



HOBBS OCD

AUG 20 2015

RECEIVED

COG Operating, LLC

Lea County, NM

Sec 20, T21S, R34E

Osprey 20 State Com #6H

Wellbore #1

Design: Wellbore #1

Survey Report - Geographic

15 April, 2015



AUG 31 2015

fm



Survey Report - Geographic



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Osprey 20 State Com #6H
Project:	Lea County, NM	TVD Reference:	Well @ 3783.0usft (Ensign #772)
Site:	Sec 20, T21S, R34E	MD Reference:	Well @ 3783.0usft (Ensign #772)
Well:	Osprey 20 State Com #6H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

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		Sec 20, T21S, R34E			
Site Position:		Northing:	533,555.40 usft	Latitude:	32° 27' 50.624 N
From:	Map	Easting:	758,676.40 usft	Longitude:	103° 29' 40.705 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.45 °

Well	Osprey 20 State Com #6H					
Well Position	+N/-S	0.0 usft	Northing:	536,075.00 usft	Latitude:	32° 28' 15.439 N
	+E/-W	0.0 usft	Easting:	760,158.00 usft	Longitude:	103° 29' 23.181 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	3,752.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	2/23/2015	7.11	60.34	48,401

Design	Wellbore #1				
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	178.80	

Survey Program	Date	4/15/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
127.0	20,670.0	MWD (Wellbore #1)	MWD default	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	536,075.00	760,158.00	32° 28' 15.439 N	103° 29' 23.181 W
127.0	0.70	163.50	127.0	-0.7	0.2	536,074.26	760,158.22	32° 28' 15.432 N	103° 29' 23.178 W
First MWD Survey @ 127' MD / 127' MD									
188.0	0.90	186.30	188.0	-1.6	0.3	536,073.42	760,158.27	32° 28' 15.424 N	103° 29' 23.178 W
250.0	0.50	175.40	250.0	-2.3	0.2	536,072.67	760,158.24	32° 28' 15.416 N	103° 29' 23.178 W
312.0	0.70	198.60	312.0	-3.0	0.1	536,072.04	760,158.14	32° 28' 15.410 N	103° 29' 23.179 W
373.0	0.50	173.60	373.0	-3.6	0.1	536,071.42	760,158.05	32° 28' 15.404 N	103° 29' 23.180 W
464.0	0.20	208.80	464.0	-4.1	0.0	536,070.89	760,158.02	32° 28' 15.399 N	103° 29' 23.181 W
553.0	0.30	188.40	553.0	-4.5	-0.1	536,070.52	760,157.91	32° 28' 15.395 N	103° 29' 23.182 W
642.0	0.30	179.30	642.0	-4.9	-0.1	536,070.06	760,157.88	32° 28' 15.390 N	103° 29' 23.183 W
733.0	0.50	163.80	733.0	-5.6	0.0	536,069.44	760,157.99	32° 28' 15.384 N	103° 29' 23.181 W
822.0	0.20	212.30	822.0	-6.1	0.0	536,068.94	760,158.02	32° 28' 15.379 N	103° 29' 23.181 W



Survey Report - Geographic



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Osprey 20 State Com #6H
Project:	Lea County, NM	TVD Reference:	Well @ 3783.0usft (Ensign #772)
Site:	Sec 20, T21S, R34E	MD Reference:	Well @ 3783.0usft (Ensign #772)
Well:	Osprey 20 State Com #6H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
912.0	0.20	69.20	912.0	-6.1	0.1	536,068.86	760,158.08	32° 28' 15.378 N	103° 29' 23.180 W
1,001.0	0.20	3.90	1,001.0	-5.9	0.2	536,069.07	760,158.24	32° 28' 15.381 N	103° 29' 23.179 W
1,092.0	0.30	209.20	1,092.0	-6.0	0.1	536,069.02	760,158.13	32° 28' 15.380 N	103° 29' 23.180 W
1,183.0	0.30	223.20	1,183.0	-6.4	-0.1	536,068.64	760,157.85	32° 28' 15.376 N	103° 29' 23.183 W
1,277.0	0.30	151.50	1,277.0	-6.8	-0.2	536,068.24	760,157.80	32° 28' 15.372 N	103° 29' 23.184 W
1,372.0	0.50	159.20	1,372.0	-7.4	0.1	536,067.64	760,158.07	32° 28' 15.366 N	103° 29' 23.181 W
1,467.0	0.20	127.60	1,467.0	-7.9	0.3	536,067.15	760,158.34	32° 28' 15.362 N	103° 29' 23.177 W
1,561.0	0.20	115.30	1,561.0	-8.0	0.6	536,066.98	760,158.62	32° 28' 15.360 N	103° 29' 23.174 W
1,656.0	0.30	163.80	1,656.0	-8.3	0.8	536,066.67	760,158.84	32° 28' 15.357 N	103° 29' 23.172 W
1,749.0	0.30	142.40	1,749.0	-8.8	1.1	536,066.24	760,159.06	32° 28' 15.352 N	103° 29' 23.169 W
1,823.0	0.30	139.90	1,823.0	-9.1	1.3	536,065.94	760,159.30	32° 28' 15.349 N	103° 29' 23.166 W
1,933.0	0.40	171.70	1,933.0	-9.7	1.5	536,065.34	760,159.54	32° 28' 15.344 N	103° 29' 23.164 W
2,028.0	0.80	157.50	2,028.0	-10.6	1.8	536,064.40	760,159.84	32° 28' 15.334 N	103° 29' 23.160 W
2,121.0	0.70	109.00	2,120.9	-11.4	2.6	536,063.61	760,160.63	32° 28' 15.326 N	103° 29' 23.151 W
2,216.0	1.00	80.50	2,215.9	-11.4	4.0	536,063.56	760,162.00	32° 28' 15.326 N	103° 29' 23.135 W
2,310.0	0.80	71.00	2,309.9	-11.1	5.4	536,063.91	760,163.43	32° 28' 15.329 N	103° 29' 23.118 W
2,405.0	0.60	284.80	2,404.9	-10.7	5.6	536,064.25	760,163.57	32° 28' 15.332 N	103° 29' 23.117 W
2,498.0	1.60	294.10	2,497.9	-10.1	3.9	536,064.91	760,161.92	32° 28' 15.339 N	103° 29' 23.136 W
2,592.0	0.60	287.20	2,591.9	-9.4	2.3	536,065.59	760,160.25	32° 28' 15.346 N	103° 29' 23.155 W
2,686.0	0.80	244.00	2,685.9	-9.6	1.2	536,065.45	760,159.19	32° 28' 15.345 N	103° 29' 23.168 W
2,780.0	1.20	246.80	2,779.9	-10.2	-0.3	536,064.77	760,157.69	32° 28' 15.338 N	103° 29' 23.185 W
2,874.0	0.50	289.70	2,873.9	-10.5	-1.6	536,064.52	760,156.40	32° 28' 15.336 N	103° 29' 23.200 W
2,968.0	0.50	347.70	2,967.9	-9.9	-2.1	536,065.06	760,155.93	32° 28' 15.341 N	103° 29' 23.206 W
3,063.0	0.40	27.90	3,062.8	-9.2	-2.0	536,065.76	760,156.00	32° 28' 15.348 N	103° 29' 23.205 W
3,157.0	0.70	39.20	3,156.8	-8.5	-1.5	536,066.50	760,156.51	32° 28' 15.355 N	103° 29' 23.199 W
3,251.0	1.00	59.60	3,250.8	-7.6	-0.4	536,067.36	760,157.58	32° 28' 15.364 N	103° 29' 23.186 W
3,346.0	1.10	89.80	3,345.8	-7.2	1.2	536,067.78	760,159.21	32° 28' 15.368 N	103° 29' 23.167 W
3,441.0	0.30	193.20	3,440.8	-7.5	2.1	536,067.54	760,160.06	32° 28' 15.365 N	103° 29' 23.157 W
3,536.0	0.30	260.70	3,535.8	-7.7	1.8	536,067.26	760,159.76	32° 28' 15.362 N	103° 29' 23.161 W
3,631.0	0.30	281.90	3,630.8	-7.7	1.3	536,067.27	760,159.27	32° 28' 15.363 N	103° 29' 23.167 W
3,725.0	0.50	312.90	3,724.8	-7.4	0.7	536,067.60	760,158.73	32° 28' 15.366 N	103° 29' 23.173 W
3,820.0	0.50	335.20	3,819.8	-6.7	0.3	536,068.26	760,158.25	32° 28' 15.372 N	103° 29' 23.178 W
3,914.0	0.50	10.40	3,913.8	-6.0	0.2	536,069.03	760,158.16	32° 28' 15.380 N	103° 29' 23.179 W
4,009.0	0.60	15.80	4,008.8	-5.1	0.4	536,069.92	760,158.37	32° 28' 15.389 N	103° 29' 23.177 W
4,103.0	0.70	9.30	4,102.8	-4.0	0.6	536,070.96	760,158.59	32° 28' 15.399 N	103° 29' 23.174 W
4,197.0	0.80	15.80	4,196.8	-2.8	0.9	536,072.16	760,158.87	32° 28' 15.411 N	103° 29' 23.171 W
4,291.0	0.90	21.40	4,290.8	-1.5	1.3	536,073.48	760,159.31	32° 28' 15.424 N	103° 29' 23.166 W
4,385.0	0.70	21.60	4,384.8	-0.3	1.8	536,074.70	760,159.79	32° 28' 15.436 N	103° 29' 23.160 W
4,479.0	0.60	16.00	4,478.8	0.7	2.1	536,075.70	760,160.14	32° 28' 15.446 N	103° 29' 23.156 W
4,573.0	0.80	27.40	4,572.7	1.8	2.6	536,076.76	760,160.58	32° 28' 15.456 N	103° 29' 23.150 W
4,668.0	1.00	44.80	4,667.7	2.9	3.5	536,077.94	760,161.47	32° 28' 15.468 N	103° 29' 23.140 W
4,763.0	1.20	35.50	4,762.7	4.3	4.6	536,079.33	760,162.63	32° 28' 15.482 N	103° 29' 23.126 W
4,856.0	0.30	104.60	4,855.7	5.1	5.4	536,080.07	760,163.43	32° 28' 15.489 N	103° 29' 23.117 W
4,950.0	0.60	155.20	4,949.7	4.6	5.9	536,079.56	760,163.88	32° 28' 15.484 N	103° 29' 23.112 W
5,044.0	1.00	176.60	5,043.7	3.3	6.1	536,078.29	760,164.13	32° 28' 15.471 N	103° 29' 23.109 W
5,139.0	0.80	193.70	5,138.7	1.8	6.0	536,076.82	760,164.02	32° 28' 15.457 N	103° 29' 23.110 W
5,233.0	1.40	209.20	5,232.7	0.2	5.3	536,075.18	760,163.31	32° 28' 15.441 N	103° 29' 23.119 W
5,328.0	1.10	216.70	5,327.6	-1.6	4.2	536,073.44	760,162.20	32° 28' 15.423 N	103° 29' 23.132 W
5,423.0	1.10	240.60	5,422.6	-2.7	2.9	536,072.26	760,160.86	32° 28' 15.412 N	103° 29' 23.148 W
5,517.0	1.10	232.90	5,516.6	-3.7	1.4	536,071.27	760,159.35	32° 28' 15.402 N	103° 29' 23.165 W
5,611.0	1.20	232.40	5,610.6	-4.9	-0.1	536,070.12	760,157.85	32° 28' 15.391 N	103° 29' 23.183 W
5,705.0	1.10	227.40	5,704.6	-6.1	-1.6	536,068.91	760,156.41	32° 28' 15.379 N	103° 29' 23.200 W
5,754.0	1.50	221.60	5,753.6	-6.9	-2.4	536,068.12	760,155.64	32° 28' 15.371 N	103° 29' 23.209 W
5,850.0	1.60	221.50	5,849.5	-8.8	-4.1	536,066.17	760,153.91	32° 28' 15.352 N	103° 29' 23.229 W
5,944.0	1.10	199.30	5,943.5	-10.7	-5.3	536,064.34	760,152.75	32° 28' 15.334 N	103° 29' 23.243 W



Survey Report - Geographic



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Osprey 20 State Com #6H
Project:	Lea County, NM	TVD Reference:	Well @ 3783.0usft (Ensign #772)
Site:	Sec 20, T21S, R34E	MD Reference:	Well @ 3783.0usft (Ensign #772)
Well:	Osprey 20 State Com #6H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
6,038.0	0.70	67.10	6,037.5	-11.3	-5.0	536,063.71	760,152.98	32° 28' 15.328 N	103° 29' 23.240 W
6,133.0	1.10	78.00	6,132.5	-10.9	-3.6	536,064.12	760,154.40	32° 28' 15.332 N	103° 29' 23.224 W
6,227.0	0.30	249.90	6,226.5	-10.8	-2.9	536,064.23	760,155.05	32° 28' 15.333 N	103° 29' 23.216 W
6,322.0	0.30	249.60	6,321.5	-10.9	-3.4	536,064.06	760,154.59	32° 28' 15.331 N	103° 29' 23.222 W
6,416.0	0.30	276.70	6,415.5	-11.0	-3.9	536,064.00	760,154.11	32° 28' 15.331 N	103° 29' 23.227 W
6,509.0	0.30	288.30	6,508.5	-10.9	-4.4	536,064.10	760,153.64	32° 28' 15.332 N	103° 29' 23.233 W
6,604.0	0.30	276.00	6,603.5	-10.8	-4.8	536,064.21	760,153.16	32° 28' 15.333 N	103° 29' 23.238 W
6,698.0	0.50	291.10	6,697.5	-10.6	-5.5	536,064.38	760,152.53	32° 28' 15.335 N	103° 29' 23.246 W
6,792.0	0.30	318.50	6,791.5	-10.3	-6.0	536,064.71	760,151.98	32° 28' 15.338 N	103° 29' 23.252 W
6,886.0	0.30	324.50	6,885.5	-9.9	-6.3	536,065.10	760,151.68	32° 28' 15.342 N	103° 29' 23.255 W
6,982.0	0.30	288.60	6,981.5	-9.6	-6.7	536,065.38	760,151.29	32° 28' 15.345 N	103° 29' 23.260 W
7,077.0	0.30	297.80	7,076.5	-9.4	-7.2	536,065.58	760,150.84	32° 28' 15.347 N	103° 29' 23.265 W
7,171.0	0.30	6.00	7,170.5	-9.1	-7.4	536,065.94	760,150.64	32° 28' 15.350 N	103° 29' 23.267 W
7,266.0	0.30	357.90	7,265.5	-8.6	-7.3	536,066.43	760,150.66	32° 28' 15.355 N	103° 29' 23.267 W
7,360.0	0.20	278.10	7,359.5	-8.3	-7.5	536,066.70	760,150.49	32° 28' 15.358 N	103° 29' 23.269 W
7,455.0	0.00	289.00	7,454.5	-8.3	-7.7	536,066.73	760,150.33	32° 28' 15.358 N	103° 29' 23.271 W
7,550.0	0.50	244.00	7,549.5	-8.5	-8.0	536,066.54	760,149.95	32° 28' 15.356 N	103° 29' 23.275 W
7,645.0	0.30	242.90	7,644.5	-8.8	-8.6	536,066.25	760,149.36	32° 28' 15.353 N	103° 29' 23.282 W
7,740.0	0.30	280.20	7,739.5	-8.8	-9.1	536,066.18	760,148.89	32° 28' 15.353 N	103° 29' 23.288 W
7,834.0	0.30	212.70	7,833.5	-9.0	-9.5	536,066.02	760,148.52	32° 28' 15.351 N	103° 29' 23.292 W
7,928.0	0.50	246.10	7,927.5	-9.4	-10.0	536,065.64	760,148.01	32° 28' 15.347 N	103° 29' 23.298 W
8,023.0	0.70	223.90	8,022.5	-9.9	-10.8	536,065.06	760,147.23	32° 28' 15.342 N	103° 29' 23.307 W
8,118.0	0.30	212.70	8,117.4	-10.6	-11.3	536,064.43	760,146.69	32° 28' 15.336 N	103° 29' 23.314 W
8,212.0	0.70	231.70	8,211.4	-11.1	-11.9	536,063.87	760,146.11	32° 28' 15.330 N	103° 29' 23.321 W
8,307.0	0.50	234.10	8,306.4	-11.7	-12.7	536,063.26	760,145.32	32° 28' 15.324 N	103° 29' 23.330 W
8,401.0	0.20	199.30	8,400.4	-12.1	-13.1	536,062.87	760,144.93	32° 28' 15.320 N	103° 29' 23.334 W
8,495.0	0.00	174.70	8,494.4	-12.3	-13.1	536,062.71	760,144.88	32° 28' 15.319 N	103° 29' 23.335 W
8,590.0	0.50	203.90	8,589.4	-12.7	-13.3	536,062.33	760,144.71	32° 28' 15.315 N	103° 29' 23.337 W
8,684.0	0.30	186.00	8,683.4	-13.3	-13.5	536,061.71	760,144.52	32° 28' 15.309 N	103° 29' 23.339 W
8,780.0	0.30	196.10	8,779.4	-13.8	-13.6	536,061.22	760,144.42	32° 28' 15.304 N	103° 29' 23.340 W
8,875.0	0.30	172.90	8,874.4	-14.3	-13.6	536,060.74	760,144.38	32° 28' 15.299 N	103° 29' 23.341 W
8,970.0	0.50	138.50	8,969.4	-14.8	-13.3	536,060.18	760,144.69	32° 28' 15.294 N	103° 29' 23.337 W
9,065.0	0.50	126.90	9,064.4	-15.4	-12.7	536,059.62	760,145.29	32° 28' 15.288 N	103° 29' 23.330 W
9,160.0	0.50	78.70	9,159.4	-15.5	-12.0	536,059.45	760,146.03	32° 28' 15.286 N	103° 29' 23.322 W
9,255.0	0.50	127.30	9,254.4	-15.7	-11.2	536,059.28	760,146.77	32° 28' 15.285 N	103° 29' 23.313 W
9,350.0	0.30	143.10	9,349.4	-16.2	-10.7	536,058.83	760,147.25	32° 28' 15.280 N	103° 29' 23.308 W
9,445.0	0.20	261.20	9,444.4	-16.4	-10.8	536,058.61	760,147.23	32° 28' 15.278 N	103° 29' 23.308 W
9,541.0	0.20	220.10	9,540.4	-16.5	-11.0	536,058.46	760,146.96	32° 28' 15.276 N	103° 29' 23.311 W
9,635.0	0.30	244.30	9,634.4	-16.8	-11.4	536,058.22	760,146.63	32° 28' 15.274 N	103° 29' 23.315 W
9,730.0	0.50	139.20	9,729.4	-17.2	-11.3	536,057.80	760,146.68	32° 28' 15.270 N	103° 29' 23.314 W
9,825.0	0.90	111.10	9,824.4	-17.8	-10.4	536,057.22	760,147.65	32° 28' 15.264 N	103° 29' 23.303 W
9,920.0	0.70	137.40	9,919.4	-18.5	-9.3	536,056.52	760,148.73	32° 28' 15.257 N	103° 29' 23.291 W
10,016.0	0.70	186.30	10,015.4	-19.5	-8.9	536,055.51	760,149.07	32° 28' 15.247 N	103° 29' 23.287 W
10,111.0	0.90	192.60	10,110.4	-20.8	-9.2	536,054.20	760,148.84	32° 28' 15.234 N	103° 29' 23.290 W
10,206.0	0.70	199.00	10,205.4	-22.1	-9.5	536,052.93	760,148.49	32° 28' 15.222 N	103° 29' 23.294 W
10,301.0	0.30	194.40	10,300.4	-22.9	-9.8	536,052.14	760,148.24	32° 28' 15.214 N	103° 29' 23.297 W
10,392.0	3.90	180.70	10,391.3	-26.2	-9.9	536,048.81	760,148.14	32° 28' 15.181 N	103° 29' 23.298 W
10,424.0	8.60	176.50	10,423.1	-29.7	-9.7	536,045.33	760,148.27	32° 28' 15.146 N	103° 29' 23.297 W
10,456.0	12.10	183.10	10,454.6	-35.4	-9.8	536,039.59	760,148.24	32° 28' 15.090 N	103° 29' 23.298 W
10,487.0	16.20	186.30	10,484.6	-43.0	-10.4	536,032.05	760,147.59	32° 28' 15.015 N	103° 29' 23.306 W
10,519.0	20.10	186.70	10,515.0	-52.9	-11.5	536,022.15	760,146.46	32° 28' 14.917 N	103° 29' 23.320 W
10,551.0	23.90	181.70	10,544.7	-64.8	-12.4	536,010.20	760,145.62	32° 28' 14.799 N	103° 29' 23.331 W
10,582.0	27.80	177.20	10,572.6	-78.3	-12.2	535,996.70	760,145.79	32° 28' 14.665 N	103° 29' 23.330 W
10,614.0	31.10	176.80	10,600.4	-94.0	-11.4	535,980.99	760,146.62	32° 28' 14.510 N	103° 29' 23.322 W
10,646.0	33.80	178.60	10,627.4	-111.2	-10.7	535,963.83	760,147.29	32° 28' 14.340 N	103° 29' 23.316 W



Survey Report - Geographic



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Osprey 20 State Com #6H
Project:	Lea County, NM	TVD Reference:	Well @ 3783.0usft (Ensign #772)
Site:	Sec 20, T21S, R34E	MD Reference:	Well @ 3783.0usft (Ensign #772)
Well:	Osprey 20 State Com #6H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,678.0	34.50	180.30	10,653.9	-129.1	-10.5	535,945.87	760,147.46	32° 28' 14.162 N	103° 29' 23.316 W
10,697.2	35.37	181.18	10,669.7	-140.1	-10.7	535,934.88	760,147.32	32° 28' 14.054 N	103° 29' 23.318 W
FTP / Crossed 330' Hard Line @ 10697' MD / 10670' TVD									
10,709.0	35.90	181.70	10,679.3	-147.0	-10.8	535,928.01	760,147.15	32° 28' 13.986 N	103° 29' 23.321 W
10,741.0	38.70	181.70	10,704.7	-166.4	-11.4	535,908.63	760,146.57	32° 28' 13.794 N	103° 29' 23.329 W
10,772.0	42.60	179.60	10,728.2	-186.6	-11.6	535,888.44	760,146.36	32° 28' 13.594 N	103° 29' 23.334 W
10,804.0	46.50	178.60	10,751.0	-209.0	-11.3	535,866.00	760,146.72	32° 28' 13.372 N	103° 29' 23.332 W
10,836.0	48.90	178.90	10,772.6	-232.7	-10.8	535,842.34	760,147.23	32° 28' 13.138 N	103° 29' 23.328 W
10,867.0	50.70	180.00	10,792.6	-256.3	-10.5	535,818.66	760,147.46	32° 28' 12.904 N	103° 29' 23.327 W
10,899.0	54.00	180.30	10,812.1	-281.7	-10.6	535,793.33	760,147.39	32° 28' 12.653 N	103° 29' 23.331 W
10,929.0	57.20	181.00	10,829.1	-306.4	-10.9	535,768.58	760,147.11	32° 28' 12.408 N	103° 29' 23.336 W
10,961.0	59.70	181.40	10,845.8	-333.7	-11.5	535,741.32	760,146.53	32° 28' 12.138 N	103° 29' 23.345 W
10,993.0	60.70	180.30	10,861.7	-361.4	-11.9	535,713.56	760,146.12	32° 28' 11.864 N	103° 29' 23.353 W
11,024.0	62.80	179.60	10,876.4	-388.8	-11.8	535,686.25	760,146.15	32° 28' 11.594 N	103° 29' 23.355 W
11,056.0	65.40	178.90	10,890.4	-417.5	-11.5	535,657.47	760,146.53	32° 28' 11.309 N	103° 29' 23.353 W
11,088.0	68.30	178.20	10,902.9	-446.9	-10.7	535,628.06	760,147.27	32° 28' 11.018 N	103° 29' 23.347 W
11,119.0	70.70	177.50	10,913.8	-476.0	-9.6	535,599.04	760,148.36	32° 28' 10.730 N	103° 29' 23.337 W
11,151.0	73.70	176.80	10,923.6	-506.4	-8.1	535,568.62	760,149.88	32° 28' 10.429 N	103° 29' 23.322 W
11,183.0	76.20	177.20	10,931.9	-537.2	-6.5	535,537.76	760,151.50	32° 28' 10.124 N	103° 29' 23.306 W
11,197.0	77.40	178.20	10,935.1	-550.9	-6.0	535,524.14	760,152.04	32° 28' 9.989 N	103° 29' 23.301 W
11,227.0	79.50	179.30	10,941.1	-580.2	-5.3	535,494.76	760,152.68	32° 28' 9.698 N	103° 29' 23.296 W
11,257.0	82.30	179.30	10,945.8	-609.9	-5.0	535,465.14	760,153.05	32° 28' 9.405 N	103° 29' 23.295 W
11,286.0	85.20	178.90	10,949.0	-638.7	-4.5	535,436.32	760,153.50	32° 28' 9.120 N	103° 29' 23.292 W
11,318.0	88.00	178.60	10,950.9	-670.6	-3.8	535,404.39	760,154.20	32° 28' 8.804 N	103° 29' 23.287 W
11,377.0	89.20	178.60	10,952.3	-729.6	-2.4	535,345.42	760,155.64	32° 28' 8.220 N	103° 29' 23.276 W
11,469.0	90.40	178.20	10,952.7	-821.5	0.2	535,253.46	760,158.21	32° 28' 7.310 N	103° 29' 23.254 W
11,564.0	91.10	177.90	10,951.4	-916.5	3.4	535,158.53	760,161.44	32° 28' 6.371 N	103° 29' 23.225 W
11,659.0	89.20	176.80	10,951.2	-1,011.4	7.8	535,063.63	760,165.83	32° 28' 5.431 N	103° 29' 23.183 W
11,753.0	89.90	176.50	10,951.9	-1,105.2	13.3	534,969.80	760,171.32	32° 28' 4.502 N	103° 29' 23.127 W
11,848.0	90.40	175.80	10,951.6	-1,200.0	19.7	534,875.01	760,177.70	32° 28' 3.564 N	103° 29' 23.061 W
11,943.0	89.40	176.80	10,951.8	-1,294.8	25.8	534,780.21	760,183.83	32° 28' 2.625 N	103° 29' 22.999 W
12,037.0	90.10	176.80	10,952.2	-1,388.6	31.1	534,686.36	760,189.08	32° 28' 1.696 N	103° 29' 22.946 W
12,133.0	90.80	176.10	10,951.5	-1,484.5	37.0	534,590.55	760,195.02	32° 28' 0.748 N	103° 29' 22.886 W
12,228.0	89.70	177.90	10,951.1	-1,579.3	42.0	534,495.69	760,199.99	32° 27' 59.809 N	103° 29' 22.836 W
12,323.0	89.60	178.90	10,951.6	-1,674.3	44.7	534,400.73	760,202.65	32° 27' 58.869 N	103° 29' 22.814 W
12,418.0	89.70	178.90	10,952.2	-1,769.3	46.5	534,305.75	760,204.47	32° 27' 57.929 N	103° 29' 22.802 W
12,512.0	90.60	178.90	10,952.0	-1,863.2	48.3	534,211.76	760,206.28	32° 27' 56.999 N	103° 29' 22.789 W
12,607.0	91.30	178.90	10,950.4	-1,958.2	50.1	534,116.80	760,208.10	32° 27' 56.059 N	103° 29' 22.777 W
12,701.0	89.90	179.60	10,949.4	-2,052.2	51.3	534,022.81	760,209.33	32° 27' 55.129 N	103° 29' 22.771 W
12,796.0	90.80	179.60	10,948.8	-2,147.2	52.0	533,927.82	760,209.99	32° 27' 54.189 N	103° 29' 22.772 W
12,891.0	88.30	178.20	10,949.6	-2,242.2	53.8	533,832.85	760,211.82	32° 27' 53.249 N	103° 29' 22.759 W
12,986.0	88.90	178.60	10,951.9	-2,337.1	56.5	533,737.91	760,214.47	32° 27' 52.310 N	103° 29' 22.737 W
13,081.0	89.40	178.20	10,953.3	-2,432.0	59.1	533,642.96	760,217.12	32° 27' 51.370 N	103° 29' 22.715 W
13,176.0	89.20	179.30	10,954.5	-2,527.0	61.2	533,547.99	760,219.19	32° 27' 50.430 N	103° 29' 22.700 W
13,268.0	89.60	180.00	10,955.4	-2,619.0	61.8	533,456.00	760,219.75	32° 27' 49.520 N	103° 29' 22.702 W
13,363.0	89.90	180.70	10,955.8	-2,714.0	61.2	533,361.00	760,219.17	32° 27' 48.580 N	103° 29' 22.717 W
13,457.0	90.60	180.70	10,955.4	-2,808.0	60.0	533,267.01	760,218.03	32° 27' 47.650 N	103° 29' 22.739 W
13,551.0	90.60	180.00	10,954.5	-2,902.0	59.5	533,173.02	760,217.45	32° 27' 46.720 N	103° 29' 22.755 W
13,646.0	91.50	179.30	10,952.7	-2,997.0	60.0	533,078.04	760,218.03	32° 27' 45.780 N	103° 29' 22.757 W
13,740.0	90.30	178.90	10,951.2	-3,090.9	61.5	532,984.06	760,219.51	32° 27' 44.850 N	103° 29' 22.748 W
13,834.0	88.90	178.60	10,951.9	-3,184.9	63.6	532,890.09	760,221.56	32° 27' 43.920 N	103° 29' 22.733 W
13,929.0	88.70	178.20	10,953.9	-3,279.9	66.2	532,795.15	760,224.21	32° 27' 42.980 N	103° 29' 22.711 W
14,023.0	88.70	178.60	10,956.0	-3,373.8	68.8	532,701.21	760,226.83	32° 27' 42.050 N	103° 29' 22.689 W
14,117.0	89.60	178.20	10,957.4	-3,467.7	71.5	532,607.26	760,229.46	32° 27' 41.121 N	103° 29' 22.667 W
14,212.0	90.40	177.90	10,957.4	-3,562.7	74.7	532,512.31	760,232.69	32° 27' 40.181 N	103° 29' 22.638 W



Survey Report - Geographic



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Osprey 20 State Com #6H
Project:	Lea County, NM	TVD Reference:	Well @ 3783.0usft (Ensign #772)
Site:	Sec 20, T21S, R34E	MD Reference:	Well @ 3783.0usft (Ensign #772)
Well:	Osprey 20 State Com #6H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
14,306.0	91.80	177.50	10,955.6	-3,656.6	78.5	532,418.41	760,236.46	32° 27' 39.251 N	103° 29' 22.602 W
14,400.0	90.40	177.90	10,953.8	-3,750.5	82.2	532,324.50	760,240.23	32° 27' 38.322 N	103° 29' 22.567 W
14,495.0	88.90	178.90	10,954.4	-3,845.5	84.9	532,229.55	760,242.89	32° 27' 37.382 N	103° 29' 22.545 W
14,589.0	89.40	179.30	10,955.8	-3,939.4	86.4	532,135.57	760,244.36	32° 27' 36.452 N	103° 29' 22.536 W
14,684.0	89.90	179.30	10,956.4	-4,034.4	87.5	532,040.58	760,245.52	32° 27' 35.512 N	103° 29' 22.531 W
14,778.0	90.80	180.30	10,955.8	-4,128.4	87.9	531,946.58	760,245.85	32° 27' 34.582 N	103° 29' 22.536 W
14,872.0	89.40	179.60	10,955.6	-4,222.4	87.9	531,852.59	760,245.93	32° 27' 33.652 N	103° 29' 22.544 W
14,967.0	89.90	179.60	10,956.2	-4,317.4	88.6	531,757.59	760,246.60	32° 27' 32.712 N	103° 29' 22.545 W
15,061.0	90.80	180.00	10,955.6	-4,411.4	88.9	531,663.59	760,246.92	32° 27' 31.782 N	103° 29' 22.550 W
15,155.0	89.00	179.30	10,955.8	-4,505.4	89.5	531,569.60	760,247.50	32° 27' 30.852 N	103° 29' 22.552 W
15,249.0	89.40	178.90	10,957.1	-4,599.4	91.0	531,475.62	760,248.98	32° 27' 29.922 N	103° 29' 22.543 W
15,343.0	89.60	178.90	10,957.9	-4,693.4	92.8	531,381.64	760,250.78	32° 27' 28.992 N	103° 29' 22.531 W
15,437.0	89.70	178.20	10,958.5	-4,787.3	95.2	531,287.68	760,253.16	32° 27' 28.062 N	103° 29' 22.512 W
15,530.0	90.40	177.90	10,958.4	-4,880.3	98.3	531,194.73	760,256.32	32° 27' 27.142 N	103° 29' 22.483 W
15,625.0	90.80	177.50	10,957.4	-4,975.2	102.1	531,099.81	760,260.13	32° 27' 26.202 N	103° 29' 22.448 W
15,720.0	88.30	177.90	10,958.2	-5,070.1	106.0	531,004.90	760,263.95	32° 27' 25.263 N	103° 29' 22.412 W
15,737.4	88.41	177.83	10,958.7	-5,087.5	106.6	530,987.52	760,264.60	32° 27' 25.091 N	103° 29' 22.406 W
Crossed Section Line @ 15737' MD / 10959' TVD									
15,815.0	88.90	177.50	10,960.5	-5,165.0	109.8	530,910.00	760,267.76	32° 27' 24.323 N	103° 29' 22.376 W
15,909.0	89.90	176.80	10,961.5	-5,258.9	114.4	530,816.13	760,272.43	32° 27' 23.394 N	103° 29' 22.330 W
16,002.0	90.80	176.10	10,960.9	-5,351.7	120.2	530,723.31	760,278.19	32° 27' 22.475 N	103° 29' 22.272 W
16,097.0	90.30	177.20	10,960.0	-5,446.5	125.7	530,628.48	760,283.74	32° 27' 21.536 N	103° 29' 22.216 W
16,191.0	89.40	178.20	10,960.2	-5,540.4	129.5	530,534.56	760,287.51	32° 27' 20.607 N	103° 29' 22.180 W
16,286.0	88.90	179.60	10,961.6	-5,635.4	131.3	530,439.59	760,289.34	32° 27' 19.667 N	103° 29' 22.168 W
16,380.0	89.60	179.30	10,962.9	-5,729.4	132.2	530,345.60	760,290.24	32° 27' 18.737 N	103° 29' 22.166 W
16,474.0	89.90	179.30	10,963.3	-5,823.4	133.4	530,251.61	760,291.39	32° 27' 17.807 N	103° 29' 22.161 W
16,568.0	89.70	179.60	10,963.6	-5,917.4	134.3	530,157.61	760,292.29	32° 27' 16.877 N	103° 29' 22.159 W
16,663.0	89.70	180.30	10,964.1	-6,012.4	134.4	530,062.62	760,292.37	32° 27' 15.937 N	103° 29' 22.167 W
16,757.0	91.00	179.60	10,963.5	-6,106.4	134.5	529,968.62	760,292.45	32° 27' 15.007 N	103° 29' 22.175 W
16,851.0	90.40	178.90	10,962.4	-6,200.4	135.7	529,874.64	760,293.69	32° 27' 14.076 N	103° 29' 22.169 W
16,946.0	91.30	178.60	10,961.0	-6,295.3	137.8	529,779.67	760,295.76	32° 27' 13.137 N	103° 29' 22.154 W
17,041.0	89.20	178.60	10,960.6	-6,390.3	140.1	529,684.70	760,298.08	32° 27' 12.197 N	103° 29' 22.135 W
17,135.0	90.10	178.60	10,961.1	-6,484.3	142.4	529,590.74	760,300.37	32° 27' 11.267 N	103° 29' 22.117 W
17,229.0	90.80	178.20	10,960.4	-6,578.2	145.0	529,496.78	760,303.00	32° 27' 10.337 N	103° 29' 22.095 W
17,324.0	89.90	178.90	10,959.8	-6,673.2	147.4	529,401.81	760,305.40	32° 27' 9.397 N	103° 29' 22.076 W
17,418.0	90.80	178.60	10,959.2	-6,767.2	149.5	529,307.83	760,307.45	32° 27' 8.467 N	103° 29' 22.061 W
17,513.0	89.40	178.60	10,959.1	-6,862.1	151.8	529,212.87	760,309.77	32° 27' 7.527 N	103° 29' 22.042 W
17,607.0	87.60	177.90	10,961.5	-6,956.1	154.6	529,118.95	760,312.64	32° 27' 6.597 N	103° 29' 22.018 W
17,701.0	88.50	177.90	10,964.7	-7,049.9	158.1	529,025.06	760,316.09	32° 27' 5.668 N	103° 29' 21.986 W
17,796.0	90.10	178.90	10,965.9	-7,144.9	160.7	528,930.11	760,318.74	32° 27' 4.729 N	103° 29' 21.964 W
17,890.0	91.50	178.90	10,964.6	-7,238.9	162.5	528,836.14	760,320.54	32° 27' 3.799 N	103° 29' 21.952 W
17,985.0	90.60	180.00	10,962.8	-7,333.8	163.5	528,741.16	760,321.45	32° 27' 2.859 N	103° 29' 21.950 W
18,079.0	91.30	179.60	10,961.3	-7,427.8	163.8	528,647.18	760,321.78	32° 27' 1.929 N	103° 29' 21.954 W
18,173.0	89.90	179.30	10,960.3	-7,521.8	164.7	528,553.19	760,322.68	32° 27' 0.999 N	103° 29' 21.953 W
18,267.0	89.00	178.90	10,961.2	-7,615.8	166.2	528,459.21	760,324.16	32° 27' 0.069 N	103° 29' 21.944 W
18,362.0	89.90	178.90	10,962.1	-7,710.8	168.0	528,364.23	760,325.98	32° 26' 59.129 N	103° 29' 21.932 W
18,456.0	90.80	178.90	10,961.5	-7,804.8	169.8	528,270.25	760,327.79	32° 26' 58.198 N	103° 29' 21.919 W
18,550.0	89.60	179.30	10,961.2	-7,898.7	171.3	528,176.26	760,329.27	32° 26' 57.268 N	103° 29' 21.911 W
18,644.0	90.30	179.30	10,961.3	-7,992.7	172.4	528,082.27	760,330.41	32° 26' 56.338 N	103° 29' 21.906 W
18,739.0	89.00	180.30	10,961.9	-8,087.7	172.7	527,987.28	760,330.75	32° 26' 55.398 N	103° 29' 21.911 W
18,833.0	89.90	180.30	10,962.8	-8,181.7	172.3	527,893.28	760,330.25	32° 26' 54.468 N	103° 29' 21.925 W
18,928.0	90.60	180.30	10,962.4	-8,276.7	171.8	527,798.29	760,329.76	32° 26' 53.528 N	103° 29' 21.940 W
19,023.0	89.20	180.30	10,962.5	-8,371.7	171.3	527,703.29	760,329.26	32° 26' 52.588 N	103° 29' 21.954 W
19,118.0	90.40	180.00	10,962.9	-8,466.7	171.0	527,608.29	760,329.01	32° 26' 51.648 N	103° 29' 21.966 W
19,212.0	89.20	179.30	10,963.2	-8,560.7	171.6	527,514.30	760,329.58	32° 26' 50.718 N	103° 29' 21.968 W

Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Osprey 20 State Com #6H
Project:	Lea County, NM	TVD Reference:	Well @ 3783.0usft (Ensign #772)
Site:	Sec 20, T21S, R34E	MD Reference:	Well @ 3783.0usft (Ensign #772)
Well:	Osprey 20 State Com #6H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
19,307.0	90.80	178.90	10,963.2	-8,655.7	173.1	527,419.31	760,331.08	32° 26' 49.778 N	103° 29' 21.959 W
19,401.0	90.60	179.30	10,962.0	-8,749.7	174.6	527,325.33	760,332.55	32° 26' 48.848 N	103° 29' 21.951 W
19,495.0	89.00	178.90	10,962.4	-8,843.7	176.0	527,231.35	760,334.03	32° 26' 47.918 N	103° 29' 21.942 W
19,591.0	89.40	178.90	10,963.7	-8,939.6	177.9	527,135.37	760,335.87	32° 26' 46.968 N	103° 29' 21.929 W
19,685.0	90.10	178.90	10,964.1	-9,033.6	179.7	527,041.39	760,337.68	32° 26' 46.038 N	103° 29' 21.917 W
19,780.0	89.20	179.60	10,964.7	-9,128.6	180.9	526,946.41	760,338.92	32° 26' 45.098 N	103° 29' 21.911 W
19,874.0	89.40	179.30	10,965.8	-9,222.6	181.8	526,852.42	760,339.82	32° 26' 44.168 N	103° 29' 21.909 W
19,969.0	89.70	179.30	10,966.6	-9,317.6	183.0	526,757.43	760,340.98	32° 26' 43.228 N	103° 29' 21.905 W
20,062.0	89.90	178.60	10,966.9	-9,410.6	184.7	526,664.44	760,342.69	32° 26' 42.308 N	103° 29' 21.893 W
20,157.0	90.40	177.90	10,966.7	-9,505.5	187.6	526,569.49	760,345.59	32° 26' 41.368 N	103° 29' 21.868 W
20,251.0	89.00	177.50	10,967.2	-9,599.4	191.4	526,475.57	760,349.36	32° 26' 40.439 N	103° 29' 21.833 W
20,345.0	89.90	176.80	10,968.1	-9,693.3	196.0	526,381.69	760,354.03	32° 26' 39.509 N	103° 29' 21.787 W
20,440.0	90.60	176.10	10,967.7	-9,788.1	201.9	526,286.88	760,359.92	32° 26' 38.571 N	103° 29' 21.727 W
20,534.0	91.70	175.80	10,965.8	-9,881.9	208.6	526,193.13	760,366.55	32° 26' 37.642 N	103° 29' 21.658 W
20,670.0	91.70	175.80	10,961.7	-10,017.4	218.5	526,057.56	760,376.51	32° 26' 36.300 N	103° 29' 21.555 W
TD @ 20670' MD / 10962' TVD									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
127.0	127.0	-0.7	0.2	First MWD Survey @ 127' MD / 127' MD
10,697.2	10,669.7	-140.1	-10.7	FTP / Crossed 330' Hard Line @ 10697' MD / 10670' TVD
15,737.4	10,958.7	-5,087.5	106.6	Crossed Section Line @ 15737' MD / 10959' TVD
20,670.0	10,961.7	-10,017.4	218.5	TD @ 20670' MD / 10962' TVD

Checked By: _____	Approved By: _____	Date: _____
-------------------	--------------------	-------------