



COG Operating LLC

Lea County, NM (NAD-83 2015)

Ragnar Fed Com #25H

API #: 30-025-43131

SHL: 185' FNL, 2358' FEL, Sec 22, T17S, R32E, Unit B

PP: 330' FSL, 2287' FEL, Sec 15, T17S, R32E, Unit O

BHL: 352' FNL, 2281' FEL, Sec 15, T17S, R32E, Unit B

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

Standard Survey Report

30 June, 2016





TDS
Survey Report



Company: COG Operating LLC
Project: Lea County, NM (NAD-83 2015)
Site: Ragnar Fed Com #25H
Well: SHL 185' FNL, 2358' FEL, Sec 22, T17S, R32E, Unit B
Wellbore: BHL 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B
Design: BHL 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B

Local Co-ordinate Reference: Well SHL 185' FNL, 2358' FEL, Sec 22, T17S, R32E, Unit B
TVD Reference: KB @ 4032.00usft (Patriot 6)
MD Reference: KB @ 4032.00usft (Patriot 6)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Project	Lea County, NM (NAD-83 2015)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site	Ragnar Fed Com #25H		
Site Position:		Northing:	665,026.10 usft
From:	Map	Easting:	719,492.80 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in
		Latitude:	32° 49' 36.624 N
		Longitude:	103° 45' 12.081 W
		Grid Convergence:	0.31 °

Well	SHL 185' FNL, 2358' FEL, Sec 22, T17S, R32E, Unit B		
Well Position	+N-S	0.00 usft	Northing: 665,026.10 usft
	+E-W	0.00 usft	Easting: 719,492.80 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft
		Latitude:	32° 49' 36.624 N
		Longitude:	103° 45' 12.081 W
		Ground Level:	4,014.00 usft

Wellbore	BHL 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B		
Magnetics	Model Name	Sample Date	Declination
	IGRF2015	6/2/2016	(°)
			7.20
			Dip Angle (°)
			60.60
			Field Strength (nT)
			48,380

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)
	0.00	0.00	0.00
			Direction (°)
			0.47

Survey Program	Date 6/30/2016		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name
100.00	2,145.00	VES Gyro #1 (BHL 350' FNL, 2284' FEL,	VES-ISCWSA-GYRO-3
2,278.00	11,143.00	TDS MWD #2 (BHL 350' FNL, 2284' FEL,	MWD
			Description
			Biaxial Semi-Cont. Gyro
			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	0.36	161.99	100.00	-0.30	0.10	-0.30	0.36	0.36	0.00
	200.00	0.44	155.20	200.00	-0.95	0.36	-0.94	0.09	0.08	-6.79
	300.00	0.54	147.20	299.99	-1.69	0.77	-1.68	0.12	0.10	-8.00
	400.00	0.39	144.81	399.99	-2.36	1.22	-2.35	0.15	-0.15	-2.39
	500.00	0.18	202.61	499.99	-2.79	1.36	-2.78	0.33	-0.21	57.80
	600.00	0.23	208.77	599.99	-3.11	1.20	-3.10	0.05	0.05	6.16



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

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TVD Reference: KB @ 4032.00usft (Patriot 6)
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North Reference: Grid
Survey Calculation Method: Minimum Curvature
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	0.41	208.18	699.99	-3.60	0.94	-3.59	0.18	0.18	-0.59
800.00	0.20	233.79	799.99	-4.02	0.63	-4.01	0.25	-0.21	25.61
900.00	0.23	186.31	899.98	-4.32	0.46	-4.32	0.18	0.03	-47.48
1,000.00	0.19	155.98	999.98	-4.67	0.51	-4.67	0.12	-0.04	-30.33
1,100.00	0.13	151.77	1,099.98	-4.92	0.63	-4.92	0.06	-0.06	-4.21
1,200.00	0.43	114.15	1,199.98	-5.18	1.03	-5.17	0.34	0.30	-37.62
1,300.00	0.50	105.34	1,299.98	-5.45	1.79	-5.43	0.10	0.07	-8.81
1,400.00	0.58	107.14	1,399.97	-5.71	2.89	-5.69	0.08	0.08	1.80
1,500.00	0.59	68.28	1,499.97	-5.65	3.85	-5.62	0.41	0.01	-40.86
1,600.00	0.86	53.00	1,599.96	-4.99	4.72	-4.96	0.32	0.27	-13.28
1,700.00	1.11	54.97	1,699.95	-3.99	6.11	-3.94	0.25	0.25	1.97
1,800.00	1.38	60.36	1,799.92	-2.84	7.95	-2.77	0.29	0.27	5.39
1,900.00	1.59	58.65	1,899.89	-1.52	10.18	-1.43	0.21	0.21	-1.71
2,000.00	1.94	66.23	1,999.84	-0.11	12.92	-0.01	0.42	0.35	7.58
2,100.00	1.62	61.10	2,099.79	1.25	15.70	1.38	0.38	-0.32	-5.13
2,145.00	1.50	62.26	2,144.78	1.83	16.78	1.97	0.28	-0.27	2.58
Tie-In to VES Gyro									
2,278.00	1.40	61.90	2,277.73	3.41	19.76	3.57	0.08	-0.08	-0.27
First TDS MWD Survey									
2,373.00	1.00	97.00	2,372.71	3.85	21.60	4.03	0.86	-0.42	36.95
2,468.00	1.00	112.00	2,467.70	3.44	23.19	3.63	0.27	0.00	15.79
2,563.00	0.90	128.80	2,562.69	2.86	24.54	2.87	0.31	-0.11	17.68
2,659.00	1.10	100.00	2,658.67	2.03	26.04	2.25	0.58	0.21	-30.00
2,754.00	1.70	95.80	2,753.64	1.73	28.34	1.96	0.64	0.83	-4.42
2,849.00	1.70	103.50	2,848.60	1.26	31.11	1.52	0.24	0.00	8.11
2,944.00	1.40	106.90	2,943.57	0.59	33.59	0.87	0.33	-0.32	3.58
3,039.00	1.50	97.40	3,038.54	0.10	35.94	0.39	0.27	0.11	-10.00
3,135.00	2.30	88.10	3,134.48	0.00	39.11	0.32	0.89	0.83	-9.69
3,230.00	2.20	90.60	3,229.41	0.04	42.84	0.39	0.15	-0.11	2.63
3,325.00	1.80	92.70	3,324.35	-0.05	46.23	0.33	0.33	-0.32	2.21
3,417.00	1.70	102.40	3,416.31	-0.42	49.09	-0.01	0.40	-0.22	10.54
3,512.00	1.70	101.20	3,511.26	-0.99	51.85	-0.57	0.04	0.00	-1.26
3,608.00	2.10	68.10	3,607.21	-0.61	54.88	-0.16	1.20	0.42	-34.48
3,703.00	2.40	58.90	3,702.14	1.06	58.19	1.54	0.49	0.32	-9.68
3,798.00	2.10	76.30	3,797.07	2.50	61.59	3.01	0.78	-0.32	18.32
3,893.00	1.10	49.80	3,892.03	3.50	63.98	4.03	1.28	-1.05	-27.89
3,988.00	0.70	357.00	3,988.02	4.69	64.65	5.22	0.91	-0.42	-55.00
4,084.00	0.60	8.90	4,083.01	5.78	64.70	6.29	0.18	-0.11	12.53
4,179.00	0.50	15.70	4,178.01	6.65	64.88	7.18	0.13	-0.11	7.16
4,274.00	0.40	205.60	4,273.01	6.75	64.85	7.28	0.94	-0.11	-179.05
4,369.00	0.40	223.90	4,368.01	6.21	64.48	6.74	0.13	0.00	19.26



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4,464.00	0.40	173.50	4,463.00	5.64	64.29	6.17	0.36	0.00	-53.05
4,559.00	0.40	162.80	4,558.00	4.99	64.42	5.52	0.08	0.00	-11.28
4,655.00	0.40	161.80	4,654.00	4.36	64.63	4.89	0.01	0.00	-1.04
4,750.00	0.40	135.40	4,749.00	3.80	64.96	4.34	0.19	0.00	-27.79
4,845.00	0.40	122.10	4,844.00	3.39	65.48	3.93	0.10	0.00	-14.00
4,940.00	0.40	131.30	4,938.99	3.00	66.01	3.54	0.07	0.00	9.68
5,035.00	0.50	127.80	5,033.99	2.52	66.58	3.07	0.11	0.11	-3.68
5,130.00	0.70	117.00	5,128.98	2.01	67.43	2.56	0.24	0.21	-11.37
5,225.00	0.10	306.00	5,223.98	1.79	67.88	2.35	0.84	-0.63	-180.00
5,320.00	0.00	207.10	5,318.98	1.84	67.81	2.40	0.11	-0.11	0.00
5,416.00	0.10	315.10	5,414.98	1.90	67.75	2.46	0.10	0.10	0.00
5,511.00	0.10	242.20	5,509.98	1.92	67.62	2.47	0.13	0.00	-76.74
5,606.00	0.10	248.90	5,604.98	1.85	67.47	2.40	0.01	0.00	7.05
5,637.00	1.30	339.60	5,635.98	2.17	67.32	2.72	4.21	3.87	292.58
5,669.00	3.70	341.60	5,667.95	3.49	66.87	4.04	7.50	7.50	6.25
5,701.00	6.20	345.70	5,699.83	8.15	66.12	6.69	7.89	7.81	12.81
5,732.00	9.60	351.10	5,730.53	10.32	65.30	10.88	11.21	10.97	17.42
5,764.00	13.30	357.50	5,761.89	16.64	64.73	17.17	12.21	11.56	20.00
5,796.00	15.70	0.70	5,792.86	24.65	64.62	25.18	7.90	7.50	10.00
5,828.00	18.90	0.50	5,823.41	34.16	64.72	34.69	10.00	10.00	-0.63
5,860.00	22.20	359.20	5,853.37	45.39	64.68	45.92	10.41	10.31	-4.06
5,891.00	25.30	357.90	5,881.74	57.87	64.36	58.40	10.14	10.00	-4.19
5,923.00	27.90	357.60	5,910.35	72.19	63.79	72.71	8.14	8.13	-0.94
5,955.00	30.70	356.60	5,938.28	87.82	62.99	88.34	8.88	8.75	-3.13
5,986.00	33.50	358.90	5,964.52	104.28	62.36	104.79	9.85	9.03	7.42
6,018.00	37.10	1.10	5,990.63	122.77	62.38	123.27	11.93	11.25	6.88
6,050.00	40.20	0.90	6,015.62	142.75	62.72	143.26	9.70	9.69	-0.63
6,081.00	41.80	0.70	6,039.01	163.08	63.01	163.59	5.18	5.16	-0.65
6,113.00	42.10	1.70	6,062.81	184.47	63.46	184.98	2.29	0.94	3.13
6,145.00	42.50	1.50	6,086.48	206.00	64.08	206.51	1.32	1.25	-0.63
6,177.00	42.80	1.30	6,110.02	227.67	64.59	228.19	1.03	0.94	-0.63
6,208.00	42.90	1.20	6,132.75	248.75	65.05	249.27	0.39	0.32	-0.32
6,240.00	43.00	1.90	6,156.17	270.54	65.64	271.07	1.52	0.31	2.19
6,272.00	45.20	2.20	6,179.15	292.80	66.43	293.33	6.91	6.88	0.94
6,304.00	48.60	2.00	6,201.01	316.14	67.29	316.88	10.63	10.63	-0.63
6,335.00	52.00	1.90	6,220.81	339.98	68.10	340.52	10.97	10.97	-0.32
6,367.00	54.90	1.00	6,239.86	365.67	68.75	366.22	9.34	9.08	-2.81
6,399.00	57.50	0.20	6,257.66	392.26	69.02	392.81	8.39	8.13	-2.50
6,431.00	60.50	359.40	6,274.14	419.69	68.92	420.24	9.62	9.38	-2.50
6,462.00	63.60	358.60	6,288.67	447.08	68.44	447.61	10.26	10.00	-2.58
6,494.00	66.50	359.60	6,302.17	476.07	67.99	476.61	9.49	9.06	3.13



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6,526.00	69.00	359.80	6,314.28	505.68	67.83	506.22	7.83	7.81	0.63
6,536.28	69.93	359.90	6,317.89	515.31	67.81	515.85	9.11	9.06	0.95
As-Drilled PP									
6,558.00	71.90	0.10	6,324.99	535.83	67.81	536.37	9.11	9.06	0.93
6,589.00	75.80	359.60	6,333.61	565.61	67.73	566.14	12.68	12.58	-1.61
6,621.00	79.50	359.20	6,340.45	596.86	67.40	597.39	11.63	11.56	-1.25
6,653.00	83.30	359.10	6,345.24	628.49	66.93	629.02	11.88	11.88	-0.31
6,685.00	86.70	359.30	6,348.03	660.36	66.49	660.88	10.64	10.63	0.63
6,716.00	89.10	359.00	6,349.16	691.33	66.03	691.85	7.80	7.74	-0.97
6,748.00	89.50	359.20	6,349.55	723.33	65.53	723.84	1.40	1.25	0.63
6,780.00	90.00	0.00	6,349.69	755.32	65.30	755.83	2.95	1.56	2.50
6,875.00	92.00	1.20	6,348.04	850.30	66.30	850.81	2.46	2.11	1.26
6,984.00	91.40	358.60	6,344.80	959.24	66.11	959.75	2.45	-0.55	-2.39
7,079.00	91.40	359.10	6,342.48	1,054.19	64.20	1,054.68	0.53	0.00	0.53
7,174.00	91.10	359.10	6,340.41	1,149.16	62.71	1,149.63	0.32	-0.32	0.00
7,270.00	90.80	359.40	6,338.82	1,245.14	61.45	1,245.60	0.44	-0.31	0.31
7,365.00	91.40	359.80	6,336.99	1,340.12	60.79	1,340.57	0.76	0.63	0.42
7,460.00	90.50	0.00	6,335.42	1,435.10	60.62	1,435.55	0.97	-0.95	0.21
7,555.00	90.80	359.90	6,334.34	1,530.10	60.54	1,530.54	0.33	0.32	-0.11
7,650.00	90.50	0.30	6,333.26	1,625.09	60.71	1,625.53	0.53	-0.32	0.42
7,745.00	90.30	359.80	6,332.60	1,720.09	60.79	1,720.53	0.57	-0.21	-0.53
7,840.00	90.30	359.40	6,332.10	1,815.08	60.13	1,815.51	0.42	0.00	-0.42
7,935.00	90.70	359.80	6,331.27	1,910.08	59.46	1,910.50	0.60	0.42	0.42
8,030.00	90.50	0.00	6,330.28	2,005.07	59.30	2,005.49	0.30	-0.21	0.21
8,126.00	90.20	0.00	6,329.69	2,101.07	59.30	2,101.48	0.31	-0.31	0.00
8,221.00	90.70	359.70	6,328.94	2,196.07	59.05	2,196.48	0.61	0.53	-0.32
8,316.00	92.10	359.10	6,326.62	2,291.03	58.05	2,291.43	1.60	1.47	-0.63
8,411.00	91.70	359.20	6,323.47	2,385.97	56.64	2,386.35	0.43	-0.42	0.11
8,506.00	91.90	0.40	6,320.49	2,480.92	56.31	2,481.30	1.28	0.21	1.26
8,601.00	90.70	0.00	6,318.33	2,575.89	56.64	2,576.27	1.33	-1.26	-0.42
8,696.00	91.10	0.80	6,316.84	2,670.87	57.31	2,671.25	0.94	0.42	0.84
8,791.00	89.50	358.60	6,316.34	2,765.86	56.81	2,766.24	2.86	-1.68	-2.32
8,886.00	89.10	358.90	6,317.51	2,860.83	54.74	2,861.19	0.53	-0.42	0.32
8,981.00	90.90	358.50	6,317.51	2,955.80	52.58	2,956.14	1.94	1.89	-0.42
9,076.00	91.60	358.50	6,315.43	3,050.75	50.10	3,051.06	0.74	0.74	0.00
9,171.00	91.40	359.10	6,312.95	3,145.70	48.11	3,145.98	0.67	-0.21	0.63
9,266.00	91.80	359.80	6,310.29	3,240.65	47.20	3,240.93	0.85	0.42	0.74
9,362.00	91.40	0.50	6,307.61	3,336.61	47.45	3,336.89	0.84	-0.42	0.73
9,457.00	91.60	1.20	6,305.13	3,431.57	48.86	3,431.86	0.77	0.21	0.74
9,552.00	91.60	0.90	6,302.47	3,526.52	50.60	3,526.81	0.32	0.00	-0.32
9,647.00	91.10	0.40	6,300.24	3,621.48	51.67	3,621.79	0.74	-0.53	-0.53



TDS
Survey Report



Company: COG Operating LLC
Project: Lea County, NM (NAD-83 2015)
Site: Ragnar Fed Com #25H
Well: SHL: 185' FNL, 2358' FEL, Sec 22, T17S, R32E, Unit B
Wellbore: BHL: 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B
Design: BHL: 350' FNL, 2284' FEL, Sec 15, T17S, R32E, Unit B

Local Co-ordinate Reference: Well SHL: 185' FNL, 2358' FEL, Sec 22, T17S, R32E, Unit B
TVD Reference: KB @ 4032.00usft (Patriot 6)
MD Reference: KB @ 4032.00usft (Patriot 6)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
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)
9,742.00	91.30	359.00	6,298.25	3,716.46	51.18	3,716.75	1.49	0.21	-1.47
9,837.00	91.60	359.00	6,295.84	3,811.41	49.52	3,811.69	0.32	0.32	0.00
9,933.00	91.60	359.70	6,293.16	3,907.37	48.43	3,907.64	0.73	0.00	0.73
10,028.00	91.70	359.40	6,290.43	4,002.33	47.68	4,002.58	0.33	0.11	-0.32
10,123.00	91.40	0.10	6,287.86	4,097.29	47.27	4,097.54	0.80	-0.32	0.74
10,218.00	91.30	359.90	6,285.62	4,192.27	47.27	4,192.51	0.24	-0.11	-0.21
10,313.00	91.60	0.20	6,283.21	4,287.23	47.35	4,287.48	0.45	0.32	0.32
10,408.00	91.40	0.50	6,280.73	4,382.20	47.93	4,382.45	0.38	-0.21	0.32
10,503.00	90.40	359.10	6,279.24	4,477.18	47.80	4,477.42	1.81	-1.05	-1.47
10,598.00	90.30	359.40	6,278.65	4,572.17	46.36	4,572.40	0.33	-0.11	0.32
10,693.00	89.90	359.70	6,278.49	4,667.17	45.61	4,667.39	0.53	-0.42	0.32
10,788.00	90.10	359.50	6,278.49	4,762.17	44.95	4,762.38	0.30	0.21	-0.21
10,884.00	90.10	359.20	6,278.32	4,858.16	43.86	4,858.36	0.31	0.00	-0.31
10,979.00	90.30	0.20	6,277.99	4,953.16	43.36	4,953.35	1.07	0.21	1.05
11,074.00	90.30	1.00	6,277.49	5,048.15	44.36	5,048.35	0.84	0.00	0.84
Final MWD Survey									
11,143.00	90.30	1.00	6,277.13	5,117.14	45.56	5,117.34	0.00	0.00	0.00
Projection to Bit/TD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N-S (usft)	+E-W (usft)	Comment
2,145.00	2,144.78	1.83	16.78	Tie-In to VES Gyro
2,278.00	2,277.73	3.41	19.76	First TDS MWD Survey
6,536.28	6,317.89	515.31	67.81	As-Drilled PP
11,074.00	6,277.49	5,048.15	44.36	Final MWD Survey
11,143.00	6,277.13	5,117.14	45.56	Projection to Bit/TD

Checked By: _____ Approved By: _____ Date: _____



PATRIOT DRILLING, LLC

OPERATOR: COG Operating, LLC
WELL/LEASE: Ragnar Fed Com 25H
COUNTY: Lea Co., New Mexico
Sec. 22, T 17S, R 32E

**STATE OF NEW MEXICO
DEVIATION REPORT**

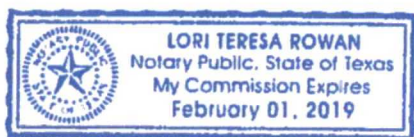
<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
381	1/2	2,373	1
908	1/4	2,944	1 1/2
1,410	1/2		
1,667	3/4		

Patriot Drilling, LLC

M. Leroy Peterson, Executive Vice-President

The foregoing instrument was acknowledged before me on this 5th day of July 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 25H
COUNTY: Lea Co., New Mexico
Sec. 22, T 17S, R 32E

**STATE OF NEW MEXICO
DEVIATION REPORT**

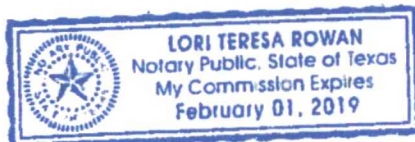
<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
381	1/2	2,373	1
908	1/4	2,944	1 1/2
1,410	1/2		
1,667	3/4		

Patriot Drilling, LLC

M. Leroy Peterson, Executive Vice-President

The foregoing instrument was acknowledged before me on this 5th day of July 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



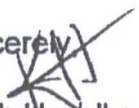
June 24, 2016

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

Attn: Kanicia Castillo

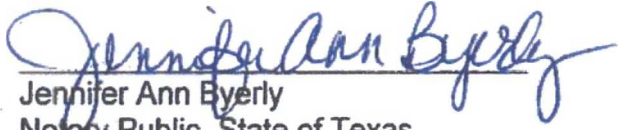
RE: Ragnar Federal Com No. 025H

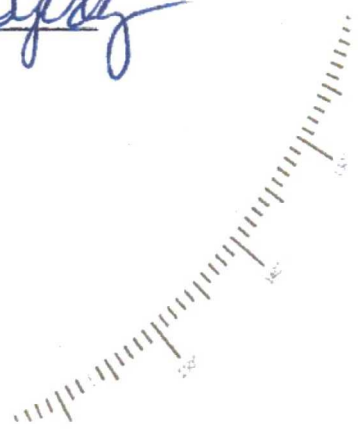
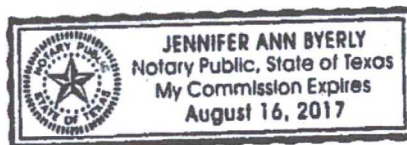
Please find enclosed a copy of the survey from 0' to 2145' ran on the above referenced well.

Sincerely,

Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 24th day of June,
A.D., 2016, by Keith Havelka.


Jennifer Ann Byerly
Notary Public, State of Texas





Company: Concho
Lease/Well: Ragnar Federal Com No./025H

Rig Name: Patriot 6
State/County: New Mexico/Lea
VS-Azi: 0.00 Degrees
Latitude: 32.82684, Longitude: -103.75336
Grid North = True North -0.31 degs (NAD 27)
Grid Correction Applied = -0.31 degs



Depth Reference : RKB = 18 Foot

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: gyro survey-de_01.ut

Minimum Curvature Method

Report Date/Time: 6/24/2016 / 12:59

VES Survey International

Midland Tx

(432) 563-5444

Surveyor: Gene Heiss

Ragnar Federal Com No. 25H / API 30-025-43131

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	0.36	161.99	100.00	-0.30	0.10	-0.30	0.31	161.99	0.36
200.00	0.44	155.20	200.00	-0.94	0.35	-0.94	1.01	159.39	0.10
300.00	0.54	147.20	299.99	-1.69	0.77	-1.69	1.86	155.45	0.12
400.00	0.39	144.81	399.99	-2.36	1.22	-2.36	2.66	152.63	0.15
500.00	0.18	202.61	499.99	-2.79	1.36	-2.79	3.11	154.02	0.33
600.00	0.23	208.77	599.99	-3.12	1.20	-3.12	3.34	158.89	0.05
700.00	0.41	208.18	699.99	-3.61	0.94	-3.61	3.73	165.46	0.18
800.00	0.20	233.79	799.99	-4.03	0.62	-4.03	4.08	171.23	0.25
900.00	0.23	186.31	899.98	-4.33	0.46	-4.33	4.36	173.99	0.17
1000.00	0.19	155.98	999.98	-4.68	0.50	-4.68	4.71	173.88	0.11
1100.00	0.13	151.77	1099.98	-4.93	0.62	-4.93	4.97	172.80	0.06
1200.00	0.43	114.15	1199.98	-5.18	1.02	-5.18	5.28	168.90	0.33
1300.00	0.50	105.34	1299.98	-5.45	1.78	-5.45	5.74	161.91	0.10
1400.00	0.58	107.14	1399.97	-5.72	2.69	-5.72	6.32	154.80	0.08
1500.00	0.59	66.28	1499.97	-5.66	3.65	-5.66	6.74	147.18	0.41
1600.00	0.86	53.00	1599.96	-5.00	4.73	-5.00	6.88	136.61	0.32

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	1.11	54.97	1699.95	-3.99	6.12	-3.99	7.31	123.07	0.25
1800.00	1.38	60.36	1799.92	-2.84	7.96	-2.84	8.45	109.60	0.29
1900.00	1.59	58.65	1899.89	-1.52	10.19	-1.52	10.30	98.49	0.22
2000.00	1.94	66.23	1999.84	-0.12	12.92	-0.12	12.92	90.53	0.42
2100.00	1.62	61.10	2099.79	1.25	15.71	1.25	15.76	85.46	0.35
2145.00	1.50	62.26	2144.78	1.83	16.79	1.83	16.89	83.78	0.28



VES Survey International
Midland Tx
(432) 563-5444
Surveyor: Gene Heiss
Ragnar Federal Com No. 25H / API 30-025-43131



20

Depth=0.0, Inc=0.0, AzG=0.0
N

Depth=2145.0, Inc=1.5, AzG=62.3

0

20

-W/+E

VES Survey Date: 6/16/2016



I Gene Heiss certify that I am employed by VES Survey International. That I did on the day(s) of 06/16/16 through 06/16/16 conduct or supervise the taking of a Rate Gyro survey from a depth of 0.00 feet to a depth of 2,145.00 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 Concho for the Ragnar Federal Com Well # 25H API # 30-025-43131 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 "Gene Heiss", is written over a horizontal line.

Gene Heiss
Service Technician
VES Survey International



I Gene Heiss certify that I am employed by VES Survey International. That I did on the day(s) of 06/16/16 through 06/16/16 conduct or supervise the taking of a Rate Gyro survey from a depth of 0.00 feet to a depth of 2,145.00 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 Concho for the Ragnar Federal Com Well # 25H API # 30-025-43131 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 "Gene Heiss", is written over a horizontal line.

Gene Heiss
Service Technician
VES Survey International