



CONCHO

NM OIL CONSERVATION
ARTESIA DISTRICT

JUN 05 2017

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COG Operating L L C

Eddy County, NM (NAD 27 NME)

Sec. 21, T 26 S. , R 28 E

Graham Nash Fed Com 7H

Wellbore #1

30-015-43811

Design: Wellbore #1

Survey Report - Geographic

01 March, 2017

Provide signature page for survey





Integrity Directional Services, LLC
Survey Report - Geographic



Company: COG Operating L L C
Project: Eddy County, NM (NAD 27 NME)
Site: Sec. 21, T 26 S., R 28 E
Well: Graham Nash Fed Com 7H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Graham Nash Fed Com 7H
TVD Reference: KB=26' @ 3014.80ft (Patriot 2)
MD Reference: KB=26' @ 3014.80ft (Patriot 2)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Multi User Db

Project	Eddy County, NM (NAD 27 NME)		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	Sec. 21, T 26 S., R 28 E		
Site Position:		Northing:	371,481.0000 usft
From:	Map	Easting:	573,699.6000 usft
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "
		Latitude:	32° 1' 15.933 N
		Longitude:	104° 5' 43.924 W
		Grid Convergence:	0.13 °

Well	Graham Nash Fed Com 7H, ACTIVE		
Well Position	+N/-S	0.00 ft	Northing: 371,481.0000 usft
	+E/-W	0.00 ft	Easting: 573,699.6000 usft
Position Uncertainty	0.00 ft	Wellhead Elevation:	0.00 ft
		Latitude:	32° 1' 15.933 N
		Longitude:	104° 5' 43.924 W
		Ground Level:	2,988.80 ft

Wellbore	Wellbore #1		
Magnetics	Model Name	Sample Date	Declination
	IGRF2015	2/8/2017	(°)
			7.22
			Dip Angle (°)
			59.79
			Field Strength (nT)
			47,800

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
			Direction
			(°)
			176.63

Survey Program	Date 3/1/2017		
From	To	Survey (Wellbore)	Tool Name
(ft)	(ft)		
100.00	7,244.00	Keeper Gyros (Wellbore #1)	Keeper
7,349.00	15,208.00	IDS MWD Surveys (Wellbore #1)	MWD
			Description
			Standard Wireline Keeper ver 1.0.2
			MWD - Standard

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	371,481.0000	573,699.6000	32° 1' 15.933 N	104° 5' 43.924 W
100.00	1.07	276.25	99.99	0.10	-0.93	371,481.1016	573,698.6718	32° 1' 15.934 N	104° 5' 43.935 W
125.00	1.15	272.84	124.99	0.14	-1.41	371,481.1395	573,698.1892	32° 1' 15.934 N	104° 5' 43.940 W
150.00	1.21	272.63	149.98	0.16	-1.93	371,481.1640	573,697.6750	32° 1' 15.935 N	104° 5' 43.946 W
175.00	1.25	271.81	174.98	0.18	-2.46	371,481.1847	573,697.1387	32° 1' 15.935 N	104° 5' 43.953 W
200.00	1.24	273.14	199.97	0.21	-3.00	371,481.2082	573,696.5961	32° 1' 15.935 N	104° 5' 43.959 W
225.00	1.25	271.87	224.97	0.23	-3.55	371,481.2319	573,696.0535	32° 1' 15.935 N	104° 5' 43.965 W
250.00	1.26	267.73	249.96	0.23	-4.09	371,481.2299	573,695.5063	32° 1' 15.935 N	104° 5' 43.972 W
275.00	1.29	270.24	274.95	0.22	-4.65	371,481.2202	573,694.9502	32° 1' 15.935 N	104° 5' 43.978 W
300.00	1.23	272.52	299.95	0.23	-5.20	371,481.2332	573,694.4007	32° 1' 15.935 N	104° 5' 43.984 W
325.00	1.27	274.09	324.94	0.26	-5.74	371,481.2647	573,693.8563	32° 1' 15.936 N	104° 5' 43.991 W



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North Reference: Grid
Survey Calculation Method: Minimum Curvature
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	1.43	274.89	349.94	0.31	-6.33	371,481.3111	573,693.2692	32° 1' 15.936 N	104° 5' 43.998 W
375.00	1.38	275.40	374.93	0.37	-6.94	371,481.3660	573,692.6587	32° 1' 15.937 N	104° 5' 44.005 W
400.00	1.41	278.67	399.92	0.44	-7.55	371,481.4407	573,692.0549	32° 1' 15.937 N	104° 5' 44.012 W
425.00	1.39	277.64	424.91	0.53	-8.15	371,481.5274	573,691.4503	32° 1' 15.938 N	104° 5' 44.019 W
450.00	1.38	279.06	449.91	0.62	-8.75	371,481.6151	573,690.8525	32° 1' 15.939 N	104° 5' 44.026 W
475.00	1.31	280.27	474.90	0.71	-9.33	371,481.7134	573,690.2740	32° 1' 15.940 N	104° 5' 44.032 W
500.00	1.27	287.72	499.89	0.85	-9.87	371,481.8487	573,689.7289	32° 1' 15.942 N	104° 5' 44.039 W
525.00	1.23	288.37	524.89	1.02	-10.39	371,482.0176	573,689.2103	32° 1' 15.943 N	104° 5' 44.045 W
550.00	1.30	290.02	549.88	1.20	-10.91	371,482.1993	573,688.6892	32° 1' 15.945 N	104° 5' 44.051 W
575.00	1.30	291.78	574.87	1.40	-11.44	371,482.4016	573,688.1594	32° 1' 15.947 N	104° 5' 44.057 W
600.00	1.24	293.78	599.87	1.62	-11.95	371,482.6159	573,687.6486	32° 1' 15.949 N	104° 5' 44.063 W
625.00	1.30	295.18	624.86	1.85	-12.46	371,482.8456	573,687.1444	32° 1' 15.951 N	104° 5' 44.069 W
650.00	1.28	295.22	649.86	2.09	-12.96	371,483.0852	573,686.6351	32° 1' 15.954 N	104° 5' 44.075 W
675.00	1.30	294.37	674.85	2.32	-13.48	371,483.3212	573,686.1242	32° 1' 15.956 N	104° 5' 44.081 W
700.00	1.39	293.91	699.84	2.56	-14.01	371,483.5611	573,685.5887	32° 1' 15.959 N	104° 5' 44.087 W
725.00	1.43	295.32	724.83	2.82	-14.57	371,483.8174	573,685.0295	32° 1' 15.961 N	104° 5' 44.093 W
750.00	1.39	293.77	749.83	3.07	-15.13	371,484.0731	573,684.4700	32° 1' 15.964 N	104° 5' 44.100 W
775.00	1.40	294.26	774.82	3.32	-15.69	371,484.3208	573,683.9141	32° 1' 15.966 N	104° 5' 44.106 W
800.00	1.40	294.25	799.81	3.57	-16.24	371,484.5717	573,683.3572	32° 1' 15.969 N	104° 5' 44.113 W
825.00	1.38	296.19	824.80	3.83	-16.79	371,484.8300	573,682.8086	32° 1' 15.971 N	104° 5' 44.119 W
850.00	1.40	296.50	849.80	4.10	-17.33	371,485.0991	573,682.2652	32° 1' 15.974 N	104° 5' 44.125 W
875.00	1.50	293.26	874.79	4.36	-17.91	371,485.3646	573,681.6912	32° 1' 15.976 N	104° 5' 44.132 W
900.00	1.51	291.66	899.78	4.62	-18.52	371,485.6154	573,681.0845	32° 1' 15.979 N	104° 5' 44.139 W
925.00	1.56	291.66	924.77	4.86	-19.14	371,485.8626	573,680.4621	32° 1' 15.981 N	104° 5' 44.146 W
950.00	1.55	290.53	949.76	5.11	-19.77	371,486.1068	573,679.8292	32° 1' 15.984 N	104° 5' 44.154 W
975.00	1.58	292.55	974.75	5.36	-20.41	371,486.3575	573,679.1942	32° 1' 15.986 N	104° 5' 44.161 W
1,000.00	1.59	289.53	999.74	5.61	-21.05	371,486.6056	573,678.5490	32° 1' 15.989 N	104° 5' 44.168 W
1,025.00	1.52	290.81	1,024.73	5.84	-21.69	371,486.8394	573,677.9122	32° 1' 15.991 N	104° 5' 44.176 W
1,050.00	1.57	290.80	1,049.73	6.08	-22.32	371,487.0788	573,677.2821	32° 1' 15.994 N	104° 5' 44.183 W
1,075.00	1.54	289.12	1,074.72	6.31	-22.96	371,487.3104	573,676.6445	32° 1' 15.996 N	104° 5' 44.191 W
1,100.00	1.55	287.62	1,099.71	6.52	-23.60	371,487.5228	573,676.0049	32° 1' 15.998 N	104° 5' 44.198 W
1,125.00	1.60	282.68	1,124.70	6.70	-24.26	371,487.7018	573,675.3421	32° 1' 16.000 N	104° 5' 44.206 W
1,150.00	1.63	284.10	1,149.69	6.87	-24.94	371,487.8650	573,674.6568	32° 1' 16.001 N	104° 5' 44.214 W
1,175.00	1.58	282.97	1,174.68	7.03	-25.62	371,488.0290	573,673.9761	32° 1' 16.003 N	104° 5' 44.222 W
1,200.00	1.56	284.02	1,199.67	7.19	-26.29	371,488.1888	573,673.3100	32° 1' 16.005 N	104° 5' 44.229 W
1,225.00	1.62	282.30	1,224.66	7.35	-26.97	371,488.3465	573,672.6346	32° 1' 16.006 N	104° 5' 44.237 W
1,250.00	1.64	278.54	1,249.65	7.47	-27.66	371,488.4749	573,671.9356	32° 1' 16.007 N	104° 5' 44.245 W
1,275.00	1.63	279.99	1,274.64	7.59	-28.37	371,488.5897	573,671.2316	32° 1' 16.009 N	104° 5' 44.253 W
1,300.00	1.62	278.23	1,299.63	7.70	-29.07	371,488.7020	573,670.5317	32° 1' 16.010 N	104° 5' 44.261 W
1,325.00	1.72	276.48	1,324.62	7.79	-29.79	371,488.7949	573,669.8092	32° 1' 16.011 N	104° 5' 44.270 W
1,350.00	1.67	277.45	1,349.61	7.88	-30.52	371,488.8845	573,669.0752	32° 1' 16.012 N	104° 5' 44.278 W
1,375.00	1.62	277.64	1,374.60	7.98	-31.24	371,488.9787	573,668.3637	32° 1' 16.013 N	104° 5' 44.287 W
1,400.00	1.66	275.03	1,399.59	8.06	-31.95	371,489.0574	573,667.6527	32° 1' 16.013 N	104° 5' 44.295 W
1,425.00	1.66	274.09	1,424.58	8.12	-32.67	371,489.1150	573,666.9309	32° 1' 16.014 N	104° 5' 44.303 W
1,450.00	1.70	273.72	1,449.57	8.16	-33.40	371,489.1649	573,666.1996	32° 1' 16.014 N	104° 5' 44.312 W
1,475.00	1.64	272.88	1,474.55	8.21	-34.13	371,489.2069	573,665.4723	32° 1' 16.015 N	104° 5' 44.320 W
1,500.00	1.48	270.70	1,499.55	8.23	-34.81	371,489.2289	573,664.7922	32° 1' 16.015 N	104° 5' 44.328 W
1,525.00	1.41	271.33	1,524.54	8.24	-35.44	371,489.2399	573,664.1618	32° 1' 16.015 N	104° 5' 44.335 W
1,550.00	1.10	274.86	1,549.53	8.27	-35.98	371,489.2674	573,663.6152	32° 1' 16.016 N	104° 5' 44.342 W
1,575.00	1.04	282.08	1,574.53	8.34	-36.45	371,489.3352	573,663.1543	32° 1' 16.016 N	104° 5' 44.347 W
1,600.00	1.06	282.67	1,599.52	8.43	-36.89	371,489.4334	573,662.7068	32° 1' 16.017 N	104° 5' 44.352 W
1,625.00	1.05	281.56	1,624.52	8.53	-37.34	371,489.5300	573,662.2568	32° 1' 16.018 N	104° 5' 44.358 W
1,650.00	1.00	282.60	1,649.51	8.62	-37.78	371,489.6235	573,661.8195	32° 1' 16.019 N	104° 5' 44.363 W
1,675.00	0.97	285.48	1,674.51	8.73	-38.20	371,489.7276	573,661.4026	32° 1' 16.020 N	104° 5' 44.368 W
1,700.00	0.99	283.36	1,699.51	8.83	-38.61	371,489.8340	573,660.9886	32° 1' 16.021 N	104° 5' 44.372 W



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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	0.99	283.38	1,724.50	8.93	-39.03	371,489.9339	573,660.5683	32° 1' 16.022 N	104° 5' 44.377 W
1,750.00	0.84	284.53	1,749.50	9.03	-39.42	371,490.0298	573,660.1808	32° 1' 16.023 N	104° 5' 44.382 W
1,775.00	0.48	285.38	1,774.50	9.10	-39.70	371,490.1036	573,659.9025	32° 1' 16.024 N	104° 5' 44.385 W
1,800.00	0.21	279.55	1,799.50	9.14	-39.84	371,490.1390	573,659.7563	32° 1' 16.024 N	104° 5' 44.387 W
1,825.00	0.07	226.47	1,824.50	9.14	-39.90	371,490.1360	573,659.7001	32° 1' 16.024 N	104° 5' 44.387 W
1,850.00	0.15	152.81	1,849.50	9.10	-39.90	371,490.0964	573,659.7040	32° 1' 16.024 N	104° 5' 44.387 W
1,875.00	0.27	145.96	1,874.50	9.02	-39.85	371,490.0185	573,659.7519	32° 1' 16.023 N	104° 5' 44.387 W
1,900.00	0.47	150.81	1,899.50	8.88	-39.77	371,489.8802	573,659.8349	32° 1' 16.022 N	104° 5' 44.386 W
1,925.00	0.68	149.36	1,924.50	8.66	-39.64	371,489.6630	573,659.9605	32° 1' 16.020 N	104° 5' 44.384 W
1,950.00	0.84	152.00	1,949.49	8.37	-39.48	371,489.3736	573,660.1221	32° 1' 16.017 N	104° 5' 44.382 W
1,975.00	0.80	154.86	1,974.49	8.05	-39.32	371,489.0538	573,660.2823	32° 1' 16.013 N	104° 5' 44.381 W
2,000.00	0.88	157.20	1,999.49	7.72	-39.17	371,488.7188	573,660.4308	32° 1' 16.010 N	104° 5' 44.379 W
2,025.00	0.88	152.18	2,024.49	7.37	-39.01	371,488.3720	573,660.5948	32° 1' 16.007 N	104° 5' 44.377 W
2,050.00	0.91	151.46	2,049.48	7.03	-38.82	371,488.0278	573,660.7793	32° 1' 16.003 N	104° 5' 44.375 W
2,075.00	0.98	153.91	2,074.48	6.66	-38.63	371,487.6614	573,660.9681	32° 1' 16.000 N	104° 5' 44.373 W
2,100.00	1.18	142.61	2,099.48	6.26	-38.38	371,487.2649	573,661.2185	32° 1' 15.996 N	104° 5' 44.370 W
2,125.00	1.32	141.14	2,124.47	5.84	-38.04	371,486.8362	573,661.5554	32° 1' 15.992 N	104° 5' 44.366 W
2,150.00	1.37	138.42	2,149.46	5.39	-37.67	371,486.3884	573,661.9345	32° 1' 15.987 N	104° 5' 44.361 W
2,175.00	1.41	139.18	2,174.45	4.93	-37.27	371,485.9321	573,662.3339	32° 1' 15.983 N	104° 5' 44.357 W
2,200.00	1.55	136.22	2,199.45	4.46	-36.83	371,485.4552	573,662.7689	32° 1' 15.978 N	104° 5' 44.352 W
2,225.00	1.53	135.45	2,224.44	3.97	-36.36	371,484.9732	573,663.2369	32° 1' 15.973 N	104° 5' 44.346 W
2,250.00	1.52	135.31	2,249.43	3.50	-35.90	371,484.4996	573,663.7043	32° 1' 15.968 N	104° 5' 44.341 W
2,275.00	1.40	136.03	2,274.42	3.04	-35.45	371,484.0441	573,664.1495	32° 1' 15.964 N	104° 5' 44.336 W
2,300.00	1.27	136.85	2,299.41	2.62	-35.05	371,483.6222	573,664.5510	32° 1' 15.960 N	104° 5' 44.331 W
2,325.00	1.21	139.18	2,324.41	2.22	-34.69	371,483.2203	573,664.9130	32° 1' 15.956 N	104° 5' 44.327 W
2,350.00	1.14	136.02	2,349.40	1.84	-34.34	371,482.8416	573,665.2583	32° 1' 15.952 N	104° 5' 44.323 W
2,375.00	1.06	138.35	2,374.40	1.49	-34.02	371,482.4899	573,665.5846	32° 1' 15.948 N	104° 5' 44.319 W
2,400.00	1.12	136.44	2,399.39	1.14	-33.69	371,482.1400	573,665.9067	32° 1' 15.945 N	104° 5' 44.315 W
2,425.00	1.05	138.41	2,424.39	0.79	-33.37	371,481.7916	573,666.2271	32° 1' 15.941 N	104° 5' 44.312 W
2,450.00	1.01	140.94	2,449.38	0.45	-33.08	371,481.4492	573,666.5180	32° 1' 15.938 N	104° 5' 44.308 W
2,475.00	0.95	141.78	2,474.38	0.12	-32.82	371,481.1153	573,666.7851	32° 1' 15.935 N	104° 5' 44.305 W
2,500.00	0.96	139.89	2,499.38	-0.21	-32.55	371,480.7923	573,667.0482	32° 1' 15.932 N	104° 5' 44.302 W
2,525.00	0.89	140.42	2,524.37	-0.52	-32.29	371,480.4825	573,667.3068	32° 1' 15.928 N	104° 5' 44.299 W
2,550.00	0.86	139.68	2,549.37	-0.81	-32.05	371,480.1898	573,667.5519	32° 1' 15.926 N	104° 5' 44.296 W
2,575.00	0.85	141.48	2,574.37	-1.10	-31.81	371,479.9017	573,667.7888	32° 1' 15.923 N	104° 5' 44.294 W
2,600.00	0.91	140.91	2,599.37	-1.40	-31.57	371,479.6025	573,668.0295	32° 1' 15.920 N	104° 5' 44.291 W
2,625.00	0.87	143.24	2,624.36	-1.70	-31.33	371,479.2964	573,668.2683	32° 1' 15.917 N	104° 5' 44.288 W
2,650.00	0.89	145.17	2,649.36	-2.02	-31.11	371,478.9849	573,668.4927	32° 1' 15.914 N	104° 5' 44.285 W
2,675.00	0.92	145.40	2,674.36	-2.34	-30.88	371,478.6604	573,668.7176	32° 1' 15.910 N	104° 5' 44.283 W
2,700.00	0.93	145.06	2,699.35	-2.67	-30.65	371,478.3288	573,668.9478	32° 1' 15.907 N	104° 5' 44.280 W
2,725.00	0.89	147.36	2,724.35	-3.00	-30.43	371,477.9990	573,669.1687	32° 1' 15.904 N	104° 5' 44.278 W
2,750.00	0.95	145.21	2,749.35	-3.33	-30.21	371,477.6653	573,669.3917	32° 1' 15.901 N	104° 5' 44.275 W
2,775.00	0.99	145.91	2,774.34	-3.68	-29.97	371,477.3163	573,669.6310	32° 1' 15.897 N	104° 5' 44.272 W
2,800.00	1.04	149.91	2,799.34	-4.06	-29.73	371,476.9411	573,669.8658	32° 1' 15.893 N	104° 5' 44.270 W
2,825.00	1.12	141.22	2,824.34	-4.45	-29.47	371,476.5543	573,670.1325	32° 1' 15.890 N	104° 5' 44.266 W
2,850.00	1.36	136.19	2,849.33	-4.85	-29.11	371,476.1498	573,670.4909	32° 1' 15.886 N	104° 5' 44.262 W
2,875.00	1.42	132.99	2,874.32	-5.28	-28.68	371,475.7244	573,670.9229	32° 1' 15.881 N	104° 5' 44.257 W
2,900.00	1.45	129.65	2,899.31	-5.69	-28.21	371,475.3114	573,671.3930	32° 1' 15.877 N	104° 5' 44.252 W
2,925.00	1.43	132.62	2,924.31	-6.10	-27.73	371,474.8983	573,671.8661	32° 1' 15.873 N	104° 5' 44.246 W
2,950.00	1.46	130.59	2,949.30	-6.52	-27.26	371,474.4799	573,672.3375	32° 1' 15.869 N	104° 5' 44.241 W
2,975.00	1.47	131.39	2,974.29	-6.94	-26.78	371,474.0606	573,672.8200	32° 1' 15.865 N	104° 5' 44.235 W
3,000.00	1.32	134.80	2,999.28	-7.35	-26.34	371,473.6457	573,673.2649	32° 1' 15.861 N	104° 5' 44.230 W
3,025.00	1.33	134.42	3,024.28	-7.76	-25.92	371,473.2398	573,673.6764	32° 1' 15.857 N	104° 5' 44.225 W
3,050.00	1.24	136.72	3,049.27	-8.16	-25.53	371,472.8398	573,674.0691	32° 1' 15.853 N	104° 5' 44.221 W
3,075.00	1.19	138.66	3,074.26	-8.55	-25.17	371,472.4479	573,674.4260	32° 1' 15.849 N	104° 5' 44.217 W



Integrity Directional Services, LLC

Survey Report - Geographic



Company: COG Operating L L C
Project: Eddy County, NM (NAD 27 NME)
Site: Sec. 21, T 26 S., R 28 E
Well: Graham Nash Fed Com 7H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Graham Nash Fed Com 7H
TVD Reference: KB=26' @ 3014.80ft (Patriot 2)
MD Reference: KB=26' @ 3014.80ft (Patriot 2)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
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	1.19	137.90	3,099.26	-8.94	-24.83	371,472.0604	573,674.7715	32° 1' 15.845 N	104° 5' 44.213 W
3,125.00	1.12	138.39	3,124.25	-9.31	-24.49	371,471.6851	573,675.1078	32° 1' 15.841 N	104° 5' 44.209 W
3,150.00	1.06	137.69	3,149.25	-9.67	-24.17	371,471.3314	573,675.4257	32° 1' 15.838 N	104° 5' 44.205 W
3,175.00	0.96	138.80	3,174.25	-10.00	-23.88	371,471.0028	573,675.7193	32° 1' 15.834 N	104° 5' 44.202 W
3,200.00	0.88	147.77	3,199.24	-10.32	-23.64	371,470.6828	573,675.9596	32° 1' 15.831 N	104° 5' 44.199 W
3,225.00	0.89	144.11	3,224.24	-10.64	-23.42	371,470.3632	573,676.1759	32° 1' 15.828 N	104° 5' 44.196 W
3,250.00	0.82	148.53	3,249.24	-10.95	-23.22	371,470.0533	573,676.3831	32° 1' 15.825 N	104° 5' 44.194 W
3,275.00	0.79	152.81	3,274.23	-11.25	-23.04	371,469.7474	573,676.5552	32° 1' 15.822 N	104° 5' 44.192 W
3,300.00	0.67	149.92	3,299.23	-11.53	-22.89	371,469.4676	573,676.7072	32° 1' 15.819 N	104° 5' 44.190 W
3,325.00	0.73	142.55	3,324.23	-11.79	-22.72	371,469.2147	573,676.8773	32° 1' 15.817 N	104° 5' 44.188 W
3,350.00	1.56	174.91	3,349.22	-12.25	-22.60	371,468.7493	573,677.0044	32° 1' 15.812 N	104° 5' 44.187 W
3,375.00	0.70	156.89	3,374.22	-12.73	-22.51	371,468.2699	573,677.0945	32° 1' 15.807 N	104° 5' 44.186 W
3,400.00	0.67	159.48	3,399.22	-13.01	-22.39	371,467.9925	573,677.2057	32° 1' 15.805 N	104° 5' 44.184 W
3,425.00	0.65	157.59	3,424.22	-13.28	-22.29	371,467.7245	573,677.3110	32° 1' 15.802 N	104° 5' 44.183 W
3,450.00	0.66	160.02	3,449.21	-13.54	-22.19	371,467.4581	573,677.4142	32° 1' 15.799 N	104° 5' 44.182 W
3,475.00	0.65	158.90	3,474.21	-13.81	-22.09	371,467.1905	573,677.5145	32° 1' 15.797 N	104° 5' 44.181 W
3,500.00	0.71	159.44	3,499.21	-14.09	-21.98	371,466.9132	573,677.6199	32° 1' 15.794 N	104° 5' 44.180 W
3,525.00	0.73	159.88	3,524.21	-14.38	-21.87	371,466.6186	573,677.7291	32° 1' 15.791 N	104° 5' 44.178 W
3,550.00	0.64	152.59	3,549.21	-14.65	-21.75	371,466.3451	573,677.8481	32° 1' 15.788 N	104° 5' 44.177 W
3,575.00	0.58	158.60	3,574.21	-14.90	-21.64	371,466.1034	573,677.9586	32° 1' 15.786 N	104° 5' 44.176 W
3,600.00	0.52	160.76	3,599.21	-15.12	-21.56	371,465.8785	573,678.0421	32° 1' 15.784 N	104° 5' 44.175 W
3,625.00	0.54	159.57	3,624.20	-15.34	-21.48	371,465.6609	573,678.1207	32° 1' 15.782 N	104° 5' 44.174 W
3,650.00	0.47	167.04	3,649.20	-15.55	-21.42	371,465.4506	573,678.1848	32° 1' 15.779 N	104° 5' 44.173 W
3,675.00	0.36	174.85	3,674.20	-15.73	-21.39	371,465.2725	573,678.2148	32° 1' 15.778 N	104° 5' 44.173 W
3,700.00	0.38	179.49	3,699.20	-15.89	-21.38	371,465.1114	573,678.2226	32° 1' 15.776 N	104° 5' 44.173 W
3,725.00	0.37	185.86	3,724.20	-16.05	-21.38	371,464.9482	573,678.2151	32° 1' 15.775 N	104° 5' 44.173 W
3,750.00	0.31	189.04	3,749.20	-16.20	-21.40	371,464.8011	573,678.1962	32° 1' 15.773 N	104° 5' 44.173 W
3,775.00	0.33	194.35	3,774.20	-16.34	-21.43	371,464.6645	573,678.1678	32° 1' 15.772 N	104° 5' 44.173 W
3,800.00	0.37	192.08	3,799.20	-16.48	-21.47	371,464.5158	573,678.1330	32° 1' 15.770 N	104° 5' 44.174 W
3,825.00	0.37	190.67	3,824.20	-16.64	-21.50	371,464.3576	573,678.1012	32° 1' 15.769 N	104° 5' 44.174 W
3,850.00	0.39	198.41	3,849.20	-16.80	-21.54	371,464.1975	573,678.0594	32° 1' 15.767 N	104° 5' 44.175 W
3,875.00	0.50	205.98	3,874.20	-16.98	-21.62	371,464.0187	573,677.9847	32° 1' 15.765 N	104° 5' 44.176 W
3,900.00	0.62	212.57	3,899.20	-17.19	-21.74	371,463.8067	573,677.8641	32° 1' 15.763 N	104° 5' 44.177 W
3,925.00	0.78	208.66	3,924.20	-17.46	-21.89	371,463.5434	573,677.7097	32° 1' 15.761 N	104° 5' 44.179 W
3,950.00	0.95	212.03	3,949.19	-17.78	-22.08	371,463.2184	573,677.5182	32° 1' 15.757 N	104° 5' 44.181 W
3,975.00	1.08	213.02	3,974.19	-18.15	-22.32	371,462.8451	573,677.2799	32° 1' 15.754 N	104° 5' 44.184 W
4,000.00	1.29	212.85	3,999.18	-18.59	-22.60	371,462.4112	573,676.9988	32° 1' 15.749 N	104° 5' 44.187 W
4,025.00	1.46	214.67	4,024.18	-19.09	-22.94	371,461.9128	573,676.6650	32° 1' 15.745 N	104° 5' 44.191 W
4,050.00	1.55	215.69	4,049.17	-19.62	-23.31	371,461.3763	573,676.2866	32° 1' 15.739 N	104° 5' 44.195 W
4,075.00	1.53	215.01	4,074.16	-20.17	-23.70	371,460.8283	573,675.8978	32° 1' 15.734 N	104° 5' 44.200 W
4,100.00	1.54	214.69	4,099.15	-20.72	-24.08	371,460.2787	573,675.5152	32° 1' 15.728 N	104° 5' 44.204 W
4,125.00	1.61	213.19	4,124.14	-21.29	-24.47	371,459.7086	573,675.1317	32° 1' 15.723 N	104° 5' 44.209 W
4,150.00	1.63	214.35	4,149.13	-21.88	-24.86	371,459.1211	573,674.7388	32° 1' 15.717 N	104° 5' 44.213 W
4,175.00	1.53	215.70	4,174.12	-22.44	-25.26	371,458.5565	573,674.3435	32° 1' 15.711 N	104° 5' 44.218 W
4,200.00	1.53	214.84	4,199.11	-22.99	-25.64	371,458.0116	573,673.9580	32° 1' 15.706 N	104° 5' 44.222 W
4,225.00	1.58	214.27	4,224.10	-23.55	-26.03	371,457.4528	573,673.5733	32° 1' 15.700 N	104° 5' 44.227 W
4,250.00	1.60	214.54	4,249.09	-24.12	-26.42	371,456.8805	573,673.1813	32° 1' 15.695 N	104° 5' 44.232 W
4,275.00	1.58	215.60	4,274.08	-24.69	-26.82	371,456.3128	573,672.7828	32° 1' 15.689 N	104° 5' 44.236 W
4,300.00	1.54	215.78	4,299.07	-25.24	-27.21	371,455.7600	573,672.3858	32° 1' 15.684 N	104° 5' 44.241 W
4,325.00	1.57	214.92	4,324.06	-25.79	-27.61	371,455.2066	573,671.9933	32° 1' 15.678 N	104° 5' 44.245 W
4,350.00	1.69	214.82	4,349.05	-26.38	-28.01	371,454.6232	573,671.5868	32° 1' 15.672 N	104° 5' 44.250 W
4,375.00	1.84	214.46	4,374.04	-27.01	-28.45	371,453.9896	573,671.1492	32° 1' 15.666 N	104° 5' 44.255 W
4,400.00	2.07	214.22	4,399.03	-27.71	-28.93	371,453.2853	573,670.6681	32° 1' 15.659 N	104° 5' 44.261 W
4,425.00	2.21	214.68	4,424.01	-28.48	-29.46	371,452.5156	573,670.1400	32° 1' 15.652 N	104° 5' 44.267 W
4,450.00	2.25	213.36	4,448.99	-29.29	-30.00	371,451.7093	573,669.5958	32° 1' 15.644 N	104° 5' 44.273 W



Integrity Directional Services, LLC

Survey Report - Geographic



Company: COG Operating L L C
Project: Eddy County, NM (NAD 27 NME)
Site: Sec. 21, T 26 S., R 28 E
Well: Graham Nash Fed Com 7H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Graham Nash Fed Com 7H
TV D Reference: KB=26' @ 3014.80ft (Patriot 2)
MD Reference: KB=26' @ 3014.80ft (Patriot 2)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
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	2.22	214.15	4,473.97	-30.10	-30.55	371,450.8987	573,669.0542	32° 1' 15.636 N	104° 5' 44.280 W
4,500.00	2.23	212.54	4,498.95	-30.91	-31.08	371,450.0880	573,668.5207	32° 1' 15.628 N	104° 5' 44.286 W
4,525.00	2.30	213.57	4,523.93	-31.74	-31.62	371,449.2600	573,667.9817	32° 1' 15.619 N	104° 5' 44.292 W
4,550.00	2.24	211.54	4,548.91	-32.57	-32.15	371,448.4256	573,667.4487	32° 1' 15.611 N	104° 5' 44.298 W
4,575.00	2.27	211.62	4,573.90	-33.41	-32.67	371,447.5876	573,666.9336	32° 1' 15.603 N	104° 5' 44.304 W
4,600.00	2.28	211.24	4,598.88	-34.26	-33.18	371,446.7408	573,666.4161	32° 1' 15.595 N	104° 5' 44.310 W
4,625.00	2.29	210.75	4,623.86	-35.11	-33.70	371,445.8864	573,665.9028	32° 1' 15.586 N	104° 5' 44.316 W
4,650.00	2.29	211.72	4,648.84	-35.97	-34.22	371,445.0323	573,665.3849	32° 1' 15.578 N	104° 5' 44.322 W
4,675.00	2.21	210.82	4,673.82	-36.81	-34.72	371,444.1935	573,664.8753	32° 1' 15.569 N	104° 5' 44.328 W
4,700.00	2.22	210.35	4,698.80	-37.64	-35.22	371,443.3617	573,664.3837	32° 1' 15.561 N	104° 5' 44.334 W
4,725.00	2.16	209.41	4,723.78	-38.47	-35.69	371,442.5334	573,663.9077	32° 1' 15.553 N	104° 5' 44.340 W
4,750.00	2.06	209.29	4,748.76	-39.27	-36.14	371,441.7311	573,663.4565	32° 1' 15.545 N	104° 5' 44.345 W
4,775.00	1.98	210.62	4,773.75	-40.03	-36.58	371,440.9676	573,663.0167	32° 1' 15.538 N	104° 5' 44.350 W
4,800.00	1.91	208.91	4,798.73	-40.77	-37.00	371,440.2312	573,662.5953	32° 1' 15.530 N	104° 5' 44.355 W
4,825.00	1.84	206.53	4,823.72	-41.49	-37.39	371,439.5074	573,662.2146	32° 1' 15.523 N	104° 5' 44.359 W
4,850.00	1.79	206.62	4,848.71	-42.20	-37.74	371,438.7993	573,661.8604	32° 1' 15.516 N	104° 5' 44.363 W
4,875.00	1.75	206.04	4,873.69	-42.89	-38.08	371,438.1072	573,661.5179	32° 1' 15.509 N	104° 5' 44.367 W
4,900.00	1.61	204.03	4,898.68	-43.56	-38.39	371,437.4435	573,661.2073	32° 1' 15.503 N	104° 5' 44.371 W
4,925.00	1.53	201.80	4,923.67	-44.19	-38.66	371,436.8128	573,660.9403	32° 1' 15.496 N	104° 5' 44.374 W
4,950.00	1.45	197.51	4,948.67	-44.80	-38.88	371,436.2013	573,660.7212	32° 1' 15.490 N	104° 5' 44.377 W
4,975.00	1.48	195.73	4,973.66	-45.41	-39.06	371,435.5889	573,660.5385	32° 1' 15.484 N	104° 5' 44.379 W
5,000.00	1.44	195.62	4,998.65	-46.02	-39.23	371,434.9756	573,660.3664	32° 1' 15.478 N	104° 5' 44.381 W
5,025.00	1.47	197.16	5,023.64	-46.63	-39.41	371,434.3667	573,660.1872	32° 1' 15.472 N	104° 5' 44.383 W
5,050.00	1.44	195.65	5,048.63	-47.24	-39.59	371,433.7578	573,660.0079	32° 1' 15.466 N	104° 5' 44.385 W
5,075.00	1.49	196.71	5,073.63	-47.86	-39.77	371,433.1440	573,659.8297	32° 1' 15.460 N	104° 5' 44.387 W
5,100.00	1.43	196.83	5,098.62	-48.47	-39.95	371,432.5341	573,659.6459	32° 1' 15.454 N	104° 5' 44.389 W
5,125.00	1.41	197.21	5,123.61	-49.06	-40.14	371,431.9417	573,659.4646	32° 1' 15.448 N	104° 5' 44.391 W
5,150.00	1.43	199.04	5,148.60	-49.65	-40.33	371,431.3530	573,659.2718	32° 1' 15.442 N	104° 5' 44.394 W
5,175.00	1.43	200.99	5,173.59	-50.23	-40.54	371,430.7669	573,659.0583	32° 1' 15.437 N	104° 5' 44.396 W
5,200.00	1.46	201.25	5,198.59	-50.82	-40.77	371,430.1788	573,658.8311	32° 1' 15.431 N	104° 5' 44.399 W
5,225.00	1.38	201.05	5,223.58	-51.40	-40.99	371,429.6011	573,658.6076	32° 1' 15.425 N	104° 5' 44.402 W
5,250.00	1.40	202.66	5,248.57	-51.96	-41.22	371,429.0383	573,658.3818	32° 1' 15.420 N	104° 5' 44.404 W
5,275.00	1.39	204.54	5,273.56	-52.52	-41.46	371,428.4806	573,658.1382	32° 1' 15.414 N	104° 5' 44.407 W
5,300.00	1.34	203.78	5,298.56	-53.06	-41.71	371,427.9373	573,657.8944	32° 1' 15.409 N	104° 5' 44.410 W
5,325.00	1.40	204.35	5,323.55	-53.61	-41.95	371,427.3916	573,657.6506	32° 1' 15.403 N	104° 5' 44.413 W
5,350.00	1.40	204.13	5,348.54	-54.17	-42.20	371,426.8346	573,657.3998	32° 1' 15.398 N	104° 5' 44.416 W
5,375.00	1.38	204.56	5,373.53	-54.72	-42.45	371,426.2821	573,657.1498	32° 1' 15.392 N	104° 5' 44.419 W
5,400.00	1.41	203.42	5,398.53	-55.27	-42.70	371,425.7260	573,656.9025	32° 1' 15.387 N	104° 5' 44.421 W
5,425.00	1.50	201.53	5,423.52	-55.86	-42.94	371,425.1394	573,656.6601	32° 1' 15.381 N	104° 5' 44.424 W
5,450.00	1.49	203.59	5,448.51	-56.46	-43.19	371,424.5372	573,656.4100	32° 1' 15.375 N	104° 5' 44.427 W
5,475.00	1.46	201.19	5,473.50	-57.06	-43.44	371,423.9424	573,656.1648	32° 1' 15.369 N	104° 5' 44.430 W
5,500.00	1.54	198.33	5,498.49	-57.67	-43.66	371,423.3265	573,655.9440	32° 1' 15.363 N	104° 5' 44.433 W
5,525.00	1.54	198.65	5,523.48	-58.31	-43.87	371,422.6893	573,655.7309	32° 1' 15.357 N	104° 5' 44.435 W
5,550.00	1.55	198.95	5,548.48	-58.95	-44.09	371,422.0512	573,655.5137	32° 1' 15.350 N	104° 5' 44.438 W
5,575.00	1.59	199.63	5,573.47	-59.60	-44.31	371,421.4048	573,655.2874	32° 1' 15.344 N	104° 5' 44.440 W
5,600.00	1.63	199.34	5,598.46	-60.26	-44.55	371,420.7426	573,655.0531	32° 1' 15.338 N	104° 5' 44.443 W
5,625.00	1.62	201.37	5,623.45	-60.92	-44.79	371,420.0780	573,654.8066	32° 1' 15.331 N	104° 5' 44.446 W
5,650.00	1.60	200.49	5,648.44	-61.58	-45.04	371,419.4220	573,654.5557	32° 1' 15.324 N	104° 5' 44.449 W
5,675.00	1.56	201.71	5,673.43	-62.22	-45.29	371,418.7789	573,654.3076	32° 1' 15.318 N	104° 5' 44.452 W
5,700.00	1.60	201.52	5,698.42	-62.86	-45.55	371,418.1380	573,654.0537	32° 1' 15.312 N	104° 5' 44.455 W
5,725.00	1.60	205.59	5,723.41	-63.50	-45.83	371,417.4986	573,653.7749	32° 1' 15.305 N	104° 5' 44.458 W
5,750.00	1.63	203.87	5,748.40	-64.14	-46.12	371,416.8586	573,653.4803	32° 1' 15.299 N	104° 5' 44.461 W
5,775.00	1.58	203.63	5,773.39	-64.78	-46.40	371,416.2177	573,653.1982	32° 1' 15.293 N	104° 5' 44.465 W
5,800.00	1.58	203.56	5,798.38	-65.41	-46.68	371,415.5860	573,652.9223	32° 1' 15.287 N	104° 5' 44.468 W
5,825.00	1.59	203.64	5,823.37	-66.05	-46.95	371,414.9524	573,652.6455	32° 1' 15.280 N	104° 5' 44.471 W



Integrity Directional Services, LLC

Survey Report - Geographic



Company: COG Operating L L C
Project: Eddy County, NM (NAD 27 NME)
Site: Sec. 21, T 26 S., R 28 E
Well: Graham Nash Fed Com 7H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Graham Nash Fed Com 7H
TVD Reference: KB=26' @ 3014.80ft (Patriot 2)
MD Reference: KB=26' @ 3014.80ft (Patriot 2)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
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	1.66	205.63	5,848.36	-66.69	-47.25	371,414.3082	573,652.3498	32° 1' 15.274 N	104° 5' 44.475 W	
5,875.00	1.57	203.26	5,873.35	-67.33	-47.54	371,413.6670	573,652.0579	32° 1' 15.268 N	104° 5' 44.478 W	
5,900.00	1.63	203.47	5,898.34	-67.97	-47.82	371,413.0263	573,651.7811	32° 1' 15.261 N	104° 5' 44.481 W	
5,925.00	1.61	203.29	5,923.33	-68.62	-48.10	371,412.3775	573,651.5006	32° 1' 15.255 N	104° 5' 44.485 W	
5,950.00	1.52	202.88	5,948.32	-69.25	-48.37	371,411.7495	573,651.2328	32° 1' 15.249 N	104° 5' 44.488 W	
5,975.00	1.61	201.35	5,973.31	-69.88	-48.62	371,411.1169	573,650.9760	32° 1' 15.242 N	104° 5' 44.491 W	
6,000.00	1.54	200.34	5,998.30	-70.53	-48.87	371,410.4748	573,650.7314	32° 1' 15.236 N	104° 5' 44.493 W	
6,025.00	1.52	200.85	6,023.29	-71.15	-49.10	371,409.8499	573,650.4966	32° 1' 15.230 N	104° 5' 44.496 W	
6,050.00	1.54	199.48	6,048.28	-71.78	-49.33	371,409.2234	573,650.2666	32° 1' 15.224 N	104° 5' 44.499 W	
6,075.00	1.60	194.88	6,073.27	-72.43	-49.54	371,408.5694	573,650.0649	32° 1' 15.217 N	104° 5' 44.501 W	
6,100.00	1.76	186.11	6,098.26	-73.15	-49.67	371,407.8503	573,649.9344	32° 1' 15.210 N	104° 5' 44.503 W	
6,125.00	2.05	172.45	6,123.25	-73.97	-49.65	371,407.0253	573,649.9523	32° 1' 15.202 N	104° 5' 44.503 W	
6,150.00	2.22	170.63	6,148.23	-74.90	-49.51	371,406.1043	573,650.0899	32° 1' 15.193 N	104° 5' 44.501 W	
6,175.00	2.18	169.44	6,173.21	-75.84	-49.34	371,405.1591	573,650.2559	32° 1' 15.183 N	104° 5' 44.499 W	
6,200.00	2.21	168.05	6,198.20	-76.78	-49.16	371,404.2201	573,650.4428	32° 1' 15.174 N	104° 5' 44.497 W	
6,225.00	2.14	169.29	6,223.18	-77.71	-48.97	371,403.2899	573,650.6294	32° 1' 15.165 N	104° 5' 44.495 W	
6,250.00	1.66	169.00	6,248.16	-78.52	-48.81	371,402.4758	573,650.7852	32° 1' 15.157 N	104° 5' 44.493 W	
6,275.00	1.18	170.07	6,273.16	-79.13	-48.70	371,401.8668	573,650.8987	32° 1' 15.151 N	104° 5' 44.492 W	
6,300.00	1.07	172.84	6,298.15	-79.62	-48.63	371,401.3816	573,650.9722	32° 1' 15.146 N	104° 5' 44.491 W	
6,325.00	0.86	181.36	6,323.15	-80.04	-48.60	371,400.9624	573,650.9968	32° 1' 15.142 N	104° 5' 44.491 W	
6,350.00	0.69	191.96	6,348.15	-80.37	-48.64	371,400.6276	573,650.9612	32° 1' 15.139 N	104° 5' 44.491 W	
6,375.00	0.55	205.09	6,373.14	-80.63	-48.72	371,400.3717	573,650.8791	32° 1' 15.136 N	104° 5' 44.492 W	
6,400.00	0.49	222.62	6,398.14	-80.82	-48.84	371,400.1843	573,650.7558	32° 1' 15.134 N	104° 5' 44.493 W	
6,425.00	0.47	246.89	6,423.14	-80.93	-49.01	371,400.0654	573,650.5891	32° 1' 15.133 N	104° 5' 44.495 W	
6,450.00	0.53	263.63	6,448.14	-80.99	-49.22	371,400.0124	573,650.3799	32° 1' 15.132 N	104° 5' 44.498 W	
6,475.00	0.55	269.91	6,473.14	-81.00	-49.46	371,399.9993	573,650.1450	32° 1' 15.132 N	104° 5' 44.501 W	
6,500.00	0.57	272.12	6,498.14	-81.00	-49.70	371,400.0038	573,649.9008	32° 1' 15.132 N	104° 5' 44.503 W	
6,525.00	0.65	274.09	6,523.14	-80.98	-49.97	371,400.0185	573,649.6351	32° 1' 15.133 N	104° 5' 44.506 W	
6,550.00	0.72	275.91	6,548.14	-80.96	-50.26	371,400.0448	573,649.3374	32° 1' 15.133 N	104° 5' 44.510 W	
6,575.00	0.71	276.48	6,573.13	-80.92	-50.57	371,400.0784	573,649.0272	32° 1' 15.133 N	104° 5' 44.514 W	
6,600.00	0.76	273.32	6,598.13	-80.89	-50.89	371,400.1055	573,648.7078	32° 1' 15.133 N	104° 5' 44.517 W	
6,625.00	0.72	269.10	6,623.13	-80.89	-51.21	371,400.1126	573,648.3852	32° 1' 15.134 N	104° 5' 44.521 W	
6,650.00	0.70	269.86	6,648.13	-80.89	-51.52	371,400.1098	573,648.0755	32° 1' 15.133 N	104° 5' 44.525 W	
6,675.00	0.73	261.70	6,673.13	-80.91	-51.83	371,400.0864	573,647.7652	32° 1' 15.133 N	104° 5' 44.528 W	
6,700.00	0.69	251.73	6,698.12	-80.98	-52.14	371,400.0162	573,647.4646	32° 1' 15.133 N	104° 5' 44.532 W	
6,725.00	0.59	241.18	6,723.12	-81.09	-52.39	371,399.9070	573,647.2089	32° 1' 15.132 N	104° 5' 44.535 W	
6,750.00	0.49	211.01	6,748.12	-81.25	-52.56	371,399.7533	573,647.0411	32° 1' 15.130 N	104° 5' 44.537 W	
6,775.00	0.54	195.64	6,773.12	-81.45	-52.65	371,399.5483	573,646.9542	32° 1' 15.128 N	104° 5' 44.538 W	
6,800.00	0.60	187.67	6,798.12	-81.70	-52.70	371,399.3051	573,646.9050	32° 1' 15.126 N	104° 5' 44.538 W	
6,825.00	0.63	182.85	6,823.12	-81.96	-52.72	371,399.0381	573,646.8807	32° 1' 15.123 N	104° 5' 44.539 W	
6,850.00	0.95	184.06	6,848.12	-82.31	-52.74	371,398.6941	573,646.8592	32° 1' 15.120 N	104° 5' 44.539 W	
6,875.00	1.18	178.58	6,873.11	-82.77	-52.75	371,398.2300	573,646.8509	32° 1' 15.115 N	104° 5' 44.539 W	
6,900.00	1.47	178.66	6,898.10	-83.35	-52.74	371,397.6521	573,646.8648	32° 1' 15.109 N	104° 5' 44.539 W	
6,925.00	1.62	172.78	6,923.09	-84.02	-52.68	371,396.9810	573,646.9167	32° 1' 15.103 N	104° 5' 44.538 W	
6,950.00	1.74	171.92	6,948.08	-84.75	-52.59	371,396.2546	573,647.0144	32° 1' 15.095 N	104° 5' 44.537 W	
6,975.00	1.80	171.98	6,973.07	-85.51	-52.48	371,395.4900	573,647.1226	32° 1' 15.088 N	104° 5' 44.536 W	
7,000.00	1.31	170.56	6,998.06	-86.18	-52.38	371,394.8193	573,647.2242	32° 1' 15.081 N	104° 5' 44.535 W	
7,025.00	0.79	167.07	7,023.06	-86.63	-52.29	371,394.3694	573,647.3097	32° 1' 15.077 N	104° 5' 44.534 W	
7,050.00	0.53	156.15	7,048.06	-86.90	-52.21	371,394.0957	573,647.3950	32° 1' 15.074 N	104° 5' 44.533 W	
7,075.00	0.52	152.64	7,073.06	-87.11	-52.11	371,393.8892	573,647.4939	32° 1' 15.072 N	104° 5' 44.532 W	
7,100.00	0.48	144.25	7,098.05	-87.30	-51.99	371,393.7035	573,647.6072	32° 1' 15.070 N	104° 5' 44.530 W	
7,125.00	0.50	135.38	7,123.05	-87.46	-51.86	371,393.5408	573,647.7450	32° 1' 15.068 N	104° 5' 44.529 W	
7,150.00	0.51	133.92	7,148.05	-87.61	-51.70	371,393.3860	573,647.9017	32° 1' 15.067 N	104° 5' 44.527 W	
7,175.00	0.54	129.46	7,173.05	-87.77	-51.53	371,393.2340	573,648.0728	32° 1' 15.065 N	104° 5' 44.525 W	
7,200.00	0.57	123.28	7,198.05	-87.91	-51.33	371,393.0909	573,648.2678	32° 1' 15.064 N	104° 5' 44.523 W	



Integrity Directional Services, LLC

Survey Report - Geographic



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Project: Eddy County, NM (NAD 27 NME)
Site: Sec. 21, T 26 S., R 28 E
Well: Graham Nash Fed Com 7H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Graham Nash Fed Com 7H
TVD Reference: KB=26' @ 3014.80ft (Patriot 2)
MD Reference: KB=26' @ 3014.80ft (Patriot 2)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
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	0.74	133.38	7,223.05	-88.09	-51.11	371,392.9117	573,648.4891	32° 1' 15.062 N	104° 5' 44.520 W
7,244.00	0.67	138.89	7,242.05	-88.26	-50.95	371,392.7438	573,648.6513	32° 1' 15.061 N	104° 5' 44.518 W
7,349.00	0.00	349.20	7,347.05	-88.72	-50.55	371,392.2812	573,649.0549	32° 1' 15.056 N	104° 5' 44.513 W
First IDS MWD Survey									
7,380.00	1.60	142.90	7,378.04	-89.06	-50.28	371,391.9360	573,649.3160	32° 1' 15.053 N	104° 5' 44.510 W
7,412.00	4.80	141.10	7,409.99	-90.46	-49.17	371,390.5374	573,650.4265	32° 1' 15.039 N	104° 5' 44.498 W
7,443.00	8.90	140.30	7,440.76	-93.32	-46.83	371,387.6818	573,652.7738	32° 1' 15.010 N	104° 5' 44.470 W
7,475.00	12.20	140.90	7,472.21	-97.85	-43.11	371,383.1520	573,656.4884	32° 1' 14.965 N	104° 5' 44.427 W
7,506.00	14.80	143.00	7,502.36	-103.55	-38.66	371,377.4469	573,660.9378	32° 1' 14.909 N	104° 5' 44.376 W
7,538.00	17.10	147.50	7,533.12	-110.79	-33.67	371,370.2137	573,665.9262	32° 1' 14.837 N	104° 5' 44.318 W
7,569.00	21.20	147.30	7,562.40	-119.35	-28.19	371,361.6494	573,671.4054	32° 1' 14.752 N	104° 5' 44.255 W
7,601.00	25.00	146.60	7,591.83	-129.87	-21.34	371,351.1314	573,678.2561	32° 1' 14.648 N	104° 5' 44.175 W
7,632.00	28.80	147.90	7,619.47	-141.67	-13.77	371,339.3326	573,685.8329	32° 1' 14.531 N	104° 5' 44.088 W
7,664.00	32.00	147.10	7,647.07	-155.32	-5.06	371,325.6805	573,694.5367	32° 1' 14.396 N	104° 5' 43.987 W
7,695.00	36.00	145.40	7,672.76	-169.72	4.58	371,311.2786	573,704.1757	32° 1' 14.253 N	104° 5' 43.875 W
7,726.00	40.30	144.50	7,697.14	-185.39	15.58	371,295.6101	573,715.1761	32° 1' 14.098 N	104° 5' 43.748 W
7,758.00	44.00	143.90	7,720.86	-202.80	28.14	371,278.1986	573,727.7386	32° 1' 13.925 N	104° 5' 43.602 W
7,789.00	46.40	146.00	7,742.70	-220.81	40.76	371,260.1895	573,740.3619	32° 1' 13.747 N	104° 5' 43.456 W
7,821.00	49.30	146.30	7,764.17	-240.51	53.97	371,240.4878	573,753.5743	32° 1' 13.551 N	104° 5' 43.303 W
7,852.00	53.50	146.20	7,783.51	-260.65	67.43	371,220.3485	573,767.0316	32° 1' 13.352 N	104° 5' 43.147 W
7,884.00	57.80	145.50	7,801.56	-282.51	82.26	371,198.4923	573,781.8622	32° 1' 13.135 N	104° 5' 42.976 W
7,915.00	61.50	144.40	7,817.22	-304.40	97.63	371,176.5992	573,797.2263	32° 1' 12.918 N	104° 5' 42.798 W
7,946.00	65.30	145.30	7,831.10	-327.06	113.58	371,153.9375	573,813.1784	32° 1' 12.694 N	104° 5' 42.613 W
7,978.00	69.10	148.80	7,843.50	-351.81	129.61	371,129.1858	573,829.2067	32° 1' 12.448 N	104° 5' 42.428 W
8,009.00	73.60	151.80	7,853.41	-377.32	144.15	371,103.6772	573,843.7448	32° 1' 12.196 N	104° 5' 42.259 W
8,041.00	78.10	154.00	7,861.24	-404.94	158.27	371,076.0611	573,857.8700	32° 1' 11.922 N	104° 5' 42.096 W
8,072.00	80.60	153.40	7,866.96	-432.25	171.77	371,048.7514	573,871.3681	32° 1' 11.651 N	104° 5' 41.940 W
8,103.00	82.90	151.90	7,871.41	-459.50	185.86	371,021.5049	573,885.4625	32° 1' 11.381 N	104° 5' 41.777 W
8,135.00	85.20	152.70	7,874.73	-487.67	200.66	370,993.3269	573,900.2558	32° 1' 11.102 N	104° 5' 41.606 W
8,167.00	87.60	153.00	7,876.74	-516.09	215.23	370,964.9111	573,914.8280	32° 1' 10.821 N	104° 5' 41.437 W
8,198.00	88.40	152.90	7,877.82	-543.68	229.32	370,937.3193	573,928.9171	32° 1' 10.547 N	104° 5' 41.274 W
8,292.00	88.70	154.70	7,880.20	-627.99	270.80	370,853.0077	573,970.4034	32° 1' 9.712 N	104° 5' 40.795 W
8,386.00	88.70	157.10	7,882.33	-713.77	309.17	370,767.2298	574,008.7737	32° 1' 8.862 N	104° 5' 40.351 W
8,480.00	85.80	161.20	7,886.84	-801.49	342.59	370,679.5163	574,042.1850	32° 1' 7.993 N	104° 5' 39.965 W
8,574.00	85.80	165.50	7,893.73	-891.28	369.44	370,589.7208	574,069.0395	32° 1' 7.104 N	104° 5' 39.656 W
8,669.00	88.30	169.30	7,898.62	-983.85	390.13	370,497.1554	574,089.7267	32° 1' 6.188 N	104° 5' 39.418 W
8,763.00	91.10	172.10	7,899.11	-1,076.59	405.31	370,404.4108	574,104.9139	32° 1' 5.269 N	104° 5' 39.244 W
8,857.00	90.60	175.20	7,897.72	-1,169.99	415.71	370,311.0097	574,115.3079	32° 1' 4.345 N	104° 5' 39.125 W
8,988.00	91.40	179.80	7,895.43	-1,300.81	421.42	370,180.1908	574,121.0202	32° 1' 3.050 N	104° 5' 39.062 W
9,082.00	92.00	180.40	7,892.64	-1,394.77	421.26	370,086.2334	574,120.8563	32° 1' 2.120 N	104° 5' 39.067 W
9,177.00	92.00	180.60	7,889.33	-1,489.71	420.43	369,991.2952	574,120.0277	32° 1' 1.181 N	104° 5' 39.079 W
9,271.00	91.30	180.30	7,886.62	-1,583.67	419.69	369,897.3379	574,119.2898	32° 1' 0.251 N	104° 5' 39.090 W
9,366.00	92.00	181.10	7,883.89	-1,678.62	418.53	369,802.3859	574,118.1298	32° 0' 59.311 N	104° 5' 39.106 W
9,461.00	90.80	180.10	7,881.56	-1,773.58	417.54	369,707.4226	574,117.1356	32° 0' 58.371 N	104° 5' 39.120 W
9,555.00	89.50	180.60	7,881.32	-1,867.58	416.96	369,613.4272	574,116.5614	32° 0' 57.441 N	104° 5' 39.129 W
9,649.00	90.20	181.00	7,881.56	-1,961.57	415.65	369,519.4377	574,115.2489	32° 0' 56.511 N	104° 5' 39.146 W
9,744.00	88.30	180.50	7,882.81	-2,056.55	414.41	369,424.4588	574,114.0055	32° 0' 55.571 N	104° 5' 39.163 W
9,839.00	88.70	180.90	7,885.29	-2,151.51	413.25	369,329.4990	574,112.8452	32° 0' 54.631 N	104° 5' 39.179 W
9,933.00	87.60	180.30	7,888.33	-2,245.45	412.26	369,235.5552	574,111.8613	32° 0' 53.702 N	104° 5' 39.193 W
10,027.00	88.90	179.50	7,891.20	-2,339.40	412.43	369,141.6021	574,112.0255	32° 0' 52.772 N	104° 5' 39.194 W
10,122.00	91.90	179.00	7,890.54	-2,434.38	413.67	369,046.6239	574,113.2687	32° 0' 51.832 N	104° 5' 39.182 W
10,216.00	92.90	179.30	7,886.60	-2,528.29	415.06	368,952.7182	574,114.6621	32° 0' 50.902 N	104° 5' 39.168 W
10,310.00	91.10	179.10	7,883.32	-2,622.22	416.37	368,858.7887	574,115.9737	32° 0' 49.973 N	104° 5' 39.155 W
10,405.00	91.00	179.40	7,881.58	-2,717.19	417.62	368,763.8131	574,117.2170	32° 0' 49.033 N	104° 5' 39.143 W
10,499.00	91.60	180.20	7,879.45	-2,811.17	417.95	368,669.8393	574,117.5451	32° 0' 48.103 N	104° 5' 39.142 W



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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,593.00	90.00	180.00	7,878.13	-2,905.15	417.78	368,575.8519	574,117.3811	32° 0' 47.173 N	104° 5' 39.146 W
10,688.00	90.20	180.30	7,877.97	-3,000.15	417.53	368,480.8527	574,117.1324	32° 0' 46.232 N	104° 5' 39.151 W
10,782.00	90.40	180.80	7,877.48	-3,094.15	416.63	368,386.8588	574,116.2301	32° 0' 45.302 N	104° 5' 39.164 W
10,877.00	90.50	181.00	7,876.73	-3,189.13	415.14	368,291.8737	574,114.7380	32° 0' 44.362 N	104° 5' 39.184 W
10,971.00	90.90	181.00	7,875.58	-3,283.11	413.50	368,197.8954	574,113.0976	32° 0' 43.432 N	104° 5' 39.205 W
11,066.00	91.20	181.30	7,873.84	-3,378.08	411.59	368,102.9309	574,111.1913	32° 0' 42.492 N	104° 5' 39.230 W
11,160.00	90.00	180.50	7,872.86	-3,472.06	410.12	368,008.9503	574,109.7150	32° 0' 41.562 N	104° 5' 39.250 W
11,254.00	90.20	180.70	7,872.69	-3,566.05	409.13	367,914.9559	574,108.7306	32° 0' 40.632 N	104° 5' 39.263 W
11,349.00	89.10	179.70	7,873.27	-3,661.05	408.80	367,819.9611	574,108.3990	32° 0' 39.692 N	104° 5' 39.270 W
11,443.00	89.50	180.00	7,874.42	-3,755.04	409.05	367,725.9689	574,108.6451	32° 0' 38.762 N	104° 5' 39.269 W
11,538.00	90.20	180.40	7,874.67	-3,850.04	408.71	367,630.9708	574,108.3135	32° 0' 37.822 N	104° 5' 39.275 W
11,632.00	90.80	180.80	7,873.85	-3,944.03	407.73	367,536.9804	574,107.3292	32° 0' 36.892 N	104° 5' 39.289 W
11,727.00	89.70	180.10	7,873.43	-4,039.02	406.98	367,441.9864	574,106.5831	32° 0' 35.951 N	104° 5' 39.300 W
11,821.00	90.30	180.50	7,873.43	-4,133.02	406.49	367,347.9885	574,106.0909	32° 0' 35.021 N	104° 5' 39.309 W
11,916.00	90.60	180.80	7,872.69	-4,228.01	405.41	367,252.9980	574,105.0132	32° 0' 34.081 N	104° 5' 39.324 W
12,010.00	90.90	181.30	7,871.46	-4,321.99	403.69	367,159.0224	574,103.2909	32° 0' 33.151 N	104° 5' 39.346 W
12,105.00	89.90	180.30	7,870.79	-4,416.97	402.37	367,064.0366	574,101.9646	32° 0' 32.211 N	104° 5' 39.364 W
12,199.00	90.20	180.50	7,870.71	-4,510.97	401.71	366,970.0392	574,101.3083	32° 0' 31.281 N	104° 5' 39.374 W
12,293.00	90.70	180.70	7,869.97	-4,604.96	400.72	366,876.0478	574,100.3240	32° 0' 30.351 N	104° 5' 39.388 W
12,388.00	90.60	179.80	7,868.90	-4,699.95	400.31	366,781.0560	574,099.9096	32° 0' 29.411 N	104° 5' 39.395 W
12,483.00	90.90	179.80	7,867.65	-4,794.94	400.64	366,686.0650	574,100.2411	32° 0' 28.470 N	104° 5' 39.394 W
12,577.00	91.50	180.10	7,865.68	-4,888.92	400.72	366,592.0864	574,100.3232	32° 0' 27.540 N	104° 5' 39.395 W
12,671.00	89.90	179.40	7,864.54	-4,982.91	401.13	366,498.0981	574,100.7334	32° 0' 26.610 N	104° 5' 39.393 W
12,765.00	88.20	178.10	7,866.09	-5,076.87	403.18	366,404.1391	574,102.7833	32° 0' 25.680 N	104° 5' 39.371 W
12,860.00	88.10	177.90	7,869.16	-5,171.76	406.50	366,309.2467	574,106.0970	32° 0' 24.741 N	104° 5' 39.335 W
12,954.00	89.10	178.50	7,871.46	-5,265.69	409.45	366,215.3229	574,109.0486	32° 0' 23.812 N	104° 5' 39.303 W
13,048.00	89.50	178.70	7,872.61	-5,359.65	411.75	366,121.3585	574,111.3450	32° 0' 22.882 N	104° 5' 39.279 W
13,143.00	89.50	178.70	7,873.44	-5,454.62	413.90	366,026.3868	574,113.5002	32° 0' 21.942 N	104° 5' 39.256 W
13,237.00	90.20	178.70	7,873.68	-5,548.60	416.03	365,932.4121	574,115.6328	32° 0' 21.012 N	104° 5' 39.234 W
13,332.00	90.70	179.10	7,872.94	-5,643.58	417.86	365,837.4332	574,117.4565	32° 0' 20.071 N	104° 5' 39.215 W
13,426.00	91.00	179.10	7,871.54	-5,737.56	419.33	365,743.4554	574,118.9328	32° 0' 19.141 N	104° 5' 39.201 W
13,521.00	91.40	179.50	7,869.55	-5,832.53	420.49	365,648.4839	574,120.0932	32° 0' 18.201 N	104° 5' 39.190 W
13,615.00	91.10	179.70	7,867.50	-5,926.50	421.15	365,554.5089	574,120.7493	32° 0' 17.271 N	104° 5' 39.184 W
13,710.00	91.30	179.90	7,865.51	-6,021.48	421.48	365,459.5306	574,121.0808	32° 0' 16.331 N	104° 5' 39.183 W
13,804.00	89.70	179.00	7,864.69	-6,115.47	422.38	365,365.5427	574,121.9832	32° 0' 15.401 N	104° 5' 39.175 W
13,899.00	89.20	178.70	7,865.60	-6,210.45	424.29	365,270.5668	574,123.8897	32° 0' 14.461 N	104° 5' 39.155 W
13,993.00	89.10	178.60	7,867.00	-6,304.41	426.50	365,176.6035	574,126.1041	32° 0' 13.531 N	104° 5' 39.132 W
14,088.00	89.70	179.20	7,867.99	-6,399.39	428.33	365,081.6272	574,127.9277	32° 0' 12.591 N	104° 5' 39.113 W
14,182.00	90.20	179.40	7,868.07	-6,493.38	429.48	364,987.6348	574,129.0761	32° 0' 11.661 N	104° 5' 39.102 W
14,277.00	90.60	179.70	7,867.41	-6,588.37	430.22	364,892.6406	574,129.8222	32° 0' 10.721 N	104° 5' 39.096 W
14,371.00	91.20	180.00	7,865.93	-6,682.36	430.47	364,798.6532	574,130.0683	32° 0' 9.791 N	104° 5' 39.096 W
14,466.00	91.30	180.40	7,863.86	-6,777.34	430.14	364,703.6768	574,129.7367	32° 0' 8.851 N	104° 5' 39.102 W
14,560.00	90.10	181.40	7,862.71	-6,871.32	428.66	364,609.6985	574,128.2603	32° 0' 7.921 N	104° 5' 39.121 W
14,655.00	90.30	181.70	7,862.38	-6,966.28	426.09	364,514.7342	574,125.6906	32° 0' 6.981 N	104° 5' 39.154 W
14,749.00	90.70	182.30	7,861.56	-7,060.22	422.81	364,420.7958	574,122.4103	32° 0' 6.051 N	104° 5' 39.194 W
14,843.00	91.00	182.60	7,860.17	-7,154.12	418.79	364,326.8925	574,118.3925	32° 0' 5.122 N	104° 5' 39.243 W
14,938.00	90.30	182.80	7,859.09	-7,249.01	414.32	364,232.0049	574,113.9177	32° 0' 4.183 N	104° 5' 39.298 W
15,032.00	90.90	183.00	7,858.11	-7,342.88	409.56	364,138.1311	574,109.1622	32° 0' 3.254 N	104° 5' 39.355 W
15,127.00	91.90	183.00	7,855.78	-7,437.72	404.59	364,043.2910	574,104.1919	32° 0' 2.316 N	104° 5' 39.416 W
Final IDS MWD Survey									
15,157.00	92.00	182.40	7,854.76	-7,467.67	403.18	364,013.3418	574,102.7795	32° 0' 2.019 N	104° 5' 39.433 W
15,208.00	92.00	182.40	7,852.98	-7,518.60	401.05	363,962.4177	574,100.6452	32° 0' 1.515 N	104° 5' 39.459 W

Projection to TD



Integrity Directional Services, LLC
Survey Report - Geographic



Company: COG Operating L L C
Project: Eddy County, NM (NAD 27 NME)
Site: Sec. 21, T 26 S. , R 28 E
Well: Graham Nash Fed Com 7H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Graham Nash Fed Com 7H
TVD Reference: KB=26' @ 3014.80ft (Patriot 2)
MD Reference: KB=26' @ 3014.80ft (Patriot 2)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Multi User Db

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N-S (ft)	+E-W (ft)	
7,349.00	7,347.05	-88.72	-50.55	First IDS MWD Survey
15,127.00	7,855.78	-7,437.72	404.59	Final IDS MWD Survey
15,208.00	7,852.98	-7,518.60	401.05	Projection to TD

Checked By: _____ Approved By: _____ Date: _____