

**McVAY DRILLING COMPANY**

P.O. Box 2450
Hobbs, New Mexico 88241
(575) 397-3311
FAX: 39-DRILL

HOBBS OCD

JAN 26 2017

RECEIVED

Well Name and Num: Azores Fed #8 H
Location: Sec 29, T24S, R32 E
Operator: COG Operating
Drilling Contractor: McVay Drilling Company

The undersigned certifies that he is an authorized representative of the drilling contractor who drilled the above described well and that he has conducted deviation tests and obtained the following results:

<u>Degrees @</u>	<u>Depth</u>	<u>Degrees @</u>	<u>Depth</u>	<u>Degrees @</u>	<u>Depth</u>	<u>Degrees @</u>	<u>Depth</u>
0.90	190	2.30	5670	92.30	13355		
0.60	385	2.50	6142	89.40	13732		
1.60	679	2.30	6519	89.60	14016		
1.50	935	2.30	6819				
1.70	1060	2.30	7274				
2.20	1430	0.30	7652				
1.10	1808	0.90	8029				
2.40	2185	1.80	8407				
2.40	2562	24.40	8787				
1.80	2940	76.60	9290				
0.80	3317	91.10	9762				
0.90	3815	90.00	10139				
1.20	4261	88.70	10517				
0.70	4480	87.40	10989				
0.50	4690	90.80	11461				
2.50	4821	92.90	11933				
2.50	5198	89.10	12877				

By: Matt A. Bann

Subscribed and sworn to before me this 28th day of July, 2016

Tina Flemens
Notary Public, Lea County, New Mexico



SURVEY CERTIFICATION FORM

3610 Elkins Road Midland, TX 79705 t:432-684-0057 f: 432-686-7964



PHOENIX
TECHNOLOGY SERVICES

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Company: COG

Well Name: Azores Federal 8H

Survey Instrument Type: North Seek Rate Gyro

Job #: 1610307

County/State: Lea/ NM

API # 30-025-43212

TIE-IN DATA

Measure Depth (ft)	Vertical Depth (ft)	Inclination (°)	Azimuth (°)	N-S Coordinates	E-W Coordinates	Data Source
0	0	0	0	0	0	Surface

First Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
2016-07-05	0	0	0

Last Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
2016-07-05	735	1.67	327.3

Projected TD Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
0	0	0	0

Grid Correction
-0.34

Gyro Operator: Phoenix Technology Services USA Ltd.

Gyro Supervisor: Jaime Stephenson

To the best of my knowledge I certify this survey data to be correct and true

Date:

7/7/16

Print Name: Andy Askew

Signature:

Andy Askew



Company: COG
 Well: Azores Federal 8H
 Location: Lea Co., NM
 Rig: McVay 8

Job Number: 1610307
 Grid Corr.: -0.34
 Lat: 32.18
 Long: -103.69

Calculation Method: Minimum Curvature
 Proposed Azimuth:
 RKB - MSL in feet: 25
 Tie Into: Surface

Survey Tool Type	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
							N/S (ft)	E/W (ft)	Distance (ft)	Angle (deg)			
Enter Tie-In Survey on Line 10					FIELD COPY, NON-DEFINITIVE								
TIE IN	0			0	0	0	0	0					
Gyro	100.00	0.70	21.54	100	100.00	0.57	0.57 N	0.22 E	0.61	21.54	0.70	0.70	21.54
	200.00	0.92	31.12	100	199.99	1.82	1.82 N	0.86 E	2.02	25.34	0.26	0.22	9.58
	300.00	0.88	33.75	100	299.98	3.15	3.15 N	1.71 E	3.58	28.43	0.06	-0.04	2.63
	400.00	0.64	17.78	100	399.97	4.32	4.32 N	2.30 E	4.89	28.06	0.32	-0.24	-15.97
	500.00	0.83	13.35	100	499.96	5.56	5.56 N	2.64 E	6.15	25.41	0.20	0.19	-4.43
	600.00	1.17	341.94	100	599.94	7.23	7.23 N	2.49 E	7.65	19.00	0.63	0.34	328.59
	700.00	1.42	331.29	100	699.92	9.29	9.29 N	1.58 E	9.42	9.65	0.35	0.25	-10.65
	735.00	1.67	327.30	35	734.91	10.10	10.10 N	1.10 E	10.16	6.19	0.78	0.71	-11.40



COG Operating, LLC

Lea County, NM

Sec 32, T24-S, R32E

Azores Federal #8H

Wellbore #1

Design: Wellbore #1

Survey Report - Geographic

20 July, 2016

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JAN 26 2017

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QES Directional Drilling, LLC

Survey Report - Geographic



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Azores Federal #8H
Project:	Lea County, NM	TVD Reference:	Well @ 3521.0usft (McVay 8)
Site:	Sec 32, T24-S, R32E	MD Reference:	Well @ 3521.0usft (McVay 8)
Well:	Azores Federal #8H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM5002

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 #8H					
Well Position	+N/-S	0.0 usft	Northing:	430,369.50 usft	Latitude:	32° 10' 53.804 N
	+E/-W	0.0 usft	Easting:	696,255.50 usft	Longitude:	103° 41' 56.373 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	3,521.0 usft	Ground Level:	3,495.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	6/30/2016	7.11	60.02	47,998

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	358.15	

Survey Program	Date 7/20/2016				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	735.0	Gyro (Wellbore #1)	GYRO-NS	Gyrocompass Gyro	
735.0	14,035.0	MWD Surveys (Wellbore #1)	MWD default	MWD - Standard	

Survey									
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	430,369.50	696,255.50	32° 10' 53.804 N	103° 41' 56.373 W
100.0	0.70	21.54	100.0	0.6	0.2	430,370.07	696,255.72	32° 10' 53.809 N	103° 41' 56.370 W
200.0	0.92	31.12	200.0	1.8	0.9	430,371.32	696,256.36	32° 10' 53.822 N	103° 41' 56.362 W
300.0	0.88	33.75	300.0	3.1	1.7	430,372.65	696,257.20	32° 10' 53.835 N	103° 41' 56.352 W
400.0	0.64	17.78	400.0	4.3	2.3	430,373.82	696,257.80	32° 10' 53.846 N	103° 41' 56.345 W
500.0	0.83	13.35	500.0	5.6	2.6	430,375.06	696,258.14	32° 10' 53.858 N	103° 41' 56.341 W
600.0	1.17	341.94	599.9	7.2	2.5	430,376.73	696,257.99	32° 10' 53.875 N	103° 41' 56.343 W
700.0	1.42	331.29	699.9	9.3	1.6	430,378.79	696,257.07	32° 10' 53.895 N	103° 41' 56.354 W
735.0	1.67	327.30	734.9	10.1	1.1	430,379.60	696,256.59	32° 10' 53.903 N	103° 41' 56.359 W
Gyro Tie-In @ 735' MD / 735' TVD									
876.0	1.50	332.00	875.9	13.5	-0.9	430,382.96	696,254.61	32° 10' 53.937 N	103° 41' 56.382 W



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Well:	Azores Federal #8H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM5002

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
735.0	734.9	10.1	1.1	Gyro Tie-In @ 735' MD / 735' TVD
14,035.0	9,120.0	4,992.3	-141.2	TD @ 14035' MD / 9120' TVD

Checked By: _____ Approved By: _____ Date: _____