



A GYRO TECHNOLOGIES INC. COMPANY

P.O. Box 261021
Corpus Christi, Texas 78426
(361) 767-0602 • (800) 606-GYRO • Fax (361) 767-0612

15- 4/238

April 17, 2014

NM OIL CONSERVATION
ARTESIA DISTRICT

JUL 10 2014

RECEIVED

COG Operating LLC (Concho)
One Concho Center
600 W. Illinois Avenue
Midland, TX 79701

Attn: Kanicia Castillo

Re: **Shoeless Joe 32 State 002H**

Please find enclosed a copy of the survey from 0' to 7,500' ran on the above referenced well.

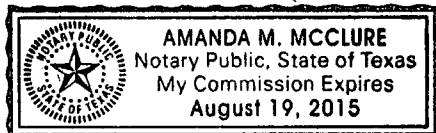
If I can be of any further service, please do not hesitate to call me at 800-606-4976.

Sincerely,


Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 17 day of April,
A.D., 2014, by Keith Havelka.




Amanda McClure
Notary Public, State of Texas



Company: COG Operating-Concho
Lease/Well: Shoeless Joe 32 State/002H

Rig Name: McVay 6
State/County: New Mexico/Eddy
Latitude: 32.62, Longitude: -104.00
GRID North is 0.18 Degrees East of True North
VS-Azi: 0.00 Degrees



Depth Reference : RKB = 18 Ft

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: ...oe 32 state 2h_gyro survey.ut

Minimum Curvature Method

Report Date/Time: 4/17/2014 / 13:20

VES Survey International

Midland, Texas

432-563-5444

Surveyor: Gene Heiss

Shoeless Joe 32 State 002H / API 30-015-41238

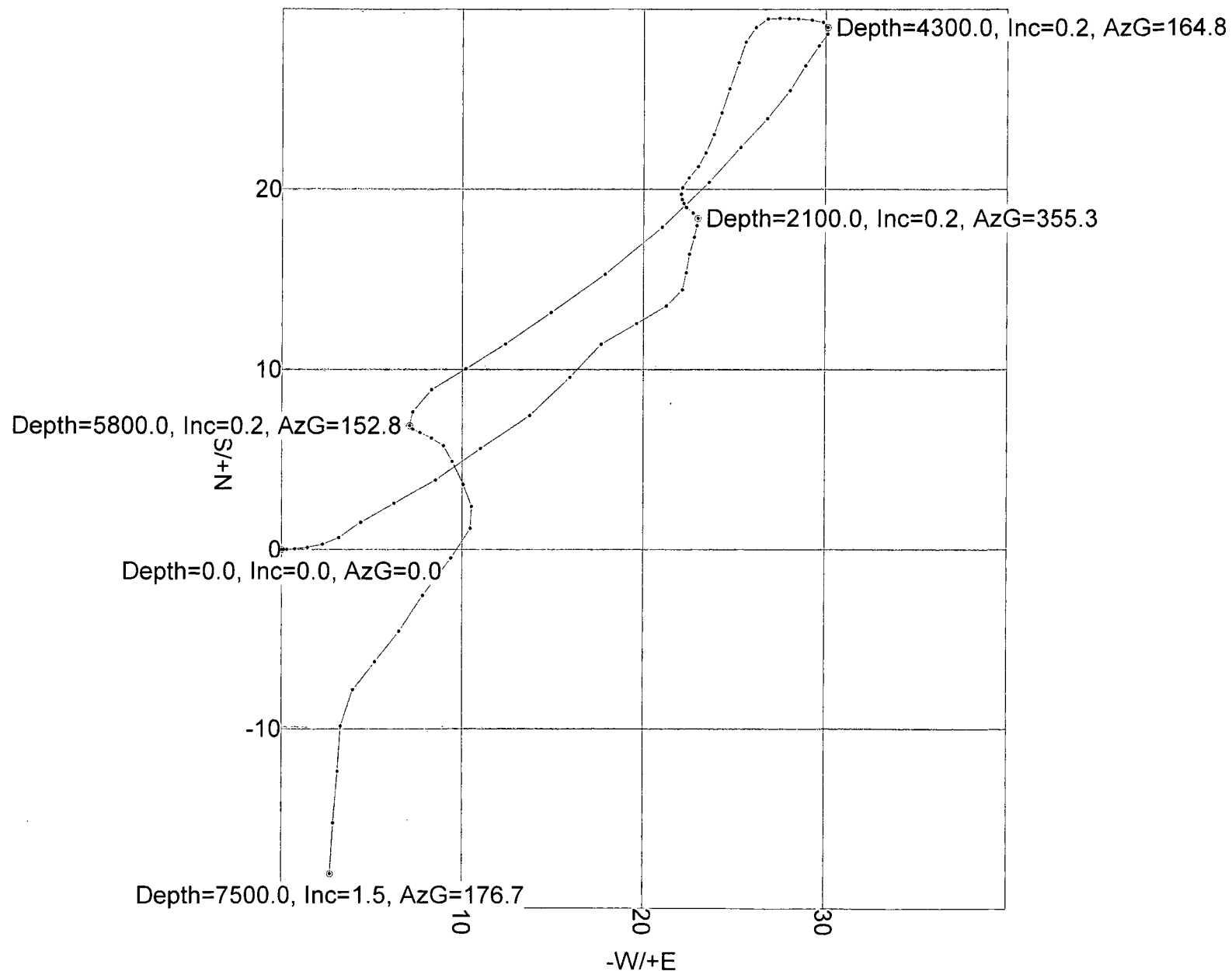
Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.09	95.59	100.00	-0.01	0.08	-0.01	0.08	95.59	0.09
200.00	0.17	86.08	200.00	-0.01	0.30	-0.01	0.30	90.97	0.08
300.00	0.34	84.59	300.00	0.03	0.74	0.03	0.74	87.45	0.17
400.00	0.48	81.98	400.00	0.12	1.45	0.12	1.45	85.30	0.14
500.00	0.51	74.94	499.99	0.29	2.29	0.29	2.31	82.71	0.07
600.00	0.62	62.25	599.99	0.66	3.20	0.66	3.27	78.32	0.17
700.00	1.10	51.45	699.98	1.51	4.43	1.51	4.68	71.17	0.50
800.00	1.35	67.03	799.95	2.56	6.25	2.56	6.76	67.71	0.41
900.00	1.67	55.15	899.92	3.86	8.53	3.86	9.36	65.68	0.45
1000.00	1.80	54.02	999.87	5.61	11.00	5.61	12.35	62.97	0.13
1100.00	1.97	58.06	1099.82	7.44	13.73	7.44	15.62	61.54	0.22
1200.00	1.64	31.97	1199.77	9.57	15.95	9.57	18.60	59.04	0.88
1300.00	1.31	57.05	1299.74	11.40	17.66	11.40	21.03	57.16	0.72
1400.00	1.29	62.20	1399.71	12.55	19.62	12.55	23.29	57.40	0.12
1500.00	0.91	55.34	1499.69	13.52	21.27	13.52	25.20	57.54	0.40
1600.00	0.58	25.59	1599.69	14.43	22.14	14.43	26.42	56.90	0.50
1700.00	0.56	359.04	1699.68	15.37	22.35	15.37	27.12	55.48	0.26
1800.00	0.66	18.57	1799.68	16.40	22.52	16.40	27.86	53.94	0.23

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
1900.00	0.46	11.09	1899.67	17.34	22.78	17.34	28.63	52.73	0.22
2000.00	0.30	15.03	1999.67	17.98	22.92	17.98	29.13	51.90	0.16
2100.00	0.17	355.31	2099.67	18.38	22.98	18.38	29.42	51.35	0.15
2200.00	0.35	301.83	2199.67	18.69	22.70	18.69	29.41	50.54	0.29
2300.00	0.19	324.56	2299.67	18.99	22.34	18.99	29.32	49.64	0.19
2400.00	0.11	330.62	2399.67	19.22	22.20	19.22	29.36	49.12	0.08
2500.00	0.17	344.28	2499.67	19.44	22.11	19.44	29.44	48.67	0.06
2600.00	0.17	354.51	2599.67	19.73	22.06	19.73	29.59	48.19	0.03
2700.00	0.27	24.55	2699.66	20.09	22.14	20.09	29.89	47.78	0.15
2800.00	0.48	36.92	2799.66	20.63	22.49	20.63	30.52	47.46	0.23
2900.00	0.44	41.63	2899.66	21.25	22.99	21.25	31.30	47.25	0.06
3000.00	0.58	17.84	2999.66	22.02	23.40	22.02	32.13	46.74	0.25
3100.00	0.70	28.91	3099.65	23.04	23.85	23.04	33.16	45.99	0.17
3200.00	0.78	10.57	3199.64	24.24	24.27	24.24	34.30	45.04	0.25
3300.00	0.85	24.53	3299.63	25.58	24.70	25.58	35.56	44.00	0.21
3400.00	0.91	14.34	3399.62	27.03	25.21	27.03	36.96	43.00	0.17
3500.00	0.48	25.93	3499.61	28.18	25.59	28.18	38.06	42.24	0.46
3600.00	0.66	39.61	3599.61	28.99	26.14	28.99	39.04	42.03	0.23
3700.00	0.33	83.84	3699.60	29.47	26.79	29.47	39.83	42.27	0.48
3800.00	0.42	89.91	3799.60	29.50	27.44	29.50	40.29	42.93	0.10
3900.00	0.20	94.78	3899.60	29.49	27.98	29.49	40.65	43.50	0.23
4000.00	0.38	90.59	3999.60	29.47	28.48	29.47	40.98	44.02	0.18
4100.00	0.48	97.63	4099.60	29.41	29.22	29.41	41.46	44.82	0.12
4200.00	0.26	111.59	4199.59	29.27	29.85	29.27	41.81	45.56	0.24
4300.00	0.23	164.81	4299.59	29.00	30.11	29.00	41.80	46.08	0.22
4400.00	0.22	202.00	4399.59	28.63	30.09	28.63	41.53	46.43	0.14
4500.00	0.72	219.55	4499.59	27.97	29.62	27.97	40.74	46.64	0.52
4600.00	0.82	209.06	4599.58	26.86	28.87	26.86	39.44	47.07	0.17
4700.00	1.04	213.58	4699.57	25.48	28.03	25.48	37.88	47.72	0.24
4800.00	1.25	222.80	4799.55	23.93	26.78	23.93	35.92	48.22	0.28
4900.00	1.25	222.05	4899.52	22.32	25.31	22.32	33.75	48.60	0.02
5000.00	1.72	221.74	4999.49	20.39	23.58	20.39	31.17	49.16	0.47
5100.00	2.38	228.64	5099.42	17.89	21.02	17.89	27.61	49.60	0.70
5200.00	2.30	232.07	5199.34	15.29	17.88	15.29	23.52	49.47	0.16
5300.00	1.90	237.08	5299.27	13.15	14.90	13.15	19.87	48.57	0.44
5400.00	1.61	233.69	5399.23	11.42	12.38	11.42	16.84	47.31	0.31
5500.00	1.38	242.28	5499.19	10.03	10.18	10.03	14.29	45.45	0.32
5600.00	1.15	233.75	5599.17	8.87	8.31	8.87	12.16	43.12	0.29
5700.00	0.78	199.99	5699.15	7.64	7.27	7.64	10.55	43.56	0.66

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
5800.00	0.16	152.82	5799.15	6.88	7.10	6.88	9.89	45.89	0.68
5900.00	0.17	122.98	5899.15	6.68	7.29	6.68	9.88	47.48	0.08
6000.00	0.33	111.34	5999.15	6.50	7.67	6.50	10.06	49.75	0.17
6100.00	0.48	118.64	6099.15	6.19	8.31	6.19	10.36	53.31	0.16
6200.00	0.41	130.21	6199.14	5.76	8.95	5.76	10.65	57.26	0.11
6300.00	0.77	160.60	6299.14	4.89	9.45	4.89	10.64	62.64	0.46
6400.00	0.85	149.89	6399.13	3.62	10.05	3.62	10.68	70.19	0.17
6500.00	0.69	170.65	6499.12	2.38	10.52	2.38	10.78	77.22	0.32
6600.00	0.72	195.55	6599.11	1.19	10.45	1.19	10.51	83.52	0.30
6700.00	1.58	219.86	6699.09	-0.47	9.40	-0.47	9.41	92.89	0.97
6800.00	1.40	213.65	6799.06	-2.55	7.84	-2.55	8.24	108.01	0.24
6900.00	1.34	212.37	6899.03	-4.55	6.53	-4.55	7.96	124.86	0.07
7000.00	1.13	224.75	6999.01	-6.24	5.21	-6.24	8.13	140.12	0.34
7100.00	1.15	209.95	7098.99	-7.81	4.02	-7.81	8.78	152.79	0.29
7200.00	1.34	189.27	7198.96	-9.84	3.33	-9.84	10.38	161.31	0.48
7300.00	1.57	179.68	7298.93	-12.36	3.15	-12.36	12.76	165.72	0.34
7400.00	1.76	189.64	7398.89	-15.25	2.90	-15.25	15.52	169.24	0.34
7500.00	1.53	176.70	7498.85	-18.09	2.72	-18.09	18.30	171.46	0.43



VES Survey International
Midland, Texas
432-563-5444
Surveyor: Gene Heiss
Shoeless Joe 32 State 002H / API 30-015-41238



VES Survey Date: 04/02/2014

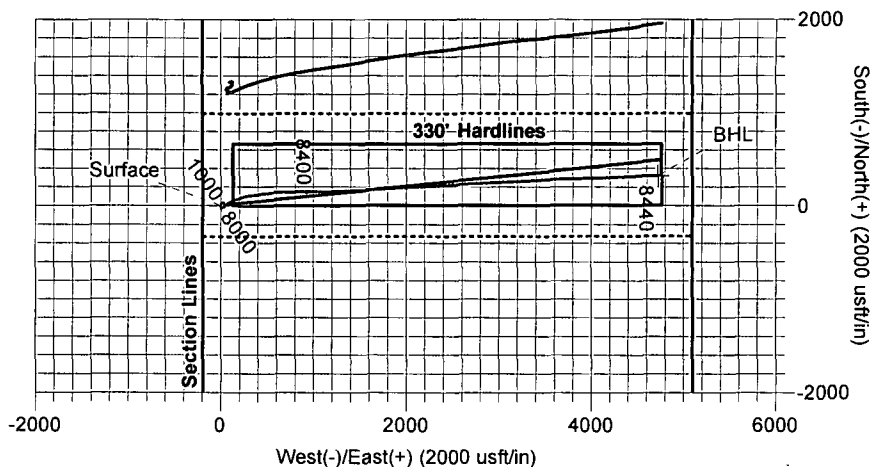
COG OPERATING, LLC

Field: Eddy County, NM
 Site: Shoeless Joe 32 State Com 2H
 Well: 2H
 Wellbore: Lateral
 Plan: Surveys



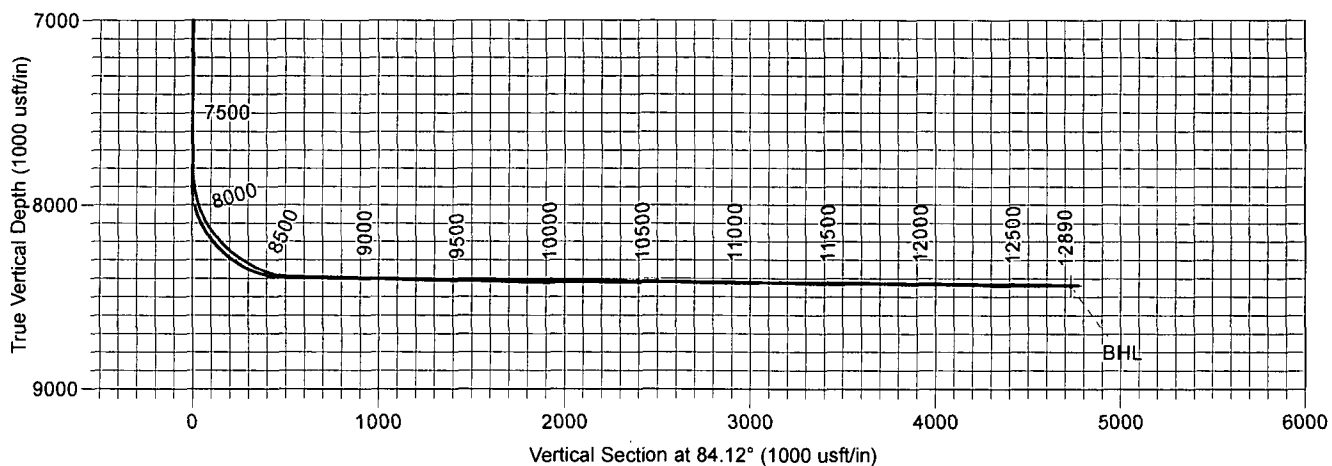
Azimuths to Grid North
 True North: -0.18°
 Magnetic North: 7.29°

Magnetic Field
 Strength: 48529.0snT
 Dip Angle: 60.41°
 Date: 3/26/2014
 Model: IGRF2010



LEGEND

- 1H, Lateral, Surveys V0
- 1H, Pilot Hole, Surveys V0
- 2H, Lateral, Plan #2 V0
- Surveys



TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
Shoeless 2H Surface	0.00	0.00	0.00	588593.60	602132.20	$32^\circ 37' 3.75''$ N	$104^\circ 0' 5.86''$ W	Point
Shoeless 2H BHL	8440.27	319.88	4721.85	588913.48	606854.05	$32^\circ 37' 6.77''$ N	$103^\circ 59' 10.64''$ W	Point



ARCHER DIRECTIONAL DRILLING SERVICES
 12101 Cutten Rd. Houston, Texas 77066
 Phone: 281-301-2600 Fax: 281-301-2795

Design: Surveys (2H/Lateral)
 Created By: Ivonne Gonzalez
 Date: 10:01, April 10 2014

Archer Survey Report

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well 2H
Project:	Eddy County, NM	TVD Reference:	3318'GL+20'KB @ 3338.00usft (Planning)
Site:	Shoeless Joe 32 State Com 2H	MD Reference:	3318'GL+20'KB @ 3338.00usft (Planning)
Well:	2H	North Reference:	Grid
Wellbore:	Lateral	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	EDM R5000.1 MULTI

Project	Eddy 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	Shoeless Joe 32 State Com 2H		
Site Position:		Northing:	588,593.60 usft
From:	Map	Easting:	602,132.20 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13.200 in
		Latitude:	32° 37' 3.75 N
		Longitude:	104° 0' 5.86 W
		Grid Convergence:	0.18 °

Well	2H		
Well Position	+N/-S	0.00 usft	Northing: 588,593.60 usft
	+E/-W	0.00 usft	Easting: 602,132.20 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft
		Latitude:	32° 37' 3.75 N
		Longitude:	104° 0' 5.86 W
		Ground Level:	3,318.00 usft

Wellbore	Lateral		
Magnetics	Model Name	Sample Date	Declination
	IGRF2010	3/26/2014	(°)
			7.47
			60.41
			48,529

Design	Surveys		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.00	0.00	0.00
			84.12

Survey Program	Date	4/10/2014		
From	To	Survey (Wellbore)	Tool Name	Description
(usft)	(usft)			
100.00	7,500.00	Survey #1 (Lateral)	Gyroscope	Gyroscope
7,728.00	12,771.00	Survey #2 (Lateral)	MWD	Std MWD
12,890.00	12,890.00	Survey #3 (Lateral)	Project	Projection

Survey									
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn
Depth	(°)	(°)	Depth	(usft)	(usft)	Section	Rate	Rate	Rate
(usft)			(usft)			(usft)	(°/100usft)	(°/100usft)	(°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.09	95.59	100.00	-0.01	0.08	0.08	0.09	0.09	0.00
200.00	0.17	86.08	200.00	-0.01	0.30	0.30	0.08	0.08	-9.51
300.00	0.34	84.59	300.00	0.03	0.75	0.75	0.17	0.17	-1.49
400.00	0.48	81.98	400.00	0.12	1.46	1.46	0.14	0.14	-2.61
500.00	0.51	74.94	499.99	0.29	2.30	2.32	0.07	0.03	-7.04
600.00	0.62	62.25	599.99	0.66	3.21	3.26	0.17	0.11	-12.69
700.00	1.10	51.45	699.98	1.51	4.44	4.57	0.50	0.48	-10.80
800.00	1.35	67.03	799.95	2.57	6.28	6.51	0.41	0.25	15.58

Archer

Survey Report

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well 2H
Project:	Eddy County, NM	TVD Reference:	3318'GL+20'KB @ 3338.00usft (Planning)
Site:	Shoeless Joe 32 State Corn 2H	MD Reference:	3318'GL+20'KB @ 3338.00usft (Planning)
Well:	2H	North Reference:	Grid
Wellbore:	Lateral	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	EDM R5000.1 MULTI

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)	
900.00	1.67	55.15	899.92	3.86	8.56	8.91	0.45	0.32	-11.88	
1,000.00	1.80	54.02	999.87	5.62	11.02	11.54	0.13	0.13	-1.13	
1,100.00	1.97	58.06	1,099.82	7.45	13.75	14.44	0.22	0.17	4.04	
1,200.00	1.64	31.97	1,199.77	9.57	15.97	16.87	0.88	-0.33	-26.09	
1,300.00	1.31	57.05	1,299.74	11.41	17.69	18.76	0.72	-0.33	25.08	
1,400.00	1.29	62.20	1,399.71	12.55	19.64	20.82	0.12	-0.02	5.15	
1,500.00	0.91	55.34	1,499.69	13.53	21.29	22.56	0.40	-0.38	-6.86	
1,600.00	0.58	25.59	1,599.69	14.44	22.16	23.52	0.50	-0.33	-29.75	
1,700.00	0.56	359.04	1,699.68	15.38	22.37	23.83	0.26	-0.02	-26.55	
1,800.00	0.66	18.57	1,799.68	16.42	22.55	24.11	0.23	0.10	19.53	
1,900.00	0.46	11.09	1,899.67	17.36	22.81	24.47	0.21	-0.20	-7.48	
2,000.00	0.30	15.03	1,999.67	18.01	22.95	24.68	0.16	-0.16	3.94	
2,100.00	0.17	355.31	2,099.67	18.41	23.01	24.77	0.15	-0.13	-19.72	
2,200.00	0.35	301.83	2,199.67	18.72	22.74	24.53	0.28	0.18	-53.48	
2,300.00	0.19	324.56	2,299.67	19.01	22.38	24.21	0.19	-0.16	22.73	
2,400.00	0.11	330.62	2,399.67	19.23	22.24	24.09	0.08	-0.08	6.06	
2,500.00	0.17	344.28	2,499.67	19.46	22.15	24.03	0.07	0.06	13.66	
2,600.00	0.17	354.51	2,599.66	19.75	22.10	24.00	0.03	0.00	10.23	
2,700.00	0.27	24.55	2,699.66	20.11	22.18	24.12	0.15	0.10	30.04	
2,800.00	0.48	36.92	2,799.66	20.66	22.53	24.53	0.22	0.21	12.37	
2,900.00	0.44	41.63	2,899.66	21.28	23.04	25.09	0.06	-0.04	4.71	
3,000.00	0.58	17.84	2,999.65	22.05	23.45	25.58	0.25	0.14	-23.79	
3,100.00	0.70	28.91	3,099.65	23.07	23.90	26.13	0.17	0.12	11.07	
3,200.00	0.78	10.57	3,199.64	24.27	24.32	26.68	0.25	0.08	-18.34	
3,300.00	0.85	24.53	3,299.63	25.61	24.75	27.24	0.21	0.07	13.96	
3,400.00	0.91	14.34	3,399.62	27.06	25.25	27.89	0.17	0.06	-10.19	
3,500.00	0.48	25.93	3,499.61	28.20	25.63	28.39	0.45	-0.43	11.59	
3,600.00	0.66	39.61	3,599.61	29.02	26.18	29.02	0.22	0.18	13.68	
3,700.00	0.33	83.84	3,699.60	29.50	26.84	29.72	0.48	-0.33	44.23	
3,800.00	0.42	89.91	3,799.60	29.53	27.49	30.37	0.10	0.09	6.07	
3,900.00	0.20	94.78	3,899.60	29.52	28.03	30.91	0.22	-0.22	4.87	
4,000.00	0.38	90.59	3,999.60	29.50	28.54	31.41	0.18	0.18	-4.19	
4,100.00	0.48	97.63	4,099.59	29.44	29.28	32.15	0.11	0.10	7.04	
4,200.00	0.26	111.59	4,199.59	29.30	29.91	32.75	0.24	-0.22	13.96	
4,300.00	0.23	164.81	4,299.59	29.02	30.17	32.99	0.22	-0.03	53.22	
4,400.00	0.22	202.00	4,399.59	28.65	30.15	32.93	0.14	-0.01	37.19	
4,500.00	0.72	219.55	4,499.59	27.99	29.68	32.39	0.51	0.50	17.55	
4,600.00	0.82	209.06	4,599.58	26.88	28.93	31.54	0.17	0.10	-10.49	
4,700.00	1.04	213.58	4,699.57	25.50	28.08	30.55	0.23	0.22	4.52	
4,800.00	1.25	222.80	4,799.55	23.94	26.84	29.15	0.28	0.21	9.22	
4,900.00	1.25	222.05	4,899.52	22.33	25.37	27.52	0.02	0.00	-0.75	
5,000.00	1.72	221.74	4,999.49	20.40	23.64	25.61	0.47	0.47	-0.31	
5,100.00	2.38	228.64	5,099.42	17.91	21.08	22.81	0.70	0.66	6.90	

Archer Survey Report

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well 2H
Project:	Eddy County, NM	TVD Reference:	3318'GL+20'KB @ 3338.00usft (Planning)
Site:	Shoeless Joe 32 State Com 2H	MD Reference:	3318'GL+20'KB @ 3338.00usft (Planning)
Well:	2H	North Reference:	Grid
Wellbore:	Lateral	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	EDM R5000.1 MULTI

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)	
5,200.00	2.30	232.07	5,199.34	15.30	17.94	19.41	0.16	-0.08	3.43	
5,300.00	1.90	237.08	5,299.27	13.17	14.97	16.24	0.44	-0.40	5.01	
5,400.00	1.61	233.69	5,399.23	11.44	12.44	13.55	0.31	-0.29	-3.39	
5,500.00	1.38	242.28	5,499.19	10.04	10.25	11.22	0.32	-0.23	8.59	
5,600.00	1.15	233.75	5,599.17	8.89	8.37	9.24	0.30	-0.23	-8.53	
5,700.00	0.78	199.99	5,699.15	7.66	7.33	8.07	0.66	-0.37	-33.76	
5,800.00	0.16	152.82	5,799.15	6.89	7.16	7.83	0.68	-0.62	-47.17	
5,900.00	0.17	122.98	5,899.15	6.69	7.35	7.99	0.09	0.01	-29.84	
6,000.00	0.33	111.34	5,999.15	6.50	7.74	8.37	0.17	0.16	-11.64	
6,100.00	0.48	118.64	6,099.15	6.20	8.38	8.97	0.16	0.15	7.30	
6,200.00	0.41	130.21	6,199.14	5.77	9.02	9.56	0.11	-0.07	11.57	
6,300.00	0.77	160.60	6,299.14	4.90	9.51	9.97	0.47	0.36	30.39	
6,400.00	0.85	149.89	6,399.13	3.63	10.11	10.43	0.17	0.08	-10.71	
6,500.00	0.69	170.65	6,499.12	2.39	10.58	10.77	0.32	-0.16	20.76	
6,600.00	0.72	195.55	6,599.11	1.19	10.51	10.57	0.31	0.03	24.90	
6,700.00	1.58	219.86	6,699.09	-0.47	9.46	9.36	0.97	0.86	24.31	
6,800.00	1.40	213.65	6,799.06	-2.55	7.90	7.59	0.24	-0.18	-6.21	
6,900.00	1.34	212.37	6,899.03	-4.55	6.59	6.09	0.07	-0.06	-1.28	
7,000.00	1.13	224.75	6,999.01	-6.24	5.27	4.61	0.34	-0.21	12.38	
7,100.00	1.15	209.95	7,098.99	-7.81	4.08	3.26	0.29	0.02	-14.80	
7,200.00	1.34	189.27	7,198.96	-9.83	3.39	2.36	0.48	0.19	-20.68	
7,300.00	1.57	179.68	7,298.93	-12.36	3.21	1.92	0.33	0.23	-9.59	
7,400.00	1.76	189.64	7,398.89	-15.24	2.96	1.38	0.35	0.19	9.96	
7,500.00	1.53	176.70	7,498.85	-18.09	2.78	0.91	0.44	-0.23	-12.94	
7,728.00	1.50	170.80	7,726.77	-24.07	3.43	0.95	0.07	-0.01	-2.59	
7,760.00	1.70	174.80	7,758.76	-24.96	3.54	0.96	0.72	0.63	12.50	
7,792.00	1.80	139.90	7,790.74	-25.82	3.91	1.24	3.29	0.31	-109.06	
7,824.00	4.00	88.50	7,822.70	-26.17	5.35	2.64	10.01	6.88	-160.63	
7,856.00	7.00	74.10	7,854.55	-25.61	8.34	5.67	10.25	9.38	-45.00	
7,887.00	9.40	62.00	7,885.24	-23.90	12.39	9.88	9.50	7.74	-39.03	
7,919.00	12.30	53.10	7,916.66	-20.63	17.43	15.22	10.44	9.06	-27.81	
7,951.00	15.10	51.70	7,947.75	-16.00	23.42	21.66	8.81	8.75	-4.38	
7,983.00	18.20	52.30	7,978.40	-10.36	30.65	29.43	9.70	9.69	1.88	
8,015.00	21.10	55.20	8,008.54	-4.01	39.34	38.72	9.56	9.06	9.06	
8,047.00	24.00	57.70	8,038.09	2.75	49.57	49.59	9.54	9.06	7.81	
8,079.00	27.70	58.40	8,066.88	10.13	61.41	62.12	11.60	11.56	2.19	
8,110.00	31.20	59.50	8,093.87	17.99	74.47	75.92	11.42	11.29	3.55	
8,142.00	34.10	60.40	8,120.81	26.62	89.41	91.67	9.19	9.06	2.81	
8,174.00	37.20	63.50	8,146.82	35.37	105.87	108.94	11.21	9.69	9.69	
8,206.00	39.50	66.20	8,171.91	43.80	123.85	127.68	8.89	7.19	8.44	
8,238.00	42.30	68.20	8,196.10	51.91	143.16	147.73	9.66	8.75	6.25	
8,270.00	45.60	69.30	8,219.13	59.95	163.86	169.14	10.58	10.31	3.44	
8,300.00	48.80	69.50	8,239.51	67.69	184.46	190.43	10.68	10.67	0.67	

Archer

Survey Report

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well 2H
Project:	Eddy County, NM	TVD Reference:	3318'GL+20'KB.@ 3338.00usft (Planning)
Site:	Shoeless Joe 32 State Com 2H	MD Reference:	3318'GL+20'KB @ 3338.00usft (Planning)
Well:	2H	North Reference:	Grid
Wellbore:	Lateral	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	EDM R5000.1 MULTI

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)	
8,333.00	52.10	69.80	8,260.52	76.54	208.32	215.06	10.02	10.00	0.91	
8,365.00	54.60	71.00	8,279.62	85.15	232.50	240.00	8.37	7.81	3.75	
8,397.00	56.40	74.90	8,297.75	92.87	257.71	265.87	11.51	5.63	12.19	
8,429.00	57.90	79.30	8,315.12	98.86	283.90	292.54	12.46	4.69	13.75	
8,461.00	61.00	82.10	8,331.38	103.30	311.09	320.04	12.27	9.69	8.75	
8,493.00	64.60	82.90	8,346.01	107.01	339.31	348.48	11.47	11.25	2.50	
8,525.00	68.30	82.80	8,358.79	110.66	368.41	377.81	11.57	11.56	-0.31	
8,557.00	72.10	81.80	8,369.63	114.70	398.24	407.89	12.23	11.88	-3.13	
8,588.00	75.70	80.90	8,378.22	119.18	427.68	437.64	11.94	11.61	-2.90	
8,620.00	79.70	81.30	8,385.04	124.01	458.56	468.85	12.56	12.50	1.25	
8,652.00	83.80	81.90	8,389.63	128.64	489.88	500.48	12.95	12.81	1.88	
8,684.00	87.80	83.30	8,391.97	132.75	521.52	532.38	13.24	12.50	4.38	
8,716.00	89.50	85.40	8,392.73	135.89	553.36	564.37	8.44	5.31	6.56	
8,780.00	89.90	86.70	8,393.06	140.30	617.20	628.33	2.13	0.63	2.03	
8,875.00	88.70	89.10	8,394.22	143.78	712.12	723.11	2.82	-1.26	2.53	
8,971.00	89.50	89.60	8,395.73	144.87	808.10	818.69	0.98	0.83	0.52	
9,066.00	86.90	89.80	8,398.71	145.37	903.05	913.19	2.74	-2.74	0.21	
9,162.00	87.30	89.80	8,403.57	145.70	998.92	1,008.60	0.42	0.42	0.00	
9,258.00	87.50	90.00	8,407.93	145.87	1,094.82	1,104.01	0.29	0.21	0.21	
9,353.00	88.20	87.60	8,411.49	147.86	1,189.73	1,198.62	2.63	0.74	-2.53	
9,449.00	89.00	87.20	8,413.84	152.21	1,285.60	1,294.43	0.93	0.83	-0.42	
9,544.00	89.60	87.60	8,415.00	156.52	1,380.50	1,389.27	0.76	0.63	0.42	
9,640.00	90.20	87.70	8,415.16	160.46	1,476.41	1,485.08	0.63	0.63	0.10	
9,734.00	88.30	86.30	8,416.40	165.38	1,570.27	1,578.95	2.51	-2.02	-1.49	
9,829.00	88.50	86.10	8,419.05	171.67	1,665.03	1,673.85	0.30	0.21	-0.21	
9,924.00	89.10	86.40	8,421.04	177.88	1,759.80	1,768.76	0.71	0.63	0.32	
10,019.00	89.70	87.00	8,422.03	183.35	1,854.64	1,863.66	0.89	0.63	0.63	
10,114.00	90.30	87.40	8,422.03	187.99	1,949.52	1,958.52	0.76	0.63	0.42	
10,209.00	91.10	87.20	8,420.87	192.47	2,044.41	2,053.37	0.87	0.84	-0.21	
10,304.00	89.10	86.70	8,420.71	197.52	2,139.27	2,148.25	2.17	-2.11	-0.53	
10,399.00	89.30	86.30	8,422.03	203.32	2,234.08	2,243.16	0.47	0.21	-0.42	
10,494.00	89.70	86.20	8,422.86	209.53	2,328.88	2,338.09	0.43	0.42	-0.11	
10,589.00	90.20	86.30	8,422.94	215.75	2,423.67	2,433.02	0.54	0.53	0.11	
10,683.00	90.90	85.90	8,422.04	222.14	2,517.45	2,526.96	0.86	0.74	-0.43	
10,778.00	88.50	87.10	8,422.54	227.94	2,612.26	2,621.87	2.82	-2.53	1.26	
10,873.00	88.70	87.10	8,424.86	232.74	2,707.11	2,716.71	0.21	0.21	0.00	
10,968.00	89.50	87.00	8,426.35	237.63	2,801.97	2,811.58	0.85	0.84	-0.11	
11,063.00	89.80	87.20	8,426.93	242.44	2,896.85	2,906.45	0.38	0.32	0.21	
11,158.00	90.90	86.60	8,426.35	247.58	2,991.71	3,001.33	1.32	1.16	-0.63	
11,252.00	90.40	88.00	8,425.29	252.00	3,085.59	3,095.18	1.58	-0.53	1.49	
11,347.00	88.00	86.80	8,426.61	256.31	3,180.48	3,190.00	2.82	-2.53	-1.26	
11,442.00	88.40	86.70	8,429.60	261.70	3,275.28	3,284.86	0.43	0.42	-0.11	
11,537.00	89.30	86.70	8,431.50	267.16	3,370.10	3,379.74	0.95	0.95	0.00	
11,632.00	90.10	86.60	8,432.00	272.71	3,464.94	3,474.64	0.85	0.84	-0.11	

Archer

Survey Report

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well 2H
Project:	Eddy County, NM	TVD Reference:	3318'GL+20'KB @ 3338.00usft (Planning)
Site:	Shoeless Joe 32 State Com 2H	MD Reference:	3318'GL+20'KB @ 3338.00usft (Planning)
Well:	2H	North Reference:	Grid
Wellbore:	Lateral	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	EDM R5000.1 MULTI

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)	
11,727.00	90.60	87.10	8,431.42	277.93	3,559.79	3,569.53	0.74	0.53	0.53	
11,822.00	90.30	87.90	8,430.67	282.08	3,654.70	3,664.37	0.90	-0.32	0.84	
11,917.00	88.70	88.80	8,431.50	284.81	3,749.65	3,759.10	1.93	-1.68	0.95	
12,012.00	89.00	88.40	8,433.41	287.13	3,844.60	3,853.79	0.53	0.32	-0.42	
12,106.00	88.90	88.20	8,435.13	289.92	3,938.54	3,947.52	0.24	-0.11	-0.21	
12,201.00	89.60	87.90	8,436.38	293.15	4,033.48	4,042.29	0.80	0.74	-0.32	
12,296.00	90.20	88.20	8,436.54	296.39	4,128.42	4,137.07	0.71	0.63	0.32	
12,391.00	88.30	87.10	8,437.79	300.28	4,223.33	4,231.87	2.31	-2.00	-1.16	
12,486.00	88.70	86.70	8,440.27	305.42	4,318.16	4,326.73	0.60	0.42	-0.42	
12,581.00	89.50	87.20	8,441.76	310.47	4,413.01	4,421.60	0.99	0.84	0.53	
12,676.00	90.10	88.00	8,442.10	314.45	4,507.93	4,516.42	1.05	0.63	0.84	
12,771.00	90.60	88.70	8,441.52	317.18	4,602.88	4,611.16	0.91	0.53	0.74	
12,890.00	90.60	88.70	8,440.27	319.88	4,721.85	4,729.77	0.00	0.00	0.00	

Design Targets										
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude	
- hit/miss target										
- Shape										
Shoeless 2H Surface	0.00	0.00	0.00	0.00	0.00	588,593.60	602,132.20	32° 37' 3.75 N	104° 0' 5.86 W	
- actual wellpath hits target center										
- Point										
Shoeless 2H BHL	0.00	0.00	8,440.27	319.88	4,721.85	588,913.49	606,854.05	32° 37' 6.77 N	103° 59' 10.64 W	
- actual wellpath hits target center										
- Point										