

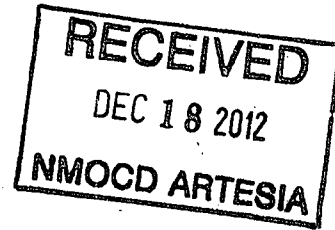
30-005-29074

COG Operating LLC

Chaves County, NM (NAD 83)

Hercules Federal Com #4H

Hercules Federal Com #4H



Wellbore #1

Survey: Crescent MWD Surveys

Standard Survey Report

24 July, 2012



COG Operating LLC
Hercules Federal Com #4H
Chaves County, NM (NAD 83)
Plan #1



Surface Location		Ground Elev: 4392.00 WELL @ 4410.00ft (Silver Oak #12)			
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.00	0.00	732091.118	704206.521	33.011384	-103.802022

TARGET DETAILS							
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
PBHL (Hercules Federal Com #4H)	8758.00	-370.65	-4614.07	731720.471	699592.454	33.010428	-103.817080

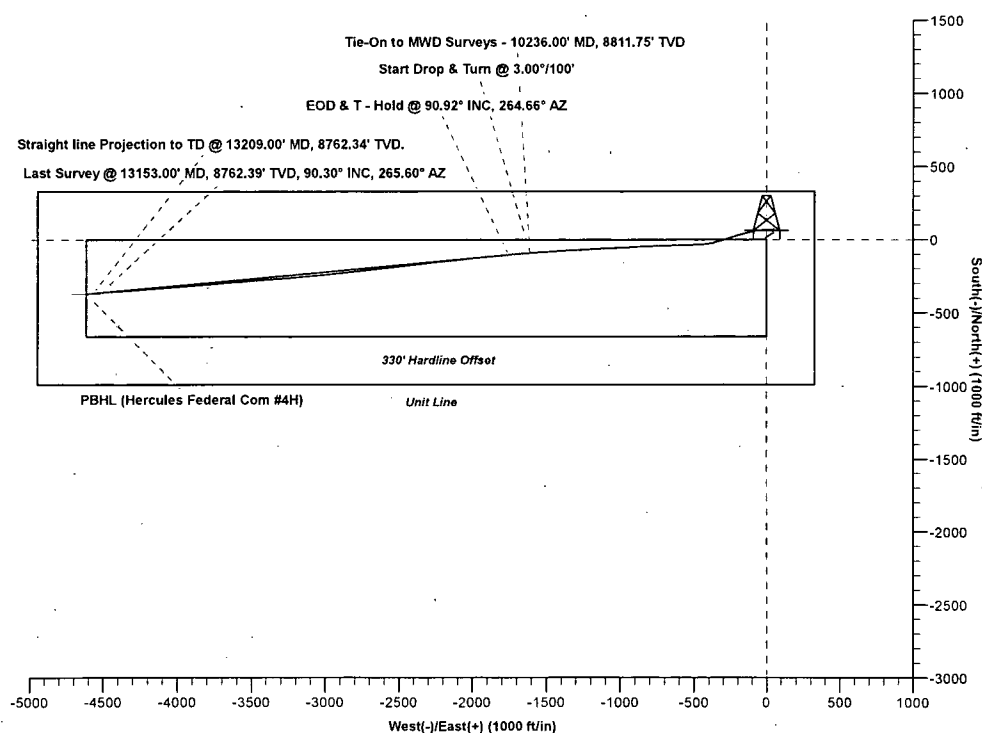
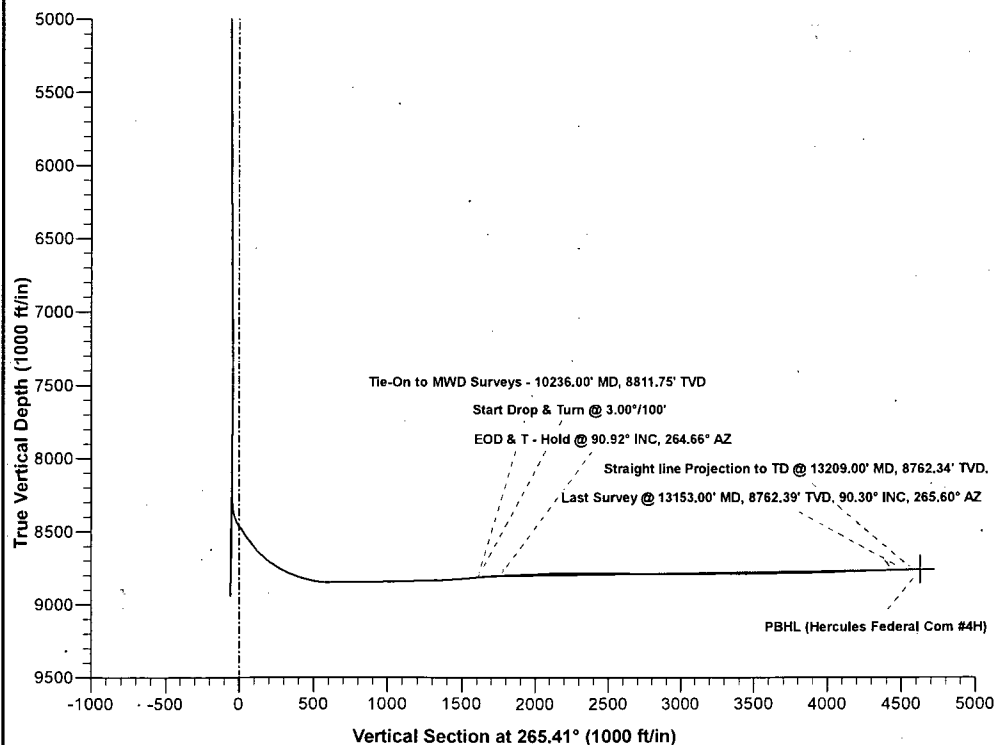
SECTION DETAILS											
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Annotation	
1	10236.00	95.10	266.00	8811.75	-91.52	-1607.33	0.00	0.00	1609.50	Tie-On to MWD Surveys - 10236.00' MD, 8811.75' TVD	
2	10382.30	90.92	264.66	8804.07	-103.41	-1752.91	3.00	-162.27	1755.56	EOD & T - Hold @ 90.92° INC, 264.66° AZ	
3	13256.28	90.92	264.66	8758.00	-370.65	-4614.07	0.00	0.00	4628.93	TD @ 13256.28' MD, 8758.00' TVD	



Azimuths to Grid North
 True North: -0.29°
 Magnetic North: 7.33°

Magnetic Field
 Strength: 48951.3snT
 Dip Angle: 60.85°
 Date: 7/6/2012
 Model: IGRF2010

Note:
The Unit line definition is an approximation based upon a perfect 5280' x 1320' drilling unit.



Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Hercules Federal Com #4H
Project:	Chaves County, NM (NAD 83)	TVD Reference:	WELL @ 4410.00ft (Silver Oak #12)
Site:	Hercules Federal Com #4H	MD Reference:	WELL @ 4410.00ft (Silver Oak #12)
Well:	Hercules Federal Com #4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Houston R5000 Database

Project:	Chaves County, NM (NAD 83)	System Datum:	Mean Sea Level
Map System:	US State Plane 1983		
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site:	Hercules Federal Com #4H				
Site Position:		Northing:	732,091.118 ft	Latitude:	33.011384
From:	Map	Easting:	704,206.521 ft	Longitude:	-103.802022
Position Uncertainty:	0.00 ft	Slot Radius:	13.200 in	Grid Convergence:	0.29 °

Well:	Hercules Federal Com #4H					
Well Position	+N-S	0.00 ft	Northing:	732,091.118 ft	Latitude:	33.011384
	+E-W	0.00 ft	Easting:	704,206.521 ft	Longitude:	-103.802022
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	4,392.00 ft

Wellbore:	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
			(°)	(°)	(nT)
	IGRF2010	7/6/2012	7.62	60.85	48,951

Design:	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section	Depth From (TVD)	+N-S	+E-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0.00	0.00	0.00	266.74	

Survey Program	Date	7/24/2012			
From	To	Survey (Wellbore)	Tool Name	Description	
(ft)	(ft)				
100.00	8,942.00	Gyro Surveys (Wellbore #1)	MWD	MWD - Standard	
8,258.00	10,236.00	MWD Surveys (Wellbore #1)	MWD	MWD - Standard	
10,271.00	13,209.00	Crescent MWD Surveys (Wellbore #1)	MWD	MWD - Standard	

Survey									
Measured Depth	Inclination	Azimuth	Vertical Depth	+N-S	+E-W	Vertical Section	Dogleg Rate	Build Rate	Turn Rate
(ft)	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(°/100ft)	(°/100ft)	(°/100ft)
10,236.00	95.10	266.00	8,811.75	-91.53	-1,607.33	1,609.94	0.00	0.00	0.00
10,271.00	95.20	265.00	8,808.60	-94.26	-1,642.08	1,644.79	2.86	0.29	-2.86
10,303.00	94.30	265.40	8,805.95	-96.93	-1,673.86	1,676.66	3.08	-2.81	1.25
10,335.00	93.40	265.60	8,803.80	-99.43	-1,705.69	1,708.58	2.88	-2.81	0.63
10,367.00	92.70	265.40	8,802.10	-101.94	-1,737.55	1,740.53	2.27	-2.19	-0.63
10,397.00	92.60	264.50	8,800.72	-104.58	-1,767.40	1,770.48	3.02	-0.33	-3.00
10,429.00	92.00	264.10	8,799.43	-107.76	-1,799.21	1,802.43	2.25	-1.88	-1.25
10,461.00	91.70	264.10	8,798.40	-111.04	-1,831.03	1,834.38	0.94	-0.94	0.00
10,493.00	92.00	264.10	8,797.36	-114.33	-1,862.84	1,866.33	0.94	0.94	0.00

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Hercules Federal Com #4H
Project:	Chaves County, NM (NAD 83)	TVD Reference:	WELL @ 4410.00ft (Silver Oak #12)
Site:	Hercules Federal Com #4H	MD Reference:	WELL @ 4410.00ft (Silver Oak #12)
Well:	Hercules Federal Com #4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Houston R5000 Database

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
10,525.00	92.20	264.00	8,796.19	-117.65	-1,894.65	1,898.27	0.70	0.63	-0.31
10,557.00	92.20	264.10	8,794.96	-120.96	-1,926.45	1,930.21	0.31	0.00	0.31
10,589.00	92.40	263.80	8,793.68	-124.33	-1,958.25	1,962.15	1.13	0.63	-0.94
10,617.00	92.20	264.50	8,792.56	-127.18	-1,986.08	1,990.10	2.60	-0.71	2.50
10,649.00	92.40	264.30	8,791.27	-130.30	-2,017.90	2,022.05	0.88	0.63	-0.63
10,677.00	93.10	264.10	8,789.93	-133.13	-2,045.73	2,049.99	2.60	2.50	-0.71
10,711.00	93.40	263.60	8,788.00	-136.76	-2,079.48	2,083.89	1.71	0.88	-1.47
10,743.00	93.30	264.00	8,786.13	-140.22	-2,111.23	2,115.79	1.29	-0.31	1.25
10,775.00	92.40	264.10	8,784.54	-143.53	-2,143.02	2,147.72	2.83	-2.81	0.31
10,806.00	91.10	263.60	8,783.59	-146.85	-2,173.83	2,178.66	4.49	-4.19	-1.61
10,838.00	90.10	263.60	8,783.26	-150.41	-2,205.63	2,210.61	3.13	-3.13	0.00
10,870.00	89.90	263.80	8,783.26	-153.93	-2,237.43	2,242.57	0.88	-0.63	0.63
10,967.00	89.90	263.60	8,783.43	-164.57	-2,333.85	2,339.43	0.21	0.00	-0.21
11,063.00	89.20	263.80	8,784.18	-175.10	-2,429.26	2,435.29	0.76	-0.73	0.21
11,158.00	89.20	263.40	8,785.51	-185.69	-2,523.66	2,530.14	0.42	0.00	-0.42
11,253.00	89.00	263.30	8,787.00	-196.69	-2,618.01	2,624.96	0.24	-0.21	-0.11
11,349.00	89.00	263.40	8,788.68	-207.81	-2,713.35	2,720.78	0.10	0.00	0.10
11,444.00	89.20	263.30	8,790.17	-218.81	-2,807.70	2,815.60	0.24	0.21	-0.11
11,539.00	89.90	264.30	8,790.91	-229.07	-2,902.14	2,910.47	1.28	0.74	1.05
11,635.00	89.60	264.70	8,791.33	-238.27	-2,997.70	3,006.39	0.52	-0.31	0.42
11,730.00	90.10	264.70	8,791.58	-247.04	-3,092.29	3,101.33	0.53	0.53	0.00
11,825.00	91.00	265.60	8,790.67	-255.08	-3,186.94	3,196.29	1.34	0.95	0.95
11,920.00	90.40	265.20	8,789.51	-262.69	-3,281.63	3,291.26	0.76	-0.63	-0.42
12,016.00	89.70	265.20	8,789.42	-270.73	-3,377.29	3,387.22	0.73	-0.73	0.00
12,111.00	90.80	265.40	8,789.01	-278.51	-3,471.97	3,482.19	1.18	1.16	0.21
12,207.00	91.00	265.40	8,787.50	-286.21	-3,567.65	3,578.15	0.21	0.21	0.00
12,302.00	91.30	265.00	8,785.60	-294.16	-3,662.30	3,673.10	0.53	0.32	-0.42
12,397.00	91.30	264.80	8,783.44	-302.60	-3,756.90	3,768.02	0.21	0.00	-0.21
12,484.00	90.30	265.20	8,782.23	-310.18	-3,843.56	3,854.97	1.24	-1.15	0.46
12,580.00	92.00	265.60	8,780.30	-317.88	-3,939.22	3,950.92	1.82	1.77	0.42
12,675.00	92.00	265.60	8,776.98	-325.16	-4,033.89	4,045.85	0.00	0.00	0.00
12,770.00	90.40	265.20	8,774.99	-332.78	-4,128.56	4,140.80	1.74	-1.68	-0.42
12,866.00	92.20	265.90	8,772.82	-340.23	-4,224.24	4,236.75	2.01	1.88	0.73
12,961.00	92.40	265.60	8,769.00	-347.26	-4,318.90	4,331.66	0.38	0.21	-0.32
13,057.00	92.60	265.70	8,764.82	-354.53	-4,414.53	4,427.55	0.23	0.21	0.10
13,153.00	90.30	265.60	8,762.39	-361.81	-4,510.22	4,523.49	2.40	-2.40	-0.10
Last Survey @ 13153.00' MD, 8762.39' TVD, 90.30° INC, 265.60° AZ									
13,209.00	89.80	265.60	8,762.34	-366.11	-4,566.05	4,579.48	0.89	-0.89	0.00
Straight line Projection to TD @ 13209.00' MD, 8762.34' TVD.									

Survey Report

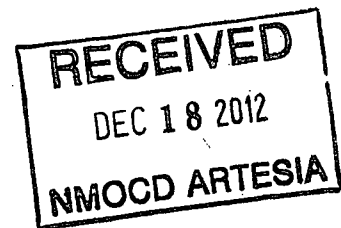
Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Hercules Federal Com #4H
Project:	Chaves County, NM (NAD 83)	TVD Reference:	WELL @ 4410.00ft (Silver Oak #12)
Site:	Hercules Federal Com #4H	MD Reference:	WELL @ 4410.00ft (Silver Oak #12)
Well:	Hercules Federal Com #4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Houston R5000 Database

Survey Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
13,153.00	8,762.39	-361.81	-4,510.22	Last Survey @ 13153.00' MD, 8762.39' TVD, 90.30° INC, 265.60° AZ
13,209.00	8,762.34	-366.11	-4,566.05	Straight line Projection to TD @ 13209.00' MD, 8762.34' TVD.

Checked By: _____ Approved By: _____ Date: _____



PO Box 1370
Artesia, NM 88211-1370
(575) 748-1288



July 23, 2012

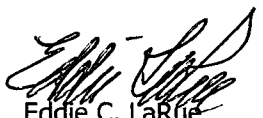
COG, LLC
Fasken Center, Tower II
550 West Texas Ave, Suite 1300
Midland, TX 79701

RE: Hercules Federal #4H
990' FSL & 330' FEL
Sec. 15, T15S, R31E
Chaves County, New Mexico

Dear Sir,

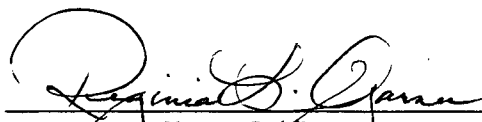
The attached is the Deviation Survey for the above captioned well.

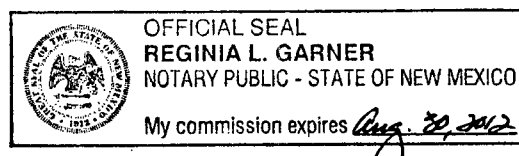
Very truly yours,


Eddie C. LaRue
Operations Manager

State of New Mexico }
County of Eddy }

The foregoing was acknowledged before me this 23rd day of July, 2012.


Regina L. Garner
Notary Public



Federal #4H

Date	Depth	Deviation	Dir/Inc	TVD
6/6/2012	152	0.30		
6/6/2012	391	0.90		
6/8/2012	617	0.70		
6/8/2012	1099	0.60		
6/8/2012	1511	0.50		
6/9/2012	1971	3.00		
6/9/2012	2412	2.40		
6/10/2012	2595	1.90		
6/10/2012	2847	1.80		
6/11/2012	3100	1.20		
6/11/2012	3385	0.10		
6/12/2012	3635	0.90		
6/14/2012	4133	0.30		
6/14/2012	4641	0.40		
6/15/2012	5141	0.30		
6/15/2012	5652	0.30		
6/16/2012	6149	1.10		
6/17/2012	6634	0.40		
6/17/2012	6634	0.40		
6/17/2012	7108	0.70		
6/18/2012	7583	0.60		
6/18/2012	7933	0.20		
6/22/2012	8185	0.50		
6/23/2012	8630	1.00		
6/29/2012	8385	14.50	266.80	8382.80
6/29/2012	8417	21.70	267.10	8413.20
6/29/2012	8481	32.00	267.30	8469.91
6/29/2012	8513	34.60	266.50	8496.65
6/29/2012	8545	35.30	266.70	8522.88
6/30/2012	8577	35.50	266.10	8548.96
6/30/2012	8608	36.00	262.00	8514.20
6/30/2012	8540	37.30	258.20	8599.80
6/30/2012	8672	41.30	254.90	
7/2/2012	8990	68.70	258.40	8800.11
7/2/2012	9086	75.70	266.70	8829.45
7/2/2012	9117	79.00	269.40	8836.24
7/2/2012	9149	81.10	268.00	8841.77
7/2/2012	9181	84.90	268.40	8845.67
7/4/2012	9313	90.10	268.10	8847.36
7/4/2012	9408	90.40	267.80	
7/5/2012	9790	92.10	266.80	8838.72
7/5/2012	9886	92.40	266.90	8834.95
7/5/2012	9981	93.20	266.60	8830.31

Date	Depth	Deviation	Dir/Inc	TVD
7/6/2012	10172	94.60	265.70	8817.46
7/7/2012	10771	95.20	265.00	
7/7/2012	10335	93.40	265.60	8804.00
7/8/2012	10617	92.20	269.50	8792.00
7/12/2012	10711	93.40	261.60	8789.00
7/12/2012	10743	93.30	269.00	8784.00
7/12/2012	10775	92.90	264.10	8289.00
7/12/2012	10838	90.10	763.60	8783.16
7/13/2012	10967	89.90	263.60	
7/13/2012	11063	89.20	263.80	8784.98
7/13/2012	11158	89.20	263.40	8785.00
7/13/2012	11221	89.00	263.30	
7/14/2012	11349	89.00	263.40	8788.00
7/14/2012	11534	89.90	264.30	8791.02
7/14/2012	11730	90.14	264.70	8791.48
7/14/2012	11825	91.00	265.60	8790.00
7/15/2012	11920	90.40	265.20	8789.00
7/15/2012	12016	89.70	265.20	8789.00
7/15/2012	12111	90.80	265.40	8789.00
7/15/2012	12207	91.00	265.40	8786.50
7/15/2012	12302	91.30	265.00	8784.08
7/15/2012	12397	91.30	264.80	8783.00
7/17/2012	12994	90.30	265.20	8781.90
7/17/2012	12580	92.00	265.60	8778.40
7/17/2012	12675	92.00	265.60	8776.00
7/18/2012	12770	90.40	265.20	8775.00
7/18/2012	12866	9.20	265.90	8772.00
7/18/2012	12961	92.40	265.60	8766.60
7/19/2012	13153	90.30	265.60	8762.00