



PATRIOT DRILLING, LLC

HOBBS OCD
JAN 04 2017
RECEIVED

OPERATOR: COG Operating, LLC
WELL/LEASE: Ivar the Boneless Fed #21H
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>
384	1/4	1,476	1/2
875	1/4	1,916	1 3/4
1,158	1/4		

Patriot Drilling, LLC

M. Leroy Peterson, Executive Vice-President

The foregoing instrument was acknowledged before me on this 31st day of October 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





HOBBS OCD
JAN 04 2017
RECEIVED

COG Operating LLC

Lea County, NM (NAD-83 2015)

Ivar the Boneless Federal #21H

API #: 30-025-43406

SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D

PP: 330' FSL, 350' FWL, Sec 15, T17S, R32E, Unit M

BHL: 365' FNL, 347' FWL, Sec 15, T17S, R32E, Unit D

Design: BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D

Standard Survey Report

16 October, 2016



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D
Project:	Lea County, NM (NAD-83 2015)	TVD Reference:	KB @ 4032.00usft (Patriot 6)
Site:	Ivar the Boneless Federal #21H	MD Reference:	KB @ 4032.00usft (Patriot 6)
Well:	SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	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		Ivar the Boneless Federal #21H			
Site Position:		Northing:	665,097.10 usft	Latitude:	32° 49' 37.451 N
From:	Map	Easting:	717,190.10 usft	Longitude:	103° 45' 39.062 W
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	0.31 °

Well	SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D					
Well Position	+N/-S	0.00 usft	Northing:	665,097.10 usft	Latitude:	32° 49' 37.451 N
	+E/-W	0.00 usft	Easting:	717,190.10 usft	Longitude:	103° 45' 39.062 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	4,014.00 usft

Wellbore	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	9/7/2016	7.17	60.59	48,352

Design	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D				
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	356.66	

Survey Program	Date	10/16/2016			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	2,100.00	VES Gyro #1 (BHL: 350' FNL, 350' FWL, S	VES-ISCWSA-GYRO-3	Biaxial Semi-Cont. Gyro	
2,100.00	11,172.00	TDS MWD #2 (BHL: 350' FNL, 350' FWL, S	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	0.12	2.57	100.00	0.10	0.00	0.10	0.12	0.12	0.00	
200.00	0.20	297.02	200.00	0.29	-0.15	0.30	0.19	0.08	-65.55	
300.00	0.13	250.40	300.00	0.33	-0.41	0.35	0.15	-0.07	-46.62	
400.00	0.06	257.42	400.00	0.28	-0.57	0.31	0.07	-0.07	7.02	
500.00	0.19	284.72	500.00	0.31	-0.78	0.36	0.14	0.13	27.30	

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D
Project:	Lea County, NM (NAD-83 2015)	TVD Reference:	KB @ 4032.00usft (Patriot 6)
Site:	Ivar the Boneless Federal #21H	MD Reference:	KB @ 4032.00usft (Patriot 6)
Well:	SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	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)
600.00	0.10	313.19	600.00	0.41	-1.00	0.47	0.11	-0.09	28.47
700.00	0.18	148.55	700.00	0.34	-0.98	0.40	0.28	0.08	-164.64
800.00	0.03	231.69	800.00	0.19	-0.92	0.24	0.18	-0.15	83.14
900.00	0.15	170.20	900.00	0.04	-0.92	0.10	0.14	0.12	-61.49
1,000.00	0.17	172.65	1,000.00	-0.23	-0.88	-0.18	0.02	0.02	2.45
1,100.00	0.12	263.50	1,100.00	-0.39	-0.96	-0.34	0.21	-0.05	90.85
1,200.00	0.31	115.62	1,200.00	-0.52	-0.82	-0.47	0.42	0.19	-147.88
1,300.00	0.34	79.79	1,300.00	-0.59	-0.29	-0.57	0.20	0.03	-35.83
1,400.00	0.76	68.93	1,399.99	-0.29	0.62	-0.33	0.43	0.42	-10.86
1,500.00	0.81	70.99	1,499.98	0.17	1.91	0.06	0.06	0.05	2.06
1,600.00	1.39	61.29	1,599.96	0.99	3.64	0.77	0.61	0.58	-9.70
1,700.00	1.73	66.34	1,699.93	2.18	6.09	1.82	0.37	0.34	5.05
1,800.00	2.09	60.92	1,799.87	3.67	9.06	3.13	0.40	0.36	-5.42
1,900.00	2.50	63.96	1,899.79	5.51	12.62	4.77	0.43	0.41	3.04
2,000.00	2.00	68.11	1,999.71	7.12	16.20	6.16	0.53	-0.50	4.15
2,100.00	1.95	71.89	2,099.65	8.30	19.43	7.15	0.14	-0.05	3.78
Tie-In to VES Gyro									
2,182.00	1.50	71.50	2,181.62	9.07	21.78	7.79	0.55	-0.55	-0.48
First TDS MWD Survey									
2,277.00	1.30	75.20	2,276.59	9.74	24.00	8.33	0.23	-0.21	3.89
2,372.00	1.00	256.20	2,371.58	9.82	24.23	8.39	2.42	-0.32	-188.42
2,467.00	2.40	257.70	2,466.54	9.20	21.49	7.93	1.47	1.47	1.58
2,562.00	3.30	251.40	2,561.42	7.90	16.95	6.90	1.00	0.95	-6.63
2,657.00	4.30	248.00	2,656.21	5.70	11.06	5.04	1.08	1.05	-3.58
2,751.00	5.40	249.70	2,749.87	2.84	3.64	2.63	1.18	1.17	1.81
2,845.00	6.20	252.30	2,843.39	-0.24	-5.34	0.08	0.90	0.85	2.77
2,939.00	5.50	248.70	2,936.90	-3.42	-14.38	-2.57	0.84	-0.74	-3.83
3,034.00	5.40	252.90	3,031.47	-6.38	-22.89	-5.04	0.43	-0.11	4.42
3,129.00	6.20	250.50	3,125.98	-9.41	-32.00	-7.53	0.88	0.84	-2.53
3,223.00	5.70	249.50	3,219.48	-12.74	-41.16	-10.32	0.54	-0.53	-1.06
3,318.00	5.60	246.80	3,314.01	-16.22	-49.84	-13.29	0.30	-0.11	-2.84
3,413.00	6.40	246.00	3,408.49	-20.20	-58.93	-16.73	0.85	0.84	-0.84
3,507.00	7.30	246.30	3,501.82	-24.73	-69.19	-20.66	0.96	0.96	0.32
3,601.00	6.80	245.90	3,595.11	-29.40	-79.74	-24.71	0.53	-0.53	-0.43
3,695.00	6.40	246.00	3,688.49	-33.81	-89.60	-28.53	0.43	-0.43	0.11
3,790.00	6.00	245.80	3,782.93	-37.99	-98.97	-32.16	0.42	-0.42	-0.21
3,885.00	5.50	245.70	3,877.45	-41.90	-107.65	-35.56	0.53	-0.53	-0.11
3,979.00	6.20	249.60	3,970.96	-45.53	-116.51	-38.66	0.86	0.74	4.15
4,074.00	7.10	243.30	4,065.32	-49.95	-126.56	-42.49	1.22	0.95	-6.63
4,168.00	6.80	241.30	4,158.63	-55.23	-136.63	-47.18	0.41	-0.32	-2.13
4,262.00	6.50	242.30	4,252.00	-60.38	-146.23	-51.76	0.34	-0.32	1.06

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D
Project:	Lea County, NM (NAD-83 2015)	TVD Reference:	KB @ 4032.00usft (Patriot 6)
Site:	Ivar the Boneless Federal #21H	MD Reference:	KB @ 4032.00usft (Patriot 6)
Well:	SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	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)
4,357.00	6.20	243.90	4,346.42	-65.14	-155.59	-55.96	0.37	-0.32	1.68
4,451.00	5.90	245.70	4,439.89	-69.36	-164.56	-59.65	0.38	-0.32	1.91
4,546.00	5.50	246.20	4,534.42	-73.20	-173.17	-62.99	0.42	-0.42	0.53
4,639.00	5.80	247.30	4,626.97	-76.82	-181.58	-66.11	0.34	0.32	1.18
4,733.00	6.70	250.80	4,720.41	-80.45	-191.14	-69.18	1.04	0.96	3.72
4,828.00	6.70	250.40	4,814.76	-84.13	-201.60	-72.25	0.05	0.00	-0.42
4,922.00	6.50	250.90	4,908.14	-87.72	-211.79	-75.23	0.22	-0.21	0.53
5,017.00	5.10	252.90	5,002.65	-90.72	-220.91	-77.69	1.49	-1.47	2.11
5,111.00	4.90	252.80	5,096.30	-93.13	-228.74	-79.65	0.21	-0.21	-0.11
5,205.00	4.80	251.70	5,189.96	-95.55	-236.31	-81.62	0.15	-0.11	-1.17
5,300.00	4.30	251.50	5,284.66	-97.93	-243.46	-83.58	0.53	-0.53	-0.21
5,394.00	3.80	248.50	5,378.42	-100.19	-249.70	-85.47	0.58	-0.53	-3.19
5,489.00	3.40	246.40	5,473.24	-102.47	-255.21	-87.43	0.44	-0.42	-2.21
5,583.00	2.80	255.30	5,567.10	-104.17	-259.98	-88.85	0.82	-0.64	9.47
5,646.00	2.70	260.70	5,630.03	-104.80	-262.94	-89.31	0.44	-0.16	8.57
5,675.00	2.80	270.50	5,658.99	-104.91	-264.32	-89.33	1.66	0.34	33.79
5,707.00	3.50	301.80	5,690.95	-104.38	-265.93	-88.71	5.71	2.19	97.81
5,738.00	5.80	335.00	5,721.85	-102.47	-267.40	-86.71	11.13	7.42	107.10
5,769.00	9.00	351.00	5,752.59	-98.65	-268.44	-82.84	12.18	10.32	51.61
5,800.00	13.10	358.50	5,783.01	-92.74	-268.91	-76.92	13.99	13.23	24.19
5,832.00	17.20	1.30	5,813.89	-84.38	-268.90	-68.57	13.01	12.81	8.75
5,863.00	20.60	2.20	5,843.22	-74.35	-268.59	-58.57	11.01	10.97	2.90
5,894.00	23.60	1.90	5,871.93	-62.69	-268.17	-46.96	9.68	9.68	-0.97
5,926.00	26.50	1.10	5,900.92	-49.15	-267.82	-33.46	9.12	9.06	-2.50
5,957.00	30.30	0.10	5,928.19	-34.41	-267.67	-18.76	12.35	12.26	-3.23
5,988.00	33.70	359.30	5,954.47	-17.98	-267.77	-2.35	11.05	10.97	-2.58
6,020.00	36.40	359.70	5,980.67	0.39	-267.92	16.00	8.47	8.44	1.25
6,051.00	39.20	0.60	6,005.16	19.39	-267.87	34.96	9.21	9.03	2.90
6,082.00	42.90	1.10	6,028.53	39.74	-267.56	55.26	11.98	11.94	1.61
6,114.00	45.70	1.00	6,051.43	62.08	-267.15	77.54	8.75	8.75	-0.31
6,146.00	45.90	1.10	6,073.74	85.02	-266.73	100.42	0.66	0.63	0.31
6,177.00	45.60	1.30	6,095.37	107.22	-266.27	122.55	1.07	-0.97	0.65
6,209.00	45.30	1.50	6,117.82	130.02	-265.71	145.28	1.04	-0.94	0.63
6,240.00	45.10	1.60	6,139.67	152.01	-265.12	167.20	0.68	-0.65	0.32
6,270.00	44.80	1.10	6,160.90	173.20	-264.62	188.32	1.54	-1.00	-1.67
6,302.00	44.50	1.20	6,183.66	195.68	-264.17	210.74	0.96	-0.94	0.31
6,333.00	47.20	1.30	6,205.25	217.92	-263.68	232.91	8.71	8.71	0.32
6,364.00	51.20	1.10	6,225.51	241.37	-263.19	256.30	12.91	12.90	-0.65
6,395.00	54.50	0.50	6,244.22	266.08	-262.85	280.94	10.76	10.65	-1.94
6,427.00	57.20	359.70	6,262.19	292.55	-262.81	307.37	8.69	8.44	-2.50
6,458.00	60.90	358.90	6,278.13	319.13	-263.13	333.92	12.14	11.94	-2.58

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D
Project:	Lea County, NM (NAD-83 2015)	TVD Reference:	KB @ 4032.00usft (Patriot 6)
Site:	Ivar the Boneless Federal #21H	MD Reference:	KB @ 4032.00usft (Patriot 6)
Well:	SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	Database:	EDM 5000.1 Single User Db

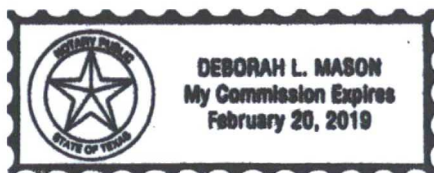
Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,490.00	64.60	358.80	6,292.78	347.57	-263.71	362.35	11.57	11.56	-0.31
6,522.00	67.90	358.90	6,305.66	376.85	-264.29	391.61	10.32	10.31	0.31
6,553.00	70.50	359.10	6,316.67	405.82	-264.80	420.56	8.41	8.39	0.65
6,582.65	73.37	359.20	6,325.86	434.01	-265.22	448.72	9.68	9.68	0.32
As-Drilled PP									
6,584.00	73.50	359.20	6,326.25	435.30	-265.24	450.01	9.68	9.68	0.32
6,615.00	76.80	359.20	6,334.19	465.26	-265.65	479.95	10.65	10.65	0.00
6,646.00	80.10	359.20	6,340.40	495.62	-266.08	510.28	10.65	10.65	0.00
6,678.00	83.10	358.90	6,345.07	527.27	-266.60	541.91	9.42	9.38	-0.94
6,710.00	87.10	358.90	6,347.81	559.14	-267.21	573.76	12.50	12.50	0.00
6,741.00	89.50	358.90	6,348.72	590.12	-267.81	604.72	7.74	7.74	0.00
6,804.00	89.30	359.00	6,349.38	653.11	-268.96	667.67	0.35	-0.32	0.16
6,836.00	89.00	358.80	6,349.86	685.10	-269.58	699.64	1.13	-0.94	-0.63
6,931.00	90.00	359.20	6,350.69	780.08	-271.24	794.56	1.13	1.05	0.42
7,025.00	91.00	0.40	6,349.87	874.07	-271.56	888.41	1.66	1.06	1.28
7,120.00	90.40	0.70	6,348.71	969.06	-270.65	983.18	0.71	-0.63	0.32
7,214.00	91.50	1.10	6,347.15	1,063.03	-269.18	1,076.91	1.25	1.17	0.43
7,308.00	91.80	0.10	6,344.44	1,156.99	-268.19	1,170.65	1.11	0.32	-1.06
7,403.00	91.10	0.10	6,342.04	1,251.96	-268.03	1,265.45	0.74	-0.74	0.00
7,498.00	91.70	359.90	6,339.72	1,346.93	-268.03	1,360.26	0.67	0.63	-0.21
7,593.00	91.10	0.20	6,337.40	1,441.90	-267.94	1,455.06	0.71	-0.63	0.32
7,687.00	91.60	359.20	6,335.18	1,535.87	-268.44	1,548.90	1.19	0.53	-1.06
7,782.00	90.90	359.40	6,333.11	1,630.84	-269.60	1,643.78	0.77	-0.74	0.21
7,877.00	91.60	359.40	6,331.04	1,725.81	-270.59	1,738.64	0.74	0.74	0.00
7,972.00	91.20	359.40	6,328.72	1,820.78	-271.58	1,833.51	0.42	-0.42	0.00
8,067.00	92.10	0.00	6,325.98	1,915.74	-272.08	1,928.33	1.14	0.95	0.63
8,161.00	91.60	0.30	6,322.95	2,009.69	-271.84	2,022.11	0.62	-0.53	0.32
8,255.00	91.50	358.90	6,320.40	2,103.65	-272.49	2,115.95	1.49	-0.11	-1.49
8,350.00	91.30	359.10	6,318.08	2,198.60	-274.15	2,210.84	0.30	-0.21	0.21
8,443.00	90.80	359.30	6,316.38	2,291.58	-275.45	2,303.73	0.58	-0.54	0.22
8,538.00	90.40	359.70	6,315.38	2,386.57	-276.28	2,398.61	0.60	-0.42	0.42
8,631.00	91.10	359.20	6,314.17	2,479.56	-277.17	2,491.49	0.92	0.75	-0.54
8,725.00	90.90	359.40	6,312.52	2,573.53	-278.32	2,585.38	0.30	-0.21	0.21
8,820.00	90.50	359.60	6,311.36	2,668.52	-279.15	2,680.25	0.47	-0.42	0.21
8,915.00	90.00	359.70	6,310.95	2,763.52	-279.73	2,775.12	0.54	-0.53	0.11
9,008.00	91.00	359.30	6,310.14	2,856.51	-280.54	2,868.00	1.16	1.08	-0.43
9,101.00	90.60	359.30	6,308.84	2,949.50	-281.67	2,960.90	0.43	-0.43	0.00
9,195.00	89.90	359.60	6,308.43	3,043.49	-282.58	3,054.78	0.81	-0.74	0.32
9,289.00	90.70	359.70	6,307.94	3,137.49	-283.15	3,148.65	0.86	0.85	0.11
9,384.00	91.30	359.20	6,306.28	3,232.47	-284.06	3,243.53	0.82	0.63	-0.53
9,478.00	90.90	359.70	6,304.47	3,326.44	-284.96	3,337.40	0.68	-0.43	0.53

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D
Project:	Lea County, NM (NAD-83 2015)	TVD Reference:	KB @ 4032.00usft (Patriot 6)
Site:	Ivar the Boneless Federal #21H	MD Reference:	KB @ 4032.00usft (Patriot 6)
Well:	SHL: 105' FNL, 613' FWL, Sec 22, T17S, R32E, Unit D	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	Database:	EDM 5000.1 Single User Db

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)
9,571.00	90.60	359.90	6,303.26	3,419.44	-285.29	3,430.25	0.39	-0.32	0.22
9,665.00	91.20	359.80	6,301.78	3,513.42	-285.54	3,524.09	0.65	0.64	-0.11
9,758.00	90.80	0.10	6,300.16	3,606.41	-285.62	3,616.92	0.54	-0.43	0.32
9,853.00	91.00	359.40	6,298.67	3,701.40	-286.03	3,711.77	0.77	0.21	-0.74
9,947.00	91.90	359.60	6,296.29	3,795.36	-286.85	3,805.63	0.98	0.96	0.21
10,043.00	91.30	359.90	6,293.61	3,891.32	-287.27	3,901.45	0.70	-0.63	0.31
10,138.00	91.60	359.40	6,291.20	3,986.29	-287.85	3,996.29	0.61	0.32	-0.53
10,232.00	91.80	359.20	6,288.41	4,080.24	-289.00	4,090.15	0.30	0.21	-0.21
10,327.00	91.30	359.70	6,285.84	4,175.20	-289.91	4,185.00	0.74	-0.53	0.53
10,422.00	91.20	0.40	6,283.77	4,270.18	-289.83	4,279.81	0.74	-0.11	0.74
10,517.00	91.60	359.60	6,281.45	4,365.15	-289.83	4,374.62	0.94	0.42	-0.84
10,612.00	91.40	0.10	6,278.96	4,460.12	-290.07	4,469.44	0.57	-0.21	0.53
10,707.00	91.00	0.40	6,276.97	4,555.09	-289.66	4,564.23	0.53	-0.42	0.32
10,802.00	91.50	359.70	6,274.90	4,650.07	-289.58	4,659.04	0.91	0.53	-0.74
10,897.00	91.40	359.20	6,272.50	4,745.04	-290.49	4,753.90	0.54	-0.11	-0.53
10,992.00	91.30	358.90	6,270.26	4,840.00	-292.06	4,848.79	0.33	-0.11	-0.32
11,087.00	90.40	358.60	6,268.85	4,934.96	-294.14	4,943.72	1.00	-0.95	-0.32
Last TDS MWD Survey									
11,172.00	90.40	358.60	6,268.26	5,019.93	-296.21	5,028.66	0.00	0.00	0.00
Projection to Bit/TD									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,100.00	2,099.65	8.30	19.43	Tie-In to VES Gyro
2,182.00	2,181.62	9.07	21.78	First TDS MWD Survey
6,582.65	6,325.86	434.01	-265.22	As-Drilled PP
11,087.00	6,268.85	4,934.96	-294.14	Last TDS MWD Survey
11,172.00	6,268.26	5,019.93	-296.21	Projection to Bit/TD

Checked By: Deborah L. Mason Approved By: [Signature] Date: 11/2/2016





11/2/16

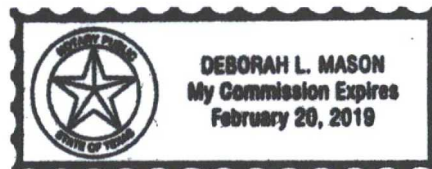
State of New Mexico
County of Lea

I, Donald D. Mason, certify that: I am employed by Terra Directional Services LLC; that I did on the day(s) of 10/02/2016 through 10/15/2016 conduct or supervise the taking of a MWD survey from a depth of 2100 feet to a depth of 11172 feet; that the data is true, correct, complete and within the limitations of the tool as set forth by Terra Directional Services LLC; that I am authorized and qualified to make this report; that this survey was conducted at the request of COG Operating LLC for the Ivar the Boneless Federal #21H Well API 30-025-43406 in Lea County, New Mexico; and that I have reviewed this report and find that it conforms to the principles and procedures as set forth by Terra Directional Services LLC.

Donald D. Mason
President

State of Texas
County of Burnet

Before me, a notary public, on this day personally appeared Donald D Mason, known to me to be the person whose name is subscribed to the foregoing document and, being by me first duly sworn, declared that the statements therein contained are true and correct.



Notary Public's Signature



HOBBS OCD
JAN 04 2017
RECEIVED

October 4, 2016

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

Attn: Kanicia Castillo

RE: **Ivar the Boneless Federal No. 021H**

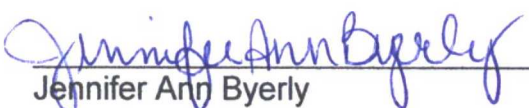
Please find enclosed a copy of the survey from 0' to 2100' ran on the above referenced well.

Sincerely,

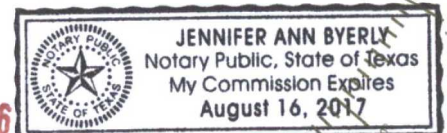

Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 4th day of October,
A.D., 2016, by Keith Havelka.


Jennifer Ann Byerly
Notary Public, State of Texas

OCT 04 2016





HOBBS OCD
JAN 04 2017
RECEIVED

I Michael Cook certify that I am employed by VES Survey International. That I did on the day(s) of 09/29/16 through 09/29/16 conduct or supervise the taking of a Rate Gyro survey from a depth of 0.00 feet to a depth of 2,100.00 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 Ivar The Boneless Federal Well # 21H API # 30-025-43406 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

Company: COG OPERATING
Lease/Well: IVAR THE BONELESS FEDERAL No /021H



Rig Name: PATRIOT 6
State/County: NEW MEXICO/LEA
VS-Azi: 356.66 Degrees
Latitude: 32.82695, Longitude: -103.76035
Grid North = True North -0.31 degs (NAD 27)
Grid Correction Applied = -0.31 degs



HOBBS OCD
JAN 04 2017
RECEIVED

Depth Reference : RKB=18 FEET

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: e-line gyro-de_01.ut

Minimum Curvature Method

Report Date/Time: 10/4/2016 / 14:23

VES Survey International

Midland, Texas

432-563-544

Surveyor: Michael Cook

Ivar the Boneless Federal No. 021H / API 30-025-43406

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	0.12	2.57	100.00	0.11	0.00	0.11	0.11	2.57	0.12
200.00	0.20	297.02	200.00	0.30	-0.15	0.31	0.33	333.34	0.19
300.00	0.13	250.40	300.00	0.34	-0.42	0.36	0.54	308.98	0.15
400.00	0.06	257.42	400.00	0.29	-0.58	0.32	0.65	296.37	0.07
500.00	0.19	284.72	500.00	0.32	-0.79	0.36	0.85	291.91	0.14
600.00	0.10	313.19	600.00	0.42	-1.01	0.48	1.09	292.45	0.11
700.00	0.18	148.55	700.00	0.34	-0.99	0.40	1.05	289.03	0.27
800.00	0.03	231.69	800.00	0.19	-0.93	0.24	0.95	281.46	0.18
900.00	0.15	170.20	900.00	0.05	-0.94	0.10	0.94	272.76	0.13
1000.00	0.17	172.65	1000.00	-0.23	-0.89	-0.18	0.92	255.51	0.03
1100.00	0.12	263.50	1100.00	-0.39	-0.98	-0.34	1.06	248.09	0.21
1200.00	0.31	115.62	1200.00	-0.52	-0.84	-0.48	0.99	237.93	0.42
1300.00	0.34	79.79	1300.00	-0.59	-0.30	-0.57	0.66	206.81	0.20
1400.00	0.76	68.93	1399.99	-0.30	0.61	-0.34	0.68	116.24	0.43
1500.00	0.81	70.99	1499.98	0.17	1.89	0.06	1.90	84.97	0.06
1600.00	1.39	61.29	1599.96	0.98	3.63	0.77	3.76	74.87	0.61

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	1.73	66.34	1699.93	2.17	6.07	1.81	6.45	70.34	0.37
1800.00	2.09	60.92	1799.87	3.66	9.05	3.13	9.76	67.97	0.40
1900.00	2.50	63.96	1899.79	5.50	12.60	4.76	13.75	66.41	0.43
2000.00	2.00	68.11	1999.71	7.11	16.18	6.16	17.67	66.27	0.53
2100.00	1.95	71.89	2099.65	8.29	19.41	7.14	21.11	66.88	0.14



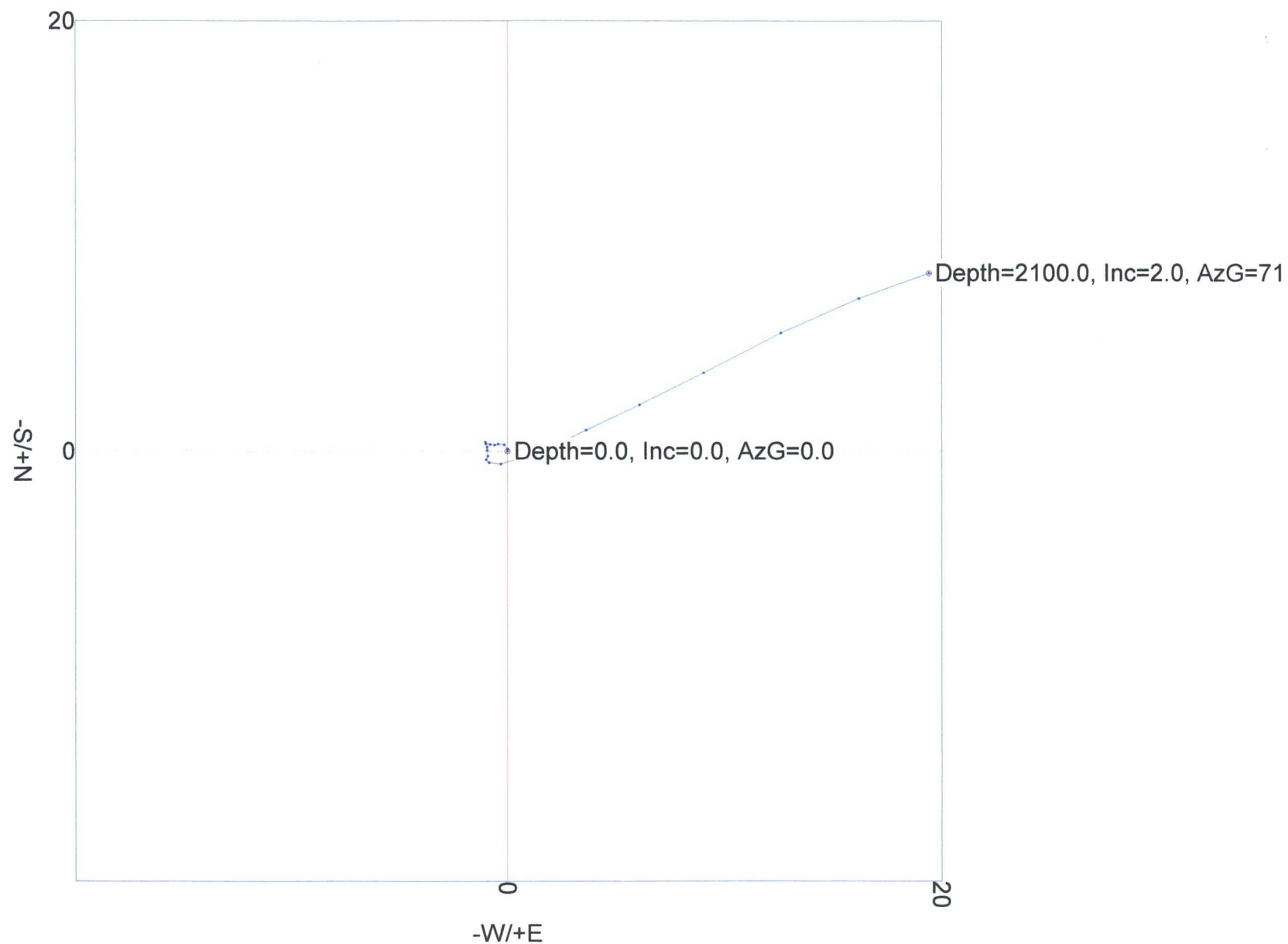
VES Survey International

Midland, Texas

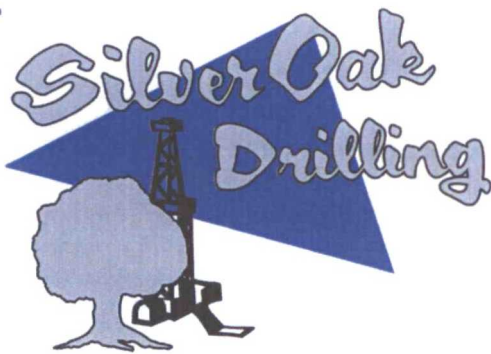
432-563-544

Surveyor: Michael Cook

Ivar the Boneless Federal No. 021H / API 30-025-43406



V.E.S. Survey Date: 9/29/2016



PO Box 1370
Artesia, NM 88211-1370
(575) 748-1288

HOBBS OCD
JAN 04 2017
RECEIVED

October 18, 2016

COG, LLC
One Concho Center
600 W. Illinois Ave.
Midland, TX 79701

RE: Halberd 27 State Com 1H
1003' FSL & 65' FWL
Sec. 26, T17S, R28E
Eddy County, New Mexico

Dear Sir,

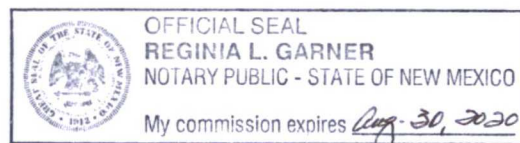
The attached is the Deviation Survey for the above captioned well.

Very truly yours,

Chris Graham
Drilling Superintendent

State of New Mexico }
County of Eddy }

The foregoing was acknowledged before me this 18th day of October, 2016.

Notary Public

Halberd 27 State Com 1H

Date	Depth	Deviation	Direction
10/8/2016	177	0.20	
10/8/2016	335	0.10	
10/9/2016	446	0.50	
10/9/2016	717	0.20	
10/10/2016	964	0.30	264.20
10/10/2016	1027	0.70	163.30
10/10/2016	1121	2.60	118.90
10/10/2016	1215	4.70	114.20
10/10/2016	1310	6.30	103.20
10/10/2016	1404	8.10	102.40
10/10/2016	1687	9.40	100.70
10/10/2016	1782	9.50	103.10
10/11/2016	1876	9.10	104.50
10/11/2016	1971	10.20	99.70
10/11/2016	2066	10.50	98.60
10/11/2016	2160	9.90	100.70
10/11/2016	2254	9.90	102.70
10/11/2016	2348	10.30	103.20
10/11/2016	2537	9.80	101.60
10/11/2016	2632	9.90	103.10
10/11/2016	2726	8.80	105.00
10/11/2016	2821	7.30	106.00
10/11/2016	2915	6.20	103.10
10/11/2016	3010	4.50	107.40
10/11/2016	3167	1.10	118.90
10/11/2016	3230	1.10	290.50
10/11/2016	3356	13.60	282.80
10/12/2016	3388	17.50	279.80
10/12/2016	3450	25.60	274.80
10/12/2016	3514	32.90	265.70
10/12/2016	3576	38.80	264.50
10/12/2016	3608	41.90	266.10
10/12/2016	3702	46.30	268.50
10/12/2016	3797	46.80	268.00
10/12/2016	3828	46.90	267.90
10/12/2016	3859	48.00	267.80
10/12/2016	3891	50.80	267.10
10/12/2016	3922	53.80	268.00
10/12/2016	3954	57.70	268.80
10/12/2016	3985	61.60	269.40
10/12/2016	4017	66.00	270.00
10/12/2016	4174	77.50	269.30

Date	Depth	Deviation	Direction
10/12/2016	4268	82.40	268.50
10/12/2016	4332	89.30	267.70
10/13/2016	4431	90.90	266.60
10/13/2016	4525	90.30	269.10
10/13/2016	4620	90.20	269.20
10/13/2016	4714	89.80	269.30
10/13/2016	4809	91.00	269.80
10/13/2016	4904	91.00	269.20
10/13/2016	4998	90.50	269.60
10/13/2016	5093	90.30	269.70
10/13/2016	5187	91.70	269.20
10/13/2016	5376	91.90	269.90
10/13/2016	5565	91.30	268.50
10/14/2016	5753	91.70	269.10
10/14/2016	5848	91.40	269.20
10/14/2016	5942	91.10	268.80
10/14/2016	6037	91.30	269.50
10/14/2016	6131	90.70	269.10
10/14/2016	6226	90.50	268.80
10/14/2016	6320	90.30	268.70
10/14/2016	6415	90.00	268.80
10/14/2016	6509	89.90	268.90
10/14/2016	6604	90.00	268.90
10/14/2016	6698	89.90	269.30
10/14/2016	6792	91.00	269.30
10/14/2016	6980	91.00	269.80
10/14/2016	7075	90.50	269.70
10/14/2016	7263	91.70	268.90
10/15/2016	7357	91.30	269.20
10/15/2016	7546	90.70	268.80
10/15/2016	7640	90.20	268.70
10/15/2016	7735	91.60	267.90
10/15/2016	7830	923.00	268.60
10/15/2016	7924	91.70	268.20
10/15/2016	8018	91.60	268.40
10/15/2016	8113	91.30	268.40
10/15/2016	8207	90.80	268.10
10/15/2016	8301	90.30	268.50
10/15/2016	8395	91.30	269.30
10/15/2016	8490	91.30	269.30
10/15/2016	8584	91.10	269.40
10/15/2016	8710	90.60	269.80