



NM OIL CONSERVATION
ARTESIA DISTRICT

NOV 09 2017

RECEIVED

COG OPERATING, LLC

Eddy /Lea County, NM (NAD27) NMEZ Burkett 16 State 12H

#12H - Slot 1160'FNL, 1630'FEL Sec 16/T17S/R31E/UnitB

PP - 948'FNL, 2116'FEL Sec 16/T17S/R31E/UnitB

Lateral

30-015-44268

Planned BHL - 10'FWL, 970'FNL Sec 16/T17S/R31E/UnitD

Actual BHL - 24'FWL, 964'FNL Sec 16/T17S/R31E/UnitD

**Please provide signature
page for directional survey**





Survey Report

Company: COG OPERATING, LLC
Project: Eddy /Lea County, NM (NAD27) NMEZ
Site: Burkett 16 State 12H
Well: #12H
Wellbore: Lateral
Design: Lateral

Local Co-ordinate Reference: Well #12H - Slot Burkett12H
TVD Reference: 3767+18 @ 3785.00ft (Planning)
MD Reference: 3767+18 @ 3785.00ft (Planning)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: VON_EDM

Project	Eddy /Lea County, NM (NAD27) NMEZ		
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	Burkett 16 State 12H			
Site Position:		Northing:	669,064.20 ft	Latitude: 32° 50' 18.546 N
From:	Map	Easting:	642,039.30 ft	Longitude: 103° 52' 15.178 W
Position Uncertainty:	0.00 ft	Slot Radius:	13.20 in	Grid Convergence: 0.25 °

Well	#12H - Slot Burkett12H			
Well Position	+N/-S	0.00 ft	Northing: 669,064.20 ft	Latitude: 32° 50' 18.546 N
	+E/-W	0.00 ft	Easting: 642,039.30 ft	Longitude: 103° 52' 15.178 W
Position Uncertainty	0.00 ft	Wellhead Elevation:	ft	Ground Level: 3,767.00 ft

Wellbore	Lateral				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	08/07/17	7.12	60.57	48,254

Design	Lateral				
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	269.63	

Survey Program	Date	08/16/17			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
100.00	1,773.00	Survey #1 (Lateral)	GYD_DP_MS	Gyrodota gyro-compassing and drop	
1,852.00	8,562.00	Survey #2 (Lateral)	MWD	MWD v3: standard declination	
8,662.00	8,662.00	Survey #3 (Lateral)	Projection	Projection	

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Burkett 16 State 12H SL									
100.00	0.44	268.27	100.00	-0.01	-0.38	0.38	0.44	0.44	0.00
200.00	0.32	243.66	200.00	-0.15	-1.02	1.02	0.20	-0.12	-24.61
300.00	0.22	237.32	300.00	-0.37	-1.43	1.43	0.10	-0.10	-6.34
400.00	0.41	252.93	399.99	-0.58	-1.93	1.94	0.21	0.19	15.61
500.00	0.46	196.96	499.99	-1.07	-2.39	2.40	0.41	0.05	-55.97
600.00	0.60	192.90	599.99	-1.97	-2.63	2.64	0.14	0.14	-4.06
700.00	0.61	201.33	699.98	-2.97	-2.94	2.96	0.09	0.01	8.43



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800.00	0.47	198.54	799.98	-3.86	-3.26	3.29	0.14	-0.14	-2.79
900.00	0.72	175.81	899.97	-4.87	-3.35	3.38	0.34	0.25	-22.73
1,000.00	0.82	167.97	999.96	-6.20	-3.15	3.19	0.15	0.10	-7.84
1,100.00	1.07	177.84	1,099.95	-7.83	-2.97	3.02	0.30	0.25	9.87
1,200.00	0.94	179.79	1,199.93	-9.59	-2.93	2.99	0.13	-0.13	1.95
1,300.00	0.88	117.00	1,299.92	-10.75	-2.24	2.31	0.95	-0.06	-62.79
1,400.00	0.93	80.25	1,399.91	-10.97	-0.76	0.83	0.57	0.05	-36.75
1,500.00	1.36	70.69	1,499.89	-10.44	1.16	-1.10	0.47	0.43	-9.56
1,600.00	1.41	78.74	1,599.86	-9.80	3.49	-3.43	0.20	0.05	8.05
1,700.00	1.67	99.05	1,699.83	-9.79	6.14	-6.07	0.60	0.26	20.31
1,773.00	1.69	91.86	1,772.80	-9.99	8.26	-8.20	0.29	0.03	-9.85
1,852.00	1.47	85.62	1,851.77	-9.95	10.44	-10.37	0.35	-0.28	-7.90
1,915.00	1.98	68.42	1,914.74	-9.49	12.25	-12.19	1.15	0.81	-27.30
2,010.00	4.33	44.17	2,009.59	-6.32	16.28	-16.24	2.79	2.47	-25.53
2,106.00	5.64	38.44	2,105.23	-0.02	21.74	-21.74	1.46	1.36	-5.97
2,200.00	6.66	34.05	2,198.68	8.11	27.66	-27.71	1.19	1.09	-4.67
2,295.00	6.24	35.38	2,293.08	16.89	33.74	-33.84	0.47	-0.44	1.40
2,390.00	7.23	38.27	2,387.43	25.79	40.43	-40.59	1.10	1.04	3.04
2,484.00	6.61	40.27	2,480.74	34.56	47.59	-47.81	0.71	-0.66	2.13
2,580.00	7.52	39.20	2,576.01	43.65	55.13	-55.41	0.96	0.95	-1.11
2,675.00	8.47	38.93	2,670.09	53.91	63.46	-63.80	1.00	1.00	-0.28
2,770.00	7.70	41.71	2,764.14	64.10	72.09	-72.50	0.91	-0.81	2.93
2,865.00	8.19	37.45	2,858.23	74.22	80.44	-80.91	0.81	0.52	-4.48
2,959.00	9.99	42.75	2,951.05	85.53	90.04	-90.59	2.11	1.91	5.64
3,054.00	9.29	45.41	3,044.71	96.96	101.10	-101.72	0.87	-0.74	2.80
3,148.00	8.69	43.53	3,137.55	107.44	111.39	-112.08	0.71	-0.64	-2.00
3,243.00	10.24	47.77	3,231.26	118.32	122.59	-123.35	1.79	1.63	4.46
3,338.00	9.87	47.97	3,324.80	129.44	134.89	-135.72	0.39	-0.39	0.21
3,433.00	9.54	48.69	3,418.44	140.09	146.85	-147.75	0.37	-0.35	0.76
3,528.00	10.12	38.82	3,512.05	151.79	158.00	-158.97	1.87	0.61	-10.39
3,623.00	9.54	30.29	3,605.66	165.09	167.20	-168.26	1.65	-0.61	-8.98
3,718.00	7.77	32.28	3,699.57	177.32	174.60	-175.74	1.89	-1.86	2.09
3,777.00	6.73	33.17	3,758.10	183.58	178.62	-179.80	1.78	-1.77	1.52
Wellpath Crosses 330°HL in Nudge									
3,813.00	6.09	33.87	3,793.88	186.93	180.84	-182.04	1.78	-1.77	1.93
3,907.00	4.30	35.85	3,887.49	193.93	185.68	-186.93	1.91	-1.90	2.11
4,002.00	2.89	14.61	3,982.30	199.14	188.37	-189.65	2.02	-1.48	-22.36
4,018.36	2.47	13.28	3,998.64	199.88	188.56	-189.84	2.62	-2.59	-8.10
Burkett 16 State 12H Tgt p2									
4,097.00	0.54	336.78	4,077.25	201.87	188.80	-190.10	2.62	-2.45	-46.42
4,192.00	0.77	309.52	4,172.25	202.68	188.13	-189.44	0.40	0.24	-28.69
4,287.00	0.09	174.11	4,267.25	203.02	187.65	-188.95	0.88	-0.72	-142.54
4,292.66	0.09	177.78	4,272.90	203.01	187.65	-188.95	0.11	-0.03	64.84
Burkett 16 State 12H Tgt p6 - Burkett 16 State 12H Tgt p5									



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4,382.00	0.11	233.54	4,362.25	202.89	187.58	-188.89	0.11	0.02	62.41
4,477.00	0.32	263.45	4,457.24	202.80	187.24	-188.55	0.24	0.22	31.48
4,508.00	1.69	269.68	4,488.24	202.79	186.70	-188.01	4.43	4.42	20.10
4,540.00	3.99	268.76	4,520.20	202.76	185.12	-186.42	7.19	7.19	-2.88
4,572.00	7.35	268.36	4,552.04	202.68	181.96	-183.26	10.50	10.50	-1.25
4,603.00	10.91	270.70	4,582.64	202.66	177.04	-178.34	11.54	11.48	7.55
4,635.00	14.58	273.04	4,613.85	202.91	169.99	-171.29	11.58	11.47	7.31
4,666.00	18.35	275.29	4,643.57	203.57	161.23	-162.54	12.33	12.16	7.26
4,698.00	21.96	275.68	4,673.60	204.62	150.25	-151.57	11.29	11.28	1.22
4,730.00	25.70	272.97	4,702.87	205.58	137.37	-138.69	12.18	11.69	-8.47
4,761.00	29.07	270.01	4,730.40	205.93	123.12	-124.44	11.72	10.87	-9.55
4,792.00	32.75	267.64	4,756.99	205.58	107.20	-108.53	12.50	11.87	-7.65
4,824.00	36.61	267.14	4,783.30	204.75	89.02	-90.34	12.10	12.06	-1.56
4,855.00	40.68	267.22	4,807.51	203.80	69.69	-71.00	13.13	13.13	0.26
4,887.00	44.54	267.65	4,831.05	202.83	48.05	-49.36	12.10	12.06	1.34
4,919.00	46.32	267.76	4,853.51	201.92	25.27	-26.57	5.57	5.56	0.34
4,950.00	46.94	267.92	4,874.80	201.07	2.75	-4.05	2.03	2.00	0.52
Burkett 16 State 12H PBHL									
4,982.00	47.35	267.81	4,896.56	200.20	-20.69	19.40	1.31	1.28	-0.34
5,013.00	47.64	267.58	4,917.51	199.28	-43.53	42.24	1.08	0.94	-0.74
5,045.00	47.97	268.53	4,939.00	198.47	-67.22	65.94	2.43	1.03	2.97
5,077.00	47.71	270.67	4,960.48	198.31	-90.94	89.66	5.02	-0.81	6.69
5,108.00	48.52	271.57	4,981.18	198.76	-114.01	112.73	3.39	2.61	2.90
5,140.00	51.58	272.73	5,001.72	199.68	-138.52	137.23	9.96	9.56	3.63
5,172.00	54.61	272.91	5,020.94	200.94	-164.08	162.78	9.48	9.47	0.56
5,203.00	57.56	271.59	5,038.23	201.95	-189.78	188.47	10.15	9.52	-4.26
5,235.00	60.13	270.27	5,054.79	202.39	-217.16	215.84	8.77	8.03	-4.13
5,266.00	63.81	269.11	5,069.35	202.24	-244.51	243.20	12.32	11.87	-3.74
5,298.00	66.59	268.81	5,082.77	201.71	-273.56	272.25	8.73	8.69	-0.94
5,330.00	69.50	268.58	5,094.74	201.03	-303.22	301.92	9.12	9.09	-0.72
5,361.00	72.12	268.50	5,104.92	200.28	-332.49	331.19	8.46	8.45	-0.26
5,393.00	75.18	269.57	5,113.93	199.77	-363.19	361.89	10.09	9.56	3.34
5,425.00	78.52	270.55	5,121.21	199.80	-394.34	393.04	10.86	10.44	3.06
5,456.00	81.33	271.24	5,126.63	200.28	-424.86	423.56	9.33	9.06	2.23
5,487.00	83.69	271.61	5,130.67	201.05	-455.58	454.27	7.70	7.61	1.19
5,500.53	85.11	271.52	5,131.99	201.41	-469.04	467.73	10.52	10.50	-0.66
Burkett 16 State 12H LP p5									
5,519.00	87.05	271.40	5,133.26	201.88	-487.46	486.15	10.52	10.50	-0.65
5,519.78	87.08	271.39	5,133.30	201.90	-488.24	486.93	3.37	3.25	-0.91
Burkett 16 State 12H LP p6									
5,551.00	88.09	271.11	5,134.61	202.58	-519.42	518.11	3.37	3.25	-0.91
5,567.55	88.40	271.12	5,135.12	202.91	-535.96	534.64	1.87	1.87	0.03
Burkett 16 State 12H LP									
5,582.00	88.67	271.12	5,135.49	203.19	-550.41	549.08	1.87	1.87	0.03



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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
5,614.00	89.31	271.20	5,136.05	203.83	-582.39	581.07	2.02	2.00	0.25
5,708.00	90.62	271.50	5,136.11	206.05	-676.37	675.02	1.43	1.39	0.32
5,813.00	92.43	269.49	5,133.32	206.96	-781.32	779.96	2.58	1.72	-1.91
5,906.00	92.16	268.04	5,129.59	204.95	-874.22	872.87	1.58	-0.29	-1.56
6,001.00	92.16	268.49	5,126.01	202.08	-969.11	967.78	0.47	0.00	0.47
6,096.00	91.97	269.20	5,122.59	200.17	-1,064.02	1,062.71	0.77	-0.20	0.75
6,191.00	91.95	269.12	5,119.34	198.77	-1,158.96	1,157.65	0.09	-0.02	-0.08
6,285.00	91.50	269.37	5,116.51	197.54	-1,252.91	1,251.61	0.55	-0.48	0.27
6,380.00	91.57	269.91	5,113.97	196.94	-1,347.87	1,346.57	0.57	0.07	0.57
6,475.00	91.54	270.12	5,111.39	196.96	-1,442.84	1,441.53	0.22	-0.03	0.22
6,569.00	91.45	269.84	5,108.93	196.93	-1,536.80	1,535.50	0.31	-0.10	-0.30
6,665.00	91.60	270.57	5,106.38	197.27	-1,632.77	1,631.46	0.78	0.16	0.76
6,758.00	91.38	268.68	5,103.96	196.67	-1,725.73	1,724.42	2.05	-0.24	-2.03
6,853.00	91.48	268.97	5,101.59	194.72	-1,820.68	1,819.39	0.32	0.11	0.31
6,948.00	90.98	269.02	5,099.55	193.05	-1,915.64	1,914.36	0.53	-0.53	0.05
7,043.00	90.81	269.27	5,098.07	191.64	-2,010.62	2,009.34	0.32	-0.18	0.26
7,139.00	90.22	269.57	5,097.20	190.66	-2,106.61	2,105.34	0.69	-0.61	0.31
7,233.00	91.64	270.45	5,095.68	190.68	-2,200.60	2,199.32	1.78	1.51	0.94
7,328.00	91.66	271.27	5,092.94	192.11	-2,295.55	2,294.26	0.86	0.02	0.86
7,423.00	91.80	269.75	5,090.08	192.95	-2,390.50	2,389.20	1.61	0.15	-1.60
7,518.00	91.96	269.34	5,086.96	192.20	-2,485.44	2,484.15	0.46	0.17	-0.43
7,613.00	91.85	269.70	5,083.80	191.40	-2,580.39	2,579.10	0.40	-0.12	0.38
7,708.00	91.51	269.91	5,081.02	191.08	-2,675.34	2,674.05	0.42	-0.36	0.22
7,802.00	91.13	270.15	5,078.85	191.13	-2,769.32	2,768.03	0.48	-0.40	0.26
7,897.00	91.70	268.75	5,076.50	190.22	-2,864.28	2,862.99	1.59	0.60	-1.47
7,992.00	91.01	268.48	5,074.26	187.92	-2,959.23	2,957.95	0.78	-0.73	-0.28
8,087.00	92.07	268.02	5,071.70	185.02	-3,054.15	3,052.89	1.22	1.12	-0.48
8,182.00	91.58	268.04	5,068.68	181.76	-3,149.04	3,147.80	0.52	-0.52	0.02
8,277.00	92.61	269.12	5,065.21	179.40	-3,243.95	3,242.72	1.57	1.08	1.14
8,356.00	91.84	269.90	5,062.14	178.73	-3,322.88	3,321.66	1.39	-0.98	0.99
Wellpath Crosses 330'HL @ Toe									
8,372.00	91.68	270.06	5,061.65	178.72	-3,338.88	3,337.65	1.39	-0.98	0.99
8,390.61	91.75	270.17	5,061.09	178.76	-3,357.48	3,356.26	0.73	0.40	0.61
Burkett 16 State 12H Tgt									
8,467.00	92.06	270.64	5,058.55	179.30	-3,433.82	3,432.59	0.73	0.40	0.61
8,562.00	92.14	271.76	5,055.07	181.29	-3,528.74	3,527.49	1.18	0.08	1.18
8,662.00	92.14	271.76	5,051.34	184.36	-3,628.62	3,627.35	0.00	0.00	0.00
TD @ 24'FWL, 964'FNL - Burkett 16 State 12H BHL - Burkett 16 State 12H PBHL p4 - Burkett 16 State 12H PBHL p5 - Burkett 16 State 12H									



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Design Targets

Target Name	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- hit/miss target	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
- Shape									
Burkett 16 State 12H SL	0.00	0.00	0.00	0.00	0.00	669,064.20	642,039.30	32° 50' 18.546 N	103° 52' 15.178 W
- actual wellpath hits target center									
- Point									
Burkett 16 State 12H BH	0.00	0.00	5,051.33	184.36	-3,628.62	669,248.56	638,410.68	32° 50' 20.525 N	103° 52' 57.698 W
- actual wellpath misses target center by 0.01ft at 8662.00ft MD (5051.33 TVD, 184.36 N, -3628.62 E)									
- Point									

Design Annotations

Measured Depth	Vertical Depth	Local Coordinates		Comment
(ft)	(ft)	+N/-S (ft)	+E/-W (ft)	
3,777.00	3,758.10	183.58	178.62	Wellpath Crosses 330'HL In Nudge
8,356.00	5,062.14	178.73	-3,322.88	Wellpath Crosses 330'HL @ Toe
8,662.00	5,051.34	184.36	-3,628.62	TD @ 24'FWL, 964'FNL

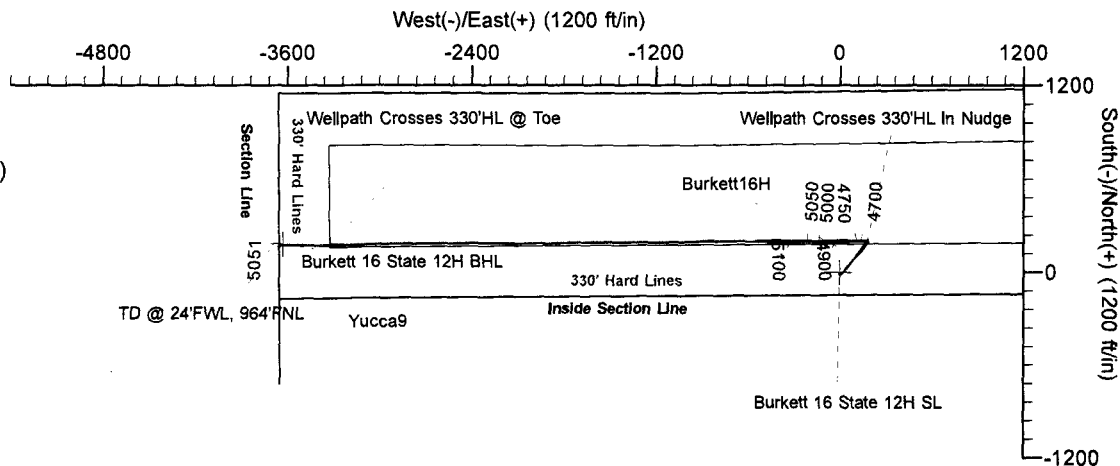
Checked By: _____ Approved By: _____ Date: _____

COG OPERATING, LLC

Project: Eddy /Lea County, NM (NAD27) NMEZ
 Site: Burkett 16 State 12H
 Well: #12H
 Wellbore: Lateral
 Design: Lateral



3767+18 @ 3785.00ft (Planning)
 NAD 1927 (NADCON CONUS)



ANNOTATIONS

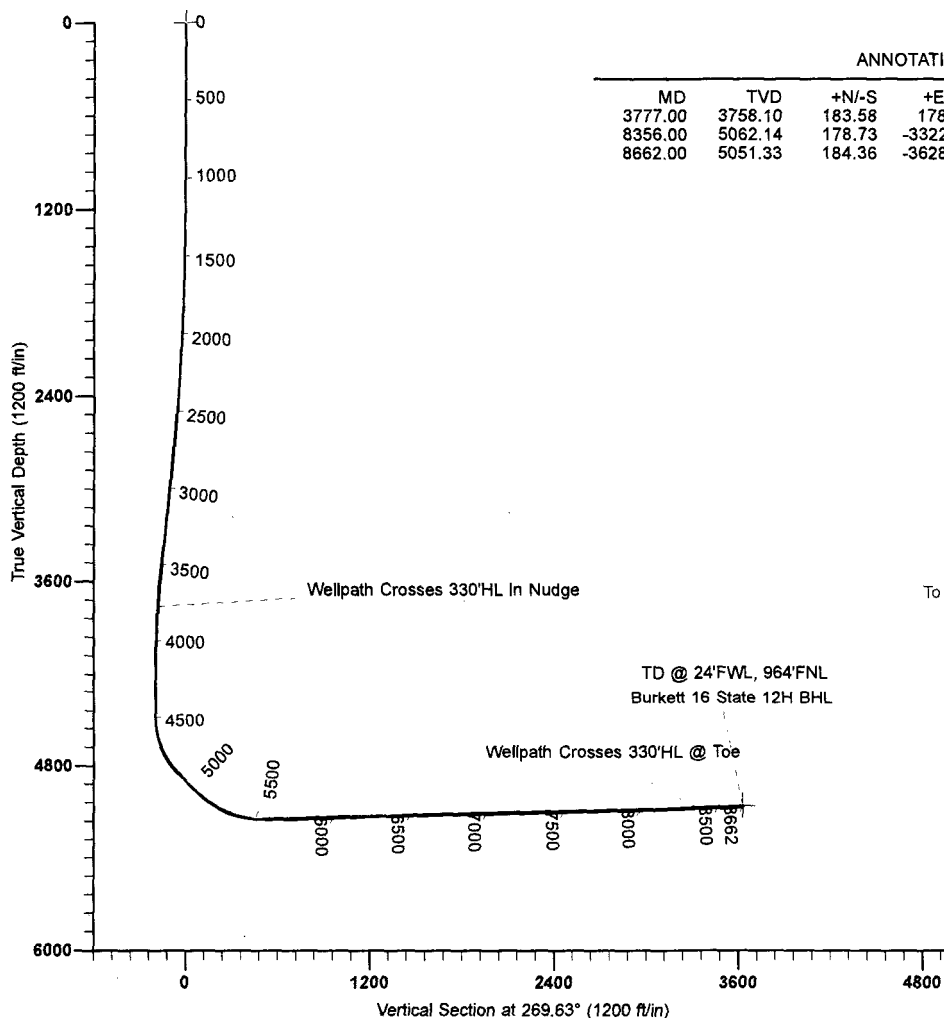
MD	TVD	+N/-S	+E/-W	Annotation
3777.00	3758.10	183.58	178.62	Wellpath Crosses 330'HL In Nudge
8356.00	5062.14	178.73	-3322.88	Wellpath Crosses 330'HL @ Toe
8662.00	5051.33	184.36	-3628.62	TD @ 24'FWL, 964'FNL



Azimuths to Grid North
 True North: -0.25°
 Magnetic North: 6.87°

Magnetic Field
 Strength: 48253.5nT
 Dip Angle: 60.57°
 Date: 08/07/2017
 Model: IGRF2015

To convert a Magnetic Direction to a Grid Direction, Add 6.87°



TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
Burkett 16 State 12H SL	0.00	0.00	0.00	669064.20	642039.30	Point
Burkett 16 State 12H BHL	5051.33	184.36	-3628.62	669248.56	638410.68	Point

Design: Lateral (#12H/Lateral)
 Created By: Mekka Williams
 eSomina Well Design
 mekka@esominawell.com
 14:36, August 16 2017

VON DIRECTIONAL
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 936-756-2400

