

Results of Directional Survey

API number:	30-005-29120		
OGRID:		Operator:	COG OPERATING LLC
		Property:	LEO 3 FEDERAL COM # 2H

surface	ULSTR:	I	03	T	15S	R	31E
				1980	FSL	430	FEL

BH Loc	ULSTR:	L	03	T	15S	R	31E
13020	MD	8718.9	TVD	1906	FSL	348	FWL
						4932	FEL

Top Perf/OH	ULSTR:	I	03	T	15S	R	31E
8929	MD	8708.6	TVD	1997	FSL	845	FEL

Bot Perf/OH	ULSTR:	L	03	T	15S	R	31E
13020	MD	8718.9	TVD	1906	FSL	348	FWL
						4932	FEL

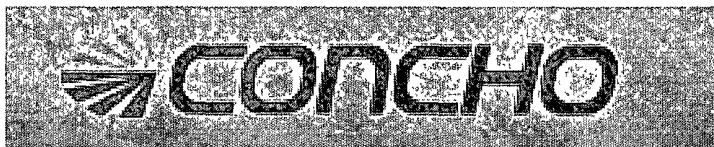
	MD	N/S	E/W	VD
	8926	17.05	-411.76	8708.08
TOP PERFS/OH	8929	17.06	-414.71	8708.60
	8958	17.13	-443.26	8713.66
	12966	-70.40	-4447.99	8719.61
BOT PERFS/OH	13020	-74.44	-4501.84	8718.86
	13020	-74.44	-4501.84	8718.86

NEXT TO LAST	12966	-70.40	-4447.99	8719.61
LAST READING	13020	-74.44	-4501.84	8718.86
TD	13020	-74.44	-4501.84	8718.86

Surface Location	1980	FS	430	FE
Projected BHL	1906	FS	4932	FE
Location of				
Top Perfs/OH	1997	FS	845	FE
Bottom Perfs/OH	1906	FS	4932	FE

SUMMARY of Subsurface Locations

Surface Location	I-03-15S-31E	1980	FS	430	FE	Vert. Depth
Top Perfs/OH	I-03-15S-31E	1997	FS	845	FE	8708.60
Bottom Perfs/OH	L-03-15S-31E	1906	FS	4932	FE	8718.86
Projected TD	L-03-15S-31E	1906	FS	4932	FE	8718.86



HOBBS OCD

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COG Operating, LLC

Chaves County, NM

Leo 3 Federal Com #2H

Leo # Federal Com #2H

Lateral #1

Survey: MWD Survey #1

Standard Survey Report

01 June, 2012

SUR: I-03-15s-31e, 1980/S & 430/E
BHL: L-03-15s-31e, 1906/S & 4932/E
API # 30-005-29120





Black Viper Energy

Survey Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Site Leo 3 Federal Com #2H
Project:	Chaves County, NM	TVD Reference:	WELL @ 4408 00ft (Original Well Elev)
Site:	Leo 3 Federal Com #2H	MD Reference:	WELL @ 4408 00ft (Original Well Elev)
Well:	Leo # Federal Com #2H	North Reference:	Grid
Wellbore:	Lateral #1	Survey Calculation Method:	Minimum Curvature
Design:	Lateral #1	Database:	EDM 5000 1 Single User Db

Project:	Chaves County, NM		
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		Leo 3 Federal Com #2H			
Site Position:		Northing:	743,641 58 ft	Latitude:	33° 2' 33 184 N
From:	Map	Easting:	704,048 95 ft	Longitude:	103° 40' 2 878 W
Position Uncertainty:	0.00 ft	Slot Radius:	13.200 in	Grid Convergence:	0.36 °

Well	Leo # Federal Com #2H					
Well Position	+N/-S	0.00 ft	Northing:	743,641.58 ft	Latitude:	33° 2' 33 184 N
	+E/-W	0.00 ft	Easting:	704,048.95 ft	Longitude:	103° 40' 2 878 W
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	4,408.00 ft

Wellbore	Lateral #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF200510	4/30/2012	7 57	60.93	49,041

Design:	Lateral #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	7,900 00
Vertical Section:	Depth From (TVD) (ft)	N/S (ft)	E/W (ft)	Direction (°)	
	0.00	0 00	0 00	356 51	

Survey Program		Date	6/1/2012		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
100.00	7,900 00	Gyro Survey #1 (OH)	Gyro		
8,036.00	13,020 00	MWD Survey #1 (Lateral #1)	MWD		

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)
	7,900.00	0.24	115.10	7,899.32	21.11	27.78	19.38	0.00	0.00	0.00
	8,036.00	0.40	72.60	8,035.32	21.13	28.49	19.36	0.20	0.12	-31.25
	8,100.00	0.40	105.10	8,099.32	21.14	28.92	19.35	0.35	0.00	50.78
	8,164.00	0.80	210.30	8,163.32	20.70	28.91	18.90	1.54	0.63	164.38
	8,196.00	4.30	251.00	8,195.28	20.12	27.66	18.40	11.66	10.94	127.19
	8,227.00	6.60	260.80	8,226.14	19.45	24.80	17.91	7.98	7.42	31.61
	8,259.00	9.00	264.70	8,257.84	18.93	20.50	17.65	7.68	7.50	12.19
	8,291.00	11.80	269.60	8,289.31	18.67	14.73	17.74	9.17	8.75	15.31
	8,323.00	14.60	270.80	8,320.46	18.71	7.42	18.22	8.79	8.75	3.75
	8,354.00	17.50	270.40	8,350.25	18.79	-1.14	18.83	9.36	9.35	-1.29



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Site:	Leo 3 Federal Com #2H	MD Reference:	WELL @ 4408.00ft (Original Well Elev)
Well:	Leo # Federal Com #2H	North Reference:	Grid
Wellbore:	Lateral #1	Survey Calculation Method:	Minimum Curvature
Design:	Lateral #1	Database:	EDM 5000 1 Single User Db

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)
8,386.00	21.20	272.10	8,380.44	19.04	-11.74	19.72	11.69	11.56	5.31
8,418.00	24.30	273.80	8,409.95	19.69	-24.10	21.12	9.90	9.69	5.31
8,450.00	27.60	274.10	8,438.72	20.65	-38.06	22.93	10.32	10.31	0.94
8,482.00	31.60	272.60	8,466.53	21.56	-53.84	24.80	12.71	12.50	-4.69
8,514.00	35.30	271.20	8,493.23	22.14	-71.46	26.44	11.81	11.56	-4.38
8,546.00	39.10	270.30	8,518.71	22.39	-90.81	27.87	12.00	11.88	-2.81
8,578.00	43.10	269.00	8,542.82	22.25	-111.84	29.01	12.78	12.50	-4.06
8,610.00	46.90	268.40	8,565.45	21.73	-134.45	29.87	11.95	11.88	-1.88
8,641.00	50.20	268.30	8,585.97	21.06	-157.68	30.61	10.65	10.65	-0.32
8,673.01	53.30	267.70	8,605.78	20.18	-182.80	31.26	9.80	9.68	-1.87
8,705.01	55.70	267.50	8,624.36	19.09	-208.82	31.75	7.52	7.50	-0.63
8,737.01	59.50	268.20	8,641.50	18.08	-235.82	32.38	12.02	11.88	2.19
8,769.00	63.20	268.90	8,656.84	17.37	-263.88	33.38	11.72	11.56	2.19
8,801.00	66.30	269.70	8,670.49	17.02	-292.82	34.79	9.95	9.69	2.50
8,833.00	69.10	270.10	8,682.63	16.97	-322.43	36.54	8.83	8.75	1.25
8,863.00	72.30	270.00	8,692.55	16.99	-350.74	38.29	10.67	10.67	-0.33
8,895.00	76.00	270.10	8,701.29	17.02	-381.51	40.19	11.57	11.56	0.31
8,926.00	78.70	270.00	8,708.08	17.05	-411.76	42.05	8.72	8.71	-0.32
8,958.00	81.20	270.30	8,713.66	17.13	-443.26	44.05	7.87	7.81	0.94
8,990.00	81.80	270.50	8,718.39	17.35	-474.91	46.20	1.97	1.88	0.63
9,022.00	83.50	270.50	8,722.48	17.63	-506.65	48.40	5.31	5.31	0.00
9,054.00	87.00	270.30	8,725.13	17.85	-538.53	50.56	10.96	10.94	-0.63
9,086.00	88.70	270.00	8,726.33	17.93	-570.51	52.59	5.39	5.31	-0.94
9,118.00	88.30	269.90	8,727.17	17.91	-602.50	54.51	1.29	-1.25	-0.31
9,182.00	87.70	270.60	8,729.40	18.19	-666.46	58.68	1.44	-0.94	1.09
9,277.00	89.00	270.00	8,732.14	18.68	-761.41	64.95	1.51	1.37	-0.63
9,373.00	90.50	270.00	8,732.56	18.68	-857.41	70.78	1.56	1.56	0.00
9,468.00	90.80	269.70	8,731.48	18.43	-952.40	76.31	0.45	0.32	-0.32
9,564.00	90.50	269.40	8,730.39	17.68	-1,048.39	81.39	0.44	-0.31	-0.31
9,660.00	90.80	268.90	8,729.30	16.26	-1,144.37	85.81	0.61	0.31	-0.52
9,755.00	90.60	268.50	8,728.14	14.10	-1,239.34	89.43	0.47	-0.21	-0.42
9,850.00	90.60	267.60	8,727.15	10.87	-1,334.28	91.98	0.95	0.00	-0.95
9,946.00	90.80	267.30	8,725.97	6.60	-1,430.18	93.55	0.38	0.21	-0.31
10,042.00	91.70	268.30	8,723.88	2.91	-1,526.08	95.70	1.40	0.94	1.04
10,137.00	91.70	269.00	8,721.06	0.68	-1,621.01	99.24	0.74	0.00	0.74
10,233.00	91.20	268.10	8,718.63	-1.75	-1,716.95	102.65	1.07	-0.52	-0.94
10,328.00	90.20	269.30	8,717.47	-3.91	-1,811.92	106.27	1.64	-1.05	1.26
10,424.00	89.40	269.00	8,717.81	-5.33	-1,907.90	110.69	0.89	-0.83	-0.31
10,519.00	89.40	269.10	8,718.80	-6.91	-2,002.89	114.89	0.11	0.00	0.11
10,614.00	89.80	269.30	8,719.46	-8.23	-2,097.87	119.34	0.47	0.42	0.21
10,710.00	89.60	267.60	8,719.97	-10.83	-2,193.83	122.58	1.78	-0.21	-1.77
10,804.00	89.70	270.10	8,720.54	-12.72	-2,287.81	126.42	2.66	0.11	2.66
10,900.00	90.10	271.60	8,720.71	-11.29	-2,383.79	133.67	1.62	0.42	1.56



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Wellbore:	Lateral #1	Survey Calculation Method:	Minimum Curvature
Design:	Lateral #1	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)
10,995.00	89.70	271.30	8,720.88	-8.89	-2,478.76	141.85	0.53	-0.42	-0.32
11,091.00	89.30	270.50	8,721.71	-7.38	-2,574.74	149.19	0.93	-0.42	-0.83
11,186.00	89.40	270.50	8,722.79	-6.55	-2,669.73	155.79	0.11	0.11	0.00
11,281.00	89.30	270.50	8,723.87	-5.72	-2,764.72	162.40	0.11	-0.11	0.00
11,377.00	89.20	269.90	8,725.12	-5.39	-2,860.71	168.57	0.63	-0.10	-0.63
11,472.00	89.30	269.50	8,726.37	-5.88	-2,955.70	173.85	0.43	0.11	-0.42
11,568.00	89.10	269.20	8,727.71	-6.97	-3,051.69	178.59	0.38	-0.21	-0.31
11,663.00	89.50	269.00	8,728.87	-8.46	-3,146.67	182.88	0.47	0.42	-0.21
11,758.00	89.60	268.50	8,729.62	-10.54	-3,241.64	186.59	0.54	0.11	-0.53
11,854.00	90.30	268.50	8,729.70	-13.05	-3,337.61	189.91	0.73	0.73	0.00
11,950.00	90.00	267.90	8,729.45	-16.07	-3,433.56	192.74	0.70	-0.31	-0.63
12,045.00	90.00	267.50	8,729.45	-19.88	-3,528.48	194.70	0.42	0.00	-0.42
12,140.00	90.70	267.60	8,728.87	-23.94	-3,623.40	196.42	0.74	0.74	0.11
12,235.00	91.40	267.10	8,727.13	-28.33	-3,718.28	197.81	0.91	0.74	-0.53
12,330.00	90.00	266.20	8,725.97	-33.88	-3,813.10	198.03	1.75	-1.47	-0.95
12,425.00	91.10	267.50	8,725.05	-39.10	-3,907.95	198.59	1.79	1.16	1.37
12,521.00	89.90	266.90	8,724.22	-43.79	-4,003.83	199.74	1.40	-1.25	-0.63
12,616.00	90.30	267.00	8,724.05	-48.85	-4,098.70	200.46	0.43	0.42	0.11
12,712.00	90.70	266.90	8,723.21	-53.95	-4,194.56	201.19	0.43	0.42	-0.10
12,807.00	90.80	266.50	8,721.97	-59.42	-4,289.39	201.50	0.43	0.11	-0.42
12,903.00	90.90	265.90	8,720.55	-65.78	-4,385.17	200.97	0.63	0.10	-0.63
12,966.00	90.80	265.70	8,719.61	-70.40	-4,447.99	200.19	0.35	-0.16	-0.32
13,020.00	90.80	265.70	8,718.86	-74.44	-4,501.84	199.42	0.00	0.00	0.00

Survey Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
8,036.00	8,035.32	21.13	28.49	First MWD Survey
12,966.00	8,719.61	-70.40	-4,447.99	Last MWD Survey
13,020.00	8,718.86	-74.44	-4,501.84	Proj to Bit

Checked By _____	Approved By _____	Date _____
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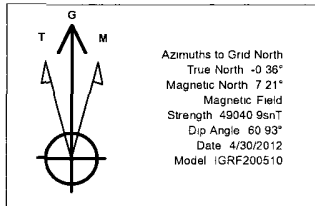


Leo 3 Federal Com #2H
Chaves County, NM
Lateral #1
1980.00 FSL
-430.00 FEL



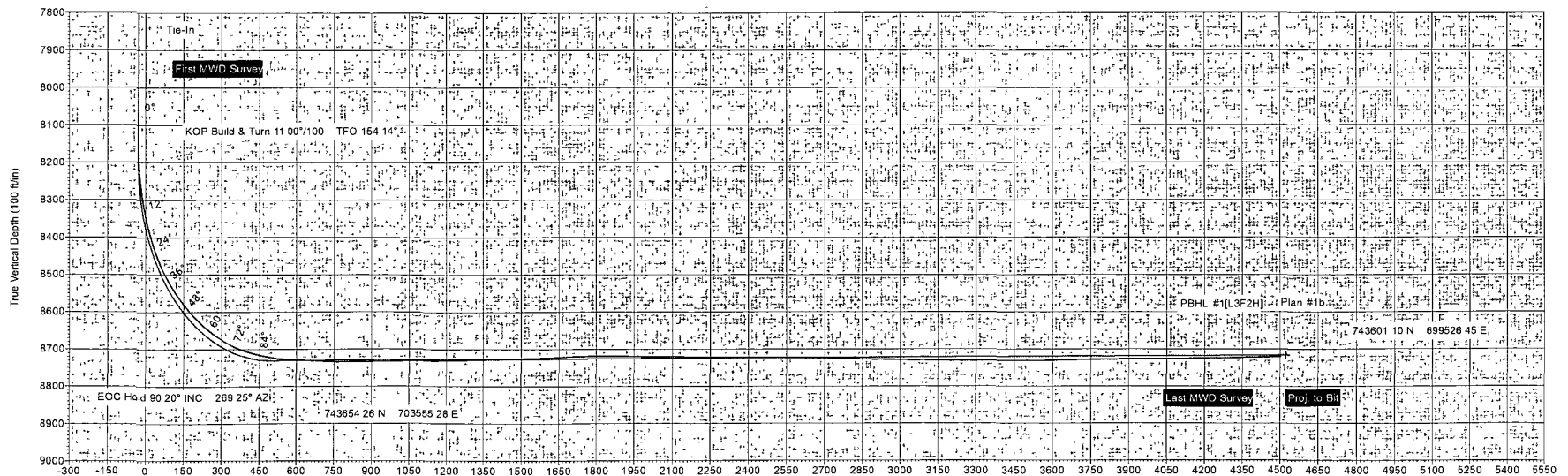
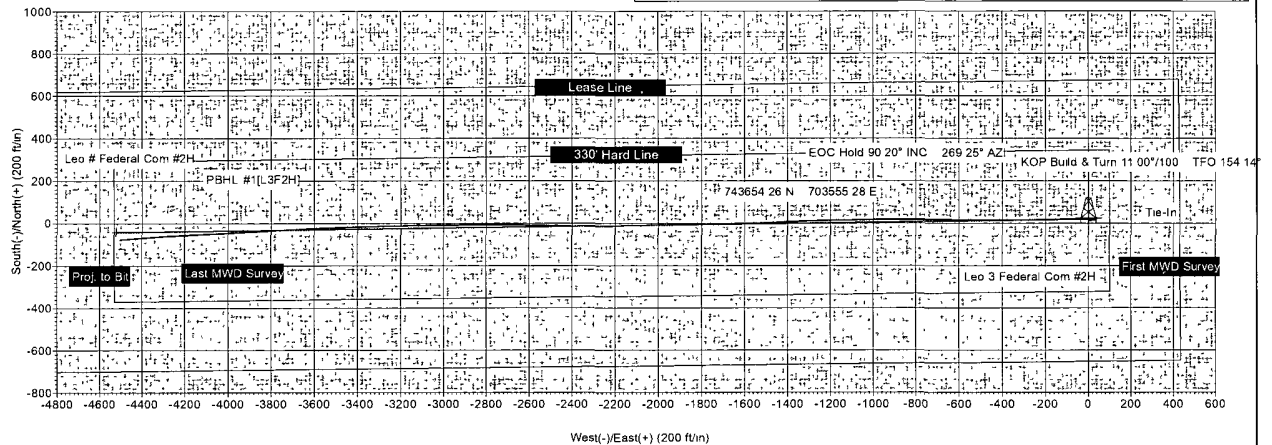
ANNOTATIONS

TVD	MD	Annotation
7899 33	7900 00	Tie-In
8206 32	8207 00	KOP Build & Turn 11 00°/100 TFO 154 14°
8729 15	9028 96	EOC Hold 90 20° INC 269 25° AZI
8729 15	9028 96	743654 26 N 703555 28 E
8715 00	13058 16	743601 10 N 699526 45 E



Well Name Leo 3 Federal Com #2H
System US State Plane 1927 (Exact solution)
Zone New Mexico East 3001
System Datum Mean Sea Level
Northing 743641 58
Easting 704048 96
Ground Level 4408 00
Depth Reference WELL @ 4408 00ft (Original Well Elev)

MD	Inc	Azi	TVD	+N-S	+E-W	Dleg	Vsect	Target
7900 00	0 24	115 10	7899 32	21 11	27 78	-0 00	-27 97	
8207 00	0 24	115 10	8206 32	20 57	26 94	0 00	-29 13	
9028 96	90 20	269 24	8729 15	12 68	-493 68	11 00	493 55	
13058 16	90 20	269 25	8715 00	-40 48	-4522 51	0 00	4522 69	



Vertical Section at 269.49° (150 ft/in)

Final

Plan Plan #16 (Leo 3 Federal Com #2H Lateral #1)
Created By Michael Herrera Date June 01 2012