



COG OPERATING, LLC

Eddy County, NM (NAD83) NMEZ Dodd Federal Unit 917H

30-015-44128

#917H - Slot 1035'FNL, 230'FEL, Sec 15/T17S/R29E/UnitA

PP - 1010'FNL, 270'FWL, Sec14/T17S/R29E/UnitA

Lateral

PLANNED BHL - 970'FNL, 10'FEL, Sec 15/T17S/R29E/UnitA

ACTUAL BHL - 966'FNL, 10'FEL, Sec 15/T17S/R29E/UnitA

**Please provide signature
page for directional survey**

**NM OIL CONSERVATION
ARTESIA DISTRICT**

NOV 03 2017

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Survey Report



Company: COG OPERATING, LLC
Project: Eddy County, NM (NAD83) NMEZ
Site: Dodd Federal Unit 917H
Well: #917H
Wellbore: Lateral
Design: Lateral

Local Co-ordinate Reference: Well #917H - Slot DFU917H
TVD Reference: 3612+18 @ 3630.00ft (Patriot6)
MD Reference: 3612+18 @ 3630.00ft (Patriot6)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: VON_EDM

Project	Eddy County, NM (NAD83) NMEZ		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site		Dodd Federal Unit 917H			
Site Position:		Northing:	669,073.20 ft	Latitude:	32° 50' 20.379 N
From:	Map	Easting:	626,883.90 ft	Longitude:	104° 3' 17.298 W
Position Uncertainty:	0.00 ft	Slot Radius:	13.20 in	Grid Convergence:	0.15 °

Well	#917H - Slot DFU917H					
Well Position	+N/-S	0.00 ft	Northing:	669,073.20 ft	Latitude:	32° 50' 20.379 N
	+E/-W	0.00 ft	Easting:	626,883.90 ft	Longitude:	104° 3' 17.298 W
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	3,612.00 ft

Wellbore	Lateral				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	06/18/17	7.22	60.55	48,249

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	90.03	

Survey Program	Date	07/14/17			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
100.00	945.00	Survey #1 (Lateral)	GYD_DP_MS	Gyrodatta gyro-compassing and drop	
1,060.00	10,159.00	Survey #2 (Lateral)	MWD	MWD v3:standard declination	
10,219.00	10,219.00	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
Dodd 917H SL									
0.02	0.00	345.67	0.02	0.00	0.00	0.00	0.00	0.00	0.00
DFU22									
19.66	0.10	345.67	19.66	0.02	0.00	0.00	0.52	0.52	0.00
PACU1 (178'@4900)									
100.00	0.52	345.67	100.00	0.44	-0.11	-0.11	0.52	0.52	0.00
200.00	0.57	348.09	199.99	1.37	-0.33	-0.33	0.06	0.05	2.42



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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)
300.00	0.73	348.77	299.99	2.48	-0.55	-0.56	0.16	0.16	0.68
400.00	0.94	349.72	399.98	3.91	-0.82	-0.83	0.21	0.21	0.95
500.00	1.25	350.37	499.96	5.79	-1.15	-1.16	0.31	0.31	0.65
600.00	1.66	353.61	599.93	8.31	-1.50	-1.50	0.42	0.41	3.24
700.00	2.36	352.12	699.86	11.79	-1.94	-1.95	0.70	0.70	-1.49
800.00	3.08	350.12	799.75	16.47	-2.68	-2.69	0.73	0.72	-2.00
900.00	3.21	354.02	899.60	21.90	-3.44	-3.45	0.25	0.13	3.90
945.00	2.92	355.06	944.54	24.30	-3.67	-3.68	0.66	-0.64	2.31
1,060.00	3.03	354.94	1,059.38	30.24	-4.19	-4.20	0.10	0.10	-0.10
1,153.00	3.28	344.88	1,152.24	35.26	-5.10	-5.12	0.65	0.27	-10.82
1,248.00	4.57	320.52	1,247.02	40.81	-8.21	-8.23	2.19	1.36	-25.64
1,343.00	4.77	304.93	1,341.71	45.99	-13.86	-13.88	1.35	0.21	-16.41
1,438.00	4.53	283.92	1,436.40	49.15	-20.74	-20.76	1.80	-0.25	-22.12
1,533.00	4.93	282.92	1,531.09	49.55	-28.43	-28.46	1.86	0.42	-22.11
1,628.00	4.91	259.93	1,625.74	48.34	-36.49	-36.51	0.27	-0.02	-3.15
1,723.00	4.42	262.80	1,720.42	47.17	-44.12	-44.14	0.57	-0.52	3.02
1,817.00	5.52	260.09	1,814.07	45.94	-52.17	-52.19	1.20	1.17	-2.88
1,911.00	5.42	261.07	1,907.64	44.47	-61.01	-61.03	0.15	-0.11	1.04
2,006.00	4.33	257.21	2,002.30	42.98	-68.94	-68.96	1.20	-1.15	-4.06
2,100.00	4.63	264.49	2,096.01	41.83	-76.17	-76.20	0.68	0.32	7.74
2,195.00	5.69	262.69	2,190.62	40.86	-84.66	-84.68	1.13	1.12	-1.89
2,289.00	7.38	262.69	2,284.01	39.50	-95.27	-95.29	1.80	1.80	0.00
2,384.00	7.55	263.22	2,378.20	37.99	-107.52	-107.54	0.19	0.18	0.56
2,478.00	6.41	258.52	2,471.51	36.21	-118.80	-118.82	1.36	-1.21	-5.00
2,573.00	6.24	257.21	2,565.93	34.02	-129.03	-129.05	0.23	-0.18	-1.38
2,666.00	6.29	258.09	2,658.37	31.85	-138.94	-138.96	0.12	0.05	0.95
2,761.00	6.47	254.80	2,752.78	29.37	-149.20	-149.21	0.43	0.19	-3.46
2,856.00	5.29	259.64	2,847.28	27.18	-158.67	-158.69	1.35	-1.24	5.09
2,949.00	3.03	264.53	2,940.03	26.17	-165.34	-165.35	2.46	-2.43	5.26
3,044.00	1.73	274.98	3,034.95	26.06	-169.27	-169.28	1.44	-1.37	11.00
3,139.00	1.38	356.92	3,129.92	27.32	-170.76	-170.77	2.16	-0.37	86.25
3,233.00	1.48	350.06	3,223.89	29.65	-171.03	-171.04	0.21	0.11	-7.30
3,252.53	1.23	354.25	3,243.42	30.11	-171.09	-171.11	1.40	-1.30	21.45
Dodd 917H Tgt p3									
3,328.00	0.49	52.72	3,318.88	31.10	-170.91	-170.93	1.40	-0.97	77.47
3,423.00	0.82	70.61	3,413.88	31.58	-169.95	-169.97	0.40	0.35	18.83
3,517.00	0.82	129.71	3,507.87	31.37	-168.80	-168.81	0.86	0.00	62.87
3,612.00	1.71	162.56	3,602.84	29.58	-167.85	-167.87	1.17	0.94	34.58
3,707.00	1.87	168.58	3,697.80	26.71	-167.12	-167.13	0.26	0.17	6.34
3,802.00	1.99	167.67	3,792.74	23.58	-166.46	-166.47	0.13	0.13	-0.96
3,897.00	0.56	193.22	3,887.72	21.52	-166.21	-166.22	1.58	-1.51	26.89
3,992.00	0.40	157.66	3,982.72	20.76	-166.19	-166.20	0.35	-0.17	-37.43
4,087.00	0.35	188.27	4,077.71	20.16	-166.11	-166.12	0.21	-0.05	32.22
4,149.00	0.42	173.41	4,139.71	19.75	-166.11	-166.12	0.20	0.11	-23.97



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4,181.00	1.40	94.75	4,171.71	19.60	-165.71	-165.72	4.31	3.06	-245.81
4,213.00	3.61	88.28	4,203.68	19.60	-164.31	-164.32	6.95	6.91	-20.22
4,244.00	6.36	83.44	4,234.56	19.83	-161.63	-161.64	8.97	8.87	-15.61
4,275.00	9.38	78.54	4,265.26	20.52	-157.45	-157.46	9.97	9.74	-15.81
4,307.00	12.65	76.22	4,296.67	21.88	-151.49	-151.50	10.31	10.22	-7.25
4,339.00	16.29	77.27	4,327.65	23.70	-143.70	-143.71	11.40	11.38	3.28
4,370.00	20.04	79.87	4,357.10	25.59	-134.23	-134.24	12.37	12.10	8.39
4,402.00	23.46	82.88	4,386.82	27.35	-122.51	-122.52	11.24	10.69	9.41
4,434.00	26.92	85.67	4,415.77	28.69	-108.96	-108.97	11.43	10.81	8.72
4,466.00	30.71	87.79	4,443.80	29.55	-93.56	-93.58	12.26	11.84	6.63
4,497.00	34.64	89.44	4,469.89	29.94	-76.84	-76.85	13.00	12.68	5.32
4,529.00	38.44	89.99	4,495.60	30.03	-57.79	-57.81	11.92	11.88	1.72
4,560.00	41.69	89.92	4,519.32	30.05	-37.84	-37.85	10.48	10.48	-0.23
4,592.00	43.78	89.93	4,542.82	30.08	-16.12	-16.14	6.53	6.53	0.03
4,624.00	44.24	90.15	4,565.84	30.06	6.11	6.09	1.51	1.44	0.69
4,655.00	44.52	90.27	4,587.99	29.98	27.79	27.77	0.94	0.90	0.39
4,687.00	44.81	90.40	4,610.75	29.85	50.28	50.27	0.95	0.91	0.41
4,719.00	45.25	90.39	4,633.37	29.69	72.92	72.91	1.38	1.38	-0.03
4,751.00	45.41	90.38	4,655.86	29.54	95.68	95.66	0.50	0.50	-0.03
4,782.00	45.62	90.44	4,677.59	29.38	117.80	117.78	0.69	0.68	0.19
4,814.00	47.19	90.38	4,699.65	29.22	140.97	140.95	4.91	4.91	-0.19
4,845.00	49.81	90.36	4,720.19	29.07	164.18	164.17	8.45	8.45	-0.06
4,877.00	52.94	89.60	4,740.16	29.08	189.18	189.17	9.96	9.78	-2.38
4,909.00	56.45	88.57	4,758.65	29.50	215.29	215.27	11.28	10.97	-3.22
4,927.00	58.67	88.27	4,768.31	29.92	230.47	230.46	12.40	12.32	-1.64
Wellpath Crosses Section Line @ Heel									
4,940.00	60.27	88.07	4,774.91	30.28	241.66	241.65	12.40	12.32	-1.57
4,972.00	63.60	88.23	4,789.97	31.19	269.88	269.87	10.42	10.41	0.50
5,004.00	66.10	89.17	4,803.57	31.84	298.84	298.82	8.25	7.81	2.94
5,036.00	68.30	89.80	4,815.97	32.11	328.34	328.32	7.11	6.88	1.97
5,068.00	70.55	90.35	4,827.21	32.06	358.29	358.27	7.21	7.03	1.72
5,099.00	73.59	90.54	4,836.75	31.84	387.78	387.77	9.82	9.81	0.61
5,131.00	77.54	90.85	4,844.73	31.46	418.76	418.75	12.38	12.34	0.97
5,163.00	81.60	90.44	4,850.52	31.11	450.23	450.21	12.75	12.69	-1.28
5,195.00	85.45	90.40	4,854.13	30.87	482.01	482.00	12.03	12.03	-0.13
5,213.50	87.47	90.70	4,855.27	30.70	500.48	500.46	11.03	10.92	1.60
Dodd 917H LP p3									
5,232.00	89.49	90.99	4,855.76	30.42	518.97	518.95	11.03	10.92	1.59
5,272.00	90.57	91.19	4,855.74	29.66	558.96	558.94	2.74	2.69	0.51
Wellpath Crosses 330' from west line									
5,327.00	92.05	91.47	4,854.48	28.39	613.93	613.91	2.74	2.69	0.51
5,422.00	92.22	90.04	4,850.95	27.13	708.85	708.84	1.51	0.18	-1.51
5,517.00	91.41	90.89	4,847.94	26.36	803.80	803.79	1.24	-0.85	0.89
5,612.00	91.92	91.27	4,845.18	24.57	898.74	898.73	0.67	0.54	0.40



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5,706.00	90.54	89.71	4,843.16	23.77	992.71	992.70	2.22	-1.47	-1.66
5,800.00	90.41	88.22	4,842.38	25.47	1,086.69	1,086.68	1.59	-0.14	-1.59
5,895.00	90.65	86.32	4,841.50	29.99	1,181.58	1,181.56	2.02	0.25	-2.00
5,990.00	90.66	86.39	4,840.41	36.03	1,276.38	1,276.36	0.07	0.01	0.07
6,084.00	90.37	87.23	4,839.57	41.26	1,370.23	1,370.20	0.95	-0.31	0.89
6,154.00	90.24	87.73	4,839.20	44.34	1,440.16	1,440.13	0.74	-0.19	0.71
Wellpath Crosses 330° From South Inside Section Line									
6,178.00	90.19	87.90	4,839.11	45.26	1,464.14	1,464.12	0.74	-0.19	0.71
6,273.00	90.86	87.10	4,838.24	49.40	1,559.04	1,559.02	1.10	0.71	-0.84
6,367.00	91.86	87.60	4,836.01	53.74	1,652.92	1,652.89	1.19	1.06	0.53
6,462.00	92.19	87.40	4,832.65	57.89	1,747.77	1,747.74	0.41	0.35	-0.21
6,556.00	91.76	89.28	4,829.41	60.61	1,841.67	1,841.63	2.05	-0.46	2.00
6,651.00	91.93	89.68	4,826.35	61.47	1,936.61	1,936.58	0.46	0.18	0.42
6,746.00	90.11	90.05	4,824.66	61.69	2,031.59	2,031.56	1.95	-1.92	0.39
6,841.00	89.98	90.80	4,824.59	60.99	2,126.59	2,126.56	0.80	-0.14	0.79
6,936.00	90.67	90.24	4,824.05	60.13	2,221.58	2,221.55	0.94	0.73	-0.59
7,031.00	90.65	90.48	4,822.95	59.53	2,316.58	2,316.54	0.25	-0.02	0.25
7,125.00	91.39	90.29	4,821.28	58.90	2,410.56	2,410.53	0.81	0.79	-0.20
7,220.00	91.35	91.09	4,819.01	57.75	2,505.52	2,505.49	0.84	-0.04	0.84
7,315.00	90.94	89.73	4,817.11	57.07	2,600.50	2,600.47	1.49	-0.43	-1.43
7,410.00	91.06	88.20	4,815.45	58.79	2,695.47	2,695.43	1.62	0.13	-1.61
7,504.00	90.88	88.42	4,813.86	61.56	2,789.41	2,789.38	0.30	-0.19	0.23
7,598.00	89.58	87.81	4,813.48	64.65	2,883.36	2,883.32	1.53	-1.38	-0.65
7,694.00	89.17	87.02	4,814.53	68.98	2,979.25	2,979.22	0.93	-0.43	-0.82
7,786.00	90.58	87.49	4,814.73	73.39	3,071.14	3,071.11	1.62	1.53	0.51
7,880.00	92.23	90.07	4,812.43	75.39	3,165.08	3,165.04	3.26	1.76	2.74
7,911.00	91.84	90.92	4,811.33	75.12	3,196.06	3,196.02	3.02	-1.26	2.74
8,006.00	91.78	91.35	4,808.33	73.24	3,291.00	3,290.96	0.46	-0.06	0.45
8,100.00	91.88	92.08	4,805.49	70.43	3,384.91	3,384.87	0.78	-0.11	0.78
8,193.00	91.50	91.16	4,802.91	67.80	3,477.84	3,477.80	1.01	-0.19	-0.99
8,287.00	91.75	91.30	4,800.24	65.78	3,571.78	3,571.74	0.30	0.27	0.15
8,382.00	90.23	90.05	4,798.60	64.67	3,666.75	3,666.72	2.07	-1.60	-1.32
8,477.00	90.41	90.45	4,798.07	64.25	3,761.75	3,761.72	0.46	0.19	0.42
8,571.00	90.39	90.71	4,797.41	63.30	3,855.74	3,855.71	0.28	-0.02	0.28
8,665.00	90.11	91.50	4,797.00	61.49	3,949.72	3,949.69	0.89	-0.30	0.84
8,759.00	90.79	90.27	4,796.27	60.03	4,043.71	4,043.67	1.50	0.72	-1.31
8,854.00	91.09	89.12	4,794.71	60.54	4,138.69	4,138.66	1.25	0.32	-1.21
8,949.00	90.90	89.31	4,793.06	61.84	4,233.67	4,233.63	0.28	-0.20	0.20
9,044.00	90.84	89.68	4,791.61	62.68	4,328.65	4,328.62	0.39	-0.06	0.39
9,139.00	90.84	89.88	4,790.22	63.04	4,423.64	4,423.61	0.21	0.00	0.21
9,234.00	90.74	90.16	4,788.91	63.01	4,518.63	4,518.60	0.31	-0.11	0.29
9,329.00	90.48	90.37	4,787.90	62.57	4,613.63	4,613.59	0.35	-0.27	0.22
9,424.00	91.36	90.00	4,786.38	62.26	4,708.61	4,708.58	1.00	0.93	-0.39



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Well: #917H
Wellbore: Lateral
Design: Lateral

Local Co-ordinate Reference: Well #917H - Slot DFU917H
TVD Reference: 3612+18 @ 3630.00ft (Patriot6)
MD Reference: 3612+18 @ 3630.00ft (Patriot6)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: VON_EDM

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)
9,519.00	91.83	90.01	4,783.73	62.26	4,803.58	4,803.54	0.49	0.49	0.01
9,613.00	91.68	90.10	4,780.85	62.17	4,897.53	4,897.50	0.19	-0.16	0.10
9,708.00	91.95	90.29	4,777.84	61.84	4,992.48	4,992.45	0.35	0.28	0.20
9,802.00	90.21	89.29	4,776.07	62.19	5,086.46	5,086.43	2.13	-1.85	-1.06
9,897.00	89.82	89.31	4,776.05	63.35	5,181.45	5,181.42	0.41	-0.41	0.02
9,899.00	89.82	89.31	4,776.05	63.37	5,183.45	5,183.42	0.00	0.00	0.00
Wellpath Crosses 330' HL @ Toe									
9,992.00	89.82	89.11	4,776.35	64.66	5,276.44	5,276.41	0.22	0.00	-0.22
10,086.00	88.33	89.34	4,777.86	65.93	5,370.42	5,370.38	1.60	-1.59	0.24
10,159.00	89.66	89.82	4,779.14	66.46	5,443.41	5,443.37	1.94	1.82	0.66
10,219.00	89.66	89.82	4,779.50	66.65	5,503.40	5,503.37	0.00	0.00	0.00
TD @ 10°FEL, 966°FNL - Dodd 917H PBHL									

Design Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
- hit/miss target									
- Shape									
Dodd 917H SL	0.00	0.00	0.00	0.00	0.00	669,073.20	626,883.90	32° 50' 20.379 N	104° 3' 17.298 W
- actual wellpath hits target center									
- Point									
Dodd 917H BHL	0.00	0.00	4,779.50	66.65	5,503.40	669,139.85	632,387.30	32° 50' 20.890 N	104° 2' 12.790 W
- actual wellpath hits target center									
- Point									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Comment
4,927.00	4,768.31	29.92	230.47	Wellpath Crosses Section Line @ Heel
5,272.00	4,855.74	29.66	558.96	Wellpath Crosses 330' from west line
6,154.00	4,839.20	44.34	1,440.16	Wellpath Crosses 330' From South Inside Section Line
9,899.00	4,776.05	63.37	5,183.45	Wellpath Crosses 330' HL @ Toe
10,219.00	4,779.50	66.65	5,503.40	TD @ 10°FEL, 966°FNL

Checked By: _____ Approved By: _____ Date: _____

COG OPERATING, LLC

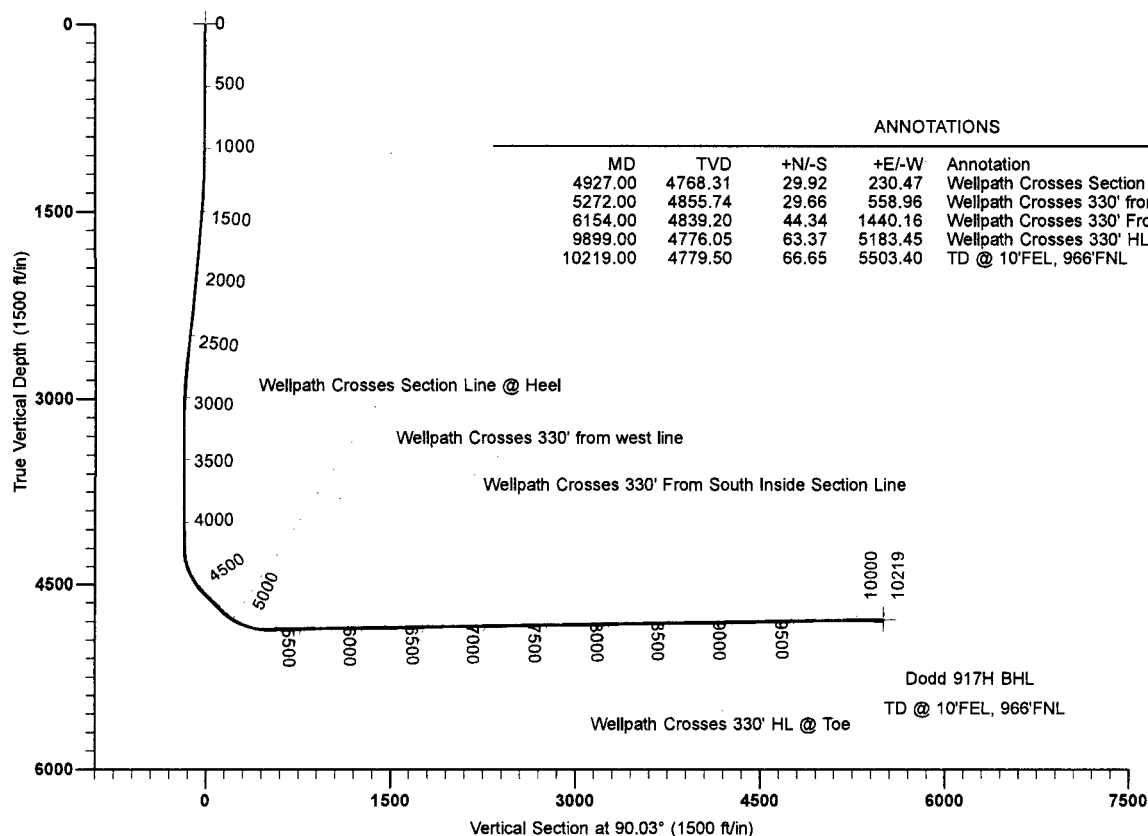
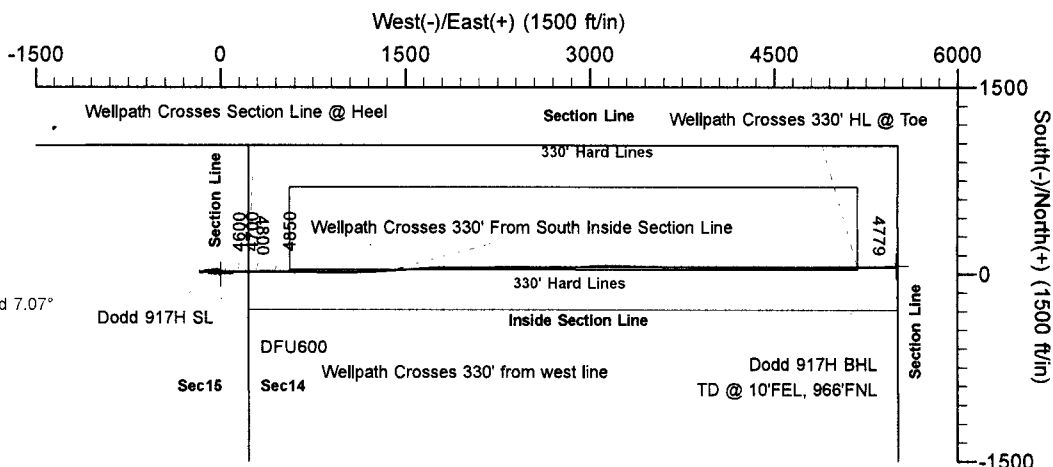
Project: Eddy County, NM (NAD83) NMEZ
 Site: Dodd Federal Unit 917H
 Well: #917H
 Wellbore: Lateral
 Design: Lateral

3612+18 @ 3630.00ft (Patriot6)
 North American Datum 1983



Azimuths to Grid North
 True North: -0.15°
 Magnetic North: 7.07°
 Magnetic Field
 Strength: 48249.2snT
 Dip Angle: 60.55°
 Date: 06/18/2017
 Model: IGRF2015

To convert a Magnetic Direction to a Grid Direction, Add 7.07°



ANNOTATIONS

MD	TVD	+N/-S	+E/-W	Annotation
4927.00	4768.31	29.92	230.47	Wellpath Crosses Section Line @ Heel
5272.00	4855.74	29.66	558.96	Wellpath Crosses 330' from west line
6154.00	4839.20	44.34	1440.16	Wellpath Crosses 330' From South Inside Section Line
9899.00	4776.05	63.37	5183.45	Wellpath Crosses 330' HL @ Toe
10219.00	4779.50	66.65	5503.40	TD @ 10'FEL, 966'FNL

TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
Dodd 917H SL	0.00	0.00	0.00	669073.20	626883.90	Point
Dodd 917H BHL	4779.50	66.65	5503.40	669139.85	632387.30	Point

Design: Lateral (#917H/Lateral)
 Created By: Mekka Williams
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 12:29, July 14 2017

VON DIRECTIONAL
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