



HOBBS OCD
NOV 07 2016
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COG Operating LLC

Lea County, NM (NAD-27 2015)

Ragnar Fed Com #15H

→ API #: 30-025-43114

SHL: 205' FNL, 2498' FEL, Sec 22, T17S, R32E, Unit B

PP: 330' FSL, 2285' FEL, Sec 15, T17S, R32E, Unit O

BHL: 377' FNL, 2282' FEL, Sec 15, T17S, R32E, Unit B

Design: BHL: 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B

Standard Survey Report

29 August, 2016





TDS
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Ragnar Fed Com #15H
Project:	Lea County, NM (NAD-27 2015)	TVD Reference:	KB @ 4033.00usft (Patriot 6)
Site:	Ragnar Fed Com #15H	MD Reference:	KB @ 4033.00usft (Patriot 6)
Well:	SHL: 205' FNL, 2498' FEL, Sec 22, T17S, R32E, Unit B	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B	Database:	EDM 5000.1 Single User Db

Project	Lea County, NM (NAD-27 2015)		
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	Ragnar Fed Com #15H				
Site Position:		Northing:	664,941.20 usft	Latitude:	32° 49' 35.998 N
From:	Map	Easting:	678,174.70 usft	Longitude:	103° 45' 11.903 W
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	0.31 °

Well	SHL: 205' FNL, 2498' FEL, Sec 22, T17S, R32E, Unit B					
Well Position	+N/-S	0.00 usft	Northing:	664,941.20 usft	Latitude:	32° 49' 35.998 N
	+E/-W	0.00 usft	Easting:	678,174.70 usft	Longitude:	103° 45' 11.903 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	4,015.00 usft

Wellbore	BHL: 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	7/27/2016	7.18	60.60	48,364

Design	BHL: 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B				
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		2.03

Survey Program	Date	8/29/2016			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	2,116.00	VES Gyro #1 (BHL: 350' FNL, 2284' FEL,	VES-ISCWSA-GYRO-3	Biaxial Semi-Cont. Gyro	
2,196.00	10,474.00	TDS MWD #2 (BHL: 350' FNL, 2284' FEL,	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	0.43	152.01	100.00	-0.33	0.18	-0.32	0.43	0.43	0.00	
200.00	0.42	139.62	200.00	-0.94	0.59	-0.92	0.09	-0.01	-12.39	
300.00	0.24	162.63	299.99	-1.42	0.89	-1.39	0.22	-0.18	23.01	
400.00	0.38	199.68	399.99	-1.93	0.84	-1.90	0.24	0.14	37.05	
500.00	0.45	198.46	499.99	-2.62	0.60	-2.59	0.07	0.07	-1.22	
600.00	0.28	176.18	599.99	-3.23	0.50	-3.21	0.22	-0.17	-22.28	

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Wellbore:	BHL: 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B	Database:	EDM 5000.1 Single User Db

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)	
700.00	0.62	206.42	699.99	-3.96	0.27	-3.95	0.40	0.34	30.24	
800.00	0.55	209.72	799.98	-4.86	-0.21	-4.87	0.08	-0.07	3.30	
900.00	0.70	189.82	899.97	-5.88	-0.55	-5.90	0.26	0.15	-19.90	
1,000.00	0.87	178.03	999.97	-7.24	-0.63	-7.26	0.23	0.17	-11.79	
1,100.00	0.80	178.40	1,099.95	-8.70	-0.58	-8.71	0.07	-0.07	0.37	
1,200.00	0.80	183.40	1,199.94	-10.09	-0.60	-10.11	0.07	0.00	5.00	
1,300.00	0.91	178.37	1,299.93	-11.59	-0.62	-11.60	0.13	0.11	-5.03	
1,400.00	0.86	181.77	1,399.92	-13.13	-0.62	-13.14	0.07	-0.05	3.40	
1,500.00	0.87	175.46	1,499.91	-14.64	-0.59	-14.65	0.10	0.01	-6.31	
1,600.00	0.90	175.47	1,599.90	-16.18	-0.46	-16.18	0.03	0.03	0.01	
1,700.00	0.88	171.00	1,699.89	-17.72	-0.28	-17.72	0.07	-0.02	-4.47	
1,800.00	0.94	162.95	1,799.87	-19.26	0.08	-19.24	0.14	0.06	-8.05	
1,900.00	1.07	154.67	1,899.86	-20.89	0.72	-20.85	0.19	0.13	-8.28	
2,000.00	1.22	150.68	1,999.84	-22.66	1.64	-22.59	0.17	0.15	-3.99	
2,100.00	1.04	147.89	2,099.82	-24.36	2.64	-24.25	0.19	-0.18	-2.79	
2,116.00	1.02	153.22	2,115.82	-24.61	2.78	-24.49	0.61	-0.13	33.31	
Tie-In to VES Gyro										
2,196.00	1.10	148.00	2,195.80	-25.89	3.51	-25.75	0.16	0.10	-6.53	
First TDS MWD Survey										
2,291.00	1.80	86.10	2,290.78	-26.57	5.48	-26.35	1.69	0.74	-65.16	
2,386.00	3.10	68.20	2,385.69	-25.51	9.36	-25.16	1.57	1.37	-18.84	
2,481.00	4.40	70.30	2,480.48	-23.33	15.17	-22.78	1.38	1.37	2.21	
2,576.00	4.70	59.40	2,575.19	-20.12	21.96	-19.33	0.96	0.32	-11.47	
2,671.00	4.20	57.10	2,669.90	-16.25	28.23	-15.24	0.56	-0.53	-2.42	
2,766.00	4.70	57.70	2,764.61	-12.28	34.44	-11.05	0.53	0.53	0.63	
2,862.00	5.80	59.80	2,860.21	-7.74	41.95	-6.25	1.16	1.15	2.19	
2,957.00	6.30	59.20	2,954.68	-2.65	50.58	-0.86	0.53	0.53	-0.63	
3,052.00	5.10	61.50	3,049.21	2.03	58.77	4.11	1.29	-1.26	2.42	
3,147.00	6.20	60.90	3,143.74	6.54	66.96	8.91	1.16	1.16	-0.63	
3,242.00	5.50	61.20	3,238.25	11.23	75.43	13.89	0.74	-0.74	0.32	
3,337.00	5.90	62.90	3,332.78	15.65	83.77	18.60	0.46	0.42	1.79	
3,432.00	5.10	62.90	3,427.34	19.79	91.88	23.04	0.84	-0.84	0.00	
3,527.00	6.00	58.90	3,521.90	24.28	99.89	27.81	1.03	0.95	-4.21	
3,622.00	5.70	58.50	3,616.40	29.31	108.16	33.13	0.32	-0.32	-0.42	
3,718.00	7.10	61.70	3,711.80	34.62	117.45	38.76	1.50	1.46	3.33	
3,813.00	6.80	62.30	3,806.10	40.01	127.60	44.51	0.32	-0.32	0.63	
3,908.00	6.30	62.70	3,900.48	45.02	137.21	49.85	0.53	-0.53	0.42	
4,003.00	5.70	64.30	3,994.96	49.46	146.09	54.60	0.66	-0.63	1.68	
4,098.00	5.10	63.50	4,089.54	53.39	154.12	58.81	0.64	-0.63	-0.84	
4,193.00	4.80	61.60	4,184.18	57.16	161.40	62.84	0.36	-0.32	-2.00	
4,289.00	5.80	61.50	4,279.77	61.39	169.19	67.34	1.04	1.04	-0.10	
4,384.00	5.60	62.20	4,374.30	65.84	177.51	72.08	0.22	-0.21	0.74	

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Survey									
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4,479.00	5.40	62.30	4,468.87	70.08	185.57	76.61	0.21	-0.21	0.11
4,574.00	5.10	62.70	4,563.47	74.09	193.28	80.89	0.32	-0.32	0.42
4,669.00	3.70	74.30	4,658.19	76.86	199.98	83.89	1.74	-1.47	12.21
4,764.00	1.50	83.70	4,753.08	77.82	204.17	85.01	2.35	-2.32	9.89
4,859.00	0.30	169.80	4,848.07	77.72	205.45	84.95	1.59	-1.26	90.63
4,955.00	0.00	142.90	4,944.07	77.47	205.50	84.70	0.31	-0.31	0.00
5,050.00	1.30	355.50	5,039.06	78.54	205.41	85.77	1.37	1.37	0.00
5,082.00	4.60	354.50	5,071.02	80.18	205.26	87.40	10.31	10.31	-3.13
5,113.00	7.50	357.60	5,101.84	83.44	205.06	90.65	9.41	9.35	10.00
5,145.00	10.90	2.90	5,133.43	88.55	205.12	95.76	10.94	10.63	16.56
5,177.00	13.50	6.70	5,164.70	95.28	205.71	102.51	8.50	8.13	11.88
5,208.00	16.40	5.60	5,194.65	103.24	206.56	110.49	9.40	9.35	-3.55
5,240.00	19.50	3.20	5,225.09	113.07	207.30	120.34	9.96	9.69	-7.50
5,272.00	22.10	1.50	5,255.00	124.42	207.76	131.70	8.34	8.13	-5.31
5,304.00	24.40	0.90	5,284.40	137.05	208.02	144.33	7.23	7.19	-1.88
5,336.00	27.10	1.50	5,313.22	150.94	208.31	158.23	8.48	8.44	1.88
5,367.00	30.40	2.70	5,340.39	165.84	208.87	173.14	10.81	10.65	3.87
5,399.00	32.90	2.40	5,367.63	182.62	209.61	189.93	7.83	7.81	-0.94
5,431.00	35.60	2.10	5,394.08	200.61	210.32	207.93	8.45	8.44	-0.94
5,463.00	39.30	1.10	5,419.48	220.06	210.85	227.39	11.72	11.56	-3.13
5,495.00	42.70	0.30	5,443.63	241.05	211.10	248.37	10.75	10.63	-2.50
5,526.00	43.70	0.00	5,466.23	262.27	211.16	269.58	3.29	3.23	-0.97
5,558.00	43.40	0.00	5,489.42	284.31	211.16	291.61	0.94	-0.94	0.00
5,590.00	43.20	0.60	5,512.71	306.26	211.27	313.55	1.43	-0.63	1.88
5,622.00	42.90	1.00	5,536.09	328.10	211.58	335.39	1.27	-0.94	1.25
5,653.00	42.70	1.20	5,558.84	349.16	211.98	356.45	0.78	-0.65	0.65
5,685.00	43.80	0.60	5,582.14	371.08	212.33	378.37	3.67	3.44	-1.88
5,717.00	47.30	359.30	5,604.55	393.92	212.30	401.19	11.31	10.94	-4.06
5,748.00	50.20	358.50	5,624.99	417.22	211.85	424.46	9.55	9.35	-2.58
5,780.00	54.10	358.80	5,644.62	442.48	211.25	449.68	12.21	12.19	0.94
5,812.00	57.70	359.40	5,662.56	468.97	210.84	476.14	11.36	11.25	1.88
5,843.00	60.80	359.40	5,678.41	495.60	210.56	502.75	10.00	10.00	0.00
5,875.00	63.40	359.00	5,693.38	523.88	210.17	531.00	8.20	8.13	-1.25
5,888.34	64.36	358.96	5,699.25	535.86	209.95	542.96	7.19	7.19	-0.32
As-Drilled PP									
5,907.00	65.70	358.90	5,707.13	552.77	209.64	559.85	7.19	7.19	-0.31
5,939.00	69.30	359.00	5,719.37	582.32	209.10	589.36	11.25	11.25	0.31
5,971.00	73.10	359.20	5,729.68	612.61	208.62	619.61	11.89	11.88	0.63
6,002.00	77.00	359.80	5,737.68	642.55	208.36	649.53	12.72	12.58	1.94
6,034.00	80.80	359.40	5,743.84	673.94	208.14	680.89	11.94	11.88	-1.25
6,066.00	84.70	359.60	5,747.88	705.68	207.86	712.60	12.20	12.19	0.63
6,097.00	88.60	358.90	5,749.69	736.62	207.46	743.51	12.78	12.58	-2.26

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6,129.00	90.30	358.20	5,749.99	768.61	206.65	775.44	5.75	5.31	-2.19	
6,193.00	91.20	358.80	5,749.16	832.58	204.97	839.32	1.69	1.41	0.94	
6,256.00	91.20	359.10	5,747.84	895.55	203.82	902.21	0.48	0.00	0.48	
6,317.00	91.00	359.00	5,746.67	956.53	202.81	963.12	0.37	-0.33	-0.16	
6,412.00	91.00	359.20	5,745.01	1,051.51	201.32	1,057.98	0.21	0.00	0.21	
6,507.00	91.50	359.80	5,742.94	1,146.48	200.49	1,152.86	0.82	0.53	0.63	
6,603.00	91.70	0.20	5,740.25	1,242.44	200.49	1,248.76	0.47	0.21	0.42	
6,698.00	91.00	359.30	5,738.02	1,337.41	200.07	1,343.66	1.20	-0.74	-0.95	
6,793.00	91.50	359.70	5,735.94	1,432.39	199.24	1,438.55	0.67	0.53	0.42	
6,888.00	91.70	359.70	5,733.29	1,527.35	198.75	1,533.43	0.21	0.21	0.00	
6,983.00	90.20	359.80	5,731.72	1,622.33	198.33	1,628.34	1.58	-1.58	0.11	
7,078.00	90.40	359.80	5,731.22	1,717.33	198.00	1,723.27	0.21	0.21	0.00	
7,173.00	90.40	359.90	5,730.56	1,812.33	197.75	1,818.19	0.11	0.00	0.11	
7,268.00	90.20	0.00	5,730.06	1,907.33	197.67	1,913.13	0.24	-0.21	0.11	
7,363.00	89.80	0.40	5,730.06	2,002.32	198.00	2,008.08	0.60	-0.42	0.42	
7,458.00	90.10	359.70	5,730.14	2,097.32	198.08	2,103.02	0.80	0.32	-0.74	
7,553.00	91.30	359.60	5,728.98	2,192.31	197.50	2,197.93	1.27	1.26	-0.11	
7,649.00	91.30	359.90	5,726.80	2,288.29	197.08	2,293.83	0.31	0.00	0.31	
7,743.00	91.20	359.90	5,724.75	2,382.27	196.92	2,387.75	0.11	-0.11	0.00	
7,839.00	91.50	0.70	5,722.49	2,478.24	197.42	2,483.67	0.89	0.31	0.83	
7,934.00	91.50	0.30	5,720.00	2,573.20	198.25	2,578.61	0.42	0.00	-0.42	
8,029.00	91.60	359.70	5,717.43	2,668.16	198.25	2,673.51	0.64	0.11	-0.63	
8,124.00	91.30	359.80	5,715.03	2,763.13	197.84	2,768.41	0.33	-0.32	0.11	
8,219.00	91.30	0.60	5,712.87	2,858.11	198.17	2,863.33	0.84	0.00	0.84	
8,314.00	91.30	359.40	5,710.72	2,953.08	198.17	2,958.25	1.26	0.00	-1.26	
8,410.00	91.60	358.70	5,708.29	3,049.04	196.58	3,054.09	0.79	0.31	-0.73	
8,505.00	91.80	359.00	5,705.47	3,143.98	194.67	3,148.90	0.38	0.21	0.32	
8,600.00	91.60	359.40	5,702.65	3,238.92	193.35	3,243.74	0.47	-0.21	0.42	
8,695.00	91.20	358.40	5,700.33	3,333.88	191.52	3,338.57	1.13	-0.42	-1.05	
8,790.00	89.80	358.20	5,699.50	3,428.83	188.70	3,433.36	1.49	-1.47	-0.21	
8,886.00	89.30	358.10	5,700.26	3,524.78	185.61	3,529.14	0.53	-0.52	-0.10	
8,980.00	90.20	359.00	5,700.67	3,618.74	183.23	3,622.96	1.35	0.96	0.96	
9,076.00	90.10	359.60	5,700.42	3,714.74	182.05	3,718.85	0.63	-0.10	0.63	
9,171.00	91.00	359.70	5,699.50	3,809.73	181.47	3,813.77	0.95	0.95	0.11	
9,266.00	91.40	0.10	5,697.51	3,904.71	181.31	3,908.68	0.60	0.42	0.42	
9,358.00	91.10	0.20	5,695.51	3,996.68	181.55	4,000.61	0.34	-0.33	0.11	
9,421.00	90.90	0.60	5,694.41	4,059.67	181.99	4,063.57	0.71	-0.32	0.63	
9,517.00	90.50	0.90	5,693.24	4,155.66	183.25	4,159.54	0.52	-0.42	0.31	
9,612.00	91.30	0.10	5,691.74	4,250.64	184.07	4,254.49	1.19	0.84	-0.84	
9,707.00	91.60	359.30	5,689.34	4,345.61	183.58	4,349.38	0.90	0.32	-0.84	
9,802.00	91.80	359.50	5,686.52	4,440.56	182.58	4,444.24	0.30	0.21	0.21	
9,897.00	92.00	358.40	5,683.37	4,535.49	180.84	4,539.05	1.18	0.21	-1.16	

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Ragnar Fed Com #15H
Project:	Lea County, NM (NAD-27 2015)	TVD Reference:	KB @ 4033.00usft (Patriot 6)
Site:	Ragnar Fed Com #15H	MD Reference:	KB @ 4033.00usft (Patriot 6)
Well:	SHL: 205' FNL, 2498' FEL, Sec 22, T17S, R32E, Unit B	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B	Database:	EDM 5000.1 Single User Db

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)
9,992.00	91.50	358.60	5,680.47	4,630.41	178.36	4,633.83	0.57	-0.53	0.21
10,087.00	90.70	358.70	5,678.65	4,725.37	176.12	4,728.64	0.85	-0.84	0.11
10,183.00	90.80	0.50	5,677.39	4,821.35	175.45	4,824.54	1.88	0.10	1.88
10,278.00	90.70	0.70	5,676.15	4,916.34	176.44	4,919.51	0.24	-0.11	0.21
10,373.00	90.50	1.20	5,675.15	5,011.32	178.02	5,014.48	0.57	-0.21	0.53
10,416.00	90.50	1.40	5,674.78	5,054.31	178.99	5,057.48	0.47	0.00	0.47
Last TDS MWD Survey									
10,474.00	90.50	1.40	5,674.27	5,112.29	180.41	5,115.47	0.00	0.00	0.00
Projection to Bit/TD									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,116.00	2,115.82	-24.61	2.78	Tie-In to VES Gyro
2,196.00	2,195.80	-25.89	3.51	First TDS MWD Survey
5,888.34	5,699.25	535.86	209.95	As-Drilled PP
10,416.00	5,674.78	5,054.31	178.99	Last TDS MWD Survey
10,474.00	5,674.27	5,112.29	180.41	Projection to Bit/TD

Checked By: _____ Approved By: _____ Date: _____



PATRIOT DRILLING, LLC

HCDPS OCD

NOV 07 2016

RECEIVED

OPERATOR:
WELL/LEASE:
COUNTY:

COG Operating, LLC
Ragnar Fed Com #15H
Lea Co., New Mexico
Sec. 22, T 17S, R 32E

**STATE OF NEW MEXICO
DEVIATION REPORT**

<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
511	1/4	1,456	1/2
910	3/4	1,710	1/2
1,202	3/4	1,960	1

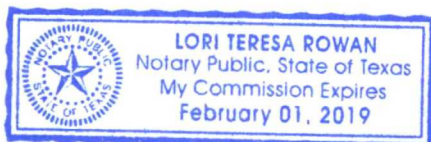
Patriot Drilling, LLC

M. Leroy Peterson, Executive Vice-President

The foregoing instrument was acknowledged before me on this 31st day of August 2016 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling, LLC.

My Commission Expires: 02/01/2019

Lori T. Rowan
Notary Public for Ector Co., Texas





PATRIOT DRILLING, LLC

OPERATOR: COG Operating, LLC
WELL/LEASE: Ragnar Fed Com #15H
COUNTY: Lea Co., New Mexico
Sec. 22, T 17S, R 32E

**STATE OF NEW MEXICO
DEVIATION REPORT**

<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
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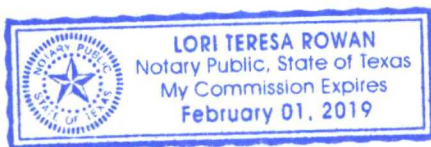
Patriot Drilling, LLC

M. Leroy Peterson, Executive Vice-President

The foregoing instrument was acknowledged before me on this 31st day of August 2016 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling, LLC.

My Commission Expires: 02/01/2019

Lori T. Rowan
Notary Public for Ector Co., Texas



August 22, 2016

Concho Resources, Inc.
One Concho Center
600 W. Illinois Avenue
Midland, Texas 79701

Attn: Kanicia Castillo

RE: **Ragnar Federal Com No. 015H**

Please find enclosed a copy of the survey from 0' to 2116' ran on the above referenced well.

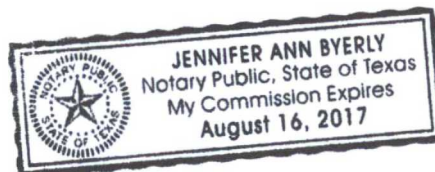
Sincerely,


Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 22nd day of August,
A.D., 2016, by Keith Havelka.


Jennifer Ann Byerly
Notary Public, State of Texas





Company: COG OPERATING
Lease/Well: RAGNAR FEDERAL COM No./015H

Rig Name: PATRIOT 6
State/County: NEW MEXICO/LEA
VS-Azi: 359.74 Degrees
Latitude: 32.82667, Longitude: -103.75331
Grid North = True North -0.31 degs (NAD 27)
Grid Correction Applied = -0.31 degs



Depth Reference : RKB 18 FEET

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: e-line gyro-de_01.ut
Minimum Curvature Method
Report Date/Time: 8/22/2016 / 12:39

VES Survey International
Midland, Texas
432-563-5444

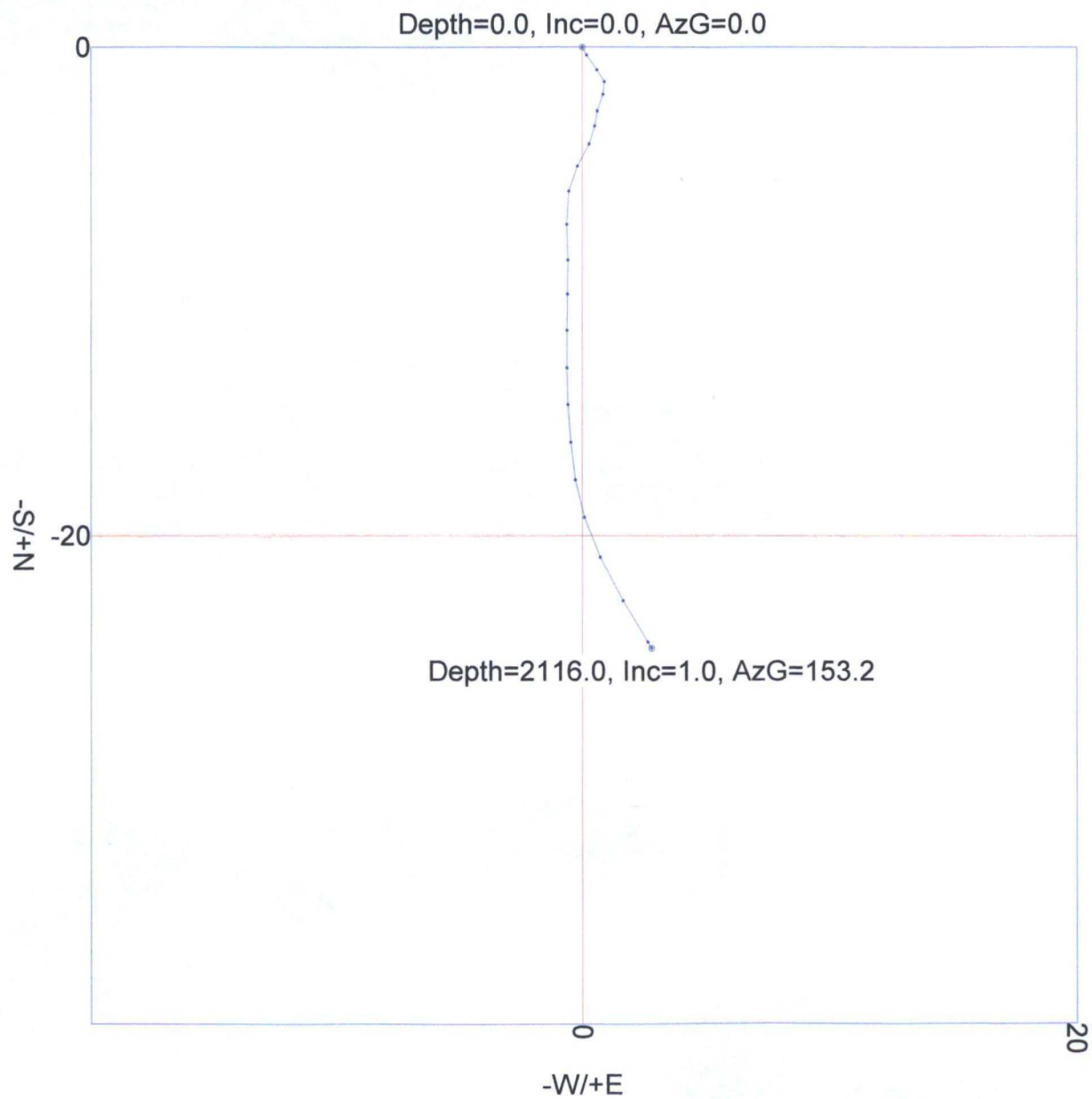
Surveyor: Michael Cook
Ragnar Federal Com No. 015H / API 30-025-43114

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.43	152.01	100.00	-0.33	0.18	-0.33	0.37	152.01	0.43
200.00	0.42	139.62	200.00	-0.94	0.59	-0.94	1.11	147.92	0.09
300.00	0.24	162.63	299.99	-1.42	0.89	-1.43	1.68	147.96	0.22
400.00	0.38	199.68	399.99	-1.94	0.84	-1.95	2.12	156.58	0.24
500.00	0.45	198.46	499.99	-2.63	0.61	-2.63	2.70	167.02	0.06
600.00	0.28	176.18	599.99	-3.24	0.50	-3.25	3.28	171.25	0.21
700.00	0.62	206.42	699.99	-3.97	0.28	-3.98	3.98	176.03	0.40
800.00	0.55	209.72	799.98	-4.87	-0.20	-4.87	4.88	182.38	0.08
900.00	0.70	189.82	899.97	-5.90	-0.55	-5.89	5.92	185.29	0.26
1000.00	0.87	178.03	999.97	-7.26	-0.62	-7.25	7.28	184.91	0.23
1100.00	0.80	178.40	1099.95	-8.71	-0.58	-8.71	8.73	183.80	0.07
1200.00	0.80	183.40	1199.94	-10.10	-0.60	-10.09	10.11	183.40	0.07
1300.00	0.91	178.37	1299.93	-11.58	-0.62	-11.58	11.60	183.06	0.14
1400.00	0.86	181.77	1399.92	-13.12	-0.62	-13.12	13.14	182.70	0.07
1500.00	0.87	175.46	1499.91	-14.63	-0.58	-14.62	14.64	182.28	0.10
1600.00	0.90	175.47	1599.90	-16.17	-0.46	-16.16	16.17	181.63	0.02

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1700.00	0.88	171.00	1699.89	-17.70	-0.28	-17.70	17.70	180.90	0.07
1800.00	0.94	162.95	1799.87	-19.25	0.08	-19.25	19.25	179.75	0.14
1900.00	1.07	154.67	1899.86	-20.88	0.72	-20.88	20.89	178.02	0.19
2000.00	1.22	150.68	1999.84	-22.65	1.64	-22.66	22.71	175.85	0.17
2100.00	1.04	147.89	2099.82	-24.35	2.65	-24.36	24.49	173.80	0.19
2116.00	1.02	153.22	2115.82	-24.60	2.79	-24.61	24.75	173.53	0.62



VES Survey International
Midland, Texas
432-563-5444
Surveyor: Michael Cook
Ragnar Federal Com No. 015H / API 30-025-43114



V.E.S. Survey Date: 8/18/2016



I Michael Cook certify that I am employed by VES Survey International. That I did on the day(s) of 08/18/16 through 08/18/16 conduct or supervise the taking of a Rate Gyro survey from a depth of 0.00 feet to a depth of 2,116.00 feet; that the data is true, correct, complete and within the limitations of the tool as set forth by Vaughn Energy Services, that I am authorized and qualified to make this report; that this survey was conducted at the request of COG Operating for the Ragnar Federal Com Well # 015H API # 30-025-43114 in Lea County / Parish New Mexico; and that I have reviewed this report and find that it conforms to the principles and procedures as set forth by VES Survey International.

A handwritten signature in blue ink, appearing to read "M. Cook", is written over a horizontal line.

Michael Cook
Service Technician
VES Survey International