

OCD - HOBBS  
11/30/2016  
RECEIVED

# **COG OPERATING LLC**

LEA COUNTY, NM

DEEP BSS

MAS FEDERAL #4H

OWB

Plan: PWP1

## **Survey Report - Geographic**

03 November, 2016

# COG Operating LLC

## Survey Report - Geographic

<b>Company:</b>	COG OPERATING LLC	<b>Local Co-ordinate Reference:</b>	Well MAS FEDERAL #4H
<b>Project:</b>	LEA COUNTY, NM	<b>TVD Reference:</b>	RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)
<b>Site:</b>	DEEP BSS	<b>MD Reference:</b>	RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)
<b>Well:</b>	MAS FEDERAL #4H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OWB	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	PWP1	<b>Database:</b>	EDM_Users

<b>Project</b>	LEA COUNTY, NM		
<b>Map System:</b>	US State Plane 1927 (Exact solution)	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	NAD 1927 (NADCON CONUS)		
<b>Map Zone:</b>	New Mexico East 3001		

Site		DEEP BSS				
Site Position:		Northing:	435,807.90 usft	Latitude:	32° 11' 46.554 N	
From:	Map	Easting:	713,748.60 usft	Longitude:	103° 38' 32.429 W	
Position Uncertainty:		0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.37 °

Well	MAS FEDERAL #4H					
Well Position	+N/-S	0.0 usft	Northing:	559,673.40 usf	Latitude:	32° 32' 10.320 N
	+E/-W	0.0 usft	Easting:	741,944.60 usf	Longitude:	103° 32' 53.739 W
Position Uncertainty		3.0 usft	Wellhead Elevation:	0.0 usf	Ground Level:	3,719.5 usf

<b>Wellbore</b>	OWB				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	WMM2015	9/12/2016	7.06	60.35	48,194

<b>Design</b>	PWP1			
<b>Audit Notes:</b>				
<b>Version:</b>	<b>Phase:</b>	PROTOTYPE	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>
	0.0	0.0	0.0	184.70

<b>Survey Tool Program</b>	<b>Date</b>	11/3/2016		
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
0.0	10,750.0	PWP1 (OWB)	Standard Keeper 104	Standard Wireline Keeper ver 1.0.4
10,750.0	16,036.2	PWP1 (OWB)	MWD	OWSG MWD - Standard

<b>Planned Survey</b>									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.0	0.00	0.00	0.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
100.0	0.00	0.00	100.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
200.0	0.00	0.00	200.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
300.0	0.00	0.00	300.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
400.0	0.00	0.00	400.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
500.0	0.00	0.00	500.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
600.0	0.00	0.00	600.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
700.0	0.00	0.00	700.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
800.0	0.00	0.00	800.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
900.0	0.00	0.00	900.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
1,000.0	0.00	0.00	1,000.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W

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## Survey Report - Geographic

<b>Company:</b>	COG OPERATING LLC	<b>Local Co-ordinate Reference:</b>	Well MAS FEDERAL #4H
<b>Project:</b>	LEA COUNTY, NM	<b>TVD Reference:</b>	RKB=3719 5+20 @ 3729 5usft (PATRIOT 2)
<b>Site:</b>	DEEP BSS	<b>MD Reference:</b>	RKB=3719 5+20 @ 3729 5usft (PATRIOT 2)
<b>Well:</b>	MAS FEDERAL #4H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OWB	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	PWP1	<b>Database:</b>	EDM_Users

### Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,100.0	0.00	0.00	1,100.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
1,200.0	0.00	0.00	1,200.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
1,300.0	0.00	0.00	1,300.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
1,400.0	0.00	0.00	1,400.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
1,500.0	0.00	0.00	1,500.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
1,600.0	0.00	0.00	1,600.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
1,700.0	0.00	0.00	1,700.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
1,800.0	0.00	0.00	1,800.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
1,900.0	0.00	0.00	1,900.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
2,000.0	0.00	0.00	2,000.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
2,100.0	0.00	0.00	2,100.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
2,200.0	0.00	0.00	2,200.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
2,300.0	0.00	0.00	2,300.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
2,400.0	0.00	0.00	2,400.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
2,500.0	0.00	0.00	2,500.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
2,600.0	0.00	0.00	2,600.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
2,700.0	0.00	0.00	2,700.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
2,800.0	0.00	0.00	2,800.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
2,900.0	0.00	0.00	2,900.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
3,000.0	0.00	0.00	3,000.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
3,100.0	0.00	0.00	3,100.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
3,200.0	0.00	0.00	3,200.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
3,300.0	0.00	0.00	3,300.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
3,400.0	0.00	0.00	3,400.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
3,500.0	0.00	0.00	3,500.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
3,600.0	0.00	0.00	3,600.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
3,700.0	0.00	0.00	3,700.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
3,800.0	0.00	0.00	3,800.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
3,900.0	0.00	0.00	3,900.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
4,000.0	0.00	0.00	4,000.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
4,100.0	0.00	0.00	4,100.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
4,200.0	0.00	0.00	4,200.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
4,300.0	0.00	0.00	4,300.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
4,400.0	0.00	0.00	4,400.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
4,500.0	0.00	0.00	4,500.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
4,600.0	0.00	0.00	4,600.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
4,700.0	0.00	0.00	4,700.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
4,800.0	0.00	0.00	4,800.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
4,900.0	0.00	0.00	4,900.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
5,000.0	0.00	0.00	5,000.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
5,100.0	0.00	0.00	5,100.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
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5,600.0	0.00	0.00	5,600.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
5,700.0	0.00	0.00	5,700.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
5,800.0	0.00	0.00	5,800.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
5,900.0	0.00	0.00	5,900.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
6,000.0	0.00	0.00	6,000.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
6,100.0	0.00	0.00	6,100.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
6,200.0	0.00	0.00	6,200.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
6,300.0	0.00	0.00	6,300.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
6,400.0	0.00	0.00	6,400.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
6,500.0	0.00	0.00	6,500.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W



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<b>Well:</b>	MAS FEDERAL #4H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OWB	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	PWP1	<b>Database:</b>	EDM_Users

### Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
6,600.0	0.00	0.00	6,600.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
6,700.0	0.00	0.00	6,700.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
6,800.0	0.00	0.00	6,800.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
6,900.0	0.00	0.00	6,900.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
7,000.0	0.00	0.00	7,000.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
7,100.0	0.00	0.00	7,100.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
7,200.0	0.00	0.00	7,200.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
7,300.0	0.00	0.00	7,300.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
7,400.0	0.00	0.00	7,400.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
7,500.0	0.00	0.00	7,500.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
7,600.0	0.00	0.00	7,600.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
7,700.0	0.00	0.00	7,700.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
7,800.0	0.00	0.00	7,800.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
7,900.0	0.00	0.00	7,900.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
8,000.0	0.00	0.00	8,000.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
8,100.0	0.00	0.00	8,100.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
8,200.0	0.00	0.00	8,200.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
8,300.0	0.00	0.00	8,300.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
8,400.0	0.00	0.00	8,400.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
8,500.0	0.00	0.00	8,500.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
8,600.0	0.00	0.00	8,600.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
8,700.0	0.00	0.00	8,700.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
8,800.0	0.00	0.00	8,800.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
8,900.0	0.00	0.00	8,900.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
9,000.0	0.00	0.00	9,000.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
9,100.0	0.00	0.00	9,100.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
9,200.0	0.00	0.00	9,200.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
9,300.0	0.00	0.00	9,300.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
9,400.0	0.00	0.00	9,400.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
9,500.0	0.00	0.00	9,500.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
9,600.0	0.00	0.00	9,600.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
9,700.0	0.00	0.00	9,700.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
9,800.0	0.00	0.00	9,800.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
9,900.0	0.00	0.00	9,900.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
10,000.0	0.00	0.00	10,000.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
10,100.0	0.00	0.00	10,100.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
10,200.0	0.00	0.00	10,200.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
10,300.0	0.00	0.00	10,300.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
10,400.0	0.00	0.00	10,400.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
10,500.0	0.00	0.00	10,500.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
10,600.0	0.00	0.00	10,600.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
10,700.0	0.00	0.00	10,700.0	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
10,776.5	0.00	0.00	10,776.5	0.0	0.0	559,673.40	741,944.60	32° 32' 10.320 N	103° 32' 53.739 W
10,800.0	2.82	209.40	10,800.0	-0.5	-0.3	559,672.90	741,944.31	32° 32' 10.315 N	103° 32' 53.743 W
10,900.0	14.82	209.40	10,898.6	-13.8	-7.8	559,659.57	741,936.80	32° 32' 10.184 N	103° 32' 53.832 W
11,000.0	26.81	209.40	10,891.9	-44.7	-25.2	559,628.67	741,919.39	32° 32' 9.880 N	103° 32' 54.038 W
11,100.0	38.81	209.40	11,075.8	-91.9	-51.8	559,581.54	741,892.84	32° 32' 9.415 N	103° 32' 54.352 W
11,200.0	50.81	209.40	11,146.6	-153.1	-86.3	559,520.25	741,858.30	32° 32' 8.811 N	103° 32' 54.761 W
11,300.0	62.81	209.40	11,201.3	-225.9	-127.3	559,447.48	741,817.30	32° 32' 8.094 N	103° 32' 55.246 W
11,400.0	74.80	209.40	11,237.4	-307.0	-173.0	559,366.40	741,771.61	32° 32' 7.295 N	103° 32' 55.786 W
11,500.0	86.80	209.40	11,253.3	-392.8	-221.4	559,280.56	741,723.24	32° 32' 6.449 N	103° 32' 56.359 W
11,518.3	89.00	209.40	11,254.0	-408.8	-230.4	559,264.60	741,714.25	32° 32' 6.292 N	103° 32' 56.465 W
11,600.0	88.99	206.13	11,255.4	-481.0	-268.4	559,192.35	741,676.21	32° 32' 5.580 N	103° 32' 56.916 W
11,700.0	88.97	202.13	11,257.2	-572.3	-309.3	559,101.13	741,635.34	32° 32' 4.680 N	103° 32' 57.401 W
11,800.0	88.96	198.13	11,259.0	-666.1	-343.7	559,007.27	741,600.94	32° 32' 3.754 N	103° 32' 57.811 W

# COG Operating LLC

## Survey Report - Geographic

<b>Company:</b>	COG OPERATING LLC	<b>Local Co-ordinate Reference:</b>	Well MAS FEDERAL #4H
<b>Project:</b>	LEA COUNTY, NM	<b>TVD Reference:</b>	RKB=3719.5+20 @ 3729 5usft (PATRIOT 2)
<b>Site:</b>	DEEP BSS	<b>MD Reference:</b>	RKB=3719.5+20 @ 3729 5usft (PATRIOT 2)
<b>Well:</b>	MAS FEDERAL #4H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OWB	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	PWP1	<b>Database:</b>	EDM_Users

### Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
11,900.0	88.96	194.13	11,260.8	-762.2	-371.4	558,911.24	741,573.16	32° 32' 2.806 N	103° 32' 58.143 W
12,000.0	88.96	190.13	11,262.6	-859.9	-392.4	558,813.51	741,552.16	32° 32' 1.840 N	103° 32' 58.397 W
12,100.0	88.97	186.13	11,264.5	-958.8	-406.6	558,714.55	741,538.02	32° 32' 0.862 N	103° 32' 58.571 W
12,200.0	88.98	182.13	11,266.2	-1,058.6	-413.8	558,614.85	741,530.82	32° 31' 59.876 N	103° 32' 58.664 W
12,252.8	88.99	180.02	11,267.2	-1,111.3	-414.8	558,562.08	741,529.83	32° 31' 59.354 N	103° 32' 58.680 W
12,300.0	88.99	180.02	11,268.0	-1,158.5	-414.8	558,514.88	741,529.82	32° 31' 58.887 N	103° 32' 58.684 W
12,400.0	88.99	180.02	11,269.8	-1,258.5	-414.8	558,414.89	741,529.79	32° 31' 57.898 N	103° 32' 58.693 W
12,500.0	88.99	180.02	11,271.5	-1,358.5	-414.8	558,314.91	741,529.76	32° 31' 56.908 N	103° 32' 58.702 W
12,600.0	88.99	180.02	11,273.3	-1,458.5	-414.9	558,214.92	741,529.73	32° 31' 55.919 N	103° 32' 58.711 W
12,700.0	88.99	180.02	11,275.1	-1,558.5	-414.9	558,114.94	741,529.70	32° 31' 54.930 N	103° 32' 58.720 W
12,800.0	88.99	180.02	11,276.8	-1,658.4	-414.9	558,014.96	741,529.67	32° 31' 53.940 N	103° 32' 58.729 W
12,900.0	88.99	180.02	11,278.6	-1,758.4	-415.0	557,914.97	741,529.64	32° 31' 52.951 N	103° 32' 58.737 W
13,000.0	88.99	180.02	11,280.4	-1,858.4	-415.0	557,814.99	741,529.61	32° 31' 51.962 N	103° 32' 58.746 W
13,100.0	88.99	180.02	11,282.1	-1,958.4	-415.0	557,715.00	741,529.58	32° 31' 50.972 N	103° 32' 58.755 W
13,200.0	88.99	180.02	11,283.9	-2,058.4	-415.0	557,615.02	741,529.55	32° 31' 49.983 N	103° 32' 58.764 W
13,300.0	88.99	180.02	11,285.7	-2,158.4	-415.1	557,515.03	741,529.52	32° 31' 48.994 N	103° 32' 58.773 W
13,400.0	88.99	180.02	11,287.4	-2,258.4	-415.1	557,415.05	741,529.49	32° 31' 48.004 N	103° 32' 58.782 W
13,500.0	88.99	180.02	11,289.2	-2,358.3	-415.1	557,315.07	741,529.46	32° 31' 47.015 N	103° 32' 58.791 W
13,600.0	88.99	180.02	11,291.0	-2,458.3	-415.2	557,215.08	741,529.43	32° 31' 46.026 N	103° 32' 58.800 W
13,700.0	88.99	180.02	11,292.7	-2,558.3	-415.2	557,115.10	741,529.40	32° 31' 45.036 N	103° 32' 58.809 W
13,800.0	88.99	180.02	11,294.5	-2,658.3	-415.2	557,015.11	741,529.37	32° 31' 44.047 N	103° 32' 58.818 W
13,900.0	88.99	180.02	11,296.3	-2,758.3	-415.3	556,915.13	741,529.34	32° 31' 43.058 N	103° 32' 58.827 W
14,000.0	88.99	180.02	11,298.0	-2,858.3	-415.3	556,815.14	741,529.31	32° 31' 42.068 N	103° 32' 58.836 W
14,100.0	88.99	180.02	11,299.8	-2,958.2	-415.3	556,715.16	741,529.28	32° 31' 41.079 N	103° 32' 58.845 W
14,200.0	88.99	180.02	11,301.6	-3,058.2	-415.3	556,615.17	741,529.25	32° 31' 40.090 N	103° 32' 58.854 W
14,300.0	88.99	180.02	11,303.3	-3,158.2	-415.4	556,515.19	741,529.22	32° 31' 39.100 N	103° 32' 58.863 W
14,400.0	88.99	180.02	11,305.1	-3,258.2	-415.4	556,415.21	741,529.19	32° 31' 38.111 N	103° 32' 58.872 W
14,500.0	88.99	180.02	11,306.9	-3,358.2	-415.4	556,315.22	741,529.16	32° 31' 37.122 N	103° 32' 58.880 W
14,600.0	88.99	180.02	11,308.6	-3,458.2	-415.5	556,215.24	741,529.13	32° 31' 36.132 N	103° 32' 58.889 W
14,700.0	88.99	180.02	11,310.4	-3,558.1	-415.5	556,115.25	741,529.10	32° 31' 35.143 N	103° 32' 58.898 W
14,800.0	88.99	180.02	11,312.2	-3,658.1	-415.5	556,015.27	741,529.07	32° 31' 34.154 N	103° 32' 58.907 W
14,900.0	88.99	180.02	11,313.9	-3,758.1	-415.6	555,915.28	741,529.04	32° 31' 33.164 N	103° 32' 58.916 W
15,000.0	88.99	180.02	11,315.7	-3,858.1	-415.6	555,815.30	741,529.01	32° 31' 32.175 N	103° 32' 58.925 W
15,100.0	88.99	180.02	11,317.5	-3,958.1	-415.6	555,715.31	741,528.98	32° 31' 31.186 N	103° 32' 58.934 W
15,200.0	88.99	180.02	11,319.2	-4,058.1	-415.6	555,615.33	741,528.95	32° 31' 30.196 N	103° 32' 58.943 W
15,300.0	88.99	180.02	11,321.0	-4,158.1	-415.7	555,515.35	741,528.92	32° 31' 29.207 N	103° 32' 58.952 W
15,400.0	88.99	180.02	11,322.8	-4,258.0	-415.7	555,415.36	741,528.89	32° 31' 28.217 N	103° 32' 58.961 W
15,500.0	88.99	180.02	11,324.5	-4,358.0	-415.7	555,315.38	741,528.86	32° 31' 27.228 N	103° 32' 58.970 W
15,600.0	88.99	180.02	11,326.3	-4,458.0	-415.8	555,215.39	741,528.83	32° 31' 26.239 N	103° 32' 58.979 W
15,700.0	88.99	180.02	11,328.1	-4,558.0	-415.8	555,115.41	741,528.80	32° 31' 25.249 N	103° 32' 58.988 W
15,800.0	88.99	180.02	11,329.8	-4,658.0	-415.8	555,015.42	741,528.77	32° 31' 24.260 N	103° 32' 58.997 W
15,900.0	88.99	180.02	11,331.6	-4,758.0	-415.9	554,915.44	741,528.74	32° 31' 23.271 N	103° 32' 59.006 W
16,000.0	88.99	180.02	11,333.4	-4,857.9	-415.9	554,815.46	741,528.71	32° 31' 22.281 N	103° 32' 59.015 W
16,036.3	88.99	180.02	11,334.0	-4,894.2	-415.9	554,779.20	741,528.70	32° 31' 21.923 N	103° 32' 59.018 W

# COG Operating LLC

## Survey Report - Geographic

<b>Company:</b>	COG OPERATING LLC	<b>Local Co-ordinate Reference:</b>	Well MAS FEDERAL #4H
<b>Project:</b>	LEA COUNTY, NM	<b>TVD Reference:</b>	RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)
<b>Site:</b>	DEEP BSS	<b>MD Reference:</b>	RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)
<b>Well:</b>	MAS FEDERAL #4H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OWB	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	PWP1	<b>Database:</b>	EDM_Users

### Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
PBHL-Mas Federal - plan misses target center by 149.9usft at 16036.3usft MD (11334.0 TVD, -4894.2 N, -415.9 E) - Point	0.00	0.01	11,334.0	-5,044.1	-414.5	554,629.30	741,530.10	32° 31' 20.439 N	103° 32' 59.014 W
PBHL-Mas Federal - plan hits target center - Point	0.00	0.00	11,334.0	-4,894.2	-415.9	554,779.20	741,528.70	32° 31' 21.923 N	103° 32' 59.018 W

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_





WELL DETAILS: MAS FEDERAL #4H

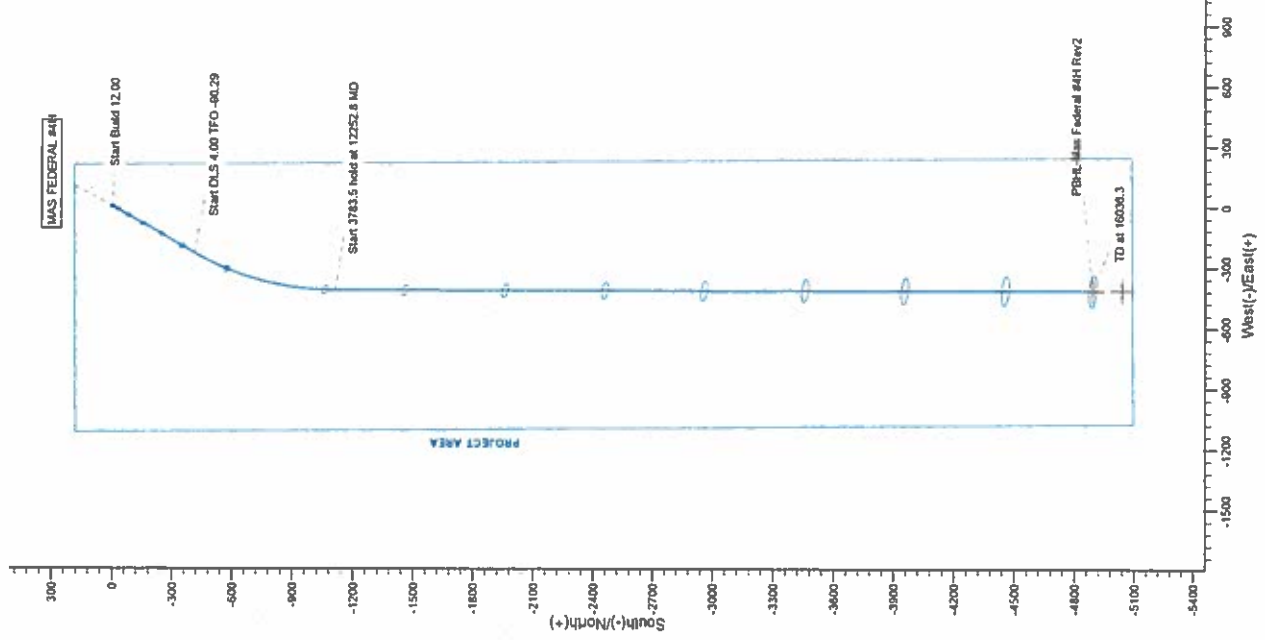
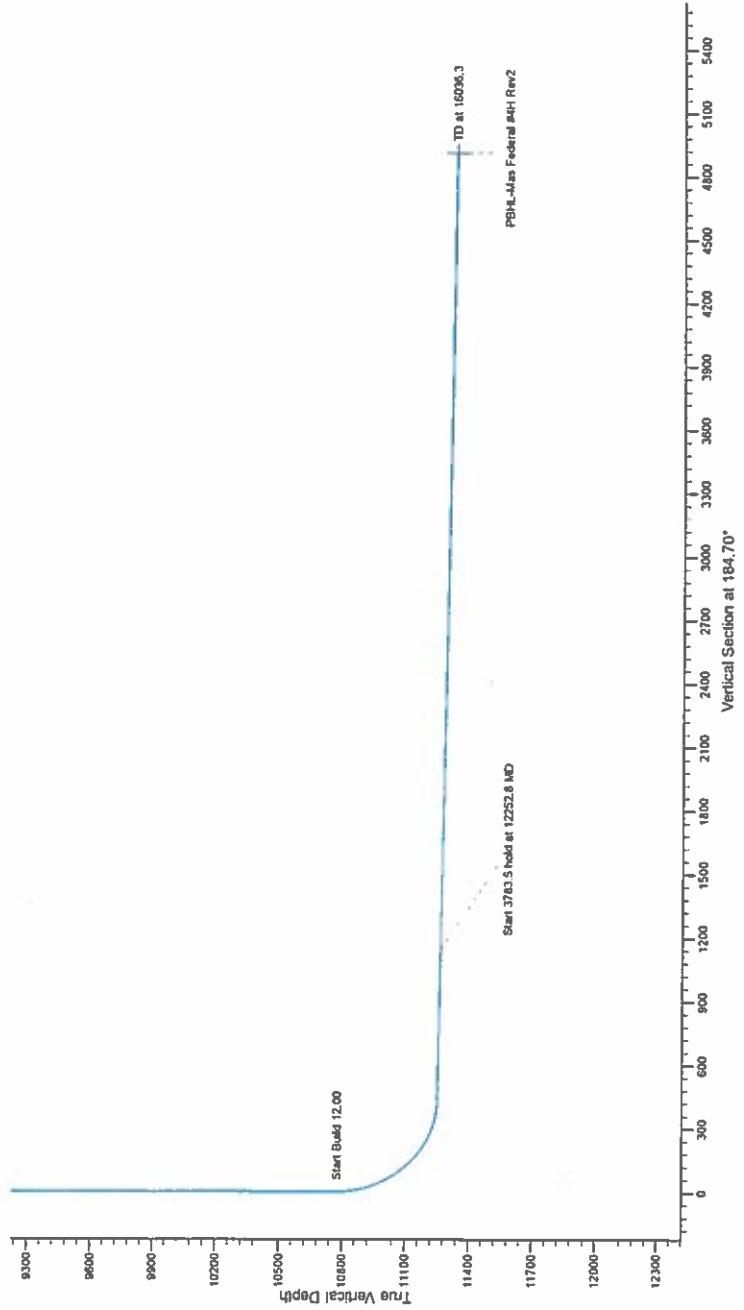
+N/S 0.0 +E/W 0.0 Northing 559673.40 Easting 741944.60 Ground Level: 3719.5 Slot

Latitude 32° 32' 10.320 N Longitude 103° 32' 53.739 W

SECTION DETAILS									
Sec	MD	Inc	Azi	TVD	+N/S	+E/W	Dleg	TFace	VSecl
1	0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0
2	10776.5	0.00	0.00	10776.5	0.0	0.0	0.00	0.00	0.0
3	11518.3	89.00	209.40	11254.0	-408.8	-230.4	12.00	209.40	426.3
4	12252.8	88.99	180.02	11267.2	-1111.3	-414.8	4.00	-90.29	1141.6
5	16036.3	88.99	180.02	11334.0	-4894.2	-415.9	0.00	0.00	4911.8

LEGEND

PWP1



# **COG OPERATING LLC**

**LEA COUNTY, NM**

**DEEP BSS**

**MAS FEDERAL #4H**

**OWB**

**PWP0**

**OCD - HOBBS**

**11/30/2016**

**RECEIVED**

## **Anticollision Report**

**13 September, 2016**



# COG Operating LLC

## Anticollision Report

<b>Company:</b>	COG OPERATING LLC	<b>Local Co-ordinate Reference:</b>	Well MAS FEDERAL #4H
<b>Project:</b>	LEA COUNTY, NM	<b>TVD Reference:</b>	RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)
<b>Reference Site:</b>	DEEP BSS	<b>MD Reference:</b>	RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)
<b>Site Error:</b>	0.0 usft	<b>North Reference:</b>	Grid
<b>Reference Well:</b>	MAS FEDERAL #4H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	3.0 usft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	OWB	<b>Database:</b>	EDM_Users
<b>Reference Design:</b>	PWP0	<b>Offset TVD Reference:</b>	Offset Datum

Reference	PWP0		
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:	Circular Conic
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program		Date	9/13/2016	
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.0	10,750.0	PWP0 (OWB)	Standard Keeper 104	Standard Wireline Keeper ver 1.0.4
10,750.0	16,186.1	PWP0 (OWB)	MWD	OWSG MWD - Standard

<b>Summary</b>							
<b>Site Name</b>	<b>Reference Measured Depth (usft)</b>	<b>Offset Measured Depth (usft)</b>	<b>Distance Between Centres (usft)</b>	<b>Distance Between Ellipses (usft)</b>	<b>Separation Factor</b>	<b>Warning</b>	
Offset Well - Wellbore - Design							
DEEP BSS							
MAS FEDERAL #3H - OWB - ACTUAL WELLPATH	0.0	7.4	541.0				
MAS FEDERAL #3H - OWB - ACTUAL WELLPATH	16,100.0	15,772.0	1,379.1	1,214.7	8.388 SF		

<b>Offset Design</b>	DEEP BSS - MAS FEDERAL #3H - OWB - ACTUAL WELLPATH												<b>Offset Site Error:</b>	0.0 usft
<b>Survey Program:</b>	100- VES GyroFlex 10652-MWD												<b>Offset Well Error:</b>	3.0 usft
<b>Reference</b>	<b>Offset</b>	<b>Semi Major Axis</b>		<b>Highside Toolface (°)</b>	<b>Distance</b>		<b>Minimum Separation (usft)</b>	<b>Separation Factor</b>	<b>Warning</b>					
<b>Measured Depth (usft)</b>	<b>Vertical Depth (usft)</b>	<b>Measured Depth (usft)</b>	<b>Vertical Depth (usft)</b>	<b>Reference (usft)</b>	<b>Offset (usft)</b>	<b>Offset Wellbore Centre +N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Between Centres (usft)</b>	<b>Between Ellipses (usft)</b>	<b>Minimum Separation (usft)</b>	<b>Separation Factor</b>			
0.0	0.0	7.4	7.4	3.0	3.0	89.58	4.0	541.0	541.0					
100.0	100.0	106.4	106.4	3.0	3.0	89.58	3.9	541.1	541.1	535.1	6.00	90.176		
200.0	200.0	206.1	206.1	3.0	3.0	89.60	3.8	541.4	541.4	535.4	6.01	90.048		
300.0	300.0	306.1	306.1	3.0	3.0	89.64	3.4	541.6	541.6	535.6	6.04	89.731		
400.0	400.0	407.1	407.1	3.0	3.0	89.68	3.1	541.8	541.8	535.7	6.07	89.216		
500.0	500.0	507.4	507.4	3.0	3.1	89.70	2.8	541.8	541.8	535.7	6.12	88.524		
600.0	600.0	607.6	607.6	3.1	3.1	89.72	2.7	541.8	541.8	535.6	6.18	87.682		
622.5	622.5	630.0	630.0	3.1	3.1	89.72	2.6	541.8	541.8	535.6	6.19	87.469		
700.0	700.0	707.3	707.3	3.1	3.1	89.74	2.4	541.8	541.8	535.6	6.25	86.676		
800.0	800.0	807.2	807.2	3.1	3.2	89.76	2.2	541.9	541.9	535.5	6.34	85.507		
900.0	900.0	906.5	906.5	3.2	3.3	89.78	2.1	542.0	542.0	535.6	6.43	84.248		
1,000.0	1,000.0	1,006.2	1,006.2	3.2	3.3	89.80	1.9	542.2	542.2	535.7	6.54	82.955		
1,100.0	1,100.0	1,105.8	1,105.8	3.3	3.4	89.81	1.8	542.5	542.5	535.8	6.64	81.678		
1,200.0	1,200.0	1,205.6	1,205.6	3.3	3.4	89.82	1.7	542.8	542.8	536.1	6.76	80.311		
1,300.0	1,300.0	1,306.5	1,306.5	3.4	3.5	89.87	1.3	543.1	543.1	536.2	6.89	78.781		
1,400.0	1,400.0	1,404.8	1,404.8	3.5	3.6	89.91	0.8	543.4	543.4	536.4	7.04	77.242		
1,500.0	1,500.0	1,506.6	1,506.6	3.5	3.7	89.98	0.2	543.7	543.7	536.5	7.19	75.658		
1,600.0	1,600.0	1,604.0	1,604.0	3.6	3.7	90.05	-0.5	544.1	544.1	536.8	7.34	74.112		
1,700.0	1,700.0	1,703.2	1,703.2	3.7	3.8	90.08	-0.8	544.8	544.8	537.4	7.50	72.681		
1,800.0	1,800.0	1,800.0	1,800.0	3.8	3.9	90.09	-0.9	545.8	545.8	538.2	7.64	71.400		
1,900.0	1,900.0	1,896.7	1,896.7	3.8	4.0	90.09	-0.9	547.2	547.3	539.6	7.80	70.208		
2,000.0	2,000.0	1,997.5	1,997.4	3.9	4.0	90.09	-0.9	549.2	549.3	541.3	7.96	69.035		
2,100.0	2,100.0	2,098.1	2,098.0	4.0	4.1	90.11	-1.1	551.0	551.0	542.9	8.13	67.769		
2,200.0	2,200.0	2,193.9	2,193.8	4.1	4.2	90.16	-1.5	553.0	553.1	544.8	8.31	66.547		

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

# COG Operating LLC

## Anticollision Report

Company: COG OPERATING LLC  
 Project: LEA COUNTY, NM  
 Reference Site: DEEP BSS  
 Site Error: 0.0 usft  
 Reference Well: MAS FEDERAL #4H  
 Well Error: 3.0 usft  
 Reference Wellbore: OWB  
 Reference Design: PWP0

Local Co-ordinate Reference: Well MAS FEDERAL #4H  
 TVD Reference: RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)  
 MD Reference: RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)  
 North Reference: Grid  
 Survey Calculation Method: Minimum Curvature  
 Output errors are at 2.00 sigma  
 Database: EDM\_Users  
 Offset TVD Reference: Offset Dalum

Offset Design DEEP BSS - MAS FEDERAL #3H - OWB - ACTUAL WELLPATH													Offset Site Error: 0.0 usft
Survey Program: 100-VES GyroFlex, 10652-MWD													Offset Well Error: 3.0 usft
Offset				Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre ±N-S (usft)	Offset Wellbore Centre ±E-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
2,300.0	2,300.0	2,295.0	2,294.9	4.2	4.3	90.19	-1.9	555.4	555.5	547.0	8.50	65.359	
2,400.0	2,400.0	2,394.4	2,394.2	4.3	4.4	90.23	-2.3	557.7	557.9	549.2	8.69	64.175	
2,500.0	2,500.0	2,493.1	2,493.0	4.4	4.5	90.28	-2.7	560.2	560.3	551.5	8.89	63.030	
2,600.0	2,600.0	2,602.5	2,602.3	4.5	4.6	90.31	-3.0	562.1	562.1	553.0	9.11	61.737	
2,700.0	2,700.0	2,700.0	2,699.8	4.6	4.8	90.34	-3.4	563.1	563.1	553.8	9.32	60.436	
2,800.0	2,800.0	2,797.0	2,796.8	4.7	4.9	90.37	-3.7	564.5	564.6	555.1	9.53	59.254	
2,900.0	2,900.0	2,894.2	2,893.9	4.8	5.0	90.39	-3.8	566.6	566.7	557.0	9.74	58.200	
3,000.0	3,000.0	2,992.7	2,992.5	4.9	5.1	90.39	-3.9	569.1	569.3	559.3	9.95	57.224	
3,100.0	3,100.0	3,097.7	3,097.4	5.0	5.2	90.37	-3.6	571.4	571.5	561.4	10.16	56.230	
3,200.0	3,200.0	3,197.6	3,197.3	5.1	5.3	90.33	-3.3	573.2	573.3	562.9	10.37	55.280	
3,300.0	3,300.0	3,297.3	3,297.0	5.2	5.4	90.26	-2.6	575.0	575.1	564.5	10.57	54.399	
3,400.0	3,400.0	3,396.9	3,396.6	5.3	5.5	90.20	-2.0	576.8	576.9	566.2	10.78	53.532	
3,500.0	3,500.0	3,495.8	3,495.4	5.4	5.6	90.16	-1.6	578.8	578.9	567.9	11.00	52.653	
3,600.0	3,600.0	3,595.1	3,594.7	5.5	5.7	90.16	-1.6	580.9	581.1	569.9	11.23	51.760	
3,700.0	3,700.0	3,695.2	3,694.7	5.6	5.8	90.19	-1.9	583.1	583.3	571.8	11.47	50.871	
3,800.0	3,800.0	3,795.4	3,794.9	5.7	6.0	90.25	-2.5	585.3	585.4	573.7	11.71	49.997	
3,900.0	3,900.0	3,895.3	3,894.8	5.8	6.1	90.35	-3.5	587.4	587.6	575.6	11.96	49.141	
4,000.0	4,000.0	3,993.8	3,993.3	6.0	6.2	90.42	-4.4	589.7	589.9	577.7	12.20	48.337	
4,100.0	4,100.0	4,093.6	4,093.1	6.1	6.4	90.49	-5.0	592.1	592.3	579.8	12.45	47.563	
4,200.0	4,200.0	4,198.6	4,198.0	6.2	6.5	90.55	-5.7	594.2	594.3	581.6	12.71	46.761	
4,300.0	4,300.0	4,298.2	4,297.6	6.3	6.6	90.54	-5.6	595.8	596.0	583.0	12.95	46.007	
4,400.0	4,400.0	4,401.7	4,401.1	6.4	6.8	90.52	-5.4	597.3	597.3	584.1	13.20	45.255	
4,500.0	4,500.0	4,502.2	4,501.6	6.5	6.9	90.50	-5.2	598.3	598.3	584.9	13.44	44.526	
4,600.0	4,600.0	4,602.1	4,601.5	6.7	7.0	90.48	-5.0	599.3	599.3	585.7	13.68	43.824	
4,700.0	4,700.0	4,703.3	4,702.7	6.8	7.1	90.45	-4.7	600.2	600.2	586.3	13.91	43.143	
4,800.0	4,800.0	4,802.2	4,801.6	6.9	7.3	90.41	-4.3	601.1	601.1	587.0	14.14	42.499	
4,900.0	4,900.0	4,904.8	4,904.2	7.0	7.4	90.37	-3.9	601.9	601.9	587.5	14.37	41.898	
5,000.0	5,000.0	5,003.9	5,003.3	7.1	7.4	90.31	-3.2	602.5	602.5	587.9	14.57	41.359	
5,100.0	5,100.0	5,104.8	5,104.2	7.3	7.5	90.26	-2.8	603.1	603.1	588.3	14.79	40.783	
5,200.0	5,200.0	5,202.7	5,202.0	7.4	7.6	90.20	-2.2	603.8	603.9	588.9	15.01	40.239	
5,300.0	5,300.0	5,304.8	5,304.2	7.5	7.7	90.12	-1.3	604.6	604.6	589.4	15.21	39.746	
5,400.0	5,400.0	5,402.4	5,401.8	7.6	7.8	90.04	-0.4	605.3	605.3	589.9	15.41	39.276	
5,500.0	5,500.0	5,502.8	5,502.1	7.7	7.9	89.94	0.6	606.2	606.2	590.6	15.62	38.805	
5,600.0	5,600.0	5,600.0	5,599.3	7.9	8.0	89.83	1.8	607.3	607.3	591.5	15.83	38.363	
5,700.0	5,700.0	5,703.7	5,703.1	8.0	8.1	89.68	3.4	608.3	608.4	592.3	16.03	37.943	
5,800.0	5,800.0	5,804.9	5,804.2	8.1	8.1	89.53	5.0	609.0	609.0	592.8	16.22	37.554	
5,900.0	5,900.0	5,902.9	5,902.2	8.2	8.2	89.35	6.9	609.6	609.7	593.3	16.40	37.186	
6,000.0	6,000.0	6,003.8	6,003.0	8.3	8.2	89.11	9.4	610.4	610.5	593.9	16.58	36.828	
6,100.0	6,100.0	6,102.5	6,101.7	8.5	8.3	88.87	12.0	611.2	611.3	594.6	16.76	36.480	
6,200.0	6,200.0	6,202.7	6,201.9	8.6	8.4	88.63	14.6	612.1	612.3	595.3	16.95	36.130	
6,300.0	6,300.0	6,302.8	6,301.9	8.7	8.4	88.38	17.4	612.9	613.2	596.0	17.13	35.787	
6,400.0	6,400.0	6,400.5	6,399.6	8.8	8.5	88.13	20.0	613.9	614.3	596.9	17.33	35.448	
6,500.0	6,500.0	6,500.3	6,499.4	9.0	8.6	87.88	22.7	615.1	615.6	598.0	17.53	35.107	
6,600.0	6,600.0	6,601.2	6,600.3	9.1	8.7	87.64	25.4	616.3	616.8	599.1	17.74	34.769	
6,700.0	6,700.0	6,704.2	6,703.2	9.2	8.7	87.40	28.0	617.1	617.8	599.8	17.94	34.431	
6,800.0	6,800.0	6,807.4	6,806.4	9.3	8.8	87.20	30.2	617.4	618.2	600.1	18.13	34.101	
6,900.0	6,900.0	6,908.6	6,907.6	9.5	8.8	87.02	32.1	617.4	618.3	600.0	18.30	33.788	
7,000.0	7,000.0	7,009.9	7,008.9	9.6	8.9	86.90	33.4	617.3	618.2	599.7	18.46	33.494	
7,100.0	7,100.0	7,112.5	7,111.4	9.7	8.9	86.81	34.4	616.7	617.7	599.1	18.58	33.238	
7,200.0	7,200.0	7,211.7	7,210.7	9.8	8.9	86.71	35.4	616.1	617.2	598.5	18.70	32.998	
7,300.0	7,300.0	7,312.6	7,311.6	10.0	8.8	86.65	36.1	615.5	616.5	597.7	18.81	32.777	
7,400.0	7,400.0	7,410.6	7,409.5	10.1	8.8	86.60	36.5	615.0	616.1	597.2	18.92	32.567	

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

# COG Operating LLC

## Anticollision Report

Company: COG OPERATING LLC  
 Project: LEA COUNTY, NM  
 Reference Site: DEEP BSS  
 Site Error: 0.0 usft  
 Reference Well: MAS FEDERAL #4H  
 Well Error: 3.0 usft  
 Reference Wellbore: OWB  
 Reference Design: PWP0

Local Co-ordinate Reference: Well MAS FEDERAL #4H  
 TVD Reference: RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)  
 MD Reference: RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)  
 North Reference: Grid  
 Survey Calculation Method: Minimum Curvature  
 Output errors are at: 2.00 sigma  
 Database: EDM\_Users  
 Offset TVD Reference: Offset Dalum

Offset Design DEEP BSS - MAS FEDERAL #3H - OWB - ACTUAL WELLPATH												Offset Site Error:	0.0 usft
Survey Program: 100-VES GyroFlex, 10652-MWD												Offset Well Error:	3.0 usft
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
7,500.0	7,500.0	7,512.8	7,511.7	10.2	8.8	86.54	37.2	614.4	615.5	596.5	19.04	32.331	
7,600.0	7,600.0	7,610.1	7,609.0	10.3	8.8	86.47	37.9	613.9	615.1	595.9	19.17	32.090	
7,700.0	7,700.0	7,709.9	7,708.8	10.5	8.8	86.43	38.3	613.7	614.9	595.6	19.30	31.861	
7,800.0	7,800.0	7,809.9	7,808.8	10.6	8.8	86.42	38.4	613.4	614.6	595.2	19.40	31.680	
7,900.0	7,900.0	7,909.0	7,907.9	10.7	8.8	86.38	38.8	613.3	614.5	595.0	19.54	31.456	
7,972.0	7,972.0	7,980.6	7,979.5	10.8	8.9	86.34	39.2	613.2	614.5	594.8	19.67	31.237	
8,000.0	8,000.0	8,008.6	8,007.5	10.8	8.9	86.33	39.3	613.2	614.5	594.8	19.72	31.154	
8,100.0	8,100.0	8,109.4	8,108.3	11.0	8.9	86.30	39.7	613.1	614.4	594.5	19.91	30.866	
8,200.0	8,200.0	8,209.7	8,208.6	11.1	9.0	86.25	40.2	613.0	614.3	594.2	20.07	30.602	
8,300.0	8,300.0	8,311.4	8,310.3	11.2	9.0	86.20	40.7	612.8	614.0	593.7	20.22	30.361	
8,400.0	8,400.0	8,413.2	8,412.1	11.4	9.0	86.14	41.2	611.9	613.3	593.0	20.35	30.141	
8,500.0	8,500.0	8,513.3	8,512.2	11.5	9.0	86.10	41.7	611.1	612.6	592.1	20.46	29.935	
8,600.0	8,600.0	8,613.3	8,612.2	11.6	9.0	86.06	42.1	610.4	611.8	591.2	20.57	29.737	
8,700.0	8,700.0	8,713.0	8,711.9	11.7	8.9	86.03	42.3	609.6	611.1	590.4	20.68	29.545	
8,800.0	8,800.0	8,812.5	8,811.4	11.9	8.9	86.03	42.2	609.0	610.4	589.7	20.78	29.382	
8,900.0	8,900.0	8,921.6	8,920.4	12.0	8.9	86.08	41.6	607.8	609.4	588.5	20.86	29.213	
9,000.0	9,000.0	9,043.1	9,041.8	12.1	8.8	86.32	38.7	602.7	605.0	584.0	20.94	28.889	
9,100.0	9,100.0	9,146.4	9,144.9	12.2	8.8	86.54	36.1	596.6	598.9	577.8	21.03	28.473	
9,200.0	9,200.0	9,241.4	9,239.8	12.4	8.8	86.64	34.7	590.9	592.8	571.7	21.13	28.053	
9,300.0	9,300.0	9,330.1	9,328.3	12.5	8.7	86.71	33.7	586.9	588.3	567.0	21.24	27.703	
9,400.0	9,400.0	9,419.7	9,417.9	12.6	8.7	86.72	33.5	584.7	585.8	564.4	21.34	27.443	
9,500.0	9,500.0	9,517.1	9,515.3	12.8	8.7	86.70	33.6	583.2	584.2	562.7	21.46	27.224	
9,600.0	9,600.0	9,613.6	9,611.8	12.9	8.7	86.68	33.8	582.1	583.1	561.5	21.59	27.014	
9,685.9	9,685.9	9,695.1	9,693.2	13.0	8.7	86.67	33.9	581.8	582.8	561.1	21.73	26.819	
9,700.0	9,700.0	9,709.1	9,707.3	13.0	8.7	86.67	33.9	581.9	582.8	561.1	21.76	26.791	
9,800.0	9,800.0	9,811.0	9,809.2	13.1	8.8	86.70	33.5	581.7	582.7	560.7	21.92	26.580	
9,845.0	9,845.0	9,854.3	9,852.5	13.2	8.8	86.72	33.3	581.6	582.6	560.6	21.99	26.494	
9,900.0	9,900.0	9,907.5	9,905.7	13.3	8.8	86.75	33.0	581.8	582.7	560.6	22.08	26.394	
10,000.0	10,000.0	10,007.7	10,005.9	13.4	8.9	86.82	32.3	582.1	583.0	560.7	22.26	26.187	
min	10,100.0	10,108.5	10,106.7	13.5	8.9	86.92	31.3	582.4	583.2	560.8	22.44	25.991	
10,200.0	10,200.0	10,212.2	10,210.3	13.7	8.9	87.05	30.0	582.3	583.1	560.5	22.60	25.804	
10,300.0	10,300.0	10,316.2	10,314.3	13.8	8.9	87.17	28.8	581.4	582.2	559.5	22.73	25.615	
10,400.0	10,400.0	10,417.3	10,415.5	13.9	8.9	87.30	27.4	580.2	580.9	558.1	22.85	25.418	
10,500.0	10,500.0	10,518.9	10,517.0	14.0	8.9	87.49	25.3	578.8	579.4	556.4	22.99	25.206	
10,600.0	10,600.0	10,618.4	10,616.5	14.2	9.0	87.74	22.8	577.3	577.8	554.6	23.13	24.978	
10,681.0	10,681.0	10,690.5	10,688.5	14.3	9.0	88.02	20.0	576.5	576.9	553.6	23.25	24.814	
10,700.0	10,700.0	10,703.4	10,701.4	14.3	9.0	88.11	19.1	576.6	577.0	553.7	23.27	24.790	
10,776.5	10,776.5	10,786.0	10,782.9	14.4	9.0	89.38	6.2	577.8	577.9	554.5	23.35	24.752	
10,800.0	10,800.0	10,808.1	10,804.2	14.4	9.0	-119.48	0.7	577.9	578.2	554.9	23.36	24.757	
10,825.0	10,824.9	10,830.2	10,825.4	14.4	9.0	-118.88	-5.5	578.1	579.4	556.0	23.37	24.790	
10,850.0	10,849.7	10,849.8	10,844.1	14.4	9.0	-118.28	-11.6	578.4	581.3	557.9	23.40	24.845	
10,875.0	10,874.3	10,866.6	10,860.0	14.4	9.0	-117.68	-17.1	578.8	584.2	560.7	23.46	24.902	
10,900.0	10,898.6	10,884.7	10,876.9	14.4	9.1	-116.99	-23.6	579.4	588.0	564.5	23.55	24.964	
10,925.0	10,922.6	10,905.0	10,895.5	14.4	9.1	-116.20	-31.4	580.3	592.7	568.0	23.68	25.024	
10,950.0	10,946.2	10,922.0	10,911.0	14.4	9.1	-115.38	-38.6	581.2	598.2	574.3	23.85	25.078	
10,975.0	10,969.3	10,940.8	10,927.7	14.4	9.1	-114.47	-47.0	582.3	604.4	580.3	24.06	25.122	
11,000.0	10,991.9	10,960.5	10,944.9	14.4	9.1	-113.48	-56.5	583.6	611.4	587.1	24.30	25.155	
11,025.0	11,013.9	10,983.5	10,964.4	14.4	9.2	-112.40	-68.5	585.2	619.0	594.4	24.59	25.175	
11,050.0	11,035.3	11,009.0	10,985.4	14.5	9.2	-111.22	-83.0	586.8	627.0	602.1	24.90	25.181	
11,075.0	11,055.9	11,034.6	11,005.8	14.5	9.3	-110.00	-98.4	588.2	635.4	610.2	25.23	25.181	
11,100.0	11,075.8	11,057.3	11,023.3	14.5	9.4	-108.78	-112.8	589.3	644.2	618.7	25.58	25.183	
11,125.0	11,094.9	11,074.9	11,036.5	14.5	9.4	-107.55	-124.4	590.3	653.5	627.6	25.93	25.200	

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



# COG Operating LLC

## Anticollision Report

**Company:** COG OPERATING LLC  
**Project:** LEA COUNTY, NM  
**Reference Site:** DEEP BSS  
**Site Error:** 0.0 usft  
**Reference Well:** MAS FEDERAL #4H  
**Well Error:** 3.0 usft  
**Reference Wellbore:** OWB  
**Reference Design:** PWP0

**Local Co-ordinate Reference:** Well MAS FEDERAL #4H  
**TVD Reference:** RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)  
**MD Reference:** RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Output errors are at** 2.00 sigma  
**Database:** EDM\_Users  
**Offset TVD Reference:** Offset Datum

Offset Design DEEP BSS - MAS FEDERAL #3H - OWB - ACTUAL WELLPATH													Offset Site Error:	0.0 usft
Survey Program: 100- VES GyroFlex, 10652-MWD													Offset Well Error:	3.0 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)	Minimum Separation (usft)	Separation Factor	Warning	
11,150.0	11,113.1	11,094.0	11,050.5	14.5	9.5	-106.28	-137.4	591.4	663.5	637.2	26.29	25.232		
11,175.0	11,130.3	11,104.0	11,057.7	14.6	9.5	-104.98	-144.3	592.1	674.0	647.3	26.65	25.294		
11,200.0	11,146.6	11,116.1	11,066.3	14.6	9.6	-103.58	-152.7	593.2	685.1	658.1	27.00	25.372		
11,225.0	11,161.9	11,125.0	11,072.8	14.7	9.6	-102.11	-158.9	594.0	696.9	669.5	27.36	25.467		
11,250.0	11,176.1	11,144.6	11,086.1	14.7	9.7	-100.72	-172.9	596.1	709.1	681.4	27.74	25.561		
11,275.0	11,189.3	11,160.7	11,096.9	14.7	9.8	-99.26	-184.8	597.9	721.8	693.7	28.11	25.680		
11,300.0	11,201.3	11,179.9	11,109.2	14.8	9.9	-97.82	-199.4	600.1	734.7	706.2	28.46	25.811		
11,325.0	11,212.1	11,198.3	11,120.5	14.8	10.0	-96.34	-213.8	602.2	747.9	719.1	28.81	25.960		
11,350.0	11,221.8	11,216.2	11,131.0	14.9	10.1	-94.83	-228.1	604.3	761.3	732.1	29.13	26.129		
11,375.0	11,230.2	11,232.5	11,140.0	15.0	10.2	-93.28	-241.5	606.2	774.9	745.4	29.44	26.320		
11,400.0	11,237.4	11,251.0	11,149.9	15.0	10.3	-91.78	-257.0	608.4	788.7	759.0	29.73	26.528		
11,425.0	11,243.3	11,268.7	11,158.9	15.1	10.5	-90.26	-272.1	610.5	802.7	772.7	30.00	26.757		
11,450.0	11,247.9	11,288.3	11,168.1	15.2	10.6	-88.79	-289.2	612.8	816.7	786.4	30.24	27.002		
11,475.0	11,251.3	11,304.6	11,175.2	15.3	10.7	-87.23	-303.8	614.6	830.7	800.3	30.46	27.273		
11,500.0	11,253.3	11,324.3	11,182.9	15.4	10.9	-85.78	-321.7	616.9	844.9	814.2	30.66	27.560		
11,518.3	11,254.0	11,342.4	11,189.4	15.5	11.1	-84.84	-338.6	618.9	855.2	824.4	30.79	27.776		
11,600.0	11,255.4	11,441.2	11,212.2	15.9	12.1	-86.86	-434.1	627.2	898.3	866.9	31.36	28.644		
11,700.0	11,257.2	11,523.9	11,218.5	16.7	13.0	-87.38	-516.4	632.2	944.2	912.0	32.23	29.299		
11,800.0	11,259.0	11,609.9	11,220.3	17.6	14.1	-87.51	-602.1	637.6	984.4	951.1	33.29	29.572		
11,900.0	11,260.8	11,727.3	11,220.7	18.6	15.7	-87.51	-719.4	644.1	1,017.6	983.0	34.57	29.436		
12,000.0	11,262.5	11,834.2	11,222.9	19.7	17.2	-87.57	-826.2	647.8	1,041.9	1,005.0	36.86	28.266		
12,100.0	11,264.3	11,909.0	11,225.7	20.8	18.2	-87.64	-900.9	651.2	1,060.3	1,021.3	39.06	27.148		
12,200.0	11,266.0	11,999.4	11,228.9	22.0	19.6	-87.70	-991.1	656.6	1,073.4	1,031.9	41.53	25.845		
12,253.3	11,267.0	12,069.7	11,231.4	22.6	20.6	-87.76	-1,061.2	660.6	1,077.4	1,034.2	43.20	24.940		
12,300.0	11,267.8	12,126.3	11,234.3	23.1	21.5	-87.86	-1,117.6	663.0	1,079.4	1,034.8	44.60	24.203		
12,400.0	11,269.5	12,229.6	11,239.0	24.3	23.1	-88.02	-1,220.8	666.8	1,082.9	1,035.5	47.38	22.855		
12,500.0	11,271.2	12,324.5	11,242.1	25.6	24.6	-88.11	-1,315.6	670.4	1,086.7	1,036.5	50.13	21.679		
12,600.0	11,272.9	12,419.1	11,244.1	26.9	26.0	-88.14	-1,410.0	674.5	1,090.9	1,038.0	52.93	20.609		
12,700.0	11,274.6	12,515.2	11,245.3	28.3	27.6	-88.12	-1,506.1	679.0	1,095.6	1,039.8	55.83	19.625		
12,800.0	11,276.3	12,612.3	11,248.0	29.7	29.1	-88.18	-1,603.0	683.9	1,100.6	1,041.8	58.79	18.721		
12,900.0	11,278.0	12,709.7	11,250.0	31.1	30.7	-88.21	-1,700.3	688.9	1,105.8	1,044.0	61.79	17.895		
13,000.0	11,279.7	12,805.5	11,251.0	32.6	32.2	-88.19	-1,795.9	694.1	1,111.2	1,046.4	64.81	17.146		
13,100.0	11,281.4	12,902.6	11,251.6	34.0	33.8	-88.14	-1,892.9	699.8	1,117.1	1,049.2	67.88	16.458		
13,200.0	11,283.1	12,998.0	11,254.5	35.6	35.4	-88.21	-1,988.0	705.6	1,123.1	1,052.2	70.94	15.831		
13,300.0	11,284.8	13,088.8	11,256.9	37.1	36.9	-88.27	-2,078.6	711.8	1,129.8	1,055.9	73.96	15.277		
13,400.0	11,286.5	13,189.9	11,258.9	38.6	38.6	-88.29	-2,179.4	719.1	1,137.1	1,059.9	77.16	14.737		
13,500.0	11,288.2	13,294.3	11,262.1	40.1	40.3	-88.38	-2,283.5	726.1	1,143.8	1,063.3	80.44	14.219		
13,600.0	11,289.9	13,391.0	11,264.2	41.7	41.9	-88.41	-2,380.0	732.6	1,150.4	1,066.8	83.60	13.761		
13,700.0	11,291.6	13,477.3	11,266.0	43.3	43.3	-88.43	-2,466.0	738.9	1,157.7	1,071.1	86.60	13.368		
13,800.0	11,293.3	13,561.4	11,270.4	44.8	44.7	-88.59	-2,549.7	746.3	1,166.5	1,076.9	89.59	13.021		
13,900.0	11,295.0	13,653.8	11,275.0	46.4	46.3	-88.75	-2,641.5	755.5	1,176.3	1,083.5	92.72	12.686		
14,000.0	11,296.7	13,750.2	11,277.8	48.0	47.9	-88.82	-2,737.3	765.1	1,186.3	1,090.3	95.94	12.365		
14,100.0	11,298.4	13,842.2	11,279.4	49.6	49.5	-88.83	-2,828.8	774.9	1,196.8	1,097.7	99.09	12.078		
14,200.0	11,300.1	13,933.0	11,280.1	51.2	51.0	-88.80	-2,919.1	785.0	1,208.0	1,105.7	102.23	11.816		
14,300.0	11,301.8	14,034.8	11,280.3	52.8	52.8	-88.74	-3,020.1	797.0	1,219.8	1,114.2	105.57	11.554		
14,400.0	11,303.6	14,139.6	11,282.5	54.4	54.6	-88.77	-3,124.3	808.2	1,230.5	1,121.5	108.96	11.293		
14,500.0	11,305.3	14,237.4	11,285.1	56.0	56.2	-88.82	-3,221.5	819.2	1,241.7	1,129.5	112.25	11.062		
14,600.0	11,307.0	14,337.7	11,288.8	57.6	58.0	-88.92	-3,321.0	830.2	1,252.6	1,137.0	115.57	10.838		
14,700.0	11,308.7	14,483.5	11,294.4	59.2	60.4	-89.08	-3,466.1	844.2	1,262.4	1,142.7	119.67	10.549		
14,800.0	11,310.4	14,605.7	11,297.8	60.9	62.5	-89.15	-3,588.1	851.5	1,268.2	1,144.9	123.34	10.282		
14,900.0	11,312.1	14,696.1	11,299.6	62.5	64.0	-89.16	-3,678.3	856.9	1,274.1	1,147.6	126.48	10.073		
15,000.0	11,313.8	14,789.4	11,301.3	64.1	65.6	-89.17	-3,771.4	863.1	1,280.7	1,151.1	129.68	9.876		

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

# COG Operating LLC

## Anticollision Report

**Company:** COG OPERATING LLC  
**Project:** LEA COUNTY, NM  
**Reference Site:** DEEP BSS  
**Site Error:** 0.0 usft  
**Reference Well:** MAS FEDERAL #4H  
**Well Error:** 3.0 usft  
**Reference Wellbore:** OWB  
**Reference Design:** PWP0

**Local Co-ordinate Reference:** Well MAS FEDERAL #4H  
**TVD Reference:** RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)  
**MD Reference:** RKB=3719.5+20 @ 3729.5usft (PATRIOT 2)  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Output errors are at** 2.00 sigma  
**Database:** EDM\_Users  
**Offset TVD Reference:** Offset Datum

Offset Design DEEP BSS - MAS FEDERAL #3H - OWB - ACTUAL WELLPATH													Offset Site Error:	0.0 usft
Survey Program: 100- VES GyroFlex, 10652-MWD													Offset Well Error:	3.0 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance						Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
15,100.0	11,315.5	14,890.1	11,302.6	65.7	67.3	-89.16	-3,871.8	869.9	1,287.5	1,154.5	133.01	9.680		
15,200.0	11,317.2	14,992.3	11,303.5	67.4	69.0	-89.12	-3,973.7	876.7	1,294.2	1,157.8	136.36	9.491		
15,300.0	11,318.9	15,093.0	11,304.0	69.0	70.7	-89.08	-4,074.3	883.2	1,300.6	1,160.9	139.69	9.311		
15,400.0	11,320.6	15,177.4	11,304.3	70.6	72.1	-89.03	-4,158.5	888.9	1,307.5	1,164.7	142.75	9.159		
15,500.0	11,322.3	15,262.8	11,304.3	72.2	73.6	-88.97	-4,243.5	896.1	1,315.9	1,170.0	145.84	9.023		
15,600.0	11,324.0	15,353.4	11,305.6	73.9	75.1	-88.97	-4,333.7	904.1	1,324.8	1,175.7	149.02	8.890		
15,700.0	11,325.7	15,440.8	11,308.7	75.5	76.6	-89.04	-4,420.7	913.0	1,334.9	1,182.7	152.15	8.773		
15,800.0	11,327.4	15,543.7	11,312.6	77.2	78.4	-89.14	-4,523.0	923.3	1,344.8	1,189.3	155.55	8.645		
15,900.0	11,329.1	15,632.1	11,315.2	78.8	79.9	-89.20	-4,610.9	932.6	1,355.3	1,196.6	158.71	8.539		
16,000.0	11,330.8	15,720.8	11,317.1	80.4	81.4	-89.22	-4,698.9	942.6	1,366.6	1,204.7	161.88	8.442		
16,100.0	11,332.5	15,772.0	11,318.0	82.1	82.3	-89.22	-4,749.8	948.6	1,379.1	1,214.7	164.40	8.388 SF		
16,186.1	11,334.0	15,772.0	11,318.0	83.5	82.3	-89.22	-4,749.8	948.6	1,394.7	1,228.9	165.82	8.411		