

Results of Directional Survey

API number:	30-025-39607		
OGRID:		Operator:	COG OPERATING LLC
		Property:	BC FEDERAL # 34

surface	ULSTR:	D	19	T 17S	R 32E
				990 FNL	1190 FWL

BH Loc	ULSTR:	D	19	T 17S	R 32E
6945	MD	6936.0	TVD	979 FNL	980 FWL

Top Perf/OH	ULSTR:	D	19	T 17S	R 32E
5270	MD	5261.4	TVD	1199 FNL	1400 FWL

Bot Perf/OH	ULSTR:	D	19	T 17S	R 32E
6630	MD	6621.0	TVD	979 FNL	980 FWL

	MD	N/S	E/W	VD
	5217	-207.86	208.20	5208.44
TOP PERFS/OH	5270	-209.20	209.52	5261.41
	5279	-209.43	209.74	5270.41
	5388	10.90	-210.29	
BOT PERFS/OH	6630	10.90	-210.29	6621.00
	6630	10.90	-210.29	

NEXT TO LAST	5388	10.90	-210.29	
LAST READING	6945	10.90	-210.29	
TD	6945	10.90	-210.29	6936.00

Surface Location	990	FN	1190	FW
Projected BHL	979	FN	980	FW
Location of				
Top Perfs/OH	1199	FN	1400	FW
Bottom Perfs/OH	979	FN	980	FW

SUMMARY of Subsurface Locations

Surface Location	D-19-17S-32E	990	FN	1190	FW	Vert. Depth
Top Perfs/OH	D-19-17S-32E	1199	FN	1400	FW	5261.41
Bottom Perfs/OH	D-19-17S-32E	979	FN	980	FW	6621.00
Projected TD	D-19-17S-32E	979	FN	980	FW	6936.00



COG Operating LLC

Lea County, NM (NAD27 NME)

BC Federal #34

BC Federal #34

OH

Design: Actual

Standard Survey Report

21 May, 2010

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HOBBSOCD

SUR: D-19-17s-32e, 990/N & 1190/W

BHL: D-19-17s-32e, 979/N & 980/W

API # 30-025-39607



Scientific Drilling
Directional Drilling Operations



Scientific Drilling
Survey Report



Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Site: BC Federal #34
Well: BC Federal #34
Wellbore: OH
Design: Actual

Local Co-ordinate Reference: Well BC Federal #34
TVD Reference: RKB Elev (12') @ 3954 00ft (Silver Oak #1)
MD Reference: RKB Elev (12') @ 3954 00ft (Silver Oak #1)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000 1 Single User Db

Project: Lea County, NM (NAD27 NME)

Map System: US State Plane 1927 (Exact solution)
Geo Datum: NAD 1927 (NADCON CONUS)
Map Zone: New Mexico East 3001

System Datum: Mean Sea Level

Site: BC Federal #34

Site Position: Northing: 664,093 90 ft Latitude: 32° 49' 28 515 N
From: Map Easting: 660,729 30 ft Longitude: 103° 48' 36 394 W
Position Uncertainty: 0 00 ft Slot Radius: 0 " Grid Convergence: 0 28 °

Well: BC Federal #34

Well Position: +N/-S 0 00 ft Northing: 664,093 90 ft Latitude: 32° 49' 28 515 N
+E/-W 0 00 ft Easting: 660,729 30 ft Longitude: 103° 48' 36 394 W
Position Uncertainty: 0 00 ft Wellhead Elevation: ft Ground Level: 3,942 00 ft

Wellbore: OH

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF200510	2010/05/18	7 86	60 75	49,088

Design: Actual

Audit Notes:

Version: 1 0 Phase: ACTUAL Tie On Depth: 0 00

Vertical Section: Depth From (TVD) (ft) +N/-S (ft) +E/-W (ft) Direction (°)
0 00 0 00 0 00 272 56

Survey Program: Date: 2010/05/21

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
100 00	2,060 00	Gyro Survey (OH)	Keeper	Standard Wireline Keeper ver 1 0 2
2 180 00	5,388 00	MWD Survey (OH)	MWD	MWD - Standard

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)
0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
100 00	0 37	320 83	100 00	0 25	-0 20	0 21	0 37	0 37	0 00
200 00	0 68	4 29	200 00	1 09	-0 36	0 41	0 48	0 31	43 46
300 00	0 77	341 37	299 99	2 32	-0 53	0 64	0 30	0 09	-22 92
400 00	0 75	353 74	399 98	3 61	-0 82	0 98	0 16	-0 02	12 37
500 00	0 89	0 76	499 97	5 04	-0 88	1 10	0 17	0 14	7 02
600 00	1 17	337 23	599 95	6 75	-1 27	1 57	0 50	0 28	-23 53
700 00	1 04	322 42	699 93	8 41	-2 21	2 59	0 31	-0 13	-14 81
800 00	0 76	319 69	799 92	9 64	-3 20	3 62	0 28	-0 28	-2 73
900 00	0 79	324 26	899 91	10 70	-4 03	4 50	0 07	0 03	4 57



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Design: Actual

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MD Reference: RKB Elev (12') @ 3954.00ft (Silver Oak #1)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000 1 Single User.Db

Survey

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)
1,000.00	0.87	326.95	999.90	11.90	-4.85	5.37	0.09	0.08	2.69
1,100.00	0.93	324.70	1,099.89	13.20	-5.73	6.31	0.07	0.06	-2.25
1,200.00	0.93	327.86	1,199.88	14.55	-6.63	7.27	0.05	0.00	3.16
1,300.00	1.17	340.55	1,299.86	16.20	-7.40	8.12	0.33	0.24	12.69
1,400.00	0.96	328.65	1,399.84	17.88	-8.18	8.97	0.30	-0.21	-11.90
1,500.00	1.17	342.31	1,499.83	19.56	-8.92	9.79	0.33	0.21	13.66
1,600.00	1.29	14.04	1,599.80	21.63	-8.96	9.92	0.68	0.12	31.73
1,700.00	1.65	21.11	1,699.77	24.06	-8.17	9.23	0.40	0.36	7.07
1,800.00	2.05	36.16	1,799.72	26.85	-6.59	7.79	0.63	0.40	15.05
1,900.00	1.91	40.68	1,899.66	29.56	-4.45	5.77	0.21	-0.14	4.52
2,000.00	1.76	33.59	1,999.61	32.10	-2.52	3.95	0.27	-0.15	-7.09
2,060.00	1.85	35.05	2,059.58	33.66	-1.45	2.95	0.17	0.15	2.43
Gyro Tie-in									
2,180.00	1.68	33.34	2,179.52	36.72	0.63	1.01	0.15	-0.14	-1.43
2,243.00	1.42	347.40	2,242.50	38.25	0.97	0.74	1.96	-0.41	-72.92
2,305.00	1.19	323.37	2,304.49	39.52	0.41	1.35	0.95	-0.37	-38.76
2,368.00	1.55	301.27	2,367.47	40.48	-0.70	2.51	1.00	0.57	-35.08
2,431.00	2.42	272.63	2,430.43	40.99	-2.76	4.59	2.05	1.38	-45.46
2,493.00	3.41	266.03	2,492.35	40.92	-5.91	7.73	1.68	1.60	-10.65
2,556.00	4.15	265.91	2,555.21	40.63	-10.05	11.86	1.17	1.17	-0.19
2,650.00	4.19	265.52	2,648.96	40.12	-16.87	18.64	0.05	0.04	-0.41
2,744.00	3.42	267.46	2,742.76	39.72	-23.09	24.84	0.83	-0.82	2.06
2,807.00	3.95	257.03	2,805.63	39.15	-27.08	28.81	1.35	0.84	-16.56
2,902.00	3.58	256.34	2,900.42	37.72	-33.16	34.81	0.39	-0.39	-0.73
3,027.00	4.27	258.76	3,025.13	35.89	-41.51	43.07	0.57	0.55	1.94
3,121.00	3.71	264.28	3,118.90	34.91	-47.97	49.48	0.72	-0.60	5.87
3,215.00	4.44	258.89	3,212.66	33.90	-54.57	56.03	0.88	0.78	-5.73
3,309.00	5.23	252.23	3,306.33	31.89	-62.22	63.58	1.03	0.84	-7.09
3,402.00	5.11	253.06	3,398.95	29.39	-70.22	71.46	0.15	-0.13	0.89
3,496.00	4.68	252.71	3,492.60	27.03	-77.88	79.01	0.46	-0.46	-0.37
3,590.00	4.70	254.63	3,586.29	24.87	-85.26	86.28	0.17	0.02	2.04
3,683.00	4.07	253.75	3,679.02	22.94	-92.10	93.03	0.68	-0.68	-0.95
3,777.00	4.98	257.95	3,772.72	21.15	-99.29	100.14	1.03	0.97	4.47
3,871.00	4.40	256.76	3,866.41	19.48	-106.79	107.56	0.63	-0.62	-1.27
3,965.00	4.00	260.33	3,960.16	18.10	-113.53	114.23	0.51	-0.43	3.80
4,059.00	3.77	257.85	4,053.94	16.90	-119.79	120.42	0.30	-0.24	-2.64
4,152.00	4.98	260.99	4,146.67	15.62	-126.76	127.33	1.33	1.30	3.38
4,247.00	5.13	266.04	4,241.30	14.68	-135.07	135.59	0.49	0.16	5.32
4,341.00	5.20	266.06	4,334.92	14.10	-143.51	144.00	0.07	0.07	0.02
4,435.00	5.12	265.68	4,428.54	13.49	-151.95	152.40	0.09	-0.09	-0.40
4,529.00	5.01	266.95	4,522.17	12.96	-160.23	160.65	0.17	-0.12	1.35
4,623.00	4.86	266.07	4,615.82	12.47	-168.30	168.69	0.18	-0.16	-0.94
4,717.00	5.18	266.98	4,709.46	11.97	-176.51	176.87	0.35	0.34	0.97



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Design: Actual

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MD Reference: RKB Elev (12') @ 3954' 00ft (Silver Oak #1)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000 1 Single User Db

Survey

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)
4,811.00	3.63	272.47	4,803.18	11.87	-183.72	184.07	1.71	-1.65	5.84
4,904.00	3.75	272.48	4,895.99	12.13	-189.70	190.05	0.13	0.13	0.01
4,998.00	3.84	275.98	4,989.78	12.59	-195.90	196.27	0.26	0.10	3.72
5,092.00	3.62	273.43	5,083.58	13.10	-201.99	202.38	0.29	-0.23	-2.71
5,154.00	2.68	264.82	5,145.49	13.09	-205.39	205.77	1.69	-1.52	-13.89
5,217.00	2.04	242.81	5,208.44	12.44	-207.86	208.20	1.74	-1.02	-34.94
5,279.00	1.22	244.12	5,270.41	11.65	-209.43	209.74	1.32	-1.32	2.11
5,342.00	0.39	209.17	5,333.40	11.17	-210.14	210.43	1.47	-1.32	-55.48
MWD Survey									
5,388.00	0.39	209.42	5,379.40	10.90	-210.29	210.57	0.00	0.00	0.54
Projection to bit									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	+E/-W (ft)	Comment
2,060.00	2,059.58	33.66	-1.45	Gyro Tie-in
5,342.00	5,333.40	11.17	-210.14	MWD Survey
5,388.00	5,379.40	10.90	-210.29	Projection to bit

Checked By _____ Approved By: _____ Date: _____