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NEW MEXICO BASIN

LEA COUNTY, NM

LUDEMAN

SKULL CAP FEDERAL COM #22H

LATERAL 01

Design: ACTUAL WELLPATH

Survey Report - Geographic

01 March, 2017

COG Operating LLC

Survey Report - Geographic

Company:	NEW MEXICO BASIN	Local Co-ordinate Reference:	Well SKULL CAP FEDERAL COM #22H
Project:	LEA COUNTY, NM	TVD Reference:	RKB=3286+26 @ 3312.0usft (Original Well Elev)
Site:	LUDEMAN	MD Reference:	RKB=3286+26 @ 3312.0usft (Original Well Elev)
Well:	SKULL CAP FEDERAL COM #22H	North Reference:	Grid
Wellbore:	LATERAL 01	Survey Calculation Method:	Minimum Curvature
Design:	ACTUAL WELLPATH	Database:	EDM_Users

Project	LEA COUNTY, NM		
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		LUDEMAN			
Site Position:		Northing:	409,564.70 usft	Latitude:	32° 7' 20.696 N
From:	Map	Easting:	795,348.70 usft	Longitude:	103° 22' 45.584 W
Position Uncertainty:	0.0 usft	Slot Radius:	17-1/2 "	Grid Convergence:	0.51 °

Well		SKULL CAP FEDERAL COM #22H				
Well Position	+N/-S	0.0 usft	Northing:	428,207.80 usft	Latitude:	32° 10' 25.391 N
	+E/-W	0.0 usft	Easting:	792,838.90 usft	Longitude:	103° 23' 12.860 W
Position Uncertainty		3.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	3,286.0 usft

Wellbore	LATERAL 01				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	WMM2015	1/27/2016	7.03	60.06	48,064.26210159

Design	ACTUAL WELLPATH				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	179.61	

Survey Program	Date	10/5/2016			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	11,916.0	GYRO (LATERAL 01)	PHX_SPT_GTD	PHX Continuous north-seeking gyro	
12,060.0	20,175.0	MWD 2 (LATERAL 01)	MWD	OWSG MWD - Standard	

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.0	0.00	0.00	0.0	0.0	0.0	428,207.80	792,838.90	32° 10' 25.391 N	103° 23' 12.860 W
100.0	0.98	331.73	100.0	0.8	-0.4	428,208.55	792,838.49	32° 10' 25.398 N	103° 23' 12.865 W
200.0	1.21	258.92	200.0	1.3	-1.8	428,209.10	792,837.05	32° 10' 25.404 N	103° 23' 12.881 W
300.0	2.01	23.36	300.0	2.7	-2.2	428,210.51	792,836.71	32° 10' 25.418 N	103° 23' 12.885 W
400.0	1.47	33.13	399.9	5.4	-0.8	428,213.19	792,838.11	32° 10' 25.444 N	103° 23' 12.869 W
500.0	1.41	12.11	499.9	7.7	0.2	428,215.47	792,839.07	32° 10' 25.467 N	103° 23' 12.857 W
600.0	0.36	44.76	599.9	9.1	0.6	428,216.90	792,839.55	32° 10' 25.481 N	103° 23' 12.852 W
700.0	0.83	62.62	699.9	9.7	1.5	428,217.45	792,840.41	32° 10' 25.486 N	103° 23' 12.841 W
800.0	0.40	52.64	799.9	10.2	2.4	428,218.00	792,841.33	32° 10' 25.491 N	103° 23' 12.831 W
900.0	0.65	87.06	899.9	10.4	3.3	428,218.24	792,842.17	32° 10' 25.494 N	103° 23' 12.821 W
1,000.0	0.72	72.27	999.8	10.7	4.4	428,218.46	792,843.34	32° 10' 25.496 N	103° 23' 12.807 W

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Site:	LUDEMAN	MD Reference:	RKB=3286+26 @ 3312.0usft (Original Well Elev)
Well:	SKULL CAP FEDERAL COM #22H	North Reference:	Grid
Wellbore:	LATERAL 01	Survey Calculation Method:	Minimum Curvature
Design:	ACTUAL WELLPATH	Database:	EDM_Users

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,100.0	1.33	70.05	1,099.8	11.2	6.1	428,219.05	792,845.03	32° 10' 25.501 N	103° 23' 12.788 W
1,200.0	0.69	114.04	1,199.8	11.4	7.8	428,219.20	792,846.67	32° 10' 25.503 N	103° 23' 12.768 W
1,300.0	0.75	154.89	1,299.8	10.6	8.6	428,218.36	792,847.50	32° 10' 25.494 N	103° 23' 12.759 W
1,400.0	0.29	186.56	1,399.8	9.7	8.8	428,217.52	792,847.75	32° 10' 25.486 N	103° 23' 12.756 W
1,500.0	0.42	158.11	1,499.8	9.1	9.0	428,216.92	792,847.85	32° 10' 25.480 N	103° 23' 12.755 W
1,600.0	0.49	350.29	1,599.8	9.2	9.0	428,217.01	792,847.92	32° 10' 25.481 N	103° 23' 12.754 W
1,700.0	0.14	265.39	1,699.8	9.6	8.8	428,217.42	792,847.72	32° 10' 25.485 N	103° 23' 12.756 W
1,800.0	0.78	325.49	1,799.8	10.2	8.3	428,217.97	792,847.22	32° 10' 25.491 N	103° 23' 12.762 W
1,900.0	0.29	116.60	1,899.8	10.6	8.2	428,218.42	792,847.06	32° 10' 25.495 N	103° 23' 12.764 W
2,000.0	0.53	78.95	1,999.8	10.6	8.8	428,218.39	792,847.74	32° 10' 25.495 N	103° 23' 12.756 W
2,100.0	0.49	120.92	2,099.8	10.5	9.7	428,218.26	792,848.56	32° 10' 25.493 N	103° 23' 12.747 W
2,200.0	0.57	172.73	2,199.8	9.7	10.1	428,217.55	792,848.99	32° 10' 25.486 N	103° 23' 12.742 W
2,300.0	0.68	154.37	2,299.8	8.7	10.4	428,216.52	792,849.31	32° 10' 25.476 N	103° 23' 12.738 W
2,400.0	0.64	108.37	2,399.8	8.0	11.2	428,215.81	792,850.09	32° 10' 25.469 N	103° 23' 12.729 W
2,500.0	0.58	311.91	2,499.8	8.2	11.4	428,215.97	792,850.25	32° 10' 25.471 N	103° 23' 12.727 W
2,600.0	0.73	222.97	2,599.8	8.0	10.5	428,215.84	792,849.44	32° 10' 25.469 N	103° 23' 12.737 W
2,700.0	0.87	156.38	2,699.8	6.9	10.4	428,214.68	792,849.31	32° 10' 25.458 N	103° 23' 12.738 W
2,800.0	0.63	215.37	2,799.8	5.7	10.4	428,213.54	792,849.29	32° 10' 25.447 N	103° 23' 12.738 W
2,900.0	0.37	85.20	2,899.7	5.3	10.4	428,213.12	792,849.30	32° 10' 25.442 N	103° 23' 12.738 W
3,000.0	0.50	84.68	2,999.7	5.4	11.2	428,213.18	792,850.05	32° 10' 25.443 N	103° 23' 12.730 W
3,100.0	0.66	71.78	3,099.7	5.6	12.1	428,213.40	792,851.03	32° 10' 25.445 N	103° 23' 12.718 W
3,200.0	0.78	70.31	3,199.7	6.0	13.3	428,213.81	792,852.22	32° 10' 25.449 N	103° 23' 12.704 W
3,300.0	0.80	113.95	3,299.7	6.0	14.6	428,213.76	792,853.50	32° 10' 25.448 N	103° 23' 12.689 W
3,400.0	0.86	83.06	3,399.7	5.8	16.0	428,213.57	792,854.88	32° 10' 25.446 N	103° 23' 12.673 W
3,500.0	0.41	73.61	3,499.7	6.0	17.1	428,213.76	792,855.97	32° 10' 25.448 N	103° 23' 12.661 W
3,600.0	0.39	224.07	3,599.7	5.8	17.2	428,213.61	792,856.08	32° 10' 25.447 N	103° 23' 12.660 W
3,700.0	0.77	64.98	3,699.7	5.9	17.6	428,213.65	792,856.45	32° 10' 25.447 N	103° 23' 12.655 W
3,800.0	0.81	108.64	3,799.7	5.9	18.8	428,213.71	792,857.73	32° 10' 25.448 N	103° 23' 12.640 W
3,900.0	0.68	95.96	3,899.7	5.6	20.1	428,213.42	792,858.99	32° 10' 25.445 N	103° 23' 12.626 W
4,000.0	0.66	38.40	3,999.7	6.0	21.0	428,213.81	792,859.94	32° 10' 25.448 N	103° 23' 12.615 W
4,100.0	0.59	37.99	4,099.7	6.9	21.7	428,214.67	792,860.61	32° 10' 25.457 N	103° 23' 12.607 W
4,200.0	1.05	36.90	4,199.7	8.0	22.6	428,215.81	792,861.48	32° 10' 25.468 N	103° 23' 12.596 W
4,300.0	1.26	56.25	4,299.6	9.4	24.0	428,217.15	792,862.94	32° 10' 25.481 N	103° 23' 12.579 W
4,400.0	2.02	75.89	4,399.6	10.4	26.7	428,218.19	792,865.57	32° 10' 25.491 N	103° 23' 12.549 W
4,500.0	2.33	83.26	4,499.5	11.1	30.4	428,218.86	792,869.29	32° 10' 25.498 N	103° 23' 12.505 W
4,600.0	1.14	100.94	4,599.5	11.1	33.4	428,218.91	792,872.29	32° 10' 25.498 N	103° 23' 12.470 W
4,700.0	2.30	133.29	4,699.4	9.5	35.8	428,217.35	792,874.73	32° 10' 25.482 N	103° 23' 12.442 W
4,800.0	2.91	160.89	4,799.3	5.8	38.1	428,213.57	792,877.02	32° 10' 25.445 N	103° 23' 12.416 W
4,900.0	1.32	175.12	4,899.3	2.2	39.1	428,210.03	792,877.95	32° 10' 25.409 N	103° 23' 12.405 W
5,000.0	0.68	99.60	4,999.3	1.0	39.7	428,208.78	792,878.63	32° 10' 25.397 N	103° 23' 12.398 W
5,100.0	1.15	69.85	5,099.2	1.2	41.3	428,209.03	792,880.16	32° 10' 25.399 N	103° 23' 12.380 W
5,200.0	1.20	137.81	5,199.2	0.8	42.9	428,208.60	792,881.80	32° 10' 25.395 N	103° 23' 12.361 W
5,300.0	1.19	155.60	5,299.2	-0.9	44.0	428,206.87	792,882.94	32° 10' 25.378 N	103° 23' 12.348 W
5,400.0	0.97	115.03	5,399.2	-2.2	45.2	428,205.57	792,884.13	32° 10' 25.365 N	103° 23' 12.334 W
5,500.0	0.91	182.36	5,499.2	-3.4	46.0	428,204.42	792,884.87	32° 10' 25.353 N	103° 23' 12.326 W
5,600.0	0.92	164.86	5,599.2	-4.9	46.1	428,202.85	792,885.04	32° 10' 25.338 N	103° 23' 12.324 W
5,700.0	1.05	148.05	5,699.2	-6.5	46.8	428,201.30	792,885.74	32° 10' 25.322 N	103° 23' 12.316 W
5,800.0	0.87	147.73	5,799.1	-7.9	47.7	428,199.88	792,886.63	32° 10' 25.308 N	103° 23' 12.306 W
5,900.0	0.59	88.35	5,899.1	-8.5	48.7	428,199.25	792,887.55	32° 10' 25.302 N	103° 23' 12.295 W
6,000.0	0.66	156.01	5,999.1	-9.1	49.4	428,198.74	792,888.30	32° 10' 25.297 N	103° 23' 12.286 W
6,100.0	0.88	179.85	6,099.1	-10.4	49.6	428,197.45	792,888.53	32° 10' 25.284 N	103° 23' 12.284 W
6,200.0	1.46	117.67	6,199.1	-11.7	50.8	428,196.09	792,889.66	32° 10' 25.270 N	103° 23' 12.271 W
6,300.0	1.12	34.90	6,299.1	-11.5	52.5	428,196.30	792,891.35	32° 10' 25.272 N	103° 23' 12.251 W
6,400.0	2.45	162.00	6,399.1	-12.7	53.7	428,195.07	792,892.57	32° 10' 25.260 N	103° 23' 12.237 W
6,500.0	0.24	186.77	6,499.0	-15.0	54.3	428,192.82	792,893.21	32° 10' 25.238 N	103° 23' 12.230 W

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Site:	LUDEMAN	MD Reference:	RKB=3286+26 @ 3312.0usft (Original Well Elev)
Well:	SKULL CAP FEDERAL COM #22H	North Reference:	Grid
Wellbore:	LATERAL 01	Survey Calculation Method:	Minimum Curvature
Design:	ACTUAL WELLPATH	Database:	EDM_Users

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
6,600.0	0.95	128.78	6,599.0	-15.7	54.9	428,192.10	792,893.83	32° 10' 25.231 N	103° 23' 12.223 W
6,700.0	1.00	186.83	6,699.0	-17.1	55.5	428,190.71	792,894.37	32° 10' 25.217 N	103° 23' 12.216 W
6,800.0	0.82	95.38	6,799.0	-18.0	56.1	428,189.78	792,894.98	32° 10' 25.208 N	103° 23' 12.209 W
6,900.0	0.76	117.79	6,899.0	-18.4	57.4	428,189.40	792,896.28	32° 10' 25.204 N	103° 23' 12.194 W
7,000.0	0.57	143.43	6,999.0	-19.1	58.3	428,188.69	792,897.16	32° 10' 25.197 N	103° 23' 12.184 W
7,100.0	0.61	66.43	7,099.0	-19.3	59.0	428,188.51	792,897.95	32° 10' 25.195 N	103° 23' 12.175 W
7,200.0	0.88	99.25	7,199.0	-19.2	60.3	428,188.60	792,899.19	32° 10' 25.195 N	103° 23' 12.161 W
7,300.0	0.89	142.26	7,299.0	-19.9	61.5	428,187.86	792,900.43	32° 10' 25.188 N	103° 23' 12.146 W
7,400.0	1.61	355.07	7,398.9	-19.2	61.9	428,188.64	792,900.78	32° 10' 25.196 N	103° 23' 12.142 W
7,500.0	1.54	135.05	7,498.9	-18.7	62.7	428,189.09	792,901.61	32° 10' 25.200 N	103° 23' 12.132 W
7,600.0	0.61	197.30	7,598.9	-20.2	63.5	428,187.63	792,902.40	32° 10' 25.186 N	103° 23' 12.123 W
7,700.0	0.88	59.69	7,698.9	-20.3	64.0	428,187.51	792,902.90	32° 10' 25.184 N	103° 23' 12.117 W
7,800.0	1.05	64.57	7,798.9	-19.5	65.5	428,188.29	792,904.40	32° 10' 25.192 N	103° 23' 12.100 W
7,900.0	1.19	127.82	7,898.9	-19.7	67.1	428,188.05	792,906.04	32° 10' 25.189 N	103° 23' 12.081 W
8,000.0	1.62	167.00	7,998.9	-21.8	68.3	428,186.04	792,907.18	32° 10' 25.169 N	103° 23' 12.068 W
8,100.0	1.08	171.61	8,098.8	-24.1	68.7	428,183.73	792,907.64	32° 10' 25.147 N	103° 23' 12.063 W
8,200.0	0.46	200.86	8,198.8	-25.4	68.7	428,182.42	792,907.63	32° 10' 25.134 N	103° 23' 12.063 W
8,300.0	1.36	94.54	8,298.8	-25.9	69.8	428,181.95	792,908.67	32° 10' 25.129 N	103° 23' 12.051 W
8,400.0	1.37	100.87	8,398.8	-26.2	72.1	428,181.63	792,911.03	32° 10' 25.126 N	103° 23' 12.024 W
8,500.0	1.29	89.60	8,498.7	-26.4	74.4	428,181.41	792,913.33	32° 10' 25.123 N	103° 23' 11.997 W
8,600.0	1.38	77.46	8,598.7	-26.1	76.7	428,181.68	792,915.63	32° 10' 25.126 N	103° 23' 11.970 W
8,700.0	1.34	66.15	8,698.7	-25.4	79.0	428,182.42	792,917.87	32° 10' 25.133 N	103° 23' 11.944 W
8,800.0	0.75	227.61	8,798.7	-25.4	79.6	428,182.45	792,918.46	32° 10' 25.133 N	103° 23' 11.937 W
8,900.0	1.45	122.58	8,898.7	-26.5	80.1	428,181.33	792,919.04	32° 10' 25.122 N	103° 23' 11.930 W
9,000.0	1.38	52.22	8,998.7	-26.4	82.2	428,181.38	792,921.06	32° 10' 25.122 N	103° 23' 11.907 W
9,100.0	1.76	74.61	9,098.6	-25.3	84.6	428,182.53	792,923.49	32° 10' 25.133 N	103° 23' 11.878 W
9,200.0	1.43	76.56	9,198.6	-24.6	87.3	428,183.22	792,926.19	32° 10' 25.140 N	103° 23' 11.847 W
9,300.0	1.25	116.88	9,298.6	-24.8	89.5	428,183.02	792,928.37	32° 10' 25.138 N	103° 23' 11.822 W
9,400.0	1.27	45.00	9,398.5	-24.5	91.2	428,183.31	792,930.13	32° 10' 25.140 N	103° 23' 11.801 W
9,500.0	1.58	8.94	9,498.5	-22.3	92.2	428,185.46	792,931.13	32° 10' 25.162 N	103° 23' 11.789 W
9,600.0	1.24	34.22	9,598.5	-20.1	93.1	428,187.71	792,931.95	32° 10' 25.184 N	103° 23' 11.780 W
9,700.0	2.19	307.63	9,698.4	-18.0	92.1	428,189.78	792,931.05	32° 10' 25.204 N	103° 23' 11.790 W
9,800.0	1.00	52.95	9,798.4	-16.3	91.3	428,191.47	792,930.23	32° 10' 25.221 N	103° 23' 11.799 W
9,900.0	0.47	56.83	9,898.4	-15.6	92.4	428,192.22	792,931.27	32° 10' 25.229 N	103° 23' 11.787 W
10,000.0	1.46	309.47	9,998.4	-14.5	91.7	428,193.25	792,930.63	32° 10' 25.239 N	103° 23' 11.794 W
10,100.0	2.48	260.19	10,098.3	-14.1	88.6	428,193.69	792,927.51	32° 10' 25.243 N	103° 23' 11.831 W
10,200.0	3.31	286.75	10,198.2	-13.6	83.7	428,194.16	792,922.62	32° 10' 25.248 N	103° 23' 11.887 W
10,300.0	3.53	288.89	10,298.0	-11.8	78.0	428,195.99	792,916.94	32° 10' 25.267 N	103° 23' 11.953 W
10,400.0	2.30	286.88	10,397.9	-10.2	73.2	428,197.57	792,912.11	32° 10' 25.283 N	103° 23' 12.009 W
10,500.0	1.47	283.53	10,497.9	-9.4	70.0	428,198.45	792,908.94	32° 10' 25.292 N	103° 23' 12.046 W
10,600.0	2.08	347.02	10,597.8	-7.3	68.4	428,200.52	792,907.28	32° 10' 25.313 N	103° 23' 12.065 W
10,700.0	1.91	354.91	10,697.8	-3.9	67.8	428,203.94	792,906.73	32° 10' 25.347 N	103° 23' 12.071 W
10,800.0	1.58	337.49	10,797.7	-0.9	67.2	428,206.88	792,906.05	32° 10' 25.376 N	103° 23' 12.079 W
10,900.0	1.41	349.06	10,897.7	1.6	66.4	428,209.36	792,905.29	32° 10' 25.400 N	103° 23' 12.087 W
11,000.0	0.91	326.16	10,997.7	3.4	65.7	428,211.23	792,904.62	32° 10' 25.419 N	103° 23' 12.095 W
11,100.0	1.28	283.44	11,097.6	4.3	64.2	428,212.15	792,903.09	32° 10' 25.428 N	103° 23' 12.113 W
11,200.0	2.63	276.70	11,197.6	4.9	60.8	428,212.67	792,899.72	32° 10' 25.434 N	103° 23' 12.152 W
11,300.0	3.28	262.99	11,297.4	4.8	55.7	428,212.59	792,894.60	32° 10' 25.433 N	103° 23' 12.211 W
11,400.0	2.97	274.88	11,397.3	4.7	50.3	428,212.46	792,889.18	32° 10' 25.433 N	103° 23' 12.275 W
11,500.0	3.30	275.36	11,497.1	5.2	44.8	428,212.95	792,883.74	32° 10' 25.438 N	103° 23' 12.338 W
11,600.0	3.39	267.91	11,597.0	5.3	39.0	428,213.11	792,877.92	32° 10' 25.440 N	103° 23' 12.406 W
11,700.0	3.13	260.77	11,696.8	4.8	33.4	428,212.57	792,872.27	32° 10' 25.435 N	103° 23' 12.471 W
11,800.0	2.37	256.71	11,796.7	3.9	28.7	428,211.66	792,867.56	32° 10' 25.426 N	103° 23' 12.526 W
11,916.0	1.83	246.93	11,912.6	2.6	24.6	428,210.38	792,863.52	32° 10' 25.414 N	103° 23' 12.573 W
12,060.0	1.60	211.30	12,056.6	0.0	21.5	428,207.76	792,860.36	32° 10' 25.388 N	103° 23' 12.610 W

COG Operating LLC

Survey Report - Geographic

Company:	NEW MEXICO BASIN	Local Co-ordinate Reference:	Well SKULL CAP FEDERAL COM #22H
Project:	LEA COUNTY, NM	TVD Reference:	RKB=3286+26 @ 3312.0usft (Original Well Elev)
Site:	LUDEMAN	MD Reference:	RKB=3286+26 @ 3312.0usft (Original Well Elev)
Well:	SKULL CAP FEDERAL COM #22H	North Reference:	Grid
Wellbore:	LATERAL 01	Survey Calculation Method:	Minimum Curvature
Design:	ACTUAL WELLPATH	Database:	EDM_Users

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
12,092.0	3.90	201.10	12,088.5	-1.4	20.8	428,206.36	792,859.74	32° 10' 25.375 N	103° 23' 12.618 W
12,123.0	8.80	189.90	12,119.3	-4.8	20.1	428,203.04	792,858.95	32° 10' 25.342 N	103° 23' 12.627 W
12,155.0	13.10	186.80	12,150.7	-10.8	19.2	428,197.03	792,858.10	32° 10' 25.282 N	103° 23' 12.638 W
12,186.0	17.90	185.10	12,180.6	-19.0	18.4	428,188.79	792,857.26	32° 10' 25.201 N	103° 23' 12.648 W
12,218.0	22.20	182.40	12,210.6	-30.0	17.7	428,177.84	792,856.57	32° 10' 25.093 N	103° 23' 12.657 W
12,249.0	25.40	180.50	12,239.0	-42.5	17.4	428,165.34	792,856.27	32° 10' 24.969 N	103° 23' 12.662 W
12,281.0	28.90	178.30	12,267.5	-57.1	17.5	428,150.74	792,856.44	32° 10' 24.825 N	103° 23' 12.662 W
12,312.0	32.90	178.10	12,294.1	-73.0	18.0	428,134.83	792,856.94	32° 10' 24.667 N	103° 23' 12.658 W
12,344.0	37.80	179.50	12,320.2	-91.5	18.4	428,116.33	792,857.31	32° 10' 24.484 N	103° 23' 12.655 W
12,376.0	39.90	179.00	12,345.1	-111.5	18.7	428,096.26	792,857.58	32° 10' 24.285 N	103° 23' 12.654 W
12,407.0	42.10	177.80	12,368.5	-131.9	19.3	428,075.93	792,858.15	32° 10' 24.084 N	103° 23' 12.650 W
12,438.0	43.10	178.30	12,391.3	-152.8	20.0	428,054.96	792,858.86	32° 10' 23.877 N	103° 23' 12.643 W
12,484.0	45.50	181.30	12,424.2	-185.0	20.1	428,022.85	792,858.96	32° 10' 23.559 N	103° 23' 12.646 W
12,533.0	52.00	183.40	12,456.5	-221.7	18.5	427,986.06	792,857.41	32° 10' 23.195 N	103° 23' 12.667 W
12,583.0	58.50	185.20	12,485.0	-262.7	15.4	427,945.12	792,854.31	32° 10' 22.790 N	103° 23' 12.708 W
12,627.0	61.80	186.20	12,506.9	-300.6	11.6	427,907.15	792,850.51	32° 10' 22.415 N	103° 23' 12.756 W
12,674.0	68.30	184.90	12,526.7	-343.0	7.5	427,864.76	792,846.41	32° 10' 21.996 N	103° 23' 12.808 W
12,722.0	70.00	183.20	12,543.8	-387.8	4.3	427,820.02	792,843.24	32° 10' 21.553 N	103° 23' 12.849 W
12,753.0	72.00	183.70	12,553.9	-417.0	2.6	427,790.76	792,841.48	32° 10' 21.264 N	103° 23' 12.873 W
12,816.0	75.50	182.70	12,571.5	-477.4	-0.8	427,730.39	792,838.11	32° 10' 20.667 N	103° 23' 12.918 W
12,864.0	83.40	183.40	12,580.3	-524.5	-3.3	427,683.30	792,835.59	32° 10' 20.201 N	103° 23' 12.952 W
12,911.0	91.10	182.40	12,582.6	-571.3	-5.7	427,636.45	792,833.22	32° 10' 19.738 N	103° 23' 12.984 W
13,039.0	89.70	182.40	12,581.7	-699.2	-11.0	427,508.57	792,827.86	32° 10' 18.473 N	103° 23' 13.060 W
13,134.0	91.50	180.50	12,580.7	-794.2	-13.4	427,413.61	792,825.46	32° 10' 17.533 N	103° 23' 13.098 W
13,229.0	93.80	179.50	12,576.3	-889.1	-13.4	427,318.72	792,825.46	32° 10' 16.594 N	103° 23' 13.107 W
13,324.0	90.10	177.90	12,573.0	-984.0	-11.3	427,223.82	792,827.61	32° 10' 15.655 N	103° 23' 13.092 W
13,418.0	89.90	179.70	12,573.0	-1,078.0	-9.3	427,129.85	792,829.58	32° 10' 14.725 N	103° 23' 13.079 W
13,513.0	89.30	178.10	12,573.7	-1,172.9	-7.5	427,034.87	792,831.41	32° 10' 13.785 N	103° 23' 13.067 W
13,607.0	90.20	179.50	12,574.1	-1,266.9	-5.5	426,940.90	792,833.37	32° 10' 12.855 N	103° 23' 13.054 W
13,702.0	89.10	179.30	12,574.7	-1,361.9	-4.5	426,845.90	792,834.37	32° 10' 11.915 N	103° 23' 13.052 W
13,796.0	90.80	178.60	12,574.8	-1,455.9	-2.8	426,751.92	792,836.09	32° 10' 10.985 N	103° 23' 13.042 W
13,891.0	89.90	178.80	12,574.2	-1,550.8	-0.7	426,656.95	792,838.25	32° 10' 10.045 N	103° 23' 13.026 W
13,985.0	90.40	178.80	12,574.0	-1,644.8	1.3	426,562.97	792,840.21	32° 10' 9.115 N	103° 23' 13.013 W
14,080.0	87.60	178.90	12,575.6	-1,739.8	3.2	426,468.02	792,842.12	32° 10' 8.175 N	103° 23' 13.001 W
14,174.0	88.40	178.60	12,578.9	-1,833.7	5.3	426,374.10	792,844.17	32° 10' 7.246 N	103° 23' 12.986 W
14,269.0	89.50	179.00	12,580.6	-1,928.7	7.3	426,279.13	792,846.16	32° 10' 6.306 N	103° 23' 12.973 W
14,363.0	89.80	181.70	12,581.2	-2,022.7	6.7	426,185.15	792,845.59	32° 10' 5.376 N	103° 23' 12.989 W
14,458.0	88.70	182.50	12,582.4	-2,117.6	3.2	426,090.22	792,842.10	32° 10' 4.437 N	103° 23' 13.039 W
14,552.0	88.60	180.70	12,584.7	-2,211.5	0.6	425,996.29	792,839.48	32° 10' 3.508 N	103° 23' 13.079 W
14,647.0	88.60	178.10	12,587.0	-2,306.5	1.6	425,901.33	792,840.48	32° 10' 2.568 N	103° 23' 13.078 W
14,742.0	90.60	180.20	12,587.6	-2,401.4	3.0	425,806.35	792,841.88	32° 10' 1.628 N	103° 23' 13.071 W
14,836.0	88.30	179.10	12,588.6	-2,495.4	3.6	425,712.37	792,842.46	32° 10' 0.698 N	103° 23' 13.074 W
14,931.0	88.40	176.00	12,591.3	-2,590.3	7.6	425,617.50	792,846.52	32° 9' 59.759 N	103° 23' 13.036 W
15,026.0	87.90	175.20	12,594.4	-2,685.0	14.9	425,522.83	792,853.80	32° 9' 58.821 N	103° 23' 12.961 W
15,119.0	89.10	174.40	12,596.8	-2,777.5	23.3	425,430.25	792,862.23	32° 9' 57.905 N	103° 23' 12.873 W
15,214.0	92.40	176.70	12,595.5	-2,872.2	30.7	425,335.57	792,869.60	32° 9' 56.967 N	103° 23' 12.797 W
15,310.0	89.40	175.20	12,594.0	-2,968.0	37.5	425,239.83	792,876.38	32° 9' 56.019 N	103° 23' 12.728 W
15,404.0	89.50	176.20	12,594.9	-3,061.7	44.5	425,146.10	792,883.42	32° 9' 55.091 N	103° 23' 12.655 W
15,499.0	92.90	177.30	12,593.0	-3,156.5	49.9	425,051.29	792,888.81	32° 9' 54.152 N	103° 23' 12.602 W
15,594.0	93.50	177.40	12,587.6	-3,251.3	54.3	424,956.54	792,893.19	32° 9' 53.214 N	103° 23' 12.561 W
15,689.0	92.40	177.90	12,582.8	-3,346.1	58.2	424,861.75	792,897.08	32° 9' 52.276 N	103° 23' 12.525 W
15,784.0	89.90	179.30	12,580.9	-3,441.0	60.5	424,766.80	792,899.40	32° 9' 51.336 N	103° 23' 12.508 W
15,879.0	90.40	182.40	12,580.6	-3,536.0	59.1	424,671.83	792,897.99	32° 9' 50.397 N	103° 23' 12.534 W
15,973.0	90.40	183.20	12,579.9	-3,629.9	54.5	424,577.94	792,893.40	32° 9' 49.468 N	103° 23' 12.597 W
16,068.0	91.10	181.30	12,578.7	-3,724.8	50.8	424,483.03	792,889.67	32° 9' 48.529 N	103° 23' 12.650 W

COG Operating LLC
Survey Report - Geographic

Company:	NEW MEXICO BASIN	Local Co-ordinate Reference:	Well SKULL CAP FEDERAL COM #22H
Project:	LEA COUNTY, NM	TVD Reference:	RKB=3286+26 @ 3312.0usft (Original Well Elev)
Site:	LUDEMAN	MD Reference:	RKB=3286+26 @ 3312.0usft (Original Well Elev)
Well:	SKULL CAP FEDERAL COM #22H	North Reference:	Grid
Wellbore:	LATERAL 01	Survey Calculation Method:	Minimum Curvature
Design:	ACTUAL WELLPATH	Database:	EDM_Users

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
16,163.0	86.90	180.30	12,580.4	-3,819.7	49.4	424,388.07	792,888.35	32° 9' 47.590 N	103° 23' 12.676 W
16,258.0	88.90	181.30	12,583.8	-3,914.6	48.1	424,293.15	792,887.02	32° 9' 46.651 N	103° 23' 12.701 W
16,353.0	89.40	180.50	12,585.3	-4,009.6	46.6	424,198.18	792,885.53	32° 9' 45.711 N	103° 23' 12.728 W
16,447.0	90.90	182.50	12,585.0	-4,103.6	44.2	424,104.22	792,883.07	32° 9' 44.781 N	103° 23' 12.766 W
16,542.0	87.90	180.70	12,586.0	-4,198.5	41.5	424,009.27	792,880.42	32° 9' 43.842 N	103° 23' 12.807 W
16,637.0	85.20	181.50	12,591.7	-4,293.3	39.7	423,914.47	792,878.60	32° 9' 42.904 N	103° 23' 12.837 W
16,731.0	89.40	181.10	12,596.1	-4,387.2	37.6	423,820.62	792,876.47	32° 9' 41.976 N	103° 23' 12.872 W
16,826.0	86.80	178.60	12,599.3	-4,482.1	37.8	423,725.69	792,876.71	32° 9' 41.036 N	103° 23' 12.879 W
16,921.0	87.40	174.20	12,604.1	-4,576.8	43.8	423,631.02	792,882.67	32° 9' 40.099 N	103° 23' 12.819 W
17,015.0	89.50	172.30	12,606.6	-4,670.1	54.8	423,537.72	792,893.72	32° 9' 39.175 N	103° 23' 12.700 W
17,110.0	93.30	175.20	12,604.3	-4,764.5	65.2	423,443.34	792,904.05	32° 9' 38.240 N	103° 23' 12.590 W
17,204.0	88.80	177.10	12,602.6	-4,858.2	71.5	423,349.60	792,910.36	32° 9' 37.312 N	103° 23' 12.526 W
17,299.0	89.70	175.90	12,603.8	-4,953.0	77.3	423,254.78	792,916.16	32° 9' 36.373 N	103° 23' 12.468 W
17,394.0	89.40	178.40	12,604.6	-5,047.9	82.0	423,159.91	792,920.88	32° 9' 35.434 N	103° 23' 12.423 W
17,488.0	87.80	179.30	12,606.9	-5,141.8	83.9	423,065.96	792,922.77	32° 9' 34.504 N	103° 23' 12.410 W
17,583.0	94.60	183.10	12,604.9	-5,236.7	81.9	422,971.08	792,920.79	32° 9' 33.566 N	103° 23' 12.443 W
17,677.0	93.80	181.60	12,598.0	-5,330.4	78.0	422,877.41	792,916.94	32° 9' 32.639 N	103° 23' 12.497 W
17,772.0	95.70	181.70	12,590.1	-5,425.0	75.3	422,782.78	792,914.22	32° 9' 31.703 N	103° 23' 12.539 W
17,866.0	93.50	182.50	12,582.6	-5,518.6	71.9	422,689.15	792,910.78	32° 9' 30.777 N	103° 23' 12.588 W
17,961.0	90.50	182.90	12,579.3	-5,613.5	67.4	422,594.33	792,906.31	32° 9' 29.839 N	103° 23' 12.650 W
18,055.0	91.10	180.20	12,578.0	-5,707.4	64.9	422,500.38	792,903.77	32° 9' 28.909 N	103° 23' 12.689 W
18,150.0	89.70	178.80	12,577.3	-5,802.4	65.7	422,405.39	792,904.60	32° 9' 27.969 N	103° 23' 12.689 W
18,244.0	89.70	178.60	12,577.8	-5,896.4	67.8	422,311.42	792,906.73	32° 9' 27.039 N	103° 23' 12.674 W
18,339.0	90.60	181.10	12,577.6	-5,991.4	68.1	422,216.43	792,906.98	32° 9' 26.099 N	103° 23' 12.681 W
18,433.0	85.70	180.20	12,580.6	-6,085.3	67.0	422,122.51	792,905.91	32° 9' 25.170 N	103° 23' 12.703 W
18,528.0	90.40	182.30	12,583.8	-6,180.2	64.9	422,027.62	792,903.84	32° 9' 24.231 N	103° 23' 12.737 W
18,622.0	87.30	180.00	12,585.7	-6,274.1	63.1	421,933.68	792,901.95	32° 9' 23.302 N	103° 23' 12.768 W
18,717.0	85.30	178.10	12,591.8	-6,368.9	64.6	421,838.90	792,903.52	32° 9' 22.364 N	103° 23' 12.760 W
18,811.0	85.20	177.90	12,599.6	-6,462.5	67.9	421,745.28	792,906.79	32° 9' 21.437 N	103° 23' 12.731 W
18,906.0	90.10	178.80	12,603.5	-6,557.4	70.6	421,650.43	792,909.52	32° 9' 20.499 N	103° 23' 12.709 W
19,000.0	90.80	179.10	12,602.8	-6,651.4	72.3	421,556.45	792,911.24	32° 9' 19.568 N	103° 23' 12.699 W
19,095.0	88.00	177.30	12,603.8	-6,746.3	75.3	421,461.51	792,914.23	32° 9' 18.629 N	103° 23' 12.674 W
19,189.0	91.70	179.70	12,604.0	-6,840.2	77.8	421,367.57	792,916.69	32° 9' 17.699 N	103° 23' 12.655 W
19,284.0	88.70	178.60	12,603.7	-6,935.2	79.2	421,272.59	792,918.10	32° 9' 16.759 N	103° 23' 12.648 W
19,378.0	91.50	180.20	12,603.5	-7,029.2	80.2	421,178.61	792,919.08	32° 9' 15.829 N	103° 23' 12.646 W
19,473.0	89.40	178.80	12,602.8	-7,124.2	81.0	421,083.62	792,919.91	32° 9' 14.889 N	103° 23' 12.646 W
19,567.0	93.00	180.10	12,600.8	-7,218.1	81.9	420,989.66	792,920.81	32° 9' 13.959 N	103° 23' 12.646 W
19,662.0	92.60	180.20	12,596.2	-7,313.0	81.7	420,894.78	792,920.56	32° 9' 13.020 N	103° 23' 12.658 W
19,756.0	89.60	179.70	12,594.4	-7,407.0	81.7	420,800.81	792,920.65	32° 9' 12.091 N	103° 23' 12.667 W
19,851.0	90.10	179.50	12,594.6	-7,502.0	82.4	420,705.81	792,921.31	32° 9' 11.150 N	103° 23' 12.669 W
19,945.0	94.10	179.60	12,591.2	-7,595.9	83.1	420,611.89	792,922.05	32° 9' 10.221 N	103° 23' 12.670 W
20,040.0	93.30	178.30	12,585.0	-7,690.7	84.9	420,517.11	792,923.78	32° 9' 9.283 N	103° 23' 12.659 W
20,124.0	91.30	178.80	12,581.7	-7,774.6	87.0	420,433.21	792,925.91	32° 9' 8.453 N	103° 23' 12.643 W
20,175.0	91.30	178.80	12,580.5	-7,825.6	88.1	420,382.23	792,926.98	32° 9' 7.948 N	103° 23' 12.636 W

Checked By: _____ Approved By: _____ Date: _____

SKULL CAP FEDERAL COM #22H (30-025-43299)

<u>Perfs</u>	<u>7 1/2% Acid (Gal)</u>	<u>Sand (#)</u>	<u>Fluid (Gal)</u>
1	3024	300484	299628
2	3024	301916	306894
3	3024	298133	419328
4	3024	301459	301098
5	3024	301790	298284
6	3024	299648	296016
7	3024	299192	297990
8	3024	303122	293160
9	3024	296400	290766
10	3066	300131	293412
11	3024	300400	292866
12	3024	300010	286146
13	3024	299016	290094
14	3024	299199	290430
15	3024	299432	294882
16	3066	297764	290220
17	2982	300399	296520
18	3024	299532	288708
19	3108	316613	363594
20	3024	300204	291984
21	3024	298646	297570
22	3024	298635	288750
23	3024	300353	293538
24	3066	299641	293286
25	3024	301451	291186
26	7560	298745	374682
27	3024	300630	289590
28	3024	299043	289212
29	3024	300289	292866
30	3024	300199	289968
31	3024	300334	288834
32	3024	301418	286902
33	3024	300578	286944
34	3024	300474	288918
35	3024	298766	286482
36	3024	300009	286356
37	2940	300554	285096
38	3024	300935	287994
39	3024	300986	288792
40	3024	300453	289590
41	3024	301566	283962
42	3234	300659	284088
43	3066	300655	283962
44	3024	300415	285852
45	3024	300782	286566
46	3024	300247	284928
47	4536	299961	334866
48	2268	300012	285852
49	2268	301426	287322
Totals	153,048	14,722,706	14,575,974

HOBBS OCD
MAR 17 2017
RECEIVED

From Bottom	Stage 46	Distance	13,353	49	14	13,204	55	14	13,055	50	14	12,801	55	14	12,807	50	12	13,303	44	12	13,154	49	12	13,006	50	12	12,857	12,931	36	148	13,377	Total Shots
From Bottom	Stage 47	Distance	13,204	55	14	13,055	50	14	12,801	55	14	12,807	50	12	13,303	44	12	13,154	49	12	13,006	50	12	12,857	12,931	36	148	13,377	Total Shots			
From Bottom	Stage 48	Distance	13,055	50	14	12,801	55	14	12,807	50	12	13,303	44	12	13,154	49	12	13,006	50	12	12,857	12,931	36	148	13,377	Total Shots						
From Bottom	Stage 49	Distance	12,801	55	14	12,807	50	12	13,303	44	12	13,154	49	12	13,006	50	12	12,857	12,931	36	148	13,377	Total Shots									
From Bottom	Stage 40	Distance	14,841	55	14	14,692	50	14	14,544	49	14	14,395	49	14	14,246	50	14	14,096	48	14	13,948	50	14	13,800	49	14	13,652	13,800	36	148	14,122	Total Shots
From Bottom	Stage 41	Distance	14,096	48	14	13,948	50	14	13,800	49	14	13,652	45	14	13,502	49	14	13,352	46	12	13,204	50	14	13,055	50	12	12,907	13,055	36	148	13,377	Total Shots
From Bottom	Stage 42	Distance	13,948	50	14	13,800	49	14	13,652	45	14	13,502	45	14	13,352	46	12	13,204	50	14	13,055	50	14	12,907	13,055	36	148	13,377	Total Shots			
From Bottom	Stage 43	Distance	13,800	49	14	13,652	45	14	13,502	45	14	13,352	45	14	13,204	50	14	13,055	50	14	12,907	13,055	36	148	13,377	Total Shots						
From Bottom	Stage 44	Distance	13,652	45	14	13,502	45	14	13,352	45	14	13,204	50	14	13,055	50	14	12,907	13,055	36	148	13,377	Total Shots									
From Bottom	Stage 45	Distance	13,502	49	14	13,352	46	12	13,204	50	14	13,055	50	14	12,907	13,055	36	148	13,377	Total Shots												
From Bottom	Stage 36	Distance	14,841	55	14	14,692	50	14	14,544	49	14	14,395	49	14	14,246	50	14	14,096	48	14	13,948	50	14	13,800	49	14	13,652	13,800	36	148	14,122	Total Shots
From Bottom	Stage 37	Distance	14,692	50	14	14,544	49	14	14,395	49	14	14,246	50	14	14,096	48	14	13,948	50	14	13,800	49	14	13,652	13,800	36	148	14,122	Total Shots			
From Bottom	Stage 38	Distance	14,544	49	14	14,395	49	14	14,246	50	14	14,096	48	14	13,948	50	14	13,800	49	14	13,652	13,800	36	148	14,122	Total Shots						
From Bottom	Stage 39	Distance	14,395	49	14	14,246	50	14	14,096	48	14	13,948	50	14	13,800	49	14	13,652	13,800	36	148	14,122	Total Shots									
From Bottom	Stage 30	Distance	16,265	114	14	16,186	45	14	16,032	50	14	15,883	50	14	15,734	54	14	15,586	49	14	15,437	50	14	15,285	49	14	15,139	15,285	36	148	15,666	Total Shots
From Bottom	Stage 26	Distance	16,265	114	14	16,186	45	14	16,032	50	14	15,883	50	14	15,734	54	14	15,586	49	14	15,437	50	14	15,285	49	14	15,139	15,285	36	148	15,666	Total Shots

**McVAY DRILLING COMPANY**

P.O. Box 2450
Hobbs, New Mexico 88241
(575) 397-3311
FAX: 39-DRILL

Well Name and Num: Skull Cap Federal Com #22H
Location: Sec 32, T24S,R35E
Operator: COG
Drilling Contractor: McVay Drilling Company

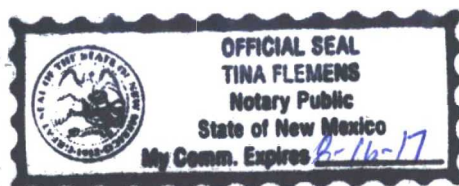
The undersigned certifies that he is an authorized representative of the drilling contractor who drilled the above described well and that he has conducted deviation tests and obtained the following results:

<u>Degrees @</u>	<u>Depth</u>	<u>Degrees @</u>	<u>Depth</u>	<u>Degrees @</u>	<u>Depth</u>	<u>Degrees @</u>	<u>Depth</u>
0.40	1218	0.70	7640	89.90	13411	88.70	19284
0.20	1594	0.80	8018	89.10	13702	89.40	19473
0.30	2026	1.10	8395	88.40	14174	92.60	19662
0.20	2350	0.90	8773	88.60	14647	91.30	20124
0.20	2727	1.00	9150	87.90	15026		
0.40	2105	1.40	9339	89.10	15119		
0.50	3483	2.80	10188	92.40	15214		
1.70	3861	2.00	10565	89.50	15434		
0.60	4050	1.20	10940	93.50	15594		
1.80	4426	2.90	11415	87.40	16921		
0.30	4804	2.00	11793	89.40	17394		
0.70	5329	1.60	12060	94.60	17583		
0.60	5847	22.20	12218	93.50	17868		
0.50	6224	37.80	12344	90.60	18055		
0.10	6791	61.80	12627	87.30	18622		
0.50	7074	91.10	12911	90.60	18906		
0.80	7452	89.70	13039	88.00	19095		

By: Mario A. Bana

Subscribed and sworn to before me this 10th day of October, 2016

Tina Flemens
Notary Public, Lea County, New Mexico



SURVEY CERTIFICATION FORM

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



Company: COG

Job #: 60362

Well Name: Skullcap Federal Com #2H

County/State: Lea Co., New Mexico

Survey Instrument Type: North Seek Rate Gyro

API # 30-025-43299

TIE-IN DATA

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

First Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
2016-09-18	0	0	0

Last Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
2016-09-18	11916	1.83	246.93

Projected TD Survey

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

Grid Correction
-0.5

Gyro Operator: Phoenix Technology Services USA Ltd.

Gyro Supervisor: Jaime Stephenson

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

Date: 09-18-16

Print Name: Noe Garza

Signature: 



Company: COG
 Well: Skullcap Federal Com # 2H
 Location: Lea Co., New Mexico
 Rig: McVay 8

Job Number: 60362
 Grid Corr.: -0.50
 Lat: 32.17
 Long: -103.39

Date: 09-18-16
 Calculation Method: Minimum Curvature
 Proposed Azimuth:
 RKB - MSL in feet: 26 Feet
 Tie Into: Surface

Survey Tool Type	Survey Depth (ft)	Inclina- tion (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
							N/S (ft)	E/W (ft)	Distance (ft)	Angle (deg)			
Enter Tie-In Survey on Line 10													
FIELD COPY, NON-DEFINITIVE													
TIE IN	0			0	0	0	0	0					
Gyro	100.00	0.98	331.73	100	100.00	0.75	0.75 N	0.41 W	0.86	331.73	0.98	0.98	331.73
	200.00	1.21	258.92	100	199.98	1.30	1.30 N	1.85 W	2.26	305.22	1.31	0.23	-72.81
	300.00	2.01	23.36	100	299.96	2.71	2.71 N	2.19 W	3.48	321.10	2.87	0.80	-235.56
	400.00	1.47	33.13	100	399.91	5.39	5.39 N	0.79 W	5.45	351.66	0.61	-0.54	9.77
	500.00	1.41	12.11	100	499.88	7.67	7.67 N	0.17 E	7.67	1.26	0.53	-0.06	-21.02
	600.00	0.36	44.76	100	599.87	9.10	9.10 N	0.65 E	9.12	4.07	1.12	-1.05	32.65
	700.00	0.83	62.62	100	699.86	9.65	9.65 N	1.51 E	9.77	8.90	0.50	0.47	17.86
	800.00	0.40	52.64	100	799.86	10.20	10.20 N	2.43 E	10.49	13.42	0.44	-0.43	-9.98
	900.00	0.65	87.06	100	899.85	10.44	10.44 N	3.28 E	10.94	17.42	0.39	0.25	34.42
	1000.00	0.72	72.27	100	999.85	10.66	10.66 N	4.44 E	11.55	22.62	0.19	0.07	-14.79
	1100.00	1.33	70.05	100	1099.83	11.25	11.25 N	6.13 E	12.81	28.59	0.61	0.61	-2.22
	1200.00	0.69	114.04	100	1199.82	11.40	11.40 N	7.77 E	13.80	34.29	0.96	-0.64	43.99
	1300.00	0.75	154.89	100	1299.81	10.56	10.56 N	8.60 E	13.62	39.16	0.51	0.06	40.85
	1400.00	0.29	186.56	100	1399.80	9.72	9.72 N	8.85 E	13.14	42.32	0.53	-0.46	31.67
	1500.00	0.42	158.11	100	1499.80	9.13	9.13 N	8.96 E	12.79	44.46	0.22	0.13	-28.45
	1600.00	0.49	350.29	100	1599.80	9.21	9.21 N	9.02 E	12.89	44.42	0.90	0.07	192.18
	1700.00	0.14	265.39	100	1699.80	9.62	9.62 N	8.83 E	13.05	42.54	0.50	-0.35	-84.90
	1800.00	0.78	325.49	100	1799.80	10.17	10.17 N	8.32 E	13.14	39.29	0.72	0.64	60.10
	1900.00	0.29	116.60	100	1899.79	10.62	10.62 N	8.16 E	13.39	37.55	1.04	-0.49	-208.89
	2000.00	0.53	78.95	100	1999.79	10.59	10.59 N	8.84 E	13.80	39.85	0.35	0.24	-37.65
	2100.00	0.49	120.92	100	2099.79	10.46	10.46 N	9.66 E	14.24	42.72	0.37	-0.04	41.97
	2200.00	0.57	172.73	100	2199.78	9.75	9.75 N	10.09 E	14.03	45.99	0.47	0.08	51.81
	2300.00	0.68	154.37	100	2299.78	8.72	8.72 N	10.41 E	13.58	50.05	0.23	0.11	-18.36
	2400.00	0.64	108.37	100	2399.77	8.01	8.01 N	11.20 E	13.77	54.43	0.52	-0.04	-46.00
	2500.00	0.58	311.91	100	2499.77	8.17	8.17 N	11.35 E	13.99	54.25	1.19	-0.06	203.54
	2600.00	0.73	222.97	100	2599.77	8.04	8.04 N	10.54 E	13.26	52.65	0.92	0.15	-88.94
	2700.00	0.87	156.38	100	2699.76	6.88	6.88 N	10.41 E	12.48	56.53	0.89	0.14	-66.59



Company: COG
 Well: Skullcap Federal Com # 2H
 Location: Lea Co., New Mexico
 Rig: McVay 8

Job Number: 60362
 Grid Corr.: -0.50
 Lat: 32.17
 Long: -103.39

Calculation Method: Minimum Curvature
 Proposed Azimuth:
 RKB - MSL in feet: 26 Feet
 Tie Into: Surface

Survey Tool Type	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
							N/S (ft)	E/W (ft)	Distance (ft)	Angle (deg)			
	2800.00	0.63	215.37	100	2799.75	5.74	5.74 N	10.40 E	11.87	61.11	0.77	-0.24	58.99
	2900.00	0.37	85.20	100	2899.75	5.32	5.32 N	10.40 E	11.68	62.93	0.91	-0.26	-130.17
	3000.00	0.50	84.68	100	2999.75	5.38	5.38 N	11.16 E	12.39	64.24	0.13	0.13	-0.52
	3100.00	0.66	71.78	100	3099.74	5.60	5.60 N	12.14 E	13.37	65.22	0.21	0.16	-12.90
	3200.00	0.78	70.31	100	3199.73	6.01	6.01 N	13.32 E	14.62	65.71	0.12	0.12	-1.47
	3300.00	0.80	113.95	100	3299.72	5.96	5.96 N	14.60 E	15.77	67.80	0.59	0.02	43.64
	3400.00	0.86	83.06	100	3399.71	5.77	5.77 N	15.99 E	16.99	70.17	0.45	0.06	-30.89
	3500.00	0.41	73.61	100	3499.71	5.96	5.96 N	17.07 E	18.08	70.76	0.46	-0.45	-9.45
	3600.00	0.39	224.07	100	3599.71	5.81	5.81 N	17.18 E	18.14	71.30	0.77	-0.02	150.46
	3700.00	0.77	64.98	100	3699.70	5.85	5.85 N	17.55 E	18.50	71.56	1.14	0.38	-159.09
	3800.00	0.81	108.64	100	3799.70	5.91	5.91 N	18.83 E	19.74	72.57	0.59	0.04	43.66
	3900.00	0.68	95.96	100	3899.69	5.62	5.62 N	20.09 E	20.86	74.36	0.21	-0.13	-12.68
	4000.00	0.66	38.40	100	3999.68	6.01	6.01 N	21.04 E	21.88	74.05	0.65	-0.02	-57.56
	4100.00	0.59	37.99	100	4099.68	6.87	6.87 N	21.71 E	22.78	72.44	0.07	-0.07	-0.41
	4200.00	1.05	36.90	100	4199.66	8.01	8.01 N	22.58 E	23.96	70.47	0.46	0.46	-1.09
	4300.00	1.26	56.25	100	4299.64	9.35	9.35 N	24.05 E	25.80	68.74	0.44	0.21	19.35
	4400.00	2.02	75.89	100	4399.60	10.39	10.39 N	26.67 E	28.62	68.71	0.93	0.76	19.64
	4500.00	2.33	83.26	100	4499.53	11.06	11.06 N	30.40 E	32.35	70.00	0.42	0.31	7.37
	4600.00	1.14	100.94	100	4599.49	11.11	11.11 N	33.39 E	35.19	71.59	1.29	-1.19	17.68
	4700.00	2.30	133.29	100	4699.44	9.55	9.55 N	35.83 E	37.08	75.08	1.47	1.16	32.35
	4800.00	2.91	160.89	100	4799.34	5.77	5.77 N	38.12 E	38.56	81.39	1.38	0.61	27.60
	4900.00	1.32	175.12	100	4899.27	2.23	2.23 N	39.05 E	39.11	86.74	1.66	-1.59	14.23
	5000.00	0.68	99.60	100	4999.26	0.98	0.98 N	39.73 E	39.75	88.59	1.33	-0.64	-75.52
	5100.00	1.15	69.85	100	5099.24	1.23	1.23 N	41.26 E	41.28	88.30	0.65	0.47	-29.75
	5200.00	1.20	137.81	100	5199.23	0.80	0.80 N	42.91 E	42.91	88.94	1.31	0.05	67.96
	5300.00	1.19	155.60	100	5299.21	-0.93	0.93 S	44.04 E	44.05	91.20	0.37	-0.01	17.79
	5400.00	0.97	115.03	100	5399.19	-2.23	2.23 S	45.23 E	45.29	92.82	0.78	-0.22	-40.57
	5500.00	0.91	182.36	100	5499.18	-3.38	3.38 S	45.97 E	46.09	94.21	1.04	-0.06	67.33
	5600.00	0.92	164.86	100	5599.17	-4.95	4.95 S	46.15 E	46.41	96.12	0.28	0.01	-17.50
	5700.00	1.05	148.05	100	5699.15	-6.50	6.50 S	46.84 E	47.29	97.90	0.32	0.13	-16.81



Company: COG
 Well: Skullcap Federal Com # 2H
 Location: Lea Co., New Mexico
 Rig: McVay 8

Job Number: 60362
 Grid Corr.: -0.50
 Lat: 32.17
 Long: -103.39

Calculation Method: Minimum Curvature
 Proposed Azimuth:
 RKB - MSL in feet: 26 Feet
 Tie Into: Surface

Survey Tool Type	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
							N/S (ft)	E/W (ft)	Distance (ft)	Angle (deg)			
	5800.00	0.87	147.73	100	5799.14	-7.92	7.92 S	47.73 E	48.38	99.42	0.18	-0.18	-0.32
	5900.00	0.59	88.35	100	5899.13	-8.55	8.55 S	48.65 E	49.40	99.97	0.76	-0.28	-59.38
	6000.00	0.66	156.01	100	5999.13	-9.06	9.06 S	49.40 E	50.22	100.39	0.70	0.07	67.66
	6100.00	0.88	179.85	100	6099.12	-10.35	10.35 S	49.64 E	50.70	101.78	0.38	0.22	23.84
	6200.00	1.46	117.67	100	6199.10	-11.71	11.71 S	50.77 E	52.10	102.99	1.31	0.58	-62.18
	6300.00	1.12	34.90	100	6299.08	-11.50	11.50 S	52.45 E	53.70	102.37	1.72	-0.34	-82.77
	6400.00	2.45	162.00	100	6399.05	-12.73	12.73 S	53.67 E	55.16	103.35	3.25	1.33	127.10
	6500.00	0.24	186.77	100	6499.02	-14.98	14.98 S	54.31 E	56.34	105.42	2.23	-2.21	24.77
	6600.00	0.95	128.78	100	6599.01	-15.70	15.70 S	54.93 E	57.13	105.95	0.85	0.71	-57.99
	6700.00	1.00	186.83	100	6699.00	-17.09	17.09 S	55.47 E	58.05	107.12	0.95	0.05	58.05
	6800.00	0.82	95.38	100	6798.99	-18.02	18.02 S	56.08 E	58.91	107.81	1.31	-0.18	-91.45
	6900.00	0.76	117.79	100	6898.98	-18.40	18.40 S	57.38 E	60.26	107.78	0.31	-0.06	22.41
	7000.00	0.57	143.43	100	6998.98	-19.11	19.11 S	58.26 E	61.32	108.16	0.35	-0.19	25.64
	7100.00	0.61	66.43	100	7098.97	-19.29	19.29 S	59.05 E	62.12	108.09	0.74	0.04	-77.00
	7200.00	0.88	99.25	100	7198.97	-19.20	19.20 S	60.29 E	63.28	107.67	0.49	0.27	32.82
	7300.00	0.89	142.26	100	7298.96	-19.94	19.94 S	61.53 E	64.68	107.96	0.65	0.01	43.01
	7400.00	1.61	355.07	100	7398.94	-19.16	19.16 S	61.88 E	64.78	107.20	2.41	0.72	212.81
	7500.00	1.54	135.05	100	7498.93	-18.71	18.71 S	62.71 E	65.44	106.61	2.96	-0.07	-220.02
	7600.00	0.61	197.30	100	7598.91	-20.17	20.17 S	63.50 E	66.63	107.62	1.37	-0.93	62.25
	7700.00	0.88	59.69	100	7698.91	-20.29	20.29 S	64.01 E	67.15	107.59	1.39	0.27	-137.61
	7800.00	1.05	64.57	100	7798.89	-19.51	19.51 S	65.50 E	68.34	106.58	0.19	0.17	4.88
	7900.00	1.19	127.82	100	7898.88	-19.75	19.75 S	67.15 E	69.99	106.39	1.18	0.14	63.25
	8000.00	1.62	167.00	100	7998.85	-21.76	21.76 S	68.28 E	71.67	107.68	1.03	0.43	39.18
	8100.00	1.08	171.61	100	8098.82	-24.07	24.07 S	68.74 E	72.83	109.30	0.55	-0.54	4.61
	8200.00	0.46	200.86	100	8198.81	-25.38	25.38 S	68.73 E	73.27	110.27	0.71	-0.62	29.25
	8300.00	1.36	94.54	100	8298.80	-25.85	25.85 S	69.77 E	74.41	110.33	1.55	0.90	-106.32
	8400.00	1.37	100.87	100	8398.78	-26.17	26.17 S	72.13 E	76.73	109.94	0.15	0.01	6.33
	8500.00	1.29	89.60	100	8498.75	-26.39	26.39 S	74.43 E	78.97	109.52	0.27	-0.08	-11.27
	8600.00	1.38	77.46	100	8598.72	-26.12	26.12 S	76.73 E	81.05	108.80	0.30	0.09	-12.14
	8700.00	1.34	66.15	100	8698.69	-25.38	25.38 S	78.98 E	82.96	107.82	0.27	-0.04	-11.31



Company: COG
Well: Skullcap Federal Com # 2H
Location: Lea Co., New Mexico
Rig: McVay 8

Job Number: 60362
Grid Corr.: -0.50
Lat: 32.17
Long: -103.39

Calculation Method: Minimum Curvature
Proposed Azimuth: _____
RKB - MSL in feet: 26 Feet
Tie Into: Surface

Survey Tool Type	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
							N/S (ft)	E/W (ft)	Distance (ft)	Angle (deg)			
	8800.00	0.75	227.61	100	8798.69	-25.35	25.35 S	79.56 E	83.50	107.67	2.06	-0.59	161.46
	8900.00	1.45	122.58	100	8898.67	-26.47	26.47 S	80.15 E	84.40	108.28	1.80	0.70	-105.03
	9000.00	1.38	52.22	100	8998.65	-26.42	26.42 S	82.16 E	86.31	107.82	1.63	-0.07	-70.36
	9100.00	1.76	74.61	100	9098.61	-25.27	25.27 S	84.60 E	88.29	106.63	0.71	0.38	22.39
	9200.00	1.43	76.56	100	9198.57	-24.58	24.58 S	87.29 E	90.68	105.72	0.33	-0.33	1.95
	9300.00	1.25	116.88	100	9298.55	-24.78	24.78 S	89.48 E	92.84	105.48	0.94	-0.18	40.32
	9400.00	1.27	45.00	100	9398.53	-24.49	24.49 S	91.23 E	94.46	105.02	1.48	0.02	-71.88
	9500.00	1.58	8.94	100	9498.50	-22.34	22.34 S	92.23 E	94.90	103.62	0.93	0.31	-36.06
	9600.00	1.24	34.22	100	9598.47	-20.09	20.09 S	93.05 E	95.20	102.18	0.70	-0.34	25.28
	9700.00	2.19	307.63	100	9698.44	-18.02	18.02 S	92.15 E	93.89	101.07	2.45	0.95	273.41
	9800.00	1.00	52.95	100	9798.41	-16.33	16.33 S	91.33 E	92.78	100.14	2.64	-1.19	-254.68
	9900.00	0.47	56.83	100	9898.40	-15.58	15.58 S	92.37 E	93.68	99.57	0.53	-0.53	3.88
	10000.00	1.46	309.47	100	9998.39	-14.55	14.55 S	91.73 E	92.88	99.01	1.66	0.99	252.64
	10100.00	2.48	260.19	100	10098.34	-14.11	14.11 S	88.62 E	89.73	99.04	1.89	1.02	-49.28
	10200.00	3.31	286.75	100	10198.22	-13.64	13.64 S	83.72 E	84.82	99.26	1.56	0.83	26.56
	10300.00	3.53	288.89	100	10298.04	-11.81	11.81 S	78.04 E	78.93	98.61	0.25	0.22	2.14
	10400.00	2.30	286.88	100	10397.91	-10.23	10.23 S	73.21 E	73.92	97.96	1.23	-1.23	-2.01
	10500.00	1.47	283.53	100	10497.85	-9.35	9.35 S	70.04 E	70.66	97.60	0.84	-0.83	-3.35
	10600.00	2.08	347.02	100	10597.81	-7.28	7.28 S	68.39 E	68.77	96.08	1.94	0.61	63.49
	10700.00	1.91	354.91	100	10697.75	-3.85	3.85 S	67.83 E	67.94	93.25	0.32	-0.17	7.89
	10800.00	1.58	337.49	100	10797.70	-0.92	0.92 S	67.16 E	67.16	90.79	0.62	-0.33	-17.42
	10900.00	1.41	349.06	100	10897.67	1.56	1.56 N	66.39 E	66.41	88.65	0.35	-0.17	11.57
	11000.00	0.91	326.16	100	10997.65	3.43	3.43 N	65.72 E	65.81	87.01	0.67	-0.50	-22.90
	11100.00	1.28	283.44	100	11097.63	4.35	4.35 N	64.19 E	64.34	86.13	0.87	0.37	-42.72
	11200.00	2.63	276.70	100	11197.57	4.87	4.87 N	60.82 E	61.02	85.42	1.37	1.35	-6.74
	11300.00	3.28	262.99	100	11297.44	4.79	4.79 N	55.71 E	55.91	85.08	0.96	0.65	-13.71
	11400.00	2.97	274.88	100	11397.29	4.66	4.66 N	50.29 E	50.50	84.70	0.72	-0.31	11.89
	11500.00	3.30	275.36	100	11497.14	5.15	5.15 N	44.84 E	45.13	83.44	0.33	0.33	0.48
	11600.00	3.39	267.91	100	11596.97	5.31	5.31 N	39.02 E	39.38	82.24	0.44	0.09	-7.45
	11700.00	3.13	260.77	100	11696.81	4.77	4.77 N	33.37 E	33.71	81.87	0.48	-0.26	-7.14



Company: COG
 Well: Skullcap Federal Com # 2H
 Location: Lea Co., New Mexico
 Rig: McVay 8

Job Number: 60362
 Grid Corr.: -0.50
 Lat: 32.17
 Long: -103.39

Calculation Method: Minimum Curvature
 Proposed Azimuth:
 RKB - MSL in feet: 26 Feet
 Tie Into: Surface

Survey Tool Type	Survey Depth (ft)	Inclina- tion (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
							N/S (ft)	E/W (ft)	Distance (ft)	Angle (deg)			
	11800.00	2.37	256.71	100	11796.70	3.86	3.86 N	28.66 E	28.92	82.34	0.78	-0.76	-4.06
	11916.00	1.83	246.93	116	11912.62	2.58	2.58 N	24.62 E	24.76	84.02	0.56	-0.47	-8.43