



COG Operating LLC

Eddy County, NM (NAN27 NME)

Yale State #18

Yale State #18

OH

Design: Actual

Standard Survey Report

08 December, 2011



Scientific Drilling
Directional Drilling Operations



Scientific Drilling
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Yale State #18
Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev (12') @ 3767 00usft (Basic #35)
Site:	Yale State #18	MD Reference:	KB Elev (12') @ 3767 00usft (Basic #35)
Well:	Yale State #18	North Reference:	Grd
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		Yale State #18			
Site Position:		Northing:	678,044 40 usft	Latitude:	32° 51' 48 357 N
From:	Map	Easting:	618,432 10 usft	Longitude:	103° 56' 51 471 W
Position Uncertainty:	0 00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0 21 °

Well	Yale State #18					
Well Position	+N/-S	0 00 usft	Northing:	678,044 40 usft	Latitude:	32° 51' 48 357 N
	+E/-W	0 00 usft	Easting:	618,432 10 usft	Longitude:	103° 56' 51 471 W
Position Uncertainty		0 00 usft	Wellhead Elevation:	usft	Ground Level:	3,755 00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
			(°)	(°)	(nT)
	IGRF2010	2011/12/02	7 75	60 70	48,911

Design	Actual				
Audit Notes:					
Version:	1 0	Phase:	ACTUAL	Tie On Depth:	0 00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(usft)	(usft)	(usft)	(°)	
	0 00	0 00	0 00	171 72	

Survey Program		Date	2011/12/08		
From	To	Survey (Wellbore)	Tool Name	Description	
(usft)	(usft)				
100 00	1,290 00	Gyro Survey (OH)	Keeper	Standard Wireline Keeper ver 1 0 2	
1,428 00	6,180 00	MWD Survey (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 27	258 74	100 00	-0 05	-0 23	0 01	0 27	0 27	0 00	
200 00	1 48	147 66	199 99	-1 18	0 23	1.20	1.60	1 21	-111.08	
300 00	1 95	133 70	299 94	-3 45	2 15	3 72	0 63	0.47	-13 96	
400 00	3 44	150 25	399 83	-7 23	4 87	7 86	1 67	1.49	16 55	
500 00	3 43	151.53	499.65	-12 46	7 78	13 46	0 08	-0 01	1 28	
600 00	2 54	156 61	599 52	-17 13	10 09	18 40	0 93	-0 89	5.08	
700 00	2 25	152.19	699.43	-20.90	11 88	22 39	0 34	-0 29	-4 42	
800 00	1 77	158.98	799.37	-24 08	13 35	25 75	0 54	-0 48	6 79	
900 00	1 61	152 02	899 32	-26 76	14 57	28 58	0 26	-0.16	-6 96	



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Site:	Yale State #18	MD Reference:	KB Elev (12') @ 3767 00usft (Basic #35)
Well:	Yale State #18	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 25	147 75	999 29	-28 92	15 81	30.90	0 38	-0 36	-4 27
1,100 00	1 05	135 94	1,099 27	-30 50	17.03	32 64	0 31	-0 20	-11 81
1,200 00	1.02	146 43	1,199 26	-31 90	18 16	34 18	0 19	-0 03	10.49
1,290 00	1 14	133.83	1,289 24	-33 19	19 25	35.62	0 29	0 13	-14 00
1,428 00	1 14	143 77	1,427 21	-35.25	21 05	37 91	0 14	0 00	7 20
1,492 00	1 03	180 95	1,491.20	-36 34	21 41	39 04	1.09	-0 17	58 09
1,555 00	1 76	210 23	1,554 18	-37 74	20 92	40 36	1 58	1 16	46 48
1,619 00	2 39	205 81	1,618.14	-39 79	19 84	42 23	1.01	0 98	-6 91
1,682 00	2.75	192.95	1,681.08	-42 44	18 93	44 73	1.08	0 57	-20 41
1,746 00	3 12	177 95	1,745 00	-45 68	18 65	47 89	1 33	0 58	-23 44
1,809.00	3 57	178 78	1,807 89	-49.36	18.75	51 54	0 72	0 71	1 32
1,872 00	4.16	184 82	1,870 74	-53 59	18 60	55.71	1 14	0 94	9 59
2,031 00	4.68	183 43	2,029 27	-65 82	17 73	67 68	0 33	0 33	-0 87
2,125 00	4 51	183.11	2,122 97	-73 33	17 30	75.06	0.18	-0 18	-0 34
2,219 00	4.24	177 37	2,216 70	-80 50	17 26	82.14	0.55	-0 29	-6 11
2,312 00	4 10	175 69	2,309 45	-87 24	17.67	88.88	0 20	-0 15	-1 81
2,408 00	3 95	176 08	2,405 21	-93 97	18 15	95.60	0 16	-0 16	0 41
2,503 00	3.55	178 89	2,500.01	-100 17	18 43	101 78	0.46	-0 42	2 96
2,599 00	3 62	175 91	2,595 82	-106 17	18.70	107.75	0 21	0 07	-3 10
2,694 00	3.99	173 25	2,690 61	-112 44	19 31	114 05	0 43	0 39	-2 80
2,789.00	3 78	173 71	2,785 39	-118 83	20 04	120 48	0.22	-0 22	0 48
2,884 00	4 21	172 06	2,880 16	-125.40	20 86	127 10	0 47	0 45	-1 74
2,980.00	4 31	173 92	2,975 90	-132 48	21 73	134 23	0 18	0 10	1 94
3,075 00	4 14	173 49	3,070 64	-139 43	22 50	141 22	0.18	-0 18	-0 45
3,168 00	4 53	169 38	3,163.37	-146 38	23 56	148 25	0.54	0 42	-4.42
3,264 00	4 58	169 79	3,259 07	-153 88	24 93	155 86	0 06	0 05	0.43
3,346 00	4 58	170 20	3,340 81	-160.33	26 07	162 41	0 04	0 00	0 50
3,360 00	4 68	172 73	3,354.76	-161 44	26 24	163 54	1 62	0.71	18 07
3,455 00	4.76	172.17	3,449 44	-169 19	27 27	171.36	0 10	0 08	-0 59
3,551 00	4 80	173 49	3,545.11	-177 13	28 27	179 35	0 12	0 04	1.38
3,646 00	4 54	171 38	3,639 79	-184 80	29 28	187 09	0 33	-0.27	-2 22
3,741 00	4.47	170.57	3,734 50	-192 16	30 45	194 55	0 10	-0 07	-0 85
3,837 00	4.41	170 32	3,830 21	-199 49	31 68	201 98	0 07	-0.06	-0 26
3,932 00	4 53	170 01	3,924 92	-206.79	32 95	209 38	0 13	0 13	-0 33
4,027.00	3 95	174 36	4,019 66	-213 74	33 92	216 40	0.70	-0 61	4 58
4,123 00	3 87	178 71	4,115 44	-220 27	34 32	222 92	0 32	-0 08	4 53
4,218 00	3 97	177.85	4,210.21	-226 76	34.51	229 37	0.12	0 11	-0.91
4,313 00	3.93	180.99	4,304 99	-233 30	34 58	235 85	0.23	-0 04	3.31
4,408 00	3 77	173 66	4,399 78	-239 66	34 87	242.18	0.54	-0 17	-7 72
4,503 00	3 81	174.60	4,494 57	-245 91	35 51	248 46	0 08	0 04	0 99
4,598 00	3 66	176 83	4,589.37	-252 08	35 98	254.63	0.22	-0 16	2 35
4,693 00	3 73	179.49	4,684 17	-258 19	36 17	260.71	0 19	0 07	2 80
4,789 00	3 78	169 47	4,779 96	-264 43	36 78	266 97	0 68	0 05	-10 44



Scientific Drilling
Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAN27 NME)
Site: Yale State #18
Well: Yale State #18
Wellbore: OH
Design: Actual

Local Co-ordinate Reference:
TVD Reference: KB Elev (12') @ 3767.00usft (Basic #35)
MD Reference: KB Elev (12') @ 3767.00usft (Basic #35)
North Reference: Gnd
Survey Calculation Method: Minimum Curvature
Database: EDM-Julio

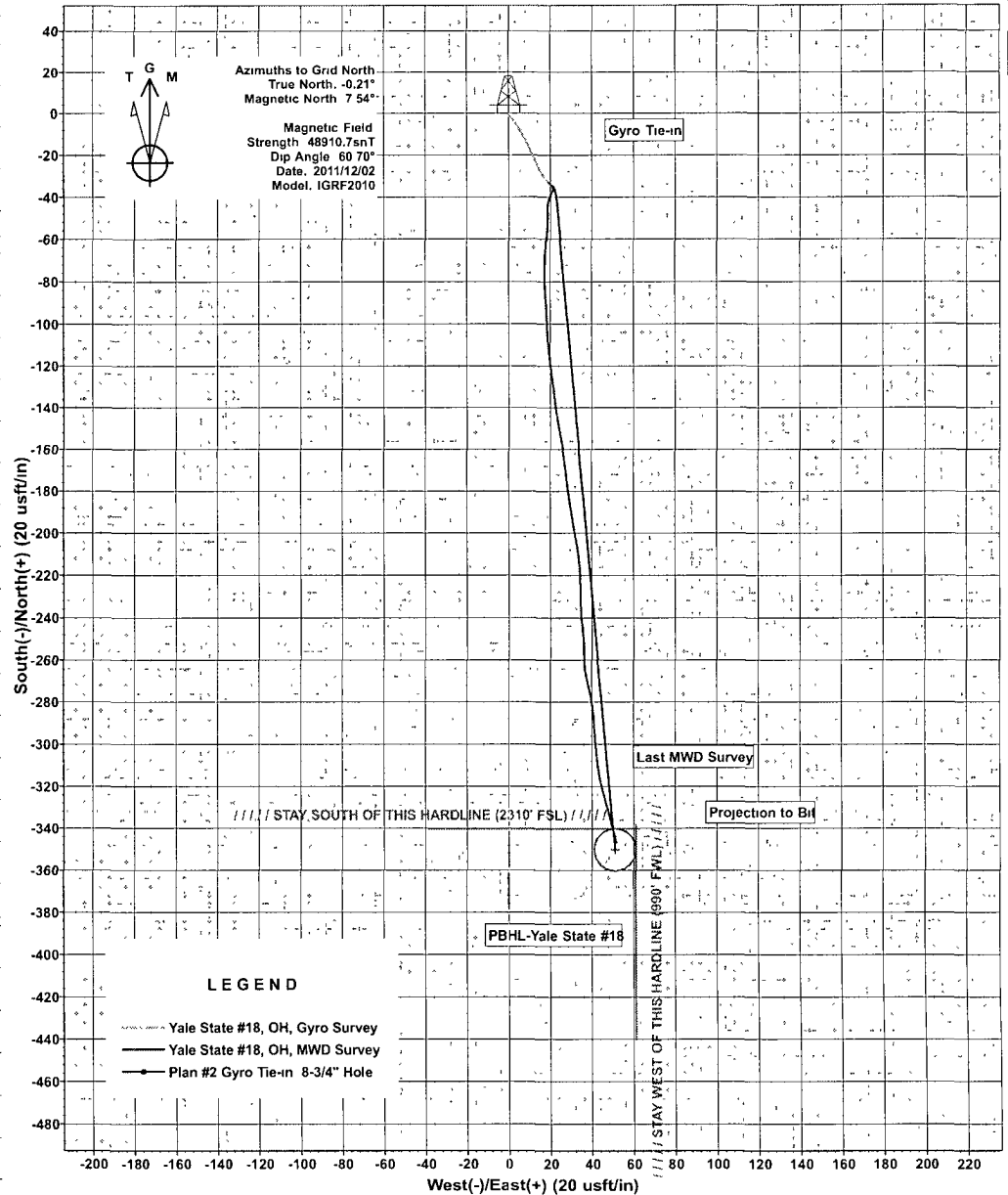
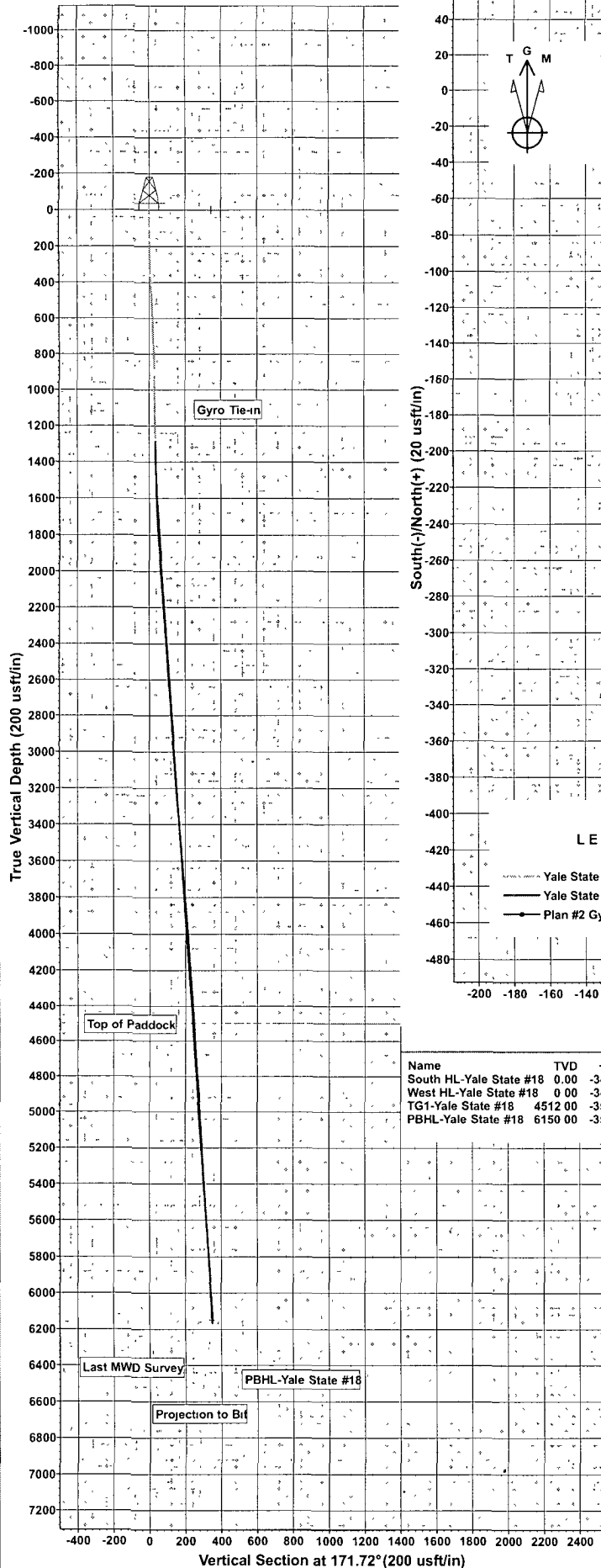
Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,884.00	3.80	168.18	4,874.76	-270.59	37.99	273.24	0.09	0.02	-1.36
4,979.00	3.77	167.75	4,969.55	-276.72	39.30	279.50	0.04	-0.03	-0.45
5,074.00	3.53	172.72	5,064.36	-282.68	40.34	285.54	0.42	-0.25	5.23
5,169.00	3.44	175.78	5,159.18	-288.42	40.92	291.30	0.22	-0.09	3.22
5,263.00	3.40	178.19	5,253.01	-294.02	41.21	296.89	0.16	-0.04	2.56
5,359.00	3.42	172.61	5,348.84	-299.70	41.67	302.58	0.35	0.02	-5.81
5,454.00	3.49	174.74	5,443.67	-305.39	42.30	308.30	0.15	0.07	2.24
5,550.00	3.24	173.47	5,539.51	-311.00	42.88	313.93	0.27	-0.26	-1.32
5,645.00	3.58	166.92	5,634.34	-316.55	43.85	319.57	0.54	0.36	-6.89
5,739.00	3.52	165.90	5,728.16	-322.21	45.22	325.36	0.09	-0.06	-1.09
5,834.00	3.54	165.03	5,822.98	-327.87	46.69	331.18	0.06	0.02	-0.92
5,929.00	3.35	164.01	5,917.80	-333.37	48.21	336.84	0.21	-0.20	-1.07
6,024.00	3.27	167.24	6,012.65	-338.68	49.57	342.29	0.21	-0.08	3.40
6,130.00	3.04	165.77	6,118.49	-344.36	50.93	348.10	0.23	-0.22	-1.39
Last MWD Survey									
6,180.00	3.04	165.77	6,168.42	-346.93	51.58	350.74	0.00	0.00	0.00
Projection to Bit									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment
6,130.00	6,118.49	-344.36	50.93	Last MWD Survey
6,180.00	6,168.42	-346.93	51.58	Projection to Bit

Checked By _____ Approved By _____ Date _____



Scientific Drilling for COG Operating LLC
Site: Eddy County, NM (NAN27 NME)
Well: Yale State #18
Wellbore: OH
Design: Plan #2 Gyro Tie-in 8-3/4" Hole



LEGEND

- Yale State #18, OH, Gyro Survey
- Yale State #18, OH, MWD Survey
- Plan #2 Gyro Tie-in 8-3/4" Hole

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
South HL-Yale State #18	0.00	-340.30	61.00	677704.10	618493.10	32°51'44.988 N	103°56'50.771 W	Rectangle (Sides: L0.00 W100.00)
West HL-Yale State #18	0.00	-340.30	61.00	677704.10	618493.10	32°51'44.988 N	103°56'50.771 W	Rectangle (Sides: L100.00 W0.00)
TG1-Yale State #18	4512.00	-350.30	51.00	677694.10	618483.10	32°51'44.889 N	103°56'50.888 W	Point
PBHL-Yale State #18	6150.00	-350.30	51.00	677694.10	618483.10	32°51'44.889 N	103°56'50.888 W	Circle (Radius: 10.00)

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Target
1	1290.00	1.14	133.83	1289.24	-33.19	19.25	0.00	0.00	35.62	
2	1450.00	1.14	133.83	1449.21	-35.39	21.54	0.00	0.00	38.13	
3	1606.50	3.90	174.84	1605.55	-41.77	23.14	2.00	54.82	44.67	
4	6161.50	3.90	174.84	6150.00	-350.30	51.00	0.00	0.00	353.99	PBHL-Yale State #18

WELL DETAILS: Yale State #18

+N/-S	+E/-W	Ground Level	3755.00
0.00	0.00	Northing	678044.40
		Easting	618432.10
		Latitude	32°51'48.357 N
		Longitude	103°56'51.471 W

PROJECT DETAILS: Eddy County, NM (NAN27 NME) Plan: Plan #2 Gyro Tie-in 8-3/4" Hole (Yale State #18/OH)

Geodetic System	US State Plane 1927 (Exact solution)	Created By:	Julio Pina	Date:	02-Dec-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				