



A GYRO TECHNOLOGIES INC. COMPANY

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

May 7, 2014

30-015-41569

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

NM OIL CONSERVATION
ARTESIA DISTRICT
AUG 28 2014

Attn: Kanicia Castillo

RECEIVED

RE: **Marauder 31 Federal No. 003H**

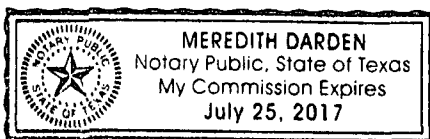
Please find enclosed a copy of the survey from 0.00' to 6,300.00' ran on the above referenced well.

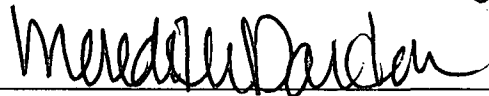
Sincerely,

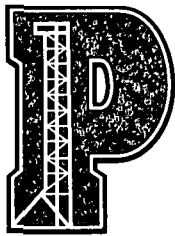

Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

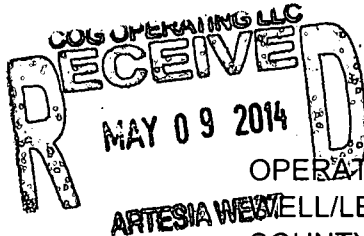
This instrument was acknowledged before me on the 7th day of May, A.D., 2014, by Keith Havelka.




Meredith Darden
Notary Public, State of Texas



PATRIOT DRILLING, LLC



OPERATOR:
WELL/LEASE:
COUNTY:

COG Operating, LLC
Marauder 31 Federal # 3H
Eddy Co., New Mexico
Sec. 31, T19S, R31E

**STATE OF NEW MEXICO
DEVIATION REPORT**

<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
366	1/2	4,118	1
696	1	4,595	1 1/4
983	1 1/4	5,088	3/4
1,250	1/2	5,691	1 1/2
1,769	1 1/2	5,984	1 1/2
2,030	2 1/2	6,302	1/4
2,218	1 3/4	6,935	1 3/4
270	2 1/4	7,219	2 1/4
3,024	2 1/4	7,827	2 1/2
3,648	3	8,138	3/4

NM OIL CONSERVATION
ARTESIA DISTRICT
AUG 28 2014

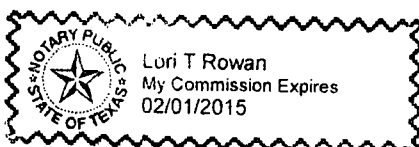
Patriot Drilling, LLC

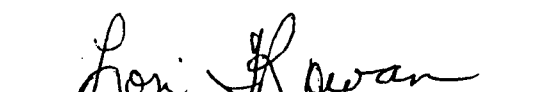
RECEIVED


M. Leroy Peterson, Executive Vice-President

The foregoing instrument was acknowledged before me on this 29th day of April, 2014 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling, LLC.

My Commission Expires: 02/01/2015




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



Company: COG Operating, LLC (Concho)
Lease/Well: Marauder 31 Federal No. /003H
Location: Sec 31 T19S R31E
Rig Name: Patriot 6
State/County: New Mexico/Eddy
Latitude: 32.62, Longitude: -103.90
GRID North is 0.23 Degrees East of True North
VS-Azi: 0.00 Degrees



NM OIL CONSERVATION
ARTESIA DISTRICT
AUG 28 2014
RECEIVED

Depth Reference : RKB = 17 Feet

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: marauder 31 federal #3h-de_01.ut

Minimum Curvature Method

Report Date/Time: 5/7/2014 / 13:55

VES Survey International

West, Texas

432-563-5444

Chris Bankson

Marauder 31 Federal No. 003H / API 30-015-41569

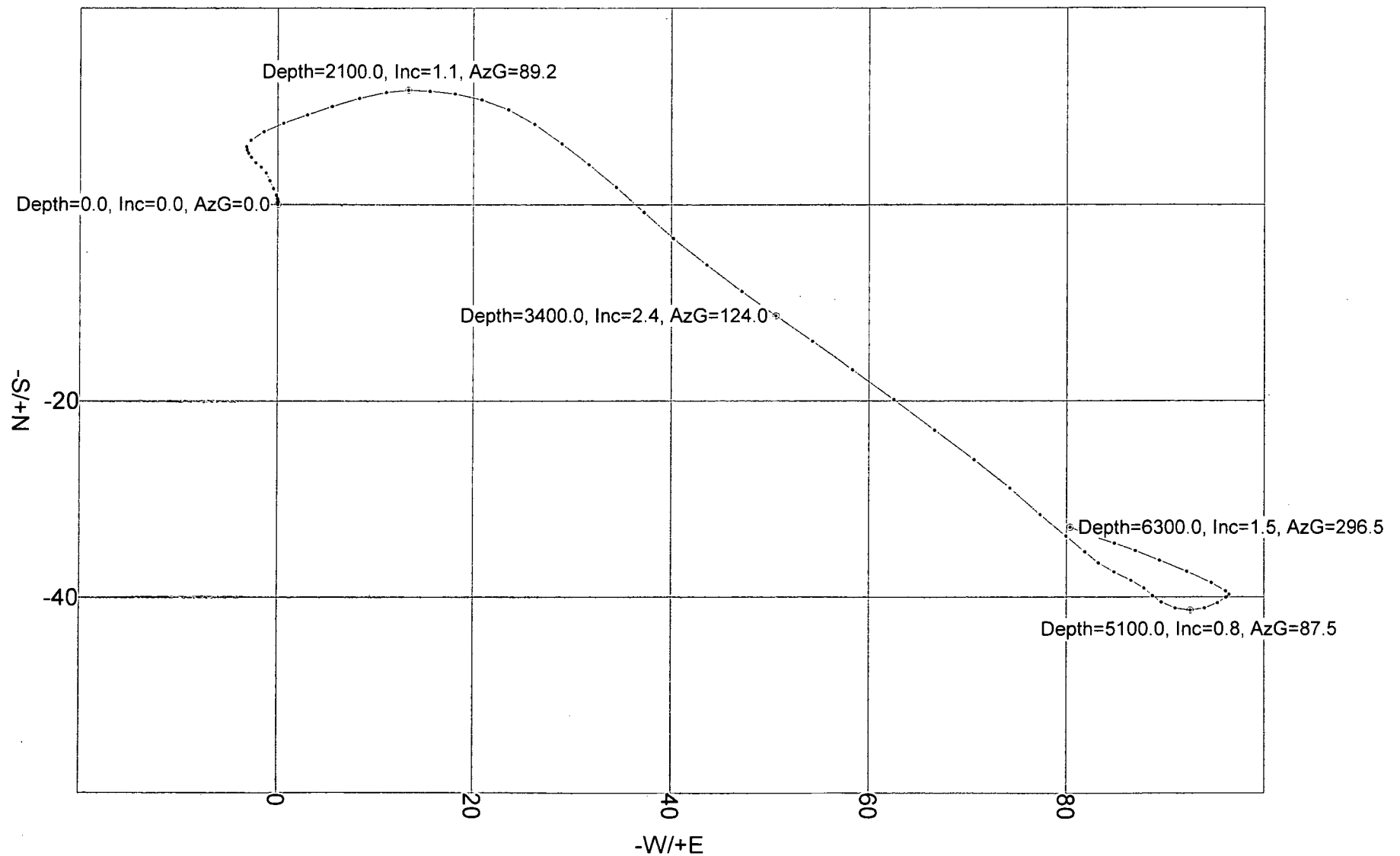
Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.16	5.76	100.00	0.14	0.01	0.14	0.14	5.76	0.16
200.00	0.10	358.13	200.00	0.37	0.03	0.37	0.37	3.96	0.07
300.00	0.12	342.84	300.00	0.56	-0.01	0.56	0.56	359.13	0.04
400.00	0.34	337.73	400.00	0.94	-0.15	0.94	0.96	350.77	0.22
500.00	0.50	335.21	500.00	1.62	-0.45	1.62	1.68	344.45	0.16
600.00	0.48	335.53	599.99	2.40	-0.81	2.40	2.53	341.38	0.02
700.00	0.54	333.63	699.99	3.20	-1.19	3.20	3.41	339.60	0.06
800.00	0.38	300.07	799.99	3.79	-1.69	3.79	4.15	335.99	0.31
900.00	0.45	317.26	899.98	4.24	-2.24	4.24	4.79	332.16	0.14
1000.00	0.38	320.96	999.98	4.78	-2.71	4.78	5.50	330.45	0.07
1100.00	0.22	335.91	1099.98	5.21	-3.00	5.21	6.02	330.11	0.17
1200.00	0.16	337.56	1199.98	5.52	-3.13	5.52	6.35	330.45	0.06
1300.00	0.24	357.49	1299.98	5.86	-3.19	5.86	6.67	331.41	0.10
1400.00	0.74	46.67	1399.97	6.51	-2.74	6.51	7.06	337.20	0.61
1500.00	1.10	63.01	1499.96	7.39	-1.41	7.39	7.52	349.19	0.45
1600.00	1.42	69.43	1599.94	8.26	0.61	8.26	8.28	4.21	0.34
1700.00	1.50	71.62	1699.90	9.10	3.01	9.10	9.59	18.27	0.10
1800.00	1.57	71.33	1799.87	9.95	5.54	9.95	11.39	29.10	0.07

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	1.81	74.83	1899.82	10.80	8.36	10.80	13.66	37.73	0.27
2000.00	1.50	81.28	1999.78	11.42	11.18	11.42	15.98	44.41	0.36
2100.00	1.05	89.22	2099.76	11.63	13.40	11.63	17.74	49.05	0.48
2200.00	1.44	95.02	2199.73	11.53	15.57	11.53	19.38	53.48	0.41
2300.00	1.50	96.76	2299.70	11.27	18.13	11.27	21.34	58.14	0.07
2400.00	1.71	108.21	2399.66	10.64	20.85	10.64	23.41	62.95	0.39
2500.00	1.60	113.07	2499.62	9.63	23.55	9.63	25.44	67.76	0.18
2600.00	1.87	124.88	2599.57	8.15	26.17	8.15	27.41	72.70	0.45
2700.00	2.00	126.63	2699.52	6.18	28.91	6.18	29.56	77.93	0.14
2800.00	1.98	128.41	2799.46	4.07	31.66	4.07	31.92	82.68	0.06
2900.00	2.13	131.40	2899.39	1.76	34.41	1.76	34.45	87.07	0.19
3000.00	2.23	132.96	2999.32	-0.79	37.23	-0.79	37.24	91.22	0.12
3100.00	2.33	130.69	3099.24	-3.45	40.20	-3.45	40.34	94.90	0.13
3200.00	2.65	126.63	3199.15	-6.15	43.59	-6.15	44.03	98.03	0.37
3300.00	2.46	127.63	3299.05	-8.84	47.15	-8.84	47.97	100.62	0.19
3400.00	2.39	124.04	3398.96	-11.32	50.58	-11.32	51.83	102.62	0.17
3500.00	2.76	126.02	3498.86	-13.91	54.26	-13.91	56.01	104.37	0.38
3600.00	2.96	125.12	3598.73	-16.80	58.31	-16.80	60.68	106.08	0.20
3700.00	2.99	126.75	3698.60	-19.85	62.51	-19.85	65.59	107.62	0.09
3800.00	2.93	127.94	3798.46	-22.98	66.62	-22.98	70.47	109.03	0.09
3900.00	2.83	125.79	3898.34	-26.00	70.64	-26.00	75.27	110.21	0.15
4000.00	2.51	131.50	3998.23	-28.89	74.28	-28.89	79.70	111.25	0.42
4100.00	2.16	131.18	4098.15	-31.59	77.34	-31.59	83.54	112.21	0.34
4200.00	1.75	128.42	4198.09	-33.78	79.96	-33.78	86.80	112.90	0.42
4300.00	1.11	133.58	4298.06	-35.40	81.86	-35.40	89.19	113.38	0.65
4400.00	0.91	123.85	4398.04	-36.51	83.22	-36.51	90.88	113.69	0.27
4500.00	1.20	117.09	4498.02	-37.43	84.81	-37.43	92.70	113.81	0.32
4600.00	0.97	116.31	4598.01	-38.28	86.50	-38.28	94.59	113.87	0.23
4700.00	0.79	127.07	4697.99	-39.07	87.81	-39.07	96.11	113.99	0.25
4800.00	0.52	136.39	4797.99	-39.81	88.68	-39.81	97.20	114.18	0.29
4900.00	0.74	122.39	4897.98	-40.49	89.54	-40.49	98.27	114.33	0.27
5000.00	1.03	106.49	4997.97	-41.10	90.95	-41.10	99.81	114.32	0.38
5100.00	0.76	87.46	5097.96	-41.32	92.48	-41.32	101.29	114.08	0.40
5200.00	0.89	75.09	5197.95	-41.09	93.89	-41.09	102.49	113.64	0.22
5300.00	0.76	60.81	5297.94	-40.57	95.21	-40.57	103.50	113.08	0.24
5400.00	0.45	51.32	5397.93	-40.00	96.10	-40.00	104.09	112.60	0.32
5500.00	0.07	352.33	5497.93	-39.70	96.39	-39.70	104.25	112.38	0.42
5600.00	0.52	307.66	5597.93	-39.35	96.02	-39.35	103.77	112.29	0.48
5700.00	1.39	298.06	5697.91	-38.51	94.59	-38.51	102.13	112.15	0.88

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	1.74	292.14	5797.88	-37.36	92.12	-37.36	99.41	112.08	0.38
5900.00	1.66	292.19	5897.83	-36.25	89.37	-36.25	96.44	112.08	0.08
6000.00	1.36	291.75	5997.80	-35.26	86.93	-35.26	93.81	112.08	0.30
6100.00	1.18	288.33	6097.77	-34.50	84.85	-34.50	91.59	112.12	0.19
6200.00	1.42	286.84	6197.75	-33.81	82.68	-33.81	89.33	112.24	0.24
6300.00	1.47	296.52	6297.71	-32.88	80.35	-32.88	86.82	112.26	0.25



VES Survey International
West, Texas
432-563-5444
Chris Bankson
Marauder 31 Federal No. 003H / API 30-015-41569





Survey Report - Geographic



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well Marauder 31 Federal Well No. 3H
Project:	Eddy County, New Mexico	TVD Reference:	RKB=3447.9+18 @ 3465.90usft (Patriot 6)
Site:	Marauder 31 Federal	MD Reference:	RKB=3447.9+18 @ 3465.90usft (Patriot 6)
Well:	Marauder 31 Federal Well No. 3H	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	EDM 5000.1 Ddatabase

Project	Eddy County, New Mexico		
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	Marauder 31 Federal				
Site Position:		Northing:	590,651.80 usft	Latitude:	32.62307409
From:	Map	Easting:	631,946.80 usft	Longitude:	-103.90476956
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.23 °

Well	Marauder 31 Federal Well No. 3H				
Well Position	+N/-S	0.00 usft	Northing:	590,651.80 usft	Latitude: 32.62307409
	+E/-W	0.00 usft	Easting:	631,946.80 usft	Longitude: -103.90476956
Position Uncertainty	0.00 usft		Wellhead Elevation:	usft	Ground Level: 3,447.90 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	3/28/2014	7.43	60.43	48,541

Design	Surveys Original Hole				
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	183.67	

Survey Program	Date	4/29/2014			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	6,300.00	Gyro (Original Hole)	NS-GYRO-MS	North sensing gyrocompassing m/s	
6,441.00	13,270.00	MWD (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.00	0.00	0.00	0.00	590,651.80	631,946.80	32.62307409	-103.90476956	
100.00	0.16	5.76	100.00	0.14	0.01	590,651.94	631,946.82	32.62307447	-103.90476951	
Gyro										
200.00	0.10	358.13	200.00	0.37	0.03	590,652.17	631,946.83	32.62307510	-103.90476947	
300.00	0.12	342.84	300.00	0.55	-0.01	590,652.36	631,946.80	32.62307561	-103.90476958	
400.00	0.34	337.73	400.00	0.93	-0.15	590,652.73	631,946.65	32.62307664	-103.90477004	
500.00	0.50	335.21	500.00	1.60	-0.45	590,653.40	631,946.36	32.62307849	-103.90477099	
600.00	0.48	335.53	599.99	2.38	-0.80	590,654.18	631,946.00	32.62308063	-103.90477214	
700.00	0.54	333.63	699.99	3.18	-1.19	590,654.98	631,945.62	32.62308284	-103.90477337	
800.00	0.38	300.07	799.99	3.77	-1.68	590,655.57	631,945.12	32.62308447	-103.90477497	
900.00	0.45	317.26	899.98	4.22	-2.24	590,656.02	631,944.57	32.62308572	-103.90477677	



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well Marauder 31 Federal Well No. 3H
Project:	Eddy County, New Mexico	TVD Reference:	RKB=3447.9+18 @ 3465.90usft (Patriot 6)
Site:	Marauder 31 Federal	MD Reference:	RKB=3447.9+18 @ 3465.90usft (Patriot 6)
Well:	Marauder 31 Federal Well No. 3H	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	EDM 5000.1 Ddatabase

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,000.00	0.38	320.96	999.98	4.77	-2.71	590,656.57	631,944.09	32.62308723	-103.90477830
1,100.00	0.22	335.91	1,099.98	5.20	-3.00	590,657.00	631,943.81	32.62308842	-103.90477923
1,200.00	0.16	337.56	1,199.98	5.50	-3.13	590,657.31	631,943.67	32.62308926	-103.90477965
1,300.00	0.24	357.49	1,299.98	5.84	-3.19	590,657.65	631,943.61	32.62309019	-103.90477985
1,400.00	0.74	46.67	1,399.97	6.50	-2.73	590,658.30	631,944.07	32.62309198	-103.90477835
1,500.00	1.10	63.01	1,499.96	7.37	-1.41	590,659.18	631,945.40	32.62309438	-103.90477403
1,600.00	1.42	69.43	1,599.94	8.24	0.61	590,660.05	631,947.41	32.62309675	-103.90476748
1,700.00	1.50	71.62	1,699.90	9.09	3.01	590,660.90	631,949.81	32.62309905	-103.90475966
1,800.00	1.57	71.33	1,799.87	9.94	5.55	590,661.75	631,952.35	32.62310137	-103.90475140
1,900.00	1.81	74.83	1,899.82	10.80	8.37	590,662.60	631,955.18	32.62310368	-103.90474223
2,000.00	1.50	81.28	1,999.78	11.41	11.19	590,663.21	631,957.99	32.62310533	-103.90473306
2,100.00	1.05	89.22	2,099.76	11.62	13.40	590,663.42	631,960.20	32.62310588	-103.90472588
2,200.00	1.44	95.02	2,199.73	11.52	15.57	590,663.32	631,962.37	32.62310559	-103.90471884
2,300.00	1.50	96.76	2,299.70	11.26	18.12	590,663.06	631,964.92	32.62310484	-103.90471056
2,400.00	1.71	108.21	2,399.66	10.64	20.84	590,662.44	631,967.64	32.62310310	-103.90470174
2,500.00	1.60	113.07	2,499.62	9.62	23.54	590,661.43	631,970.34	32.62310028	-103.90469298
2,600.00	1.87	124.88	2,599.58	8.14	26.16	590,659.95	631,972.97	32.62309619	-103.90468448
2,700.00	2.00	126.63	2,699.52	6.17	28.90	590,657.97	631,975.70	32.62309073	-103.90467561
2,800.00	1.98	128.41	2,799.46	4.05	31.65	590,655.86	631,978.46	32.62308489	-103.90466670
2,900.00	2.13	131.40	2,899.39	1.75	34.40	590,653.56	631,981.21	32.62307853	-103.90465780
3,000.00	2.23	132.96	2,999.32	-0.80	37.22	590,651.00	631,984.02	32.62307148	-103.90464868
3,100.00	2.33	130.69	3,099.24	-3.45	40.18	590,648.35	631,986.99	32.62306415	-103.90463909
3,200.00	2.65	126.63	3,199.15	-6.16	43.58	590,645.65	631,990.38	32.62305668	-103.90462809
3,300.00	2.46	127.63	3,299.05	-8.85	47.14	590,642.96	631,993.94	32.62304925	-103.90461658
3,400.00	2.39	124.04	3,398.96	-11.33	50.56	590,640.48	631,997.37	32.62304240	-103.90460548
3,500.00	2.76	126.02	3,498.86	-13.91	54.24	590,637.90	632,001.04	32.62303526	-103.90459358
3,600.00	2.96	125.12	3,598.73	-16.81	58.30	590,634.99	632,005.10	32.62302724	-103.90458043
3,700.00	2.99	126.75	3,698.60	-19.86	62.50	590,631.95	632,009.30	32.62301882	-103.90456683
3,800.00	2.93	127.94	3,798.46	-22.99	66.60	590,628.82	632,013.41	32.62301017	-103.90455353
3,900.00	2.83	125.79	3,898.34	-26.00	70.62	590,625.80	632,017.43	32.62300184	-103.90454052
4,000.00	2.51	131.50	3,998.23	-28.90	74.27	590,622.91	632,021.07	32.62299384	-103.90452873
4,100.00	2.16	131.18	4,098.15	-31.59	77.32	590,620.21	632,024.13	32.62298641	-103.90451883
4,200.00	1.75	128.42	4,198.09	-33.78	79.94	590,618.02	632,026.74	32.62298036	-103.90451037
4,300.00	1.11	133.58	4,298.06	-35.39	81.84	590,616.41	632,028.64	32.62297589	-103.90450422
4,400.00	0.91	123.85	4,398.04	-36.50	83.20	590,615.30	632,030.00	32.62297283	-103.90449982
4,500.00	1.20	117.09	4,498.02	-37.42	84.79	590,614.38	632,031.59	32.62297028	-103.90449466
4,600.00	0.97	116.31	4,598.01	-38.28	86.48	590,613.53	632,033.28	32.62296792	-103.90448918
4,700.00	0.79	127.07	4,697.99	-39.07	87.79	590,612.74	632,034.59	32.62296573	-103.90448494
4,800.00	0.52	136.39	4,797.99	-39.81	88.65	590,611.99	632,035.46	32.62296368	-103.90448215
4,900.00	0.74	122.39	4,897.98	-40.49	89.51	590,611.32	632,036.31	32.62296182	-103.90447937
5,000.00	1.03	106.49	4,997.97	-41.09	90.92	590,610.72	632,037.72	32.62296015	-103.90447480
5,100.00	0.76	87.46	5,097.96	-41.31	92.44	590,610.49	632,039.25	32.62295951	-103.90446986
5,200.00	0.89	75.09	5,197.95	-41.08	93.85	590,610.72	632,040.66	32.62296013	-103.90446526
5,300.00	0.76	60.81	5,297.94	-40.56	95.18	590,611.24	632,041.99	32.62296155	-103.90446094
5,400.00	0.45	51.32	5,397.93	-39.99	96.07	590,611.81	632,042.87	32.62296310	-103.90445806
5,500.00	0.07	352.33	5,497.93	-39.68	96.37	590,612.12	632,043.17	32.62296394	-103.90445708
5,600.00	0.52	307.66	5,597.93	-39.35	96.00	590,612.46	632,042.80	32.62296487	-103.90445827
5,700.00	1.39	298.06	5,697.91	-38.50	94.57	590,613.30	632,041.38	32.62296722	-103.90446290
5,800.00	1.74	292.14	5,797.88	-37.36	92.09	590,614.45	632,038.90	32.62297039	-103.90447093
5,900.00	1.66	292.19	5,897.83	-36.24	89.35	590,615.57	632,036.15	32.62297350	-103.90447984
6,000.00	1.36	291.75	5,997.80	-35.25	86.90	590,616.55	632,033.71	32.62297623	-103.90448776
6,100.00	1.18	288.33	6,097.77	-34.49	84.82	590,617.32	632,031.63	32.62297836	-103.90449451
6,200.00	1.42	286.84	6,197.75	-33.80	82.66	590,618.00	632,029.46	32.62298026	-103.90450153
6,300.00	1.47	296.52	6,297.72	-32.87	80.33	590,618.93	632,027.13	32.62298284	-103.90450909



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well Marauder 31 Federal Well No. 3H
Project:	Eddy County, New Mexico	TVD Reference:	RKB=3447.9+18 @ 3465.90usft (Patriot 6)
Site:	Marauder 31 Federal	MD Reference:	RKB=3447.9+18 @ 3465.90usft (Patriot 6)
Well:	Marauder 31 Federal Well No. 3H	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	EDM 5000.1 Ddatabase

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
6,441.00	1.40	305.00	6,438.67	-31.08	77.30	590,620.73	632,024.10	32.62298781	-103.90451891
MWD surveys									
6,631.00	1.40	291.10	6,628.62	-28.91	73.23	590,622.89	632,020.04	32.62299381	-103.90453209
6,821.00	1.40	282.20	6,818.56	-27.58	68.80	590,624.22	632,015.60	32.62299751	-103.90454647
7,011.00	2.10	271.10	7,008.47	-27.03	63.05	590,624.78	632,009.85	32.62299910	-103.90456514
7,201.00	2.40	252.30	7,198.33	-28.17	55.78	590,623.63	632,002.58	32.62299604	-103.90458877
7,391.00	2.10	309.20	7,388.20	-27.18	49.29	590,624.62	631,996.09	32.62299884	-103.90460983
7,580.00	1.10	346.30	7,577.13	-23.23	46.18	590,628.58	631,992.98	32.62300974	-103.90461989
7,771.00	0.70	210.60	7,768.12	-22.45	45.15	590,629.35	631,991.95	32.62301188	-103.90462322
7,961.00	0.60	140.70	7,958.11	-24.22	45.19	590,627.58	631,991.99	32.62300702	-103.90462311
8,051.00	0.40	91.80	8,048.11	-24.59	45.80	590,627.21	631,992.60	32.62300598	-103.90462113
8,233.00	0.70	141.40	8,230.10	-25.48	47.13	590,626.32	631,993.93	32.62300353	-103.90461682
8,360.00	1.70	180.20	8,357.07	-27.97	47.61	590,623.83	631,994.41	32.62299668	-103.90461531
8,391.00	2.90	186.90	8,388.04	-29.21	47.51	590,622.59	631,994.31	32.62299327	-103.90461563
8,423.00	8.70	191.50	8,419.87	-32.39	46.93	590,619.41	631,993.73	32.62298454	-103.90461756
8,455.00	14.40	190.20	8,451.21	-38.68	45.74	590,613.12	631,992.55	32.62296726	-103.90462150
8,486.00	19.00	194.10	8,480.89	-47.37	43.83	590,604.43	631,990.63	32.62294339	-103.90462783
8,518.00	23.50	196.90	8,510.71	-58.54	40.70	590,593.27	631,987.51	32.62291274	-103.90463813
8,550.00	26.40	196.70	8,539.72	-71.46	36.80	590,580.34	631,983.61	32.62287726	-103.90465096
8,581.00	27.00	196.00	8,567.41	-84.82	32.88	590,566.98	631,979.69	32.62284057	-103.90466387
8,613.00	29.50	195.70	8,595.60	-99.39	28.75	590,552.41	631,975.55	32.62280057	-103.90467749
8,645.00	33.30	196.00	8,622.91	-115.43	24.19	590,536.37	631,971.00	32.62275654	-103.90469249
8,676.00	36.70	197.30	8,648.30	-132.46	19.09	590,519.34	631,965.90	32.62270979	-103.90470929
8,708.00	39.90	196.90	8,673.41	-151.41	13.26	590,500.39	631,960.07	32.62265775	-103.90472847
8,740.00	42.80	196.40	8,697.43	-171.67	7.21	590,480.14	631,954.01	32.62260215	-103.90474839
8,771.00	45.00	196.20	8,719.76	-192.30	1.18	590,459.51	631,947.98	32.62254551	-103.90476826
8,803.00	46.90	195.30	8,742.01	-214.43	-5.06	590,437.37	631,941.74	32.62248473	-103.90478881
8,835.00	47.00	194.80	8,763.86	-237.01	-11.14	590,414.79	631,935.67	32.62242273	-103.90480883
8,837.00	46.99	194.79	8,765.22	-238.43	-11.51	590,413.38	631,935.30	32.62241884	-103.90481006
330 Hard line intercept @ 8837 MD									
8,866.00	46.80	194.60	8,785.04	-258.91	-16.88	590,392.90	631,929.92	32.62236261	-103.90482777
8,898.00	50.40	192.70	8,806.20	-282.23	-22.53	590,369.57	631,924.27	32.62229857	-103.90484644
8,929.00	54.10	190.20	8,825.18	-306.25	-27.38	590,345.55	631,919.42	32.62223260	-103.90486251
8,961.00	56.50	188.10	8,843.39	-332.22	-31.56	590,319.58	631,915.25	32.62216126	-103.90487641
8,993.00	61.60	186.90	8,859.84	-359.42	-35.13	590,292.38	631,911.67	32.62208653	-103.90488837
9,024.00	67.90	185.70	8,873.06	-387.27	-38.20	590,264.53	631,908.60	32.62201000	-103.90489870
9,056.00	71.80	185.30	8,884.08	-417.17	-41.08	590,234.63	631,905.73	32.62192785	-103.90490844
9,088.00	75.20	186.60	8,893.17	-447.68	-44.26	590,204.12	631,902.54	32.62184402	-103.90491917
9,119.00	78.70	187.60	8,900.17	-477.65	-47.99	590,174.16	631,898.81	32.62176170	-103.90493169
9,151.00	82.20	187.40	8,905.48	-508.93	-52.11	590,142.88	631,894.69	32.62167576	-103.90494548
9,183.00	86.60	186.60	8,908.60	-540.53	-55.99	590,111.27	631,890.81	32.62158894	-103.90495849
9,214.00	90.00	185.30	8,909.52	-571.34	-59.20	590,080.46	631,887.60	32.62150427	-103.90496932
9,246.00	90.70	183.60	8,909.32	-603.25	-61.69	590,048.56	631,885.12	32.62141661	-103.90497780
9,309.00	90.90	183.00	8,908.44	-666.13	-65.31	589,985.67	631,881.49	32.62124379	-103.90499041
9,404.00	91.60	183.00	8,906.37	-760.98	-70.28	589,890.82	631,876.52	32.62098313	-103.90500779
9,499.00	90.70	183.20	8,904.47	-855.82	-75.42	589,795.98	631,871.39	32.62072250	-103.90502571
9,594.00	91.10	183.20	8,902.97	-950.66	-80.72	589,701.14	631,866.08	32.62046186	-103.90504418
9,689.00	91.30	183.00	8,900.98	-1,045.50	-85.86	589,606.30	631,860.95	32.62020123	-103.90506210
9,784.00	89.80	182.90	8,900.07	-1,140.37	-90.75	589,511.43	631,856.06	32.61994052	-103.90507922
9,879.00	90.80	182.70	8,899.57	-1,235.25	-95.39	589,416.55	631,851.42	32.61967976	-103.90509553
9,974.00	91.50	182.70	8,897.67	-1,330.13	-99.86	589,321.68	631,846.94	32.61941902	-103.90511131
10,069.00	90.00	183.70	8,896.42	-1,424.97	-105.16	589,226.84	631,841.64	32.61915839	-103.90512977
10,164.00	89.90	184.60	8,896.51	-1,519.72	-112.04	589,132.09	631,834.77	32.61889802	-103.90515334
10,259.00	89.80	185.30	8,896.76	-1,614.36	-120.24	589,037.44	631,826.57	32.61863796	-103.90518120
10,354.00	88.80	185.70	8,897.92	-1,708.92	-129.34	588,942.89	631,817.46	32.61837815	-103.90521200



Survey Report - Geographic



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well Marauder 31 Federal Well No. 3H
Project:	Eddy County, New Mexico	TVD Reference:	RKB=3447.9+18 @ 3465.90usft (Patriot 6)
Site:	Marauder 31 Federal	MD Reference:	RKB=3447.9+18 @ 3465.90usft (Patriot 6)
Well:	Marauder 31 Federal Well No. 3H	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	EDM 5000.1 Ddatabase

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,449.00	90.00	184.30	8,898.91	-1,803.55	-137.62	588,848.26	631,809.19	32.61811813	-103.90524013
10,544.00	89.80	184.60	8,899.08	-1,898.26	-144.99	588,753.54	631,801.81	32.61785787	-103.90526531
10,639.00	89.00	184.80	8,900.07	-1,992.93	-152.77	588,658.87	631,794.03	32.61759772	-103.90529182
10,735.00	90.30	184.80	8,900.66	-2,088.59	-160.81	588,563.21	631,786.00	32.61733487	-103.90531916
10,829.00	90.70	185.10	8,899.84	-2,182.24	-168.92	588,469.56	631,777.89	32.61707755	-103.90534673
10,925.00	89.80	183.40	8,899.42	-2,277.97	-176.03	588,373.83	631,770.77	32.61681449	-103.90537108
11,020.00	89.40	183.70	8,900.08	-2,372.78	-181.91	588,279.02	631,764.89	32.61655393	-103.90539143
11,115.00	88.60	184.30	8,901.74	-2,467.54	-188.54	588,184.27	631,758.27	32.61629355	-103.90541418
11,210.00	91.40	184.60	8,901.74	-2,562.24	-195.91	588,089.56	631,750.90	32.61603332	-103.90543936
11,305.00	91.30	183.70	8,899.50	-2,656.96	-202.78	587,994.84	631,744.02	32.61577302	-103.90546292
11,400.00	90.50	182.90	8,898.01	-2,751.79	-208.25	587,900.01	631,738.55	32.61551242	-103.90548192
11,495.00	90.50	183.70	8,897.18	-2,846.63	-213.72	587,805.17	631,733.09	32.61525180	-103.90550091
11,590.00	89.60	182.00	8,897.10	-2,941.51	-218.44	587,710.29	631,728.36	32.61499105	-103.90551749
11,685.00	89.60	182.30	8,897.76	-3,036.44	-222.01	587,615.36	631,724.80	32.61473015	-103.90553031
11,779.00	89.20	182.30	8,898.75	-3,130.36	-225.78	587,521.44	631,721.03	32.61447204	-103.90554379
11,874.00	89.10	183.20	8,900.15	-3,225.24	-230.33	587,426.56	631,716.47	32.61421129	-103.90555983
11,969.00	90.00	182.30	8,900.90	-3,320.12	-234.89	587,331.68	631,711.91	32.61395052	-103.90557587
12,064.00	90.00	183.20	8,900.90	-3,415.01	-239.45	587,236.79	631,707.35	32.61368974	-103.90559191
12,159.00	90.20	183.60	8,900.74	-3,509.85	-245.08	587,141.96	631,701.72	32.61342914	-103.90561145
12,254.00	89.50	184.30	8,900.98	-3,604.62	-251.63	587,047.18	631,695.18	32.61316870	-103.90563394
12,350.00	89.70	182.70	8,901.65	-3,700.44	-257.49	586,951.37	631,689.32	32.61290539	-103.90565422
12,445.00	89.20	183.40	8,902.57	-3,795.30	-262.54	586,856.51	631,684.26	32.61264470	-103.90567188
12,540.00	90.00	182.70	8,903.23	-3,890.16	-267.60	586,761.65	631,679.21	32.61238401	-103.90568953
12,636.00	89.30	183.20	8,903.82	-3,986.03	-272.54	586,665.78	631,674.27	32.61212054	-103.90570683
12,731.00	89.20	181.80	8,905.06	-4,080.93	-276.68	586,570.88	631,670.12	32.61185973	-103.90572152
12,826.00	89.80	181.80	8,905.89	-4,175.88	-279.67	586,475.93	631,667.14	32.61159877	-103.90573245
12,920.00	91.70	183.70	8,904.66	-4,269.75	-284.17	586,382.05	631,662.63	32.61134079	-103.90574832
13,015.00	91.40	184.60	8,902.09	-4,364.47	-291.05	586,287.34	631,655.76	32.61108051	-103.90577188
13,110.00	90.60	185.70	8,900.43	-4,459.07	-299.57	586,192.74	631,647.23	32.61082058	-103.90580080
13,270.00	90.60	185.70	8,898.75	-4,618.27	-315.46	586,033.54	631,631.34	32.61038315	-103.90585448

Survey projected to 13270.00 MD

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
100.00	100.00	0.14	0.01	Gyro
6,441.00	6,438.67	-31.08	77.30	MWD surveys
8,837.00	8,765.22	-238.43	-11.51	330 Hard line intercept @ 8837 MD
13,270.00	8,898.75	-4,618.27	-315.46	Survey projected to 13270.00 MD



COG Operating LLC

Well: Marauder 31 Federal Well No. 3H
Site: Marauder 31 Federal
Project: Eddy County, New Mexico
Design: rev3
Rig: Patriot 6

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation
1	8835.00	47.00	194.80	8763.86	-237.01	-11.14	0.00	0.00	237.24	Survey Begin 5°/100' build
2	8895.00	50.00	194.80	8803.61	-280.46	-22.61	5.00	0.00	281.33	Begin 14.42°/100' build/turn
3	9181.76	90.00	183.30	8899.99	-541.20	-60.60	14.42	-17.56	543.97	Begin 90.00° lateral
4	13274.06	90.00	183.30	8900.00	-4626.70	-296.50	0.00	0.00	4636.19	PBHL/TD

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	Vsect	Departure	Annotation
100.00	100.00	0.16	5.76	0.14	0.01	-0.14	0.14	Gyro
6438.67	6441.00	1.40	305.00	-31.08	77.30	26.07	146.87	MWD surveys
8765.22	8837.00	46.99	194.79	-238.43	-11.51	238.68	411.21	330 Hard line intercept @ 8837 MD
8898.75	13270.00	90.60	185.70	-4618.27	-315.46	4628.99	4803.59	Survey projected to 13270.00 MD

Surface Location: RKB=3447.9+18 @ 3465.90usft (Patriot 6)

US State Plane 1927 (Exact solution)

New Mexico East 3001

Northing 590651.80 Easting 631946.80 Latitude 32.62307409 Longitude -103.90476956
Total Correction (M => G) To convert a Magnetic Direction to a Grid Direction, Add 7.20°

N-ONE



Azimuths to Grid North
True North: -0.23°
Magnetic North: 7.20°

Magnetic Field
Strength: 48541.4snT
Dip Angle: 60.43°
Date: 3/28/2014
Model: IGRF2010

