

Results of Directional Survey

DD

API number:	30-025-40096			
OGRID:		Operator:	COG OPERATING LLC	
		Property:	MC FEDERAL	# 57

surface	ULSTR:	J	21	T 17S	R 32E
				2576 FSL	1474 FEL

BH Loc	ULSTR:	I	21	T 17S	R 32E
7112	MD	7066.6	TVD	2319 FSL	888 FEL

Top Perf/OH	ULSTR:	I	21	T 17S	R 32E
5505	MD	5474.8	TVD	2409 FSL	1088 FEL

Bot Perf/OH	ULSTR:	I	21	T 17S	R 32E
6850	MD	6807.1	TVD	2332 FSL	921 FEL

	MD	N/S	E/W	VD
	5460	-164.19	380.19	5430.21
TOP PERFS/OH	5505	-166.82	385.55	5474.81
	5554	-169.69	391.39	5523.38
	6770	-239.72	543.02	6727.81
BOT PERFS/OH	6850	-243.64	553.45	6807.11
	6863	-244.28	555.14	6820.00

NEXT TO LAST	7062	-254.31	580.32	7017.05
LAST READING	7112	-256.88	586.37	7066.61
TD	7112	-256.88	586.37	7066.61

Surface Location	2576	FS	1474	FE
Projected BHL	2319	FS	888	FE
Location of				
Top Perfs/OH	2409	FS	1088	FE
Bottom Perfs/OH	2332	FS	921	FE

SUMMARY of Subsurface Locations

Surface Location	J-21-17S-32E	2576	FS	1474	FE	Vert. Depth
Top Perfs/OH	I-21-17S-32E	2409	FS	1088	FE	5474.81
Bottom Perfs/OH	I-21-17S-32E	2332	FS	921	FE	6807.11
Projected TD	I-21-17S-32E	2319	FS	888	FE	7066.61



HOBBS OCD

MAY 14 2012

RECEIVED

COG Operating LLC

Lea County, NM (NAN27 NME)

MC Federal #57

MC Federal #57

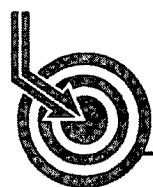
OH

SUR: J-21-17s-32e, 2576/S & 1474/E
BHL: I-21-17s-32e, 2319/S & 888/E
API # 30-025-40096

Design: Actual

Standard Survey Report

07 March, 2012



Scientific Drilling
Directional Drilling Operations



SDI
Survey Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well MC Federal #57
Project:	Lea County, NM (NAN27 NME)	TVD Reference:	RF @ 4066.00usft (JW #4)
Site:	MC Federal #57	MD Reference:	RF @ 4066.00usft (JW #4)
Well:	MC Federal #57	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM 5000 1 Single User Db

Project: Lea County, NM (NAN27-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		MC Federal #57			
Site Position:		Northing:	662,415.00 usft	Latitude:	32° 49' 11.234 N
From:	Map	Easting:	673,848.10 usft	Longitude:	103° 46' 2.764 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.31 °

Well MC Federal #57						
Well Position	+N/-S	0 00 usft	Northing:	662,415 00 usft	Latitude:	32° 49' 11 234 N
	+E/-W	0 00 usft	Easting:	673,848 10 usft	Longitude:	103° 46' 2 764 W
Position Uncertainty		0 00 usft	Wellhead Elevation:	usft	Ground Level:	4,053 00 usft

Wellbore		OH			
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	03/01/12	7 63	60 69	48,878

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)	Direction (°)	
	0 00	0 00	0 00	113 79	

Survey Program		Date	03/07/12		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100 00	2,050 00	Gyro (OH)	Keeper	Standard Wireline Keeper ver 1 0 2	
2,181 00	7,112 00	MWD (OH)	MWD	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
100.00	0.30	195.45	100.00	-0.25	-0.07	0.04	0.30	0.30	0.00
200.00	0.26	192.91	200.00	-0.73	-0.19	0.12	0.04	-0.04	-2.54
300.00	0.45	189.96	300.00	-1.33	-0.31	0.26	0.19	0.19	-2.95
400.00	0.68	196.24	399.99	-2.29	-0.54	0.43	0.24	0.23	6.28
500.00	0.81	195.34	499.98	-3.54	-0.90	0.61	0.13	0.13	-0.90
600.00	0.72	207.29	599.97	-4.78	-1.37	0.67	0.18	-0.09	11.95
700.00	0.44	169.09	699.97	-5.72	-1.59	0.85	0.46	-0.28	-38.20
800.00	0.39	269.22	799.97	-6.10	-1.85	0.76	0.64	-0.05	100.13
900.00	0.50	260.57	899.96	-6.17	-2.62	0.09	0.13	0.11	-8.65



SDI
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well MC Federal #57
Project:	Lea County, NM (NAN27 NME)	TVD Reference:	RF @ 4066 00usft (JW #4)
Site:	MC Federal #57	MD Reference:	RF @ 4066 00usft (JW #4)
Well:	MC Federal #57	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM:5000 1:Single User Db

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)
1,000 00	0 57	236 02	999 96	-6 52	-3 47	-0 54	0 24	0 07	-24 55
1,100 00	0 37	220 21	1,099 96	-7 05	-4 09	-0 90	0 24	-0 20	-15 81
1,200 00	0 29	289 65	1,199 96	-7 21	-4 54	-1 24	0 38	-0 08	69 44
1,300 00	0 65	290 22	1,299 95	-6 93	-5 31	-2 06	0 36	0 36	0 57
1,400 00	0 48	264 97	1,399 95	-6 77	-6 26	-2 99	0 30	-0 17	-25 25
1,500 00	0 32	5 80	1,499 95	-6 53	-6 64	-3 45	0 62	-0 16	100 83
1,600 00	0 93	340 50	1,599 94	-5 49	-6 89	-4 09	0 66	0 61	-25 30
1,700 00	0 88	1 44	1,699 93	-3 95	-7 14	-4 94	0 33	-0 05	20 94
1,800 00	1 16	27 49	1,799 91	-2 29	-6 65	-5 16	0 53	0 28	26 05
1,900 00	1 75	31 12	1,899 88	-0 08	-5 40	-4 90	0 60	0 59	3 63
2,000 00	1 51	41 60	1,999 84	2 21	-3 73	-4 31	0 38	-0 24	10 48
2,050 00	1 20	44 72	2,049 83	3 07	-2 93	-3 92	0 64	-0 62	6 24
Gyro Tie-In									
2,181 00	0 65	42 74	2,180 81	4 59	-1 46	-3 19	0 42	-0 42	-1 51
2,243 00	0 72	83 19	2,242 80	4 90	-0 83	-2 74	0 77	0 11	65 24
2,306 00	1 07	104 68	2,305 80	4 80	0 13	-1 82	0 76	0 56	34 11
2,369 00	1 38	113 00	2,368 78	4 35	1 40	-0 48	0 57	0 49	13 21
2,431 00	2 06	120 03	2,430 75	3 50	3 05	1 38	1 15	1 10	11 34
2,494 00	2 60	130 71	2,493 70	2 00	5 11	3 87	1 10	0 86	16 95
2,556 00	3 00	127 12	2,555 63	0 11	7 47	6 80	0 70	0 65	-5 79
2,618 00	3 84	118 89	2,617 52	-1 87	10 59	10 44	1 57	1 35	-13 27
2,680 00	4 67	115 69	2,679 35	-3 97	14 68	15 03	1 39	1 34	-5 16
2,742 00	5 69	115 81	2,741 09	-6 40	19 72	20 63	1 65	1 65	0 19
2,805 00	6 72	115 97	2,803 72	-9 38	25 84	27 43	1 64	1 63	0 25
2,867 00	7 49	114 56	2,865 24	-12 65	32 78	35 10	1 27	1 24	-2 27
2,929 00	8 45	112 37	2,926 65	-16 06	40 67	43 69	1 62	1 55	-3 53
3,023 00	7 92	111 60	3,019 69	-21 07	53 08	57 07	0 58	-0 56	-0 82
3,085 00	7 88	112 79	3,081 10	-24 29	60 97	65 59	0 27	-0 06	1 92
3,179 00	8 25	113 49	3,174 17	-29 48	73 09	78 77	0 41	0 39	0 74
3,271 00	8 64	116 51	3,265 17	-35 19	85 33	92 28	0 64	0 42	3 28
3,365 00	8 10	118 08	3,358 17	-41 46	97 49	105 93	0 62	-0 57	1 67
3,458 00	8 52	118 51	3,450 19	-47 83	109 33	119 33	0 46	0 45	0 46
3,551 00	8 99	117 86	3,542 11	-54 52	121 80	133 45	0 52	0 51	-0 70
3,645 00	9 05	119 21	3,634 95	-61 56	134 75	148 13	0 23	0 06	1 44
3,740 00	8 92	117 30	3,728 78	-68 58	147 82	162 92	0 34	-0 14	-2 01
3,833 00	9 07	112 81	3,820 64	-74 73	160 98	177 45	0 77	0 16	-4 83
3,927 00	8 86	114 00	3,913 49	-80 55	174 42	192 09	0 30	-0 22	1 27
4,022 00	8 81	114 78	4,007 36	-86 57	187 71	206 68	0 14	-0 05	0 82
4,115 00	9 21	108 84	4,099 22	-91 96	201 22	221 22	1 09	0 43	-6 39
4,210 00	9 47	108 96	4,192 96	-96 95	215 81	236 58	0 27	0 27	0 13
4,304 00	8 76	108 73	4,285 77	-101 76	229 90	251 42	0 76	-0 76	-0 24
4,398 00	8 86	110 43	4,378 66	-106 59	243 46	265 77	0 30	0 11	1 81
4,493 00	8 63	111 64	4,472 56	-111 77	256 94	280 20	0 31	-0 24	1 27



SDI
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well MC Federal #57
Project:	Lea County, NM (NAN27 NME)	TVD Reference:	RF @ 4066 00usft (JW #4)
Site:	MC Federal #57	MD Reference:	RF @ 4066 00usft (JW #4)
Well:	MC Federal #57	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-5000 1 Single User Db

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)
4,587 00	8 73	112 86	4,565 48	-117 14	270 07	294 38	0 22	0 11	1 30
4,680 00	7 94	110 65	4,657 50	-122 15	282 59	307 85	0 92	-0 85	-2 38
4,774 00	7 93	111 44	4,750 60	-126 81	294 70	320 81	0 12	-0 01	0 84
4,868 00	8 14	112 86	4,843 68	-131 77	306 87	333 94	0 31	0 22	1 51
4,961 00	8 42	113 48	4,935 71	-137 04	319 18	347 34	0 32	0 30	0 67
5,055 00	7 58	112 79	5,028 79	-142 18	331 21	360 42	0 90	-0 89	-0 73
5,108 00	7 45	113 08	5,081 34	-144 88	337 59	367 35	0 26	-0 25	0 55
5,181 00	7 55	113 99	5,153 71	-148 69	346 33	376 88	0 21	0 14	1 25
5,275 00	7 57	114 50	5,246 89	-153 76	357 60	389 24	0 07	0 02	0 54
5,368 00	7 81	114 22	5,339 06	-158 90	368 94	401 69	0 26	0 26	-0 30
5,460 00	7 73	116 15	5,430 21	-164 19	380 19	414 12	0 30	-0 09	2 10
5,554 00	7 52	116 19	5,523 38	-169 69	391 39	426 58	0 22	-0 22	0 04
5,648 00	7 66	117 19	5,616 56	-175 27	402 48	438 98	0 20	0 15	1 06
5,741 00	7 82	119 04	5,708 71	-181 17	413 52	451 47	0 32	0 17	1 99
5,834 00	7 84	119 18	5,800 84	-187 33	424 59	464 08	0 03	0 02	0 15
5,927 00	7 97	119 63	5,892 96	-193 61	435 74	476 81	0 15	0 14	0 48
6,020 00	8 30	119 68	5,985 02	-200 13	447 17	489 90	0 35	0 35	0 05
6,113 00	7 74	111 89	6,077 12	-205 78	458 82	502 84	1 31	-0 60	-8 38
6,208 00	7 74	111 66	6,171 25	-210 53	470 70	515 63	0 03	0 00	-0 24
6,301 00	7 78	112 57	6,263 40	-215 26	482 33	528 18	0 14	0 04	0 98
6,395 00	8 21	112 93	6,356 49	-220 32	494 39	541 25	0 46	0 46	0 38
6,488 00	8 31	113 53	6,448 52	-225 59	506 66	554 61	0 14	0 11	0 65
6,582 00	7 78	110 94	6,541 60	-230 57	518 83	567 76	0 68	-0 56	-2 76
6,676 00	7 89	110 47	6,634 72	-235 10	530 82	580 55	0 14	0 12	-0 50
6,770 00	8 06	111 01	6,727 81	-239 72	543 02	593 58	0 20	0 18	0 57
6,863 00	7 95	110 17	6,819 90	-244 28	555 14	606 51	0 17	-0 12	-0 90
6,958 00	7 92	111 81	6,913 99	-248 97	567 38	619 60	0 24	-0 03	1 73
7,062 00	7 55	113 06	7,017 05	-254 31	580 32	633 60	0 39	-0 36	1 20
Last MWD Survey									
7,112 00	7 55	113 06	7,066 61	-256 88	586 37	640 17	0 00	0 00	0 00
Projection to Bit									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,050 00	2,049 83	3 07	-2 93	Gyro Tie-in
7,062 00	7,017 05	-254 31	580 32	Last MWD Survey
7,112 00	7,066 61	-256 88	586 37	Projection to Bit

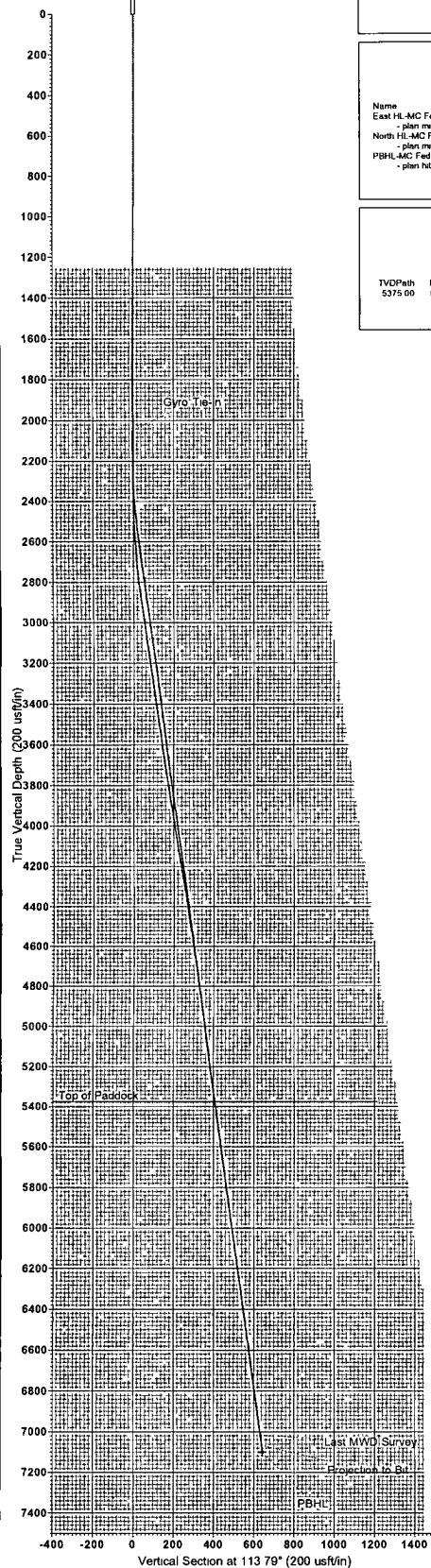
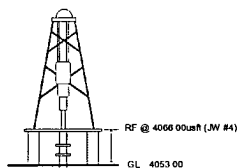
Checked By: _____ Approved By: _____ Date: _____



MC Federal #57
Lea County, NM (NAN27 NME)
Northing (Y) 662415.00
Easting (X) 673848.10
Plan #4 vs Actual - 7-7/8" Hole



Azimuth to Grd North
True North -0.31°
Magnetic North 7.33°
Magnetic Field
Strength 48877 Gauss
Dip Angle 60.69°
Date 03/01/2012
Model IGRF2010
To convert Magnetic North to Grd Add 7.33°
To convert True North to Grd Subtract 0.31°



WELL DETAILS MC Federal #57

+N/S	+E/W	Northing	Ground Level	4053.00	Latitude	Longitude	Slot
0.00	0.00	662415.00	673848.10	32° 49' 11.234 N	103° 46' 2.764 W		

SECTION DETAILS

Sect	MD	Inc	Azi	TVD	+N/S	+E/W	Dleg	TFace	Vsect	Target
1	2050.00	1.20	44.72	2049.82	3.07	-2.93	0.00	0.00	-3.92	
2	2200.00	1.20	44.72	2169.79	5.31	-0.72	0.00	0.00	-2.80	
3	2572.96	7.79	114.52	2571.52	-2.42	25.06	2.00	78.43	23.81	
4	7143.81	7.79	114.52	7100.00	-259.50	588.80	0.00	0.00	643.27	PBHL-MC Fed #57

DESIGN TARGET DETAILS

Name	TVD	+N/S	+E/W	Northing	Easting	Latitude	Longitude	Shape
East HL-MC Fed #08	-1.00	-240.50	578.90	662165.50	674426.70	32° 49' 8.734 N	103° 45' 56.000 W	Rectangle (Sides 1.00 00 W 00 00)
- plan masses target center by 2146 50usft at 2050 00usft MD (2049 82 TVD, 3.07 N, -2.93 E)								
North HL-MC Fed #08	-1.00	-240.50	578.90	662165.50	674426.70	32° 49' 8.734 N	103° 45' 56.000 W	Rectangle (Sides 1.00 00 W 100 00)
- plan masses target center by 2146 50usft at 2050 00usft MD (2049 82 TVD, 3.07 N, -2.93 E)								
PBHL-MC Fed #57	7100.00	-259.50	588.80	662165.50	674436.70	32° 49' 8.635 N	103° 45' 55.864 W	Circle (Radius 10.00)
- plan hole target center								

FORMATION TOP DETAILS

TVDPath	MDPath	Formation	DipAngle	DipDir
5375.00	5402.55	Top of Paddock	0.00	

CASING DETAILS

TVD	MD	Name	Size
2100.00	2100.18	8-5/8" Casing	8-5/8"

SITE DETAILS MC Federal #57

Site Centre Northing 662415.00
Easting 673848.10
Positional Uncertainty 0.00
Convergence 0.31
Local North Grid

Map System US State Plane 1927 (Exact solution)
Datum NAD 1927 (NADCON CONUS)
Ellipsoid Clarke 1866
Zone Name New Mexico East 3001
Local Origin Well MC Federal #57, Grd North
Latitude 32° 49' 11.234 N
Longitude 103° 46' 2.764 W

Grd East 673848.10
Grd North 662415.00
Scale Factor 1.000

Geomagnetic Model IGRF2010
Sample Date 01-Mar-12
Magnetic Declination 7.63°
Dip Angle from Horizontal 60.69°
Magnetic Field Strength 48878
To convert Magnetic North to Grd Add 7.33°
To convert Magnetic North to True North Add 7.63° East
To convert True North to Grd Subtract 0.31°

PROJECT DETAILS Lea County, NM (NAN27 NME)

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

