



December 30, 2014

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

NM OIL CONSERVATION
ARTESIA DISTRICT

FEB 13 2015

RECEIVED

15- 42327

Attn: Kanicia Castillo

RE: **Copperhead Fee 'A' 3H**

Please find enclosed a copy of the survey from 0.00' to 7600.00' 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.

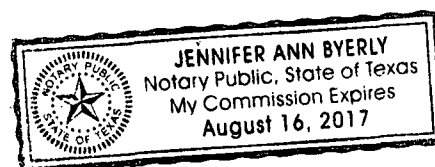
Sincerely,

Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 30 day of December A.D., 2014, by Keith Havelka.

Jennifer Ann Byerly
Notary Public, State of Texas





Company: COG Operating
Lease/Well: Copperhead Fee 'A' 3H
Location: Sec-31 Town Ship 26s Range 29e
Rig Name: Patriot #2
State/County: New Mexico/Eddy
Latitude: 32.02, Longitude: -104.03
GRID North is 0.16 Degrees East of True North
VS-Azi: 0.00 Degrees



NM OIL CONSERVATION
ARTESIA DISTRICT
FEB 13 2015
RECEIVED

Depth Reference : 17 Feet

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: gyro survey.ut
Minimum Curvature Method
Report Date/Time: 12/30/2014 / 14:28

Vaughn Energy Services
Fort Worth, Texas
Surveyor: Jason Wilson
817-718-1320

Copperhead Fee 'A' 3H / API 30-015-42327

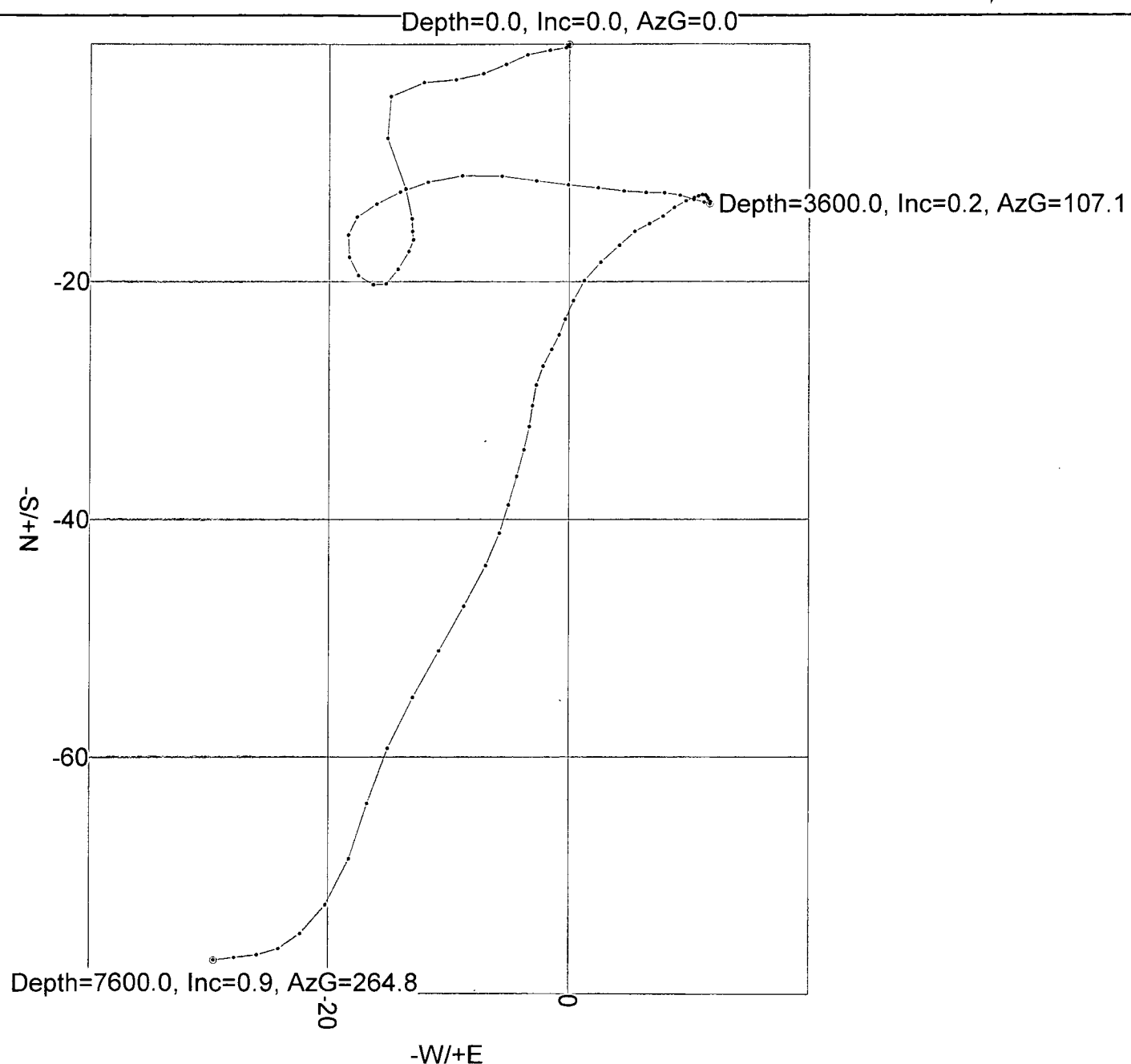
Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
50.00	0.22	220.87	50.00	-0.07	-0.06	-0.07	0.10	220.87	0.44
100.00	0.56	231.01	100.00	-0.30	-0.31	-0.30	0.43	226.53	0.68
200.00	1.09	274.85	199.99	-0.52	-1.64	-0.52	1.72	252.37	0.79
300.00	1.15	242.94	299.97	-0.90	-3.48	-0.90	3.60	255.57	0.62
400.00	1.08	248.06	399.95	-1.70	-5.25	-1.70	5.52	252.02	0.12
500.00	1.27	246.57	499.93	-2.50	-7.14	-2.50	7.56	250.73	0.20
600.00	1.43	267.16	599.90	-3.00	-9.41	-3.00	9.87	252.31	0.51
700.00	1.68	262.83	699.87	-3.24	-12.10	-3.24	12.53	255.00	0.27
800.00	1.88	233.31	799.82	-4.40	-14.87	-4.40	15.51	253.50	0.93
900.00	3.17	158.05	899.74	-7.94	-15.15	-7.94	17.11	242.33	3.24
1000.00	2.04	163.57	999.64	-12.21	-13.62	-12.21	18.29	228.11	1.15
1100.00	0.92	179.32	1099.61	-14.72	-13.10	-14.72	19.71	221.68	1.18
1200.00	0.31	173.11	1199.60	-15.79	-13.06	-15.79	20.49	219.60	0.62
1300.00	0.50	172.86	1299.60	-16.49	-12.98	-16.49	20.98	218.20	0.19
1400.00	0.81	219.47	1399.59	-17.47	-13.37	-17.47	22.00	217.43	0.59
1500.00	1.20	204.81	1499.57	-18.97	-14.26	-18.97	23.73	216.93	0.47
1600.00	0.70	243.97	1599.56	-20.19	-15.25	-20.19	25.30	217.06	0.80
1700.00	0.64	290.45	1699.56	-20.26	-16.32	-20.26	26.01	218.84	0.53

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
1800.00	1.05	308.85	1799.54	-19.49	-17.55	-19.49	26.23	222.00	0.49
1900.00	1.10	356.14	1899.53	-17.95	-18.33	-17.95	25.66	225.60	0.87
2000.00	1.04	358.49	1999.51	-16.09	-18.42	-16.09	24.46	228.87	0.08
2100.00	1.11	52.46	2099.50	-14.59	-17.68	-14.59	22.92	230.47	0.98
2200.00	1.16	58.84	2199.48	-13.48	-16.04	-13.48	20.95	229.97	0.14
2300.00	1.38	66.09	2299.45	-12.47	-14.08	-12.47	18.81	228.48	0.27
2400.00	1.46	74.86	2399.42	-11.65	-11.75	-11.65	16.55	225.26	0.23
2500.00	1.91	82.90	2499.38	-11.11	-8.87	-11.11	14.21	218.60	0.51
2600.00	1.88	98.29	2599.32	-11.14	-5.59	-11.14	12.46	206.65	0.51
2700.00	1.42	97.21	2699.28	-11.53	-2.73	-11.53	11.85	193.34	0.47
2800.00	1.62	96.79	2799.25	-11.85	-0.10	-11.85	11.85	180.50	0.20
2900.00	1.27	95.40	2899.22	-12.13	2.40	-12.13	12.36	168.79	0.35
3000.00	1.18	98.23	2999.19	-12.38	4.53	-12.38	13.18	159.90	0.11
3100.00	0.96	89.61	3099.17	-12.52	6.39	-12.52	14.06	152.96	0.28
3200.00	0.78	92.72	3199.16	-12.55	7.90	-12.55	14.83	147.80	0.19
3300.00	0.76	105.43	3299.15	-12.76	9.22	-12.76	15.74	144.14	0.17
3400.00	0.62	107.26	3399.15	-13.09	10.38	-13.09	16.71	141.59	0.14
3500.00	0.38	102.19	3499.14	-13.33	11.23	-13.33	17.42	139.89	0.25
3600.00	0.20	107.15	3599.14	-13.45	11.71	-13.45	17.83	138.94	0.19
3700.00	0.28	323.80	3699.14	-13.30	11.73	-13.30	17.74	138.58	0.45
3800.00	0.08	344.70	3799.14	-13.04	11.57	-13.04	17.43	138.41	0.21
3900.00	0.09	327.27	3899.14	-12.90	11.51	-12.90	17.29	138.26	0.03
4000.00	0.17	311.37	3999.14	-12.74	11.36	-12.74	17.06	138.28	0.08
4100.00	0.19	252.70	4099.14	-12.69	11.08	-12.69	16.85	138.87	0.18
4200.00	0.20	247.28	4199.14	-12.81	10.76	-12.81	16.73	139.96	0.02
4300.00	0.25	253.93	4299.14	-12.94	10.39	-12.94	16.59	141.23	0.06
4400.00	0.59	244.26	4399.14	-13.22	9.72	-13.22	16.41	143.69	0.34
4500.00	0.70	237.06	4499.13	-13.78	8.74	-13.78	16.31	147.61	0.14
4600.00	0.69	227.70	4599.12	-14.51	7.78	-14.51	16.47	151.80	0.11
4700.00	0.81	250.33	4699.11	-15.15	6.68	-15.15	16.56	156.23	0.31
4800.00	0.79	234.11	4799.10	-15.79	5.46	-15.79	16.71	160.94	0.23
4900.00	1.18	223.93	4899.09	-16.94	4.18	-16.94	17.45	166.13	0.43
5000.00	1.24	230.39	4999.07	-18.37	2.63	-18.37	18.56	171.84	0.15
5100.00	1.15	211.64	5099.05	-19.92	1.27	-19.92	19.96	176.34	0.40
5200.00	1.04	205.25	5199.03	-21.59	0.36	-21.59	21.59	179.04	0.17
5300.00	0.92	201.13	5299.01	-23.16	-0.32	-23.16	23.16	180.78	0.13
5400.00	0.68	202.82	5399.00	-24.46	-0.84	-24.46	24.47	181.96	0.25
5500.00	0.89	208.32	5498.99	-25.69	-1.44	-25.69	25.73	183.20	0.23
5600.00	0.93	206.03	5598.98	-27.10	-2.16	-27.10	27.19	184.56	0.05

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
5700.00	1.02	193.43	5698.97	-28.69	-2.72	-28.69	28.82	185.42	0.23
5800.00	0.99	187.23	5798.95	-30.42	-3.04	-30.42	30.57	185.70	0.11
5900.00	1.05	189.36	5898.94	-32.18	-3.30	-32.18	32.35	185.85	0.07
6000.00	1.23	195.15	5998.92	-34.12	-3.73	-34.12	34.32	186.23	0.22
6100.00	1.42	195.05	6098.89	-36.36	-4.33	-36.36	36.61	186.79	0.18
6200.00	1.47	196.65	6198.86	-38.78	-5.02	-38.78	39.10	187.37	0.06
6300.00	1.38	197.39	6298.83	-41.15	-5.74	-41.15	41.55	187.94	0.08
6400.00	2.01	206.18	6398.78	-43.88	-6.88	-43.88	44.41	188.91	0.68
6500.00	2.43	209.13	6498.71	-47.30	-8.68	-47.30	48.09	190.40	0.43
6600.00	2.49	209.20	6598.62	-51.04	-10.77	-51.04	52.17	191.91	0.06
6700.00	2.67	209.29	6698.51	-54.97	-12.97	-54.97	56.47	193.27	0.18
6800.00	2.82	202.68	6798.40	-59.26	-15.05	-59.26	61.14	194.25	0.35
6900.00	2.88	197.29	6898.28	-63.93	-16.74	-63.93	66.08	194.68	0.27
7000.00	2.78	198.79	6998.15	-68.62	-18.27	-68.62	71.01	194.91	0.12
7100.00	2.27	216.32	7098.06	-72.51	-20.23	-72.51	75.27	195.59	0.92
7200.00	1.44	228.47	7198.01	-74.94	-22.34	-74.94	78.20	196.60	0.91
7300.00	1.13	243.19	7297.98	-76.22	-24.16	-76.22	79.96	197.59	0.46
7400.00	1.05	265.02	7397.96	-76.74	-25.95	-76.74	81.01	198.69	0.42
7500.00	1.10	261.28	7497.95	-76.97	-27.82	-76.97	81.84	199.87	0.08
7600.00	0.88	264.79	7597.93	-77.18	-29.53	-77.18	82.64	200.94	0.23



Vaughn Energy Services
Fort Worth, Texas
Surveyor: Jason Wilson
817-718-1320
Copperhead Fee 'A' 3H / API 30-015-42327



VES Survey Date: 12/17/2014



Survey Report - Geographic



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well Copperhead Fee A Well 3H
Project:	Eddy County, New Mexico	TVD Reference:	RKB=2923.4+17 @ 2940.40usft (Rig)
Site:	Copperhead Fee A	MD Reference:	RKB=2923.4+17 @ 2940.40usft (Rig)
Well:	Copperhead Fee A Well 3H	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	Dbase Nov0914

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	Copperhead Fee A				
Site Position:		Northing:	364,256.60 usft	Latitude:	32° 0' 3.921535 N
From:	Map	Easting:	594,413.50 usft	Longitude:	104° 1' 43.555658 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.16 °

Well	Copperhead Fee A Well 3H					
Well Position	+N/-S	0.00 usft	Northing:	364,256.60 usft	Latitude:	32° 0' 3.921535 N
	+E/-W	0.00 usft	Easting:	594,413.50 usft	Longitude:	104° 1' 43.555658 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	2,923.40 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	12/17/2014	7.35	59.82	48,086

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	354.39	

Survey Program	Date	12/23/2014			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
50.00	7,600.00	Gyro (Original Hole)	NS-GYRO-MS	North sensing gyrocompassing m/s	
7,750.00	13,684.00	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	364,256.60	594,413.50	32° 0' 3.921535 N	104° 1' 43.555658 W	
50.00	0.22	220.87	50.00	-0.07	-0.06	364,256.53	594,413.44	32° 0' 3.920818 N	104° 1' 43.556390 W	
Gyro										
100.00	0.56	231.01	100.00	-0.30	-0.32	364,256.30	594,413.19	32° 0' 3.918585 N	104° 1' 43.559332 W	
200.00	1.09	274.85	199.99	-0.53	-1.64	364,256.07	594,411.86	32° 0' 3.916375 N	104° 1' 43.574757 W	
300.00	1.15	242.94	299.97	-0.90	-3.48	364,255.70	594,410.02	32° 0' 3.912704 N	104° 1' 43.596154 W	
400.00	1.08	248.06	399.95	-1.71	-5.25	364,254.89	594,408.25	32° 0' 3.904751 N	104° 1' 43.616710 W	
500.00	1.27	246.57	499.93	-2.50	-7.14	364,254.09	594,406.36	32° 0' 3.896958 N	104° 1' 43.638696 W	
600.00	1.43	267.16	599.90	-3.01	-9.41	364,253.59	594,404.10	32° 0' 3.892048 N	104° 1' 43.664994 W	
700.00	1.68	262.83	699.87	-3.25	-12.11	364,253.35	594,401.40	32° 0' 3.889701 N	104° 1' 43.696365 W	
800.00	1.88	233.31	799.82	-4.41	-14.88	364,252.18	594,398.63	32° 0' 3.878268 N	104° 1' 43.728569 W	



Survey Report - Geographic



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well Copperhead Fee A Well 3H
Project:	Eddy County, New Mexico	TVD Reference:	RKB=2923.4+17 @ 2940.40usft (Rig)
Site:	Copperhead Fee A	MD Reference:	RKB=2923.4+17 @ 2940.40usft (Rig)
Well:	Copperhead Fee A Well 3H	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	Dbase Nov0914

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
900.00	3.17	158.05	899.74	-7.96	-15.16	364,248.64	594,398.34	32° 0' 3.843187 N	104° 1' 43.731958 W
1,000.00	2.04	163.57	999.64	-12.23	-13.62	364,244.37	594,399.88	32° 0' 3.800868 N	104° 1' 43.714249 W
1,100.00	0.92	179.32	1,099.60	-14.74	-13.11	364,241.86	594,400.39	32° 0' 3.776013 N	104° 1' 43.708373 W
1,200.00	0.31	173.11	1,199.60	-15.81	-13.07	364,240.79	594,400.44	32° 0' 3.765409 N	104° 1' 43.707921 W
1,300.00	0.50	172.86	1,299.60	-16.51	-12.98	364,240.08	594,400.52	32° 0' 3.758464 N	104° 1' 43.706937 W
1,400.00	0.81	219.47	1,399.59	-17.49	-13.38	364,239.11	594,400.13	32° 0' 3.748790 N	104° 1' 43.711557 W
1,500.00	1.20	204.81	1,499.57	-18.99	-14.26	364,237.61	594,399.24	32° 0' 3.734008 N	104° 1' 43.721927 W
1,600.00	0.70	243.97	1,599.56	-20.21	-15.25	364,236.39	594,398.25	32° 0' 3.721976 N	104° 1' 43.733444 W
1,700.00	0.64	290.45	1,699.55	-20.28	-16.32	364,236.32	594,397.18	32° 0' 3.721284 N	104° 1' 43.745898 W
1,800.00	1.05	308.85	1,799.54	-19.51	-17.56	364,237.09	594,395.94	32° 0' 3.728938 N	104° 1' 43.760236 W
1,900.00	1.10	356.14	1,899.53	-17.98	-18.34	364,238.62	594,395.16	32° 0' 3.744126 N	104° 1' 43.769223 W
2,000.00	1.04	358.49	1,999.51	-16.11	-18.43	364,240.49	594,395.08	32° 0' 3.762584 N	104° 1' 43.770191 W
2,100.00	1.11	52.46	2,099.50	-14.62	-17.68	364,241.98	594,395.82	32° 0' 3.777383 N	104° 1' 43.761500 W
2,200.00	1.16	58.84	2,199.48	-13.50	-16.05	364,243.10	594,397.45	32° 0' 3.788362 N	104° 1' 43.742485 W
2,300.00	1.38	66.09	2,299.45	-12.49	-14.08	364,244.11	594,399.42	32° 0' 3.798320 N	104° 1' 43.719609 W
2,400.00	1.46	74.86	2,399.42	-11.67	-11.75	364,244.93	594,401.75	32° 0' 3.806378 N	104° 1' 43.692517 W
2,500.00	1.91	82.90	2,499.38	-11.13	-8.87	364,245.47	594,404.63	32° 0' 3.811629 N	104° 1' 43.659014 W
2,600.00	1.88	98.29	2,599.32	-11.16	-5.59	364,245.44	594,407.91	32° 0' 3.811236 N	104° 1' 43.620960 W
2,700.00	1.42	97.21	2,699.28	-11.55	-2.74	364,245.05	594,410.76	32° 0' 3.807277 N	104° 1' 43.587847 W
2,800.00	1.62	96.79	2,799.25	-11.88	-0.11	364,244.72	594,413.40	32° 0' 3.804010 N	104° 1' 43.557282 W
2,900.00	1.27	95.40	2,899.21	-12.15	2.40	364,244.45	594,415.90	32° 0' 3.801254 N	104° 1' 43.528178 W
3,000.00	1.18	98.23	2,999.19	-12.40	4.52	364,244.20	594,418.03	32° 0' 3.798704 N	104° 1' 43.503539 W
3,100.00	0.96	89.61	3,099.17	-12.54	6.38	364,244.06	594,419.88	32° 0' 3.797250 N	104° 1' 43.481981 W
3,200.00	0.78	92.72	3,199.16	-12.57	7.90	364,244.03	594,421.40	32° 0' 3.796945 N	104° 1' 43.464358 W
3,300.00	0.76	105.43	3,299.15	-12.78	9.22	364,243.82	594,422.72	32° 0' 3.794842 N	104° 1' 43.449045 W
3,400.00	0.62	107.26	3,399.15	-13.11	10.37	364,243.49	594,423.88	32° 0' 3.791475 N	104° 1' 43.435632 W
3,500.00	0.38	102.19	3,499.14	-13.34	11.21	364,243.25	594,424.72	32° 0' 3.789170 N	104° 1' 43.425875 W
3,600.00	0.20	107.15	3,599.14	-13.46	11.70	364,243.13	594,425.21	32° 0' 3.787954 N	104° 1' 43.420178 W
3,700.00	0.28	323.80	3,699.14	-13.32	11.73	364,243.28	594,425.23	32° 0' 3.789395 N	104° 1' 43.419912 W
3,800.00	0.08	344.70	3,799.14	-13.05	11.56	364,243.54	594,425.07	32° 0' 3.792017 N	104° 1' 43.421793 W
3,900.00	0.09	327.27	3,899.14	-12.92	11.50	364,243.68	594,425.01	32° 0' 3.793339 N	104° 1' 43.422496 W
4,000.00	0.17	311.37	3,999.14	-12.76	11.35	364,243.84	594,424.85	32° 0' 3.794968 N	104° 1' 43.424277 W
4,100.00	0.19	252.70	4,099.14	-12.71	11.08	364,243.89	594,424.58	32° 0' 3.795458 N	104° 1' 43.427407 W
4,200.00	0.20	247.28	4,199.14	-12.82	10.76	364,243.77	594,424.26	32° 0' 3.794312 N	104° 1' 43.431118 W
4,300.00	0.25	253.93	4,299.14	-12.95	10.39	364,243.65	594,423.89	32° 0' 3.793057 N	104° 1' 43.435427 W
4,400.00	0.59	244.26	4,399.14	-13.24	9.72	364,243.36	594,423.22	32° 0' 3.790265 N	104° 1' 43.443256 W
4,500.00	0.70	237.06	4,499.13	-13.79	8.74	364,242.81	594,422.24	32° 0' 3.784793 N	104° 1' 43.454614 W
4,600.00	0.69	227.70	4,599.12	-14.53	7.78	364,242.07	594,421.29	32° 0' 3.777522 N	104° 1' 43.465763 W
4,700.00	0.81	250.33	4,699.11	-15.17	6.67	364,241.43	594,420.17	32° 0' 3.771188 N	104° 1' 43.478686 W
4,800.00	0.79	234.11	4,799.10	-15.82	5.45	364,240.78	594,418.95	32° 0' 3.764867 N	104° 1' 43.492922 W
4,900.00	1.18	223.93	4,899.09	-16.96	4.17	364,239.64	594,417.68	32° 0' 3.753564 N	104° 1' 43.507742 W
5,000.00	1.24	230.39	4,999.07	-18.39	2.63	364,238.21	594,416.13	32° 0' 3.739441 N	104° 1' 43.525765 W
5,100.00	1.15	211.64	5,099.05	-19.94	1.27	364,236.66	594,414.77	32° 0' 3.724197 N	104° 1' 43.541610 W
5,200.00	1.04	205.25	5,199.03	-21.61	0.35	364,234.99	594,413.86	32° 0' 3.707644 N	104° 1' 43.552273 W
5,300.00	0.92	201.13	5,299.01	-23.18	-0.32	364,233.42	594,413.18	32° 0' 3.692129 N	104° 1' 43.560181 W
5,400.00	0.68	202.82	5,399.00	-24.48	-0.84	364,232.12	594,412.66	32° 0' 3.679319 N	104° 1' 43.566257 W
5,500.00	0.89	208.32	5,498.99	-25.71	-1.44	364,230.89	594,412.06	32° 0' 3.667157 N	104° 1' 43.573249 W
5,600.00	0.93	206.03	5,598.98	-27.12	-2.17	364,229.48	594,411.34	32° 0' 3.653194 N	104° 1' 43.581709 W
5,700.00	1.02	193.43	5,698.97	-28.72	-2.73	364,227.88	594,410.77	32° 0' 3.637425 N	104° 1' 43.588298 W
5,800.00	0.99	187.23	5,798.95	-30.44	-3.05	364,226.16	594,410.46	32° 0' 3.620385 N	104° 1' 43.592018 W
5,900.00	1.05	189.36	5,898.94	-32.20	-3.30	364,224.40	594,410.20	32° 0' 3.602963 N	104° 1' 43.595069 W
6,000.00	1.23	195.15	5,998.92	-34.14	-3.73	364,222.46	594,409.77	32° 0' 3.583775 N	104° 1' 43.600120 W
6,100.00	1.42	195.05	6,098.89	-36.37	-4.33	364,220.23	594,409.17	32° 0' 3.561697 N	104° 1' 43.607187 W
6,200.00	1.47	196.65	6,198.86	-38.80	-5.02	364,217.80	594,408.48	32° 0' 3.537713 N	104° 1' 43.615271 W
6,300.00	1.38	197.39	6,298.83	-41.18	-5.75	364,215.42	594,407.75	32° 0' 3.514199 N	104° 1' 43.623796 W



Survey Report - Geographic



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well Copperhead Fee A Well 3H
Project:	Eddy County, New Mexico	TVD Reference:	RKB=2923.4+17 @ 2940.40usft (Rig)
Site:	Copperhead Fee A	MD Reference:	RKB=2923.4+17 @ 2940.40usft (Rig)
Well:	Copperhead Fee A Well 3H	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	Dbase Nov0914

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
6,400.00	2.01	206.18	6,398.78	-43.90	-6.88	364,212.70	594,406.62	32° 0' 3.487283 N	104° 1' 43.637050 W
6,500.00	2.43	209.13	6,498.71	-47.32	-8.69	364,209.27	594,404.81	32° 0' 3.453431 N	104° 1' 43.658132 W
6,600.00	2.49	209.20	6,598.61	-51.07	-10.78	364,205.53	594,402.72	32° 0' 3.416397 N	104° 1' 43.682545 W
6,700.00	2.67	209.29	6,698.51	-55.00	-12.98	364,201.60	594,400.52	32° 0' 3.377588 N	104° 1' 43.708214 W
6,800.00	2.82	202.68	6,798.40	-59.30	-15.07	364,197.30	594,398.43	32° 0' 3.335080 N	104° 1' 43.732603 W
6,900.00	2.88	197.29	6,898.27	-63.97	-16.76	364,192.63	594,396.74	32° 0' 3.288926 N	104° 1' 43.752442 W
7,000.00	2.78	198.79	6,998.15	-68.66	-18.29	364,187.93	594,395.21	32° 0' 3.242509 N	104° 1' 43.770337 W
7,100.00	2.27	216.32	7,098.06	-72.56	-20.25	364,184.04	594,393.26	32° 0' 3.204050 N	104° 1' 43.793158 W
7,200.00	1.44	228.47	7,198.00	-74.98	-22.36	364,181.61	594,391.14	32° 0' 3.180072 N	104° 1' 43.817784 W
7,300.00	1.13	243.19	7,297.98	-76.26	-24.18	364,180.34	594,389.32	32° 0' 3.167477 N	104° 1' 43.838969 W
7,400.00	1.05	265.02	7,397.96	-76.79	-25.97	364,179.81	594,387.53	32° 0' 3.162338 N	104° 1' 43.859807 W
7,500.00	1.10	261.28	7,497.94	-77.01	-27.84	364,179.59	594,385.67	32° 0' 3.160163 N	104° 1' 43.881433 W
7,600.00	0.88	264.79	7,597.93	-77.23	-29.55	364,179.37	594,383.95	32° 0' 3.158080 N	104° 1' 43.901339 W
7,750.00	1.10	231.60	7,747.91	-78.23	-31.82	364,178.37	594,381.68	32° 0' 3.148257 N	104° 1' 43.927797 W
MWD surveys									
7,782.00	0.90	342.00	7,779.90	-78.18	-32.14	364,178.42	594,381.36	32° 0' 3.148744 N	104° 1' 43.931493 W
7,814.00	4.60	11.20	7,811.86	-76.68	-31.97	364,179.92	594,381.53	32° 0' 3.163567 N	104° 1' 43.929451 W
7,846.00	8.60	7.30	7,843.64	-73.05	-31.42	364,183.55	594,382.09	32° 0' 3.199510 N	104° 1' 43.922905 W
7,878.00	13.00	2.40	7,875.07	-67.07	-30.96	364,189.53	594,382.54	32° 0' 3.258603 N	104° 1' 43.917426 W
7,909.00	16.90	1.00	7,905.02	-59.08	-30.74	364,197.52	594,382.77	32° 0' 3.337690 N	104° 1' 43.914555 W
7,941.00	20.90	359.60	7,935.28	-48.72	-30.70	364,207.88	594,382.81	32° 0' 3.440242 N	104° 1' 43.913735 W
7,972.00	24.60	358.60	7,963.87	-36.73	-30.89	364,219.86	594,382.61	32° 0' 3.558848 N	104° 1' 43.915623 W
8,003.00	28.30	356.10	7,991.62	-22.95	-31.55	364,233.65	594,381.95	32° 0' 3.695310 N	104° 1' 43.922810 W
8,035.00	32.70	355.00	8,019.18	-6.76	-32.82	364,249.84	594,380.68	32° 0' 3.855541 N	104° 1' 43.937029 W
8,067.00	37.30	354.70	8,045.39	11.51	-34.47	364,268.11	594,379.03	32° 0' 4.036448 N	104° 1' 43.955591 W
8,098.00	40.50	354.00	8,069.51	30.88	-36.39	364,287.48	594,377.11	32° 0' 4.228190 N	104° 1' 43.977259 W
8,130.00	41.00	354.30	8,093.76	51.66	-38.52	364,308.26	594,374.98	32° 0' 4.433895 N	104° 1' 44.001301 W
8,162.00	44.20	354.70	8,117.31	73.22	-40.59	364,329.82	594,372.91	32° 0' 4.647300 N	104° 1' 44.024675 W
8,193.00	48.20	353.60	8,138.76	95.47	-42.88	364,352.07	594,370.62	32° 0' 4.867584 N	104° 1' 44.050508 W
8,225.00	52.40	353.30	8,159.20	119.93	-45.69	364,376.53	594,367.81	32° 0' 5.109677 N	104° 1' 44.082339 W
8,257.00	56.10	352.60	8,177.89	145.70	-48.88	364,402.29	594,364.62	32° 0' 5.364789 N	104° 1' 44.118549 W
8,288.00	59.60	351.90	8,194.38	171.70	-52.42	364,428.30	594,361.08	32° 0' 5.622219 N	104° 1' 44.158830 W
8,320.00	63.00	352.20	8,209.75	199.49	-56.30	364,456.09	594,357.20	32° 0' 5.897402 N	104° 1' 44.202985 W
8,352.00	67.70	352.90	8,223.09	228.32	-60.07	364,484.92	594,353.43	32° 0' 6.182831 N	104° 1' 44.245785 W
8,384.00	71.30	354.00	8,234.30	258.10	-63.48	364,514.69	594,350.02	32° 0' 6.477575 N	104° 1' 44.284472 W
8,410.00	73.50	353.30	8,242.16	282.73	-66.23	364,539.32	594,347.28	32° 0' 6.721396 N	104° 1' 44.315507 W
8,442.00	76.70	354.00	8,250.38	313.46	-69.64	364,570.05	594,343.86	32° 0' 7.025616 N	104° 1' 44.354201 W
8,473.00	80.20	354.30	8,256.59	343.66	-72.74	364,600.26	594,340.76	32° 0' 7.324673 N	104° 1' 44.389152 W
8,505.00	82.30	355.00	8,261.46	375.15	-75.69	364,631.75	594,337.82	32° 0' 7.636378 N	104° 1' 44.422361 W
8,537.00	83.80	355.00	8,265.33	406.80	-78.46	364,663.39	594,335.05	32° 0' 7.949614 N	104° 1' 44.453477 W
8,569.00	85.00	355.40	8,268.45	438.53	-81.12	364,695.13	594,332.38	32° 0' 8.263756 N	104° 1' 44.483386 W
8,600.00	85.30	355.40	8,271.07	469.32	-83.60	364,725.92	594,329.91	32° 0' 8.568536 N	104° 1' 44.511148 W
8,632.00	85.70	355.40	8,273.58	501.12	-86.16	364,757.72	594,327.35	32° 0' 8.883304 N	104° 1' 44.539821 W
8,727.00	86.60	354.70	8,279.96	595.55	-94.34	364,852.15	594,319.17	32° 0' 9.818072 N	104° 1' 44.631718 W
8,822.00	88.70	354.30	8,283.86	690.03	-103.43	364,946.62	594,310.07	32° 0' 10.753332 N	104° 1' 44.734281 W
8,918.00	87.30	354.30	8,287.21	785.49	-112.96	365,042.09	594,300.54	32° 0' 11.698373 N	104° 1' 44.841821 W
9,013.00	88.70	354.00	8,290.52	879.94	-122.64	365,136.53	594,290.87	32° 0' 12.633329 N	104° 1' 44.951114 W
9,108.00	90.80	354.30	8,290.94	974.44	-132.32	365,231.03	594,281.18	32° 0' 13.568816 N	104° 1' 45.060469 W
9,203.00	92.70	354.00	8,288.04	1,068.89	-142.00	365,325.49	594,271.51	32° 0' 14.503885 N	104° 1' 45.169775 W
9,298.00	90.80	355.00	8,285.14	1,163.41	-151.10	365,420.00	594,262.40	32° 0' 15.439495 N	104° 1' 45.272372 W
9,393.00	91.00	355.00	8,283.64	1,258.03	-159.38	365,514.63	594,254.13	32° 0' 16.376208 N	104° 1' 45.365426 W
9,488.00	89.00	354.30	8,283.64	1,352.61	-168.23	365,609.21	594,245.27	32° 0' 17.312482 N	104° 1' 45.465201 W
9,583.00	87.80	354.30	8,286.30	1,447.10	-177.67	365,703.70	594,235.84	32° 0' 18.247890 N	104° 1' 45.571648 W
9,678.00	88.30	353.60	8,289.53	1,541.52	-187.67	365,798.12	594,225.83	32° 0' 19.182558 N	104° 1' 45.684780 W
9,774.00	90.60	353.60	8,290.45	1,636.91	-198.37	365,893.51	594,215.13	32° 0' 20.126900 N	104° 1' 45.805929 W

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well: Copperhead Fee A Well 3H
Project:	Eddy County, New Mexico	TVD Reference:	RKB=2923.4+17 @ 2940.40usft (Rig)
Site:	Copperhead Fee A	MD Reference:	RKB=2923.4+17 @ 2940.40usft (Rig)
Well:	Copperhead Fee A Well 3H	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	Dbase, Nov0914

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
9,869.00	89.00	354.00	8,290.78	1,731.35	-208.63	365,987.95	594,204.87	32° 0' 21.061825 N	104° 1' 45.921996 W
9,964.00	90.60	354.00	8,291.11	1,825.83	-218.56	366,082.43	594,194.94	32° 0' 21.997090 N	104° 1' 46.034233 W
10,059.00	92.70	353.60	8,288.38	1,920.23	-228.82	366,176.83	594,184.69	32° 0' 22.931611 N	104° 1' 46.150250 W
10,154.00	89.70	354.00	8,286.39	2,014.64	-239.07	366,271.24	594,174.43	32° 0' 23.866259 N	104° 1' 46.266282 W
10,249.00	88.50	355.40	8,287.88	2,109.22	-247.85	366,365.82	594,165.66	32° 0' 24.802504 N	104° 1' 46.365094 W
10,344.00	89.60	355.40	8,289.46	2,203.90	-255.46	366,460.50	594,158.04	32° 0' 25.739720 N	104° 1' 46.450475 W
10,439.00	90.60	355.00	8,289.29	2,298.56	-263.41	366,555.16	594,150.09	32° 0' 26.676804 N	104° 1' 46.539707 W
10,534.00	88.90	355.70	8,289.70	2,393.25	-271.12	366,649.84	594,142.39	32° 0' 27.614050 N	104° 1' 46.626058 W
10,629.00	87.40	356.10	8,292.77	2,487.95	-277.90	366,744.55	594,135.60	32° 0' 28.551491 N	104° 1' 46.701810 W
10,724.00	89.90	356.10	8,295.01	2,582.70	-284.36	366,839.29	594,129.14	32° 0' 29.489334 N	104° 1' 46.773735 W
10,819.00	90.10	355.00	8,295.01	2,677.41	-291.73	366,934.01	594,121.77	32° 0' 30.426866 N	104° 1' 46.856250 W
10,915.00	91.30	355.00	8,293.84	2,773.03	-300.10	367,029.63	594,113.40	32° 0' 31.373467 N	104° 1' 46.950295 W
11,010.00	90.10	354.30	8,292.68	2,867.61	-308.96	367,124.21	594,104.55	32° 0' 32.309700 N	104° 1' 47.050075 W
11,105.00	88.30	354.70	8,294.00	2,962.16	-318.06	367,218.76	594,095.44	32° 0' 33.245669 N	104° 1' 47.152727 W
11,200.00	89.90	354.70	8,295.49	3,056.74	-326.83	367,313.34	594,086.67	32° 0' 34.181923 N	104° 1' 47.251543 W
11,295.00	91.70	354.30	8,294.17	3,151.29	-335.94	367,407.89	594,077.56	32° 0' 35.117891 N	104° 1' 47.354195 W
11,390.00	90.80	355.40	8,292.10	3,245.88	-344.46	367,502.48	594,069.04	32° 0' 36.054261 N	104° 1' 47.450122 W
11,485.00	89.70	356.10	8,291.68	3,340.62	-351.50	367,597.21	594,062.00	32° 0' 36.992018 N	104° 1' 47.528798 W
11,580.00	86.90	355.70	8,294.50	3,435.32	-358.29	367,691.92	594,055.21	32° 0' 37.929468 N	104° 1' 47.604552 W
11,675.00	88.50	355.70	8,298.31	3,529.97	-365.41	367,786.57	594,048.09	32° 0' 38.866409 N	104° 1' 47.684124 W
11,770.00	91.30	356.10	8,298.48	3,624.72	-372.20	367,881.32	594,041.30	32° 0' 39.804270 N	104° 1' 47.759915 W
11,865.00	90.40	356.50	8,297.07	3,719.51	-378.33	367,976.11	594,035.17	32° 0' 40.742541 N	104° 1' 47.828018 W
11,960.00	89.40	356.10	8,297.23	3,814.31	-384.46	368,070.91	594,029.04	32° 0' 41.680911 N	104° 1' 47.896129 W
12,056.00	87.60	355.70	8,299.75	3,910.03	-391.32	368,166.63	594,022.18	32° 0' 42.628377 N	104° 1' 47.972695 W
12,151.00	90.60	356.80	8,301.24	4,004.80	-397.53	368,261.40	594,015.97	32° 0' 43.566474 N	104° 1' 48.041747 W
12,246.00	88.50	356.80	8,301.98	4,099.65	-402.84	368,356.24	594,010.67	32° 0' 44.505249 N	104° 1' 48.100243 W
12,341.00	89.70	356.50	8,303.48	4,194.47	-408.39	368,451.07	594,005.12	32° 0' 45.443837 N	104° 1' 48.161620 W
12,436.00	91.70	355.70	8,302.32	4,289.24	-414.85	368,545.84	593,998.66	32° 0' 46.381890 N	104° 1' 48.233566 W
12,531.00	90.60	355.70	8,300.41	4,383.95	-421.97	368,640.55	593,991.53	32° 0' 47.319412 N	104° 1' 48.313192 W
12,626.00	89.70	354.70	8,300.16	4,478.61	-429.92	368,735.21	593,983.59	32° 0' 48.256486 N	104° 1' 48.402435 W
12,722.00	88.30	354.30	8,301.84	4,574.15	-439.12	368,830.75	593,974.39	32° 0' 49.202270 N	104° 1' 48.506170 W
12,816.00	90.30	354.00	8,302.98	4,667.65	-448.70	368,924.25	593,964.81	32° 0' 50.127852 N	104° 1' 48.614389 W
12,912.00	90.60	353.30	8,302.23	4,763.06	-459.31	369,019.66	593,954.19	32° 0' 51.072353 N	104° 1' 48.734599 W
13,007.00	89.70	352.60	8,301.98	4,857.34	-470.97	369,113.94	593,942.53	32° 0' 52.005724 N	104° 1' 48.866951 W
13,102.00	91.80	352.20	8,300.74	4,951.49	-483.54	369,208.09	593,929.97	32° 0' 52.937855 N	104° 1' 49.009795 W
13,197.00	91.00	351.90	8,298.42	5,045.55	-496.67	369,302.15	593,916.83	32° 0' 53.869072 N	104° 1' 49.159296 W
13,293.00	90.10	351.90	8,297.50	5,140.59	-510.20	369,397.19	593,903.31	32° 0' 54.809987 N	104° 1' 49.313301 W
13,388.00	88.20	353.60	8,298.91	5,234.81	-522.18	369,491.41	593,891.32	32° 0' 55.742797 N	104° 1' 49.449460 W
13,483.00	89.90	353.30	8,300.48	5,329.17	-533.02	369,585.77	593,880.48	32° 0' 56.676972 N	104° 1' 49.572234 W
13,577.00	92.20	352.90	8,298.76	5,422.47	-544.31	369,679.07	593,869.19	32° 0' 57.600606 N	104° 1' 49.700330 W
13,684.00	92.20	352.90	8,294.65	5,528.57	-557.53	369,785.17	593,855.98	32° 0' 58.651012 N	104° 1' 49.850376 W
Survey projected to 13684.00 MD									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment
50.00	50.00	-0.07	-0.06	Gyro
7,750.00	7,747.91	-78.23	-31.82	MWD surveys
13,684.00	8,294.65	5,528.57	-557.53	Survey projected to 13684.00 MD



COG Operating LLC

Well: Copperhead Fee A Well 3H
 Site: Copperhead Fee A
 Project: Eddy County, New Mexico
 Design: rev2
 Rig: Rig

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Annotation
1	7941.00	20.90	359.60	7935.28	-48.72	-30.70	0.00	0.00	-45.49	Survey Begin 10.4°/100' build/turn
2	8602.99	89.66	354.63	8290.21	461.86	-66.95	10.40	-5.33	466.19	Begin 89.66 lateral section
3	13694.64	89.66	354.63	8320.00	5531.10	-543.20	0.00	0.00	5557.71	PBHL/TD

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSec	Departure	Annotation
50.00	50.00	0.22	220.87	-0.07	-0.06	-0.07	0.10	Gyro
7747.91	7750.00	1.10	231.60	-78.23	-31.82	-74.74	157.24	MWD surveys
8294.65	13684.00	92.20	352.90	5528.57	-557.53	5556.59	5790.73	Survey projected to 13684.00 MD

Surface Location: RKB=2923.4+17 @ 2940.40usft (Rig)
 US State Plane 1927 (Exact solution)
 New Mexico East 3001

Northing 364256.60 Easting 594413.50
 Latitude 32° 0' 3.921535 N Longitude 104° 1' 43.555658 W

Total Correction (M => G) To convert a Magnetic Direction to a Grid Direction, Add 7.19°



Azimuths to Grid North
 True North: -0.16°
 Magnetic North: 7.19°

Magnetic Field
 Strength: 48085.9nT
 Dip Angle: 59.82°
 Date: 12/17/2014
 Model: IGRF2010

