



CONCHO

NM OIL CONSERVATION
ARTESIA DISTRICT

NOV 01 2017

RECEIVED

COG OPERATING, LLC

Eddy /Lea County, NM (NAD27) NMEZ

Dodd Federal Unit 923H

30-015-44151

923H - Slot - 500'FSL, 190'FEL Sec 14/T17S/R29E/UnitP

PP- 350'FSL, 692'FEL Sec 14/T17S/R29E/UnitP

Lateral

PLANNED BHL 350'FSL, 220'FWL Sec 14/T17S/R29E/UnitM

ACTUAL BHL 350'FSL, 212'FWL Sec 14/T17S/R29E/UnitM

Please provide signature
page for directional survey





Survey Report



Company: COG OPERATING, LLC
Project: Eddy /Lea County, NM (NAD27) NMEZ
Site: Dodd Federal Unit 923H
Well: 923H
Wellbore: Lateral
Design: Lateral

Local Co-ordinate Reference: Well 923H - Slot DFU923H
TVD Reference: 3608+18 @ 3626.00ft (SilverOak3)
MD Reference: 3608+18 @ 3626.00ft (SilverOak3)
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)
Geo Datum: NAD 1927 (NADCON CONUS)
Map Zone: New Mexico East 3001

System Datum: Mean Sea Level

Site Dodd Federal Unit 923H

Site Position: Northing: 665,265.00 ft Latitude: 32° 49' 42.764 N
From: Map Easting: 591,037.80 ft Longitude: 104° 2' 13.079 W
Position Uncertainty: 0.00 ft Slot Radius: 13.20 in Grid Convergence: 0.16 °

Well 923H - Slot DFU923H

Well Position: +N/-S 0.00 ft Northing: 665,265.00 ft Latitude: 32° 49' 42.764 N
+E/-W 0.00 ft Easting: 591,037.80 ft Longitude: 104° 2' 13.079 W
Position Uncertainty: 0.00 ft Wellhead Elevation: ft Ground Level: 3,608.00 ft

Wellbore Lateral

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	06/29/17	7.21	60.54	48,242

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	269.95

Survey Program Date 07/17/17

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
100.00	893.00	Survey #1 (Lateral)	GYD_DP_MS	Gyrodata gyro-compassing and drop
968.00	9,513.00	Survey #2 (Lateral)	MWD	MWD v3: standard declination
9,586.00	9,586.00	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 923H SL									
100.00	0.22	145.09	100.00	-0.16	0.11	-0.11	0.22	0.22	0.00
200.00	0.48	163.26	200.00	-0.72	0.34	-0.34	0.28	0.26	18.17
300.00	0.19	197.61	300.00	-1.28	0.41	-0.41	0.34	-0.29	34.35
400.00	0.53	126.00	399.99	-1.71	0.73	-0.73	0.50	0.34	-71.61
500.00	0.23	96.12	499.99	-2.00	1.31	-1.31	0.35	-0.30	-29.88
600.00	0.90	80.33	599.99	-1.89	2.28	-2.28	0.68	0.67	-15.79
700.00	1.38	83.21	699.97	-1.61	4.25	-4.25	0.48	0.48	2.88

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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)
800.00	1.29	87.32	799.94	-1.42	6.57	-6.57	0.13	-0.09	4.11
893.00	1.19	89.02	892.92	-1.35	8.58	-8.58	0.11	-0.11	1.83
968.00	1.34	71.61	967.90	-1.06	10.19	-10.19	0.55	0.20	-23.21
1,062.00	1.83	113.44	1,061.87	-1.31	12.61	-12.61	1.30	0.52	44.50
1,157.00	3.48	132.30	1,156.76	-3.86	16.14	-16.14	1.94	1.74	19.85
1,252.00	3.79	136.39	1,251.57	-8.07	20.44	-20.43	0.43	0.33	4.31
1,347.00	4.55	128.29	1,346.32	-12.68	25.56	-25.55	1.01	0.80	-8.53
1,441.00	4.50	126.49	1,440.03	-17.18	31.45	-31.44	0.16	-0.05	-1.91
1,536.00	5.49	127.17	1,534.67	-22.14	38.07	-38.05	1.04	1.04	0.72
1,630.00	5.21	127.44	1,628.26	-27.46	45.04	-45.02	0.30	-0.30	0.29
1,725.00	4.73	126.29	1,722.90	-32.40	51.62	-51.59	0.52	-0.51	-1.21
1,820.00	4.11	125.09	1,817.62	-36.67	57.57	-57.53	0.66	-0.65	-1.26
1,915.00	3.69	121.95	1,912.40	-40.25	62.95	-62.91	0.50	-0.44	-3.31
2,010.00	3.18	123.74	2,007.22	-43.33	67.73	-67.69	0.55	-0.54	1.88
2,105.00	4.34	126.09	2,102.02	-46.91	72.83	-72.79	1.23	1.22	2.47
2,200.00	5.16	131.79	2,196.69	-51.87	78.92	-78.87	0.99	0.86	6.00
2,295.00	4.75	131.06	2,291.34	-57.30	85.07	-85.02	0.44	-0.43	-0.77
2,390.00	6.61	133.01	2,385.87	-63.62	92.03	-91.98	1.97	1.96	2.05
2,484.00	6.81	131.76	2,479.22	-71.02	100.15	-100.08	0.26	0.21	-1.33
2,580.00	6.88	145.70	2,574.54	-79.56	107.63	-107.56	1.73	0.07	14.52
2,674.00	5.61	151.92	2,667.99	-88.27	112.97	-112.89	1.53	-1.35	6.62
2,769.00	5.24	151.65	2,762.56	-96.18	117.21	-117.13	0.39	-0.39	-0.28
2,863.00	5.33	153.08	2,856.16	-103.85	121.23	-121.14	0.17	0.10	1.52
2,958.00	4.80	145.13	2,950.79	-111.05	125.50	-125.40	0.92	-0.56	-8.37
3,053.00	4.76	143.28	3,045.46	-117.47	130.13	-130.03	0.17	-0.04	-1.95
3,147.00	4.64	144.64	3,139.14	-123.69	134.66	-134.55	0.17	-0.13	1.45
3,242.00	4.57	143.89	3,233.84	-129.89	139.11	-139.00	0.10	-0.07	-0.79
3,336.00	4.28	124.22	3,327.56	-134.88	144.22	-144.10	1.64	-0.31	-20.93
3,431.00	4.42	124.56	3,422.29	-138.95	150.17	-150.05	0.15	0.15	0.36
3,526.00	4.12	126.01	3,517.03	-143.04	155.94	-155.82	0.34	-0.32	1.53
3,621.00	3.06	139.26	3,611.84	-146.97	160.36	-160.23	1.41	-1.12	13.95
3,715.00	3.14	136.96	3,705.70	-150.75	163.75	-163.62	0.16	0.09	-2.45
3,810.00	1.76	133.40	3,800.61	-153.65	166.59	-166.45	1.46	-1.45	-3.75
3,904.00	0.37	257.25	3,894.60	-154.71	167.34	-167.21	2.12	-1.48	131.76
3,998.00	0.36	270.21	3,988.60	-154.78	166.75	-166.62	0.09	-0.01	13.79
4,009.39	0.35	271.09	3,999.98	-154.78	166.68	-166.54	0.08	-0.07	7.69
Dodd 923H Tgt									
4,093.00	0.30	278.82	4,083.60	-154.74	166.21	-166.07	0.08	-0.06	9.25
4,187.00	1.84	271.65	4,177.58	-154.66	164.45	-164.32	1.64	1.64	-7.63
4,219.00	4.22	270.06	4,209.53	-154.64	162.76	-162.63	7.44	7.44	-4.97
4,251.00	7.56	271.18	4,241.36	-154.60	159.48	-159.35	10.44	10.44	3.50
4,282.00	11.29	271.83	4,271.93	-154.46	154.41	-154.27	12.04	12.03	2.10
4,314.00	15.13	272.75	4,303.08	-154.16	147.10	-146.97	12.02	12.00	2.88

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4,345.00	18.73	273.53	4,332.73	-153.66	138.09	-137.96	11.64	11.61	2.52
4,377.00	22.31	274.37	4,362.70	-152.88	126.90	-126.77	11.23	11.19	2.63
4,408.00	26.23	274.14	4,390.95	-151.93	114.20	-114.07	12.65	12.65	-0.74
4,440.00	30.13	272.13	4,419.15	-151.12	99.11	-98.98	12.54	12.19	-6.28
4,471.00	33.61	269.75	4,445.48	-150.87	82.75	-82.62	11.93	11.23	-7.68
4,503.00	36.08	268.03	4,471.74	-151.23	64.48	-64.34	8.31	7.72	-5.38
4,535.00	38.33	267.38	4,497.22	-152.01	45.14	-45.01	7.14	7.03	-2.03
4,566.00	40.54	267.24	4,521.16	-152.94	25.47	-25.34	7.13	7.13	-0.45
4,661.00	45.27	268.07	4,590.73	-155.56	-39.13	39.26	5.01	4.98	0.87
4,755.00	46.66	268.55	4,656.07	-157.55	-106.67	106.81	1.52	1.48	0.51
4,786.00	47.04	268.32	4,677.27	-158.17	-129.28	129.42	1.34	1.23	-0.74
4,801.00	47.22	268.37	4,687.48	-158.49	-140.27	140.41	1.21	1.19	0.34
Wellpath Crosses 330°HL @ Heel									
4,818.00	47.42	268.43	4,699.00	-158.83	-152.76	152.90	1.21	1.19	0.34
4,849.00	49.90	269.61	4,719.47	-159.23	-176.03	176.17	8.49	8.00	3.81
4,881.00	54.03	271.59	4,739.19	-158.95	-201.23	201.37	13.79	12.91	6.19
4,912.00	57.95	272.96	4,756.53	-157.93	-226.90	227.04	13.16	12.65	4.42
4,944.00	62.18	273.26	4,772.49	-156.42	-254.58	254.72	13.24	13.22	0.94
4,975.00	64.50	272.07	4,786.40	-155.13	-282.25	282.39	8.23	7.48	-3.84
5,007.00	66.48	270.91	4,799.67	-154.38	-311.36	311.49	7.01	6.19	-3.63
5,039.00	68.51	269.58	4,811.92	-154.26	-340.92	341.05	7.42	6.34	-4.16
5,070.00	71.47	268.75	4,822.53	-154.68	-370.04	370.17	9.87	9.55	-2.68
5,102.00	75.21	268.86	4,831.70	-155.32	-400.68	400.82	11.69	11.69	0.34
5,134.00	79.15	269.91	4,838.80	-155.65	-431.88	432.01	12.72	12.31	3.28
5,165.00	83.07	270.31	4,843.59	-155.59	-462.50	462.64	12.71	12.65	1.29
5,197.00	86.94	270.25	4,846.38	-155.44	-494.37	494.51	12.10	12.09	-0.19
5,204.59	87.77	270.16	4,846.73	-155.41	-501.95	502.09	11.03	10.97	-1.13
Dodd 923H LP									
5,229.00	90.45	269.89	4,847.10	-155.40	-526.36	526.49	11.03	10.97	-1.12
5,328.00	92.07	268.92	4,844.93	-156.43	-625.33	625.46	1.91	1.64	-0.98
5,423.00	90.80	269.88	4,842.55	-157.42	-720.29	720.42	1.68	-1.34	1.01
5,518.00	89.13	268.93	4,842.61	-158.41	-815.28	815.42	2.02	-1.76	-1.00
5,612.00	92.05	273.21	4,841.64	-156.65	-909.22	909.36	5.51	3.11	4.55
5,707.00	90.23	271.73	4,839.75	-152.56	-1,004.11	1,004.24	2.47	-1.92	-1.56
5,801.00	90.08	272.16	4,839.49	-149.37	-1,098.06	1,098.19	0.48	-0.16	0.46
5,896.00	89.69	271.85	4,839.68	-146.05	-1,193.00	1,193.12	0.52	-0.41	-0.33
5,991.00	91.06	271.75	4,839.06	-143.06	-1,287.95	1,288.07	1.45	1.44	-0.11
6,085.00	90.78	269.87	4,837.55	-141.74	-1,381.92	1,382.04	2.02	-0.30	-2.00
6,180.00	91.05	270.69	4,836.04	-141.27	-1,476.91	1,477.03	0.91	0.28	0.86
6,275.00	90.37	268.37	4,834.86	-142.05	-1,571.89	1,572.01	2.54	-0.72	-2.44
6,370.00	90.27	268.43	4,834.33	-144.70	-1,666.85	1,666.98	0.12	-0.11	0.06
6,464.00	91.35	268.58	4,833.00	-147.15	-1,760.81	1,760.93	1.16	1.15	0.16
6,559.00	91.07	268.93	4,830.99	-149.22	-1,855.76	1,855.89	0.47	-0.29	0.37
6,654.00	90.88	269.31	4,829.38	-150.68	-1,950.74	1,950.87	0.45	-0.20	0.40

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6,749.00	90.51	270.10	4,828.22	-151.17	-2,045.73	2,045.86	0.92	-0.39	0.83
6,843.00	88.82	269.08	4,828.77	-151.84	-2,139.72	2,139.85	2.10	-1.80	-1.09
6,937.00	89.82	268.42	4,829.89	-153.89	-2,233.69	2,233.82	1.27	1.06	-0.70
7,032.00	92.01	269.80	4,828.37	-155.37	-2,328.66	2,328.79	2.72	2.31	1.45
7,127.00	92.07	270.41	4,824.99	-155.19	-2,423.60	2,423.73	0.64	0.06	0.64
7,221.00	92.50	272.83	4,821.24	-152.54	-2,517.61	2,517.61	2.61	0.46	2.57
7,316.00	91.76	272.98	4,817.71	-147.73	-2,612.29	2,612.42	0.79	-0.78	0.16
7,410.00	91.03	270.99	4,815.42	-144.47	-2,706.20	2,706.32	2.25	-0.78	-2.12
7,504.00	91.11	268.88	4,813.67	-144.58	-2,800.18	2,800.30	2.25	0.09	-2.24
7,599.00	91.23	268.82	4,811.73	-146.48	-2,895.14	2,895.27	0.14	0.13	-0.06
7,692.00	90.77	268.92	4,810.10	-148.32	-2,988.11	2,988.23	0.51	-0.49	0.11
7,787.00	90.39	269.14	4,809.14	-149.93	-3,083.09	3,083.22	0.46	-0.40	0.23
7,881.00	91.77	268.65	4,807.37	-151.74	-3,177.05	3,177.18	1.56	1.47	-0.52
7,976.00	91.15	268.21	4,804.95	-154.34	-3,271.98	3,272.12	0.80	-0.65	-0.46
8,070.00	90.78	267.63	4,803.37	-157.75	-3,365.91	3,366.04	0.73	-0.39	-0.62
8,164.00	92.62	268.88	4,800.58	-160.61	-3,459.82	3,459.96	2.37	1.96	1.33
8,258.00	91.37	270.28	4,797.31	-161.30	-3,553.75	3,553.89	2.00	-1.33	1.49
8,352.00	90.81	269.82	4,795.52	-161.22	-3,647.74	3,647.87	0.77	-0.60	-0.49
8,446.00	91.51	270.73	4,793.62	-160.77	-3,741.71	3,741.85	1.22	0.74	0.97
8,540.00	91.56	271.08	4,791.10	-159.28	-3,835.67	3,835.81	0.38	0.05	0.37
8,635.00	91.63	271.25	4,788.45	-157.35	-3,930.61	3,930.75	0.19	0.07	0.18
8,729.00	92.04	271.85	4,785.44	-154.81	-4,024.53	4,024.66	0.77	0.44	0.64
8,823.00	90.89	270.63	4,783.04	-152.78	-4,118.47	4,118.60	1.78	-1.22	-1.30
8,918.00	90.74	270.95	4,781.69	-151.47	-4,213.45	4,213.58	0.37	-0.16	0.34
9,012.00	91.13	269.72	4,780.15	-150.92	-4,307.44	4,307.57	1.37	0.41	-1.31
9,106.00	91.53	269.91	4,777.97	-151.22	-4,401.41	4,401.54	0.47	0.43	0.20
9,200.00	91.70	270.25	4,775.32	-151.09	-4,495.37	4,495.50	0.40	0.18	0.36
9,294.00	91.11	268.87	4,773.02	-151.81	-4,589.34	4,589.47	1.60	-0.63	-1.47
9,388.00	91.43	269.46	4,770.94	-153.18	-4,683.31	4,683.44	0.71	0.34	0.63
9,468.00	91.33	269.88	4,769.01	-153.65	-4,763.28	4,763.41	0.54	-0.13	0.52
Wellpath Crosses 330°HL @ Toe									
9,482.00	91.31	269.95	4,768.69	-153.67	-4,777.28	4,777.41	0.54	-0.13	0.52
9,513.00	91.26	269.91	4,767.99	-153.70	-4,808.27	4,808.40	0.21	-0.16	-0.13
9,577.94	91.26	269.91	4,766.56	-153.81	-4,873.20	4,873.33	0.00	0.00	0.00
Dodd 923H PBHL p3									
9,586.00	91.26	269.91	4,766.39	-153.82	-4,881.25	4,881.38	0.00	0.00	0.00
TD @ 350°FSL, 212°FWL									

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Database: VON_EDM

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Dodd 923H SL - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	665,265.00	591,037.80	32° 49' 42.764 N	104° 2' 13.079 W
Dodd 923H BHL - actual wellpath misses target center by 0.01ft at 9586.00ft MD (4766.39 TVD, -153.82 N, -4881.25 E) - Point	0.00	0.00	4,766.39	-153.83	-4,881.25	665,111.18	586,156.55	32° 49' 41.374 N	104° 3' 10.290 W

Design Annotations

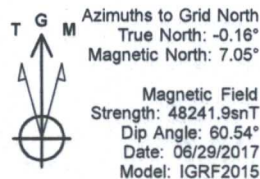
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
4,801.00	4,687.48	-158.49	-140.27	Wellpath Crosses 330'HL @ Heel
9,468.00	4,769.01	-153.65	-4,763.28	Wellpath Crosses 330'HL @ Toe
9,586.00	4,766.39	-153.82	-4,881.25	TD @ 350'FSL, 212'FWL

Checked By: _____ Approved By: _____ Date: _____

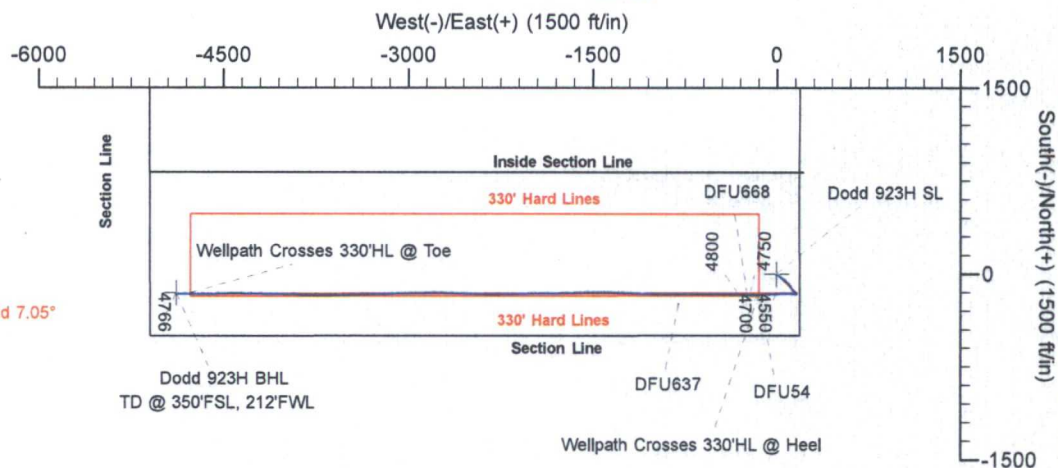
COG OPERATING, LLC

Project: Eddy /Lea County, NM (NAD27) NMEZ
 Site: Dodd Federal Unit 923H
 Well: 923H
 Wellbore: Lateral
 Design: Lateral

3608+18 @ 3626.00ft (SilverOak3)
 NAD 1927 (NADCON CONUS)

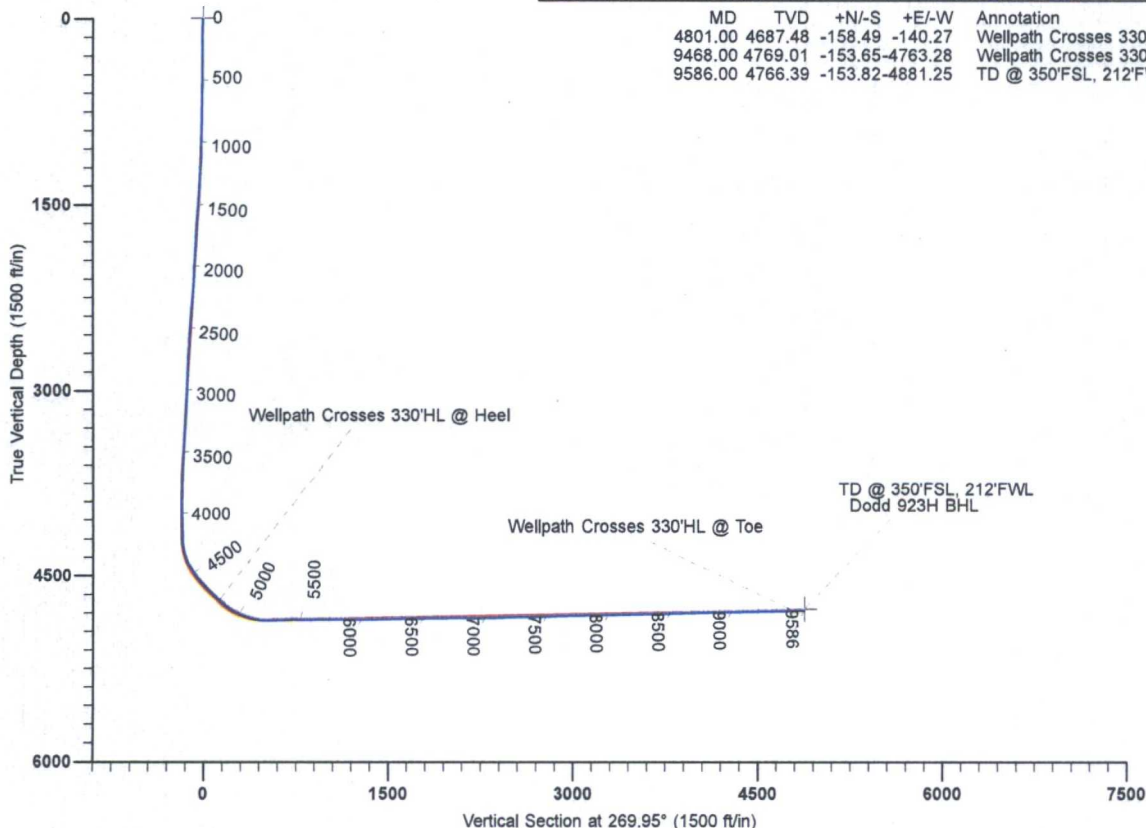


To convert a Magnetic Direction to a Grid Direction, Add 7.05°



ANNOTATIONS

MD	TVD	+N/-S	+E/-W	Annotation
4801.00	4687.48	-158.49	-140.27	Wellpath Crosses 330'HL @ Heel
9468.00	4769.01	-153.65	-4763.28	Wellpath Crosses 330'HL @ Toe
9586.00	4766.39	-153.82	-4881.25	TD @ 350'FSL, 212'FWL



TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
Dodd 923H SL	0.00	0.00	0.00	665265.00	591037.80	Point
Dodd 923H BHL	4766.39	-153.82	-4881.25	665111.18	586156.55	Point

Design: Lateral (923H/Lateral)
 Created By: Mekka Williams
 eSomina Well Design
 mekka@esominawelldesign.com
 11:01, July 17 2017

VON DIRECTIONAL
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