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CONCHO

COG Operating L L C

Lea County, NM (NAD27 NME)

Sec. 20, T 23 S. , R 34 E

Broadcaster 29 Fed 4H

Wellbore #1

Design: Wellbore #1

Survey Report - Geographic

12 April, 2017





Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Broadcaster 29 Fed 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Site:	Sec. 20, T 23 S., R 34 E	MD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Well:	Broadcaster 29 Fed 4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Project	Lea County, NM (NAD27 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. 20, T 23 S., R 34 E		
Site Position:		Northing:	467,761.6600 usft
From:	Map	Easting:	762,110.3200 usft
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "
		Latitude:	32° 16' 59.322 N
		Longitude:	103° 29' 6.714 W
		Grid Convergence:	0.45 °

Well	Broadcaster 29 Fed 4H, ACTIVE		
Well Position	+N/-S	0.00 ft	Northing:
	+E/-W	0.00 ft	Easting:
Position Uncertainty	0.00 ft	Wellhead Elevation:	0.00 ft
		Latitude:	32° 16' 59.322 N
		Longitude:	103° 29' 6.714 W
		Ground Level:	3.495.40 ft

Wellbore	Wellbore #1		
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Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
	IGRF2015	3/16/2017	(°)	(°)	(nT)
			6.95	60.13	48,008

Design	Wellbore #1		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(ft)	(ft)	(ft)
	0.00	0.00	0.00
			179.48

Survey Program	Date 4/12/2017		
From	To	Survey (Wellbore)	Tool Name
(ft)	(ft)		Description
100.00	10,953.00	Phoenix Surveys (Wellbore #1)	MWD
11,058.00	16,640.00	IDS MWD Surveys (Wellbore #1)	MWD

Survey									
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Map	Map	Latitude	Longitude
Depth	(°)	(°)	Depth	(ft)	(ft)	Northing	Easting		
(ft)			(ft)			(usft)	(usft)		
0.00	0.00	0.00	0.00	0.00	0.00	467,761.6600	762,110.3200	32° 16' 59.322 N	103° 29' 6.714 W
100.00	0.22	196.62	100.00	-0.18	-0.05	467,761.4761	762,110.2650	32° 16' 59.320 N	103° 29' 6.715 W
125.00	0.26	165.25	125.00	-0.28	-0.05	467,761.3752	762,110.2658	32° 16' 59.319 N	103° 29' 6.715 W
150.00	0.54	207.20	150.00	-0.44	-0.09	467,761.2156	762,110.2263	32° 16' 59.318 N	103° 29' 6.715 W
175.00	0.55	126.02	175.00	-0.62	-0.05	467,761.0402	762,110.2695	32° 16' 59.316 N	103° 29' 6.715 W
200.00	0.70	126.81	200.00	-0.78	0.17	467,760.8782	762,110.4889	32° 16' 59.314 N	103° 29' 6.712 W
225.00	0.54	200.32	225.00	-0.98	0.25	467,760.6762	762,110.5702	32° 16' 59.312 N	103° 29' 6.711 W
250.00	0.87	127.23	249.99	-1.21	0.36	467,760.4509	762,110.6804	32° 16' 59.310 N	103° 29' 6.710 W
275.00	0.79	117.81	274.99	-1.40	0.66	467,760.2556	762,110.9840	32° 16' 59.308 N	103° 29' 6.707 W
300.00	0.90	113.01	299.99	-1.56	1.00	467,760.0985	762,111.3171	32° 16' 59.307 N	103° 29' 6.703 W
325.00	0.81	159.39	324.99	-1.80	1.24	467,759.8563	762,111.5601	32° 16' 59.304 N	103° 29' 6.700 W



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Site:	Sec. 20, T 23 S., R 34 E	MD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Well:	Broadcaster 29 Fed 4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
350.00	0.78	99.45	349.98	-2.00	1.47	467,759.6630	762,111.7901	32° 16' 59.302 N	103° 29' 6.697 W	
375.00	0.76	80.06	374.98	-2.00	1.80	467,759.6637	762,112.1213	32° 16' 59.302 N	103° 29' 6.693 W	
400.00	0.63	41.59	399.98	-1.86	2.06	467,759.7951	762,112.3758	32° 16' 59.303 N	103° 29' 6.691 W	
425.00	1.25	350.84	424.98	-1.49	2.10	467,760.1671	762,112.4237	32° 16' 59.307 N	103° 29' 6.690 W	
450.00	1.50	348.06	449.97	-0.90	1.99	467,760.7564	762,112.3126	32° 16' 59.313 N	103° 29' 6.691 W	
475.00	1.62	341.46	474.96	-0.25	1.81	467,761.4116	762,112.1325	32° 16' 59.319 N	103° 29' 6.693 W	
500.00	1.72	336.31	499.95	0.43	1.55	467,762.0902	762,111.8694	32° 16' 59.326 N	103° 29' 6.696 W	
525.00	1.56	337.34	524.94	1.09	1.27	467,762.7478	762,111.5875	32° 16' 59.333 N	103° 29' 6.699 W	
550.00	1.61	337.54	549.93	1.73	1.00	467,763.3864	762,111.3223	32° 16' 59.339 N	103° 29' 6.702 W	
575.00	1.66	340.48	574.92	2.39	0.75	467,764.0523	762,111.0671	32° 16' 59.346 N	103° 29' 6.705 W	
600.00	1.44	341.48	599.91	3.03	0.53	467,764.6914	762,110.8463	32° 16' 59.352 N	103° 29' 6.708 W	
625.00	1.47	338.54	624.90	3.63	0.31	467,765.2877	762,110.6292	32° 16' 59.358 N	103° 29' 6.710 W	
650.00	1.35	335.08	649.90	4.19	0.07	467,765.8532	762,110.3878	32° 16' 59.364 N	103° 29' 6.713 W	
675.00	1.15	333.05	674.89	4.68	-0.17	467,766.3439	762,110.1501	32° 16' 59.368 N	103° 29' 6.716 W	
700.00	1.05	343.14	699.88	5.13	-0.35	467,766.7868	762,109.9699	32° 16' 59.373 N	103° 29' 6.718 W	
725.00	0.86	318.72	724.88	5.49	-0.54	467,767.1470	762,109.7797	32° 16' 59.376 N	103° 29' 6.720 W	
750.00	0.82	314.08	749.88	5.75	-0.79	467,767.4124	762,109.5274	32° 16' 59.379 N	103° 29' 6.723 W	
775.00	0.80	319.36	774.88	6.01	-1.03	467,767.6693	762,109.2852	32° 16' 59.382 N	103° 29' 6.726 W	
800.00	0.74	318.21	799.87	6.26	-1.26	467,767.9221	762,109.0640	32° 16' 59.384 N	103° 29' 6.728 W	
825.00	0.70	106.06	824.87	6.34	-1.22	467,768.0002	762,109.1032	32° 16' 59.385 N	103° 29' 6.728 W	
850.00	0.69	324.93	849.87	6.42	-1.16	467,768.0812	762,109.1634	32° 16' 59.386 N	103° 29' 6.727 W	
875.00	0.61	329.46	874.87	6.66	-1.31	467,768.3190	762,109.0093	32° 16' 59.388 N	103° 29' 6.729 W	
900.00	0.60	322.81	899.87	6.88	-1.46	467,768.5379	762,108.8626	32° 16' 59.390 N	103° 29' 6.731 W	
925.00	0.58	323.50	924.87	7.08	-1.61	467,768.7439	762,108.7082	32° 16' 59.392 N	103° 29' 6.732 W	
950.00	0.61	327.63	949.87	7.30	-1.76	467,768.9580	762,108.5617	32° 16' 59.394 N	103° 29' 6.734 W	
975.00	0.68	303.59	974.87	7.49	-1.95	467,769.1525	762,108.3668	32° 16' 59.396 N	103° 29' 6.736 W	
1,000.00	0.56	319.28	999.86	7.67	-2.16	467,769.3272	762,108.1636	32° 16' 59.398 N	103° 29' 6.739 W	
1,025.00	0.60	314.59	1,024.86	7.85	-2.33	467,769.5117	762,107.9906	32° 16' 59.400 N	103° 29' 6.741 W	
1,050.00	0.69	258.41	1,049.86	7.91	-2.57	467,769.5733	762,107.7500	32° 16' 59.401 N	103° 29' 6.743 W	
1,075.00	0.79	273.49	1,074.86	7.89	-2.89	467,769.5536	762,107.4305	32° 16' 59.400 N	103° 29' 6.747 W	
1,100.00	0.83	249.92	1,099.86	7.84	-3.23	467,769.5019	762,107.0884	32° 16' 59.400 N	103° 29' 6.751 W	
1,125.00	0.84	271.26	1,124.85	7.78	-3.58	467,769.4437	762,106.7351	32° 16' 59.399 N	103° 29' 6.755 W	
1,150.00	0.85	264.82	1,149.85	7.77	-3.95	467,769.4310	762,106.3672	32° 16' 59.399 N	103° 29' 6.760 W	
1,175.00	1.04	277.02	1,174.85	7.78	-4.36	467,769.4420	762,105.9574	32° 16' 59.399 N	103° 29' 6.764 W	
1,200.00	1.04	277.51	1,199.84	7.84	-4.81	467,769.4994	762,105.5072	32° 16' 59.400 N	103° 29' 6.770 W	
1,225.00	1.10	270.37	1,224.84	7.87	-5.28	467,769.5306	762,105.0424	32° 16' 59.400 N	103° 29' 6.775 W	
1,250.00	1.05	276.35	1,249.84	7.90	-5.75	467,769.5575	762,104.5747	32° 16' 59.401 N	103° 29' 6.780 W	
1,275.00	0.92	261.91	1,274.83	7.89	-6.17	467,769.5546	762,104.1484	32° 16' 59.401 N	103° 29' 6.785 W	
1,300.00	0.77	257.81	1,299.83	7.83	-6.53	467,769.4909	762,103.7855	32° 16' 59.400 N	103° 29' 6.790 W	
1,325.00	1.02	261.71	1,324.83	7.76	-6.92	467,769.4233	762,103.4011	32° 16' 59.399 N	103° 29' 6.794 W	
1,350.00	1.03	266.37	1,349.82	7.72	-7.36	467,769.3770	762,102.9566	32° 16' 59.399 N	103° 29' 6.799 W	
1,375.00	1.11	268.10	1,374.82	7.69	-7.83	467,769.3547	762,102.4904	32° 16' 59.399 N	103° 29' 6.805 W	
1,400.00	1.18	272.61	1,399.81	7.70	-8.33	467,769.3584	762,101.9912	32° 16' 59.399 N	103° 29' 6.811 W	
1,425.00	1.20	271.55	1,424.81	7.72	-8.85	467,769.3772	762,101.4724	32° 16' 59.399 N	103° 29' 6.817 W	
1,450.00	0.98	283.93	1,449.80	7.78	-9.32	467,769.4358	762,101.0032	32° 16' 59.400 N	103° 29' 6.822 W	
1,475.00	1.09	269.68	1,474.80	7.83	-9.76	467,769.4859	762,100.5579	32° 16' 59.400 N	103° 29' 6.827 W	
1,500.00	1.23	272.58	1,499.79	7.84	-10.27	467,769.4967	762,100.0521	32° 16' 59.400 N	103° 29' 6.833 W	
1,525.00	1.21	40.53	1,524.79	8.05	-10.36	467,769.7094	762,099.9555	32° 16' 59.403 N	103° 29' 6.834 W	
1,550.00	1.40	268.99	1,549.79	8.24	-10.50	467,769.9047	762,099.8217	32° 16' 59.404 N	103° 29' 6.836 W	
1,575.00	1.41	259.02	1,574.78	8.18	-11.11	467,769.8407	762,099.2144	32° 16' 59.404 N	103° 29' 6.843 W	
1,600.00	1.48	274.74	1,599.77	8.15	-11.73	467,769.8088	762,098.5907	32° 16' 59.404 N	103° 29' 6.850 W	
1,625.00	1.43	278.41	1,624.76	8.22	-12.36	467,769.8811	762,097.9604	32° 16' 59.404 N	103° 29' 6.857 W	
1,650.00	1.52	273.82	1,649.76	8.29	-13.00	467,769.9488	762,097.3209	32° 16' 59.405 N	103° 29' 6.865 W	
1,675.00	1.57	277.36	1,674.75	8.35	-13.67	467,770.0148	762,096.6504	32° 16' 59.406 N	103° 29' 6.873 W	
1,700.00	1.66	286.63	1,699.74	8.50	-14.36	467,770.1623	762,095.9638	32° 16' 59.407 N	103° 29' 6.881 W	



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Site:	Sec. 20, T 23 S., R 34 E	MD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Well:	Broadcaster 29 Fed 4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
1,725.00	1.44	275.87	1,724.73	8.64	-15.02	467,770.2980	762,095.3044	32° 16' 59.409 N	103° 29' 6.888 W	
1,750.00	1.56	276.98	1,749.72	8.71	-15.67	467,770.3715	762,094.6541	32° 16' 59.409 N	103° 29' 6.896 W	
1,775.00	1.34	281.69	1,774.71	8.81	-16.29	467,770.4721	762,094.0301	32° 16' 59.411 N	103° 29' 6.903 W	
1,800.00	1.36	279.40	1,799.70	8.92	-16.87	467,770.5798	762,093.4512	32° 16' 59.412 N	103° 29' 6.910 W	
1,825.00	1.42	280.31	1,824.70	9.02	-17.47	467,770.6837	762,092.8537	32° 16' 59.413 N	103° 29' 6.917 W	
1,850.00	1.19	277.63	1,849.69	9.11	-18.03	467,770.7736	762,092.2916	32° 16' 59.414 N	103° 29' 6.923 W	
1,875.00	1.14	269.78	1,874.69	9.15	-18.53	467,770.8071	762,091.7856	32° 16' 59.414 N	103° 29' 6.929 W	
1,900.00	0.98	262.28	1,899.68	9.12	-18.99	467,770.7774	762,091.3251	32° 16' 59.414 N	103° 29' 6.935 W	
1,925.00	1.04	273.59	1,924.68	9.10	-19.43	467,770.7629	762,090.8868	32° 16' 59.414 N	103° 29' 6.940 W	
1,950.00	1.20	271.71	1,949.67	9.12	-19.92	467,770.7849	762,090.3987	32° 16' 59.414 N	103° 29' 6.945 W	
1,975.00	1.09	280.71	1,974.67	9.18	-20.42	467,770.8369	762,089.9034	32° 16' 59.414 N	103° 29' 6.951 W	
2,000.00	1.26	271.59	1,999.66	9.23	-20.92	467,770.8888	762,089.3950	32° 16' 59.415 N	103° 29' 6.957 W	
2,025.00	1.14	274.87	2,024.66	9.26	-21.45	467,770.9175	762,088.8724	32° 16' 59.415 N	103° 29' 6.963 W	
2,050.00	1.43	277.97	2,049.65	9.32	-22.00	467,770.9819	762,088.3157	32° 16' 59.416 N	103° 29' 6.970 W	
2,075.00	1.25	272.18	2,074.64	9.38	-22.59	467,771.0355	762,087.7343	32° 16' 59.417 N	103° 29' 6.977 W	
2,100.00	1.39	276.07	2,099.64	9.42	-23.16	467,771.0779	762,087.1603	32° 16' 59.417 N	103° 29' 6.983 W	
2,125.00	1.22	293.95	2,124.63	9.56	-23.70	467,771.2180	762,086.6155	32° 16' 59.418 N	103° 29' 6.990 W	
2,150.00	1.10	305.01	2,149.63	9.80	-24.14	467,771.4637	762,086.1758	32° 16' 59.421 N	103° 29' 6.995 W	
2,175.00	1.30	300.03	2,174.62	10.08	-24.59	467,771.7433	762,085.7337	32° 16' 59.424 N	103° 29' 7.000 W	
2,200.00	1.41	311.61	2,199.61	10.43	-25.06	467,772.0895	762,085.2582	32° 16' 59.427 N	103° 29' 7.005 W	
2,225.00	1.26	313.68	2,224.61	10.82	-25.49	467,772.4836	762,084.8294	32° 16' 59.431 N	103° 29' 7.010 W	
2,250.00	1.40	312.42	2,249.60	11.22	-25.91	467,772.8794	762,084.4052	32° 16' 59.435 N	103° 29' 7.015 W	
2,275.00	1.20	308.59	2,274.59	11.59	-26.34	467,773.2487	762,083.9751	32° 16' 59.439 N	103° 29' 7.020 W	
2,300.00	1.40	308.75	2,299.59	11.94	-26.79	467,773.6032	762,083.5323	32° 16' 59.442 N	103° 29' 7.025 W	
2,325.00	1.34	313.70	2,324.58	12.34	-27.24	467,773.9963	762,083.0828	32° 16' 59.446 N	103° 29' 7.030 W	
2,350.00	1.32	306.82	2,349.57	12.71	-27.68	467,774.3708	762,082.6410	32° 16' 59.450 N	103° 29' 7.036 W	
2,375.00	1.20	293.28	2,374.57	12.99	-28.15	467,774.6469	762,082.1700	32° 16' 59.453 N	103° 29' 7.041 W	
2,400.00	1.45	308.72	2,399.56	13.29	-28.64	467,774.9482	762,081.6827	32° 16' 59.456 N	103° 29' 7.047 W	
2,425.00	1.62	219.97	2,424.55	13.22	-29.11	467,774.8752	762,081.2089	32° 16' 59.455 N	103° 29' 7.052 W	
2,450.00	1.27	311.57	2,449.55	13.13	-29.55	467,774.7882	762,080.7746	32° 16' 59.454 N	103° 29' 7.057 W	
2,475.00	1.52	312.02	2,474.54	13.53	-30.00	467,775.1940	762,080.3210	32° 16' 59.458 N	103° 29' 7.062 W	
2,500.00	1.38	310.73	2,499.53	13.95	-30.47	467,775.6123	762,079.8465	32° 16' 59.462 N	103° 29' 7.068 W	
2,525.00	1.42	308.64	2,524.53	14.34	-30.94	467,776.0022	762,079.3764	32° 16' 59.466 N	103° 29' 7.073 W	
2,550.00	1.59	31.30	2,549.52	14.83	-31.01	467,776.4920	762,079.3147	32° 16' 59.471 N	103° 29' 7.074 W	
2,575.00	1.46	320.10	2,574.51	15.37	-31.03	467,777.0328	762,079.2905	32° 16' 59.477 N	103° 29' 7.074 W	
2,600.00	1.45	322.14	2,599.50	15.87	-31.43	467,777.5268	762,078.8921	32° 16' 59.482 N	103° 29' 7.079 W	
2,625.00	1.54	320.56	2,624.50	16.38	-31.84	467,778.0360	762,078.4846	32° 16' 59.487 N	103° 29' 7.084 W	
2,650.00	1.40	316.70	2,649.49	16.86	-32.26	467,778.5177	762,078.0617	32° 16' 59.491 N	103° 29' 7.088 W	
2,675.00	1.08	316.74	2,674.48	17.25	-32.63	467,778.9115	762,077.6908	32° 16' 59.495 N	103° 29' 7.093 W	
2,700.00	0.77	295.69	2,699.48	17.50	-32.94	467,779.1559	762,077.3780	32° 16' 59.498 N	103° 29' 7.096 W	
2,725.00	0.65	302.03	2,724.48	17.64	-33.21	467,779.3040	762,077.1064	32° 16' 59.499 N	103° 29' 7.100 W	
2,750.00	0.73	288.30	2,749.48	17.77	-33.49	467,779.4292	762,076.8350	32° 16' 59.500 N	103° 29' 7.103 W	
2,775.00	0.83	306.56	2,774.47	17.93	-33.78	467,779.5870	762,076.5383	32° 16' 59.502 N	103° 29' 7.106 W	
2,800.00	0.96	284.23	2,799.47	18.09	-34.13	467,779.7464	762,076.1899	32° 16' 59.504 N	103° 29' 7.110 W	
2,825.00	0.97	295.09	2,824.47	18.23	-34.52	467,779.8876	762,075.7952	32° 16' 59.505 N	103° 29' 7.115 W	
2,850.00	0.92	87.65	2,849.47	18.33	-34.52	467,779.9856	762,075.8041	32° 16' 59.506 N	103° 29' 7.115 W	
2,875.00	0.90	293.15	2,874.46	18.41	-34.50	467,780.0710	762,075.8241	32° 16' 59.507 N	103° 29' 7.114 W	
2,900.00	0.80	310.40	2,899.46	18.60	-34.81	467,780.2613	762,075.5107	32° 16' 59.509 N	103° 29' 7.118 W	
2,925.00	0.96	306.16	2,924.46	18.84	-35.11	467,780.4980	762,075.2087	32° 16' 59.511 N	103° 29' 7.122 W	
2,950.00	0.96	318.12	2,949.45	19.12	-35.42	467,780.7775	762,074.8998	32° 16' 59.514 N	103° 29' 7.125 W	
2,975.00	0.80	318.56	2,974.45	19.40	-35.68	467,781.0643	762,074.6445	32° 16' 59.517 N	103° 29' 7.128 W	
3,000.00	0.90	328.07	2,999.45	19.70	-35.89	467,781.3617	762,074.4251	32° 16' 59.520 N	103° 29' 7.131 W	
3,025.00	0.66	62.37	3,024.45	19.94	-35.87	467,781.5951	762,074.4488	32° 16' 59.522 N	103° 29' 7.130 W	
3,050.00	0.91	328.28	3,049.45	20.17	-35.85	467,781.8308	762,074.4720	32° 16' 59.524 N	103° 29' 7.130 W	
3,075.00	0.92	335.85	3,074.44	20.52	-36.03	467,782.1828	762,074.2855	32° 16' 59.528 N	103° 29' 7.132 W	



Integrity Directional Services, LLC

Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Broadcaster 29 Fed 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Site:	Sec. 20, T 23 S., R 34 E	MD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Well:	Broadcaster 29 Fed 4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
3,100.00	1.06	130.98	3,099.44	20.55	-35.94	467,782.2143	762,074.3780	32° 16' 59.528 N	103° 29' 7.131 W	
3,125.00	0.94	343.05	3,124.44	20.60	-35.83	467,782.2588	762,074.4928	32° 16' 59.529 N	103° 29' 7.130 W	
3,150.00	1.03	343.83	3,149.44	21.01	-35.95	467,782.6708	762,074.3704	32° 16' 59.533 N	103° 29' 7.131 W	
3,175.00	0.81	343.82	3,174.43	21.40	-36.06	467,783.0563	762,074.2586	32° 16' 59.537 N	103° 29' 7.132 W	
3,200.00	0.84	330.79	3,199.43	21.73	-36.20	467,783.3859	762,074.1200	32° 16' 59.540 N	103° 29' 7.134 W	
3,225.00	0.99	335.00	3,224.43	22.08	-36.38	467,783.7416	762,073.9393	32° 16' 59.543 N	103° 29' 7.136 W	
3,250.00	0.87	333.86	3,249.42	22.45	-36.56	467,784.1078	762,073.7644	32° 16' 59.547 N	103° 29' 7.138 W	
3,275.00	0.92	348.24	3,274.42	22.81	-36.68	467,784.4746	762,073.6398	32° 16' 59.551 N	103° 29' 7.139 W	
3,300.00	1.00	337.05	3,299.42	23.21	-36.81	467,784.8720	762,073.5139	32° 16' 59.555 N	103° 29' 7.141 W	
3,325.00	1.01	355.90	3,324.41	23.63	-36.91	467,785.2927	762,073.4130	32° 16' 59.559 N	103° 29' 7.142 W	
3,350.00	1.15	354.66	3,349.41	24.10	-36.95	467,785.7622	762,073.3739	32° 16' 59.563 N	103° 29' 7.142 W	
3,375.00	1.25	356.82	3,374.40	24.62	-36.98	467,786.2843	762,073.3355	32° 16' 59.569 N	103° 29' 7.143 W	
3,400.00	1.35	1.45	3,399.40	25.19	-36.99	467,786.8510	762,073.3278	32° 16' 59.574 N	103° 29' 7.143 W	
3,425.00	1.49	8.49	3,424.39	25.81	-36.94	467,787.4668	762,073.3832	32° 16' 59.580 N	103° 29' 7.142 W	
3,450.00	1.48	10.18	3,449.38	26.45	-36.83	467,788.1061	762,073.4883	32° 16' 59.587 N	103° 29' 7.141 W	
3,475.00	1.56	16.65	3,474.37	27.09	-36.68	467,788.7499	762,073.6428	32° 16' 59.593 N	103° 29' 7.139 W	
3,500.00	1.50	22.05	3,499.36	27.72	-36.46	467,789.3792	762,073.8632	32° 16' 59.599 N	103° 29' 7.136 W	
3,525.00	1.19	19.45	3,524.36	28.27	-36.25	467,789.9272	762,074.0725	32° 16' 59.605 N	103° 29' 7.134 W	
3,550.00	0.77	35.44	3,549.35	28.65	-36.06	467,790.3089	762,074.2563	32° 16' 59.608 N	103° 29' 7.132 W	
3,575.00	0.56	46.65	3,574.35	28.87	-35.88	467,790.5296	762,074.4426	32° 16' 59.611 N	103° 29' 7.130 W	
3,600.00	0.51	48.60	3,599.35	29.03	-35.71	467,790.6870	762,074.6149	32° 16' 59.612 N	103° 29' 7.128 W	
3,625.00	0.37	263.62	3,624.35	29.09	-35.70	467,790.7516	762,074.6181	32° 16' 59.613 N	103° 29' 7.127 W	
3,650.00	0.37	39.40	3,649.35	29.15	-35.73	467,790.8051	762,074.5891	32° 16' 59.613 N	103° 29' 7.128 W	
3,675.00	0.39	78.18	3,674.35	29.22	-35.60	467,790.8849	762,074.7236	32° 16' 59.614 N	103° 29' 7.126 W	
3,700.00	0.51	71.99	3,699.35	29.28	-35.41	467,790.9367	762,074.9127	32° 16' 59.615 N	103° 29' 7.124 W	
3,725.00	0.44	12.50	3,724.35	29.40	-35.28	467,791.0648	762,075.0393	32° 16' 59.616 N	103° 29' 7.123 W	
3,750.00	0.60	358.74	3,749.35	29.63	-35.26	467,791.2894	762,075.0572	32° 16' 59.618 N	103° 29' 7.122 W	
3,775.00	0.52	20.18	3,774.35	29.87	-35.23	467,791.5267	762,075.0935	32° 16' 59.620 N	103° 29' 7.122 W	
3,800.00	0.64	33.49	3,799.34	30.09	-35.11	467,791.7497	762,075.2097	32° 16' 59.623 N	103° 29' 7.120 W	
3,825.00	0.72	67.44	3,824.34	30.27	-34.89	467,791.9264	762,075.4317	32° 16' 59.624 N	103° 29' 7.118 W	
3,850.00	0.71	78.23	3,849.34	30.36	-34.59	467,792.0182	762,075.7284	32° 16' 59.625 N	103° 29' 7.114 W	
3,875.00	0.63	13.52	3,874.34	30.52	-34.41	467,792.1835	762,075.9122	32° 16' 59.627 N	103° 29' 7.112 W	
3,900.00	0.96	84.75	3,899.34	30.68	-34.17	467,792.3363	762,076.1529	32° 16' 59.628 N	103° 29' 7.109 W	
3,925.00	1.08	84.97	3,924.33	30.72	-33.72	467,792.3761	762,076.5961	32° 16' 59.629 N	103° 29' 7.104 W	
3,950.00	1.02	94.72	3,949.33	30.72	-33.27	467,792.3784	762,077.0526	32° 16' 59.629 N	103° 29' 7.099 W	
3,975.00	1.04	89.41	3,974.33	30.70	-32.82	467,792.3624	762,077.5012	32° 16' 59.628 N	103° 29' 7.094 W	
4,000.00	1.05	76.72	3,999.32	30.76	-32.37	467,792.4174	762,077.9510	32° 16' 59.629 N	103° 29' 7.088 W	
4,025.00	1.26	79.18	4,024.32	30.86	-31.88	467,792.5216	762,078.4440	32° 16' 59.630 N	103° 29' 7.083 W	
4,050.00	1.76	77.76	4,049.31	30.99	-31.23	467,792.6546	762,079.0891	32° 16' 59.631 N	103° 29' 7.075 W	
4,075.00	1.87	74.27	4,074.29	31.19	-30.46	467,792.8466	762,079.8569	32° 16' 59.633 N	103° 29' 7.066 W	
4,100.00	2.16	71.88	4,099.28	31.44	-29.62	467,793.1037	762,080.6973	32° 16' 59.636 N	103° 29' 7.056 W	
4,125.00	2.14	73.99	4,124.26	31.72	-28.73	467,793.3790	762,081.5937	32° 16' 59.638 N	103° 29' 7.046 W	
4,150.00	2.08	74.38	4,149.24	31.97	-27.84	467,793.6298	762,082.4793	32° 16' 59.641 N	103° 29' 7.036 W	
4,175.00	2.01	80.91	4,174.23	32.16	-26.97	467,793.8213	762,083.3492	32° 16' 59.642 N	103° 29' 7.025 W	
4,200.00	2.00	75.98	4,199.21	32.34	-26.11	467,793.9962	762,084.2054	32° 16' 59.644 N	103° 29' 7.015 W	
4,225.00	1.63	78.19	4,224.20	32.51	-25.34	467,794.1747	762,084.9766	32° 16' 59.646 N	103° 29' 7.006 W	
4,250.00	1.23	70.09	4,249.19	32.68	-24.74	467,794.3388	762,085.5770	32° 16' 59.647 N	103° 29' 6.999 W	
4,275.00	1.06	54.87	4,274.19	32.90	-24.30	467,794.5633	762,086.0184	32° 16' 59.650 N	103° 29' 6.994 W	
4,300.00	1.22	61.37	4,299.18	33.16	-23.88	467,794.8239	762,086.4411	32° 16' 59.652 N	103° 29' 6.989 W	
4,325.00	1.14	56.19	4,324.18	33.43	-23.44	467,795.0898	762,086.8813	32° 16' 59.655 N	103° 29' 6.984 W	
4,350.00	1.25	65.41	4,349.17	33.68	-22.98	467,795.3416	762,087.3359	32° 16' 59.657 N	103° 29' 6.979 W	
4,375.00	1.40	72.14	4,374.17	33.89	-22.45	467,795.5487	762,087.8746	32° 16' 59.659 N	103° 29' 6.973 W	
4,400.00	1.80	70.60	4,399.16	34.11	-21.78	467,795.7728	762,088.5356	32° 16' 59.661 N	103° 29' 6.965 W	
4,425.00	1.94	84.21	4,424.14	34.29	-20.99	467,795.9459	762,089.3269	32° 16' 59.663 N	103° 29' 6.956 W	
4,450.00	1.84	85.06	4,449.13	34.36	-20.17	467,796.0232	762,090.1478	32° 16' 59.664 N	103° 29' 6.946 W	



Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Broadcaster 29 Fed 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Site:	Sec. 20, T 23 S., R 34 E	MD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Well:	Broadcaster 29 Fed 4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
4,475.00	1.69	82.43	4,474.12	34.45	-19.41	467,796.1063	762,090.9131	32° 16' 59.664 N	103° 29' 6.937 W	
4,500.00	1.65	73.08	4,499.11	34.60	-18.70	467,796.2596	762,091.6229	32° 16' 59.666 N	103° 29' 6.929 W	
4,525.00	1.89	73.35	4,524.10	34.82	-17.96	467,796.4825	762,092.3622	32° 16' 59.668 N	103° 29' 6.920 W	
4,550.00	1.84	72.98	4,549.08	35.06	-17.18	467,796.7181	762,093.1410	32° 16' 59.670 N	103° 29' 6.911 W	
4,575.00	1.75	67.09	4,574.07	35.32	-16.44	467,796.9842	762,093.8763	32° 16' 59.673 N	103° 29' 6.903 W	
4,600.00	2.10	66.25	4,599.06	35.66	-15.67	467,797.3173	762,094.6472	32° 16' 59.676 N	103° 29' 6.894 W	
4,625.00	2.05	71.92	4,624.04	35.98	-14.83	467,797.6405	762,095.4915	32° 16' 59.679 N	103° 29' 6.884 W	
4,650.00	1.89	70.92	4,649.02	36.25	-14.01	467,797.9140	762,096.3062	32° 16' 59.682 N	103° 29' 6.874 W	
4,675.00	1.85	76.77	4,674.01	36.48	-13.23	467,798.1412	762,097.0887	32° 16' 59.684 N	103° 29' 6.865 W	
4,700.00	1.83	71.51	4,699.00	36.70	-12.46	467,798.3601	762,097.8601	32° 16' 59.686 N	103° 29' 6.856 W	
4,725.00	1.92	65.37	4,723.98	37.00	-11.70	467,798.6612	762,098.6193	32° 16' 59.689 N	103° 29' 6.847 W	
4,750.00	2.11	64.71	4,748.97	37.37	-10.90	467,799.0324	762,099.4161	32° 16' 59.693 N	103° 29' 6.838 W	
4,775.00	2.02	60.53	4,773.95	37.79	-10.10	467,799.4458	762,100.2158	32° 16' 59.697 N	103° 29' 6.829 W	
4,800.00	1.77	51.06	4,798.94	38.25	-9.42	467,799.9052	762,100.8998	32° 16' 59.701 N	103° 29' 6.820 W	
4,825.00	1.48	47.11	4,823.93	38.71	-8.88	467,800.3676	762,101.4366	32° 16' 59.706 N	103° 29' 6.814 W	
4,850.00	1.30	42.08	4,848.92	39.14	-8.46	467,800.7978	762,101.8632	32° 16' 59.710 N	103° 29' 6.809 W	
4,875.00	1.23	37.58	4,873.92	39.56	-8.10	467,801.2209	762,102.2169	32° 16' 59.714 N	103° 29' 6.805 W	
4,900.00	1.28	48.36	4,898.91	39.96	-7.73	467,801.6191	762,102.5892	32° 16' 59.718 N	103° 29' 6.801 W	
4,925.00	1.24	51.36	4,923.90	40.31	-7.31	467,801.9735	762,103.0092	32° 16' 59.722 N	103° 29' 6.796 W	
4,950.00	1.37	29.87	4,948.90	40.74	-6.95	467,802.4016	762,103.3693	32° 16' 59.726 N	103° 29' 6.791 W	
4,975.00	1.21	43.79	4,973.89	41.19	-6.62	467,802.8513	762,103.7008	32° 16' 59.730 N	103° 29' 6.788 W	
5,000.00	1.11	38.78	4,998.89	41.57	-6.28	467,803.2306	762,104.0351	32° 16' 59.734 N	103° 29' 6.784 W	
5,025.00	0.82	66.44	5,023.88	41.83	-5.97	467,803.4909	762,104.3508	32° 16' 59.736 N	103° 29' 6.780 W	
5,050.00	1.07	31.67	5,048.88	42.10	-5.68	467,803.7611	762,104.6373	32° 16' 59.739 N	103° 29' 6.777 W	
5,075.00	1.08	38.22	5,073.88	42.48	-5.41	467,804.1448	762,104.9056	32° 16' 59.743 N	103° 29' 6.773 W	
5,100.00	0.92	40.41	5,098.87	42.82	-5.14	467,804.4828	762,105.1815	32° 16' 59.746 N	103° 29' 6.770 W	
5,125.00	0.97	31.23	5,123.87	43.16	-4.90	467,804.8165	762,105.4213	32° 16' 59.749 N	103° 29' 6.767 W	
5,150.00	1.16	33.77	5,148.86	43.55	-4.65	467,805.2078	762,105.6717	32° 16' 59.753 N	103° 29' 6.764 W	
5,175.00	0.88	33.33	5,173.86	43.92	-4.40	467,805.5786	762,105.9179	32° 16' 59.757 N	103° 29' 6.762 W	
5,200.00	1.10	21.75	5,198.86	44.30	-4.21	467,805.9619	762,106.1123	32° 16' 59.761 N	103° 29' 6.759 W	
5,225.00	0.90	20.34	5,223.85	44.71	-4.05	467,806.3689	762,106.2694	32° 16' 59.765 N	103° 29' 6.757 W	
5,250.00	0.86	23.81	5,248.85	45.06	-3.91	467,806.7246	762,106.4134	32° 16' 59.768 N	103° 29' 6.756 W	
5,275.00	0.91	12.63	5,273.85	45.43	-3.79	467,807.0900	762,106.5326	32° 16' 59.772 N	103° 29' 6.754 W	
5,300.00	0.87	20.73	5,298.84	45.80	-3.68	467,807.4612	762,106.6432	32° 16' 59.776 N	103° 29' 6.753 W	
5,325.00	0.89	14.14	5,323.84	46.17	-3.56	467,807.8270	762,106.7578	32° 16' 59.779 N	103° 29' 6.752 W	
5,350.00	0.94	17.97	5,348.84	46.55	-3.45	467,808.2103	762,106.8685	32° 16' 59.783 N	103° 29' 6.750 W	
5,375.00	1.05	24.38	5,373.83	46.95	-3.29	467,808.6140	762,107.0263	32° 16' 59.787 N	103° 29' 6.748 W	
5,400.00	0.97	28.64	5,398.83	47.35	-3.10	467,809.0084	762,107.2223	32° 16' 59.791 N	103° 29' 6.746 W	
5,425.00	0.93	33.52	5,423.83	47.70	-2.88	467,809.3633	762,107.4357	32° 16' 59.794 N	103° 29' 6.743 W	
5,450.00	0.96	40.38	5,448.82	48.03	-2.64	467,809.6919	762,107.6835	32° 16' 59.798 N	103° 29' 6.741 W	
5,475.00	1.08	35.73	5,473.82	48.38	-2.36	467,810.0427	762,107.9567	32° 16' 59.801 N	103° 29' 6.737 W	
5,500.00	1.02	40.78	5,498.81	48.74	-2.08	467,810.4025	762,108.2396	32° 16' 59.805 N	103° 29' 6.734 W	
5,525.00	0.68	49.79	5,523.81	49.01	-1.82	467,810.6668	762,108.4983	32° 16' 59.807 N	103° 29' 6.731 W	
5,550.00	0.87	12.60	5,548.81	49.29	-1.67	467,810.9478	762,108.6530	32° 16' 59.810 N	103° 29' 6.729 W	
5,575.00	0.86	31.76	5,573.81	49.63	-1.53	467,811.2925	762,108.7931	32° 16' 59.813 N	103° 29' 6.728 W	
5,600.00	0.89	37.35	5,598.80	49.95	-1.31	467,811.6064	762,109.0097	32° 16' 59.816 N	103° 29' 6.725 W	
5,625.00	1.03	31.33	5,623.80	50.29	-1.08	467,811.9527	762,109.2443	32° 16' 59.820 N	103° 29' 6.722 W	
5,650.00	0.94	28.61	5,648.80	50.66	-0.86	467,812.3246	762,109.4593	32° 16' 59.823 N	103° 29' 6.720 W	
5,675.00	0.88	253.23	5,673.80	50.79	-0.95	467,812.4493	762,109.3737	32° 16' 59.825 N	103° 29' 6.721 W	
5,700.00	1.09	28.84	5,698.79	50.94	-1.02	467,812.6022	762,109.3046	32° 16' 59.826 N	103° 29' 6.721 W	
5,725.00	1.11	35.47	5,723.79	51.35	-0.76	467,813.0077	762,109.5598	32° 16' 59.830 N	103° 29' 6.718 W	
5,750.00	1.05	50.15	5,748.78	51.69	-0.44	467,813.3517	762,109.8762	32° 16' 59.834 N	103° 29' 6.715 W	
5,775.00	1.07	62.86	5,773.78	51.95	-0.06	467,813.6049	762,110.2598	32° 16' 59.836 N	103° 29' 6.710 W	
5,800.00	0.96	82.48	5,798.78	52.08	0.36	467,813.7388	762,110.6751	32° 16' 59.837 N	103° 29' 6.705 W	
5,825.00	0.93	66.34	5,823.77	52.19	0.75	467,813.8476	762,111.0686	32° 16' 59.838 N	103° 29' 6.701 W	



Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Broadcaster 29 Fed 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Site:	Sec. 20, T 23 S., R 34 E	MD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Well:	Broadcaster 29 Fed 4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude		Longitude
5,850.00	1.00	78.45	5,848.77	52.31	1.15	467,813.9727	762,111.4681	32° 16' 59.840 N		103° 29' 6.696 W
5,875.00	1.09	53.41	5,873.77	52.50	1.55	467,814.1582	762,111.8728	32° 16' 59.841 N		103° 29' 6.691 W
5,900.00	0.88	58.75	5,898.76	52.74	1.91	467,814.3995	762,112.2278	32° 16' 59.844 N		103° 29' 6.687 W
5,925.00	0.97	52.37	5,923.76	52.97	2.24	467,814.6283	762,112.5596	32° 16' 59.846 N		103° 29' 6.683 W
5,950.00	1.19	56.95	5,948.75	53.24	2.62	467,814.8991	762,112.9447	32° 16' 59.849 N		103° 29' 6.679 W
5,975.00	1.27	64.00	5,973.75	53.50	3.09	467,815.1621	762,113.4113	32° 16' 59.851 N		103° 29' 6.673 W
6,000.00	1.19	76.89	5,998.74	53.68	3.59	467,815.3424	762,113.9132	32° 16' 59.853 N		103° 29' 6.667 W
6,025.00	1.02	67.95	6,023.74	53.82	4.05	467,815.4849	762,114.3723	32° 16' 59.854 N		103° 29' 6.662 W
6,050.00	0.93	73.62	6,048.73	53.97	4.45	467,815.6256	762,114.7732	32° 16' 59.856 N		103° 29' 6.657 W
6,075.00	1.01	11.59	6,073.73	54.24	4.69	467,815.8987	762,115.0121	32° 16' 59.858 N		103° 29' 6.655 W
6,100.00	0.99	46.64	6,098.73	54.60	4.89	467,816.2628	762,115.2134	32° 16' 59.862 N		103° 29' 6.652 W
6,125.00	1.07	39.38	6,123.72	54.93	5.20	467,816.5915	762,115.5185	32° 16' 59.865 N		103° 29' 6.649 W
6,150.00	1.20	40.09	6,148.72	55.31	5.52	467,816.9722	762,115.8352	32° 16' 59.869 N		103° 29' 6.645 W
6,175.00	1.15	45.54	6,173.71	55.69	5.86	467,817.3482	762,116.1828	32° 16' 59.873 N		103° 29' 6.641 W
6,200.00	1.24	54.88	6,198.71	56.02	6.26	467,817.6795	762,116.5831	32° 16' 59.876 N		103° 29' 6.636 W
6,225.00	1.05	64.07	6,223.70	56.28	6.69	467,817.9353	762,117.0104	32° 16' 59.878 N		103° 29' 6.631 W
6,250.00	1.14	42.75	6,248.68	56.56	7.07	467,818.2181	762,117.3852	32° 16' 59.881 N		103° 29' 6.627 W
6,275.00	1.13	22.61	6,273.69	56.97	7.33	467,818.6283	762,117.6488	32° 16' 59.885 N		103° 29' 6.624 W
6,300.00	1.36	38.95	6,298.69	57.43	7.61	467,819.0866	762,117.9301	32° 16' 59.890 N		103° 29' 6.620 W
6,325.00	1.25	49.95	6,323.68	57.83	8.01	467,819.4928	762,118.3253	32° 16' 59.894 N		103° 29' 6.616 W
6,350.00	1.18	57.21	6,348.68	58.15	8.43	467,819.8076	762,118.7505	32° 16' 59.897 N		103° 29' 6.611 W
6,375.00	1.07	47.71	6,373.67	58.44	8.82	467,820.1041	762,119.1395	32° 16' 59.900 N		103° 29' 6.606 W
6,400.00	1.23	70.31	6,398.67	58.69	9.24	467,820.3516	762,119.5648	32° 16' 59.902 N		103° 29' 6.601 W
6,425.00	1.25	34.96	6,423.66	59.01	9.65	467,820.6655	762,119.9737	32° 16' 59.905 N		103° 29' 6.596 W
6,450.00	1.32	33.21	6,448.65	59.47	9.97	467,821.1299	762,120.2877	32° 16' 59.910 N		103° 29' 6.593 W
6,475.00	1.38	35.83	6,473.65	59.95	10.30	467,821.6149	762,120.6216	32° 16' 59.915 N		103° 29' 6.589 W
6,500.00	1.40	35.18	6,498.64	60.45	10.65	467,822.1085	762,120.9738	32° 16' 59.919 N		103° 29' 6.585 W
6,525.00	1.41	46.39	6,523.63	60.91	11.05	467,822.5703	762,121.3725	32° 16' 59.924 N		103° 29' 6.580 W
6,550.00	1.45	42.53	6,548.63	61.36	11.49	467,823.0156	762,121.8090	32° 16' 59.928 N		103° 29' 6.575 W
6,575.00	1.34	49.88	6,573.62	61.78	11.93	467,823.4370	762,122.2463	32° 16' 59.932 N		103° 29' 6.570 W
6,600.00	1.17	41.91	6,598.61	62.16	12.32	467,823.8153	762,122.6404	32° 16' 59.936 N		103° 29' 6.565 W
6,625.00	1.15	39.90	6,623.61	62.54	12.65	467,824.1977	762,122.9718	32° 16' 59.940 N		103° 29' 6.561 W
6,650.00	1.01	40.18	6,648.60	62.90	12.95	467,824.5585	762,123.2749	32° 16' 59.943 N		103° 29' 6.558 W
6,675.00	1.14	29.90	6,673.60	63.28	13.22	467,824.9425	762,123.5410	32° 16' 59.947 N		103° 29' 6.554 W
6,700.00	1.03	21.82	6,698.59	63.71	13.43	467,825.3667	762,123.7485	32° 16' 59.951 N		103° 29' 6.552 W
6,725.00	1.36	32.73	6,723.59	64.16	13.67	467,825.8248	762,123.9924	32° 16' 59.956 N		103° 29' 6.549 W
6,750.00	1.37	45.43	6,748.58	64.62	14.05	467,826.2842	762,124.3657	32° 16' 59.960 N		103° 29' 6.545 W
6,775.00	1.14	41.23	6,773.57	65.02	14.42	467,826.6809	762,124.7425	32° 16' 59.964 N		103° 29' 6.540 W
6,800.00	1.05	42.93	6,798.57	65.38	14.74	467,827.0357	762,125.0625	32° 16' 59.968 N		103° 29' 6.537 W
6,825.00	0.77	59.68	6,823.57	65.63	15.04	467,827.2882	762,125.3635	32° 16' 59.970 N		103° 29' 6.533 W
6,850.00	0.95	36.68	6,848.56	65.88	15.31	467,827.5392	762,125.6323	32° 16' 59.973 N		103° 29' 6.530 W
6,875.00	1.02	9.06	6,873.56	66.27	15.47	467,827.9252	762,125.7911	32° 16' 59.977 N		103° 29' 6.528 W
6,900.00	1.16	29.80	6,898.56	66.70	15.63	467,828.3645	762,125.9519	32° 16' 59.981 N		103° 29' 6.526 W
6,925.00	1.19	38.88	6,923.55	67.13	15.92	467,828.7862	762,126.2406	32° 16' 59.985 N		103° 29' 6.523 W
6,950.00	1.06	48.65	6,948.55	67.48	16.26	467,829.1410	762,126.5772	32° 16' 59.989 N		103° 29' 6.519 W
6,975.00	0.80	51.52	6,973.54	67.74	16.57	467,829.4024	762,126.8874	32° 16' 59.991 N		103° 29' 6.515 W
7,000.00	0.93	56.37	6,998.54	67.96	16.87	467,829.6234	762,127.1929	32° 16' 59.993 N		103° 29' 6.511 W
7,025.00	0.93	46.54	7,023.54	68.22	17.19	467,829.8753	762,127.5091	32° 16' 59.996 N		103° 29' 6.508 W
7,050.00	0.93	55.03	7,048.53	68.47	17.50	467,830.1311	762,127.8227	32° 16' 59.998 N		103° 29' 6.504 W
7,075.00	0.82	58.85	7,073.53	68.68	17.82	467,830.3399	762,128.1420	32° 17' 0.000 N		103° 29' 6.500 W
7,100.00	0.81	55.26	7,098.53	68.87	18.12	467,830.5332	762,128.4403	32° 17' 0.002 N		103° 29' 6.497 W
7,125.00	0.75	75.28	7,123.53	69.02	18.42	467,830.6754	762,128.7438	32° 17' 0.004 N		103° 29' 6.493 W
7,150.00	0.68	56.24	7,148.52	69.14	18.71	467,830.7995	762,129.0254	32° 17' 0.005 N		103° 29' 6.490 W
7,175.00	0.70	57.06	7,173.52	69.31	18.96	467,830.9649	762,129.2769	32° 17' 0.006 N		103° 29' 6.487 W
7,200.00	0.55	64.64	7,198.52	69.44	19.19	467,831.0994	762,129.5134	32° 17' 0.008 N		103° 29' 6.484 W



Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Broadcaster 29 Fed 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Site:	Sec. 20, T 23 S., R 34 E	MD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Well:	Broadcaster 29 Fed 4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
7,225.00	0.59	52.81	7,223.52	69.57	19.40	467,831.2286	762,129.7244	32° 17' 0.009 N	103° 29' 6.482 W	
7,250.00	0.66	70.90	7,248.52	69.69	19.64	467,831.3535	762,129.9630	32° 17' 0.010 N	103° 29' 6.479 W	
7,275.00	0.52	32.21	7,273.52	69.84	19.84	467,831.4966	762,130.1595	32° 17' 0.012 N	103° 29' 6.477 W	
7,300.00	0.63	329.97	7,298.52	70.05	19.83	467,831.7116	762,130.1512	32° 17' 0.014 N	103° 29' 6.477 W	
7,325.00	0.37	14.44	7,323.51	70.25	19.78	467,831.9087	762,130.1026	32° 17' 0.016 N	103° 29' 6.477 W	
7,350.00	0.36	30.83	7,348.51	70.39	19.84	467,832.0543	762,130.1629	32° 17' 0.017 N	103° 29' 6.477 W	
7,375.00	0.35	20.24	7,373.51	70.53	19.91	467,832.1934	762,130.2296	32° 17' 0.018 N	103° 29' 6.476 W	
7,400.00	0.27	149.75	7,398.51	70.55	19.97	467,832.2142	762,130.2857	32° 17' 0.019 N	103° 29' 6.475 W	
7,425.00	0.19	152.50	7,423.51	70.47	20.01	467,832.1265	762,130.3345	32° 17' 0.018 N	103° 29' 6.475 W	
7,450.00	0.16	69.41	7,448.51	70.44	20.07	467,832.1020	762,130.3863	32° 17' 0.018 N	103° 29' 6.474 W	
7,475.00	0.16	18.28	7,473.51	70.49	20.11	467,832.1475	762,130.4300	32° 17' 0.018 N	103° 29' 6.474 W	
7,500.00	0.11	309.09	7,498.51	70.54	20.10	467,832.1957	762,130.4223	32° 17' 0.018 N	103° 29' 6.474 W	
7,525.00	0.18	143.45	7,523.51	70.52	20.11	467,832.1793	762,130.4270	32° 17' 0.018 N	103° 29' 6.474 W	
7,550.00	0.14	251.87	7,548.51	70.48	20.10	467,832.1383	762,130.4214	32° 17' 0.018 N	103° 29' 6.474 W	
7,575.00	0.16	156.33	7,573.51	70.44	20.09	467,832.0968	762,130.4064	32° 17' 0.017 N	103° 29' 6.474 W	
7,600.00	0.09	227.74	7,598.51	70.39	20.09	467,832.0516	762,130.4059	32° 17' 0.017 N	103° 29' 6.474 W	
7,625.00	0.14	94.90	7,623.51	70.38	20.10	467,832.0358	762,130.4218	32° 17' 0.017 N	103° 29' 6.474 W	
7,650.00	0.21	82.83	7,648.51	70.38	20.18	467,832.0389	762,130.4977	32° 17' 0.017 N	103° 29' 6.473 W	
7,675.00	0.06	340.18	7,673.51	70.40	20.22	467,832.0570	762,130.5387	32° 17' 0.017 N	103° 29' 6.472 W	
7,700.00	0.10	287.51	7,698.51	70.42	20.19	467,832.0758	762,130.5134	32° 17' 0.017 N	103° 29' 6.473 W	
7,725.00	0.50	184.21	7,723.51	70.31	20.16	467,831.9736	762,130.4846	32° 17' 0.016 N	103° 29' 6.473 W	
7,750.00	0.09	288.30	7,748.51	70.21	20.14	467,831.8710	762,130.4580	32° 17' 0.015 N	103° 29' 6.473 W	
7,775.00	0.13	232.94	7,773.51	70.20	20.10	467,831.8601	762,130.4167	32° 17' 0.015 N	103° 29' 6.474 W	
7,800.00	0.33	10.84	7,798.51	70.25	20.09	467,831.9137	762,130.4076	32° 17' 0.016 N	103° 29' 6.474 W	
7,825.00	0.15	354.99	7,823.51	70.36	20.10	467,832.0170	762,130.4183	32° 17' 0.017 N	103° 29' 6.474 W	
7,850.00	0.14	357.97	7,848.51	70.42	20.09	467,832.0801	762,130.4143	32° 17' 0.017 N	103° 29' 6.474 W	
7,875.00	0.24	346.07	7,873.51	70.50	20.08	467,832.1615	762,130.4007	32° 17' 0.018 N	103° 29' 6.474 W	
7,900.00	0.34	78.13	7,898.51	70.57	20.14	467,832.2275	762,130.4606	32° 17' 0.019 N	103° 29' 6.473 W	
7,925.00	0.46	179.10	7,923.51	70.48	20.21	467,832.1424	762,130.5348	32° 17' 0.018 N	103° 29' 6.472 W	
7,950.00	0.25	107.90	7,948.51	70.37	20.27	467,832.0253	762,130.5883	32° 17' 0.017 N	103° 29' 6.472 W	
7,975.00	0.18	14.13	7,973.51	70.39	20.33	467,832.0467	762,130.6498	32° 17' 0.017 N	103° 29' 6.471 W	
8,000.00	0.23	134.72	7,998.51	70.39	20.38	467,832.0494	762,130.6950	32° 17' 0.017 N	103° 29' 6.470 W	
8,025.00	0.24	83.05	8,023.51	70.36	20.46	467,832.0205	762,130.7826	32° 17' 0.017 N	103° 29' 6.469 W	
8,050.00	0.20	85.80	8,048.51	70.37	20.56	467,832.0300	762,130.8781	32° 17' 0.017 N	103° 29' 6.468 W	
8,075.00	0.35	122.43	8,073.51	70.33	20.67	467,831.9922	762,130.9861	32° 17' 0.016 N	103° 29' 6.467 W	
8,100.00	0.38	103.08	8,098.51	70.27	20.81	467,831.9325	762,131.1313	32° 17' 0.016 N	103° 29' 6.465 W	
8,125.00	0.30	141.60	8,123.51	70.20	20.93	467,831.8625	762,131.2527	32° 17' 0.015 N	103° 29' 6.464 W	
8,150.00	0.25	94.38	8,148.51	70.15	21.03	467,831.8070	762,131.3477	32° 17' 0.015 N	103° 29' 6.463 W	
8,175.00	0.34	136.89	8,173.51	70.09	21.13	467,831.7487	762,131.4528	32° 17' 0.014 N	103° 29' 6.462 W	
8,200.00	0.31	159.31	8,198.51	69.97	21.21	467,831.6313	762,131.5274	32° 17' 0.013 N	103° 29' 6.461 W	
8,225.00	0.36	94.15	8,223.51	69.90	21.31	467,831.5623	762,131.6296	32° 17' 0.012 N	103° 29' 6.460 W	
8,250.00	0.37	77.79	8,248.51	69.91	21.47	467,831.5737	762,131.7869	32° 17' 0.012 N	103° 29' 6.458 W	
8,275.00	0.50	107.92	8,273.51	69.90	21.65	467,831.5572	762,131.9695	32° 17' 0.012 N	103° 29' 6.456 W	
8,300.00	0.57	90.15	8,298.51	69.86	21.88	467,831.5233	762,132.1977	32° 17' 0.012 N	103° 29' 6.453 W	
8,325.00	0.54	114.47	8,323.50	69.81	22.11	467,831.4742	762,132.4293	32° 17' 0.011 N	103° 29' 6.450 W	
8,350.00	0.64	113.49	8,348.50	69.71	22.34	467,831.3698	762,132.6645	32° 17' 0.010 N	103° 29' 6.448 W	
8,375.00	0.65	112.87	8,373.50	69.60	22.60	467,831.2590	762,132.9233	32° 17' 0.009 N	103° 29' 6.445 W	
8,400.00	0.77	68.81	8,398.50	69.60	22.89	467,831.2646	762,133.2105	32° 17' 0.009 N	103° 29' 6.441 W	
8,425.00	0.51	119.01	8,423.50	69.61	23.14	467,831.2714	762,133.4645	32° 17' 0.009 N	103° 29' 6.438 W	
8,450.00	0.41	247.10	8,448.50	69.52	23.16	467,831.1826	762,133.4794	32° 17' 0.008 N	103° 29' 6.438 W	
8,475.00	0.37	118.51	8,473.50	69.45	23.15	467,831.1093	762,133.4679	32° 17' 0.007 N	103° 29' 6.438 W	
8,500.00	0.24	160.84	8,498.50	69.36	23.24	467,831.0213	762,133.5560	32° 17' 0.007 N	103° 29' 6.437 W	
8,525.00	0.49	69.96	8,523.50	69.35	23.35	467,831.0084	762,133.6736	32° 17' 0.006 N	103° 29' 6.436 W	
8,550.00	0.53	89.51	8,548.50	69.39	23.57	467,831.0461	762,133.8897	32° 17' 0.007 N	103° 29' 6.433 W	
8,575.00	0.64	81.75	8,573.49	69.41	23.82	467,831.0671	762,134.1435	32° 17' 0.007 N	103° 29' 6.430 W	



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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
8,600.00	0.66	94.98	8,598.49	69.41	24.11	467,831.0746	762,134.4251	32° 17' 0.007 N	103° 29' 6.427 W	
8,625.00	0.73	93.99	8,623.49	69.39	24.41	467,831.0510	762,134.7274	32° 17' 0.007 N	103° 29' 6.424 W	
8,650.00	0.63	89.92	8,648.49	69.38	24.70	467,831.0402	762,135.0237	32° 17' 0.007 N	103° 29' 6.420 W	
8,675.00	0.69	99.06	8,673.49	69.36	24.99	467,831.0166	762,135.3098	32° 17' 0.006 N	103° 29' 6.417 W	
8,700.00	0.82	120.55	8,698.49	69.24	25.29	467,830.9020	762,135.6125	32° 17' 0.005 N	103° 29' 6.413 W	
8,725.00	0.97	113.47	8,723.48	69.07	25.64	467,830.7268	762,135.9607	32° 17' 0.003 N	103° 29' 6.409 W	
8,750.00	0.96	120.32	8,748.48	68.88	26.02	467,830.5368	762,136.3356	32° 17' 0.002 N	103° 29' 6.405 W	
8,775.00	0.95	126.87	8,773.48	68.65	26.36	467,830.3067	762,136.6822	32° 16' 59.999 N	103° 29' 6.401 W	
8,800.00	1.03	123.31	8,798.47	68.40	26.72	467,830.0590	762,137.0358	32° 16' 59.997 N	103° 29' 6.397 W	
8,825.00	0.95	133.54	8,823.47	68.13	27.05	467,829.7928	762,137.3738	32° 16' 59.994 N	103° 29' 6.393 W	
8,850.00	0.82	125.62	8,848.47	67.89	27.35	467,829.5459	762,137.6694	32° 16' 59.992 N	103° 29' 6.389 W	
8,875.00	0.83	126.69	8,873.46	67.67	27.64	467,829.3335	762,137.9600	32° 16' 59.990 N	103° 29' 6.386 W	
8,900.00	0.73	140.06	8,898.46	67.44	27.89	467,829.1032	762,138.2075	32° 16' 59.987 N	103° 29' 6.383 W	
8,925.00	0.72	136.47	8,923.46	67.21	28.10	467,828.8672	762,138.4179	32° 16' 59.985 N	103° 29' 6.381 W	
8,950.00	0.42	82.18	8,948.46	67.11	28.30	467,828.7658	762,138.6169	32° 16' 59.984 N	103° 29' 6.379 W	
8,975.00	0.38	96.66	8,973.46	67.11	28.47	467,828.7687	762,138.7900	32° 16' 59.984 N	103° 29' 6.376 W	
9,000.00	0.36	256.12	8,998.46	67.08	28.48	467,828.7402	762,138.7961	32° 16' 59.984 N	103° 29' 6.376 W	
9,025.00	0.35	73.43	9,023.46	67.08	28.47	467,828.7431	762,138.7930	32° 16' 59.984 N	103° 29' 6.376 W	
9,050.00	0.35	40.30	9,048.46	67.16	28.60	467,828.8231	762,138.9156	32° 16' 59.984 N	103° 29' 6.375 W	
9,075.00	0.48	86.64	9,073.46	67.23	28.75	467,828.8875	762,139.0695	32° 16' 59.985 N	103° 29' 6.373 W	
9,100.00	0.55	115.26	9,098.45	67.18	28.96	467,828.8424	762,139.2826	32° 16' 59.985 N	103° 29' 6.371 W	
9,125.00	0.85	122.91	9,123.45	67.03	29.23	467,828.6905	762,139.5468	32° 16' 59.983 N	103° 29' 6.368 W	
9,150.00	0.87	144.97	9,148.45	66.77	29.49	467,828.4343	762,139.8114	32° 16' 59.980 N	103° 29' 6.365 W	
9,175.00	0.99	150.67	9,173.45	66.43	29.71	467,828.0906	762,140.0261	32° 16' 59.977 N	103° 29' 6.362 W	
9,200.00	1.04	151.76	9,198.44	66.04	29.92	467,827.7025	762,140.2393	32° 16' 59.973 N	103° 29' 6.360 W	
9,225.00	1.18	150.69	9,223.44	65.62	30.15	467,827.2781	762,140.4726	32° 16' 59.969 N	103° 29' 6.357 W	
9,250.00	1.00	172.73	9,248.43	65.18	30.31	467,826.8373	762,140.6263	32° 16' 59.965 N	103° 29' 6.355 W	
9,275.00	1.12	161.26	9,273.43	64.73	30.41	467,826.3895	762,140.7324	32° 16' 59.960 N	103° 29' 6.354 W	
9,300.00	1.09	167.94	9,298.42	64.27	30.54	467,825.9256	762,140.8605	32° 16' 59.956 N	103° 29' 6.353 W	
9,325.00	1.13	160.22	9,323.42	63.80	30.67	467,825.4611	762,140.9936	32° 16' 59.951 N	103° 29' 6.351 W	
9,350.00	1.16	154.71	9,348.41	63.34	30.87	467,825.0003	762,141.1852	32° 16' 59.946 N	103° 29' 6.349 W	
9,375.00	0.99	147.96	9,373.41	62.93	31.09	467,824.5884	762,141.4079	32° 16' 59.942 N	103° 29' 6.346 W	
9,400.00	0.97	144.17	9,398.41	62.57	31.33	467,824.2338	762,141.6463	32° 16' 59.939 N	103° 29' 6.344 W	
9,425.00	1.03	108.07	9,423.40	62.33	31.66	467,823.9925	762,141.9838	32° 16' 59.936 N	103° 29' 6.340 W	
9,450.00	1.27	117.62	9,448.40	62.13	32.12	467,823.7944	762,142.4429	32° 16' 59.934 N	103° 29' 6.334 W	
9,475.00	1.42	114.52	9,473.39	61.88	32.65	467,823.5374	762,142.9702	32° 16' 59.932 N	103° 29' 6.328 W	
9,500.00	1.63	106.17	9,498.38	61.65	33.27	467,823.3098	762,143.5935	32° 16' 59.929 N	103° 29' 6.321 W	
9,525.00	1.72	105.69	9,523.37	61.45	33.98	467,823.1093	762,144.2962	32° 16' 59.927 N	103° 29' 6.313 W	
9,550.00	1.52	109.71	9,548.36	61.24	34.65	467,822.8960	762,144.9696	32° 16' 59.925 N	103° 29' 6.305 W	
9,575.00	1.59	125.62	9,573.35	60.92	35.24	467,822.5822	762,145.5637	32° 16' 59.922 N	103° 29' 6.298 W	
9,600.00	1.91	131.57	9,598.34	60.44	35.84	467,822.1037	762,146.1573	32° 16' 59.917 N	103° 29' 6.291 W	
9,625.00	1.80	136.33	9,623.33	59.88	36.42	467,821.5433	762,146.7401	32° 16' 59.912 N	103° 29' 6.285 W	
9,650.00	1.70	137.83	9,648.32	59.32	36.94	467,820.9845	762,147.2602	32° 16' 59.906 N	103° 29' 6.279 W	
9,675.00	1.80	133.40	9,673.30	58.78	37.47	467,820.4398	762,147.7944	32° 16' 59.901 N	103° 29' 6.272 W	
9,700.00	1.92	132.74	9,698.29	58.23	38.07	467,819.8858	762,148.3873	32° 16' 59.895 N	103° 29' 6.266 W	
9,725.00	2.11	134.98	9,723.28	57.62	38.70	467,819.2763	762,149.0204	32° 16' 59.889 N	103° 29' 6.258 W	
9,750.00	2.08	140.82	9,748.26	56.94	39.31	467,818.5993	762,149.6326	32° 16' 59.882 N	103° 29' 6.251 W	
9,775.00	1.96	140.97	9,773.24	56.26	39.87	467,817.9155	762,150.1884	32° 16' 59.876 N	103° 29' 6.245 W	
9,800.00	1.81	145.83	9,798.23	55.60	40.36	467,817.2568	762,150.6794	32° 16' 59.869 N	103° 29' 6.239 W	
9,825.00	1.87	145.54	9,823.22	54.93	40.81	467,816.5938	762,151.1319	32° 16' 59.862 N	103° 29' 6.234 W	
9,850.00	1.74	151.07	9,848.20	54.27	41.23	467,815.9253	762,151.5463	32° 16' 59.856 N	103° 29' 6.229 W	
9,875.00	1.84	151.76	9,873.19	53.58	41.60	467,815.2395	762,151.9198	32° 16' 59.849 N	103° 29' 6.225 W	
9,900.00	1.91	157.34	9,898.18	52.84	41.95	467,814.5014	762,152.2703	32° 16' 59.842 N	103° 29' 6.221 W	
9,925.00	1.70	162.08	9,923.17	52.10	42.22	467,813.7642	762,152.5449	32° 16' 59.834 N	103° 29' 6.218 W	
9,950.00	1.46	151.07	9,948.16	51.47	42.49	467,813.1326	762,152.8130	32° 16' 59.828 N	103° 29' 6.215 W	



Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Broadcaster 29 Fed 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Site:	Sec. 20, T 23 S., R 34 E	MD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Well:	Broadcaster 29 Fed 4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
9,975.00	1.50	166.87	9,973.15	50.88	42.72	467,812.5352	762,153.0414	32° 16' 59.822 N	103° 29' 6.212 W	
10,000.00	1.40	175.27	9,998.14	50.25	42.82	467,811.9121	762,153.1409	32° 16' 59.816 N	103° 29' 6.211 W	
10,025.00	1.36	175.22	10,023.13	49.65	42.87	467,811.3121	762,153.1908	32° 16' 59.810 N	103° 29' 6.210 W	
10,050.00	1.29	182.64	10,048.13	49.08	42.88	467,810.7354	762,153.2026	32° 16' 59.804 N	103° 29' 6.210 W	
10,075.00	1.29	166.31	10,073.12	48.52	42.94	467,810.1809	762,153.2562	32° 16' 59.799 N	103° 29' 6.210 W	
10,100.00	1.48	174.33	10,098.11	47.93	43.03	467,809.5862	762,153.3547	32° 16' 59.793 N	103° 29' 6.209 W	
10,125.00	1.49	170.71	10,123.11	47.28	43.12	467,808.9441	762,153.4391	32° 16' 59.787 N	103° 29' 6.208 W	
10,150.00	1.51	164.62	10,148.10	46.65	43.26	467,808.3058	762,153.5789	32° 16' 59.780 N	103° 29' 6.206 W	
10,175.00	1.58	165.28	10,173.09	45.99	43.43	467,807.6548	762,153.7539	32° 16' 59.774 N	103° 29' 6.204 W	
10,200.00	1.49	161.73	10,198.08	45.35	43.62	467,807.0128	762,153.9434	32° 16' 59.767 N	103° 29' 6.202 W	
10,225.00	1.50	169.20	10,223.07	44.72	43.79	467,806.3828	762,154.1066	32° 16' 59.761 N	103° 29' 6.200 W	
10,250.00	1.39	185.07	10,248.06	44.10	43.82	467,805.7593	762,154.1411	32° 16' 59.755 N	103° 29' 6.200 W	
10,275.00	1.37	182.09	10,273.06	43.50	43.78	467,805.1586	762,154.1034	32° 16' 59.749 N	103° 29' 6.200 W	
10,300.00	1.44	192.06	10,298.05	42.89	43.71	467,804.5528	762,154.0268	32° 16' 59.743 N	103° 29' 6.201 W	
10,325.00	1.41	186.81	10,323.04	42.28	43.60	467,803.9402	762,153.9247	32° 16' 59.737 N	103° 29' 6.202 W	
10,350.00	1.18	186.68	10,348.03	41.72	43.54	467,803.3791	762,153.8583	32° 16' 59.731 N	103° 29' 6.203 W	
10,375.00	1.12	201.23	10,373.03	41.24	43.42	467,802.8957	762,153.7399	32° 16' 59.727 N	103° 29' 6.205 W	
10,400.00	1.24	188.03	10,398.02	40.74	43.29	467,802.4001	762,153.6136	32° 16' 59.722 N	103° 29' 6.206 W	
10,425.00	1.22	191.96	10,423.02	40.21	43.20	467,801.8718	762,153.5207	32° 16' 59.717 N	103° 29' 6.207 W	
10,450.00	1.23	187.85	10,448.01	39.69	43.11	467,801.3457	762,153.4289	32° 16' 59.711 N	103° 29' 6.209 W	
10,475.00	0.96	172.65	10,473.01	39.21	43.10	467,800.8721	762,153.4191	32° 16' 59.707 N	103° 29' 6.209 W	
10,500.00	1.22	166.07	10,498.00	38.75	43.19	467,800.4061	762,153.5099	32° 16' 59.702 N	103° 29' 6.208 W	
10,525.00	1.03	170.23	10,523.00	38.27	43.29	467,799.9264	762,153.6121	32° 16' 59.697 N	103° 29' 6.207 W	
10,550.00	1.25	158.65	10,547.99	37.79	43.43	467,799.4510	762,153.7495	32° 16' 59.693 N	103° 29' 6.205 W	
10,575.00	1.41	163.48	10,572.99	37.24	43.62	467,798.9021	762,153.9363	32° 16' 59.687 N	103° 29' 6.203 W	
10,600.00	1.28	213.83	10,597.98	36.72	43.55	467,798.3752	762,153.8683	32° 16' 59.682 N	103° 29' 6.204 W	
10,625.00	1.41	157.81	10,622.97	36.20	43.51	467,797.8585	762,153.8290	32° 16' 59.677 N	103° 29' 6.204 W	
10,650.00	1.33	168.02	10,647.97	35.63	43.69	467,797.2898	762,154.0054	32° 16' 59.671 N	103° 29' 6.202 W	
10,675.00	1.34	154.02	10,672.96	35.08	43.87	467,796.7433	762,154.1936	32° 16' 59.666 N	103° 29' 6.200 W	
10,700.00	1.68	163.40	10,697.95	34.47	44.11	467,796.1293	762,154.4264	32° 16' 59.660 N	103° 29' 6.197 W	
10,725.00	1.71	168.37	10,722.94	33.75	44.29	467,795.4127	762,154.6063	32° 16' 59.653 N	103° 29' 6.195 W	
10,750.00	1.58	182.70	10,747.93	33.04	44.35	467,794.7031	762,154.6652	32° 16' 59.646 N	103° 29' 6.195 W	
10,775.00	1.58	180.56	10,772.92	32.35	44.33	467,794.0142	762,154.6456	32° 16' 59.639 N	103° 29' 6.195 W	
10,800.00	1.52	251.50	10,797.91	31.90	44.01	467,793.5643	762,154.3278	32° 16' 59.634 N	103° 29' 6.199 W	
10,825.00	1.54	183.66	10,822.91	31.46	43.67	467,793.1238	762,153.9919	32° 16' 59.630 N	103° 29' 6.203 W	
10,850.00	1.73	181.65	10,847.90	30.75	43.64	467,792.4113	762,153.9596	32° 16' 59.623 N	103° 29' 6.203 W	
10,875.00	1.61	164.52	10,872.89	30.04	43.72	467,791.6957	762,154.0424	32° 16' 59.616 N	103° 29' 6.202 W	
10,900.00	1.92	184.41	10,897.87	29.28	43.78	467,790.9396	762,154.1040	32° 16' 59.608 N	103° 29' 6.202 W	
10,925.00	1.94	179.50	10,922.86	28.44	43.76	467,790.0989	762,154.0755	32° 16' 59.600 N	103° 29' 6.202 W	
10,950.00	2.13	177.40	10,947.84	27.55	43.78	467,789.2117	762,154.1002	32° 16' 59.591 N	103° 29' 6.202 W	
10,953.00	2.10	177.30	10,950.84	27.44	43.79	467,789.1011	762,154.1054	32° 16' 59.590 N	103° 29' 6.202 W	
11,058.00	2.20	172.80	11,055.77	23.52	44.13	467,785.1800	762,154.4486	32° 16' 59.551 N	103° 29' 6.198 W	
First IDS MWD Survey										
11,089.00	2.10	171.10	11,086.75	22.37	44.29	467,784.0285	762,154.6110	32° 16' 59.540 N	103° 29' 6.196 W	
11,121.00	3.80	166.70	11,118.70	20.76	44.63	467,782.4172	762,154.9457	32° 16' 59.524 N	103° 29' 6.193 W	
11,152.00	7.40	172.50	11,149.55	17.78	45.12	467,779.4373	762,155.4427	32° 16' 59.494 N	103° 29' 6.187 W	
11,184.00	10.40	176.90	11,181.16	12.85	45.55	467,774.5089	762,155.8680	32° 16' 59.446 N	103° 29' 6.183 W	
11,215.00	13.40	176.60	11,211.49	6.47	45.91	467,768.1277	762,156.2325	32° 16' 59.382 N	103° 29' 6.179 W	
11,246.00	15.90	175.50	11,241.48	-1.35	46.46	467,760.3075	762,156.7787	32° 16' 59.305 N	103° 29' 6.173 W	
11,278.00	19.10	175.60	11,272.00	-10.94	47.20	467,750.7151	762,157.5245	32° 16' 59.210 N	103° 29' 6.165 W	
11,309.00	22.20	177.30	11,301.00	-21.85	47.87	467,739.8054	762,158.1897	32° 16' 59.102 N	103° 29' 6.159 W	
11,341.00	25.60	177.90	11,330.25	-34.81	48.41	467,726.8541	762,158.7279	32° 16' 58.974 N	103° 29' 6.154 W	
11,372.00	29.10	181.50	11,357.79	-49.04	48.46	467,712.6203	762,158.7760	32° 16' 58.833 N	103° 29' 6.154 W	
11,404.00	32.30	182.80	11,385.30	-65.36	47.83	467,696.2978	762,158.1545	32° 16' 58.672 N	103° 29' 6.163 W	
11,435.00	36.80	181.30	11,410.82	-82.93	47.22	467,678.7334	762,157.5390	32° 16' 58.498 N	103° 29' 6.172 W	



Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Broadcaster 29 Fed 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Site:	Sec. 20, T 23 S., R 34 E	MD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Well:	Broadcaster 29 Fed 4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
11,467.00	41.20	180.90	11,435.69	-103.06	46.84	467,658.6039	762,157.1558	32° 16' 58.299 N	103° 29' 6.178 W
11,498.00	45.10	179.70	11,458.30	-124.25	46.73	467,637.4078	762,157.0529	32° 16' 58.089 N	103° 29' 6.181 W
11,530.00	48.70	179.70	11,480.16	-147.61	46.86	467,614.0468	762,157.1752	32° 16' 57.858 N	103° 29' 6.182 W
11,561.00	52.20	179.20	11,499.90	-171.51	47.09	467,590.1487	762,157.4072	32° 16' 57.621 N	103° 29' 6.182 W
11,593.00	55.00	179.10	11,518.89	-197.26	47.47	467,564.3976	762,157.7897	32° 16' 57.366 N	103° 29' 6.180 W
11,624.00	58.50	181.80	11,535.88	-223.18	47.25	467,538.4815	762,157.5739	32° 16' 57.110 N	103° 29' 6.184 W
11,656.00	62.80	180.90	11,551.56	-251.06	46.60	467,510.6037	762,156.9216	32° 16' 56.834 N	103° 29' 6.195 W
11,687.00	66.30	179.40	11,564.88	-279.04	46.53	467,482.6175	762,156.8536	32° 16' 56.557 N	103° 29' 6.198 W
11,719.00	69.80	178.10	11,576.84	-308.71	47.19	467,452.9498	762,157.5051	32° 16' 56.264 N	103° 29' 6.193 W
11,751.00	73.30	178.70	11,586.97	-339.05	48.03	467,422.6113	762,158.3509	32° 16' 55.963 N	103° 29' 6.186 W
11,782.00	77.10	179.20	11,594.89	-369.01	48.58	467,392.6504	762,158.8989	32° 16' 55.667 N	103° 29' 6.182 W
11,813.00	81.00	178.80	11,600.77	-399.44	49.11	467,362.2255	762,159.4307	32° 16' 55.366 N	103° 29' 6.179 W
11,845.00	85.50	178.80	11,604.53	-431.20	49.78	467,330.4625	762,160.0960	32° 16' 55.051 N	103° 29' 6.174 W
11,878.00	89.00	178.50	11,606.12	-464.15	50.55	467,297.5149	762,160.8726	32° 16' 54.725 N	103° 29' 6.168 W
11,941.00	90.20	178.70	11,606.56	-527.12	52.09	467,234.5365	762,162.4117	32° 16' 54.102 N	103° 29' 6.156 W
12,035.00	90.40	178.10	11,606.06	-621.09	54.72	467,140.5751	762,165.0363	32° 16' 53.172 N	103° 29' 6.134 W
12,130.00	90.20	178.30	11,605.57	-716.04	57.70	467,045.6236	762,168.0203	32° 16' 52.232 N	103° 29' 6.108 W
12,224.00	89.40	179.60	11,605.90	-810.02	59.42	466,951.6429	762,169.7428	32° 16' 51.302 N	103° 29' 6.097 W
12,319.00	89.50	180.00	11,606.81	-905.01	59.75	466,856.6483	762,170.0744	32° 16' 50.362 N	103° 29' 6.102 W
12,413.00	90.40	180.60	11,606.89	-999.01	59.26	466,762.6512	762,169.5822	32° 16' 49.432 N	103° 29' 6.116 W
12,508.00	91.40	180.80	11,605.40	-1,093.99	58.10	466,667.6714	762,168.4218	32° 16' 48.492 N	103° 29' 6.138 W
12,602.00	92.50	181.10	11,602.20	-1,187.92	56.54	466,573.7405	762,166.8643	32° 16' 47.563 N	103° 29' 6.165 W
12,696.00	92.40	180.80	11,598.18	-1,281.82	54.99	466,479.8396	762,165.3072	32° 16' 46.634 N	103° 29' 6.192 W
12,791.00	92.70	181.20	11,593.95	-1,376.71	53.33	466,384.9487	762,163.6509	32° 16' 45.695 N	103° 29' 6.220 W
12,885.00	91.90	181.00	11,590.18	-1,470.62	51.53	466,291.0427	762,161.8479	32° 16' 44.766 N	103° 29' 6.250 W
12,980.00	91.80	181.00	11,587.11	-1,565.56	49.87	466,196.1069	762,160.1908	32° 16' 43.827 N	103° 29' 6.278 W
13,074.00	92.00	181.10	11,584.00	-1,659.49	48.15	466,102.1746	762,158.4692	32° 16' 42.897 N	103° 29' 6.306 W
13,169.00	91.60	180.80	11,581.01	-1,754.43	46.58	466,007.2350	762,156.8949	32° 16' 41.958 N	103° 29' 6.333 W
13,263.00	91.40	180.70	11,578.55	-1,848.39	45.35	465,913.2755	762,155.6649	32° 16' 41.028 N	103° 29' 6.356 W
13,357.00	91.80	181.00	11,575.93	-1,942.34	43.95	465,819.3230	762,154.2710	32° 16' 40.099 N	103° 29' 6.381 W
13,452.00	92.70	181.70	11,572.20	-2,037.24	41.71	465,724.4243	762,152.0348	32° 16' 39.160 N	103° 29' 6.416 W
13,546.00	91.00	181.00	11,569.16	-2,131.16	39.50	465,630.5036	762,149.8217	32° 16' 38.231 N	103° 29' 6.450 W
13,641.00	91.70	181.10	11,566.93	-2,226.12	37.76	465,535.5467	762,148.0813	32° 16' 37.291 N	103° 29' 6.479 W
13,735.00	91.70	180.40	11,564.14	-2,320.07	36.53	465,441.5969	762,146.8515	32° 16' 36.362 N	103° 29' 6.502 W
13,829.00	92.40	180.50	11,560.77	-2,414.00	35.79	465,347.6607	762,146.1137	32° 16' 35.432 N	103° 29' 6.520 W
13,924.00	92.20	180.10	11,556.96	-2,508.93	35.30	465,252.7390	762,145.6167	32° 16' 34.493 N	103° 29' 6.534 W
14,018.00	91.30	179.50	11,554.09	-2,602.88	35.62	465,158.7850	762,145.9448	32° 16' 33.563 N	103° 29' 6.539 W
14,113.00	91.00	179.50	11,552.18	-2,697.86	36.45	465,063.8081	762,146.7736	32° 16' 32.623 N	103° 29' 6.538 W
14,207.00	90.80	179.30	11,550.71	-2,791.84	37.44	464,969.8252	762,147.7579	32° 16' 31.693 N	103° 29' 6.535 W
14,302.00	87.70	179.50	11,551.95	-2,886.82	38.43	464,874.8503	762,148.7525	32° 16' 30.753 N	103° 29' 6.532 W
14,396.00	88.00	179.40	11,555.48	-2,980.74	39.33	464,780.9211	762,149.6542	32° 16' 29.824 N	103° 29' 6.531 W
14,490.00	88.50	180.20	11,558.35	-3,074.70	39.66	464,686.9668	762,149.9821	32° 16' 28.894 N	103° 29' 6.535 W
14,584.00	88.30	179.80	11,560.97	-3,168.66	39.66	464,593.0039	762,149.9821	32° 16' 27.964 N	103° 29' 6.544 W
14,679.00	88.00	180.20	11,564.04	-3,263.61	39.66	464,498.0539	762,149.9821	32° 16' 27.025 N	103° 29' 6.553 W
14,773.00	89.10	179.80	11,566.42	-3,357.58	39.66	464,404.0858	762,149.9822	32° 16' 26.095 N	103° 29' 6.562 W
14,867.00	88.10	179.80	11,568.72	-3,451.55	39.99	464,310.1158	762,150.3102	32° 16' 25.165 N	103° 29' 6.566 W
14,962.00	86.80	179.50	11,572.94	-3,546.45	40.57	464,215.2140	762,150.8898	32° 16' 24.226 N	103° 29' 6.568 W
15,056.00	87.60	179.30	11,577.53	-3,640.34	41.55	464,121.3323	762,151.8730	32° 16' 23.297 N	103° 29' 6.566 W
15,151.00	88.40	179.80	11,580.85	-3,735.27	42.30	464,026.3944	762,152.6186	32° 16' 22.357 N	103° 29' 6.566 W
15,245.00	89.80	180.20	11,582.33	-3,829.26	42.30	463,932.4087	762,152.6185	32° 16' 21.427 N	103° 29' 6.574 W
15,340.00	90.20	180.00	11,582.33	-3,924.26	42.13	463,837.4093	762,152.4527	32° 16' 20.487 N	103° 29' 6.585 W
15,434.00	89.90	180.10	11,582.24	-4,018.26	42.05	463,743.4097	762,152.3707	32° 16' 19.557 N	103° 29' 6.595 W
15,529.00	91.20	180.70	11,581.33	-4,113.25	41.39	463,648.4190	762,151.7076	32° 16' 18.617 N	103° 29' 6.611 W
15,623.00	91.30	180.70	11,579.28	-4,207.22	40.24	463,554.4486	762,150.5595	32° 16' 17.688 N	103° 29' 6.633 W
15,717.00	91.30	180.20	11,577.15	-4,301.19	39.50	463,460.4762	762,149.8214	32° 16' 16.758 N	103° 29' 6.650 W



Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Broadcaster 29 Fed 4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Site:	Sec. 20, T 23 S. , R 34 E	MD Reference:	KB=20' @ 3515.40ft (Patriot 2)
Well:	Broadcaster 29 Fed 4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
15,811.00	91.70	180.20	11,574.69	-4,395.16	39.17	463,366.5093	762,149.4934	32° 16' 15.828 N	103° 29' 6.663 W
15,905.00	90.90	179.40	11,572.56	-4,489.13	39.50	463,272.5358	762,149.8215	32° 16' 14.898 N	103° 29' 6.668 W
16,000.00	91.50	179.70	11,570.57	-4,584.11	40.25	463,177.5603	762,150.5675	32° 16' 13.958 N	103° 29' 6.668 W
16,094.00	90.00	179.20	11,569.34	-4,678.09	41.15	463,083.5759	762,151.4698	32° 16' 13.028 N	103° 29' 6.666 W
16,188.00	90.60	179.00	11,568.84	-4,772.08	42.63	462,989.5894	762,152.9462	32° 16' 12.098 N	103° 29' 6.657 W
16,283.00	91.10	179.30	11,567.43	-4,867.06	44.04	462,894.6109	762,154.3554	32° 16' 11.158 N	103° 29' 6.650 W
16,377.00	90.70	179.40	11,565.96	-4,961.04	45.10	462,800.6290	762,155.4216	32° 16' 10.228 N	103° 29' 6.646 W
16,472.00	90.10	179.60	11,565.29	-5,056.03	45.93	462,705.6356	762,156.2506	32° 16' 9.288 N	103° 29' 6.645 W
16,566.00	91.00	178.90	11,564.39	-5,150.02	47.16	462,611.6497	762,157.4809	32° 16' 8.358 N	103° 29' 6.639 W

Final IDS MWD Survey

16,640.00	91.00	178.90	11,563.10	-5,224.00	48.58	462,537.6747	762,158.9013	32° 16' 7.626 N	103° 29' 6.629 W
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Projection to TD

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
11,058.00	11,055.77	23.52	44.13	First IDS MWD Survey
16,566.00	11,564.39	-5,150.02	47.16	Final IDS MWD Survey
16,640.00	11,563.10	-5,224.00	48.58	Projection to TD

Checked By: _____ Approved By: _____ Date: _____