

PATRIOT DRILLING, LLC

NM OIL CONSERVATION

ARTESIA DISTRICT

JUL 25 2016

RECEIVED

OPERATOR: COG Operating, LLC
WELL/LEASE: Man State 3H
COUNTY: Eddy Co., New Mexico
Sec. 32, T 18S, R 28E

30-015-43315

**STATE OF NEW MEXICO
DEVIATION REPORT**

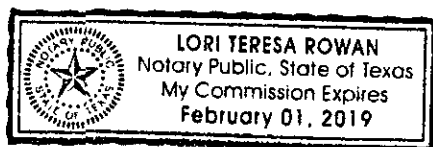
<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
398	1/2	3,970	1
856	3/4	4,159	1
1,134	1/2	4,536	1
1,512	1	4,725	1 1/4
2,078	1	5,104	1 1/2
2,454	1 1/4	5,672	3/4
2,832	1	6,050	1
3,021	1 1/4	6,428	1
3,590	1		

Patriot Drilling, LLC

M. Leroy Peterson, Executive Vice-President

The foregoing instrument was acknowledged before me on this 4th day of May 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

SURVEY CERTIFICATION FORM

3610 Elkins Road Midland, TX 79705 t:432-684-0057 f: 432-686-7964



Company: COG
Well Name: Man State # 3H
Survey Instrument Type: North Seek Rate Gyro

Job #: 1610256
County/State: Eddy Co., New Mexico
API #: 30-015-43315

TIE-IN DATA

Measure Depth (ft)	Vertical Depth (ft)	Inclination (°)	Azimuth (°)	N-S Coordinates	E-W Coordinates	Data Source
0	0	0	0	0	0	Surface

First Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
2016-04-19	0	0	0

Last Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
2016-04-19	6450	0.99	296.16

Projected TD Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
0	0	0	0

Grid Correction
-0.08

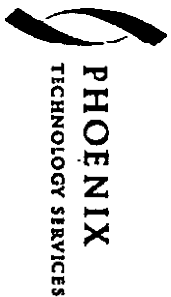
Gyro Operator: Phoenix Technology Services USA Ltd.
Gyro Supervisor: Jaime Stephenson

To the best of my knowledge I certify this survey data to be correct and true

Date: 04-19-16

Print Name: Noe Garza

Signature: [Signature]



PHOENIX

TECHNOLOGY SERVICES

Company: COG
Well: Man State # 3H
Location: Eddy Co., New Mexico
Rig: Patriot 2

Job Number: 1610256
Grid Corr.: -0.08
Lat: 32.70
Long: -104.19

Date: 04-19-16
Calculation Method: Minimum Curvature
Proposed Azimuth:
RKB - MSL in feet: 20 Feet
Tie Info: Surface

Survey Tool Type	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates N/S (ft)	E/W (ft)	Closure Distance (ft)	Closure Angle (deg)	Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
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Enter Tie-In Survey on Line 10

FIELD COPY, NON-DEFINITIVE

TIE IN	0			0	0	0	0	0					
Gyro	100.00	0.14	84.47	100	100.00	0.01	0.01 N	0.12 E	20.12	84.47	0.14	0.14	84.47
	200.00	0.17	123.14	100	200.00	-0.06	0.06 S	0.37 E	0.37	98.90	0.11	0.03	38.67
	300.00	0.26	114.53	100	300.00	-0.23	0.23 S	0.70 E	0.74	108.45	0.10	0.09	-8.61
	400.00	0.35	99.04	100	400.00	-0.38	0.38 S	1.21 E	1.26	107.27	0.12	0.09	-15.49
	500.00	0.85	73.11	100	499.99	-0.21	0.21 S	2.22 E	2.23	95.35	0.56	0.50	-25.93
	600.00	0.66	104.94	100	599.98	-0.14	0.14 S	3.48 E	3.49	92.31	0.45	-0.19	31.83
	700.00	0.58	289.62	100	699.98	-0.12	0.12 S	3.56 E	3.57	91.91	1.24	-0.08	184.68
	800.00	0.57	283.80	100	799.98	0.17	0.17 N	2.60 E	2.61	86.27	0.06	-0.01	-5.82
	900.00	0.58	283.74	100	899.97	0.41	0.41 N	1.63 E	1.68	75.92	0.01	0.01	-0.06
	1000.00	0.58	312.36	100	999.97	0.87	0.87 N	0.76 E	1.16	41.27	0.29	0.00	28.62
	1100.00	0.51	270.01	100	1099.96	1.21	1.21 N	0.06 W	1.21	357.36	0.40	-0.07	-42.35
	1200.00	0.50	235.68	100	1199.96	0.96	0.96 N	0.86 W	1.29	318.25	0.30	-0.01	-34.33
	1300.00	0.40	206.62	100	1299.96	0.41	0.41 N	1.38 W	1.44	286.45	0.25	-0.10	-29.06
	1400.00	0.48	247.19	100	1399.95	-0.07	0.07 S	1.92 W	1.92	267.98	0.31	0.08	40.57
	1500.00	0.47	286.15	100	1499.95	-0.12	0.12 S	2.70 W	2.70	267.54	0.32	-0.01	38.96
	1600.00	0.56	248.47	100	1599.95	-0.18	0.18 S	3.55 W	3.55	267.08	0.34	0.09	-37.68
	1700.00	0.62	238.49	100	1699.94	-0.64	0.64 S	4.46 W	4.51	261.80	0.12	0.06	-9.98
	1800.00	0.79	227.25	100	1799.93	-1.39	1.39 S	5.43 W	5.61	255.61	0.22	0.17	-11.24
	1900.00	0.97	236.68	100	1899.92	-2.33	2.33 S	6.65 W	7.04	250.70	0.23	0.18	9.43
	2000.00	0.87	248.85	100	1999.91	-3.07	3.07 S	8.06 W	8.62	249.18	0.22	-0.10	12.17
	2100.00	0.98	258.64	100	2099.89	-3.51	3.51 S	9.61 W	10.23	249.94	0.19	0.11	9.79
	2200.00	0.99	241.65	100	2199.88	-4.09	4.09 S	11.21 W	11.93	249.96	0.29	0.01	-16.99
	2300.00	0.94	254.73	100	2299.87	-4.71	4.71 S	12.76 W	13.60	249.72	0.23	-0.05	13.08
	2400.00	1.01	290.51	100	2399.85	-4.62	4.62 S	14.37 W	15.10	252.18	0.60	0.07	35.78
	2500.00	1.02	267.19	100	2499.84	-4.36	4.36 S	16.09 W	16.67	254.85	0.41	0.01	-23.32
	2600.00	0.85	245.07	100	2599.82	-4.71	4.71 S	17.65 W	18.27	255.05	0.40	-0.17	-22.12
	2700.00	1.26	236.21	100	2699.81	-5.64	5.64 S	19.24 W	20.05	253.67	0.44	0.41	-8.86



PHOENIX

TECHNOLOGY SERVICES

Company: COG
Well: Man State # 3H
Location: Eddy Co., New Mexico
Rig: Patriot 2

Job Number: 1610256
Grid Corr.: -0.08
Lat: 32.70
Long: -104.19

Calculation Method: Minimum Curvature
Proposed Azimuth: 20 Feet
RKB - MSL in feet: Surface
Tie Into:

Survey Tool Type	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
	2800.00	1.13	241.98	100	2799.79	-6.71	6.71 S	21.02 W	22.07	252.30	0.18	-0.13	5.77
	2900.00	1.17	253.64	100	2899.77	-7.46	7.46 S	22.87 W	24.06	251.93	0.24	0.04	11.66
	3000.00	1.13	247.59	100	2999.75	-8.12	8.12 S	24.76 W	26.06	251.84	0.13	-0.04	-6.05
	3100.00	1.05	239.46	100	3099.73	-8.97	8.97 S	26.46 W	27.94	251.28	0.17	-0.08	-8.13
	3200.00	1.14	251.54	100	3199.71	-9.75	9.75 S	28.20 W	29.83	250.93	0.25	0.09	12.08
	3300.00	1.46	251.85	100	3299.68	-10.46	10.46 S	30.35 W	32.10	250.99	0.32	0.32	0.31
	3400.00	1.20	249.09	100	3399.66	-11.23	11.23 S	32.54 W	34.42	250.96	0.27	-0.26	-2.76
	3500.00	1.23	245.27	100	3499.63	-12.05	12.05 S	34.49 W	36.54	250.74	0.09	0.03	-3.82
	3600.00	1.03	250.67	100	3599.61	-12.80	12.80 S	36.32 W	38.50	250.59	0.23	-0.20	5.40
	3700.00	0.95	253.19	100	3699.60	-13.34	13.34 S	37.96 W	40.23	250.64	0.09	-0.08	2.52
	3800.00	1.00	245.84	100	3799.58	-13.93	13.93 S	39.55 W	41.93	250.59	0.13	0.05	-7.35
	3900.00	1.00	269.86	100	3899.57	-14.29	14.29 S	41.22 W	43.62	250.88	0.42	0.00	24.02
	4000.00	1.01	274.04	100	3999.55	-14.23	14.23 S	42.97 W	45.26	251.67	0.07	0.01	4.18
	4100.00	0.80	283.73	100	4099.54	-14.00	14.00 S	44.52 W	46.67	252.54	0.26	-0.21	9.69
	4200.00	0.88	295.89	100	4199.53	-13.50	13.50 S	45.89 W	47.84	253.60	0.19	0.08	12.16
	4300.00	0.93	275.50	100	4299.52	-13.09	13.09 S	47.39 W	49.17	254.56	0.32	0.05	-20.39
	4400.00	0.84	251.66	100	4399.51	-13.24	13.24 S	48.90 W	50.66	254.85	0.38	-0.09	-23.84
	4500.00	1.00	263.39	100	4499.49	-13.57	13.57 S	50.46 W	52.25	254.94	0.25	0.16	11.73
	4600.00	0.77	263.04	100	4599.48	-13.76	13.76 S	51.99 W	53.78	255.18	0.23	-0.23	-0.35
	4700.00	0.94	248.52	100	4699.47	-14.14	14.14 S	53.42 W	55.26	255.18	0.27	0.17	-14.52
	4800.00	1.11	249.23	100	4799.45	-14.78	14.78 S	55.09 W	57.04	254.98	0.17	0.17	0.71
	4900.00	1.14	256.80	100	4899.44	-15.35	15.35 S	56.97 W	59.00	254.92	0.15	0.03	7.57
	5000.00	1.31	266.85	100	4999.41	-15.64	15.64 S	59.08 W	61.11	255.17	0.27	0.17	10.05
	5100.00	1.35	265.85	100	5099.39	-15.79	15.79 S	61.39 W	63.39	255.58	0.05	0.04	-1.00
	5200.00	0.65	341.42	100	5199.37	-15.34	15.34 S	62.75 W	64.59	256.26	1.34	-0.70	75.57
	5300.00	0.62	337.83	100	5299.37	-14.30	14.30 S	63.13 W	64.73	257.24	0.05	-0.03	-3.59
	5400.00	0.59	297.47	100	5399.36	-13.56	13.56 S	63.79 W	65.22	258.00	0.42	-0.03	-40.36
	5500.00	1.17	22.08	100	5499.35	-12.38	12.38 S	63.87 W	65.05	259.03	1.26	0.58	-275.39
	5600.00	1.04	1.51	100	5599.33	-10.52	10.52 S	63.46 W	64.33	260.58	0.41	-0.13	-20.57
	5700.00	0.45	19.48	100	5699.33	-9.25	9.25 S	63.30 W	63.98	261.69	0.63	-0.59	17.97



PHOENIX
TECHNOLOGY SERVICES

Company: COG
Well: Man State # 3H
Location: Eddy Co., New Mexico
Rig: Patriot 2

Job Number: 1610256
Grid Corr.: -0.08
Lat: 32.70
Long: -104.19

Calculation Method: Minimum Curvature
Proposed Azimuth: 20 Feet
RKB - MSL in feet: Surface
Tie Into: Surface

Survey Tool Type	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure Distance (ft)	Closure Angle (deg)	Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
	5800.00	0.50	337.86	100	5799.32	-8.47	8.47 S	63.34 W	63.90	262.38	0.34	0.05	318.38
	5900.00	0.41	331.67	100	5899.32	-7.75	7.75 S	63.67 W	64.14	263.06	0.10	-0.09	-6.19
	6000.00	0.46	307.49	100	5999.32	-7.19	7.19 S	64.16 W	64.56	263.60	0.19	0.05	-24.18
	6100.00	0.70	288.64	100	6099.31	-6.75	6.75 S	65.06 W	65.41	264.07	0.30	0.24	-18.85
	6200.00	0.63	284.23	100	6199.30	-6.42	6.42 S	66.17 W	66.48	264.46	0.09	-0.07	-4.41
	6300.00	0.79	304.38	100	6299.30	-5.90	5.90 S	67.27 W	67.53	264.99	0.29	0.16	20.15
	6400.00	0.92	292.65	100	6399.29	-5.20	5.20 S	68.58 W	68.78	265.66	0.22	0.13	-11.73
	6450.00	0.99	296.16	50	6449.28	-4.86	4.86 S	69.34 W	69.51	265.99	0.18	0.14	7.02

NM OIL CONSERVATION

ARTESIA DISTRICT

JUL 25 2016

RECEIVED

COG Production L L C

Eddy County, NM (NAD 27 NME)

Sec. 23 T.18-S R. 28-S

Man State 3H

Wellbore #2

Design: Wellbore #2

Survey Report - Geographic

02 May, 2016

Integrity Directional Services, LLC

Survey Report - Geographic

Company:	COG Production L L C	Local Co-ordinate Reference:	Site Sec. 23 T.18-S R. 28-S
Project:	Eddy County, NM (NAD 27 NME)	TVD Reference:	KB=20' @ 3574.8usft
Site:	Sec. 23 T.18-S R. 28-S	MD Reference:	KB=20' @ 3574.8usft
Well:	Man State 3H	North Reference:	Grid
Wellbore:	Wellbore #2	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #2	Database:	EDM 5000.1 Multi User Db

Project	Eddy County, NM (NAD 27 NME)		
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	Sec. 23 T.18-S R. 28-S		
Site Position:		Northing:	617,510.50 usft
From:	Map	Easting:	544,082.50 usft
Position Uncertainty:	5.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 41' 51.190 N
		Longitude:	104° 11' 24.122 W
		Grid Convergence:	0.08 °

Well	Man State 3H		
Well Position	+N/-S	0.0 usft	Northing: 617,510.50 usft
	+E/-W	0.0 usft	Easting: 544,082.50 usft
Position Uncertainty	5.0 usft	Wellhead Elevation:	0.0 usft
		Latitude:	32° 41' 51.190 N
		Longitude:	104° 11' 24.122 W
		Ground Level:	3,554.8 usft

Wellbore	Wellbore #2		
Magnetics	Model Name	Sample Date	Declination
	IGRF2015	4/22/2016	(°)
			7.40
			Dip Angle
			(°)
			60.41
			Field Strength
			(nT)
			48,270

Design	Wellbore #2		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	6,300.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.0	0.0	0.0
			269.51

Survey Program	Date 5/2/2016		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		
100.0	6,300.0	Gyros (Wellbore #1)	MWD
6,355.0	11,118.0	MWD (Wellbore #2)	MWD
			Description
			MWD - Standard
			MWD - Standard

Survey									
Measured	Depth	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Map	Map	
	(usft)	(°)	(°)	Depth	(usft)	(usft)	Northing	Easting	
				(usft)			(usft)	(usft)	Latitude
									Longitude
	0.0	0.00	0.00	0.0	0.0	0.0	617,510.50	544,082.50	32° 41' 51.190 N
	100.0	0.14	84.47	100.0	0.0	0.1	617,510.52	544,082.62	104° 11' 24.121 W
	200.0	0.17	123.14	200.0	-0.1	0.4	617,510.45	544,082.87	104° 11' 24.118 W
	300.0	0.26	114.53	300.0	-0.2	0.7	617,510.27	544,083.20	104° 11' 24.114 W
	400.0	0.35	99.04	400.0	-0.4	1.2	617,510.13	544,083.71	104° 11' 24.108 W
	500.0	0.85	73.11	500.0	-0.2	2.2	617,510.30	544,084.72	104° 11' 24.096 W
	600.0	0.66	104.94	600.0	-0.1	3.5	617,510.36	544,085.99	104° 11' 24.081 W
	700.0	0.58	289.62	700.0	-0.1	3.6	617,510.38	544,086.07	104° 11' 24.080 W
	800.0	0.57	283.80	800.0	0.2	2.6	617,510.67	544,085.11	104° 11' 24.092 W
	900.0	0.58	283.74	900.0	0.4	1.6	617,510.91	544,084.13	104° 11' 24.103 W
	1,000.0	0.58	312.36	1,000.0	0.9	0.8	617,511.37	544,083.27	104° 11' 24.113 W

Integrity Directional Services, LLC

Survey Report - Geographic

Company:	COG Production L L C	Local Co-ordinate Reference:	Site Sec. 23 T.18-S R. 28-S
Project:	Eddy County, NM (NAD 27 NME)	TVD Reference:	KB=20' @ 3574.8usft
Site:	Sec. 23 T.18-S R. 28-S	MD Reference:	KB=20' @ 3574.8usft
Well:	Man State 3H	North Reference:	Grid
Wellbore:	Wellbore #2	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #2	Database:	EDM 5000.1 Multi User Db

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,100.0	0.51	270.01	1,100.0	1.2	-0.1	617,511.71	544,082.45	32° 41' 51.202 N	104° 11' 24.123 W
1,200.0	0.50	235.68	1,200.0	1.0	-0.9	617,511.47	544,081.64	32° 41' 51.200 N	104° 11' 24.132 W
1,300.0	0.40	206.62	1,300.0	0.4	-1.4	617,510.91	544,081.12	32° 41' 51.194 N	104° 11' 24.138 W
1,400.0	0.48	247.19	1,400.0	-0.1	-1.9	617,510.44	544,080.58	32° 41' 51.189 N	104° 11' 24.145 W
1,500.0	0.47	286.15	1,499.9	-0.1	-2.7	617,510.39	544,079.80	32° 41' 51.189 N	104° 11' 24.154 W
1,600.0	0.56	248.47	1,599.9	-0.2	-3.5	617,510.32	544,078.95	32° 41' 51.188 N	104° 11' 24.164 W
1,700.0	0.62	238.49	1,699.9	-0.6	-4.5	617,509.86	544,078.04	32° 41' 51.184 N	104° 11' 24.174 W
1,800.0	0.79	227.25	1,799.9	-1.4	-5.4	617,509.11	544,077.07	32° 41' 51.176 N	104° 11' 24.186 W
1,900.0	0.97	236.68	1,899.9	-2.3	-6.6	617,508.18	544,075.86	32° 41' 51.167 N	104° 11' 24.200 W
2,000.0	0.87	248.85	1,999.9	-3.1	-8.1	617,507.44	544,074.44	32° 41' 51.160 N	104° 11' 24.216 W
2,100.0	0.98	258.64	2,099.9	-3.5	-9.6	617,507.00	544,072.89	32° 41' 51.155 N	104° 11' 24.235 W
2,200.0	0.99	241.65	2,199.9	-4.1	-11.2	617,506.42	544,071.30	32° 41' 51.150 N	104° 11' 24.253 W
2,300.0	0.94	254.73	2,299.9	-4.7	-12.8	617,505.79	544,069.74	32° 41' 51.144 N	104° 11' 24.271 W
2,400.0	1.01	290.51	2,399.9	-4.6	-14.4	617,505.88	544,068.13	32° 41' 51.145 N	104° 11' 24.290 W
2,500.0	1.02	267.19	2,499.8	-4.4	-16.1	617,506.15	544,066.41	32° 41' 51.147 N	104° 11' 24.310 W
2,600.0	0.85	245.07	2,599.8	-4.7	-17.7	617,505.79	544,064.85	32° 41' 51.144 N	104° 11' 24.329 W
2,700.0	1.26	236.21	2,699.8	-5.6	-19.2	617,504.87	544,063.26	32° 41' 51.135 N	104° 11' 24.347 W
2,800.0	1.13	241.98	2,799.8	-6.7	-21.0	617,503.79	544,061.48	32° 41' 51.124 N	104° 11' 24.368 W
2,900.0	1.17	253.64	2,899.8	-7.5	-22.9	617,503.04	544,059.63	32° 41' 51.117 N	104° 11' 24.390 W
3,000.0	1.13	247.59	2,999.7	-8.1	-24.8	617,502.38	544,057.74	32° 41' 51.110 N	104° 11' 24.412 W
3,100.0	1.05	239.46	3,099.7	-9.0	-26.5	617,501.54	544,056.04	32° 41' 51.102 N	104° 11' 24.432 W
3,200.0	1.14	251.54	3,199.7	-9.7	-28.2	617,500.76	544,054.31	32° 41' 51.094 N	104° 11' 24.452 W
3,300.0	1.46	251.85	3,299.7	-10.5	-30.4	617,500.05	544,052.15	32° 41' 51.087 N	104° 11' 24.477 W
3,400.0	1.20	249.09	3,399.7	-11.2	-32.5	617,499.27	544,049.96	32° 41' 51.079 N	104° 11' 24.503 W
3,500.0	1.23	245.27	3,499.6	-12.1	-34.5	617,498.45	544,048.01	32° 41' 51.071 N	104° 11' 24.526 W
3,600.0	1.03	250.67	3,599.6	-12.8	-36.3	617,497.71	544,046.19	32° 41' 51.064 N	104° 11' 24.547 W
3,700.0	0.95	253.19	3,699.6	-13.3	-38.0	617,497.17	544,044.55	32° 41' 51.059 N	104° 11' 24.566 W
3,800.0	1.00	245.84	3,799.6	-13.9	-39.5	617,496.57	544,042.96	32° 41' 51.053 N	104° 11' 24.585 W
3,900.0	1.00	269.86	3,899.6	-14.3	-41.2	617,496.21	544,041.29	32° 41' 51.049 N	104° 11' 24.605 W
4,000.0	1.01	274.04	3,999.6	-14.2	-43.0	617,496.27	544,039.53	32° 41' 51.050 N	104° 11' 24.625 W
4,100.0	0.80	283.73	4,099.5	-14.0	-44.5	617,496.50	544,037.98	32° 41' 51.052 N	104° 11' 24.643 W
4,200.0	0.88	295.89	4,199.5	-13.5	-45.9	617,497.00	544,036.61	32° 41' 51.057 N	104° 11' 24.659 W
4,300.0	0.93	275.50	4,299.5	-13.1	-47.4	617,497.41	544,035.11	32° 41' 51.061 N	104° 11' 24.677 W
4,400.0	0.84	251.66	4,399.5	-13.2	-48.9	617,497.26	544,033.61	32° 41' 51.060 N	104° 11' 24.694 W
4,500.0	1.00	263.39	4,499.5	-13.6	-50.5	617,496.93	544,032.04	32° 41' 51.056 N	104° 11' 24.713 W
4,600.0	0.77	263.04	4,599.5	-13.8	-52.0	617,496.75	544,030.51	32° 41' 51.055 N	104° 11' 24.731 W
4,700.0	0.94	248.52	4,699.5	-14.1	-53.4	617,496.37	544,029.08	32° 41' 51.051 N	104° 11' 24.747 W
4,800.0	1.11	249.23	4,799.5	-14.8	-55.1	617,495.72	544,027.41	32° 41' 51.044 N	104° 11' 24.767 W
4,900.0	1.14	256.80	4,899.4	-15.4	-57.0	617,495.15	544,025.54	32° 41' 51.039 N	104° 11' 24.789 W
5,000.0	1.31	266.85	4,999.4	-15.6	-59.1	617,494.86	544,023.43	32° 41' 51.036 N	104° 11' 24.814 W
5,100.0	1.35	265.85	5,099.4	-15.8	-61.4	617,494.71	544,021.11	32° 41' 51.035 N	104° 11' 24.841 W
5,200.0	0.65	341.42	5,199.4	-15.3	-62.7	617,495.17	544,019.75	32° 41' 51.039 N	104° 11' 24.857 W
5,300.0	0.62	337.83	5,299.4	-14.3	-63.1	617,496.20	544,019.37	32° 41' 51.049 N	104° 11' 24.861 W
5,400.0	0.59	297.47	5,399.4	-13.6	-63.8	617,496.94	544,018.71	32° 41' 51.057 N	104° 11' 24.869 W
5,500.0	1.17	22.08	5,499.4	-12.4	-63.9	617,498.13	544,018.64	32° 41' 51.068 N	104° 11' 24.870 W
5,600.0	1.04	1.51	5,599.3	-10.5	-63.5	617,499.98	544,019.04	32° 41' 51.087 N	104° 11' 24.865 W
5,700.0	0.45	19.48	5,699.3	-9.2	-63.3	617,501.26	544,019.20	32° 41' 51.099 N	104° 11' 24.863 W
5,800.0	0.50	337.86	5,799.3	-8.5	-63.3	617,502.03	544,019.16	32° 41' 51.107 N	104° 11' 24.863 W
5,900.0	0.41	331.67	5,899.3	-7.8	-63.7	617,502.75	544,018.83	32° 41' 51.114 N	104° 11' 24.867 W
6,000.0	0.46	307.49	5,999.3	-7.2	-64.2	617,503.31	544,018.34	32° 41' 51.120 N	104° 11' 24.873 W
6,100.0	0.70	288.64	6,099.3	-6.8	-65.1	617,503.75	544,017.45	32° 41' 51.124 N	104° 11' 24.883 W
6,200.0	0.63	284.23	6,199.3	-6.4	-66.2	617,504.08	544,016.33	32° 41' 51.127 N	104° 11' 24.896 W
6,300.0	0.79	304.38	6,299.3	-5.9	-67.3	617,504.60	544,015.23	32° 41' 51.133 N	104° 11' 24.909 W
Final Gyro Survey									

Integrity Directional Services, LLC

Survey Report - Geographic

Company:	COG Production L L C	Local Co-ordinate Reference:	Site Sec. 23 T.18-S R. 28-S
Project:	Eddy County, NM (NAD 27 NME)	TVD Reference:	KB=20' @ 3574.8usft
Site:	Sec. 23 T.18-S R. 28-S	MD Reference:	KB=20' @ 3574.8usft
Well:	Man State 3H	North Reference:	Grid
Wellbore:	Wellbore #2	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #2	Database:	EDM 5000.1 Multi User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
6,355.0	0.90	255.90	6,354.3	-5.8	-68.0	617,504.71	544,014.50	32° 41' 51.134 N	104° 11' 24.918 W	
First MWD Survey										
6,387.0	1.90	262.20	6,386.3	-5.9	-68.8	617,504.58	544,013.73	32° 41' 51.132 N	104° 11' 24.927 W	
6,418.0	4.70	272.20	6,417.2	-5.9	-70.6	617,504.56	544,011.95	32° 41' 51.132 N	104° 11' 24.948 W	
6,450.0	6.20	274.60	6,449.1	-5.8	-73.6	617,504.75	544,008.92	32° 41' 51.134 N	104° 11' 24.983 W	
6,481.0	7.10	275.40	6,479.9	-5.4	-77.2	617,505.06	544,005.34	32° 41' 51.137 N	104° 11' 25.025 W	
6,513.0	9.50	281.10	6,511.5	-4.7	-81.7	617,505.76	544,000.78	32° 41' 51.144 N	104° 11' 25.078 W	
6,544.0	13.20	285.00	6,541.9	-3.3	-87.7	617,507.17	543,994.85	32° 41' 51.158 N	104° 11' 25.148 W	
6,575.0	16.70	284.80	6,571.9	-1.3	-95.4	617,509.22	543,987.12	32° 41' 51.179 N	104° 11' 25.238 W	
6,606.0	19.60	281.30	6,601.3	0.9	-104.8	617,511.38	543,977.72	32° 41' 51.200 N	104° 11' 25.348 W	
6,638.0	23.00	277.80	6,631.1	2.8	-116.2	617,513.28	543,966.25	32° 41' 51.219 N	104° 11' 25.482 W	
6,669.0	27.00	275.00	6,659.2	4.2	-129.3	617,514.71	543,953.24	32° 41' 51.233 N	104° 11' 25.635 W	
6,701.0	29.60	271.90	6,687.4	5.1	-144.4	617,515.61	543,938.10	32° 41' 51.242 N	104° 11' 25.812 W	
6,730.0	32.60	272.00	6,712.2	5.6	-159.4	617,516.12	543,923.13	32° 41' 51.248 N	104° 11' 25.987 W	
6,762.0	35.90	272.00	6,738.7	6.2	-177.4	617,516.75	543,905.14	32° 41' 51.254 N	104° 11' 26.198 W	
6,794.0	38.80	271.30	6,764.1	6.8	-196.8	617,517.30	543,885.73	32° 41' 51.260 N	104° 11' 26.425 W	
6,825.0	41.80	274.30	6,787.8	7.8	-216.8	617,518.30	543,865.71	32° 41' 51.270 N	104° 11' 26.659 W	
6,857.0	44.50	272.70	6,811.1	9.1	-238.6	617,519.63	543,843.87	32° 41' 51.283 N	104° 11' 26.914 W	
6,888.0	46.70	275.30	6,832.8	10.7	-260.7	617,521.18	543,821.78	32° 41' 51.299 N	104° 11' 27.173 W	
6,920.0	49.70	275.00	6,854.1	12.8	-284.5	617,523.32	543,798.03	32° 41' 51.321 N	104° 11' 27.451 W	
6,952.0	53.10	274.30	6,874.1	14.8	-309.4	617,525.34	543,773.10	32° 41' 51.341 N	104° 11' 27.743 W	
6,984.0	56.40	274.40	6,892.5	16.8	-335.5	617,527.33	543,747.05	32° 41' 51.361 N	104° 11' 28.047 W	
7,015.0	59.70	274.50	6,909.0	18.9	-361.7	617,529.37	543,720.83	32° 41' 51.382 N	104° 11' 28.354 W	
7,047.0	63.10	276.60	6,924.3	21.6	-389.6	617,532.09	543,692.87	32° 41' 51.409 N	104° 11' 28.681 W	
7,078.0	66.20	279.30	6,937.5	25.5	-417.4	617,535.97	543,665.14	32° 41' 51.448 N	104° 11' 29.006 W	
7,110.0	69.20	277.00	6,949.7	29.7	-446.7	617,540.16	543,635.83	32° 41' 51.489 N	104° 11' 29.349 W	
7,140.0	72.30	276.70	6,959.6	33.0	-474.8	617,543.54	543,607.72	32° 41' 51.523 N	104° 11' 29.678 W	
7,172.0	75.50	276.40	6,968.4	36.5	-505.3	617,547.05	543,577.17	32° 41' 51.558 N	104° 11' 30.035 W	
7,203.0	79.00	276.60	6,975.3	40.0	-535.4	617,550.47	543,547.14	32° 41' 51.593 N	104° 11' 30.387 W	
7,235.0	82.40	276.80	6,980.5	43.7	-566.7	617,554.15	543,515.78	32° 41' 51.630 N	104° 11' 30.753 W	
7,267.0	85.90	276.40	6,983.7	47.3	-598.3	617,557.81	543,484.16	32° 41' 51.666 N	104° 11' 31.123 W	
7,298.0	89.20	275.50	6,985.0	50.5	-629.1	617,561.02	543,453.36	32° 41' 51.698 N	104° 11' 31.484 W	
7,330.0	92.20	273.80	6,984.7	53.1	-661.0	617,563.62	543,421.47	32° 41' 51.724 N	104° 11' 31.857 W	
7,362.0	95.00	271.60	6,982.6	54.6	-692.9	617,565.12	543,389.58	32° 41' 51.740 N	104° 11' 32.230 W	
7,425.0	95.30	267.60	6,977.0	54.2	-755.7	617,564.68	543,326.85	32° 41' 51.736 N	104° 11' 32.964 W	
7,519.0	96.60	266.90	6,967.2	49.7	-849.0	617,560.20	543,233.46	32° 41' 51.693 N	104° 11' 34.057 W	
7,613.0	95.90	265.60	6,957.0	43.6	-942.3	617,554.09	543,140.22	32° 41' 51.634 N	104° 11' 35.148 W	
7,708.0	95.00	264.90	6,948.0	35.8	-1,036.5	617,546.26	543,045.98	32° 41' 51.558 N	104° 11' 36.251 W	
7,802.0	96.30	265.30	6,938.7	27.8	-1,129.7	617,538.27	542,952.78	32° 41' 51.480 N	104° 11' 37.342 W	
7,896.0	95.00	265.70	6,929.5	20.4	-1,223.0	617,530.93	542,859.53	32° 41' 51.408 N	104° 11' 38.434 W	
7,990.0	94.00	266.00	6,922.1	13.6	-1,316.4	617,524.15	542,766.07	32° 41' 51.342 N	104° 11' 39.527 W	
8,084.0	95.40	265.90	6,914.4	7.0	-1,409.9	617,517.53	542,672.62	32° 41' 51.278 N	104° 11' 40.621 W	
8,178.0	94.70	267.40	6,906.1	1.6	-1,503.4	617,512.06	542,579.15	32° 41' 51.225 N	104° 11' 41.715 W	
8,272.0	96.00	267.20	6,897.4	-2.9	-1,596.8	617,507.65	542,485.66	32° 41' 51.183 N	104° 11' 42.809 W	
8,366.0	95.30	268.30	6,888.1	-6.5	-1,690.3	617,503.98	542,392.19	32° 41' 51.148 N	104° 11' 43.903 W	
8,461.0	94.20	268.30	6,880.2	-9.3	-1,784.9	617,501.17	542,297.56	32° 41' 51.121 N	104° 11' 45.010 W	
8,556.0	94.40	269.80	6,873.1	-10.9	-1,879.7	617,499.60	542,202.84	32° 41' 51.107 N	104° 11' 46.119 W	
8,650.0	94.00	270.90	6,866.2	-10.3	-1,973.4	617,500.17	542,109.10	32° 41' 51.114 N	104° 11' 47.216 W	
8,745.0	95.10	269.90	6,858.7	-9.7	-2,068.1	617,500.83	542,014.41	32° 41' 51.121 N	104° 11' 48.324 W	
8,839.0	94.80	271.40	6,850.6	-8.6	-2,161.7	617,501.90	541,920.76	32° 41' 51.133 N	104° 11' 49.420 W	
8,934.0	96.20	271.30	6,841.5	-6.4	-2,256.3	617,504.12	541,826.23	32° 41' 51.156 N	104° 11' 50.526 W	
9,029.0	95.10	270.60	6,832.1	-4.8	-2,350.8	617,505.69	541,731.71	32° 41' 51.173 N	104° 11' 51.632 W	
9,124.0	94.00	269.00	6,824.6	-5.1	-2,445.5	617,505.36	541,637.01	32° 41' 51.171 N	104° 11' 52.741 W	
9,218.0	92.80	268.50	6,819.0	-7.2	-2,539.3	617,503.31	541,543.20	32° 41' 51.152 N	104° 11' 53.838 W	
9,313.0	93.60	267.90	6,813.7	-10.2	-2,634.1	617,500.33	541,448.40	32° 41' 51.124 N	104° 11' 54.948 W	

Integrity Directional Services, LLC

Survey Report - Geographic

Company:	COG Production L L C	Local Co-ordinate Reference:	Site Sec. 23 T.18-S R. 28-S
Project:	Eddy County, NM (NAD 27 NME)	TVD Reference:	KB=20' @ 3574.8usft
Site:	Sec. 23 T.18-S R. 28-S	MD Reference:	KB=20' @ 3574.8usft
Well:	Man State 3H	North Reference:	Grid
Wellbore:	Wellbore #2	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #2	Database:	EDM 5000.1 Multi User Db

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
9,501.0	93.40	269.10	6,802.2	-15.1	-2,821.7	617,495.42	541,260.82	32° 41' 51.077 N	104° 11' 57.143 W
9,595.0	92.80	270.10	6,797.1	-15.7	-2,915.5	617,494.77	541,166.96	32° 41' 51.072 N	104° 11' 58.242 W
9,690.0	93.80	269.20	6,791.7	-16.3	-3,010.4	617,494.19	541,072.12	32° 41' 51.067 N	104° 11' 59.351 W
9,785.0	92.80	270.50	6,786.2	-16.6	-3,105.2	617,493.94	540,977.28	32° 41' 51.066 N	104° 12' 0.461 W
9,881.0	94.20	270.10	6,780.4	-16.1	-3,201.0	617,494.44	540,881.46	32° 41' 51.072 N	104° 12' 1.583 W
9,975.0	94.00	270.00	6,773.6	-16.0	-3,294.8	617,494.52	540,787.70	32° 41' 51.074 N	104° 12' 2.680 W
10,070.0	92.90	269.40	6,767.9	-16.5	-3,389.6	617,494.03	540,692.88	32° 41' 51.071 N	104° 12' 3.789 W
10,164.0	92.90	269.10	6,763.2	-17.7	-3,483.5	617,492.80	540,599.01	32° 41' 51.060 N	104° 12' 4.888 W
10,258.0	90.90	269.10	6,760.0	-19.2	-3,577.4	617,491.32	540,505.08	32° 41' 51.046 N	104° 12' 5.987 W
10,353.0	90.90	269.10	6,758.5	-20.7	-3,672.4	617,489.83	540,410.10	32° 41' 51.032 N	104° 12' 7.099 W
10,448.0	92.00	268.90	6,756.1	-22.3	-3,767.4	617,488.17	540,315.15	32° 41' 51.017 N	104° 12' 8.210 W
10,541.0	91.60	267.90	6,753.2	-24.9	-3,860.3	617,485.58	540,222.23	32° 41' 50.993 N	104° 12' 9.297 W
10,636.0	90.90	269.20	6,751.2	-27.3	-3,955.2	617,483.17	540,127.28	32° 41' 50.970 N	104° 12' 10.408 W
10,730.0	92.60	269.10	6,748.3	-28.7	-4,049.2	617,481.78	540,033.34	32° 41' 50.957 N	104° 12' 11.508 W
10,823.0	93.00	268.70	6,743.7	-30.5	-4,142.0	617,480.00	539,940.47	32° 41' 50.941 N	104° 12' 12.595 W
10,918.0	91.90	268.70	6,739.7	-32.7	-4,236.9	617,477.84	539,845.58	32° 41' 50.921 N	104° 12' 13.705 W
11,047.0	93.90	268.60	6,733.2	-35.7	-4,365.7	617,474.81	539,716.79	32° 41' 50.892 N	104° 12' 15.212 W
Final MWD Survey									
11,118.0	93.90	268.60	6,728.3	-37.4	-4,436.5	617,473.08	539,645.98	32° 41' 50.876 N	104° 12' 16.041 W
Projection to TD									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
6,300.0	6,299.3	-5.9	-67.3	Final Gyro Survey
6,355.0	6,354.3	-5.8	-68.0	First MWD Survey
11,047.0	6,733.2	-35.7	-4,365.7	Final MWD Survey
11,118.0	6,728.3	-37.4	-4,436.5	Projection to TD

Checked By: _____	Approved By: _____	Date: _____
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COG Production L L C
Project: Eddy County, NM (NAD 27 NME)
Site: Sec. 23 T.18-S R. 28-S
Well: Man State 3H
Wellbore: Wellbore #2
Plan: Plan #6 (Man State 3H/Wellbore #2)

WELL DETAILS: Man State 3H

Ground Elevation: 3554.8
RKB Elevation: KB=20' @ 3574.8usft
Rig Name:

Northing 617510.50 Easting 544082.50 Latitude 32° 41' 51.190 N Longitude 104° 11' 24.122 W

Section Details

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Target
1	6701.0	29.60	271.90	5687.4	5.1	-144.4	0.00	0.00	144.4	
2	6767.0	29.60	271.90	5744.8	6.2	-177.0	0.00	0.00	176.9	
3	7308.2	95.00	269.31	5983.0	7.5	-630.5	12.09	-2.84	630.4	
4	9280.2	95.00	269.31	6811.1	-16.1	-2594.9	0.00	0.00	2594.9	
5	9426.1	92.08	269.31	6802.1	-17.9	-2740.5	2.00	179.91	2740.5	
6	11134.8	92.08	269.31	6740.0	-38.3	-4447.9	0.00	0.00	4448.1	Pin #6 PBHL Man State 3H

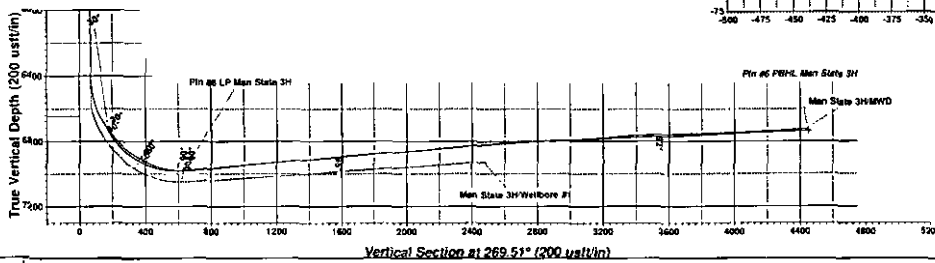
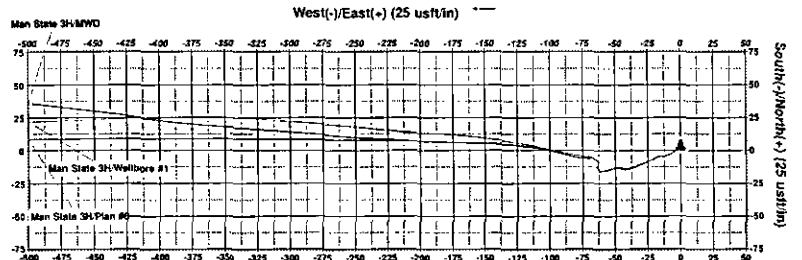
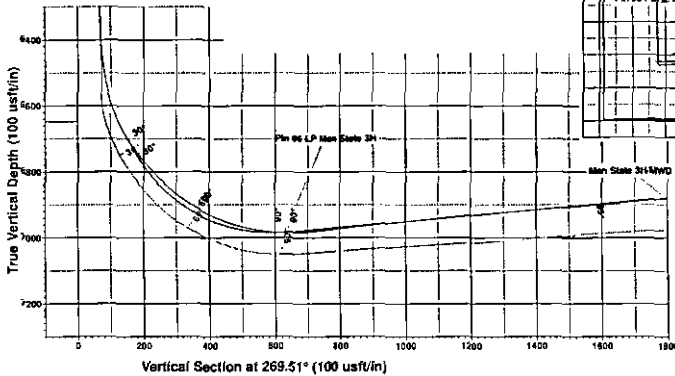
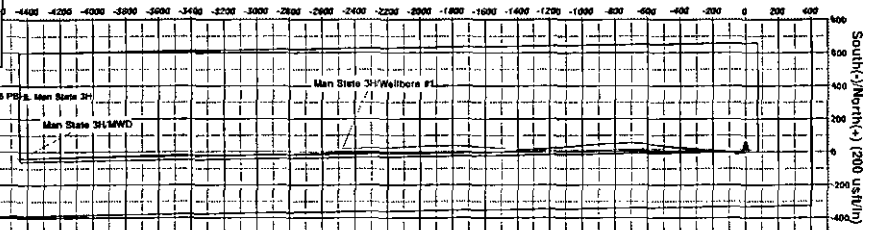
FORMATION TOP DETAILS

IVOPath	MDPath	Formation	DipAngle	DipDir
145.8	142.8	BCS T.18-S	0.00	
703.6	703.6	Yates	0.00	
1054.8	1054.8	Seven Rivers	0.00	
1664.8	1664.8	Queen	0.00	
1880.6	1880.6	Grayburg	0.00	
2517.8	2517.8	Wichita	0.00	
2831.8	2832.0000	Sarg (SSGL)	0.00	
3027.9	3028.1	U. Aragon Sh	0.00	
3307.8	3308.2	L. Aragon Sh	0.00	
5524.8	5525.5	FSSG sand	0.00	
5617.8	5618.3	SISG sand	0.00	

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Pin #6 PBHL Man State 3H	6740.0	-38.3	-4447.9	617472.18	539834.81	32° 41' 50.887 N	104° 12' 18.174 W
Man State 3H target center	6983.0	7.7	-433.8	617938.18	543481.26	32° 41' 51.274 N	104° 11' 31.508 W

- plan misses target center by 0.2 units at 7208 South MD (8802.8 TVD, 7.5 N, -433.8 E)



Compass rose showing True North, Magnetic North, and Dip Angle. Text: Azimuths to Grid North True North: -0.08° Magnetic North: 7.32° Magnetic Field Strength: 48270.2nT Dip Angle: 60.41° Date: 4/22/2016 Model: IGRF2015

PROJECT DETAILS: Eddy County, NM (NAD 27 NME)
Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level
Local North: Grid



Integrity Directional Services