6,773.7	17.5	3.7	-179.79	25.8	109.4	613.2	594.3	32.562		
6,900.0	6,877.6	6,877.4	6,875.6	17.8	3.7	-179.82	25.8	108.4	621.0	601.9	32.486		
7,000.0	6,977.2	6,976.5	6,974.8	18.0	3.8	-179.88	26.1	107.0	628.6	609.2	32.400		
7,100.0	7,076.8	7,077.8	7,076.1	18.3	3.8	-179.94	26.5	105.7	636.3	616.6	32.317		
7,200.0	7,176.5	7,179.3	7,177.5	18.6	3.9	-179.99	26.7	104.0	643.6	623.6	32.220		
7,300.0	7,276.1	7,281.0	7,279.2	18.9	3.9	-179.99	26.4	102.2	650.6	630.3	32.113		
7,400.0	7,375.7	7,380.1	7,378.3	19.1	4.0	-179.96	26.3	100.2	657.5	636.9	32.003		
7,500.0	7,475.3	7,478.4	7,476.6	19.4	4.0	-179.94	26.0	98.5	664.6	643.7	31.907		
7,600.0	7,574.9	7,573.4	7,571.6	19.7	4.1	-179.97	25.4	97.4	672.0	650.9	31.836		
7,700.0	7,674.5	7,670.4	7,668.6	20.0	4.1	-179.99	25.0	96.8	680.2	658.8	31.797		
7,800.0	7,774.1	7,770.2	7,768.4	20.2	4.2	-179.99	24.7	96.3	688.5	666.8	31.764		
7,900.0	7,873.7	7,870.9	7,869.1	20.5	4.2	-179.96	24.2	95.8	696.7	674.8	31.726		
8,000.0	7,973.3	7,971.7	7,969.8	20.8	4.3	-179.90	23.3	95.2	704.8	682.5	31.682		
8,100.0	8,072.9	8,072.8	8,071.0	21.1	4.3	-179.83	22.2	94.5	712.6	690.1	31.632		
8,200.0	8,172.6	8,170.0	8,168.1	21.3	4.4	-179.76	21.0	93.8	720.5	697.7	31.585		
8,300.0	8,272.2	8,268.3	8,266.4	21.6	4.4	-179.69	20.0	93.5	728.8	705.7	31.556		
8,400.0	8,371.8	8,367.5	8,365.7	21.9	4.5	-179.62	18.9	93.3	737.1	713.7	31.529		
8,500.0	8,471.4	8,467.3	8,465.4	22.2	4.5	-179.53	17.6	93.1	745.4	721.8	31.504		
8,600.0	8,571.0	8,569.4	8,567.5	22.4	4.6	-179.46	16.5	92.8	753.7	729.7	31.472		
8,687.5	8,658.2	8,656.7	8,654.8	22.7	4.6	-179.42	15.7	92.1	760.6	736.4	31.436		
8,700.0	8,670.6	8,669.0	8,667.1	22.7	4.6	-163.34	15.7	92.1	761.6	737.3	31.431		
8,725.0	8,695.5	8,693.5	8,691.6	22.8	4.7	132.83	15.5	91.9	763.3	739.0	31.421		
8,750.0	8,720.3	8,719.0	8,717.1	22.8	4.7	114.66	15.4	91.7	764.7	740.3	31.401		
8,775.0	8,745.0	8,744.7	8,742.8	22.9	4.7	104.72	15.3	91.5	765.8	741.4	31.372		
8,800.0	8,769.5	8,770.3	8,768.3	22.9	4.7	98.95	15.1	91.3	766.6	742.1	31.333		
8,825.0	8,793.6	8,795.5	8,793.6	23.0	4.7	95.43	15.0	91.0	767.1	742.5	31.285		
8,850.0	8,817.5	8,820.5	8,818.6	23.0	4.7	93.23	14.9	90.7	767.3	742.7	31.227		
8,875.0	8,840.9	8,845.2	8,843.3	23.0	4.7	91.87	14.7	90.4	767.3	742.7	31.159		
8,900.0	8,863.9	8,869.3	8,867.4	23.1	4.7	91.09	14.6	90.0	767.1	742.4	31.082		
8,925.0	8,886.3	8,892.9	8,891.0	23.1	4.8	90.72	14.4	89.6	766.8	742.1	30.997		
8,950.0	8,908.2	8,915.4	8,913.5	23.1	4.8	90.64	14.3	89.2	766.4	741.6	30.907		
8,975.0	8,929.3	8,937.0	8,935.0	23.2	4.8	90.78	14.1	88.8	766.0	741.2	30.814		
9,000.0	8,949.8	8,957.8	8,955.8	23.2	4.8	91.08	14.0	88.4	765.7	740.8	30.721		
9,025.0	8,969.5	8,977.8	8,975.8	23.2	4.8	91.50	13.8	88.0	765.5	740.5	30.632		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference:
TVD Reference:
MD Reference:
North Reference:
Survey Calculation Method:
Output errors are at
Database:
Offset TVD Reference:

Well Azores Federal #12H
Well @ 3522.0usft (McVay 8)
Well @ 3522.0usft (McVay 8)
Grid
Minimum Curvature
2.00 sigma
EDM5002
Offset Datum

Offset Design												Offset Site Error:	0.0 usft
Sec 32, T24-S, R32E - Azores Federal #3H - Wellbore #1 - Wellbore #1												Offset Well Error:	0.0 usft
Survey Program: 100-Good_gyro, 10100-MWD default													
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
9,041.3	8,981.9	8,990.4	8,988.4	23.2	4.8	91.82	13.7	87.7	765.4	740.4	30.576		
9,050.0	8,988.3	8,996.9	8,995.0	23.2	4.8	92.00	13.6	87.6	765.4	740.4	30.549		
9,075.0	9,006.3	9,015.8	9,013.8	23.2	4.8	92.58	13.4	87.2	765.7	740.5	30.474		
9,100.0	9,023.4	9,033.8	9,031.8	23.3	4.8	93.19	13.3	86.8	766.2	741.0	30.412		
9,125.0	9,039.5	9,050.7	9,048.7	23.3	4.8	93.77	13.1	86.4	767.0	741.8	30.365		
9,150.0	9,054.5	9,066.5	9,064.5	23.3	4.9	94.32	12.9	86.0	768.3	743.0	30.335		
9,175.0	9,068.5	9,081.1	9,079.2	23.3	4.9	94.81	12.7	85.6	770.1	744.7	30.324		
9,200.0	9,081.4	9,094.6	9,092.6	23.3	4.9	95.21	12.6	85.2	772.4	747.0	30.331		
9,225.0	9,093.2	9,106.6	9,104.6	23.4	4.9	95.49	12.4	84.9	775.4	749.8	30.358		
9,250.0	9,103.8	9,117.1	9,115.1	23.4	4.9	95.64	12.3	84.6	778.9	753.3	30.402		
9,275.0	9,113.2	9,126.5	9,124.5	23.4	4.9	95.66	12.2	84.3	783.1	757.4	30.464		
9,300.0	9,121.4	9,134.6	9,132.6	23.5	4.9	95.54	12.1	84.1	788.0	762.2	30.544		
9,325.0	9,128.4	9,141.4	9,139.4	23.5	4.9	95.26	12.0	83.9	793.6	767.7	30.641		
9,350.0	9,134.1	9,146.9	9,144.9	23.6	4.9	94.82	11.9	83.7	799.9	773.9	30.756		
9,375.0	9,138.5	9,151.2	9,149.2	23.6	4.9	94.21	11.9	83.6	806.9	780.8	30.892		
9,400.0	9,141.7	9,154.1	9,152.1	23.7	4.9	93.43	11.8	83.5	814.6	788.3	31.051		
9,425.0	9,143.5	9,155.7	9,153.7	23.8	4.9	92.47	11.8	83.4	822.9	796.5	31.238		
9,450.0	9,144.0	9,155.9	9,153.9	23.8	4.9	91.34	11.8	83.4	831.8	805.3	31.458		
9,452.8	9,144.0	9,155.9	9,153.9	23.9	4.9	91.20	11.8	83.4	832.8	806.4	31.485		
9,500.0	9,143.5	9,154.8	9,152.8	24.0	4.9	91.12	11.8	83.5	851.5	824.8	31.867		
9,600.0	9,142.4	9,152.5	9,150.5	24.6	4.9	90.95	11.9	83.5	897.9	870.6	32.792		
9,700.0	9,141.4	9,150.2	9,148.2	25.3	4.9	90.78	11.9	83.6	952.7	924.5	33.821		
9,800.0	9,140.3	9,147.9	9,145.9	26.1	4.9	90.61	11.9	83.7	1,014.3	985.2	34.899		
9,900.0	9,139.2	9,145.6	9,143.6	27.0	4.9	90.44	11.9	83.7	1,081.7	1,051.6	35.986		
10,000.0	9,138.2	9,143.3	9,141.3	28.0	4.9	90.27	12.0	83.8	1,153.8	1,122.7	37.051		
10,100.0	9,137.1	9,141.0	9,139.0	29.1	4.9	90.10	12.0	83.9	1,229.8	1,197.5	38.074		
10,200.0	9,136.0	9,138.7	9,136.7	30.3	4.9	89.93	12.0	83.9	1,309.1	1,275.6	39.044		
10,300.0	9,135.0	9,136.4	9,134.4	31.6	4.9	89.75	12.1	84.0	1,391.0	1,356.2	39.953		
10,400.0	9,133.9	9,134.0	9,132.0	32.8	4.9	89.58	12.1	84.1	1,475.2	1,439.0	40.801		
10,500.0	9,132.9	9,131.7	9,129.7	34.2	4.9	89.41	12.1	84.1	1,561.2	1,523.6	41.587		
10,600.0	9,131.8	9,129.3	9,127.3	35.6	4.9	89.23	12.1	84.2	1,648.8	1,609.8	42.314		
10,700.0	9,130.7	11,963.3	10,572.8	37.0	28.2	151.10	1,585.0	101.7	1,658.3	1,618.5	41.615		
10,800.0	9,129.7	12,067.0	10,571.8	38.5	30.0	151.12	1,688.7	100.4	1,658.1	1,616.3	39.650		
10,900.0	9,128.6	12,171.0	10,570.5	39.9	31.7	151.14	1,792.6	98.8	1,657.6	1,613.8	37.845		
10,952.4	9,128.0	12,214.3	10,570.1	40.7	32.5	151.15	1,835.9	98.3	1,657.4	1,612.7	37.054		
11,000.0	9,127.5	12,251.0	10,569.8	41.5	33.1	151.15	1,872.7	98.1	1,657.6	1,612.0	36.386		
11,100.0	9,126.5	12,330.6	10,569.8	43.0	34.4	151.16	1,952.2	97.8	1,658.8	1,611.5	35.073		
11,200.0	9,125.4	12,409.7	10,570.9	44.5	35.7	151.17	2,031.3	98.0	1,661.3	1,612.2	33.874		
11,300.0	9,124.3	12,503.2	10,572.4	46.1	37.2	151.14	2,124.8	99.7	1,664.8	1,613.8	32.652		
11,400.0	9,123.3	12,612.8	10,573.4	47.7	39.1	151.07	2,234.4	102.5	1,668.1	1,614.9	31.381		
11,500.0	9,122.2	12,710.0	10,573.9	49.3	40.7	151.00	2,331.5	105.1	1,671.1	1,615.8	30.265		
11,600.0	9,121.1	12,830.0	10,574.1	51.0	42.8	150.91	2,451.5	108.1	1,673.6	1,616.1	29.088		
11,700.0	9,120.1	12,929.5	10,573.2	52.6	44.5	150.81	2,551.0	111.1	1,675.6	1,615.9	28.069		
11,800.0	9,119.0	13,028.7	10,572.4	54.2	46.2	150.70	2,650.1	114.0	1,677.6	1,615.8	27.129		
11,900.0	9,117.9	13,131.9	10,571.6	55.9	47.9	150.61	2,753.2	116.7	1,679.4	1,615.4	26.231		
12,000.0	9,116.9	13,222.6	10,571.2	57.6	49.4	150.54	2,843.9	118.8	1,681.5	1,615.4	25.451		
12,100.0	9,115.8	13,311.4	10,572.0	59.2	50.9	150.51	2,932.7	120.3	1,684.2	1,616.2	24.749		
12,200.0	9,114.8	13,419.4	10,573.3	60.9	52.8	150.49	3,040.7	121.6	1,687.2	1,616.9	24.016		
12,300.0	9,113.7	13,531.6	10,573.3	62.6	54.7	150.43	3,152.9	123.4	1,689.2	1,616.6	23.284		
12,400.0	9,112.6	13,630.2	10,573.1	64.3	56.4	150.38	3,251.5	125.0	1,691.0	1,616.3	22.642		
12,500.0	9,111.6	13,732.6	10,573.0	66.0	58.1	150.33	3,353.9	126.6	1,692.9	1,616.1	22.024		
12,600.0	9,110.5	13,824.0	10,573.3	67.7	59.7	150.32	3,445.2	127.2	1,694.8	1,615.9	21.482		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design Sec 32, T24-S, R32E - Azores Federal #3H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 10100-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
12,700.0	9,109.4	13,907.9	10,574.2	69.5	61.1	150.31	3,529.1		128.0	1,697.6	1,616.7	21.000	
12,800.0	9,108.4	14,005.7	10,575.8	71.2	62.7	150.28	3,627.0		129.9	1,701.1	1,618.1	20.505	
12,900.0	9,107.3	14,113.3	10,576.6	72.9	64.6	150.22	3,734.5		132.2	1,704.1	1,618.8	19.992	
13,000.0	9,106.2	14,240.5	10,576.4	74.7	66.8	150.13	3,861.6		135.3	1,706.5	1,618.7	19.438	
13,100.0	9,105.2	14,359.8	10,573.6	76.4	68.9	150.00	3,980.9		138.2	1,706.8	1,616.5	18.895	
13,200.0	9,104.1	14,434.0	10,572.5	78.1	70.1	149.93	4,055.1		139.8	1,707.8	1,615.5	18.505	
13,300.0	9,103.0	14,555.9	10,571.6	79.9	72.2	149.88	4,176.9		141.0	1,708.9	1,614.2	18.038	
13,395.6	9,102.0	14,658.6	10,570.1	81.6	74.0	149.86	4,279.6		140.9	1,708.8	1,611.9	17.634	
13,400.0	9,102.0	14,662.2	10,570.0	81.6	74.0	149.86	4,283.2		140.9	1,708.8	1,611.8	17.619	
13,500.0	9,100.9	14,742.8	10,569.6	83.4	75.4	149.86	4,363.9		140.6	1,709.4	1,610.5	17.280	
13,600.0	9,099.9	14,814.0	10,570.3	85.1	76.6	149.88	4,435.0		140.2	1,711.3	1,610.6	16.991	
13,700.0	9,098.8	14,893.5	10,572.2	86.9	77.9	149.91	4,514.5		140.0	1,714.5	1,612.0	16.715	
13,800.0	9,097.7	15,008.1	10,575.3	88.7	79.9	149.95	4,629.1		140.5	1,718.4	1,613.6	16.396	
13,900.0	9,096.7	15,098.0	10,576.7	90.4	81.5	149.95	4,718.9		141.2	1,721.4	1,614.6	16.110	
14,000.0	9,095.6	15,098.0	10,576.7	92.2	81.5	149.95	4,718.9		141.2	1,728.1	1,620.2	16.010	
14,100.0	9,094.5	15,098.0	10,576.7	93.9	81.5	149.95	4,718.9		141.2	1,740.5	1,631.5	15.964	
14,149.6	9,094.0	15,098.0	10,576.7	94.8	81.5	149.95	4,718.9		141.2	1,748.8	1,639.2	15.961 SF	



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference:
TVD Reference:
MD Reference:
North Reference:
Survey Calculation Method:
Output errors are at
Database:
Offset TVD Reference:

Well Azores Federal #12H
Well @ 3522.0usft (McVay 8)
Well @ 3522.0usft (McVay 8)
Grid
Minimum Curvature
2.00 sigma
EDM5002
Offset Datum

Offset Design Sec 32, T24-S, R32E - Azores Federal #7H - Wellbore #1 - Wellbore #1											Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 8513-MWD default											Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	111.16	-408.3	1,054.7	1,131.0			
100.0	100.0	95.9	95.9	0.1	0.0	111.15	-408.0	1,054.8	1,130.9	1,130.8	9,395.334	
200.0	200.0	195.8	195.8	0.3	0.1	111.12	-407.5	1,054.9	1,130.9	1,130.5	2,848.906	
300.0	300.0	296.7	296.7	0.5	0.1	111.10	-407.0	1,055.0	1,130.7	1,130.1	1,676.129	
400.0	400.0	395.8	395.8	0.8	0.2	111.08	-406.6	1,055.0	1,130.6	1,129.7	1,188.513	
425.6	425.6	420.7	420.6	0.8	0.2	111.07	-406.4	1,055.0	1,130.6	1,129.6	1,106.321 CC	
500.0	500.0	492.4	492.4	1.0	0.2	111.05	-406.1	1,055.3	1,130.7	1,129.5	921.772	
600.0	600.0	590.4	590.4	1.2	0.3	111.02	-405.7	1,055.8	1,131.0	1,129.5	752.640	
700.0	700.0	693.6	693.6	1.4	0.4	110.99	-405.2	1,056.3	1,131.3	1,129.5	635.008	
800.0	800.0	794.2	794.2	1.7	0.4	110.97	-405.0	1,056.4	1,131.4	1,129.3	549.497	
900.0	900.0	893.2	893.2	1.9	0.5	110.96	-404.8	1,056.6	1,131.5	1,129.2	484.466	
1,000.0	1,000.0	990.2	990.2	2.1	0.5	110.94	-404.4	1,057.1	1,131.8	1,129.2	433.444	
1,100.0	1,100.0	1,086.8	1,086.8	2.3	0.6	-144.68	-404.3	1,057.7	1,133.8	1,130.9	395.101	
1,200.0	1,199.8	1,185.2	1,185.2	2.5	0.6	-144.79	-404.2	1,058.6	1,138.9	1,135.8	365.683	
1,253.2	1,252.9	1,237.9	1,237.9	2.6	0.6	-144.88	-404.1	1,059.1	1,142.8	1,139.5	351.914	
1,300.0	1,299.5	1,284.3	1,284.3	2.7	0.7	-145.01	-404.1	1,059.6	1,146.6	1,143.2	340.444	
1,400.0	1,399.1	1,388.1	1,388.1	2.9	0.7	-145.28	-404.2	1,060.3	1,154.6	1,150.9	317.819	
1,500.0	1,498.7	1,482.9	1,482.8	3.2	0.8	-145.52	-404.3	1,061.0	1,162.5	1,158.6	298.178	
1,600.0	1,598.3	1,587.0	1,587.0	3.4	0.8	-145.78	-404.5	1,061.8	1,170.6	1,166.5	280.461	
1,700.0	1,697.9	1,689.1	1,689.0	3.7	0.9	-146.03	-404.6	1,062.2	1,178.4	1,173.9	264.704	
1,800.0	1,797.5	1,786.7	1,786.7	3.9	0.9	-146.26	-404.8	1,062.6	1,186.1	1,181.4	250.765	
1,900.0	1,897.1	1,884.1	1,884.0	4.2	1.0	-146.49	-405.1	1,063.1	1,194.0	1,189.0	238.315	
2,000.0	1,996.8	1,986.5	1,986.5	4.4	1.0	-146.72	-405.4	1,063.6	1,202.0	1,196.7	226.994	
2,100.0	2,096.4	2,085.9	2,085.8	4.7	1.1	-146.93	-405.8	1,063.9	1,209.8	1,204.2	216.804	
2,200.0	2,196.0	2,184.2	2,184.2	4.9	1.1	-147.15	-406.1	1,064.3	1,217.7	1,211.9	207.591	
2,300.0	2,295.6	2,283.7	2,283.6	5.2	1.2	-147.36	-406.4	1,064.8	1,225.7	1,219.6	199.195	
2,400.0	2,395.2	2,379.1	2,379.0	5.5	1.2	-147.57	-406.7	1,065.4	1,233.9	1,227.5	191.561	
2,500.0	2,494.8	2,475.9	2,475.8	5.7	1.3	-147.78	-407.1	1,066.4	1,242.4	1,235.7	184.577	
2,600.0	2,594.4	2,577.6	2,577.5	6.0	1.3	-148.01	-407.3	1,067.4	1,251.0	1,243.9	178.101	
2,700.0	2,694.0	2,673.7	2,673.6	6.3	1.4	-148.21	-407.7	1,068.4	1,259.5	1,252.2	172.194	
2,800.0	2,793.6	2,768.5	2,768.4	6.5	1.4	-148.39	-408.4	1,069.5	1,268.4	1,260.8	166.793	
2,900.0	2,893.2	2,864.9	2,864.8	6.8	1.5	-148.57	-409.4	1,071.0	1,277.7	1,269.8	161.807	
3,000.0	2,992.9	2,967.1	2,967.0	7.1	1.5	-148.77	-410.3	1,072.7	1,287.0	1,278.8	157.124	
3,100.0	3,092.5	3,074.2	3,074.1	7.3	1.6	-148.95	-411.3	1,073.9	1,295.9	1,287.5	152.667	
3,200.0	3,192.1	3,186.3	3,186.1	7.6	1.7	-149.13	-412.5	1,074.2	1,304.1	1,295.3	148.381	
3,300.0	3,291.7	3,288.8	3,288.6	7.9	1.7	-149.29	-413.5	1,073.8	1,311.6	1,302.5	144.376	
3,400.0	3,391.3	3,392.9	3,392.7	8.1	1.8	-149.45	-414.4	1,073.2	1,318.9	1,309.5	140.590	
3,500.0	3,490.9	3,498.4	3,498.3	8.4	1.8	-149.61	-415.1	1,072.2	1,325.8	1,316.1	136.984	
3,600.0	3,590.5	3,597.6	3,597.5	8.7	1.9	-149.76	-415.8	1,071.1	1,332.5	1,322.6	133.613	
3,700.0	3,690.1	3,704.4	3,704.3	9.0	1.9	-149.92	-416.5	1,069.6	1,339.0	1,328.7	130.366	
3,800.0	3,789.7	3,818.8	3,818.6	9.2	2.0	-150.09	-416.9	1,067.1	1,344.6	1,334.1	127.175	
3,900.0	3,889.3	3,919.7	3,919.4	9.5	2.0	-150.24	-416.9	1,064.3	1,349.6	1,338.7	124.178	
4,000.0	3,988.9	4,004.6	4,004.3	9.8	2.1	-150.38	-417.1	1,062.4	1,355.3	1,344.1	121.486	
4,100.0	4,088.6	4,100.0	4,099.7	10.1	2.1	-150.52	-417.5	1,061.0	1,361.6	1,350.2	118.936	
4,200.0	4,188.2	4,192.9	4,192.6	10.3	2.2	-150.64	-418.3	1,059.9	1,368.4	1,356.7	116.558	
4,300.0	4,287.8	4,286.9	4,286.6	10.6	2.2	-150.75	-419.7	1,059.1	1,375.6	1,363.6	114.320	
4,400.0	4,387.4	4,379.1	4,378.8	10.9	2.3	-150.83	-421.6	1,058.6	1,383.3	1,371.0	112.227	
4,500.0	4,487.0	4,483.4	4,483.1	11.1	2.3	-150.91	-424.1	1,058.1	1,391.2	1,378.6	110.190	
4,600.0	4,586.6	4,584.0	4,583.6	11.4	2.4	-150.99	-426.5	1,057.4	1,398.8	1,385.9	108.237	
4,700.0	4,686.2	4,688.1	4,687.7	11.7	2.4	-151.07	-428.7	1,056.5	1,406.3	1,393.1	106.349	
4,800.0	4,785.8	4,787.3	4,786.8	12.0	2.5	-151.15	-430.8	1,055.5	1,413.5	1,400.0	104.549	
4,900.0	4,885.4	4,894.6	4,894.1	12.2	2.6	-151.24	-432.9	1,054.2	1,420.6	1,406.8	102.785	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference:
TVD Reference:
MD Reference:
North Reference:
Survey Calculation Method:
Output errors are at
Database:
Offset TVD Reference:

Well Azores Federal #12H
Well @ 3522.0usft (McVay 8)
Well @ 3522.0usft (McVay 8)
Grid
Minimum Curvature
2.00 sigma
EDM5002
Offset Datum

Offset Design												Offset Site Error:	0.0 usft
Sec 32, T24-S, R32E - Azores Federal #7H - Wellbore #1 - Wellbore #1												Offset Well Error:	0.0 usft
Survey Program: 100-Good_gyro, 8513-MWD default													
Reference	Offset	Semi Major Axis		Highside		Offset Wellbore Centre		Distance		Separation	Warning		
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Toolface (")	+N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Factor		
5,000.0	4,985.0	4,988.5	4,988.0	12.5	2.6	-151.32	-434.7	1,053.0	1,427.6	1,413.5	101.133		
5,100.0	5,084.7	5,096.3	5,095.8	12.8	2.7	-151.41	-436.8	1,051.6	1,434.6	1,420.2	99.501		
5,200.0	5,184.3	5,199.1	5,198.5	13.1	2.7	-151.49	-438.7	1,049.8	1,441.1	1,426.4	97.921		
5,300.0	5,283.9	5,294.3	5,293.8	13.3	2.8	-151.56	-440.6	1,048.2	1,447.7	1,432.7	96.432		
5,400.0	5,383.5	5,394.0	5,393.4	13.6	2.8	-151.63	-442.6	1,046.6	1,454.4	1,439.1	94.996		
5,500.0	5,483.1	5,488.6	5,479.9	13.9	2.9	-151.69	-444.7	1,045.6	1,461.6	1,446.0	93.679		
5,600.0	5,582.7	5,584.2	5,583.5	14.2	2.9	-151.75	-447.4	1,044.8	1,469.3	1,453.4	92.389		
5,700.0	5,682.3	5,685.6	5,684.9	14.4	3.0	-151.82	-449.6	1,043.7	1,476.6	1,460.4	91.134		
5,800.0	5,781.9	5,782.6	5,781.8	14.7	3.0	-151.89	-451.6	1,042.8	1,483.9	1,467.4	89.942		
5,900.0	5,881.5	5,881.6	5,880.9	15.0	3.1	-151.97	-453.5	1,042.1	1,491.4	1,474.6	88.798		
6,000.0	5,981.1	5,980.0	5,979.2	15.3	3.1	-152.06	-455.2	1,041.4	1,499.0	1,481.9	87.700		
6,100.0	6,080.8	6,082.7	6,081.9	15.5	3.2	-152.15	-457.0	1,040.7	1,506.5	1,489.1	86.627		
6,200.0	6,180.4	6,183.7	6,182.9	15.8	3.3	-152.23	-458.9	1,039.7	1,513.8	1,496.2	85.583		
6,300.0	6,280.0	6,285.1	6,284.3	16.1	3.3	-152.31	-460.7	1,038.7	1,521.1	1,503.1	84.569		
6,400.0	6,379.6	6,380.7	6,379.9	16.4	3.4	-152.39	-462.3	1,037.9	1,528.4	1,510.1	83.607		
6,500.0	6,479.2	6,480.8	6,479.9	16.6	3.4	-152.49	-463.8	1,037.2	1,535.9	1,517.4	82.678		
6,600.0	6,578.8	6,575.8	6,574.9	16.9	3.5	-152.58	-465.0	1,036.7	1,543.5	1,524.6	81.796		
6,700.0	6,678.4	6,675.1	6,674.2	17.2	3.5	-152.68	-466.3	1,036.4	1,551.3	1,532.2	80.944		
6,800.0	6,778.0	6,774.9	6,774.0	17.5	3.6	-152.77	-467.8	1,035.9	1,559.1	1,539.7	80.113		
6,900.0	6,877.6	6,870.1	6,869.1	17.8	3.6	-152.86	-469.2	1,035.7	1,567.0	1,547.3	79.324		
7,000.0	6,977.2	6,974.7	6,973.8	18.0	3.7	-152.96	-470.6	1,035.5	1,575.1	1,555.0	78.547		
7,100.0	7,076.8	7,074.4	7,073.4	18.3	3.7	-153.06	-471.9	1,035.1	1,582.8	1,562.4	77.787		
7,200.0	7,176.5	7,174.0	7,173.0	18.6	3.8	-153.16	-473.0	1,034.8	1,590.6	1,569.9	77.055		
7,300.0	7,276.1	7,270.5	7,269.5	18.9	3.8	-153.26	-474.2	1,034.5	1,598.4	1,577.5	76.351		
7,400.0	7,375.7	7,371.5	7,370.6	19.1	3.9	-153.35	-475.5	1,034.3	1,606.4	1,585.2	75.665		
7,500.0	7,475.3	7,474.3	7,473.3	19.4	4.0	-153.45	-476.8	1,033.9	1,614.2	1,592.7	74.986		
7,600.0	7,574.9	7,575.9	7,575.0	19.7	4.0	-153.54	-478.1	1,033.4	1,621.9	1,600.1	74.321		
7,700.0	7,674.5	7,674.5	7,673.5	20.0	4.1	-153.64	-479.2	1,032.8	1,629.5	1,607.4	73.679		
7,800.0	7,774.1	7,771.2	7,770.2	20.2	4.1	-153.74	-480.0	1,032.5	1,637.2	1,614.8	73.066		
7,900.0	7,873.7	7,869.9	7,868.9	20.5	4.2	-153.85	-480.6	1,032.4	1,645.2	1,622.5	72.475		
8,000.0	7,973.3	7,967.4	7,966.4	20.8	4.2	-153.96	-481.3	1,032.3	1,653.1	1,630.1	71.903		
8,100.0	8,072.9	8,065.7	8,064.7	21.1	4.3	-154.07	-482.0	1,032.3	1,661.2	1,638.0	71.350		
8,200.0	8,172.6	8,035.2	9,092.4	21.3	15.6	179.17	199.8	694.4	1,633.7	1,598.3	46.175		
8,300.0	8,272.2	9,635.1	9,092.4	21.6	15.6	179.18	199.7	694.4	1,587.0	1,551.4	44.565		
8,400.0	8,371.8	9,635.0	9,092.4	21.9	15.6	179.18	199.6	694.4	1,545.4	1,509.5	43.116		
8,500.0	8,471.4	9,634.9	9,092.4	22.2	15.6	179.19	199.4	694.4	1,509.2	1,473.1	41.839		
8,600.0	8,571.0	9,634.7	9,092.4	22.4	15.6	179.20	199.3	694.5	1,478.9	1,442.6	40.739		
8,687.5	8,658.2	9,634.6	9,092.4	22.7	15.6	179.20	199.2	694.5	1,457.5	1,421.0	39.929		
8,700.0	8,670.6	9,634.7	9,092.4	22.7	15.6	162.37	199.2	694.5	1,454.8	1,418.3	39.820		
8,725.0	8,695.5	9,635.4	9,092.4	22.8	15.6	132.56	200.0	694.3	1,449.5	1,412.9	39.603		
8,750.0	8,720.3	9,637.0	9,092.4	22.8	15.6	114.91	201.5	693.9	1,444.3	1,407.7	39.383		
8,775.0	8,745.0	9,639.4	9,092.4	22.9	15.6	105.32	203.8	693.3	1,439.2	1,402.5	39.159		
8,800.0	8,769.5	9,642.6	9,092.4	22.9	15.7	99.72	206.9	692.4	1,434.3	1,397.4	38.931		
8,825.0	8,793.6	9,646.6	9,092.4	23.0	15.8	96.20	210.8	691.4	1,429.4	1,392.5	38.697		
8,850.0	8,817.5	9,651.5	9,092.4	23.0	15.8	93.83	215.5	690.1	1,424.7	1,387.7	38.457		
8,875.0	8,840.9	9,657.2	9,092.4	23.0	15.9	92.15	221.0	688.7	1,420.2	1,383.0	38.211		
8,900.0	8,863.9	9,675.0	9,092.6	23.1	16.2	90.50	238.2	684.2	1,415.8	1,378.3	37.733		
8,925.0	8,886.3	9,675.0	9,092.6	23.1	16.2	89.84	238.2	684.2	1,411.5	1,373.9	37.622		
8,950.0	8,908.2	9,675.0	9,092.6	23.1	16.2	89.39	238.2	684.2	1,407.3	1,369.8	37.520		
8,975.0	8,929.3	9,675.0	9,092.6	23.2	16.2	89.09	238.2	684.2	1,403.3	1,365.8	37.424		
9,000.0	8,949.8	9,675.0	9,092.6	23.2	16.2	88.90	238.2	684.2	1,399.6	1,362.1	37.336		
9,025.0	8,969.5	9,701.4	9,093.1	23.2	16.7	87.96	263.8	677.8	1,395.6	1,357.6	36.739		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design Sec 32, T24-S, R32E - Azores Federal #7H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 8513-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
9,050.0	8,988.3	9,710.1	9,093.3	23.2	16.8	87.88	272.3	675.8	1,391.9	1,353.8	36.495		
9,075.0	9,006.3	9,719.3	9,093.4	23.2	17.0	87.45	281.2	673.7	1,388.4	1,350.1	36.248		
9,100.0	9,023.4	9,728.9	9,093.6	23.3	17.1	87.26	290.7	671.6	1,385.0	1,346.5	35.997		
9,125.0	9,039.5	9,739.1	9,093.8	23.3	17.3	87.11	300.6	669.4	1,381.6	1,343.0	35.742		
9,150.0	9,054.5	9,769.0	9,094.5	23.3	17.8	86.54	329.9	663.4	1,378.6	1,339.4	35.164		
9,175.0	9,068.5	9,769.0	9,094.5	23.3	17.8	86.73	329.9	663.4	1,375.3	1,336.1	35.082		
9,200.0	9,081.4	9,769.0	9,094.5	23.3	17.8	86.93	329.9	663.4	1,372.1	1,332.9	35.001		
9,225.0	9,093.2	9,769.0	9,094.5	23.4	17.8	87.12	329.9	663.4	1,369.2	1,330.0	34.921		
9,250.0	9,103.8	9,793.7	9,095.0	23.4	18.2	86.89	354.2	658.9	1,366.2	1,326.5	34.431		
9,275.0	9,113.2	9,805.0	9,095.2	23.4	18.4	86.95	365.3	657.0	1,363.3	1,323.4	34.163		
9,300.0	9,121.4	9,816.5	9,095.3	23.5	18.6	87.03	376.7	655.2	1,360.5	1,320.4	33.891		
9,325.0	9,128.4	9,828.2	9,095.3	23.5	18.8	87.14	388.2	653.5	1,357.8	1,317.4	33.616		
9,350.0	9,134.1	9,863.0	9,095.2	23.6	19.3	87.07	422.7	648.8	1,355.5	1,314.4	33.004		
9,375.0	9,138.5	9,863.0	9,095.2	23.6	19.3	87.37	422.7	648.8	1,352.6	1,311.5	32.893		
9,400.0	9,141.7	9,863.0	9,095.2	23.7	19.3	87.65	422.7	648.8	1,350.0	1,308.8	32.783		
9,425.0	9,143.5	9,863.0	9,095.2	23.8	19.3	87.91	422.7	648.8	1,347.7	1,306.4	32.675		
9,450.0	9,144.0	9,893.6	9,094.9	23.8	19.8	88.14	453.1	645.4	1,345.1	1,303.2	32.119		
9,452.8	9,144.0	9,895.3	9,094.9	23.9	19.9	88.17	454.8	645.2	1,344.8	1,302.9	32.083		
9,500.0	9,143.5	9,923.1	9,094.6	24.0	20.3	88.17	482.5	642.5	1,340.5	1,297.9	31.423		
9,600.0	9,142.4	9,980.6	9,094.3	24.6	21.3	88.17	539.8	638.2	1,333.8	1,289.5	30.115		
9,700.0	9,141.4	10,052.0	9,094.6	25.3	22.4	88.22	611.2	635.7	1,330.5	1,284.2	28.759		
9,800.0	9,140.3	10,119.4	9,095.3	26.1	23.5	88.28	678.6	634.8	1,329.4	1,281.2	27.535		
9,892.7	9,139.3	10,204.8	9,095.6	26.9	24.8	88.33	763.9	634.1	1,329.2	1,278.5	26.235		
9,900.0	9,139.2	10,211.4	9,095.5	27.0	25.0	88.33	770.5	634.0	1,329.2	1,278.3	26.136		
10,000.0	9,138.2	10,315.3	9,094.7	28.0	26.7	88.34	874.4	633.4	1,329.2	1,275.5	24.746		
10,077.5	9,137.4	10,389.4	9,093.6	28.9	27.9	88.33	948.5	632.8	1,329.1	1,273.2	23.799		
10,100.0	9,137.1	10,409.9	9,093.3	29.1	28.2	88.32	969.0	632.6	1,329.1	1,272.6	23.537		
10,200.0	9,136.0	10,503.3	9,092.5	30.3	29.7	88.33	1,062.4	632.4	1,329.5	1,270.3	22.444		
10,300.0	9,135.0	10,604.8	9,092.2	31.6	31.3	88.37	1,163.9	632.5	1,330.2	1,268.0	21.385		
10,400.0	9,133.9	10,696.8	9,091.2	32.8	32.8	88.37	1,255.9	632.6	1,331.0	1,265.9	20.457		
10,500.0	9,132.9	10,784.8	9,092.5	34.2	34.2	88.47	1,343.9	633.5	1,332.5	1,264.7	19.630		
10,600.0	9,131.8	10,883.6	9,093.2	35.6	35.8	88.54	1,442.7	635.1	1,334.7	1,263.8	18.810		
10,700.0	9,130.7	10,969.9	9,091.2	37.0	37.2	88.50	1,529.0	636.7	1,337.3	1,263.4	18.109		
10,800.0	9,129.7	11,101.8	9,091.0	38.5	39.3	88.56	1,660.8	639.1	1,339.9	1,262.4	17.286		
10,900.0	9,128.6	11,233.2	9,092.5	39.9	41.4	88.68	1,792.2	636.9	1,338.6	1,257.4	16.477		
11,000.0	9,127.5	11,322.8	9,091.7	41.5	42.9	88.69	1,881.7	635.3	1,337.5	1,253.2	15.862		
11,100.0	9,126.5	11,428.1	9,092.1	43.0	44.7	88.75	1,987.1	633.9	1,336.8	1,249.1	15.243		
11,200.0	9,125.4	11,542.7	9,097.2	44.5	46.6	88.02	2,101.5	631.3	1,335.0	1,243.7	14.628		
11,300.0	9,124.3	11,644.1	9,100.2	46.1	48.3	89.19	2,202.7	628.3	1,332.6	1,237.9	14.079		
11,400.0	9,123.3	11,725.7	9,101.7	47.7	49.7	89.29	2,284.4	626.3	1,330.8	1,233.1	13.623		
11,500.0	9,122.2	11,818.4	9,103.7	49.3	51.3	89.42	2,377.0	625.3	1,330.3	1,229.4	13.179		
11,590.3	9,121.2	11,903.0	9,104.3	50.8	52.7	89.48	2,461.6	624.5	1,330.1	1,226.2	12.803		
11,600.0	9,121.1	11,911.9	9,104.4	51.0	52.9	89.49	2,470.5	624.4	1,330.1	1,225.9	12.764		
11,700.0	9,120.1	12,020.9	9,105.9	52.6	54.7	89.61	2,579.5	623.7	1,330.0	1,222.3	12.346		
11,800.0	9,119.0	12,118.9	9,107.9	54.2	56.4	89.74	2,677.4	622.5	1,329.4	1,218.3	11.970		
11,900.0	9,117.9	12,227.8	9,108.7	55.9	58.2	89.83	2,786.3	621.0	1,328.6	1,214.0	11.590		
12,000.0	9,116.9	12,331.5	9,108.5	57.6	60.0	89.86	2,890.0	618.8	1,327.2	1,209.1	11.238		
12,100.0	9,115.8	12,413.0	9,107.0	59.2	61.3	89.84	2,971.5	617.7	1,326.5	1,205.3	10.946		
12,100.3	9,115.8	12,413.0	9,107.0	59.2	61.3	89.84	2,971.5	617.7	1,326.5	1,205.4	10.952		
12,200.0	9,114.8	12,497.0	9,105.2	60.9	62.8	89.79	3,055.5	617.7	1,327.1	1,202.8	10.675		
12,300.0	9,113.7	12,595.1	9,105.4	62.6	64.4	89.85	3,153.6	618.3	1,328.4	1,200.7	10.403		
12,400.0	9,112.6	12,695.1	9,106.3	64.3	66.1	89.94	3,253.5	619.0	1,329.8	1,198.7	10.142		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference:
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design Sec 32, T24-S, R32E - Azores Federal #7H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 8513-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
12,500.0	9,111.6	12,790.4	9,105.0	66.0	67.7	89.92	3,348.8	619.9	1,331.3	1,196.8	9.900		
12,600.0	9,110.5	12,890.1	9,104.4	67.7	69.4	89.94	3,448.6	620.9	1,333.0	1,195.1	9.667		
12,700.0	9,109.4	12,987.7	9,105.2	69.5	71.1	90.02	3,546.1	622.1	1,334.9	1,193.6	9.448		
12,800.0	9,108.4	13,109.3	9,107.1	71.2	73.1	90.16	3,667.7	622.5	1,335.8	1,190.7	9.206		
12,900.0	9,107.3	13,213.7	9,108.0	72.9	74.9	90.24	3,772.1	621.9	1,335.8	1,187.2	8.988		
13,000.0	9,106.2	13,322.6	9,109.0	74.7	76.7	90.34	3,880.9	620.9	1,335.6	1,183.4	8.773		
13,100.0	9,105.2	13,469.1	9,112.1	76.4	79.2	90.54	4,027.4	616.5	1,333.3	1,176.8	8.517		
13,200.0	9,104.1	13,576.0	9,116.4	78.1	81.1	90.77	4,134.1	610.8	1,328.7	1,168.5	8.296		
13,300.0	9,103.0	13,681.8	9,118.6	79.9	82.9	90.92	4,239.7	605.2	1,324.1	1,160.3	8.084		
13,400.0	9,102.0	13,793.1	9,120.3	81.6	84.8	91.05	4,350.7	597.9	1,318.2	1,150.6	7.868		
13,500.0	9,100.9	13,892.5	9,120.4	83.4	86.6	91.11	4,449.9	591.3	1,312.2	1,141.1	7.670		
13,600.0	9,099.9	13,992.7	9,118.7	85.1	88.3	91.09	4,549.9	584.6	1,306.2	1,131.6	7.479		
13,700.0	9,098.8	14,078.9	9,116.8	86.9	89.8	91.05	4,635.8	579.2	1,300.6	1,122.7	7.309		
13,800.0	9,097.7	14,166.6	9,115.8	88.7	91.3	91.04	4,723.4	574.8	1,296.2	1,115.0	7.151		
13,900.0	9,096.7	14,276.8	9,112.6	90.4	93.3	90.96	4,833.4	569.6	1,292.1	1,107.1	6.985		
14,000.0	9,095.6	14,376.6	9,108.6	92.2	95.0	90.83	4,933.0	564.2	1,287.3	1,098.7	6.828		
14,100.0	9,094.5	14,450.0	9,105.7	93.9	96.3	90.74	5,006.3	560.2	1,282.7	1,091.1	6.695		
14,135.1	9,094.2	14,450.0	9,105.7	94.6	96.3	90.74	5,006.3	560.2	1,282.2	1,090.1	6.672		
14,149.6	9,094.0	14,450.0	9,105.7	94.8	96.3	90.74	5,006.3	560.2	1,282.3	1,089.9	6.663	ES, SF	

Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Azores Federal #12H
Project:	Lea County, NM	TVD Reference:	Well @ 3522.0usft (McVay 8)
Reference Site:	Sec 32, T24-S, R32E	MD Reference:	Well @ 3522.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Azores Federal #12H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Plan #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 32, T24-S, R32E - Azores Federal #8H - Wellbore #1 - Plan #1												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
0.0	0.0	0.0	0.0	0.0	0.0	89.43	1.0	100.0	100.0				
100.0	100.0	99.0	99.0	0.1	0.1	89.43	1.0	100.0	100.0	99.8	604.276		
200.0	200.0	199.0	199.0	0.3	0.3	89.43	1.0	100.0	100.0	99.4	162.978		
300.0	300.0	299.0	299.0	0.5	0.5	89.43	1.0	100.0	100.0	98.9	94.065		
400.0	400.0	399.0	399.0	0.8	0.8	89.43	1.0	100.0	100.0	98.5	66.111		
500.0	500.0	499.0	499.0	1.0	1.0	89.43	1.0	100.0	100.0	98.0	50.966		
600.0	600.0	599.0	599.0	1.2	1.2	89.43	1.0	100.0	100.0	97.6	41.466		
700.0	700.0	699.0	699.0	1.4	1.4	89.43	1.0	100.0	100.0	97.1	34.951		
800.0	800.0	799.0	799.0	1.7	1.7	89.43	1.0	100.0	100.0	96.7	30.206		
900.0	900.0	899.0	899.0	1.9	1.9	89.43	1.0	100.0	100.0	96.2	26.595		
1,000.0	1,000.0	999.0	999.0	2.1	2.1	89.43	1.0	100.0	100.0	95.8	23.755	CC, ES	
1,100.0	1,100.0	1,100.6	1,100.5	2.3	2.3	-165.63	-0.3	99.0	100.7	96.1	21.845		
1,200.0	1,199.8	1,200.5	1,200.4	2.5	2.5	-165.15	-2.5	97.5	104.3	99.3	20.933		
1,253.2	1,252.9	1,253.6	1,253.5	2.6	2.6	-165.10	-3.6	96.7	107.5	102.3	20.749		
1,300.0	1,299.5	1,300.3	1,300.2	2.7	2.7	-165.13	-4.6	95.9	110.8	105.4	20.652		
1,400.0	1,399.1	1,400.0	1,399.9	2.9	2.9	-165.19	-6.7	94.4	117.8	112.0	20.432		
1,500.0	1,498.7	1,499.8	1,499.6	3.2	3.1	-165.24	-8.9	92.9	124.8	118.6	20.211		
1,600.0	1,598.3	1,599.5	1,599.3	3.4	3.3	-165.28	-11.0	91.3	131.8	125.2	19.995		
1,700.0	1,697.9	1,699.3	1,699.1	3.7	3.5	-165.33	-13.1	89.8	138.8	131.8	19.788		
1,800.0	1,797.5	1,799.0	1,798.8	3.9	3.7	-165.36	-15.3	88.2	145.8	138.4	19.591		
1,900.0	1,897.1	1,898.8	1,898.5	4.2	3.9	-165.40	-17.4	86.7	152.8	145.0	19.405		
2,000.0	1,996.8	1,998.5	1,998.2	4.4	4.1	-165.43	-19.5	85.2	159.9	151.5	19.230		
2,100.0	2,096.4	2,098.3	2,097.9	4.7	4.3	-165.46	-21.6	83.6	166.9	158.1	19.067		
2,200.0	2,196.0	2,198.1	2,197.7	4.9	4.5	-165.48	-23.8	82.1	173.9	164.7	18.914		
2,300.0	2,295.6	2,297.8	2,297.4	5.2	4.8	-165.51	-25.9	80.5	180.9	171.2	18.771		
2,400.0	2,395.2	2,397.6	2,397.1	5.5	5.0	-165.53	-28.0	79.0	187.9	177.8	18.638		
2,500.0	2,494.8	2,497.3	2,496.8	5.7	5.2	-165.55	-30.2	77.5	194.9	184.4	18.513		
2,600.0	2,594.4	2,597.1	2,596.5	6.0	5.4	-165.57	-32.3	75.9	201.9	190.9	18.395		
2,700.0	2,694.0	2,696.8	2,696.3	6.3	5.6	-165.59	-34.4	74.4	208.9	197.5	18.286		
2,800.0	2,793.6	2,796.6	2,796.0	6.5	5.9	-165.60	-36.6	72.8	215.9	204.0	18.183		
2,900.0	2,893.2	2,896.3	2,895.7	6.8	6.1	-165.62	-38.7	71.3	222.9	210.6	18.086		
3,000.0	2,992.9	2,995.1	2,995.4	7.1	6.3	-165.63	-40.8	69.8	229.9	217.2	17.995		
3,100.0	3,092.5	3,095.8	3,095.1	7.3	6.5	-165.65	-42.9	68.2	237.0	223.7	17.909		
3,200.0	3,192.1	3,195.6	3,194.9	7.6	6.8	-165.66	-45.1	66.7	244.0	230.3	17.828		
3,300.0	3,291.7	3,295.3	3,294.6	7.9	7.0	-165.67	-47.2	65.1	251.0	236.8	17.752		
3,400.0	3,391.3	3,395.1	3,394.3	8.1	7.2	-165.69	-49.3	63.6	258.0	243.4	17.678		
3,500.0	3,490.9	3,494.9	3,494.0	8.4	7.4	-165.70	-51.5	62.1	265.0	249.9	17.608		
3,600.0	3,590.5	3,594.6	3,593.7	8.7	7.7	-165.71	-53.6	60.5	272.0	256.5	17.541		
3,700.0	3,690.1	3,694.4	3,693.4	9.0	7.9	-165.72	-55.7	59.0	279.0	263.0	17.477		
3,800.0	3,789.7	3,794.1	3,793.2	9.2	8.1	-165.73	-57.9	57.4	286.0	269.6	17.416		
3,900.0	3,889.3	3,893.9	3,892.9	9.5	8.3	-165.74	-60.0	55.9	293.0	276.1	17.358		
4,000.0	3,988.9	3,993.6	3,992.6	9.8	8.6	-165.74	-62.1	54.4	300.0	282.7	17.303		
4,100.0	4,088.6	4,093.4	4,092.3	10.1	8.8	-165.75	-64.2	52.8	307.0	289.2	17.251		
4,200.0	4,188.2	4,193.1	4,192.0	10.3	9.0	-165.76	-66.4	51.3	314.1	295.8	17.200		
4,300.0	4,287.8	4,292.9	4,291.8	10.6	9.3	-165.77	-68.5	49.7	321.1	302.3	17.152		
4,400.0	4,387.4	4,392.6	4,391.5	10.9	9.5	-165.77	-70.6	48.2	328.1	308.9	17.106		
4,500.0	4,487.0	4,492.4	4,491.2	11.1	9.7	-165.78	-72.8	46.7	335.1	315.4	17.062		
4,600.0	4,586.6	4,592.2	4,590.9	11.4	9.9	-165.79	-74.9	45.1	342.1	322.0	17.020		
4,700.0	4,686.2	4,691.9	4,690.6	11.7	10.2	-165.79	-77.0	43.6	349.1	328.5	16.980		
4,800.0	4,785.8	4,791.7	4,790.4	12.0	10.4	-165.80	-79.2	42.0	356.1	335.1	16.941		
4,900.0	4,885.4	4,891.4	4,890.1	12.2	10.6	-165.81	-81.3	40.5	363.1	341.6	16.903		
5,000.0	4,985.0	4,991.2	4,989.8	12.5	10.8	-165.81	-83.4	39.0	370.1	348.2	16.867		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Azores Federal #12H
Project:	Lea County, NM	TVD Reference:	Well @ 3522.0usft (McVay 8)
Reference Site:	Sec 32, T24-S, R32E	MD Reference:	Well @ 3522.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Azores Federal #12H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Plan #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 32, T24-S, R32E - Azores Federal #8H - Wellbore #1 - Plan #1													Offset Site Error:	0.0 usft
Survey Program: 0-MWD default													Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning		
5,100.0	5,084.7	5,090.9	5,089.5	12.8	11.1	-165.82	-85.6	37.4	377.1	354.7	16.833			
5,200.0	5,184.3	5,190.7	5,189.2	13.1	11.3	-165.82	-87.7	35.9	384.1	361.3	16.799			
5,300.0	5,283.9	5,290.4	5,289.0	13.3	11.5	-165.83	-89.8	34.3	391.2	367.8	16.767			
5,400.0	5,383.5	5,390.2	5,388.7	13.6	11.8	-165.83	-91.9	32.8	398.2	374.4	16.736			
5,500.0	5,483.1	5,489.9	5,488.4	13.9	12.0	-165.84	-94.1	31.3	405.2	380.9	16.707			
5,600.0	5,582.7	5,589.7	5,588.1	14.2	12.2	-165.84	-96.2	29.7	412.2	387.5	16.678			
5,700.0	5,682.3	5,689.4	5,687.8	14.4	12.4	-165.85	-98.3	28.2	419.2	394.0	16.650			
5,800.0	5,781.9	5,789.2	5,787.6	14.7	12.7	-165.85	-100.5	26.6	426.2	400.6	16.623			
5,900.0	5,881.5	5,889.0	5,887.3	15.0	12.9	-165.85	-102.6	25.1	433.2	407.1	16.597			
6,000.0	5,981.1	5,988.7	5,987.0	15.3	13.1	-165.86	-104.7	23.6	440.2	413.7	16.572			
6,100.0	6,080.8	6,088.5	6,086.7	15.5	13.4	-165.86	-106.9	22.0	447.2	420.2	16.547			
6,200.0	6,180.4	6,188.2	6,186.4	15.8	13.6	-165.87	-109.0	20.5	454.2	426.7	16.524			
6,300.0	6,280.0	6,288.0	6,286.2	16.1	13.8	-165.87	-111.1	18.9	461.2	433.3	16.501			
6,400.0	6,379.6	6,387.7	6,385.9	16.4	14.0	-165.87	-113.2	17.4	468.3	439.8	16.479			
6,500.0	6,479.2	6,487.5	6,485.6	16.6	14.3	-165.88	-115.4	15.9	475.3	446.4	16.457			
6,600.0	6,578.8	6,587.2	6,585.3	16.9	14.5	-165.88	-117.5	14.3	482.3	452.9	16.436			
6,700.0	6,678.4	6,687.0	6,685.0	17.2	14.7	-165.88	-119.6	12.8	489.3	459.5	16.416			
6,800.0	6,778.0	6,786.7	6,784.7	17.5	15.0	-165.89	-121.8	11.2	496.3	466.0	16.397			
6,900.0	6,877.6	6,886.5	6,884.5	17.8	15.2	-165.89	-123.9	9.7	503.3	472.6	16.377			
7,000.0	6,977.2	6,986.2	6,984.2	18.0	15.4	-165.89	-126.0	8.2	510.3	479.1	16.359			
7,100.0	7,076.8	7,086.0	7,083.9	18.3	15.7	-165.90	-128.2	6.6	517.3	485.7	16.341			
7,200.0	7,176.5	7,185.8	7,183.6	18.6	15.9	-165.90	-130.3	5.1	524.3	492.2	16.323			
7,300.0	7,276.1	7,285.5	7,283.3	18.9	16.1	-165.90	-132.4	3.5	531.3	498.8	16.306			
7,400.0	7,375.7	7,385.3	7,383.1	19.1	16.3	-165.90	-134.5	2.0	538.3	505.3	16.289			
7,500.0	7,475.3	7,485.0	7,482.8	19.4	16.6	-165.91	-136.7	0.5	545.4	511.8	16.273			
7,600.0	7,574.9	7,584.8	7,582.5	19.7	16.8	-165.91	-138.8	-1.1	552.4	518.4	16.257			
7,700.0	7,674.5	7,684.5	7,682.2	20.0	17.0	-165.91	-140.9	-2.6	559.4	524.9	16.242			
7,800.0	7,774.1	7,784.3	7,781.9	20.2	17.3	-165.91	-143.1	-4.2	566.4	531.5	16.227			
7,900.0	7,873.7	7,884.0	7,881.7	20.5	17.5	-165.92	-145.2	-5.7	573.4	538.0	16.213			
8,000.0	7,973.3	7,983.8	7,981.4	20.8	17.7	-165.92	-147.3	-7.3	580.4	544.6	16.198			
8,100.0	8,072.9	8,083.5	8,081.1	21.1	17.9	-165.92	-149.5	-8.8	587.4	551.1	16.184			
8,200.0	8,172.6	8,183.3	8,180.8	21.3	18.2	-165.92	-151.6	-10.3	594.4	557.7	16.171			
8,300.0	8,272.2	8,283.1	8,280.5	21.6	18.4	-165.92	-153.7	-11.9	601.4	564.2	16.158			
8,400.0	8,371.8	8,382.8	8,380.3	21.9	18.6	-165.93	-155.8	-13.4	608.4	570.8	16.145			
8,500.0	8,471.4	8,482.6	8,480.0	22.2	18.9	-165.93	-158.0	-15.0	615.5	577.3	16.132			
8,600.0	8,571.0	8,582.3	8,579.7	22.4	19.1	-165.93	-160.1	-16.5	622.5	583.8	16.120			
8,687.5	8,658.2	8,669.4	8,666.8	22.7	19.3	-166.18	-159.2	-17.9	628.6	589.6	16.124			
8,700.0	8,670.6	8,681.7	8,679.0	22.7	19.3	176.44	-158.0	-18.1	629.5	590.5	16.131			
8,725.0	8,695.5	8,706.3	8,703.3	22.8	19.3	145.58	-154.6	-18.5	631.3	592.2	16.147			
8,750.0	8,720.3	8,730.7	8,727.3	22.8	19.4	126.93	-150.0	-18.9	633.0	593.9	16.164			
8,775.0	8,745.0	8,755.0	8,750.8	22.9	19.4	116.38	-144.3	-19.3	634.8	595.6	16.183			
8,800.0	8,769.5	8,779.1	8,774.0	22.9	19.4	109.89	-137.4	-19.7	636.6	597.3	16.202			
8,825.0	8,793.6	8,803.1	8,796.6	23.0	19.5	105.52	-129.3	-20.1	638.3	599.0	16.221			
8,850.0	8,817.5	8,827.1	8,818.7	23.0	19.5	102.36	-120.2	-20.5	640.1	600.7	16.241			
8,875.0	8,840.9	8,850.9	8,840.3	23.0	19.5	99.95	-110.0	-20.9	641.8	602.3	16.261			
8,900.0	8,863.9	8,875.0	8,861.5	23.1	19.5	98.04	-98.7	-21.3	643.5	604.0	16.279			
8,925.0	8,886.3	8,898.2	8,881.4	23.1	19.5	96.47	-86.7	-21.7	645.2	605.6	16.297			
8,950.0	8,908.2	8,921.7	8,900.9	23.1	19.6	95.15	-73.6	-22.1	646.8	607.2	16.313			
8,975.0	8,929.3	8,945.2	8,919.7	23.2	19.6	94.02	-59.6	-22.5	648.4	608.7	16.328			
9,000.0	8,949.8	8,968.5	8,937.8	23.2	19.6	93.04	-44.8	-22.9	649.9	610.2	16.340			
9,025.0	8,969.5	8,991.8	8,955.0	23.2	19.6	92.18	-29.2	-23.3	651.4	611.6	16.349			
9,050.0	8,988.3	9,015.0	8,971.4	23.2	19.7	91.42	-12.8	-23.7	652.8	612.9	16.355			

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Azores Federal #12H
Project:	Lea County, NM	TVD Reference:	Well @ 3522.0usft (McVay 8)
Reference Site:	Sec 32, T24-S, R32E	MD Reference:	Well @ 3522.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Azores Federal #12H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Plan #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 32, T24-S, R32E - Azores Federal #8H - Wellbore #1 - Plan #1													Offset Site Error:	0.0 usft
Survey Program: 0-MWD default													Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning		
9,075.0	9,006.3	9,038.1	8,986.9	23.2	19.7	90.74	4.3	-24.0	654.2	614.2	16.358			
9,100.0	9,023.4	9,061.1	9,001.5	23.3	19.7	90.13	22.1	-24.4	655.5	615.4	16.357			
9,125.0	9,039.5	9,084.1	9,015.3	23.3	19.8	89.58	40.6	-24.8	656.7	616.5	16.351			
9,150.0	9,054.5	9,107.1	9,028.1	23.3	19.8	89.09	59.6	-25.1	657.9	617.6	16.340			
9,175.0	9,068.5	9,130.0	9,039.9	23.3	19.9	88.66	79.2	-25.4	658.9	618.6	16.324			
9,200.0	9,081.4	9,152.8	9,050.8	23.3	19.9	88.27	99.3	-25.7	659.9	619.4	16.302			
9,225.0	9,093.2	9,175.0	9,060.4	23.4	20.0	87.93	119.3	-26.0	660.8	620.2	16.275			
9,250.0	9,103.8	9,198.3	9,069.5	23.4	20.1	87.62	140.8	-26.3	661.6	620.9	16.239			
9,275.0	9,113.2	9,221.1	9,077.4	23.4	20.2	87.36	162.1	-26.6	662.4	621.5	16.198			
9,300.0	9,121.4	9,243.8	9,084.2	23.5	20.3	87.14	183.7	-26.9	663.0	621.9	16.150			
9,325.0	9,128.4	9,266.4	9,090.0	23.5	20.4	86.95	205.6	-27.1	663.5	622.3	16.095			
9,350.0	9,134.1	9,289.1	9,094.7	23.6	20.5	86.80	227.8	-27.4	664.0	622.6	16.033			
9,375.0	9,138.5	9,311.7	9,098.4	23.6	20.6	86.69	250.1	-27.6	664.3	622.7	15.964			
9,400.0	9,141.7	9,334.4	9,101.0	23.7	20.7	86.61	272.6	-27.8	664.5	622.7	15.888			
9,425.0	9,143.5	9,357.0	9,102.5	23.8	20.8	86.56	295.2	-28.0	664.7	622.6	15.806			
9,450.0	9,144.0	9,379.6	9,103.0	23.8	21.0	86.55	317.8	-28.1	664.7	622.4	15.717			
9,452.8	9,144.0	9,382.3	9,103.0	23.9	21.0	86.55	320.4	-28.2	664.7	622.4	15.706			
9,500.0	9,143.5	9,429.5	9,102.8	24.0	21.3	86.57	367.6	-28.5	664.7	621.8	15.494			
9,600.0	9,142.4	9,529.5	9,102.2	24.6	22.0	86.62	467.6	-29.2	664.6	620.3	15.008			
9,700.0	9,141.4	9,629.5	9,101.7	25.3	22.8	86.66	567.6	-30.0	664.5	618.5	14.473			
9,800.0	9,140.3	9,729.5	9,101.2	26.1	23.8	86.71	667.6	-30.7	664.4	616.6	13.909			
9,900.0	9,139.2	9,829.5	9,100.7	27.0	24.9	86.76	767.6	-31.4	664.2	614.4	13.334			
10,000.0	9,138.2	9,929.5	9,100.1	28.0	26.0	86.80	867.6	-32.1	664.1	612.1	12.762			
10,100.0	9,137.1	10,029.5	9,099.6	29.1	27.2	86.85	967.6	-32.8	664.0	609.6	12.202			
10,200.0	9,136.0	10,129.4	9,099.1	30.3	28.5	86.90	1,067.6	-33.6	663.9	607.0	11.661			
10,300.0	9,135.0	10,229.4	9,098.6	31.6	29.8	86.94	1,167.6	-34.3	663.8	604.3	11.144			
10,400.0	9,133.9	10,329.4	9,098.0	32.8	31.2	86.99	1,267.6	-35.0	663.7	601.4	10.653			
10,500.0	9,132.9	10,429.4	9,097.5	34.2	32.6	87.03	1,367.6	-35.7	663.6	598.5	10.190			
10,600.0	9,131.8	10,529.4	9,097.0	35.6	34.1	87.08	1,467.6	-36.4	663.5	595.5	9.754			
10,700.0	9,130.7	10,629.4	9,096.5	37.0	35.6	87.13	1,567.6	-37.2	663.4	592.4	9.344			
10,800.0	9,129.7	10,729.4	9,096.0	38.5	37.1	87.17	1,667.6	-37.9	663.3	589.3	8.960			
10,900.0	9,128.6	10,829.4	9,095.4	39.9	38.7	87.22	1,767.6	-38.6	663.2	586.1	8.600			
11,000.0	9,127.5	10,929.4	9,094.9	41.5	40.2	87.27	1,867.6	-39.3	663.1	582.8	8.263			
11,100.0	9,126.5	11,029.4	9,094.4	43.0	41.8	87.31	1,967.6	-40.1	663.0	579.6	7.948			
11,200.0	9,125.4	11,129.4	9,093.9	44.5	43.4	87.36	2,067.6	-40.8	662.9	576.3	7.652			
11,300.0	9,124.3	11,229.4	9,093.3	46.1	45.1	87.41	2,167.6	-41.5	662.8	572.9	7.374			
11,400.0	9,123.3	11,329.4	9,092.8	47.7	46.7	87.45	2,267.6	-42.2	662.7	569.5	7.114			
11,500.0	9,122.2	11,429.4	9,092.3	49.3	48.4	87.50	2,367.6	-42.9	662.6	566.1	6.869			
11,600.0	9,121.1	11,529.4	9,091.8	51.0	50.0	87.55	2,467.6	-43.7	662.5	562.7	6.639			
11,700.0	9,120.1	11,629.4	9,091.2	52.6	51.7	87.59	2,567.6	-44.4	662.4	559.3	6.423			
11,800.0	9,119.0	11,729.4	9,090.7	54.2	53.4	87.64	2,667.6	-45.1	662.3	555.8	6.219			
11,900.0	9,117.9	11,829.4	9,090.2	55.9	55.1	87.68	2,767.6	-45.8	662.2	552.3	6.026			
12,000.0	9,116.9	11,929.4	9,089.7	57.6	56.8	87.73	2,867.6	-46.6	662.1	548.8	5.844			
12,100.0	9,115.8	12,029.4	9,089.1	59.2	58.5	87.78	2,967.6	-47.3	662.0	545.3	5.672			
12,200.0	9,114.8	12,129.4	9,088.6	60.9	60.2	87.82	3,067.6	-48.0	661.9	541.8	5.509			
12,300.0	9,113.7	12,229.4	9,088.1	62.6	62.0	87.87	3,167.6	-48.7	661.8	538.2	5.355			
12,400.0	9,112.6	12,329.4	9,087.6	64.3	63.7	87.92	3,267.6	-49.4	661.7	534.7	5.209			
12,500.0	9,111.6	12,429.4	9,087.0	66.0	65.4	87.96	3,367.6	-50.2	661.6	531.1	5.070			
12,600.0	9,110.5	12,529.4	9,086.5	67.7	67.2	88.01	3,467.6	-50.9	661.5	527.5	4.937			
12,700.0	9,109.4	12,629.4	9,086.0	69.5	68.9	88.06	3,567.6	-51.6	661.4	524.0	4.812			
12,800.0	9,108.4	12,729.4	9,085.5	71.2	70.7	88.10	3,667.6	-52.3	661.3	520.4	4.692			
12,900.0	9,107.3	12,829.4	9,085.0	72.9	72.4	88.15	3,767.6	-53.1	661.2	516.8	4.577			

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design												Offset Site Error:	0.0 usft
Sec 32, T24-S, R32E - Azores Federal #8H - Wellbore #1 - Plan #1												Offset Well Error:	0.0 usft
Survey Program: 0-MWD default													
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
13,000.0	9,106.2	12,929.4	9,084.4	74.7	74.2	88.20	3,867.4	-53.8	661.1	513.2	4.468		
13,100.0	9,105.2	13,029.4	9,083.9	76.4	75.9	88.24	3,967.4	-54.5	661.1	509.6	4.364		
13,200.0	9,104.1	13,129.4	9,083.4	78.1	77.7	88.29	4,067.4	-55.2	661.0	505.9	4.264		
13,300.0	9,103.0	13,229.4	9,082.9	79.9	79.4	88.34	4,167.4	-55.9	660.9	502.3	4.169		
13,400.0	9,102.0	13,329.4	9,082.3	81.6	81.2	88.38	4,267.4	-56.7	660.8	498.7	4.077		
13,500.0	9,100.9	13,429.4	9,081.8	83.4	83.0	88.43	4,367.4	-57.4	660.7	495.1	3.989		
13,600.0	9,099.9	13,529.4	9,081.3	85.1	84.8	88.48	4,467.4	-58.1	660.6	491.4	3.905		
13,700.0	9,098.8	13,629.4	9,080.8	86.9	86.5	88.52	4,567.4	-58.8	660.5	487.8	3.825		
13,800.0	9,097.7	13,729.4	9,080.2	88.7	88.3	88.57	4,667.4	-59.6	660.4	484.2	3.747		
13,900.0	9,096.7	13,829.4	9,079.7	90.4	90.1	88.62	4,767.4	-60.3	660.3	480.5	3.672		
14,000.0	9,095.6	13,929.4	9,079.2	92.2	91.9	88.66	4,867.4	-61.0	660.2	476.9	3.601		
14,100.0	9,094.5	14,029.4	9,078.7	93.9	93.6	88.71	4,967.4	-61.7	660.1	473.2	3.531		
14,149.6	9,094.0	14,079.0	9,078.4	94.8	94.5	88.73	5,017.0	-62.1	660.1	471.4	3.498 SF		



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference:
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design Sec 32, T24-S, R32E - Azores Federal #8H - Wellbore #1 - Wellbore #1													Offset Site Error: 0.0 usft
Survey Program: 100-GYRO-NS, 876-MWD default													Offset Well Error: 0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning	
0.0	0.0	0.0	0.0	0.0	0.0	89.43	1.0	100.0	100.0				
100.0	100.0	98.5	98.5	0.1	0.1	89.11	1.6	100.2	100.2	100.0	452.029		
200.0	200.0	198.1	198.1	0.3	0.5	88.41	2.8	100.8	100.9	100.1	128.420		
300.0	300.0	298.1	298.1	0.5	0.8	87.68	4.1	101.7	101.8	100.4	74.837		
400.0	400.0	398.6	398.6	0.8	1.2	87.03	5.3	102.3	102.4	100.5	52.901		
500.0	500.0	498.6	498.6	1.0	1.5	86.36	6.5	102.6	102.8	100.3	40.953		
600.0	600.0	599.5	599.5	1.2	1.9	85.41	8.2	102.5	102.8	99.7	33.277		
700.0	700.0	700.1	700.0	1.4	2.2	84.22	10.3	101.6	102.1	98.4	27.835		
800.0	800.0	800.2	800.1	1.7	2.5	82.78	12.7	100.1	100.9	96.8	24.424		
900.0	900.0	900.0	899.9	1.9	2.6	81.36	15.0	98.8	100.0	95.5	22.216		
1,000.0	1,000.0	1,000.1	999.9	2.1	2.6	79.86	17.4	97.5	99.1	94.3	20.847		
1,025.8	1,025.8	1,025.9	1,025.7	2.2	2.7	-176.13	18.1	97.2	98.9	94.1	20.550	CC, ES	
1,100.0	1,100.0	1,100.5	1,100.3	2.3	2.7	-177.33	19.9	96.0	99.8	94.8	19.972		
1,200.0	1,199.8	1,201.5	1,201.2	2.5	2.7	-178.40	21.2	93.9	103.3	98.0	19.701		
1,253.2	1,252.9	1,255.1	1,254.8	2.6	2.8	-178.67	21.3	92.5	106.1	100.8	19.743		
1,300.0	1,299.5	1,301.9	1,301.6	2.7	2.8	-178.71	20.9	91.2	109.0	103.4	19.780		
1,400.0	1,399.1	1,401.9	1,401.5	2.9	2.9	-178.23	19.2	88.7	114.9	109.1	19.820		
1,500.0	1,498.7	1,500.5	1,500.1	3.2	3.0	-177.28	16.4	86.6	121.1	115.0	19.840		
1,600.0	1,598.3	1,598.5	1,598.1	3.4	3.1	-176.44	13.9	85.8	128.6	122.2	20.036		
1,700.0	1,697.9	1,697.6	1,697.1	3.7	3.2	-175.76	11.7	86.0	137.2	130.4	20.310		
1,800.0	1,797.5	1,797.0	1,796.5	3.9	3.3	-175.22	9.7	86.2	145.9	138.8	20.567		
1,900.0	1,897.1	1,896.8	1,896.3	4.2	3.5	-174.84	7.9	86.5	154.7	147.2	20.764		
2,000.0	1,996.8	1,996.7	1,996.2	4.4	3.6	-174.63	6.5	86.5	163.3	155.4	20.914		
2,100.0	2,096.4	2,098.1	2,097.6	4.7	3.8	-174.35	4.8	86.0	171.3	163.1	20.938		
2,200.0	2,196.0	2,199.5	2,198.9	4.9	3.9	-173.78	1.9	84.6	178.3	169.7	20.833		
2,300.0	2,295.6	2,300.4	2,299.8	5.2	4.1	-173.13	-1.5	82.5	184.5	175.6	20.626		
2,400.0	2,395.2	2,401.1	2,400.4	5.5	4.3	-172.50	-5.0	79.8	190.2	180.9	20.367		
2,500.0	2,494.8	2,501.1	2,500.2	5.7	4.4	-171.98	-8.3	77.0	195.7	186.0	20.098		
2,600.0	2,594.4	2,600.6	2,599.7	6.0	4.6	-171.58	-11.3	74.0	201.2	191.1	19.846		
2,700.0	2,694.0	2,699.5	2,698.5	6.3	4.8	-171.17	-14.4	71.5	207.1	196.5	19.642		
2,800.0	2,793.6	2,798.6	2,797.5	6.5	5.0	-170.75	-17.5	69.4	213.4	202.4	19.485		
2,900.0	2,893.2	2,897.9	2,896.7	6.8	5.2	-170.41	-20.4	67.5	219.9	208.6	19.355		
3,000.0	2,992.9	2,996.8	2,995.6	7.1	5.3	-170.16	-23.0	65.8	226.7	215.0	19.253		
3,100.0	3,092.5	3,095.6	3,094.3	7.3	5.5	-169.99	-25.3	64.6	234.0	221.8	19.189		
3,200.0	3,192.1	3,194.6	3,193.4	7.6	5.7	-169.90	-27.2	63.7	241.6	229.0	19.155		
3,300.0	3,291.7	3,293.9	3,292.6	7.9	5.9	-169.91	-28.8	62.9	249.5	236.4	19.137		
3,400.0	3,391.3	3,393.1	3,391.8	8.1	6.1	-169.99	-30.0	62.4	257.5	244.0	19.131		
3,500.0	3,490.9	3,492.3	3,491.0	8.4	6.3	-170.10	-31.1	62.0	265.7	251.8	19.138		
3,600.0	3,590.5	3,593.0	3,591.7	8.7	6.5	-170.20	-32.1	61.5	273.8	259.5	19.138		
3,700.0	3,690.1	3,694.0	3,692.7	9.0	6.7	-170.28	-33.4	60.5	281.5	266.7	19.106		
3,800.0	3,789.7	3,792.9	3,791.5	9.2	6.9	-170.33	-34.7	59.5	289.0	273.9	19.074		
3,900.0	3,889.3	3,891.7	3,890.4	9.5	7.1	-170.36	-36.1	58.8	296.9	281.4	19.064		
4,000.0	3,988.9	3,992.0	3,990.6	9.8	7.3	-170.34	-37.7	58.1	304.9	288.9	19.050		
4,100.0	4,088.6	4,092.1	4,090.8	10.1	7.5	-170.29	-39.5	57.3	312.6	296.2	19.025		
4,200.0	4,188.2	4,191.8	4,190.4	10.3	7.7	-170.23	-41.4	56.5	320.3	303.4	18.996		
4,300.0	4,287.8	4,291.1	4,289.7	10.6	7.9	-170.18	-43.3	55.6	328.0	310.7	18.969		
4,400.0	4,387.4	4,389.7	4,388.3	10.9	8.1	-170.14	-45.0	55.0	336.0	318.2	18.955		
4,500.0	4,487.0	4,488.7	4,487.3	11.1	8.3	-170.15	-46.5	54.7	344.2	326.1	18.957		
4,600.0	4,586.6	4,588.0	4,586.5	11.4	8.5	-170.22	-47.6	54.5	352.6	334.0	18.967		
4,700.0	4,686.2	4,688.6	4,687.2	11.7	8.7	-170.28	-48.8	54.3	361.0	342.0	18.973		
4,800.0	4,785.8	4,790.5	4,789.0	12.0	8.9	-170.08	-51.6	53.7	368.9	349.4	18.947		
4,900.0	4,885.4	4,890.3	4,888.7	12.2	9.1	-169.69	-55.8	52.8	376.4	356.4	18.901		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design Sec 32, T24-S, R32E - Azores Federal #8H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-GYRO-NS, 876-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
5,000.0	4,985.0	4,989.3	4,987.6	12.5	9.3	-169.28	-80.2	52.1	384.0	363.7	18.865		
5,100.0	5,084.7	5,089.0	5,087.2	12.8	9.5	-168.87	-84.6	51.4	391.8	371.0	18.833		
5,200.0	5,184.3	5,189.0	5,187.1	13.1	9.7	-168.50	-89.0	50.7	399.5	378.3	18.799		
5,300.0	5,283.9	5,292.0	5,290.0	13.3	9.9	-168.14	-73.4	49.6	406.8	385.1	18.744		
5,400.0	5,383.5	5,395.1	5,393.0	13.6	10.1	-167.80	-77.8	47.5	413.3	391.1	18.651		
5,500.0	5,483.1	5,494.2	5,492.0	13.9	10.3	-167.50	-81.9	45.2	419.4	396.8	18.554		
5,600.0	5,582.7	5,593.6	5,591.2	14.2	10.6	-167.22	-86.0	43.1	425.8	402.7	18.467		
5,700.0	5,682.3	5,693.9	5,691.5	14.4	10.8	-166.99	-89.7	40.9	432.1	408.6	18.380		
5,800.0	5,781.9	5,794.1	5,791.6	14.7	11.0	-166.82	-93.1	38.6	438.3	414.3	18.292		
5,900.0	5,881.5	5,894.1	5,891.5	15.0	11.2	-166.67	-96.3	36.2	444.4	420.0	18.207		
6,000.0	5,981.1	5,994.6	5,991.9	15.3	11.4	-166.53	-99.5	33.7	450.5	425.7	18.123		
6,100.0	6,080.8	6,095.6	6,092.9	15.5	11.6	-166.39	-102.7	31.0	456.4	431.1	18.032		
6,200.0	6,180.4	6,196.0	6,193.2	15.8	11.8	-166.25	-106.0	28.1	462.0	436.2	17.937		
6,300.0	6,280.0	6,295.9	6,292.9	16.1	12.1	-166.12	-109.2	25.1	467.6	441.4	17.845		
6,400.0	6,379.6	6,395.5	6,392.4	16.4	12.3	-166.00	-112.3	22.2	473.2	446.5	17.756		
6,500.0	6,479.2	6,494.9	6,491.8	16.6	12.5	-165.90	-115.3	19.3	478.9	451.8	17.672		
6,600.0	6,578.8	6,594.0	6,590.8	16.9	12.7	-165.82	-118.1	16.6	484.7	457.1	17.594		
6,700.0	6,678.4	6,693.0	6,689.7	17.2	12.9	-165.75	-120.9	14.0	490.6	462.6	17.525		
6,800.0	6,778.0	6,792.8	6,789.4	17.5	13.1	-165.68	-123.6	11.6	496.7	468.3	17.462		
6,900.0	6,877.6	6,892.7	6,889.3	17.8	13.3	-165.59	-126.7	9.1	502.8	473.9	17.401		
7,000.0	6,977.2	6,992.1	6,988.6	18.0	13.5	-165.48	-129.8	6.6	508.8	479.5	17.343		
7,100.0	7,076.8	7,091.6	7,088.0	18.3	13.8	-165.37	-133.0	4.2	515.0	485.2	17.289		
7,200.0	7,176.5	7,192.0	7,188.4	18.6	14.0	-165.26	-136.2	1.8	521.1	490.9	17.233		
7,300.0	7,276.1	7,292.4	7,288.6	18.9	14.2	-165.16	-139.3	-0.8	527.2	496.5	17.175		
7,400.0	7,375.7	7,392.2	7,388.4	19.1	14.4	-165.06	-142.5	-3.4	533.1	502.0	17.118		
7,500.0	7,475.3	7,490.5	7,486.5	19.4	14.6	-164.94	-145.8	-5.9	539.1	507.5	17.066		
7,600.0	7,574.9	7,584.7	7,580.7	19.7	14.8	-164.95	-147.9	-7.6	545.9	513.9	17.047		
7,700.0	7,674.5	7,680.0	7,676.0	20.0	15.0	-165.13	-148.4	-8.3	553.7	521.2	17.061		
7,800.0	7,774.1	7,778.3	7,774.3	20.2	15.2	-165.30	-148.9	-8.6	561.9	529.0	17.087		
7,900.0	7,873.7	7,876.6	7,872.6	20.5	15.4	-165.41	-150.0	-8.7	570.3	537.0	17.117		
8,000.0	7,973.3	7,974.8	7,970.8	20.8	15.6	-165.49	-151.4	-8.6	579.0	545.2	17.154		
8,100.0	8,072.9	8,075.2	8,071.2	21.1	15.8	-165.55	-153.0	-8.3	587.8	553.6	17.190		
8,200.0	8,172.6	8,178.6	8,174.5	21.3	16.0	-165.49	-155.9	-8.5	596.2	561.5	17.206		
8,300.0	8,272.2	8,281.2	8,277.1	21.6	16.3	-165.35	-159.7	-9.3	604.0	568.9	17.203		
8,400.0	8,371.8	8,383.6	8,379.4	21.9	16.5	-165.25	-163.0	-10.5	611.3	575.8	17.188		
8,500.0	8,471.4	8,484.3	8,480.1	22.2	16.7	-165.28	-164.9	-12.1	618.3	582.3	17.172		
8,600.0	8,571.0	8,584.6	8,580.4	22.4	16.9	-165.56	-164.1	-13.7	625.3	588.8	17.158		
8,687.5	8,658.2	8,690.3	8,685.2	22.7	17.1	-166.81	-152.7	-16.6	630.5	593.7	17.139		
8,700.0	8,670.6	8,711.7	8,706.0	22.7	17.1	175.49	-147.4	-17.8	630.9	594.1	17.133		
8,725.0	8,695.5	8,746.9	8,739.4	22.8	17.1	144.17	-136.9	-20.5	631.3	594.4	17.114		
8,750.0	8,720.3	8,768.3	8,759.3	22.8	17.2	125.38	-129.4	-22.2	631.7	594.8	17.097		
8,775.0	8,745.0	8,787.0	8,776.5	22.9	17.2	114.77	-122.1	-23.7	632.2	595.2	17.085		
8,800.0	8,769.5	8,802.1	8,790.2	22.9	17.2	108.28	-115.8	-24.7	632.9	595.9	17.082		
8,825.0	8,793.6	8,815.7	8,802.4	23.0	17.2	103.95	-109.9	-25.3	634.1	597.0	17.090		
8,850.0	8,817.5	8,834.0	8,818.7	23.0	17.2	100.74	-101.5	-25.9	635.6	598.5	17.108		
8,875.0	8,840.9	8,847.3	8,830.4	23.0	17.2	98.35	-95.0	-26.2	637.4	600.2	17.134		
8,900.0	8,863.9	8,867.9	8,848.0	23.1	17.3	96.36	-84.5	-26.5	639.3	602.0	17.161		
8,925.0	8,886.3	8,888.2	8,865.0	23.1	17.3	94.72	-73.4	-26.7	641.2	603.9	17.190		
8,950.0	8,908.2	8,908.5	8,881.5	23.1	17.3	93.33	-61.6	-26.8	643.2	605.9	17.219		
8,975.0	8,929.3	8,928.9	8,897.6	23.2	17.3	92.13	-49.1	-26.9	645.3	607.9	17.250		
9,000.0	8,949.8	8,957.6	8,919.4	23.2	17.3	91.03	-30.4	-27.1	647.2	609.7	17.272		
9,025.0	8,969.5	8,987.4	8,940.9	23.2	17.3	90.05	-9.8	-27.6	648.7	611.2	17.283		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Azores Federal #12H
Project:	Lea County, NM	TVD Reference:	Well @ 3522.0usft (McVay 8)
Reference Site:	Sec 32, T24-S, R32E	MD Reference:	Well @ 3522.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Azores Federal #12H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Plan #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 32, T24-S, R32E - Azores Federal #8H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-GYRO-NS, 876-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
9,050.0	8,988.3	9,019.2	8,962.7	23.2	17.4	89.18	13.3	-28.6	649.9	612.3	17.279		
9,075.0	9,006.3	9,044.5	8,979.0	23.2	17.4	88.48	32.6	-29.6	650.8	613.1	17.267		
9,100.0	9,023.4	9,068.7	8,993.6	23.3	17.5	87.84	51.9	-30.8	651.4	613.7	17.250		
9,125.0	9,039.5	9,088.5	9,004.7	23.3	17.5	87.31	68.3	-31.7	652.0	614.2	17.231		
9,150.0	9,054.5	9,108.0	9,014.9	23.3	17.6	86.84	84.9	-32.5	652.7	614.7	17.211		
9,175.0	9,068.5	9,125.7	9,023.6	23.3	17.6	86.42	100.3	-33.2	653.3	615.3	17.190		
9,200.0	9,081.4	9,142.0	9,031.1	23.3	17.7	86.07	114.7	-33.6	654.0	615.9	17.170		
9,225.0	9,093.2	9,165.0	9,041.1	23.4	17.8	85.75	135.4	-33.9	654.9	616.7	17.144		
9,250.0	9,103.8	9,177.3	9,046.1	23.4	17.8	85.50	146.7	-34.0	655.8	617.5	17.126		
9,275.0	9,113.2	9,198.5	9,054.1	23.4	17.9	85.29	166.4	-34.1	656.7	618.3	17.090		
9,300.0	9,121.4	9,220.5	9,061.8	23.5	18.0	85.16	186.9	-34.1	657.5	618.9	17.043		
9,325.0	9,128.4	9,242.7	9,069.1	23.5	18.1	85.10	207.9	-34.1	658.1	619.4	16.987		
9,350.0	9,134.1	9,278.7	9,079.3	23.6	18.2	85.19	242.5	-34.5	658.4	619.4	16.880		
9,375.0	9,138.5	9,313.1	9,086.8	23.6	18.4	85.31	276.0	-35.6	658.1	618.8	16.752		
9,400.0	9,141.7	9,346.3	9,092.0	23.7	18.6	85.46	308.6	-37.3	657.2	617.6	16.605		
9,425.0	9,143.5	9,378.1	9,094.8	23.8	18.8	85.64	340.3	-39.4	655.8	615.9	16.442		
9,450.0	9,144.0	9,404.8	9,096.0	23.8	19.0	85.89	366.8	-41.5	654.0	613.8	16.270		
9,452.8	9,144.0	9,407.6	9,096.1	23.9	19.0	85.92	369.7	-41.8	653.8	613.6	16.251		
9,500.0	9,143.5	9,455.8	9,097.7	24.0	19.4	86.08	417.7	-45.7	650.2	609.3	15.914		
9,600.0	9,142.4	9,561.7	9,099.6	24.6	20.2	86.30	523.1	-54.9	641.9	599.5	15.149		
9,700.0	9,141.4	9,636.2	9,100.2	25.3	20.9	86.40	597.5	-60.6	634.8	591.0	14.489		
9,800.0	9,140.3	9,719.1	9,099.7	26.1	21.7	86.42	680.3	-63.7	631.7	586.2	13.887		
9,887.0	9,139.4	9,792.5	9,098.5	26.9	22.4	86.37	753.7	-65.2	630.6	583.5	13.390		
9,900.0	9,139.2	9,802.4	9,098.3	27.0	22.5	86.37	763.5	-65.2	630.6	583.3	13.325		
10,000.0	9,138.2	9,884.4	9,097.5	28.0	23.4	86.38	845.6	-63.8	632.9	583.6	12.848		
10,100.0	9,137.1	9,984.8	9,097.3	29.1	24.4	86.48	945.8	-61.0	636.3	584.8	12.360		
10,200.0	9,136.0	10,086.6	9,097.5	30.3	25.5	86.62	1,047.6	-58.5	639.3	585.4	11.864		
10,300.0	9,135.0	10,189.7	9,097.8	31.6	26.8	86.76	1,150.7	-56.0	642.3	585.8	11.372		
10,400.0	9,133.9	10,293.7	9,099.5	32.8	28.1	87.02	1,254.7	-54.4	644.3	585.1	10.892		
10,500.0	9,132.9	10,389.8	9,101.4	34.2	29.4	87.28	1,350.8	-52.9	646.3	584.5	10.453		
10,600.0	9,131.8	10,489.5	9,103.0	35.6	30.7	87.53	1,450.4	-50.8	649.0	584.3	10.037		
10,700.0	9,130.7	10,590.4	9,105.7	37.0	32.1	87.87	1,551.3	-48.8	651.4	583.9	9.643		
10,800.0	9,129.7	10,684.9	9,109.0	38.5	33.5	88.25	1,645.7	-46.7	654.2	583.7	9.287		
10,900.0	9,128.6	10,785.4	9,112.6	39.9	34.9	88.68	1,746.0	-43.9	657.5	584.0	8.948		
11,000.0	9,127.5	10,881.7	9,117.7	41.5	36.3	89.21	1,842.2	-41.1	660.9	584.4	8.642		
11,100.0	9,126.5	11,004.8	9,124.1	43.0	38.2	89.88	1,965.1	-39.3	663.1	583.1	8.296		
11,200.0	9,125.4	11,109.6	9,126.3	44.5	39.8	90.17	2,069.8	-40.1	662.9	579.8	7.972		
11,291.9	9,124.4	11,198.9	9,126.9	46.0	41.2	90.30	2,159.2	-41.0	662.6	576.6	7.701		
11,300.0	9,124.3	11,206.1	9,127.0	46.1	41.3	90.32	2,166.3	-41.0	662.6	576.3	7.679		
11,400.0	9,123.3	11,300.5	9,131.6	47.7	42.7	90.80	2,260.7	-40.8	663.5	574.1	7.421		
11,500.0	9,122.2	11,408.5	9,132.6	49.3	44.5	90.98	2,368.7	-41.3	663.7	571.0	7.155		
11,600.0	9,121.1	11,507.2	9,132.1	51.0	46.0	91.03	2,467.3	-42.2	663.5	567.5	6.912		
11,700.0	9,120.1	11,616.4	9,135.2	52.6	47.8	91.40	2,576.5	-43.2	663.3	563.9	6.673		
11,800.0	9,119.0	11,719.8	9,131.9	54.2	49.4	91.21	2,679.7	-45.9	661.3	558.5	6.435		
11,900.0	9,117.9	11,816.9	9,126.3	55.9	51.1	90.82	2,776.7	-48.0	659.7	553.6	6.221		
12,000.0	9,116.9	11,908.5	9,120.2	57.6	52.5	90.38	2,868.1	-49.4	658.8	549.6	6.032		
12,009.2	9,116.8	11,916.8	9,119.7	57.7	52.7	90.34	2,876.4	-49.4	658.8	549.3	6.016		
12,100.0	9,115.8	12,000.8	9,115.1	59.2	54.0	90.02	2,960.2	-49.5	659.3	546.9	5.866		
12,200.0	9,114.8	12,087.1	9,110.2	60.9	55.4	89.67	3,046.4	-48.4	661.2	545.7	5.725		
12,300.0	9,113.7	12,176.2	9,106.7	62.6	56.9	89.46	3,135.4	-45.3	665.3	546.7	5.608		
12,400.0	9,112.6	12,278.7	9,103.2	64.3	58.6	89.26	3,237.7	-41.0	670.2	548.2	5.493		
12,500.0	9,111.6	12,387.3	9,103.2	66.0	60.3	89.35	3,346.2	-37.7	673.9	548.4	5.370		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference:
TVD Reference:
MD Reference:
North Reference:
Survey Calculation Method:
Output errors are at
Database:
Offset TVD Reference:

Well Azores Federal #12H
Well @ 3522.0usft (McVay 8)
Well @ 3522.0usft (McVay 8)
Grid
Minimum Curvature
2.00 sigma
EDM5002
Offset Datum

Offset Design												Offset Site Error:	0.0 usft
Sec 32, T24-S, R32E - Azores Federal #8H - Wellbore #1 - Wellbore #1												Offset Well Error:	0.0 usft
Survey Program: 100-GYRO-NS, 876-MWD default													
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	Offset Wellbore Centre +E-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning	
12,600.0	9,110.5	12,517.3	9,104.5	67.7	62.4	89.58	3,476.2	-37.3	674.8	545.4	5.217		
12,700.0	9,109.4	12,624.9	9,103.3	69.5	64.2	89.58	3,583.8	-40.2	672.8	539.9	5.063		
12,800.0	9,108.4	12,724.2	9,100.9	71.2	65.9	89.46	3,683.0	-43.4	670.2	533.9	4.917		
12,900.0	9,107.3	12,819.3	9,102.1	72.9	67.4	89.65	3,778.0	-45.8	668.3	528.7	4.787		
13,000.0	9,106.2	12,919.2	9,103.7	74.7	69.1	89.88	3,877.9	-48.1	666.7	523.6	4.660		
13,100.0	9,105.2	13,020.4	9,104.8	76.4	70.9	90.06	3,979.1	-50.4	665.0	518.4	4.538		
13,200.0	9,104.1	13,121.5	9,104.3	78.1	72.6	90.11	4,080.1	-53.0	663.1	513.0	4.419		
13,216.6	9,103.9	13,125.0	9,104.2	78.4	72.6	90.11	4,083.6	-53.1	662.9	512.5	4.408		
13,300.0	9,103.0	13,125.0	9,104.2	79.9	72.6	90.11	4,083.6	-53.1	668.1	516.2	4.400 SF		
13,400.0	9,102.0	13,125.0	9,104.2	81.6	72.6	90.11	4,083.6	-53.1	687.8	534.2	4.477		
13,500.0	9,100.9	13,125.0	9,104.2	83.4	72.6	90.11	4,083.6	-53.1	720.9	565.5	4.640		
13,600.0	9,099.9	13,125.0	9,104.2	85.1	72.6	90.11	4,083.6	-53.1	765.8	608.6	4.873		
13,700.0	9,098.8	13,125.0	9,104.2	86.9	72.6	90.11	4,083.6	-53.1	820.4	661.5	5.163		
13,800.0	9,097.7	13,125.0	9,104.2	88.7	72.6	90.11	4,083.6	-53.1	883.0	722.4	5.495		
13,900.0	9,096.7	13,125.0	9,104.2	90.4	72.6	90.11	4,083.6	-53.1	952.1	789.6	5.860		
14,000.0	9,095.6	13,125.0	9,104.2	92.2	72.6	90.11	4,083.6	-53.1	1,026.2	862.0	6.248		
14,100.0	9,094.5	13,125.0	9,104.2	93.9	72.6	90.11	4,083.6	-53.1	1,104.5	938.4	6.653		
14,149.6	9,094.0	13,125.0	9,104.2	94.8	72.6	90.11	4,083.6	-53.1	1,144.5	977.6	6.858		



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design Sec 32, T24-S, R32E - Convo Federal #2H - Wellbore #1 - Wellbore #1											Offset Site Error:	0.0 usft
Survey Program: 100-MWD default, 7793-MWD default											Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Centre +E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	107.38	-386.3	1,234.4	1,293.5			
100.0	100.0	84.8	84.8	0.1	0.1	107.38	-386.3	1,234.5	1,293.5	1,293.4	8,018.070	
200.0	200.0	179.9	179.9	0.3	0.3	107.38	-386.5	1,234.8	1,293.9	1,293.3	2,231.534	ES
300.0	300.0	273.8	273.8	0.5	0.5	107.39	-386.8	1,235.5	1,294.8	1,293.7	1,275.413	
400.0	400.0	372.2	372.2	0.8	0.7	107.38	-387.2	1,236.7	1,295.9	1,294.5	894.114	
500.0	500.0	473.9	473.9	1.0	0.9	107.37	-387.3	1,237.8	1,297.1	1,295.2	689.122	
600.0	600.0	576.8	576.7	1.2	1.1	107.35	-387.0	1,238.9	1,298.0	1,295.7	560.414	
700.0	700.0	683.5	683.5	1.4	1.3	107.32	-386.7	1,239.7	1,298.6	1,295.9	471.357	
800.0	800.0	786.0	786.0	1.7	1.5	107.31	-386.5	1,240.0	1,298.8	1,295.6	407.601	
900.0	900.0	885.8	885.8	1.9	1.7	107.30	-386.3	1,240.2	1,298.9	1,295.3	358.899	
1,000.0	1,000.0	985.5	985.5	2.1	2.0	107.29	-386.1	1,240.4	1,299.1	1,295.0	320.161	
1,100.0	1,100.0	1,082.4	1,082.3	2.3	2.2	-148.33	-385.6	1,240.8	1,300.8	1,296.4	290.779	
1,200.0	1,199.8	1,182.5	1,182.4	2.5	2.4	-148.43	-385.0	1,241.4	1,305.7	1,300.9	267.843	
1,253.2	1,252.9	1,236.4	1,236.4	2.6	2.5	-148.51	-384.7	1,241.7	1,309.5	1,304.4	257.331	
1,300.0	1,299.5	1,284.1	1,284.0	2.7	2.6	-148.61	-384.6	1,241.9	1,313.2	1,307.9	248.617	
1,400.0	1,399.1	1,383.4	1,383.4	2.9	2.8	-148.82	-384.4	1,242.2	1,320.9	1,315.2	231.862	
1,500.0	1,498.7	1,483.3	1,483.3	3.2	3.0	-149.03	-384.3	1,242.5	1,328.7	1,322.6	217.070	
1,600.0	1,598.3	1,582.4	1,582.4	3.4	3.2	-149.23	-384.2	1,242.8	1,336.6	1,330.0	204.079	
1,700.0	1,697.9	1,680.4	1,680.3	3.7	3.4	-149.43	-384.1	1,243.1	1,344.5	1,337.5	192.619	
1,800.0	1,797.5	1,778.7	1,778.7	3.9	3.6	-149.63	-383.9	1,243.6	1,352.5	1,345.1	182.380	
1,900.0	1,897.1	1,879.1	1,879.1	4.2	3.8	-149.82	-383.8	1,244.1	1,360.6	1,352.8	173.205	
2,000.0	1,996.8	1,979.8	1,979.8	4.4	4.0	-150.02	-383.8	1,244.5	1,368.7	1,360.4	165.017	
2,100.0	2,096.4	2,073.3	2,073.2	4.7	4.2	-150.19	-383.8	1,245.0	1,376.8	1,368.1	157.873	
2,200.0	2,196.0	2,161.5	2,161.5	4.9	4.4	-150.36	-383.9	1,246.0	1,385.6	1,376.5	151.586	
2,300.0	2,295.6	2,260.3	2,260.3	5.2	4.6	-150.55	-384.1	1,247.8	1,395.1	1,385.5	145.590	
2,400.0	2,395.2	2,377.9	2,377.8	5.5	4.9	-150.77	-384.3	1,249.1	1,403.9	1,393.9	139.557	
2,500.0	2,494.8	2,480.3	2,480.2	5.7	5.1	-150.96	-384.0	1,249.3	1,411.8	1,401.3	134.351	
2,600.0	2,594.4	2,592.2	2,592.1	6.0	5.3	-151.19	-383.2	1,249.3	1,419.3	1,408.4	129.298	
2,700.0	2,694.0	2,686.9	2,686.8	6.3	5.5	-151.36	-382.8	1,248.8	1,426.5	1,415.1	125.013	
2,800.0	2,793.6	2,785.5	2,785.5	6.5	5.7	-151.51	-383.2	1,248.4	1,434.0	1,422.1	120.974	
2,900.0	2,893.2	2,882.5	2,882.4	6.8	5.9	-151.65	-383.6	1,248.1	1,441.5	1,429.2	117.263	
3,000.0	2,992.9	2,980.7	2,980.7	7.1	6.1	-151.80	-383.9	1,248.0	1,449.2	1,436.5	113.793	
3,100.0	3,092.5	3,079.5	3,079.4	7.3	6.3	-151.95	-384.2	1,247.9	1,457.1	1,443.9	110.553	
3,200.0	3,192.1	3,179.3	3,179.2	7.6	6.5	-152.10	-384.6	1,247.9	1,464.9	1,451.3	107.514	
3,300.0	3,291.7	3,279.0	3,278.9	7.9	6.8	-152.26	-384.7	1,247.9	1,472.7	1,458.7	104.666	
3,400.0	3,391.3	3,378.0	3,377.9	8.1	7.0	-152.41	-384.8	1,247.9	1,480.6	1,466.1	102.003	
3,500.0	3,490.9	3,477.8	3,477.8	8.4	7.2	-152.57	-384.9	1,248.0	1,488.5	1,473.5	99.499	
3,600.0	3,590.5	3,577.7	3,577.6	8.7	7.4	-152.72	-385.0	1,248.0	1,496.4	1,481.0	97.147	
3,700.0	3,690.1	3,677.5	3,677.4	9.0	7.6	-152.87	-385.1	1,248.0	1,504.3	1,488.4	94.923	
3,800.0	3,789.7	3,777.3	3,777.3	9.2	7.8	-153.01	-385.3	1,248.0	1,512.2	1,495.9	92.819	
3,900.0	3,889.3	3,876.9	3,876.9	9.5	8.0	-153.15	-385.6	1,247.9	1,520.0	1,503.3	90.828	
4,000.0	3,988.9	3,976.4	3,976.4	9.8	8.2	-153.30	-385.8	1,247.9	1,527.9	1,510.8	88.940	
4,100.0	4,088.6	4,075.9	4,075.8	10.1	8.4	-153.44	-385.9	1,247.8	1,535.8	1,518.2	87.151	
4,200.0	4,188.2	4,175.7	4,175.7	10.3	8.6	-153.58	-386.2	1,247.8	1,543.8	1,525.7	85.448	
4,300.0	4,287.8	4,275.5	4,275.4	10.6	8.8	-153.71	-386.3	1,247.8	1,551.7	1,533.2	83.817	
4,400.0	4,387.4	4,375.6	4,375.5	10.9	9.0	-153.85	-386.5	1,247.7	1,559.6	1,540.6	82.255	
4,500.0	4,487.0	4,476.8	4,476.7	11.1	9.3	-153.99	-386.7	1,247.6	1,567.5	1,548.0	80.753	
4,600.0	4,586.6	4,578.3	4,578.2	11.4	9.5	-154.12	-386.9	1,247.4	1,575.2	1,555.3	79.311	
4,700.0	4,686.2	4,680.3	4,680.2	11.7	9.7	-154.25	-387.2	1,247.0	1,582.8	1,562.5	77.920	
4,800.0	4,785.8	4,780.3	4,780.2	12.0	9.9	-154.38	-387.5	1,246.5	1,590.4	1,569.6	76.600	
4,900.0	4,885.4	4,879.7	4,879.6	12.2	10.1	-154.50	-387.6	1,246.0	1,597.9	1,576.7	75.343	
5,000.0	4,985.0	4,978.0	4,977.9	12.5	10.3	-154.63	-387.7	1,245.6	1,605.5	1,583.9	74.147	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Azores Federal #12H
Project:	Lea County, NM	TVD Reference:	Well @ 3522.0usft (McVay 8)
Reference Site:	Sec 32, T24-S, R32E	MD Reference:	Well @ 3522.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Azores Federal #12H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Plan #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 32, T24-S, R32E - Convo Federal #2H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-MWD default, 7793-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
5,100.0	5,084.7	5,077.4	5,077.3	12.8	10.5	-154.76	-387.8	1,245.3	1,613.2	1,591.1	72.995		
5,200.0	5,184.3	5,177.3	5,177.2	13.1	10.7	-154.89	-387.7	1,245.0	1,620.9	1,598.3	71.882		
5,300.0	5,283.9	5,274.2	5,274.1	13.3	10.9	-155.02	-387.7	1,244.7	1,628.6	1,605.6	70.836		
5,400.0	5,383.5	5,372.8	5,372.7	13.6	11.1	-155.15	-387.7	1,244.6	1,636.5	1,613.1	69.827		
5,500.0	5,483.1	5,474.5	5,474.4	13.9	11.4	-155.29	-387.6	1,244.5	1,644.4	1,620.5	68.835		
5,600.0	5,582.7	5,574.9	5,574.8	14.2	11.6	-155.42	-387.5	1,244.2	1,652.1	1,627.8	67.888		
5,700.0	5,682.3	5,675.2	5,675.1	14.4	11.8	-155.55	-387.4	1,244.0	1,659.9	1,635.1	66.976		
5,800.0	5,781.9	5,775.2	5,775.1	14.7	12.0	-155.68	-387.2	1,243.7	1,667.6	1,642.4	66.091		
5,900.0	5,881.5	5,872.2	5,872.1	15.0	12.2	-155.80	-386.9	1,243.4	1,675.4	1,649.7	65.256		
6,000.0	5,981.1	5,968.7	5,968.6	15.3	12.4	-155.93	-386.7	1,243.4	1,683.4	1,657.3	64.466		
6,100.0	6,080.8	6,065.2	6,065.1	15.5	12.6	-156.05	-386.7	1,243.5	1,691.5	1,665.0	63.713		
6,200.0	6,180.4	6,166.5	6,166.4	15.8	12.8	-156.16	-387.0	1,243.6	1,699.8	1,672.8	62.961		
6,300.0	6,280.0	6,268.0	6,267.9	16.1	13.0	-156.28	-387.2	1,243.6	1,707.9	1,680.4	62.223		
6,400.0	6,379.6	6,370.4	6,370.3	16.4	13.2	-156.40	-387.3	1,243.5	1,715.9	1,688.0	61.501		
6,500.0	6,479.2	6,470.4	6,470.3	16.6	13.4	-156.50	-387.7	1,243.2	1,723.8	1,695.4	60.809		
6,600.0	6,578.8	6,570.1	6,570.0	16.9	13.6	-156.61	-387.9	1,243.0	1,731.7	1,702.9	60.138		
6,700.0	6,678.4	6,672.9	6,672.8	17.2	13.9	-156.72	-388.0	1,242.7	1,739.5	1,710.3	59.473		
6,800.0	6,778.0	6,771.6	6,771.5	17.5	14.1	-156.83	-388.3	1,242.3	1,747.2	1,717.5	58.844		
6,900.0	6,877.6	6,871.2	6,871.1	17.8	14.3	-156.92	-388.7	1,241.9	1,755.1	1,724.9	58.236		
7,000.0	6,977.2	6,968.8	6,968.7	18.0	14.5	-157.00	-389.6	1,241.4	1,762.9	1,732.3	57.652		
7,100.0	7,076.8	7,065.8	7,065.7	18.3	14.7	-157.09	-390.2	1,241.2	1,770.9	1,739.9	57.090		
7,200.0	7,176.5	7,163.7	7,163.6	18.6	14.9	-157.17	-391.0	1,241.1	1,779.0	1,747.5	56.547		
7,300.0	7,276.1	7,261.8	7,261.7	18.9	15.1	-157.26	-391.7	1,241.0	1,787.2	1,755.3	56.021		
7,400.0	7,375.7	7,360.1	7,360.0	19.1	15.3	-157.34	-392.4	1,241.1	1,795.5	1,763.2	55.508		
7,500.0	7,475.3	7,459.7	7,459.6	19.4	15.5	-157.43	-393.1	1,241.2	1,803.9	1,771.1	55.005		
7,600.0	7,574.9	7,557.8	7,557.6	19.7	15.7	-157.52	-393.7	1,241.3	1,812.2	1,779.0	54.523		
7,700.0	7,674.5	7,655.1	7,654.9	20.0	15.9	-157.60	-394.5	1,241.5	1,820.7	1,787.0	54.062		
7,800.0	7,774.1	7,751.0	7,750.9	20.2	16.1	-157.67	-395.4	1,241.9	1,829.4	1,795.3	53.665		
7,900.0	7,873.7	7,856.0	7,855.9	20.5	16.1	-157.76	-396.2	1,242.2	1,838.0	1,803.6	53.474		
8,000.0	7,973.3	7,903.0	7,902.8	20.8	16.1	-157.88	-394.0	1,243.2	1,847.8	1,813.1	53.390		
8,100.0	8,072.9	7,950.0	7,949.3	21.1	16.1	-158.11	-388.4	1,246.4	1,860.8	1,825.9	53.406		
8,200.0	8,172.6	7,982.0	7,980.6	21.3	16.1	-158.33	-382.8	1,249.9	1,877.1	1,842.0	53.512		
8,300.0	8,272.2	8,002.2	8,000.2	21.6	16.1	-158.49	-378.7	1,252.8	1,896.9	1,861.6	53.716		
8,400.0	8,371.8	8,014.0	8,011.5	21.9	16.1	-158.59	-376.1	1,254.8	1,920.7	1,885.2	54.027		
8,500.0	8,471.4	8,045.0	8,040.9	22.2	16.2	-158.87	-368.5	1,261.2	1,948.1	1,912.3	54.437		
8,600.0	8,571.0	8,076.0	8,069.6	22.4	16.2	-159.20	-359.6	1,268.8	1,979.0	1,943.0	54.941		
8,687.5	8,658.2	8,127.5	8,115.8	22.7	16.2	-159.83	-341.7	1,282.8	2,008.3	1,972.1	55.436		
8,700.0	8,670.6	8,135.7	8,122.9	22.7	16.2	-177.64	-338.4	1,285.1	2,012.6	1,976.4	55.553		
8,725.0	8,695.5	8,385.5	8,310.7	22.8	16.7	146.53	-186.4	1,336.9	2,021.2	1,984.7	55.387		
8,750.0	8,720.3	8,397.4	8,317.8	22.8	16.7	127.21	-176.9	1,338.4	2,028.0	1,991.5	55.500		
8,775.0	8,745.0	8,409.5	8,324.7	22.9	16.8	115.97	-167.1	1,339.8	2,035.0	1,998.4	55.610		
8,800.0	8,769.5	8,424.0	8,332.7	22.9	16.8	108.73	-155.1	1,341.5	2,042.1	2,005.4	55.710		
8,825.0	8,793.6	8,432.8	8,337.4	23.0	16.9	103.71	-147.8	1,342.5	2,049.3	2,012.6	55.828		
8,850.0	8,817.5	8,443.7	8,343.1	23.0	16.9	99.85	-138.6	1,343.8	2,056.6	2,019.8	55.936		
8,875.0	8,840.9	8,455.0	8,348.9	23.0	17.0	96.73	-128.9	1,345.1	2,064.0	2,027.1	56.045		
8,900.0	8,863.9	8,471.7	8,357.1	23.1	17.0	94.01	-114.5	1,347.1	2,071.3	2,034.4	56.116		
8,925.0	8,886.3	8,489.9	8,365.7	23.1	17.1	91.63	-98.6	1,349.1	2,078.6	2,041.6	56.180		
8,950.0	8,908.2	8,513.2	8,376.2	23.1	17.3	89.44	-78.0	1,351.6	2,085.8	2,048.7	56.208		
8,975.0	8,929.3	8,530.8	8,383.8	23.2	17.4	87.55	-62.1	1,353.4	2,092.8	2,055.6	56.271		
9,000.0	8,949.8	8,548.0	8,390.9	23.2	17.5	85.84	-46.6	1,355.1	2,099.7	2,062.5	56.346		
9,025.0	8,969.5	8,565.5	8,397.7	23.2	17.6	84.27	-30.6	1,356.7	2,106.4	2,069.1	56.418		
9,050.0	8,988.3	8,584.4	8,404.7	23.2	17.7	82.81	-13.1	1,358.4	2,112.9	2,075.5	56.489		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design Sec 32, T24-S, R32E - Convo Federal #2H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-MWD default, 7793-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
9,075.0	9,006.3	8,607.2	8,412.5	23.2	17.8	81.42	8.3	1,360.3	2,119.2	2,081.7	56.529		
9,100.0	9,023.4	8,652.1	8,425.4	23.3	18.2	79.89	51.2	1,363.0	2,125.0	2,087.3	56.368		
9,125.0	9,039.5	8,671.3	8,430.1	23.3	18.3	78.76	69.7	1,363.8	2,130.4	2,092.7	56.420		
9,150.0	9,054.5	8,690.9	8,434.4	23.3	18.5	77.72	88.9	1,364.6	2,135.5	2,097.7	56.461		
9,175.0	9,068.5	8,706.0	8,437.6	23.3	18.6	76.81	103.6	1,365.1	2,140.3	2,102.4	56.540		
9,200.0	9,081.4	8,722.2	8,440.7	23.3	18.8	75.98	119.5	1,365.6	2,144.8	2,106.9	56.594		
9,225.0	9,093.2	8,737.0	8,443.4	23.4	18.9	75.24	134.1	1,366.2	2,148.9	2,111.0	56.651		
9,250.0	9,103.8	8,746.5	8,444.9	23.4	19.0	74.60	143.4	1,366.5	2,152.8	2,114.9	56.742		
9,275.0	9,113.2	8,757.4	8,446.4	23.4	19.1	74.02	154.2	1,366.9	2,156.4	2,118.4	56.800		
9,300.0	9,121.4	8,768.0	8,447.7	23.5	19.2	73.51	164.7	1,367.3	2,159.7	2,121.7	56.837		
9,325.0	9,128.4	8,787.8	8,449.6	23.5	19.4	73.02	184.4	1,367.9	2,162.6	2,124.4	56.724		
9,350.0	9,134.1	8,799.0	8,450.3	23.6	19.5	72.63	195.6	1,368.2	2,165.1	2,126.9	56.679		
9,375.0	9,138.5	8,823.6	8,451.5	23.6	19.7	72.28	220.1	1,368.7	2,167.1	2,128.7	56.398		
9,400.0	9,141.7	8,841.1	8,452.1	23.7	19.9	72.03	237.6	1,369.1	2,168.8	2,130.2	56.165		
9,425.0	9,143.5	8,858.6	8,452.6	23.8	20.1	71.86	255.1	1,369.5	2,170.0	2,131.2	55.882		
9,450.0	9,144.0	8,876.1	8,453.0	23.8	20.3	71.77	272.6	1,370.0	2,170.8	2,131.7	55.547		
9,452.8	9,144.0	8,878.1	8,453.0	23.9	20.3	71.77	274.6	1,370.0	2,170.9	2,131.8	55.506		
9,500.0	9,143.5	8,921.6	8,453.5	24.0	20.7	71.80	318.1	1,371.1	2,172.0	2,132.2	54.579		
9,600.0	9,142.4	9,018.1	8,454.6	24.6	21.7	71.88	414.6	1,373.5	2,174.2	2,132.8	52.511		
9,700.0	9,141.4	9,107.9	8,455.0	25.3	22.7	71.94	504.3	1,376.3	2,177.3	2,134.2	50.486		
9,800.0	9,140.3	9,296.0	8,457.2	26.1	25.0	72.07	692.4	1,378.1	2,178.1	2,131.8	47.105		
9,900.0	9,139.2	9,408.1	8,458.2	27.0	26.5	72.11	804.4	1,375.8	2,176.1	2,127.4	44.725		
9,989.1	9,138.3	9,462.0	8,458.0	27.9	27.3	72.12	858.3	1,375.0	2,175.3	2,125.0	43.246		
10,000.0	9,138.2	9,462.0	8,458.0	28.0	27.3	72.12	858.3	1,375.0	2,175.3	2,124.9	43.150		
10,100.0	9,137.1	9,502.4	8,457.5	29.1	27.8	72.12	898.8	1,375.4	2,177.0	2,124.9	41.811		
10,200.0	9,136.0	9,556.0	8,456.4	30.3	28.5	72.13	952.3	1,378.0	2,182.0	2,128.0	40.431		
10,300.0	9,135.0	9,651.0	8,455.9	31.6	29.8	72.20	1,047.0	1,384.2	2,188.6	2,132.1	38.750		
10,400.0	9,133.9	9,705.6	8,456.0	32.8	30.6	72.25	1,101.5	1,387.8	2,195.2	2,136.6	37.495		
10,500.0	9,132.9	9,862.0	8,454.3	34.2	32.9	72.34	1,257.5	1,398.8	2,203.0	2,140.9	35.465		
10,600.0	9,131.8	10,138.2	8,456.7	35.6	37.1	72.50	1,533.6	1,400.1	2,202.5	2,134.9	32.572		
10,700.0	9,130.7	10,262.6	8,459.1	37.0	39.0	72.57	1,657.9	1,396.0	2,199.1	2,128.1	31.010		
10,800.0	9,129.7	10,377.8	8,461.8	38.5	40.8	72.63	1,772.9	1,391.1	2,194.6	2,120.4	29.599		
10,900.0	9,128.6	10,488.2	8,461.4	39.9	42.6	72.61	1,883.1	1,385.0	2,189.6	2,112.3	28.311		
11,000.0	9,127.5	10,576.7	8,459.6	41.5	44.0	72.55	1,971.4	1,379.5	2,184.6	2,104.5	27.250		
11,100.0	9,126.5	10,631.5	8,459.4	43.0	44.9	72.54	2,026.2	1,377.0	2,180.9	2,098.3	26.432		
11,200.0	9,125.4	10,689.0	8,458.8	44.5	45.7	72.54	2,083.7	1,376.0	2,179.5	2,094.6	25.671		
11,216.5	9,125.2	10,689.0	8,458.8	44.8	45.7	72.54	2,083.7	1,376.0	2,179.5	2,094.3	25.593		
11,300.0	9,124.3	10,767.9	8,457.9	46.1	47.0	72.54	2,162.6	1,375.8	2,179.8	2,092.2	24.870		
11,400.0	9,123.3	10,845.5	8,457.1	47.7	48.2	72.54	2,240.2	1,375.8	2,180.5	2,090.1	24.118		
11,500.0	9,122.2	10,936.6	8,455.4	49.3	49.7	72.53	2,331.3	1,376.7	2,182.3	2,088.9	23.365		
11,600.0	9,121.1	11,093.9	8,456.9	51.0	52.2	72.63	2,488.5	1,377.8	2,183.1	2,085.6	22.394		
11,700.0	9,120.1	11,219.4	8,458.7	52.6	54.3	72.70	2,614.0	1,375.6	2,181.2	2,080.1	21.566		
11,800.0	9,119.0	11,308.2	8,458.1	54.2	55.7	72.70	2,702.8	1,373.4	2,179.4	2,075.2	20.922		
11,900.0	9,117.9	11,395.8	8,458.5	55.9	57.2	72.72	2,790.4	1,372.2	2,178.2	2,071.0	20.321		
12,000.0	9,116.9	11,493.2	8,458.3	57.6	58.8	72.74	2,887.7	1,371.0	2,177.3	2,066.9	19.727		
12,100.0	9,115.8	11,591.8	8,460.6	59.2	60.4	72.83	2,986.3	1,370.5	2,176.5	2,062.8	19.155		
12,200.0	9,114.8	11,717.5	8,462.5	60.9	62.5	72.90	3,112.0	1,369.2	2,175.4	2,058.1	18.537		
12,300.0	9,113.7	11,839.8	8,463.1	62.6	64.6	72.93	3,234.2	1,365.7	2,172.8	2,051.8	17.953		
12,400.0	9,112.6	11,920.0	8,464.0	64.3	65.9	72.96	3,314.4	1,363.2	2,170.0	2,046.0	17.500		
12,500.0	9,111.6	11,993.9	8,465.4	66.0	67.1	73.01	3,388.3	1,361.9	2,168.1	2,041.3	17.091		
12,574.4	9,110.8	12,049.8	8,466.0	67.3	68.0	73.04	3,444.1	1,361.8	2,167.9	2,038.9	16.803		
12,600.0	9,110.5	12,071.8	8,466.0	67.7	68.4	73.04	3,466.2	1,361.7	2,167.9	2,038.1	16.701		

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design Sec 32, T24-S, R32E - Convo Federal #2H - Wellbore #1 - Wellbore #1											Offset Site Error: 0.0 usft	
Survey Program: 100-MWD default, 7793-MWD default											Offset Well Error: 0.0 usft	
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference Offset		Highside Toolface (')	Offset Wellbore Centre +N-S +E-W		Distance Between Centres Between Ellipses		Separation Factor	Warning
				(usft)	(usft)		(usft)	(usft)	(usft)	(usft)		
12,700.0	9,109.4	12,164.9	8,465.8	69.5	69.9	73.07	3,559.2	1,361.7	2,168.3	2,035.3	16.304	
12,800.0	9,108.4	12,204.0	8,467.2	71.2	70.6	73.12	3,598.3	1,362.2	2,169.6	2,034.3	16.031	
12,900.0	9,107.3	12,299.0	8,468.2	72.9	72.2	73.20	3,693.2	1,365.6	2,173.0	2,034.4	15.679	
13,000.0	9,106.2	12,371.5	8,468.2	74.7	73.4	73.26	3,765.6	1,369.4	2,178.1	2,036.6	15.396	
13,100.0	9,105.2	12,473.3	8,471.4	76.4	75.1	73.41	3,867.2	1,374.9	2,182.6	2,037.7	15.063	
13,200.0	9,104.1	12,561.3	8,471.4	78.1	76.6	73.47	3,955.2	1,379.1	2,187.6	2,039.5	14.773	
13,300.0	9,103.0	12,643.8	8,469.3	79.9	78.0	73.47	4,037.5	1,383.1	2,193.2	2,042.0	14.511	
13,400.0	9,102.0	12,738.6	8,465.0	81.6	79.6	73.43	4,132.1	1,387.7	2,199.4	2,045.1	14.250	
13,500.0	9,100.9	12,866.0	8,462.0	83.4	81.6	73.44	4,259.3	1,393.7	2,204.9	2,046.8	13.947	
13,600.0	9,099.9	12,961.0	8,461.3	85.1	83.2	73.48	4,354.2	1,398.1	2,209.9	2,048.6	13.695	
13,700.0	9,098.8	13,076.1	8,459.5	86.9	85.2	73.51	4,469.2	1,403.6	2,215.3	2,050.3	13.429	
13,800.0	9,097.7	13,231.5	8,460.8	88.7	87.8	73.63	4,624.4	1,408.7	2,218.5	2,049.2	13.106	
13,900.0	9,096.7	13,321.0	8,463.9	90.4	89.3	73.75	4,713.9	1,411.2	2,220.6	2,048.1	12.871	
14,000.0	9,095.6	13,321.0	8,463.9	92.2	89.3	73.75	4,713.9	1,411.2	2,225.4	2,051.1	12.771	
14,100.0	9,094.5	13,321.0	8,463.9	93.9	89.3	73.75	4,713.9	1,411.2	2,234.6	2,058.6	12.699	
14,149.6	9,094.0	13,321.0	8,463.9	94.8	89.3	73.75	4,713.9	1,411.2	2,240.8	2,064.0	12.673 SF	



QES Directional Drilling, LLC
Anticollision Report



Company: COG Operating, LLC
Project: Lea County, NM
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Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design Sec 32, T24-S, R32E - Convo Federal #3H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
0.0	0.0	0.0	0.0	0.0	0.0	95.05	-17.7	200.1	201.1				
100.0	100.0	91.7	91.7	0.1	0.1	95.06	-17.7	199.8	200.6	200.4	1,194.322		
200.0	200.0	191.2	191.2	0.3	0.3	95.04	-17.6	199.2	200.0	199.4	339.832		
300.0	300.0	292.5	292.4	0.5	0.5	94.86	-16.9	198.6	199.3	198.3	193.909		
400.0	400.0	393.8	393.8	0.8	0.7	94.56	-15.7	197.3	198.0	196.5	134.650		
500.0	500.0	493.9	493.8	1.0	0.9	94.32	-14.8	195.6	196.2	194.3	102.784		
600.0	600.0	595.2	595.2	1.2	1.1	94.00	-13.5	193.6	194.1	191.8	82.380		
700.0	700.0	695.5	695.3	1.4	1.4	93.47	-11.6	191.2	191.6	188.8	68.295		
800.0	800.0	795.0	794.8	1.7	1.6	92.84	-9.4	188.8	189.1	185.9	58.384		
900.0	900.0	894.3	894.1	1.9	1.8	92.35	-7.7	186.8	187.0	183.3	51.039		
1,000.0	1,000.0	993.4	993.2	2.1	2.0	91.92	-6.2	185.1	185.2	181.1	45.274		
1,039.7	1,039.7	1,032.7	1,032.5	2.2	2.1	-163.84	-5.7	184.5	184.9	180.7	43.577	CC, ES	
1,100.0	1,100.0	1,092.6	1,092.4	2.3	2.2	-164.20	-4.9	183.8	185.6	181.1	41.313		
1,200.0	1,199.8	1,192.5	1,192.2	2.5	2.4	-164.98	-3.6	182.8	189.6	184.7	38.769		
1,253.2	1,252.9	1,245.2	1,245.0	2.6	2.5	-165.47	-3.0	182.3	193.2	188.1	37.857		
1,300.0	1,299.5	1,291.6	1,291.3	2.7	2.6	-165.91	-2.5	182.0	196.8	191.5	37.173		
1,400.0	1,399.1	1,391.4	1,391.1	2.9	2.8	-166.76	-1.6	181.2	204.6	198.9	35.830		
1,500.0	1,498.7	1,491.2	1,490.9	3.2	3.0	-167.56	-0.7	180.4	212.4	206.3	34.648		
1,600.0	1,598.3	1,590.9	1,590.6	3.4	3.2	-168.35	0.4	179.5	220.2	213.7	33.600		
1,700.0	1,697.9	1,690.2	1,689.9	3.7	3.5	-169.06	1.4	178.7	228.1	221.1	32.678		
1,800.0	1,797.5	1,790.1	1,789.8	3.9	3.7	-169.67	2.2	177.9	236.1	228.7	31.855		
1,900.0	1,897.1	1,889.7	1,889.3	4.2	3.9	-170.17	2.7	177.1	244.0	236.2	31.111		
2,000.0	1,996.8	1,989.5	1,989.2	4.4	4.1	-170.62	3.1	176.3	251.9	243.7	30.445		
2,100.0	2,096.4	2,089.4	2,089.1	4.7	4.3	-171.01	3.3	175.4	259.8	251.1	29.832		
2,200.0	2,196.0	2,189.0	2,188.6	4.9	4.5	-171.29	3.2	174.5	267.7	258.5	29.267		
2,300.0	2,295.6	2,289.1	2,288.7	5.2	4.7	-171.49	2.7	173.7	275.5	265.9	28.744		
2,400.0	2,395.2	2,389.5	2,389.2	5.5	4.9	-171.66	2.1	172.6	283.1	273.1	28.252		
2,500.0	2,494.8	2,489.9	2,489.5	5.7	5.2	-171.81	1.5	171.3	290.5	280.0	27.778		
2,600.0	2,594.4	2,590.5	2,590.1	6.0	5.4	-171.96	0.8	169.7	297.6	286.7	27.313		
2,700.0	2,694.0	2,691.0	2,690.6	6.3	5.6	-172.07	-0.1	167.9	304.4	293.1	26.857		
2,800.0	2,793.6	2,791.9	2,791.4	6.5	5.8	-172.18	-1.0	165.8	311.0	299.2	26.413		
2,900.0	2,893.2	2,892.5	2,892.0	6.8	6.0	-172.36	-1.5	163.3	317.2	305.0	25.980		
3,000.0	2,992.9	2,992.9	2,992.5	7.1	6.2	-172.55	-1.9	160.5	323.2	310.6	25.552		
3,100.0	3,092.5	3,094.5	3,093.9	7.3	6.4	-172.83	-1.8	157.4	328.9	315.8	25.126		
3,200.0	3,192.1	3,195.5	3,194.9	7.6	6.7	-173.23	-1.1	153.6	334.1	320.6	24.694		
3,300.0	3,291.7	3,295.2	3,294.5	7.9	6.9	-173.64	-0.2	149.8	339.2	325.2	24.280		
3,400.0	3,391.3	3,394.6	3,393.9	8.1	7.1	-174.02	0.6	146.0	344.3	329.9	23.904		
3,500.0	3,490.9	3,493.6	3,492.8	8.4	7.3	-174.37	1.3	142.5	349.7	334.9	23.570		
3,600.0	3,590.5	3,590.8	3,589.9	8.7	7.5	-174.68	1.9	139.5	355.6	340.3	23.291		
3,700.0	3,690.1	3,689.4	3,688.5	9.0	7.7	-174.89	2.1	137.2	362.0	346.3	23.054		
3,800.0	3,789.7	3,790.2	3,789.3	9.2	7.9	-174.99	1.5	134.9	368.5	352.4	22.820		
3,900.0	3,889.3	3,886.4	3,885.4	9.5	8.1	-175.01	0.6	133.0	375.3	358.7	22.630		
4,000.0	3,988.9	3,983.6	3,982.6	9.8	8.3	-174.96	-0.6	132.1	382.9	365.9	22.503		
4,100.0	4,088.6	4,079.8	4,078.8	10.1	8.5	-174.86	-2.1	131.9	391.3	373.8	22.428		
4,200.0	4,188.2	4,179.1	4,178.1	10.3	8.7	-174.79	-3.4	132.3	400.2	382.3	22.380		
4,300.0	4,287.8	4,279.6	4,278.6	10.6	8.9	-174.74	-4.5	132.5	409.0	390.7	22.323		
4,400.0	4,387.4	4,378.0	4,377.0	10.9	9.1	-174.74	-5.2	132.6	417.8	399.0	22.275		
4,500.0	4,487.0	4,477.2	4,476.2	11.1	9.3	-174.77	-5.8	133.0	426.9	407.7	22.244		
4,600.0	4,586.6	4,580.4	4,579.4	11.4	9.6	-174.84	-6.1	133.0	435.6	416.0	22.187		
4,700.0	4,686.2	4,681.0	4,680.0	11.7	9.8	-174.91	-6.5	132.3	443.7	423.6	22.102		
4,800.0	4,785.8	4,781.2	4,780.2	12.0	10.0	-174.99	-6.8	131.5	451.7	431.2	22.018		
4,900.0	4,885.4	4,881.3	4,880.3	12.2	10.2	-175.06	-7.1	130.6	459.5	438.6	21.928		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design Sec 32, T24-S, R32E - Convo Federal #3H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
5,000.0	4,985.0	4,980.2	4,979.2	12.5	10.4	-175.15	-7.3	129.7	467.4	446.0	21.849		
5,100.0	5,084.7	5,079.0	5,078.0	12.8	10.6	-175.30	-6.9	129.0	475.5	453.7	21.785		
5,200.0	5,184.3	5,177.1	5,176.1	13.1	10.8	-175.49	-6.1	128.4	483.8	461.6	21.736		
5,300.0	5,283.9	5,275.9	5,274.9	13.3	11.0	-175.67	-5.3	128.0	492.4	469.8	21.698		
5,400.0	5,383.5	5,375.2	5,374.2	13.6	11.2	-175.84	-4.5	127.8	501.2	478.0	21.663		
5,500.0	5,483.1	5,475.4	5,474.4	13.9	11.4	-176.02	-3.6	127.5	509.9	486.3	21.629		
5,600.0	5,582.7	5,576.1	5,575.1	14.2	11.6	-176.21	-2.6	127.1	518.4	494.4	21.586		
5,700.0	5,682.3	5,675.5	5,674.5	14.4	11.8	-176.41	-1.4	126.4	526.8	502.4	21.544		
5,800.0	5,781.9	5,776.9	5,775.9	14.7	12.0	-176.61	-0.2	125.8	535.2	510.3	21.497		
5,900.0	5,881.5	5,875.9	5,874.9	15.0	12.3	-176.79	0.8	124.9	543.3	518.0	21.446		
6,000.0	5,981.1	5,975.5	5,974.5	15.3	12.5	-176.96	1.8	124.2	551.7	525.9	21.402		
6,100.0	6,080.8	6,074.9	6,073.8	15.5	12.7	-177.11	2.8	123.5	560.0	533.7	21.360		
6,200.0	6,180.4	6,175.9	6,174.9	15.8	12.9	-177.31	4.1	122.6	568.2	541.6	21.316		
6,300.0	6,280.0	6,274.9	6,273.8	16.1	13.1	-177.51	5.5	121.6	576.3	549.2	21.269		
6,400.0	6,379.6	6,374.6	6,373.5	16.4	13.3	-177.67	6.6	120.8	584.6	557.0	21.228		
6,500.0	6,479.2	6,475.6	6,474.5	16.6	13.5	-177.83	7.7	119.8	592.7	564.7	21.180		
6,600.0	6,578.8	6,577.8	6,576.7	16.9	13.7	-177.96	8.5	118.6	600.5	572.1	21.121		
6,700.0	6,678.4	6,676.0	6,674.8	17.2	13.9	-178.06	9.0	117.3	608.1	579.3	21.064		
6,800.0	6,778.0	6,771.3	6,770.2	17.5	14.1	-178.14	9.4	116.5	616.3	587.0	21.033		
6,900.0	6,877.6	6,873.3	6,872.1	17.8	14.4	-178.23	10.0	116.1	624.8	595.1	21.006		
7,000.0	6,977.2	6,973.8	6,972.6	18.0	14.6	-178.28	10.0	115.2	632.8	602.7	20.962		
7,100.0	7,076.8	7,071.8	7,070.6	18.3	14.8	-178.29	9.8	114.6	641.0	610.4	20.929		
7,200.0	7,176.5	7,174.2	7,173.1	18.6	15.0	-178.29	9.4	114.0	649.2	618.1	20.892		
7,300.0	7,276.1	7,278.4	7,277.2	18.9	15.2	-178.24	8.2	112.9	656.7	625.2	20.831		
7,400.0	7,375.7	7,375.7	7,374.5	19.1	15.4	-178.14	6.5	111.7	664.0	632.0	20.774		
7,500.0	7,475.3	7,471.7	7,470.4	19.4	15.6	-178.04	4.9	111.1	671.8	639.4	20.740		
7,600.0	7,574.9	7,568.1	7,566.8	19.7	15.8	-177.97	3.8	110.9	680.2	647.4	20.723		
7,700.0	7,674.5	7,665.5	7,664.2	20.0	16.0	-177.91	2.7	111.1	689.0	655.7	20.716		
7,800.0	7,774.1	7,763.6	7,762.4	20.2	16.2	-177.81	1.3	111.7	698.0	664.3	20.717		
7,900.0	7,873.7	7,866.8	7,865.5	20.5	16.4	-177.69	-0.5	112.1	706.9	672.8	20.706		
8,000.0	7,973.3	7,938.7	7,937.4	20.8	16.6	-177.82	0.9	112.3	716.7	682.2	20.761		
8,100.0	8,072.9	8,000.6	7,998.6	21.1	16.7	-178.47	9.6	114.5	732.0	697.1	20.984		
8,200.0	8,172.6	8,061.1	8,056.0	21.3	16.8	-179.86	28.2	116.7	752.1	716.8	21.341		
8,300.0	8,272.2	8,117.2	8,106.4	21.6	16.9	178.37	52.5	119.2	777.8	742.2	21.847		
8,400.0	8,371.8	8,167.0	8,149.0	21.9	17.1	176.57	78.3	121.9	809.4	773.5	22.507		
8,500.0	8,471.4	8,220.4	8,192.1	22.2	17.2	174.45	109.6	125.0	846.8	810.5	23.290		
8,600.0	8,571.0	8,267.9	8,228.0	22.4	17.4	172.42	140.7	127.3	889.5	852.8	24.200		
8,687.5	8,658.2	8,304.1	8,253.3	22.7	17.5	170.77	166.5	128.6	931.4	894.3	25.101		
8,700.0	8,670.6	8,308.8	8,256.4	22.7	17.5	152.61	170.0	128.7	937.6	900.4	25.220		
8,725.0	8,695.5	8,325.0	8,267.0	22.8	17.6	119.95	182.3	129.0	950.1	912.7	25.442		
8,750.0	8,720.3	8,325.0	8,267.0	22.8	17.6	100.25	182.3	129.0	962.3	924.9	25.716		
8,775.0	8,745.0	8,334.6	8,272.9	22.9	17.6	88.32	189.7	129.1	974.3	936.8	25.973		
8,800.0	8,769.5	8,342.2	8,277.6	22.9	17.7	80.61	195.8	129.2	986.1	948.6	26.255		
8,825.0	8,793.6	8,356.0	8,285.8	23.0	17.7	74.89	206.9	129.4	997.8	960.2	26.543		
8,850.0	8,817.5	8,356.0	8,285.8	23.0	17.7	70.89	206.9	129.4	1,009.0	971.5	26.895		
8,875.0	8,840.9	8,367.6	8,292.4	23.0	17.8	67.38	216.4	129.6	1,020.0	982.5	27.246		
8,900.0	8,863.9	8,377.2	8,297.8	23.1	17.8	64.50	224.4	129.8	1,030.5	993.2	27.638		
8,925.0	8,886.3	8,388.0	8,303.7	23.1	17.9	62.03	233.4	130.0	1,040.7	1,003.6	28.065		
8,950.0	8,908.2	8,398.7	8,309.3	23.1	17.9	59.90	242.5	130.2	1,050.3	1,013.5	28.529		
8,975.0	8,929.3	8,417.0	8,318.6	23.2	18.0	57.89	258.3	130.4	1,059.5	1,023.0	29.019		
9,000.0	8,949.8	8,417.0	8,318.6	23.2	18.0	56.43	258.3	130.4	1,068.1	1,032.0	29.589		
9,025.0	8,969.5	8,435.2	8,327.3	23.2	18.1	54.87	274.3	130.5	1,076.2	1,040.5	30.155		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Azores Federal #12H
Project:	Lea County, NM	TVD Reference:	Well @ 3522.0usft (McVay 8)
Reference Site:	Sec 32, T24-S, R32E	MD Reference:	Well @ 3522.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Azores Federal #12H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Plan #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 32, T24-S, R32E - Convo Federal #3H - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 usft
Survey Program: 100-MWD default													Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning		
9,050.0	8,988.3	8,448.0	8,333.2	23.2	18.2	53.57	285.6	130.6	1,083.6	1,048.4	30.774			
9,075.0	9,006.3	8,467.1	8,341.8	23.2	18.3	52.36	302.7	130.6	1,090.4	1,055.7	31.407			
9,100.0	9,023.4	8,485.6	8,349.9	23.3	18.4	51.31	319.3	130.4	1,096.4	1,062.2	32.064			
9,125.0	9,039.5	8,502.3	8,357.0	23.3	18.5	50.43	334.5	130.2	1,101.7	1,068.1	32.743			
9,150.0	9,054.5	8,511.0	8,360.5	23.3	18.6	49.73	342.4	130.0	1,106.3	1,073.2	33.462			
9,175.0	9,068.5	8,527.1	8,366.7	23.3	18.7	49.07	357.3	129.5	1,110.2	1,077.7	34.155			
9,200.0	9,081.4	8,542.0	8,372.0	23.3	18.8	48.53	371.2	128.9	1,113.5	1,081.5	34.848			
9,225.0	9,093.2	8,550.3	8,374.8	23.4	18.9	48.12	379.0	128.6	1,116.1	1,084.7	35.543			
9,250.0	9,103.8	8,563.4	8,379.0	23.4	19.0	47.78	391.3	128.1	1,118.0	1,087.1	36.175			
9,275.0	9,113.2	8,574.0	8,382.3	23.4	19.0	47.54	401.4	127.7	1,119.2	1,088.8	36.758			
9,300.0	9,121.4	8,590.4	8,387.2	23.5	19.2	47.38	417.0	127.1	1,119.7	1,089.6	37.214			
9,325.0	9,128.4	8,605.0	8,391.4	23.5	19.3	47.32	431.0	126.6	1,119.5	1,089.7	37.569			
9,350.0	9,134.1	8,620.5	8,395.6	23.6	19.4	47.36	445.9	126.1	1,118.6	1,089.0	37.778			
9,375.0	9,138.5	8,636.0	8,399.7	23.6	19.5	47.50	460.9	125.5	1,116.9	1,087.4	37.833			
9,400.0	9,141.7	8,656.4	8,404.9	23.7	19.7	47.76	480.6	124.8	1,114.3	1,084.8	37.657			
9,425.0	9,143.5	8,674.2	8,409.3	23.8	19.9	48.12	497.8	124.2	1,111.0	1,081.2	37.333			
9,450.0	9,144.0	8,689.7	8,412.9	23.8	20.0	48.58	512.9	123.7	1,106.9	1,076.9	36.869			
9,452.8	9,144.0	8,691.4	8,413.3	23.9	20.0	48.64	514.6	123.6	1,106.4	1,076.3	36.807			
9,500.0	9,143.5	8,713.9	8,418.2	24.0	20.2	48.82	536.5	122.9	1,098.3	1,067.8	36.002			
9,600.0	9,142.4	8,763.0	8,426.7	24.6	20.7	49.15	584.8	121.7	1,084.7	1,053.2	34.388			
9,700.0	9,141.4	8,815.8	8,433.2	25.3	21.2	49.42	637.2	120.9	1,075.3	1,042.6	32.858			
9,800.0	9,140.3	8,875.2	8,438.1	26.1	21.8	49.67	696.4	121.2	1,070.1	1,036.1	31.400			
9,900.0	9,139.2	8,945.6	8,441.8	27.0	22.6	49.94	766.6	123.4	1,068.8	1,033.1	29.973			
9,933.8	9,138.9	8,973.8	8,442.7	27.4	22.9	50.02	794.8	124.1	1,068.7	1,032.4	29.470			
10,000.0	9,138.2	9,024.5	8,443.3	28.0	23.5	50.12	845.5	125.2	1,069.1	1,031.7	28.584			
10,100.0	9,137.1	9,166.3	8,442.1	29.1	25.2	50.20	987.4	126.4	1,070.7	1,030.9	26.899			
10,200.0	9,136.0	9,250.6	8,442.5	30.3	26.2	50.22	1,071.6	124.8	1,068.8	1,027.1	25.630			
10,300.0	9,135.0	9,375.5	8,442.3	31.6	27.8	50.17	1,196.4	121.4	1,066.6	1,022.5	24.203			
10,400.0	9,133.9	9,455.0	8,442.5	32.8	28.8	50.18	1,275.9	119.9	1,064.7	1,018.6	23.119			
10,500.0	9,132.9	9,570.0	8,442.8	34.2	30.4	50.19	1,390.9	117.5	1,062.9	1,014.3	21.905			
10,600.0	9,131.8	9,659.5	8,443.2	35.6	31.7	50.20	1,480.4	115.4	1,060.5	1,009.8	20.894			
10,700.0	9,130.7	9,747.5	8,443.1	37.0	33.0	50.21	1,568.4	114.2	1,059.3	1,006.2	19.965			
10,800.0	9,129.7	9,840.4	8,442.6	38.5	34.4	50.23	1,661.3	113.6	1,059.0	1,003.5	19.093			
10,900.0	9,128.6	9,940.4	8,444.3	39.9	35.8	50.41	1,761.2	115.0	1,058.8	1,000.7	18.237			
10,900.7	9,128.6	9,940.9	8,444.3	39.9	35.8	50.41	1,761.7	115.0	1,058.8	1,000.7	18.231			
11,000.0	9,127.5	10,023.0	8,445.7	41.5	37.1	50.61	1,843.8	117.4	1,059.7	999.2	17.514			
11,100.0	9,126.5	10,117.0	8,446.4	43.0	38.5	50.81	1,937.7	120.7	1,061.9	998.7	16.814			
11,200.0	9,125.4	10,192.6	8,446.9	44.5	39.6	51.02	2,013.2	124.6	1,065.3	999.7	16.243			
11,300.0	9,124.3	10,307.0	8,446.7	46.1	41.4	51.30	2,127.4	130.9	1,069.5	1,000.9	15.590			
11,400.0	9,123.3	10,396.2	8,444.5	47.7	42.8	51.35	2,216.6	133.5	1,073.2	1,002.0	15.080			
11,500.0	9,122.2	10,491.8	8,440.8	49.3	44.3	51.34	2,312.0	136.1	1,077.6	1,003.8	14.608			
11,600.0	9,121.1	10,613.9	8,439.3	51.0	46.1	51.49	2,434.1	140.0	1,080.6	1,003.8	14.068			
11,700.0	9,120.1	10,709.8	8,440.1	52.6	47.6	51.75	2,529.8	145.0	1,083.9	1,004.3	13.605			
11,800.0	9,119.0	10,847.0	8,446.1	54.2	49.7	52.27	2,666.7	150.5	1,084.0	1,000.7	13.007			
11,876.2	9,118.2	10,917.9	8,448.6	55.5	50.9	52.48	2,737.6	152.3	1,083.7	998.2	12.665			
11,900.0	9,117.9	10,939.0	8,449.0	55.9	51.2	52.52	2,758.7	152.6	1,083.8	997.5	12.568			
12,000.0	9,116.9	11,028.4	8,448.6	57.6	52.7	52.59	2,848.1	153.4	1,084.5	995.6	12.191			
12,100.0	9,115.8	11,123.6	8,445.8	59.2	54.2	52.53	2,943.3	153.2	1,086.1	994.4	11.852			
12,200.0	9,114.8	11,241.6	8,443.4	60.9	56.1	52.50	3,061.2	153.2	1,087.2	992.6	11.491			
12,300.0	9,113.7	11,346.9	8,444.4	62.6	57.8	52.63	3,166.5	153.8	1,086.9	989.3	11.138			
12,400.0	9,112.6	11,452.7	8,446.1	64.3	59.5	52.79	3,272.3	154.3	1,086.2	985.5	10.792			
12,500.0	9,111.6	11,555.3	8,445.2	66.0	61.2	52.75	3,374.8	152.1	1,084.9	981.4	10.484			

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Offset Design Sec 32, T24-S, R32E - Convo Federal #3H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference Offset (usft) (usft)		Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
12,600.0	9,110.5	11,642.1	8,444.0	67.7	62.6	52.71	3,461.7	150.6	1,084.2	978.1	10.218		
12,601.3	9,110.5	11,643.2	8,444.0	67.8	62.7	52.71	3,462.7	150.6	1,084.2	978.1	10.215		
12,700.0	9,109.4	11,724.0	8,443.5	69.5	64.0	52.76	3,543.5	151.4	1,085.2	976.4	9.978		
12,800.0	9,108.4	11,794.5	8,443.5	71.2	65.2	52.91	3,614.0	154.3	1,088.3	977.0	9.773		
12,900.0	9,107.3	11,889.7	8,444.2	72.9	66.7	53.20	3,708.9	160.8	1,093.2	978.7	9.549		
13,000.0	9,106.2	11,981.3	8,444.2	74.7	68.2	53.44	3,800.3	166.7	1,098.3	980.8	9.345		
13,100.0	9,105.2	12,100.9	8,442.1	76.4	70.2	53.62	3,919.8	172.8	1,103.4	982.5	9.128		
13,200.0	9,104.1	12,252.2	8,446.7	78.1	72.6	54.05	4,070.9	177.2	1,103.3	978.3	8.827		
13,279.2	9,103.3	12,322.2	8,448.3	79.5	73.8	54.19	4,140.8	178.1	1,102.9	975.6	8.661		
13,300.0	9,103.0	12,340.0	8,448.4	79.9	74.1	54.21	4,158.7	178.2	1,103.0	975.0	8.621		
13,400.0	9,102.0	12,469.9	8,447.8	81.6	76.3	54.25	4,288.5	177.6	1,103.0	971.7	8.397		
13,500.0	9,100.9	12,582.6	8,451.6	83.4	78.1	54.43	4,401.2	175.9	1,099.7	965.1	8.166		
13,600.0	9,099.9	12,671.0	8,454.0	85.1	79.6	54.53	4,489.5	174.1	1,096.4	958.9	7.970		
13,700.0	9,098.8	12,747.0	8,453.4	86.9	80.9	54.50	4,565.5	172.2	1,094.8	954.6	7.812		
13,722.3	9,098.5	12,766.0	8,452.8	87.3	81.2	54.47	4,584.5	171.7	1,094.8	954.1	7.779		
13,800.0	9,097.7	12,836.5	8,449.7	88.7	82.5	54.33	4,654.9	170.0	1,095.1	952.4	7.673		
13,900.0	9,096.7	12,907.0	8,445.7	90.4	83.7	54.14	4,725.2	167.8	1,096.2	951.2	7.561		
14,000.0	9,095.6	12,907.0	8,445.7	92.2	83.7	54.14	4,725.2	167.8	1,104.1	957.6	7.537 SF		
14,100.0	9,094.5	12,907.0	8,445.7	93.9	83.7	54.14	4,725.2	167.8	1,120.8	972.8	7.573		
14,149.6	9,094.0	12,907.0	8,445.7	94.8	83.7	54.14	4,725.2	167.8	1,132.3	983.6	7.612		

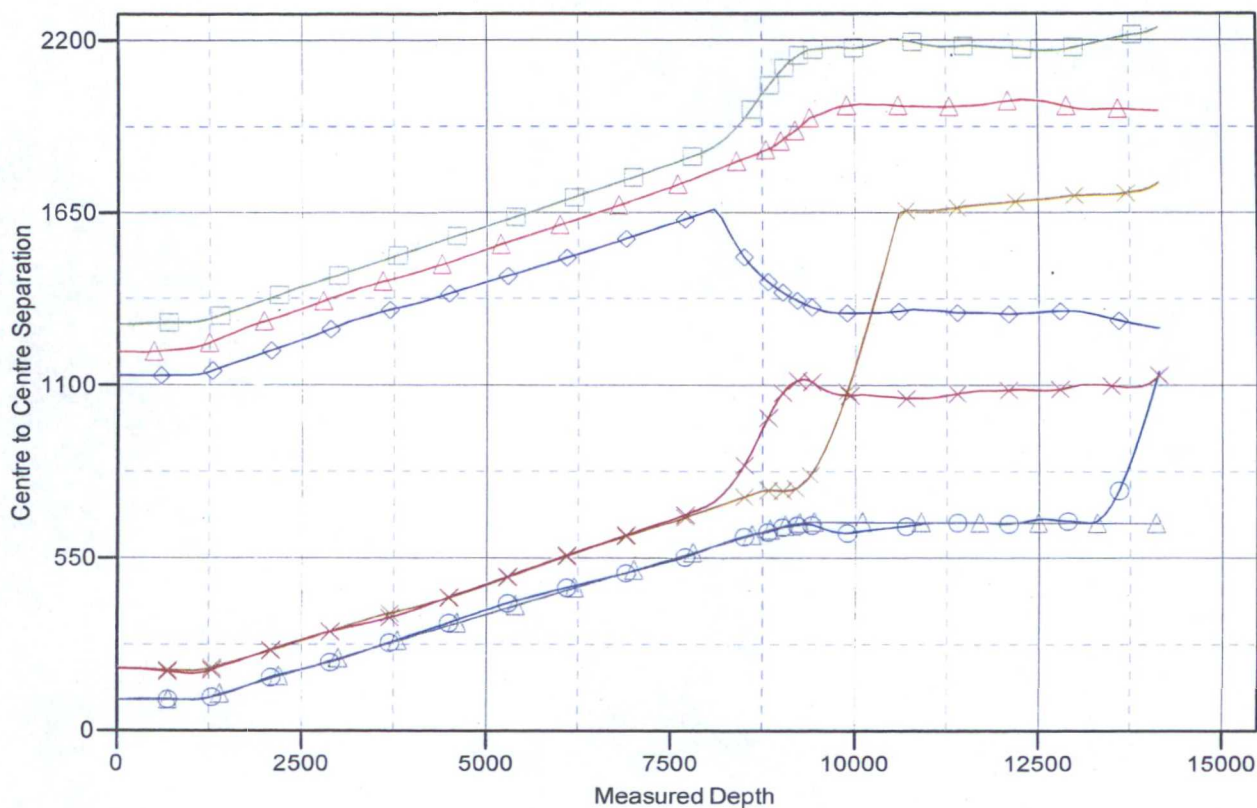
Company: COG Operating, LLC
Project: Lea County, NM
Reference Site: Sec 32, T24-S, R32E
Site Error: 0.0 usft
Reference Well: Azores Federal #12H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Azores Federal #12H
TVD Reference: Well @ 3522.0usft (McVay 8)
MD Reference: Well @ 3522.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Reference Depths are relative to Well @ 3522.0usft (McVay 8)
Offset Depths are relative to Offset Datum
Central Meridian is 104° 20' 0.000 W

Coordinates are relative to: Azores Federal #12H
Coordinate System is US State Plane 1927 (Exact solution), New Mexico East 3001
Grid Convergence at Surface is: 0.34°

Ladder Plot



LEGEND

Azores Federal #11H, Wellbore #1, Wellbore #1 V0 (Blue line with circles)
 Azores Federal #3H, Wellbore #1, Wellbore #1 V0 (Green line with squares)
 Azores Federal #7H, Wellbore #1, Wellbore #1 V0 (Red line with crosses)
 Azores Federal #8H, Wellbore #1, Wellbore #1 V0 (Blue line with circles)
 Convo Federal #2H, Wellbore #1, Wellbore #1 V0 (Green line with squares)
 Convo Federal #3H, Wellbore #1, Wellbore #1 V0 (Red line with crosses)
 Azores Federal #8H, Wellbore #1, Plan #1 (Blue line with triangles)

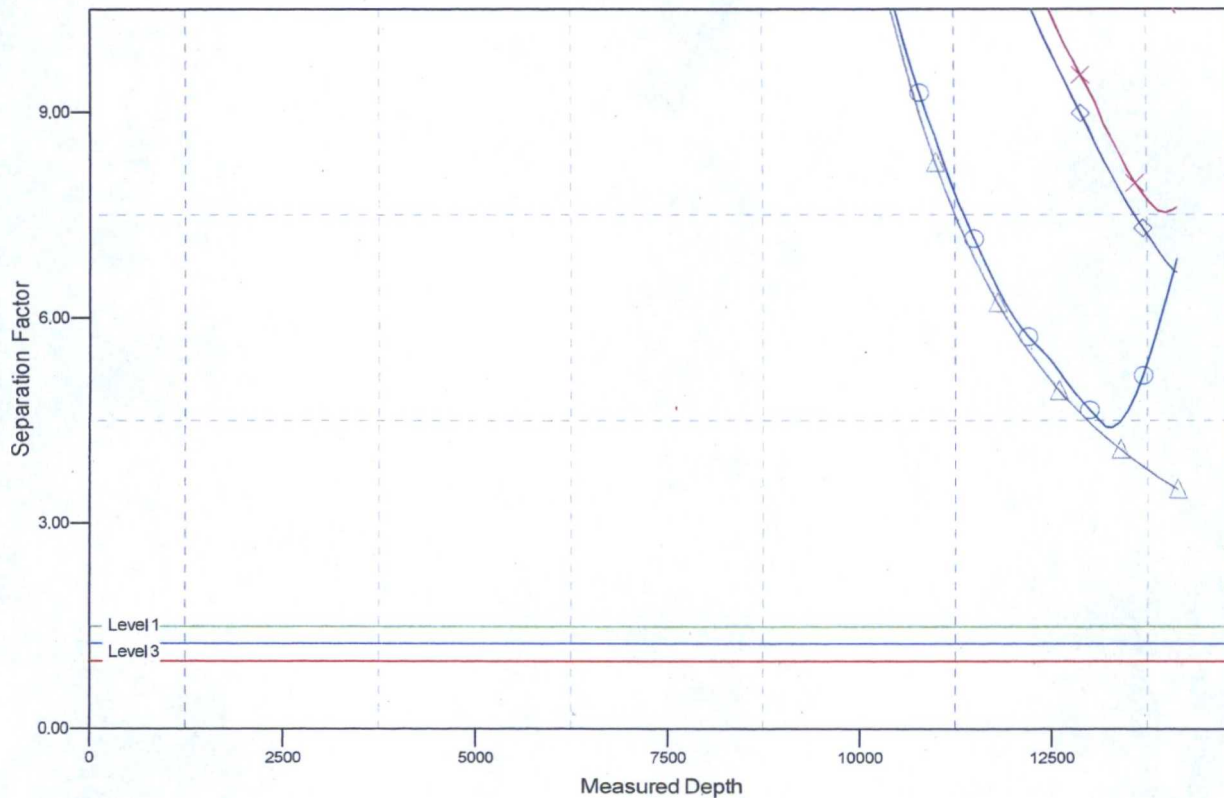
Company: COG Operating, LLC
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Grid Convergence at Surface is: 0.34°

Separation Factor Plot



LEGEND

Azores Federal #11H, Wellbore #1, Wellbore #1 V0  Azores Federal #8H, Wellbore #1, Wellbore #1 V0  Azores Federal #8H, Wellbore #1, Plan #1 \
 Azores Federal #3H, Wellbore #1, Wellbore #1 V0  Convo Federal #2H, Wellbore #1, Wellbore #1 V0
 Azores Federal #7H, Wellbore #1, Wellbore #1 V0  Convo Federal #3H, Wellbore #1, Wellbore #1 V0