



Company: COG
 Well: Spruce Goose Federal Com 2H
 Location: Eddy Co., NM
 Rig: Patriot 2

Job Number: _____
 Grid Corr.: -0.28
 Lat: 32.67
 Long: -103.81

Date: 08-14-16
 Calculation Method: Minimum Curvature
 Proposed Azimuth: _____
 RKB - MSL in feet: 20
 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)			
Enter Tie-In Survey on Line 10													
FIELD COPY, NON-DEFINITIVE													
TIE IN	0			0	0	0	0	0					
Gyro	100.00	0.13	127.36	100	100.00	-0.07	0.07 S	0.09 E	0.11	127.36	0.13	0.13	127.36
	200.00	0.15	354.62	100	200.00	-0.01	0.01 S	0.17 E	0.17	92.51	0.26	0.02	227.26
	300.00	0.10	259.87	100	300.00	0.11	0.11 N	0.07 E	0.13	33.00	0.19	-0.05	-94.75
	400.00	0.13	169.09	100	400.00	-0.02	0.02 S	0.01 E	0.02	164.08	0.17	0.03	-90.78
	500.00	0.13	75.13	100	500.00	-0.10	0.10 S	0.14 E	0.17	126.60	0.19	0.00	-93.96
	600.00	0.25	304.66	100	600.00	0.05	0.05 N	0.07 E	0.08	52.21	0.35	0.12	229.53
	700.00	0.38	137.06	100	700.00	-0.07	0.07 S	0.11 E	0.13	120.58	0.63	0.13	-167.60
	800.00	0.67	289.83	100	800.00	-0.11	0.11 S	0.21 W	0.24	242.17	1.02	0.29	152.77
	860.00	0.76	256.83	60	859.99	-0.08	0.08 S	0.93 W	0.93	264.89	0.69	0.15	-55.00



COG Operating L L C

Eddy County, NM (NAD 27 NME)

Sec. 12, T 19 S. , R 31 E

Spruce Goose Federal Com #2H

Wellbore #1

Design: Wellbore #1

Survey Report - Geographic

29 August, 2016

HOBBS OCD
JAN 13 2017
RECEIVED





Integrity Directional Services, LLC

Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Spruce Goose Federal Com #2H
Project:	Eddy County, NM (NAD 27 NME)	TVD Reference:	KB=20' @ 3646.20ft (Patriot 2)
Site:	Sec. 12, T 19 S. , R 31 E	MD Reference:	KB=20' @ 3646.20ft (Patriot 2)
Well:	Spruce Goose Federal Com #2H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	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. 12, T 19 S. , R 31 E				
Site Position:		Northing:	611,290.90 usft	Latitude:	32° 40' 46.084 N
From:	Map	Easting:	659,465.20 usft	Longitude:	103° 48' 54.235 W
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.28 °

Well	Spruce Goose Federal Com #2H				
Well Position	+N/-S	0.00 ft	Northing:	611,290.90 usft	Latitude: 32° 40' 46.084 N
	+E/-W	0.00 ft	Easting:	659,465.20 usft	Longitude: 103° 48' 54.235 W
Position Uncertainty		0.00 ft	Wellhead Elevation:	0.00 ft	Ground Level: 3,626.20 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	8/9/2016	7.19	60.45	48,269

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	83.23	

Survey Program	Date 8/29/2016				
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
100.00	860.00	GYROS (Wellbore #1)	NS-GYRO-MS	North sensing gyrocompassing m/s	
935.00	14,517.00	IDS MWD Surveys (Wellbore #1)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.00	0.00	0.00	0.00	611,290.90	659,465.20	32° 40' 46.084 N	103° 48' 54.235 W	
100.00	0.13	127.36	100.00	-0.07	0.09	611,290.83	659,465.29	32° 40' 46.084 N	103° 48' 54.234 W	
200.00	0.15	354.62	200.00	-0.01	0.17	611,290.90	659,465.37	32° 40' 46.084 N	103° 48' 54.233 W	
300.00	0.10	259.87	300.00	0.11	0.07	611,291.01	659,465.27	32° 40' 46.085 N	103° 48' 54.235 W	
400.00	0.13	169.09	400.00	-0.02	0.01	611,290.88	659,465.21	32° 40' 46.084 N	103° 48' 54.235 W	
500.00	0.13	75.13	500.00	-0.10	0.14	611,290.80	659,465.34	32° 40' 46.083 N	103° 48' 54.234 W	
600.00	0.25	304.66	600.00	0.05	0.07	611,290.96	659,465.27	32° 40' 46.085 N	103° 48' 54.235 W	
700.00	0.38	137.06	700.00	-0.07	0.11	611,290.84	659,465.32	32° 40' 46.084 N	103° 48' 54.234 W	
800.00	0.67	289.83	800.00	-0.11	-0.21	611,290.79	659,464.99	32° 40' 46.083 N	103° 48' 54.238 W	
860.00	0.76	256.83	859.99	-0.08	-0.93	611,290.82	659,464.28	32° 40' 46.083 N	103° 48' 54.246 W	



Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Spruce Goose Federal Com #2H
Project:	Eddy County, NM (NAD 27 NME)	TVD Reference:	KB=20' @ 3646.20ft (Patriot 2)
Site:	Sec. 12, T 19 S., R 31 E	MD Reference:	KB=20' @ 3646.20ft (Patriot 2)
Well:	Spruce Goose Federal Com #2H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
935.00	0.70	236.60	934.99	-0.45	-1.80	611,290.46	659,463.41	32° 40' 46.080 N	103° 48' 54.256 W
First IDS MWD Survey									
1,092.00	4.70	17.00	1,091.83	5.18	-0.71	611,296.08	659,464.49	32° 40' 46.135 N	103° 48' 54.244 W
1,187.00	4.90	14.20	1,186.49	12.83	1.42	611,303.74	659,466.62	32° 40' 46.211 N	103° 48' 54.218 W
1,281.00	4.70	11.00	1,280.16	20.51	3.14	611,311.41	659,468.34	32° 40' 46.287 N	103° 48' 54.198 W
1,375.00	4.70	13.60	1,373.85	28.03	4.78	611,318.93	659,469.98	32° 40' 46.361 N	103° 48' 54.178 W
1,469.00	4.50	14.20	1,467.55	35.35	6.59	611,326.25	659,471.79	32° 40' 46.434 N	103° 48' 54.156 W
1,564.00	4.60	14.60	1,562.25	42.65	8.46	611,333.55	659,473.67	32° 40' 46.506 N	103° 48' 54.134 W
1,658.00	4.70	15.40	1,655.94	50.01	10.44	611,340.91	659,475.64	32° 40' 46.579 N	103° 48' 54.111 W
1,753.00	4.70	16.50	1,750.62	57.49	12.58	611,348.40	659,477.78	32° 40' 46.652 N	103° 48' 54.085 W
1,847.00	4.90	4.20	1,844.29	65.19	13.96	611,356.09	659,479.17	32° 40' 46.729 N	103° 48' 54.068 W
1,942.00	5.50	359.30	1,938.90	73.79	14.20	611,364.69	659,479.41	32° 40' 46.814 N	103° 48' 54.065 W
2,036.00	5.60	5.70	2,032.46	82.86	14.61	611,373.76	659,479.81	32° 40' 46.903 N	103° 48' 54.060 W
2,131.00	5.30	2.30	2,127.03	91.85	15.24	611,382.76	659,480.45	32° 40' 46.992 N	103° 48' 54.052 W
2,225.00	5.20	359.40	2,220.64	100.45	15.37	611,391.35	659,480.58	32° 40' 47.077 N	103° 48' 54.050 W
2,319.00	5.10	2.70	2,314.26	108.88	15.52	611,399.79	659,480.73	32° 40' 47.161 N	103° 48' 54.048 W
2,414.00	5.40	2.60	2,408.86	117.57	15.93	611,408.47	659,481.13	32° 40' 47.247 N	103° 48' 54.042 W
2,508.00	5.20	4.50	2,502.46	126.23	16.46	611,417.13	659,481.66	32° 40' 47.332 N	103° 48' 54.036 W
2,603.00	4.70	344.60	2,597.11	134.28	15.76	611,425.18	659,480.97	32° 40' 47.412 N	103° 48' 54.043 W
2,697.00	4.50	340.10	2,690.81	141.46	13.49	611,432.36	659,478.69	32° 40' 47.483 N	103° 48' 54.070 W
2,792.00	4.30	347.90	2,785.53	148.44	11.47	611,439.35	659,476.68	32° 40' 47.553 N	103° 48' 54.093 W
2,886.00	4.20	359.10	2,879.27	155.33	10.68	611,446.23	659,475.88	32° 40' 47.621 N	103° 48' 54.102 W
2,990.00	4.00	350.00	2,983.00	162.71	9.99	611,453.61	659,475.19	32° 40' 47.694 N	103° 48' 54.109 W
3,108.00	3.50	351.30	3,100.75	170.32	8.73	611,461.23	659,473.93	32° 40' 47.769 N	103° 48' 54.124 W
3,202.00	3.40	347.30	3,194.58	175.88	7.68	611,466.78	659,472.89	32° 40' 47.824 N	103° 48' 54.136 W
3,296.00	5.00	4.30	3,288.33	182.68	7.38	611,473.59	659,472.58	32° 40' 47.892 N	103° 48' 54.139 W
3,391.00	4.80	3.30	3,382.98	190.78	7.92	611,481.68	659,473.12	32° 40' 47.972 N	103° 48' 54.132 W
3,485.00	4.70	4.20	3,476.66	198.55	8.42	611,489.45	659,473.63	32° 40' 48.048 N	103° 48' 54.126 W
3,579.00	4.40	2.10	3,570.36	205.99	8.84	611,496.89	659,474.04	32° 40' 48.122 N	103° 48' 54.120 W
3,673.00	4.10	0.60	3,664.10	212.96	9.01	611,503.86	659,474.21	32° 40' 48.191 N	103° 48' 54.118 W
3,768.00	4.00	0.60	3,758.87	219.66	9.08	611,510.57	659,474.28	32° 40' 48.257 N	103° 48' 54.117 W
3,862.00	3.70	1.20	3,852.65	225.98	9.17	611,516.88	659,474.38	32° 40' 48.320 N	103° 48' 54.115 W
3,957.00	5.00	8.80	3,947.38	233.13	9.87	611,524.03	659,475.08	32° 40' 48.391 N	103° 48' 54.107 W
4,051.00	4.60	7.40	4,041.05	240.92	10.98	611,531.82	659,476.19	32° 40' 48.468 N	103° 48' 54.093 W
4,145.00	4.20	7.40	4,134.77	248.07	11.91	611,538.97	659,477.12	32° 40' 48.538 N	103° 48' 54.082 W
4,239.00	5.80	10.70	4,228.41	256.15	13.24	611,547.05	659,478.44	32° 40' 48.618 N	103° 48' 54.066 W
4,334.00	5.70	12.40	4,322.93	265.47	15.14	611,556.38	659,480.35	32° 40' 48.710 N	103° 48' 54.043 W
4,428.00	5.80	5.40	4,416.46	274.76	16.59	611,565.67	659,481.80	32° 40' 48.802 N	103° 48' 54.026 W
4,522.00	5.50	6.60	4,510.01	283.97	17.56	611,574.87	659,482.76	32° 40' 48.893 N	103° 48' 54.014 W
4,617.00	5.30	3.50	4,604.58	292.87	18.35	611,583.77	659,483.55	32° 40' 48.981 N	103° 48' 54.004 W
4,712.00	4.80	2.80	4,699.22	301.22	18.81	611,592.12	659,484.01	32° 40' 49.064 N	103° 48' 53.998 W
4,806.00	4.60	3.40	4,792.90	308.91	19.22	611,599.81	659,484.43	32° 40' 49.140 N	103° 48' 53.993 W
4,901.00	4.50	1.60	4,887.60	316.44	19.55	611,607.34	659,484.76	32° 40' 49.214 N	103° 48' 53.989 W
4,995.00	4.00	2.40	4,981.34	323.40	19.80	611,614.30	659,485.00	32° 40' 49.283 N	103° 48' 53.985 W
5,089.00	4.00	1.90	5,075.11	329.95	20.04	611,620.85	659,485.25	32° 40' 49.348 N	103° 48' 53.982 W
5,182.00	3.70	359.00	5,167.90	336.19	20.10	611,627.10	659,485.30	32° 40' 49.410 N	103° 48' 53.981 W
5,276.00	5.10	4.00	5,261.62	343.39	20.33	611,634.30	659,485.54	32° 40' 49.481 N	103° 48' 53.978 W
5,370.00	4.50	2.30	5,355.29	351.25	20.77	611,642.15	659,485.98	32° 40' 49.559 N	103° 48' 53.972 W
5,465.00	4.20	3.00	5,450.02	358.44	21.11	611,649.35	659,486.31	32° 40' 49.630 N	103° 48' 53.968 W
5,560.00	3.60	0.80	5,544.80	364.90	21.33	611,655.80	659,486.53	32° 40' 49.694 N	103° 48' 53.965 W
5,655.00	4.00	358.40	5,639.59	371.19	21.28	611,662.10	659,486.48	32° 40' 49.756 N	103° 48' 53.965 W
5,750.00	3.80	358.90	5,734.37	377.65	21.13	611,668.56	659,486.33	32° 40' 49.820 N	103° 48' 53.967 W
5,844.00	5.10	4.50	5,828.09	384.93	21.39	611,675.84	659,486.60	32° 40' 49.892 N	103° 48' 53.963 W
5,939.00	4.70	7.40	5,922.74	393.00	22.23	611,683.91	659,487.43	32° 40' 49.972 N	103° 48' 53.953 W
6,033.00	4.30	8.40	6,016.45	400.31	23.24	611,691.21	659,488.44	32° 40' 50.044 N	103° 48' 53.941 W



Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Spruce Goose Federal Com #2H
Project:	Eddy County, NM (NAD 27 NME)	TVD Reference:	KB=20' @ 3646.20ft (Patriot 2)
Site:	Sec. 12, T 19 S. , R 31 E	MD Reference:	KB=20' @ 3646.20ft (Patriot 2)
Well:	Spruce Goose Federal Com #2H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
6,128.00	4.90	4.00	6,111.14	407.88	24.04	611,698.78	659,489.25	32° 40' 50.119 N	103° 48' 53.931 W
6,222.00	4.70	4.00	6,204.81	415.73	24.59	611,706.63	659,489.79	32° 40' 50.197 N	103° 48' 53.924 W
6,317.00	4.40	5.80	6,299.51	423.23	25.23	611,714.14	659,490.43	32° 40' 50.271 N	103° 48' 53.916 W
6,411.00	4.20	6.60	6,393.25	430.24	25.99	611,721.14	659,491.19	32° 40' 50.340 N	103° 48' 53.907 W
6,506.00	4.80	358.80	6,487.96	437.67	26.31	611,728.57	659,491.51	32° 40' 50.414 N	103° 48' 53.903 W
6,600.00	4.20	0.00	6,581.67	445.04	26.22	611,735.95	659,491.43	32° 40' 50.487 N	103° 48' 53.903 W
6,694.00	5.10	356.50	6,675.36	452.66	25.97	611,743.56	659,491.17	32° 40' 50.562 N	103° 48' 53.906 W
6,789.00	4.50	359.40	6,770.02	460.60	25.67	611,751.50	659,490.88	32° 40' 50.641 N	103° 48' 53.909 W
6,883.00	5.40	357.70	6,863.67	468.71	25.46	611,759.61	659,490.66	32° 40' 50.721 N	103° 48' 53.911 W
6,978.00	5.00	356.90	6,958.28	477.31	25.05	611,768.21	659,490.26	32° 40' 50.806 N	103° 48' 53.915 W
7,072.00	4.60	355.40	7,051.95	485.15	24.53	611,776.06	659,489.73	32° 40' 50.884 N	103° 48' 53.921 W
7,167.00	3.80	352.80	7,146.69	492.07	23.83	611,782.98	659,489.03	32° 40' 50.952 N	103° 48' 53.929 W
7,261.00	3.50	0.40	7,240.50	498.03	23.46	611,788.94	659,488.66	32° 40' 51.011 N	103° 48' 53.933 W
7,356.00	5.10	5.90	7,335.23	505.13	23.91	611,796.04	659,489.12	32° 40' 51.081 N	103° 48' 53.927 W
7,450.00	4.40	6.60	7,428.91	512.87	24.76	611,803.77	659,489.96	32° 40' 51.158 N	103° 48' 53.917 W
7,545.00	5.10	11.00	7,523.58	520.64	25.98	611,811.54	659,491.19	32° 40' 51.235 N	103° 48' 53.902 W
7,640.00	4.30	15.60	7,618.26	528.21	27.74	611,819.11	659,492.95	32° 40' 51.310 N	103° 48' 53.881 W
7,734.00	5.10	0.00	7,711.95	535.78	28.69	611,826.69	659,493.90	32° 40' 51.385 N	103° 48' 53.869 W
7,829.00	4.60	3.80	7,806.61	543.81	28.94	611,834.71	659,494.15	32° 40' 51.464 N	103° 48' 53.866 W
7,923.00	4.40	0.90	7,900.32	551.17	29.25	611,842.08	659,494.46	32° 40' 51.537 N	103° 48' 53.862 W
8,018.00	4.30	2.00	7,995.05	558.38	29.43	611,849.28	659,494.64	32° 40' 51.608 N	103° 48' 53.859 W
8,114.00	3.90	2.50	8,090.80	565.24	29.70	611,856.14	659,494.90	32° 40' 51.676 N	103° 48' 53.856 W
8,209.00	3.60	359.70	8,185.60	571.45	29.83	611,862.35	659,495.03	32° 40' 51.737 N	103° 48' 53.854 W
8,303.00	3.30	2.70	8,279.43	577.10	29.94	611,868.00	659,495.14	32° 40' 51.793 N	103° 48' 53.852 W
8,398.00	3.10	355.00	8,374.28	582.39	29.84	611,873.29	659,495.05	32° 40' 51.846 N	103° 48' 53.853 W
8,493.00	3.20	353.40	8,469.14	587.58	29.31	611,878.49	659,494.52	32° 40' 51.897 N	103° 48' 53.859 W
8,581.00	3.10	358.40	8,557.00	592.40	28.96	611,883.30	659,494.17	32° 40' 51.945 N	103° 48' 53.863 W
8,612.00	3.10	4.70	8,587.96	594.08	29.01	611,884.98	659,494.21	32° 40' 51.961 N	103° 48' 53.862 W
8,644.00	4.60	47.20	8,619.89	595.81	30.02	611,886.71	659,495.23	32° 40' 51.978 N	103° 48' 53.850 W
8,675.00	8.80	68.80	8,650.68	597.51	33.15	611,888.42	659,498.35	32° 40' 51.995 N	103° 48' 53.813 W
8,707.00	13.50	71.90	8,682.06	599.56	38.98	611,890.46	659,504.19	32° 40' 52.015 N	103° 48' 53.745 W
8,738.00	17.70	70.60	8,711.92	602.25	46.87	611,893.15	659,512.08	32° 40' 52.041 N	103° 48' 53.653 W
8,769.00	21.90	71.50	8,741.08	605.65	56.80	611,896.55	659,522.01	32° 40' 52.075 N	103° 48' 53.536 W
8,801.00	25.70	74.60	8,770.35	609.39	69.16	611,900.29	659,534.36	32° 40' 52.111 N	103° 48' 53.392 W
8,832.00	29.30	77.20	8,797.84	612.86	83.04	611,903.76	659,548.24	32° 40' 52.145 N	103° 48' 53.229 W
8,863.00	32.50	78.50	8,824.44	616.20	98.60	611,907.10	659,563.81	32° 40' 52.177 N	103° 48' 53.047 W
8,895.00	35.90	81.30	8,850.91	619.33	116.31	611,910.23	659,581.51	32° 40' 52.207 N	103° 48' 52.839 W
8,926.00	39.50	84.10	8,875.43	621.72	135.10	611,912.62	659,600.31	32° 40' 52.230 N	103° 48' 52.619 W
8,958.00	41.90	85.30	8,899.69	623.64	155.88	611,914.55	659,621.09	32° 40' 52.248 N	103° 48' 52.376 W
8,989.00	44.20	86.00	8,922.34	625.25	176.98	611,916.15	659,642.18	32° 40' 52.263 N	103° 48' 52.129 W
9,020.00	46.40	86.20	8,944.15	626.74	198.96	611,917.65	659,664.17	32° 40' 52.276 N	103° 48' 51.872 W
9,051.00	49.50	88.40	8,964.91	627.82	221.95	611,918.72	659,687.16	32° 40' 52.286 N	103° 48' 51.603 W
9,083.00	53.00	89.20	8,984.94	628.33	246.90	611,919.24	659,712.10	32° 40' 52.290 N	103° 48' 51.311 W
9,114.00	56.90	89.60	9,002.73	628.60	272.27	611,919.50	659,737.47	32° 40' 52.291 N	103° 48' 51.014 W
9,145.00	60.00	89.30	9,018.95	628.85	298.68	611,919.76	659,763.89	32° 40' 52.292 N	103° 48' 50.705 W
9,177.00	63.00	88.20	9,034.22	629.47	326.79	611,920.37	659,792.00	32° 40' 52.297 N	103° 48' 50.376 W
9,209.00	65.70	87.50	9,048.07	630.55	355.62	611,921.46	659,820.82	32° 40' 52.306 N	103° 48' 50.039 W
9,240.00	68.40	87.50	9,060.16	631.80	384.13	611,922.70	659,849.34	32° 40' 52.317 N	103° 48' 49.705 W
9,241.49	68.53	87.49	9,060.71	631.86	385.52	611,922.76	659,850.72	32° 40' 52.318 N	103° 48' 49.689 W
Enter Sec. 7									
9,272.00	71.20	87.30	9,071.21	633.16	414.13	611,924.06	659,879.34	32° 40' 52.329 N	103° 48' 49.354 W
9,303.00	74.30	88.70	9,080.40	634.19	443.72	611,925.09	659,908.92	32° 40' 52.338 N	103° 48' 49.008 W
9,334.00	76.80	90.20	9,088.13	634.48	473.73	611,925.38	659,938.93	32° 40' 52.340 N	103° 48' 48.657 W
9,365.00	79.80	91.70	9,094.42	633.97	504.08	611,924.88	659,969.28	32° 40' 52.333 N	103° 48' 48.302 W
9,397.00	82.60	92.70	9,099.32	632.76	535.67	611,923.66	660,000.88	32° 40' 52.320 N	103° 48' 47.932 W



Integrity Directional Services, LLC

Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Spruce Goose Federal Com #2H
Project:	Eddy County, NM (NAD 27 NME)	TVD Reference:	KB=20' @ 3646.20ft (Patriot 2)
Site:	Sec. 12, T 19 S. , R 31 E	MD Reference:	KB=20' @ 3646.20ft (Patriot 2)
Well:	Spruce Goose Federal Com #2H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
9,418.00	84.50	93.90	9,101.67	631.56	556.50	611,922.46	660,021.71	32° 40' 52.307 N	103° 48' 47.688 W
9,449.00	86.40	93.60	9,104.13	629.54	587.34	611,920.44	660,052.54	32° 40' 52.285 N	103° 48' 47.328 W
9,512.00	87.20	91.60	9,107.65	626.68	650.17	611,917.59	660,115.38	32° 40' 52.254 N	103° 48' 46.593 W
9,575.00	87.40	91.00	9,110.62	625.25	713.09	611,916.16	660,178.29	32° 40' 52.237 N	103° 48' 45.857 W
9,577.51	87.40	90.95	9,110.73	625.21	715.59	611,916.11	660,180.80	32° 40' 52.236 N	103° 48' 45.827 W
Sec 7 West Hardline Crossing									
9,669.00	87.30	89.30	9,114.96	625.01	806.98	611,915.91	660,272.19	32° 40' 52.230 N	103° 48' 44.758 W
9,763.00	87.90	90.00	9,118.90	625.58	900.90	611,916.49	660,366.10	32° 40' 52.231 N	103° 48' 43.659 W
9,858.00	88.40	90.80	9,121.97	624.92	995.84	611,915.82	660,461.05	32° 40' 52.220 N	103° 48' 42.548 W
9,952.00	88.70	89.90	9,124.35	624.35	1,089.81	611,915.25	660,555.01	32° 40' 52.209 N	103° 48' 41.449 W
10,047.00	88.60	88.30	9,126.59	625.84	1,184.77	611,916.74	660,649.97	32° 40' 52.220 N	103° 48' 40.338 W
10,141.00	89.30	88.40	9,128.31	628.54	1,278.71	611,919.45	660,743.92	32° 40' 52.242 N	103° 48' 39.239 W
10,236.00	90.50	88.70	9,128.47	630.95	1,373.68	611,921.85	660,838.88	32° 40' 52.261 N	103° 48' 38.127 W
10,330.00	88.90	89.60	9,128.97	632.34	1,467.67	611,923.24	660,932.87	32° 40' 52.270 N	103° 48' 37.028 W
10,425.00	88.80	90.40	9,130.87	632.34	1,562.65	611,923.24	661,027.85	32° 40' 52.265 N	103° 48' 35.916 W
10,519.00	87.90	90.10	9,133.58	631.93	1,656.61	611,922.83	661,121.81	32° 40' 52.257 N	103° 48' 34.817 W
10,614.00	89.10	90.60	9,136.07	631.35	1,751.57	611,922.25	661,216.77	32° 40' 52.246 N	103° 48' 33.706 W
10,708.00	88.60	90.20	9,137.95	630.70	1,845.55	611,921.60	661,310.75	32° 40' 52.235 N	103° 48' 32.607 W
10,803.00	87.50	89.20	9,141.18	631.19	1,940.49	611,922.09	661,405.69	32° 40' 52.236 N	103° 48' 31.496 W
10,897.00	86.90	87.70	9,145.78	633.73	2,034.34	611,924.63	661,499.54	32° 40' 52.256 N	103° 48' 30.398 W
10,991.00	87.50	87.90	9,150.37	637.34	2,128.16	611,928.24	661,593.36	32° 40' 52.287 N	103° 48' 29.300 W
11,086.00	88.10	88.60	9,154.02	640.23	2,223.04	611,931.14	661,688.24	32° 40' 52.311 N	103° 48' 28.189 W
11,180.00	89.20	90.00	9,156.23	641.38	2,317.00	611,932.28	661,782.20	32° 40' 52.318 N	103° 48' 27.090 W
11,275.00	88.20	90.10	9,158.39	641.30	2,411.98	611,932.20	661,877.18	32° 40' 52.313 N	103° 48' 25.979 W
11,369.00	87.60	89.60	9,161.83	641.55	2,505.91	611,932.45	661,971.11	32° 40' 52.310 N	103° 48' 24.880 W
11,464.00	87.40	90.10	9,165.97	641.79	2,600.82	611,932.70	662,066.02	32° 40' 52.308 N	103° 48' 23.769 W
11,558.00	88.00	89.80	9,169.75	641.88	2,694.75	611,932.78	662,159.95	32° 40' 52.304 N	103° 48' 22.670 W
11,652.00	88.30	88.60	9,172.78	643.19	2,788.69	611,934.09	662,253.89	32° 40' 52.313 N	103° 48' 21.571 W
11,747.00	87.80	87.70	9,176.01	646.25	2,883.58	611,937.15	662,348.78	32° 40' 52.338 N	103° 48' 20.461 W
11,841.00	87.40	87.90	9,179.95	649.86	2,977.43	611,940.76	662,442.63	32° 40' 52.369 N	103° 48' 19.363 W
11,936.00	87.20	88.30	9,184.43	653.00	3,072.27	611,943.91	662,537.47	32° 40' 52.396 N	103° 48' 18.253 W
12,030.00	87.40	89.00	9,188.85	655.22	3,166.14	611,946.12	662,631.34	32° 40' 52.413 N	103° 48' 17.154 W
12,125.00	87.80	88.30	9,192.83	657.45	3,261.03	611,948.35	662,726.23	32° 40' 52.431 N	103° 48' 16.044 W
12,219.00	87.80	87.30	9,196.44	661.06	3,354.89	611,951.96	662,820.09	32° 40' 52.462 N	103° 48' 14.946 W
12,313.00	87.40	86.50	9,200.38	666.14	3,448.67	611,957.04	662,913.87	32° 40' 52.507 N	103° 48' 13.848 W
12,407.00	87.80	85.70	9,204.31	672.52	3,542.37	611,963.43	663,007.57	32° 40' 52.566 N	103° 48' 12.752 W
12,502.00	88.30	86.20	9,207.55	679.23	3,637.08	611,970.13	663,102.27	32° 40' 52.628 N	103° 48' 11.643 W
12,596.00	89.20	87.30	9,209.60	684.56	3,730.90	611,975.46	663,196.10	32° 40' 52.676 N	103° 48' 10.545 W
12,690.00	89.80	88.50	9,210.42	688.00	3,824.83	611,978.90	663,290.03	32° 40' 52.705 N	103° 48' 9.446 W
12,784.00	87.60	88.80	9,212.55	690.22	3,918.78	611,981.12	663,383.97	32° 40' 52.722 N	103° 48' 8.347 W
12,879.00	86.20	90.20	9,217.69	691.04	4,013.63	611,981.95	663,478.82	32° 40' 52.726 N	103° 48' 7.237 W
12,973.00	86.60	91.70	9,223.59	689.49	4,107.43	611,980.39	663,572.62	32° 40' 52.706 N	103° 48' 6.139 W
13,067.00	87.40	93.90	9,228.51	684.90	4,201.18	611,975.81	663,666.38	32° 40' 52.656 N	103° 48' 5.043 W
13,162.00	87.60	95.60	9,232.65	677.04	4,295.76	611,967.95	663,760.96	32° 40' 52.573 N	103° 48' 3.937 W
13,256.00	87.90	95.50	9,236.34	667.96	4,389.25	611,958.86	663,854.44	32° 40' 52.479 N	103° 48' 2.843 W
13,350.00	87.60	95.70	9,240.03	658.79	4,482.73	611,949.70	663,947.92	32° 40' 52.383 N	103° 48' 1.750 W
13,445.00	88.30	96.00	9,243.43	649.12	4,577.17	611,940.02	664,042.37	32° 40' 52.283 N	103° 48' 0.646 W
13,539.00	88.80	97.00	9,245.81	638.48	4,670.53	611,929.38	664,135.73	32° 40' 52.173 N	103° 47' 59.554 W
13,633.00	89.70	98.10	9,247.04	626.13	4,763.71	611,917.03	664,228.90	32° 40' 52.046 N	103° 47' 58.465 W
13,727.00	89.10	97.70	9,248.03	613.21	4,856.81	611,904.11	664,322.01	32° 40' 51.914 N	103° 47' 57.376 W
13,822.00	88.10	97.10	9,250.35	600.98	4,950.99	611,891.88	664,416.18	32° 40' 51.788 N	103° 47' 56.275 W
13,916.00	87.10	95.30	9,254.28	590.84	5,044.35	611,881.74	664,509.55	32° 40' 51.683 N	103° 47' 55.183 W
14,010.00	87.70	93.80	9,258.55	583.39	5,137.96	611,874.29	664,603.15	32° 40' 51.605 N	103° 47' 54.089 W
14,105.00	88.70	92.90	9,261.53	577.84	5,232.75	611,868.74	664,697.94	32° 40' 51.545 N	103° 47' 52.980 W
14,198.00	88.60	91.70	9,263.72	574.11	5,325.64	611,865.01	664,790.84	32° 40' 51.503 N	103° 47' 51.893 W



Integrity Directional Services, LLC
Survey Report - Geographic



Company: COG Operating L L C
Project: Eddy County, NM (NAD 27 NME)
Site: Sec. 12, T 19 S. , R 31 E
Well: Spruce Goose Federal Com #2H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Spruce Goose Federal Com #2H
TVD Reference: KB=20' @ 3646.20ft (Patriot 2)
MD Reference: KB=20' @ 3646.20ft (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
14,243.67	88.98	91.60	9,264.69	572.79	5,371.28	611,863.69	664,836.48	32° 40' 51.488 N	103° 47' 51.359 W
Sec 7 East Hardline Crossing									
14,293.00	89.40	91.50	9,265.38	571.46	5,420.59	611,862.36	664,885.79	32° 40' 51.472 N	103° 47' 50.783 W
14,387.00	90.50	91.80	9,265.46	568.75	5,514.55	611,859.65	664,979.74	32° 40' 51.441 N	103° 47' 49.683 W
14,440.00	91.20	92.10	9,264.68	566.95	5,567.51	611,857.85	665,032.71	32° 40' 51.420 N	103° 47' 49.064 W
Final IDS MWD Survey									
14,517.00	91.20	92.10	9,263.06	564.13	5,644.45	611,855.03	665,109.64	32° 40' 51.389 N	103° 47' 48.164 W
Projection to TD									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
935.00	934.99	-0.45	-1.80	First IDS MWD Survey
9,241.49	9,060.71	631.86	385.52	Enter Sec. 7
9,577.51	9,110.73	625.21	715.59	Sec 7 West Hardline Crossing
14,243.67	9,264.69	572.79	5,371.28	Sec 7 East Hardline Crossing
14,440.00	9,264.68	566.95	5,567.51	Final IDS MWD Survey
14,517.00	9,263.06	564.13	5,644.45	Projection to TD

Checked By: _____ Approved By: _____ Date: _____

SPRUCE GOOSE FEDERAL COM #2H**30-015-43878****Sec 12-T19S-R31E**

<u>Perfs</u>	<u>7 1/2% Acid (Gal)</u>	<u>Sand (#)</u>	<u>Fluid (Gal)</u>
14337-14450	4032	223580	275142
14186-14295	3024	245400	256620
14036-14142	3024	222030	252798
13885-13994	3024	234056	255528
13734-13847	3024	242560	246918
13587-13697	3024	241660	246498
13433-13546	3024	241980	250614
13286-13385	3024	217490	242802
13132-13245	3024	236740	242424
12981-13085	3024	242920	243558
12830-12943	3024	242080	245028
12680-12793	3024	241050	236250
12529-12642	3024	240676	236124
12378-12491	3024	240359	241416
12227-12340	3024	240590	251328
12077-12190	3024	240320	240702
11926-12039	3024	244940	241416
11775-11888	3024	239240	233520
11625-11738	3024	239550	234738
11474-11587	3024	244260	240324
11323-11436	3024	242760	239862
11173-11286	3024	240550	236712
11022-11135	3024	241910	236334
10871-10984	3024	242230	233352
10721-10834	3024	241820	241626
10570-10683	3024	241940	233898
10419-10532	3024	240700	231042
10269-10382	3024	235800	232344
10121-10231	3024	242700	237174
9967-10080	3024	237390	234360
9822-9930	3024	241240	233016
9666-9779	3024	239750	233898
9513-9624	3024	242330	236418
9365-9480	3024	244620	232176
Totals	103824	8137221	8205960

HOBBS OCD**JAN 13 2017****RECEIVED**



PATRIOT DRILLING, LLC

HOBBS OCD

JAN 13 2017

RECEIVED

OPERATOR:
WELL/LEASE:
COUNTY:

COG Operating, LLC
Spruce Goose Fed Com #2H
Eddy Co., New Mexico
Sec. 12, T 19S, R 31E

**STATE OF NEW MEXICO
DEVIATION REPORT**

<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
218	1/2	751	1/2
520	1/4	895	1

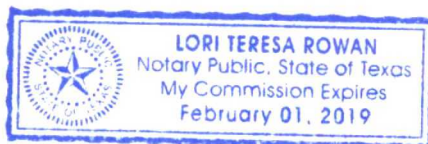
Patriot Drilling, LLC

M. Leroy Peterson, Executive Vice-President

The foregoing instrument was acknowledged before me on this 31st day of August 2016 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling, LLC.

My Commission Expires: 02/01/2019

Lori T. Rowan
Notary Public for Ector Co., Texas



SURVEY CERTIFICATION FORM

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



Company: COG

Well Name: Spruce Goose Federal Com 2H

Survey Instrument Type: North Seek Rate Gyro

Job #: 060299

County/State: Eddy/ New Mexico

API # 30-015-43878

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 (°)
2016-08-14	0	0	0

Last Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
2016-08-14	860	0.76	256.83

Projected TD Survey

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

Grid Correction
-0.28

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:

8/14/16

Print Name: Andy Askew

Signature:

A handwritten signature of Andy Askew.