

COG Operating LLC

Eddy County, NM (NAN27 NME)

Electra Federal #60

Electra Federal #60

30-015-38183

OH

Design: Actual

Standard Survey Report

28 February, 2011





Scientific Drilling
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Electra Federal #60
Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev (12') @ 3753.00usft (Silver Oak #5)
Site:	Electra Federal #60	MD Reference:	KB Elev (12') @ 3753.00usft (Silver Oak #5)
Well:	Electra Federal #60	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Julio

Project	Eddy 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	Electra Federal #60		
Site Position:		Northing:	675,209.80 usft
From:	Map	Easting:	614,921.40 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 51' 20.433 N
		Longitude:	103° 57' 32.749 W
		Grid Convergence:	0.20 °

Well	Electra Federal #60		
Well Position	+N/-S	0.00 usft	Northing:
	+E/-W	0.00 usft	Easting:
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft
		Latitude:	32° 51' 20.433 N
		Longitude:	103° 57' 32.749 W
		Ground Level:	3,741.00 usft

Wellbore	OH		
Magnetics	Model Name	Sample Date	Declination
			(°)
	IGRF200510	2010/07/21	7.91
			Dip Angle
			(°)
			60.75
			Field Strength
			(nT)
			49,074

Design	Actual		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.00	0.00	0.00
			Direction
			(°)
			125.10

Survey Program	Date 2011/02/28		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		
100.00	1,277.00	Gyro Survey (OH)	Keeper
1,361.00	4,924.00	MWD Survey (OH)	MWD
			Description
			Standard Wireline Keeper ver 1.0.2
			MWD - Standard

Survey	Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn
	Depth	(°)	(°)	Depth	(usft)	(usft)	Section	Rate	Rate	Rate
	(usft)			(usft)			(usft)	(°/100usft)	(°/100usft)	(°/100usft)
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	100.00	0.02	243.19	100.00	-0.01	-0.02	-0.01	0.02	0.02	0.00
	200.00	0.50	227.82	200.00	-0.31	-0.35	-0.11	0.48	0.48	-15.37
	300.00	0.41	237.69	300.00	-0.79	-0.98	-0.35	0.12	-0.09	9.87
	400.00	0.84	225.66	399.99	-1.50	-1.81	-0.62	0.45	0.43	-12.03
	500.00	0.91	202.19	499.98	-2.74	-2.63	-0.57	0.36	0.07	-23.47
	600.00	1.02	202.62	599.96	-4.30	-3.27	-0.20	0.11	0.11	0.43
	700.00	0.81	210.56	699.95	-5.73	-3.98	0.04	0.24	-0.21	7.94
	800.00	0.54	169.74	799.94	-6.80	-4.25	0.43	0.53	-0.27	-40.82
	900.00	0.83	111.27	899.94	-7.53	-3.49	1.47	0.72	0.29	-58.47



Scientific Drilling Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Electra Federal #60
Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev (12') @ 3753.00usft (Silver Oak #5)
Site:	Electra Federal #60	MD Reference:	KB Elev (12') @ 3753.00usft (Silver Oak #5)
Well:	Electra Federal #60	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)
1,000.00	1.12	104.65	999.92	-8.04	-1.87	3.09	0.31	0.29	-6.62
1,100.00	1.56	90.24	1,099.90	-8.29	0.44	5.12	0.55	0.44	-14.41
1,200.00	1.42	90.04	1,199.86	-8.30	3.04	7.26	0.14	-0.14	-0.20
1,277.00	1.78	102.91	1,276.83	-8.57	5.16	9.14	0.66	0.47	16.71
Gyro Tie-in									
1,361.00	1.82	108.75	1,360.79	-9.29	7.69	11.63	0.22	0.05	6.95
1,457.00	1.57	98.75	1,456.75	-9.98	10.43	14.27	0.40	-0.26	-10.42
1,520.00	1.91	135.98	1,519.72	-10.86	12.02	16.08	1.84	0.54	59.10
1,584.00	2.82	131.09	1,583.67	-12.67	13.94	18.69	1.46	1.42	-7.64
1,648.00	4.02	126.10	1,647.55	-15.02	16.94	22.50	1.93	1.88	-7.80
1,712.00	5.25	134.90	1,711.34	-18.41	20.83	27.63	2.21	1.92	13.75
1,775.00	6.50	132.23	1,774.01	-22.84	25.51	34.01	2.03	1.98	-4.24
1,839.00	7.71	129.91	1,837.52	-28.03	31.49	41.88	1.94	1.89	-3.63
1,903.00	7.48	130.40	1,900.96	-33.49	37.95	50.31	0.37	-0.36	0.77
2,005.00	7.57	120.65	2,002.08	-41.21	48.79	63.62	1.25	0.09	-9.56
2,100.00	6.98	121.98	2,096.32	-47.46	59.07	75.62	0.65	-0.62	1.40
2,196.00	7.42	123.34	2,191.56	-53.96	69.20	87.64	0.49	0.46	1.42
2,292.00	7.44	123.77	2,286.75	-60.82	79.54	100.05	0.06	0.02	0.45
2,387.00	7.58	128.54	2,380.94	-68.14	89.56	112.45	0.67	0.15	5.02
2,482.00	8.05	126.92	2,475.06	-76.04	99.77	125.36	0.55	0.49	-1.71
2,578.00	8.29	125.82	2,570.08	-84.13	110.76	138.99	0.30	0.25	-1.15
2,674.00	8.41	121.25	2,665.07	-91.82	122.37	152.92	0.70	0.13	-4.76
2,769.00	7.95	121.57	2,759.10	-98.87	133.91	166.41	0.49	-0.48	0.34
2,865.00	7.65	121.37	2,854.21	-105.67	145.02	179.41	0.31	-0.31	-0.21
2,961.00	7.41	119.62	2,949.38	-112.05	155.86	191.95	0.35	-0.25	-1.82
3,056.00	7.44	119.82	3,043.59	-118.14	166.52	204.17	0.04	0.03	0.21
3,152.00	7.37	117.64	3,138.79	-124.09	177.37	216.47	0.30	-0.07	-2.27
3,247.00	8.01	122.47	3,232.93	-130.47	188.35	229.12	0.96	0.67	5.08
3,438.00	8.69	128.50	3,421.91	-146.60	210.87	256.82	0.58	0.36	3.16
3,534.00	8.73	126.39	3,516.80	-155.43	222.41	271.34	0.34	0.04	-2.20
3,662.00	8.61	124.13	3,643.34	-166.57	238.16	290.63	0.28	-0.09	-1.77
3,768.00	8.55	124.28	3,748.16	-175.46	251.24	306.44	0.06	-0.06	0.14
3,853.00	7.78	124.90	3,832.29	-182.31	261.18	318.51	0.91	-0.91	0.73
3,949.00	7.66	127.29	3,927.42	-189.91	271.60	331.41	0.36	-0.13	2.49
4,044.00	6.56	122.82	4,021.69	-196.68	281.20	343.16	1.30	-1.16	-4.71
4,140.00	5.38	128.22	4,117.17	-202.44	289.34	353.13	1.36	-1.23	5.63
4,235.00	3.66	116.39	4,211.87	-206.54	295.56	360.57	2.05	-1.81	-12.45
4,331.00	2.33	132.92	4,307.74	-209.23	299.73	365.54	1.64	-1.39	17.22
4,425.00	2.54	129.57	4,401.66	-211.86	302.74	369.51	0.27	0.22	-3.56
4,522.00	0.99	139.64	4,498.61	-213.87	304.94	372.46	1.62	-1.60	10.38
4,618.00	0.59	79.89	4,594.60	-214.42	305.96	373.61	0.90	-0.42	-62.24
4,715.00	0.58	104.25	4,691.60	-214.45	306.93	374.42	0.25	-0.01	25.11
4,809.00	0.57	96.06	4,785.59	-214.61	307.85	375.28	0.09	-0.01	-8.71



Scientific Drilling
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Electra Federal #60
Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev (12') @ 3753.00usft (Silver Oak #5)
Site:	Electra Federal #60	MD Reference:	KB Elev (12') @ 3753.00usft (Silver Oak #5)
Well:	Electra Federal #60	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Julio

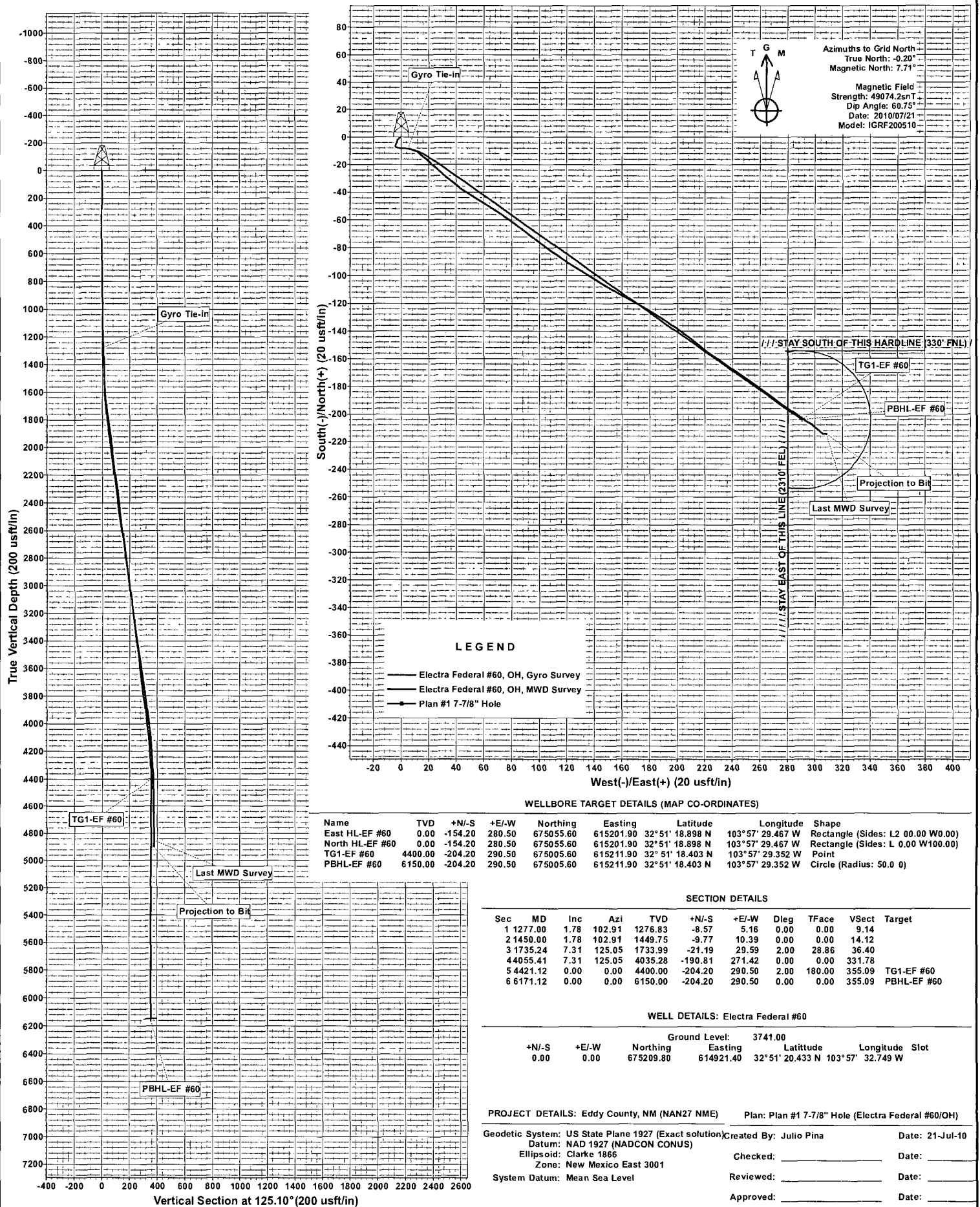
Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
4,874.00	0.36	65.67	4,850.59	-214.56	308.36	375.66	0.49	-0.32	-46.75	
Last MWD Survey										
4,924.00	0.36	65.67	4,900.59	-214.44	308.65	375.82	0.00	0.00	0.00	
Projection to Bit										

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
1,277.00	1,276.83	-8.57	5.16	Gyro Tie-in	
4,874.00	4,850.59	-214.56	308.36	Last MWD Survey	
4,924.00	4,900.59	-214.44	308.65	Projection to Bit	

Checked By: _____	Approved By: _____	Date: _____
-------------------	--------------------	-------------



Scientific Drilling for COG Operating LLC
Site: Eddy County, NM (NAN27 NME)
Well: Electra Federal #60
Wellbore: OH
Design: Plan #1 vs Actual 7-7/8" Hole



WELLBORE TARGET DETAILS (MAP CO-ORDINATES)									
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape	
East HL-EF #60	0.00	-154.20	280.50	675055.60	615201.90	32° 51' 18.898 N	103° 57' 29.467 W	Rectangle (Sides: L2 00.00 W00.00)	
North HL-EF #60	0.00	-154.20	280.50	675055.60	615201.90	32° 51' 18.898 N	103° 57' 29.467 W	Rectangle (Sides: L 0.00 W100.00)	
TG1-EF #60	4400.00	-204.20	290.50	675005.60	615211.90	32° 51' 18.403 N	103° 57' 29.352 W	Point	
PBHL-EF #60	6150.00	-204.20	290.50	675005.60	615211.90	32° 51' 18.403 N	103° 57' 29.352 W	Circle (Radius: 50.0 0)	

SECTION DETAILS										
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Target
1	1277.00	1.78	102.91	1276.83	-8.57	5.16	0.00	0.00	9.14	
2	1450.00	1.78	102.91	1449.75	-9.77	10.39	0.00	0.00	14.12	
3	1735.24	7.31	125.05	1733.99	-21.19	29.59	2.00	28.86	36.40	
4	4055.41	7.31	125.05	4035.28	-190.81	271.42	0.00	0.00	331.78	
5	4421.12	0.00	0.00	4400.00	-204.20	290.50	2.00	180.00	355.09	TG1-EF #60
6	6171.12	0.00	0.00	6150.00	-204.20	290.50	0.00	0.00	355.09	PBHL-EF #60

WELL DETAILS: Electra Federal #60					
Ground Level:			3741.00		
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.00	0.00	675209.80	614921.40	32° 51' 20.433 N	103° 57' 32.749 W

PROJECT DETAILS: Eddy County, NM (NAN27 NME)			Plan: Plan #1 7-7/8" Hole (Electra Federal #60/OH)		
Geodetic System: US State Plane 1927 (Exact solution)			Created By: Julio Pina		
Datum: NAD 1927 (NADCON CONUS)			Date: 21-Jul-10		
Ellipsoid: Clarke 1866			Checked: _____		
Zone: New Mexico East 3001			Date: _____		
System Datum: Mean Sea Level			Reviewed: _____		
			Date: _____		
			Approved: _____		
			Date: _____		