



30-015-38145

COG Operating LLC

Eddy County, NM (NAN27 NME)

Miranda Federal #19H

Miranda Federal #19H

OH

Design: Actual

Standard Survey Report

04 October, 2010



Scientific Drilling
Directional Drilling Operations



Scientific Drilling Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Miranda Federal #19H
Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev (12') @ 3711.20usft (Silver Oak #1)
Site:	Miranda Federal #19H	MD Reference:	KB Elev (12') @ 3711.20usft (Silver Oak #1)
Well:	Miranda Federal #19H	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:	Miranda Federal #19H				
Site Position:		Northing:	675,225.40 usft	Latitude:	32° 51' 20.802 N
From:	Map	Easting:	608,626.40 usft	Longitude:	103° 58' 46.545 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.19 °

Well:	Miranda Federal #19H					
Well Position	+N/-S	0.00 usft	Northing:	675,225.40 usft	Latitude:	32° 51' 20.802 N
	+E/-W	0.00 usft	Easting:	608,626.40 usft	Longitude:	103° 58' 46.545 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	3,699.20 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	BGGM2010	2010/09/21	7.97	60.73	49,060

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	93.78	

Survey Program		Date	2010/10/01	
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.00	1,296.00	Gyro Survey (OH)	Keeper	Standard Wireline Keeper ver 1.0.2
1,438.00	7,496.00	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	0.13	99.60	100.00	-0.02	0.11	0.11	0.13	0.13	0.00
	200.00	0.58	102.20	200.00	-0.14	0.72	0.73	0.45	0.45	2.60
	300.00	0.74	101.89	299.99	-0.38	1.85	1.87	0.16	0.16	-0.31
	400.00	1.06	106.18	399.98	-0.78	3.37	3.41	0.33	0.32	4.29
	500.00	1.19	95.07	499.96	-1.13	5.29	5.35	0.25	0.13	-11.11
	600.00	1.01	90.44	599.94	-1.22	7.20	7.27	0.20	-0.18	-4.63
	700.00	0.86	95.64	699.93	-1.30	8.83	8.90	0.17	-0.15	5.20
	800.00	0.95	84.30	799.92	-1.30	10.40	10.47	0.20	0.09	-11.34
	900.00	0.85	88.35	899.90	-1.19	11.97	12.02	0.12	-0.10	4.05



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Site: Miranda Federal #19H
Well: Miranda Federal #19H
Wellbore: OH
Design: Actual

Local Co-ordinate Reference: Site Miranda Federal #19H
TVD Reference: KB Elev (12') @ 3711.20usft (Silver Oak #1)
MD Reference: KB Elev (12') @ 3711.20usft (Silver Oak #1)
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)
1,000.00	1.47	79.60	999.88	-0.94	13.97	14.00	0.64	0.62	-8.75
1,100.00	1.62	76.40	1,099.85	-0.38	16.61	16.60	0.17	0.15	-3.20
1,200.00	1.25	96.11	1,199.81	-0.16	19.07	19.04	0.61	-0.37	19.71
1,296.00	1.34	104.74	1,295.79	-0.56	21.19	21.18	0.22	0.09	8.99
Gyro tie-in									
1,438.00	0.95	110.87	1,437.76	-1.40	23.90	23.94	0.29	-0.27	4.32
1,470.00	1.11	111.41	1,469.76	-1.61	24.44	24.49	0.50	0.50	1.69
1,563.00	1.76	146.40	1,562.73	-3.12	26.06	26.21	1.14	0.70	37.62
1,657.00	2.91	169.28	1,656.65	-6.67	27.31	27.69	1.55	1.22	24.34
1,751.00	4.68	185.81	1,750.44	-12.83	27.36	28.15	2.19	1.88	17.59
1,845.00	4.81	188.91	1,844.12	-20.54	26.36	27.66	0.31	0.14	3.30
1,939.00	5.03	183.44	1,937.78	-28.55	25.51	27.33	0.55	0.23	-5.82
2,034.00	5.45	181.50	2,032.38	-37.21	25.14	27.54	0.48	0.44	-2.04
2,128.00	5.42	181.60	2,125.96	-46.11	24.90	27.88	0.03	-0.03	0.11
2,222.00	5.36	184.30	2,219.54	-54.93	24.44	28.01	0.28	-0.06	2.87
2,315.00	5.13	178.20	2,312.15	-63.42	24.25	28.38	0.65	-0.25	-6.56
2,409.00	4.85	179.60	2,405.80	-71.59	24.41	29.08	0.32	-0.30	1.49
2,503.00	4.76	181.20	2,499.47	-79.46	24.36	29.54	0.17	-0.10	1.70
2,597.00	4.45	185.95	2,593.16	-86.99	23.90	29.58	0.52	-0.33	5.05
2,691.00	4.60	188.74	2,686.87	-94.34	22.95	29.11	0.28	0.16	2.97
2,786.00	5.15	179.21	2,781.53	-102.37	22.42	29.13	1.03	0.58	-10.03
2,879.00	5.56	179.45	2,874.12	-111.05	22.53	29.80	0.44	0.44	0.26
2,973.00	5.86	180.25	2,967.65	-120.40	22.55	30.44	0.33	0.32	0.85
3,067.00	6.41	182.05	3,061.12	-130.44	22.34	30.89	0.62	0.59	1.91
3,160.00	5.89	179.18	3,153.58	-140.40	22.22	31.43	0.65	-0.56	-3.09
3,255.00	6.05	178.27	3,248.06	-150.28	22.44	32.30	0.20	0.17	-0.96
3,349.00	5.01	171.39	3,341.63	-159.29	23.21	33.66	1.31	-1.11	-7.32
3,442.00	5.04	175.88	3,434.27	-167.38	24.11	35.09	0.42	0.03	4.83
3,536.00	4.83	179.75	3,527.92	-175.46	24.42	35.94	0.42	-0.22	4.12
3,630.00	4.03	175.36	3,621.64	-182.71	24.71	36.70	0.92	-0.85	-4.67
3,723.00	4.25	176.02	3,714.40	-189.40	25.21	37.64	0.24	0.24	0.71
3,817.00	4.75	178.59	3,808.11	-196.77	25.55	38.46	0.57	0.53	2.73
3,911.00	5.21	183.27	3,901.75	-204.92	25.40	38.85	0.65	0.49	4.98
4,005.00	5.50	186.05	3,995.34	-213.66	24.68	38.71	0.41	0.31	2.96
4,058.00	5.69	180.50	4,048.09	-218.81	24.39	38.76	1.08	0.36	-10.47
4,090.00	7.48	164.10	4,079.88	-222.40	24.95	39.56	8.06	5.59	-51.25
4,121.00	10.57	154.37	4,110.50	-226.91	26.73	41.63	11.08	9.97	-31.39
4,153.00	13.28	145.93	4,141.80	-232.60	30.06	45.33	10.05	8.47	-26.38
4,185.00	15.82	136.74	4,172.78	-238.82	35.11	50.78	10.70	7.94	-28.72
4,217.00	18.15	128.46	4,203.39	-245.10	42.00	58.07	10.48	7.28	-25.88
4,249.00	20.54	120.27	4,233.58	-251.03	50.76	67.20	11.28	7.47	-25.59
4,281.00	23.01	113.87	4,263.30	-256.40	61.33	78.10	10.70	7.72	-20.00
4,312.00	25.19	106.80	4,291.60	-260.76	73.19	90.22	11.66	7.03	-22.81



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Survey

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4,343.00	26.92	100.08	4,319.46	-263.89	86.42	103.63	11.03	5.58	-21.68
4,375.00	29.19	94.79	4,347.70	-265.81	101.33	118.63	10.52	7.09	-16.53
4,407.00	31.35	91.64	4,375.34	-266.70	117.43	134.76	8.38	6.75	-9.84
4,438.00	34.08	91.83	4,401.42	-267.21	134.18	151.50	8.81	8.81	0.61
4,470.00	36.98	92.75	4,427.46	-267.96	152.75	170.09	9.21	9.06	2.88
4,502.00	39.93	93.62	4,452.51	-269.07	172.62	189.98	9.37	9.22	2.72
4,594.00	52.49	91.66	4,516.06	-272.00	238.83	256.24	13.74	13.65	-2.13
4,626.00	58.01	89.18	4,534.29	-272.18	265.11	282.48	18.39	17.25	-7.75
4,658.00	61.42	88.74	4,550.43	-271.67	292.73	310.01	10.72	10.66	-1.38
4,690.00	63.94	88.68	4,565.11	-271.03	321.15	338.32	7.88	7.88	-0.19
4,721.00	67.37	89.53	4,577.89	-270.59	349.39	366.47	11.34	11.06	2.74
4,753.00	70.72	89.50	4,589.33	-270.34	379.27	396.27	10.47	10.47	-0.09
4,785.00	74.06	89.45	4,599.01	-270.06	409.76	426.68	10.44	10.44	-0.16
4,817.00	77.14	89.00	4,606.97	-269.64	440.75	457.57	9.72	9.63	-1.41
4,849.00	78.64	89.00	4,613.68	-269.10	472.03	488.75	4.69	4.69	0.00
4,880.00	78.95	89.00	4,619.70	-268.56	502.44	519.05	1.00	1.00	0.00
4,912.00	81.67	89.90	4,625.09	-268.26	533.98	550.50	8.94	8.50	2.81
4,944.00	84.85	90.26	4,628.85	-268.31	565.75	582.21	10.00	9.94	1.13
4,976.00	88.15	90.41	4,630.80	-268.49	597.69	614.09	10.32	10.31	0.47
5,008.00	88.08	90.25	4,631.85	-268.68	629.67	646.01	0.55	-0.22	-0.50
5,103.00	87.11	90.57	4,635.84	-269.36	724.58	740.76	1.08	-1.02	0.34
5,198.00	88.42	88.72	4,639.54	-268.77	819.50	835.44	2.38	1.38	-1.95
5,294.00	88.18	90.04	4,642.39	-267.73	915.45	931.11	1.40	-0.25	1.38
5,389.00	87.78	88.97	4,645.74	-266.91	1,010.39	1,025.78	1.20	-0.42	-1.13
5,484.00	87.38	88.94	4,649.75	-265.18	1,105.29	1,120.36	0.42	-0.42	-0.03
5,580.00	86.46	89.36	4,654.91	-263.76	1,201.14	1,215.91	1.05	-0.96	0.44
5,675.00	87.51	87.67	4,659.91	-261.30	1,295.97	1,310.37	2.09	1.11	-1.78
5,770.00	87.10	87.65	4,664.37	-257.42	1,390.78	1,404.73	0.43	-0.43	-0.02
5,865.00	88.86	86.97	4,667.72	-252.97	1,485.61	1,499.06	1.99	1.85	-0.72
5,960.00	89.66	88.68	4,668.95	-249.36	1,580.53	1,593.54	1.99	0.84	1.80
6,056.00	90.37	89.46	4,668.92	-247.80	1,676.52	1,689.21	1.10	0.74	0.81
6,152.00	89.36	88.94	4,669.15	-246.46	1,772.51	1,784.90	1.18	-1.05	-0.54
6,247.00	88.69	88.73	4,670.77	-244.53	1,867.48	1,879.53	0.74	-0.71	-0.22
6,342.00	87.85	88.04	4,673.63	-241.86	1,962.39	1,974.07	1.14	-0.88	-0.73
6,437.00	86.94	89.74	4,677.95	-240.02	2,057.27	2,068.62	2.03	-0.96	1.79
6,532.00	87.05	89.22	4,682.93	-239.16	2,152.14	2,163.22	0.56	0.12	-0.55
6,628.00	86.68	88.32	4,688.18	-237.10	2,247.97	2,258.71	1.01	-0.39	-0.94
6,723.00	85.60	87.48	4,694.58	-233.63	2,342.69	2,352.99	1.44	-1.14	-0.88
6,819.00	88.22	88.06	4,699.75	-229.90	2,438.47	2,448.32	2.80	2.73	0.60
6,914.00	87.62	89.65	4,703.20	-228.00	2,533.38	2,542.90	1.79	-0.63	1.67
7,009.00	88.18	89.64	4,706.68	-227.41	2,628.32	2,637.59	0.59	0.59	-0.01
7,104.00	88.18	89.64	4,709.70	-226.82	2,723.27	2,732.30	0.00	0.00	0.00
7,200.00	88.66	89.98	4,712.35	-226.50	2,819.23	2,828.03	0.61	0.50	0.35



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Survey Report



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Well: Miranda Federal #19H
Wellbore: OH
Design: Actual

Local Co-ordinate Reference: Site Miranda Federal #19H
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MD Reference: KB Elev (12') @ 3711.20usft (Silver Oak #1)
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)
7,294.00	87.95	89.84	4,715.13	-226.35	2,913.19	2,921.77	0.77	-0.76	-0.15
7,389.00	87.20	90.15	4,719.15	-226.34	3,008.10	3,016.48	0.85	-0.79	0.33
Last MWD Survey									
7,496.00	87.20	90.15	4,724.37	-226.62	3,114.97	3,123.14	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
1,296.00	1,295.79	-0.56	21.19	Gyro tie-in
7,389.00	4,719.15	-226.34	3,008.10	Last MWD Survey
7,496.00	4,724.37	-226.62	3,114.97	Projection to Bit

Checked By: _____ Approved By: _____ Date: _____