

Results of Directional Survey

DD

API number:	30-025-40143			
OGRID:		Operator:	COG OPERATING LLC	
		Property:	GC FEDERAL	# 46

surface	ULSTR:	P	20	T 17S	R 32E
				733 FSL	1270 FEL

BH Loc	ULSTR:	P	20	T 17S	R 32E
7119	MD	7103.2	TVD	967 FSL	1026 FEL

Top Perf/OH	ULSTR:	P	20	T 17S	R 32E
5420	MD	5404.2	TVD	508 FSL	1025 FEL

Bot Perf/OH	ULSTR:	P	20	T 17S	R 32E
6850	MD	6834.2	TVD	876 FSL	1026 FEL

	MD	N/S	E/W	VD
	5400	-225.32	245.05	5384.23
TOP PERFS/OH	5420	-225.28	244.97	5404.23
	5500	-225.11	244.65	5484.23
	5700	-244.45	244.45	5684.23
BOT PERFS/OH	6850	143.10	243.68	6834.23
	5760	-224.23	244.41	5744.23

NEXT TO LAST	5700	-244.45	244.45	5684.23
LAST READING	5760	-224.23	244.41	5744.23
TD	7119	233.75	243.50	7103.23

Surface Location	733	FS	1270	FE
Projected BHL	967	FS	1026	FE
Location of				
Top Perfs/OH	508	FS	1025	FE
Bottom Perfs/OH	876	FS	1026	FE

SUMMARY of Subsurface Locations

Surface Location	P-20-17S-32E	733	FS	1270	FE	Vert. Depth
Top Perfs/OH	P-20-17S-32E	508	FS	1025	FE	5404.23
Bottom Perfs/OH	P-20-17S-32E	876	FS	1026	FE	6834.23
Projected TD	P-20-17S-32E	967	FS	1026	FE	7103.23

OCT 25 2011

SUR: P-20-17s-32e, 733/S & 1270/E
BHL: P-20-17s-32e, 967/S & 1026/E
API # 30-025-40143

WELL NAME AND NUMBER GC Federal No. 46

LOCATION Section 20, T17S, R32E, 606 FSL, 1222 FEL, Lea County

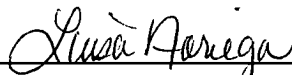
OPERATOR COG Operating LLC

DRILLING CONTRACTOR United Drilling, Inc.

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

Degrees @ Depth	Degrees @ Depth	Degrees @ Depth
.39° @ 92'		
.68° @ 174'		
.72° @ 272'		
.69° @ 362'		
5.57° @ 485'		
10.64° @ 577'		
12.4° @ 591'		
.55° @ 6194'		
.84° @ 6668'		

Drilling Contractor- UNITED DRILLING, INC.

By: 
(Luisa Noriega)

Title: Asst. Office Manager

Subscribed and sworn to before me this 9th day of August, 2011.


Notary Public
Chaves New Mexico
County State

My Commission Expires: 10/8/12





COG Operating LLC

Lea County, NM (NAD27 NME)

GC Federal #46

GC Federal #46

OH

HOBBS OCD

OCT 08 2011

RECEIVED

Design: Actual

Standard Survey Report

05 August, 2011

SUR: P-20-17s-32e, 733/S & 1270/E
BHL: P-20-17s-32e, 967/S & 1026/E
API # 30-025-40143



Scientific Drilling
Directional Drilling Operations



Scientific Drilling
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well GC Federal #46
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (20') @ 4007 00usft (UDI #42)
Site:	GC Federal #46	MD Reference:	KB Elev (20') @ 4007 00usft (UDI #42)
Well:	GC Federal #46	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Julio

Project	Lea County, NM (NAD27 NME)		
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	GC Federal #46		
Site Position:		Northing:	660,445 40 usft
From:	Map	Easting:	668,925 00 usft
Position Uncertainty:	0 00 usft	Slot Radius:	0 "
		Latitude:	32° 48' 52 002 N
		Longitude:	103° 47' 0 573 W
		Grid Convergence:	0 30 °

Well	GC Federal #46		
Well Position	+N/-S	0 00 usft	Northing:
	+E/-W	0 00 usft	Easting:
Position Uncertainty	0 00 usft	Wellhead Elevation:	usft
		Latitude:	32° 48' 52 002 N
		Longitude:	103° 47' 0 573 W
		Ground Level:	3,987 00 usft

Wellbore	OH		
Magnetics	Model Name	Sample Date	Declination (°)
	IGRF2010	2011/08/01	7 71
			Dip Angle (°)
			60 69
			Field Strength (nT)
			48,932

Design	Actual		
Audit Notes:			
Version:	1 0	Phase:	ACTUAL
		Tie On Depth:	0 00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)
	0 00	0 00	0 00
			Direction (°)
			132 67

Survey Program	Date 2011/08/05		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name
100 00	600 00	Gyro Survey (OH)	Keeper
681 00	5,809 00	MWD Survey (OH)	MWD
			Description
			Standard Wireline Keeper ver 1 0 2
			MWD - Standard

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 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	
East HL-GC #46 - South HL-GC #46										
100 00	0 30	304 61	100 00	0 15	-0 22	-0 26	0 30	0 30	0 00	
200 00	0 55	287 51	200 00	0 44	-0 89	-0 95	0 28	0 25	-17 10	
300 00	0 59	306 34	299 99	0 89	-1 76	-1 90	0 19	0 04	18 83	
400 00	1 62	122 11	399 98	0 44	-0 98	-1 02	2 21	1 03	175 77	
500 00	7 33	139 87	499 64	-5 19	4 33	6 70	5 81	5 71	17 76	
600 00	12 91	143 26	598 04	-19 03	15 14	24 03	5 61	5 58	3 39	
700 00	12 28	139 30	695 59	-36 19	28 94	45 81	1 07	-0 63	-3 96	
800 00	10 13	135 82	793 67	-50 59	42 04	65 20	2 26	-2 15	-3 48	



Scientific Drilling
Survey Report



Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Site: GC Federal #46
Well: GC Federal #46
Wellbore: OH
Design: Actual

Local Co-ordinate Reference: Well GC Federal #46
TVD Reference: KB Elev (20') @ 4007 00usft (UDI #42)
MD Reference: KB Elev (20') @ 4007 00usft (UDI #42)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM-Julio

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)
900 00	8 21	132 05	892 39	-61 65	53 49	81 11	2 01	-1 91	-3 77
1,000 00	7 36	129 48	991 51	-70 25	63 56	94 35	0 92	-0 85	-2 57
1,100 00	6 70	129 41	1,090 78	-77 90	72 86	106 37	0 66	-0 66	-0 06
1,200 00	6 46	129 12	1,190 11	-85 22	81 78	117 89	0 25	-0 24	-0 29
1,300 00	5 11	128 99	1,289 59	-91 73	89 58	128 04	1 34	-1 34	-0 13
1,400 00	4 34	126 05	1,389 25	-96 41	96 27	136 13	0 81	-0 77	-2 94
1,500 00	3 31	123 45	1,489 04	-100 20	101 65	142 65	1 05	-1 04	-2 60
1,600 00	2 93	123 58	1,588 89	-103 09	106 16	147 93	0 38	-0 38	0 12
1,700 00	2 93	126 88	1,688 76	-106 06	110 27	152 96	0 17	0 00	3 31
1,800 00	3 06	124 51	1,788 63	-109 16	114 47	158 15	0 18	0 14	-2 37
1,900 00	3 16	123 91	1,888 48	-112 12	119 05	163 53	0 10	0 09	-0 61
2,000 00	2 99	128 51	1,988 33	-115 34	123 44	168 93	0 30	-0 16	4 61
2,100 00	2 80	126 41	2,088 20	-118 48	127 35	173 94	0 22	-0 19	-2 10
2,200 00	2 53	130 25	2,188 09	-121 32	131 05	178 58	0 33	-0 28	3 84
2,300 00	2 76	137 29	2,287 99	-124 49	134 34	183 16	0 40	0 23	7 04
2,400 00	3 21	138 17	2,387 85	-128 36	137 84	188 35	0 46	0 46	0 89
2,500 00	3 30	134 91	2,487 69	-132 49	141 77	194 04	0 20	0 08	-3 26
2,600 00	3 08	134 43	2,587 53	-136 44	145 77	199 66	0 22	-0 22	-0 48
2,700 00	2 41	132 30	2,687 42	-139 74	149 19	204 41	0 68	-0 67	-2 13
2,800 00	2 22	125 64	2,787 34	-142 11	152 21	208 24	0 33	-0 19	-6 66
2,900 00	2 74	129 78	2,887 25	-144 78	155 75	212 64	0 55	0 52	4 14
3,000 00	2 90	133 36	2,987 13	-148 14	159 30	217 53	0 24	0 16	3 58
3,100 00	3 04	131 83	3,086 99	-151 58	163 26	222 78	0 16	0 14	-1 53
3,200 00	3 23	135 12	3,186 85	-155 33	167 08	228 13	0 26	0 19	3 29
3,300 00	3 34	133 94	3,286 67	-159 46	171 28	234 02	0 13	0 12	-1 18
3,400 00	3 17	133 31	3,386 51	-163 35	175 38	239 67	0 18	-0 17	-0 63
3,500 00	3 11	133 31	3,486 36	-167 10	179 36	245 13	0 07	-0 07	0 00
3,600 00	3 06	132 60	3,586 22	-170 77	183 29	250 51	0 06	-0 04	-0 71
3,700 00	2 97	131 16	3,686 08	-174 30	187 21	255 79	0 12	-0 09	-1 44
3,800 00	2 96	132 44	3,785 95	-177 70	191 07	260 93	0 07	-0 01	1 28
3,900 00	2 82	134 72	3,885 82	-181 19	194 74	265 99	0 18	-0 14	2 28
4,000 00	2 61	134 74	3,985 70	-184 54	198 10	270 73	0 21	-0 21	0 02
4,100 00	2 54	135 37	4,085 60	-187 71	201 27	275 21	0 08	-0 07	0 63
4,200 00	2 56	131 00	4,185 51	-190 76	204 50	279 66	0 20	0 02	-4 37
4,300 00	2 88	125 87	4,285 39	-193 71	208 27	284 42	0 40	0 32	-5 13
4,400 00	2 41	128 16	4,385 29	-196 46	211 91	288 97	0 49	-0 48	2 30
4,500 00	2 45	129 28	4,485 20	-199 13	215 22	293 21	0 06	0 04	1 12
4,600 00	2 53	127 66	4,585 11	-201 76	218 55	297 44	0 11	0 08	-1 62
4,700 00	3 08	127 66	4,684 98	-204 81	222 48	302 40	0 55	0 55	0 00
4,800 00	3 19	128 01	4,784 83	-208 15	226 89	307 90	0 11	0 11	0 35
4,900 00	3 10	129 96	4,884 68	-211 68	231 08	313 37	0 14	-0 09	1 95
5,000 00	2 97	129 32	4,984 54	-214 99	235 26	318 69	0 14	-0 13	-0 64
5,100 00	2 81	132 61	5,084 41	-218 31	238 98	323 68	0 23	-0 16	3 29



Scientific Drilling
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well GC Federal #46
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (20') @ 4007 00usft (UDI #42)
Site:	GC Federal #46	MD Reference:	KB Elev (20') @ 4007 00usft (UDI #42)
Well:	GC Federal #46	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Julio

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)
5,200 00	2 39	133 10	5,184 30	-221 48	242 42	328 36	0 41	-0 41	0 49
5,300 00	1 37	148 71	5,284 25	-223 90	244 59	331 59	1 14	-1 03	15 61
5,390 76	0 30	194 73	5,374 99	-225 05	245 09	332 74	1 30	-1 18	50 70
TG1-GC #46									
5,400 00	0 25	217 97	5,384 23	-225 32	245 05	332 90	1 30	-0 49	251 41
5,500 00	0 48	325 87	5,484 23	-225 11	244 65	332 46	0 61	0 23	107 90
5,600 00	0 02	75 81	5,584 23	-224 80	244 46	332 11	0 49	-0 46	109 94
5,700 00	0 27	353 27	5,684 23	-224 55	244 45	331 93	0 27	0 25	-82 54
5,760 00	0 34	352 86	5,744 23	-224 23	244 41	331 68	0 11	0 11	-0 69
Last MWD Survey									
5,800 00	0 34	352 86	5,784 23	-223 99	244 38	331 50	0 00	0 00	0 00
PBHL-GC #46									

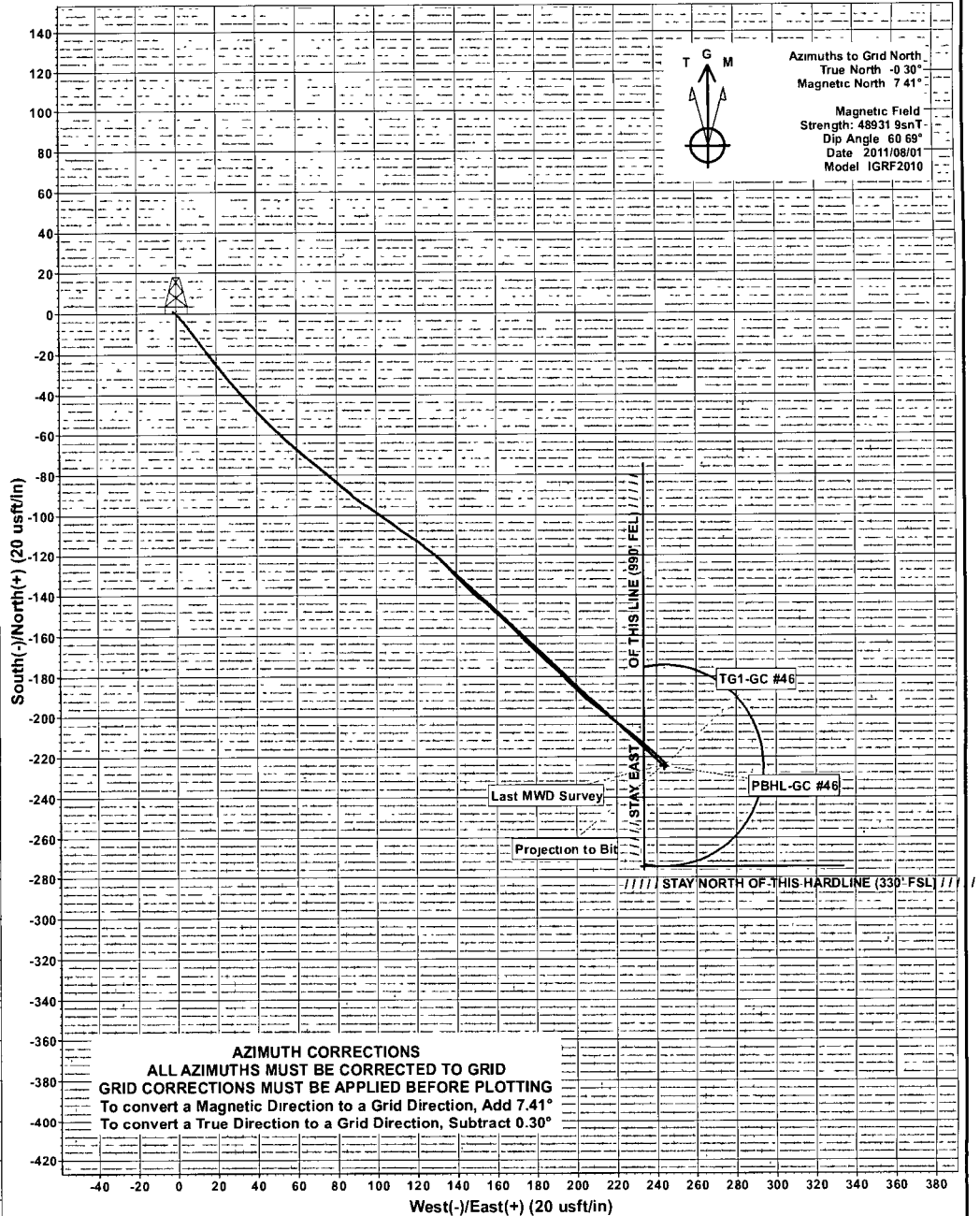
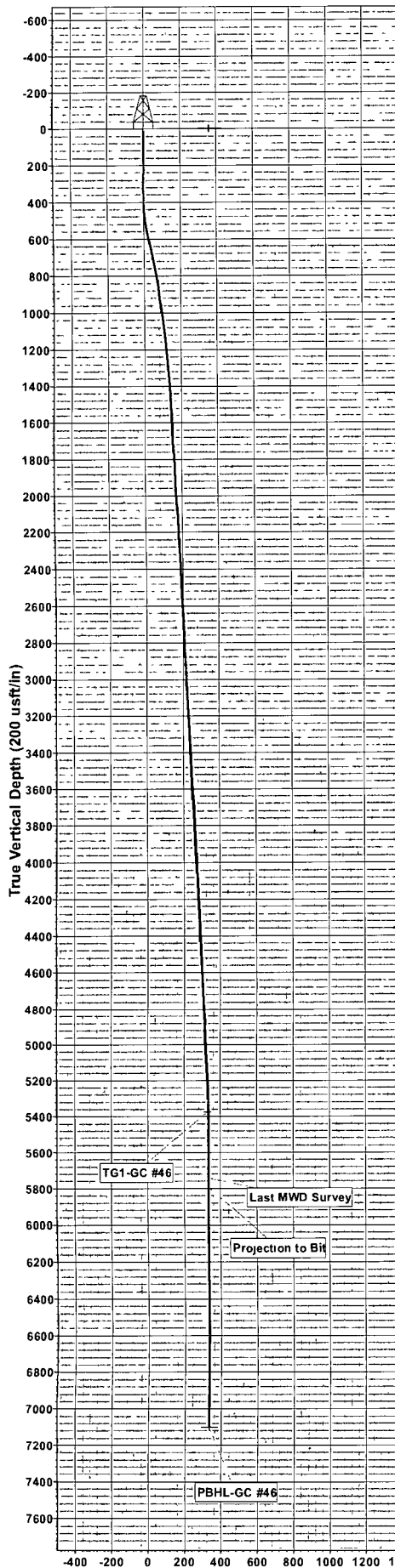
Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
5,760 00	5,744 23	-224 23	244 41	Last MWD Survey
5,809 00	5,793 23	-223 94	244 37	Projection to Bit

Checked By: _____ Approved By: _____ Date: _____



Scientific Drilling for COG Operating LLC
Site: Lea County, NM (NAD27 NME)
Well: GC Federal #46
Wellbore: OH
Design: Plan #2 7-7/8" Hole



AZIMUTH CORRECTIONS
ALL AZIMUTHS MUST BE CORRECTED TO GRID
GRID CORRECTIONS MUST BE APPLIED BEFORE PLOTTING
To convert a Magnetic Direction to a Grid Direction, Add 7.41°
To convert a True Direction to a Grid Direction, Subtract 0.30°

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
East HL-GC #46	0.00	-274.80	233.90	660170.60	669158.90	32°48' 49.271 N	103°46' 57.849 W	Rectangle (Sides: L2 00 00 W0 00)
South HL-GC #46	0.00	-274.80	233.90	660170.60	669158.90	32°48' 49.271 N	103°46' 57.849 W	Rectangle (Sides: L 00 00 W100 00)
TG1-GC #46	5375.00	-224.80	243.90	660220.60	669168.90	32°48' 49.765 N	103°46' 57.729 W	Point
PBHL-GC #46	7100.00	-224.80	243.90	660220.60	669168.90	32°48' 49.765 N	103°46' 57.729 W	Circle (Radius: 50.0 0)

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Target
1	2137.00	2.72	126.26	2125.16	-119.54	128.78	0.00	0.00	175.71	
2	2152.58	2.81	132.45	2140.72	-120.01	129.36	2.00	76.54	176.46	
3	5250.19	2.81	132.45	5234.61	-222.48	241.36	0.00	0.00	328.25	
4	5390.64	0.00	0.00	5375.00	-224.80	243.90	2.00	180.00	331.70	TG1-GC #46
5	7115.64	0.00	0.00	7100.00	-224.80	243.90	0.00	0.00	331.70	PBHL-GC #46

WELL DETAILS: GC Federal #46

Ground Level:		3987.00				
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.00	0.00	660445.40	668925.00	32°48' 52.002 N	103°47' 0.573 W	

PROJECT DETAILS: Lea County, NM (NAD27 NME)		Plan: Plan #2 7-7/8" Hole (GC Federal #46/OH)	
Geodetic System	US State Plane 1927 (Exact solution)	Created By: Julio Pina	Date: 01-Aug-11
Datum	NAD 1927 (NADCON CONUS)	Checked: _____	Date: _____
Ellipsoid	Clarke 1866	Reviewed: _____	Date: _____
Zone	New Mexico East 3001	Approved: _____	Date: _____
System Datum	Mean Sea Level		