

**Provide Signature Page for
Directional Survey**



Marathon Oil

Marathon Oil

Eddy County, NM

Bootlegger 21 Fed Com

No. 1H

30-015-43970

OH

Design: MWD 84' - 12819' PTB 12869'

Standard Survey Report

27 June, 2017



Company: Marathon Oil
Project: Eddy County, NM
Site: Bootlegger 21 Fed Com
Well: No. 1H
Wellbore: OH
Design: MWD 84' - 12819' PTB 12869'

Local Co-ordinate Reference: Well No. 1H
TVD Reference: Well @ 3309.00usft (GL: 3284' + KB: 25' (H&P498))
MD Reference: Well @ 3309.00usft (GL: 3284' + KB: 25' (H&P498))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Project	Eddy 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	Bootlegger 21 Fed Com		
Site Position:		Northing:	569,997.10 usft
From:	Map	Easting:	580,471.50 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32.5667577
		Longitude:	-104.0721243
		Grid Convergence:	0.14 °

Well	No. 1H		
Well Position	+N/-S	0.00 usft	Northing: 569,997.10 usft
	+E/-W	0.00 usft	Easting: 580,471.50 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft
		Latitude:	32.5667577
		Longitude:	-104.0721243
		Ground Level:	3,284.00 usft

Wellbore	OH		
Magnetics	Model Name	Sample Date	Declination (°)
	HDGM	5/26/2017	7.42
		Dip Angle (°)	60.43
		Field Strength (nT)	48,217.20

Design	MWD 84' - 12819' PTB 12869'		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)
	0.00	0.00	0.00
		Direction (°)	179.87

Survey Program	Date 6/27/2017		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name
83.99	422.18	Gyro Run #1: (OH)	NS-GYRO-MS
515.00	12,869.00	MWD Run #1: (OH)	MWD+IFR1
			Description
			North sensing gyrocompassing m/s
			OWSG MWD + IFR1

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
83.99	0.32	19.66	83.99	0.22	0.08	-0.22	0.38	0.38	0.00
175.31	0.47	10.46	175.31	0.83	0.23	-0.83	0.18	0.16	-10.07
212.05	1.45	209.63	212.04	0.57	0.03	-0.57	5.17	2.67	-437.75
305.08	1.45	206.63	305.04	-1.50	-1.08	1.50	0.08	0.00	-3.22
398.11	1.13	205.60	398.05	-3.38	-2.00	3.38	0.34	-0.34	-1.11
422.18	1.18	198.63	422.12	-3.83	-2.18	3.83	0.62	0.21	-28.96
515.00	1.60	213.90	514.91	-5.81	-3.21	5.80	0.60	0.45	16.45



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607.00	2.10	203.80	606.86	-8.42	-4.61	8.41	0.65	0.54	-10.98
699.00	2.30	193.30	698.79	-11.76	-5.71	11.75	0.49	0.22	-11.41
791.00	2.20	172.70	790.72	-15.31	-5.91	15.29	0.88	-0.11	-22.39
883.00	1.80	152.40	882.67	-18.34	-5.02	18.33	0.88	-0.43	-22.07
975.00	2.30	120.30	974.61	-20.55	-2.76	20.54	1.34	0.54	-34.89
1,067.00	2.50	110.30	1,066.53	-22.18	0.72	22.18	0.50	0.22	-10.87
1,161.00	3.00	104.80	1,160.42	-23.52	5.02	23.53	0.60	0.53	-5.85
1,256.00	2.80	98.70	1,255.30	-24.50	9.72	24.53	0.39	-0.21	-6.42
1,350.00	2.70	92.80	1,349.19	-24.96	14.20	24.99	0.32	-0.11	-6.28
1,444.00	1.50	97.70	1,443.13	-25.23	17.63	25.27	1.29	-1.28	5.21
1,539.00	0.80	104.30	1,538.11	-25.56	19.50	25.61	0.75	-0.74	6.95
1,634.00	1.00	106.90	1,633.10	-25.97	20.94	26.02	0.21	0.21	2.74
1,728.00	0.90	97.20	1,727.09	-26.30	22.46	26.35	0.20	-0.11	-10.32
1,823.00	0.90	107.60	1,822.07	-26.62	23.91	26.67	0.17	0.00	10.95
1,917.00	0.70	122.90	1,916.06	-27.15	25.09	27.21	0.31	-0.21	16.28
2,012.00	0.80	132.20	2,011.06	-27.91	26.07	27.97	0.17	0.11	9.79
2,106.00	0.70	140.00	2,105.05	-28.79	26.93	28.86	0.15	-0.11	8.30
2,201.00	0.80	144.40	2,200.04	-29.78	27.69	29.84	0.12	0.11	4.63
2,295.00	0.80	124.20	2,294.03	-30.68	28.61	30.75	0.30	0.00	-21.49
2,390.00	0.70	121.90	2,389.02	-31.36	29.65	31.43	0.11	-0.11	-2.42
2,485.00	0.80	115.70	2,484.01	-31.95	30.74	32.03	0.14	0.11	-6.53
2,581.00	0.80	93.90	2,580.01	-32.29	32.01	32.37	0.32	0.00	-22.71
2,675.00	1.10	110.70	2,673.99	-32.65	33.51	32.73	0.43	0.32	17.87
2,770.00	1.00	116.00	2,768.98	-33.34	35.11	33.42	0.15	-0.11	5.58
2,864.00	1.00	117.70	2,862.96	-34.08	36.57	34.17	0.03	0.00	1.81
2,959.00	1.10	118.40	2,957.95	-34.90	38.11	34.99	0.11	0.11	0.74
3,053.00	1.10	116.10	3,051.93	-35.73	39.72	35.82	0.05	0.00	-2.45
3,170.00	1.20	102.80	3,168.91	-36.49	41.92	36.59	0.24	0.09	-11.37
3,233.00	0.00	129.40	3,231.90	-36.64	42.56	36.74	1.90	-1.90	0.00
3,328.00	1.20	289.20	3,326.89	-36.31	41.62	36.41	1.26	1.26	0.00
3,423.00	1.30	292.60	3,421.87	-35.57	39.69	35.66	0.13	0.11	3.58
3,517.00	1.30	298.50	3,515.85	-34.65	37.77	34.74	0.14	0.00	6.28
3,612.00	1.40	297.60	3,610.82	-33.60	35.79	33.68	0.11	0.11	-0.95
3,706.00	1.40	301.40	3,704.79	-32.47	33.79	32.55	0.10	0.00	4.04
3,801.00	1.20	304.30	3,799.77	-31.30	31.98	31.38	0.22	-0.21	3.05
3,896.00	1.20	301.80	3,894.75	-30.22	30.31	30.29	0.06	0.00	-2.63
3,990.00	1.10	301.10	3,988.73	-29.23	28.70	29.30	0.11	-0.11	-0.74
4,085.00	1.20	296.00	4,083.71	-28.33	27.03	28.39	0.15	0.11	-5.37
4,180.00	1.20	290.90	4,178.69	-27.54	25.21	27.59	0.11	0.00	-5.37
4,274.00	1.30	292.70	4,272.67	-26.77	23.30	26.83	0.11	0.11	1.91
4,369.00	1.40	291.90	4,367.64	-25.92	21.23	25.97	0.11	0.11	-0.84
4,463.00	1.30	286.10	4,461.61	-25.20	19.14	25.24	0.18	-0.11	-6.17

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4,558.00	1.00	291.40	4,556.60	-24.60	17.33	24.64	0.33	-0.32	5.58
4,653.00	0.80	301.70	4,651.58	-23.95	16.00	23.99	0.27	-0.21	10.84
4,747.00	0.80	324.20	4,745.57	-23.07	15.06	23.11	0.33	0.00	23.94
4,842.00	0.60	19.40	4,840.57	-22.06	14.83	22.10	0.71	-0.21	58.11
4,937.00	0.80	23.50	4,935.56	-20.99	15.26	21.02	0.22	0.21	4.32
5,031.00	1.00	21.40	5,029.55	-19.62	15.82	19.66	0.22	0.21	-2.23
5,126.00	1.10	9.70	5,124.53	-17.95	16.28	17.99	0.25	0.11	-12.32
5,221.00	1.20	6.20	5,219.51	-16.06	16.54	16.10	0.13	0.11	-3.68
5,315.00	1.30	357.40	5,313.49	-14.02	16.60	14.06	0.23	0.11	-9.36
5,410.00	1.50	347.90	5,408.46	-11.73	16.29	11.76	0.32	0.21	-10.00
5,504.00	1.50	343.60	5,502.43	-9.34	15.68	9.38	0.12	0.00	-4.57
5,599.00	1.60	346.00	5,597.40	-6.86	15.01	6.90	0.13	0.11	2.53
5,693.00	1.40	346.50	5,691.36	-4.47	14.43	4.51	0.21	-0.21	0.53
5,788.00	1.30	347.90	5,786.34	-2.29	13.93	2.32	0.11	-0.11	1.47
5,882.00	1.30	343.00	5,880.31	-0.23	13.40	0.26	0.12	0.00	-5.21
5,977.00	1.10	350.70	5,975.29	1.70	12.93	-1.67	0.27	-0.21	8.11
6,072.00	0.80	334.80	6,070.28	3.20	12.50	-3.17	0.42	-0.32	-16.74
6,167.00	0.80	311.10	6,165.27	4.24	11.72	-4.21	0.35	0.00	-24.95
6,261.00	0.50	287.20	6,259.27	4.79	10.83	-4.77	0.42	-0.32	-25.43
6,356.00	0.70	285.50	6,354.26	5.07	9.88	-5.04	0.21	0.21	-1.79
6,451.00	0.90	288.60	6,449.25	5.46	8.61	-5.44	0.22	0.21	3.26
6,546.00	1.80	224.70	6,544.23	4.64	6.86	-4.62	1.71	0.95	-67.26
6,640.00	2.70	206.40	6,638.16	1.61	4.83	-1.59	1.21	0.96	-19.47
6,735.00	1.60	199.00	6,733.09	-1.65	3.41	1.66	1.19	-1.16	-7.79
6,829.00	1.60	199.80	6,827.05	-4.13	2.53	4.13	0.02	0.00	0.85
6,924.00	1.00	216.80	6,922.03	-6.04	1.59	6.04	0.74	-0.63	17.89
7,018.00	0.90	210.70	7,016.01	-7.33	0.72	7.33	0.15	-0.11	-6.49
7,113.00	0.60	230.60	7,111.01	-8.29	-0.04	8.29	0.41	-0.32	20.95
7,208.00	0.70	231.20	7,206.00	-8.97	-0.88	8.97	0.11	0.11	0.63
7,307.00	0.80	226.60	7,304.99	-9.82	-1.85	9.82	0.12	0.10	-4.65
7,402.00	3.30	197.50	7,399.92	-12.89	-3.16	12.88	2.77	2.63	-30.63
7,433.00	6.50	197.10	7,430.81	-15.41	-3.94	15.40	10.32	10.32	-1.29
7,465.00	10.10	191.20	7,462.47	-19.90	-5.02	19.89	11.55	11.25	-18.44
7,496.00	13.70	188.88	7,492.80	-26.19	-6.12	26.18	11.71	11.61	-7.48
7,528.00	16.80	190.28	7,523.67	-34.49	-7.53	34.47	9.75	9.69	4.38
7,559.00	19.10	193.08	7,553.15	-43.84	-9.47	43.82	7.92	7.42	9.03
7,591.00	21.70	196.78	7,583.15	-54.61	-12.37	54.58	9.07	8.13	11.56
7,623.00	24.90	197.40	7,612.53	-66.70	-16.09	66.66	10.03	10.00	1.94
7,654.00	27.70	196.80	7,640.32	-79.83	-20.13	79.78	9.07	9.03	-1.94
7,681.00	31.10	195.10	7,663.84	-92.57	-23.76	92.52	12.97	12.59	-6.30
7,713.00	33.60	195.50	7,690.87	-109.09	-28.28	109.02	7.84	7.81	1.25
7,744.00	37.30	192.70	7,716.12	-126.52	-32.64	126.45	13.03	11.94	-9.03



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7,776.00	40.90	188.00	7,740.96	-146.37	-36.23	146.28	14.57	11.25	-14.69
7,807.00	44.80	184.30	7,763.68	-167.32	-38.46	167.23	14.97	12.58	-11.94
7,839.00	49.10	181.50	7,785.53	-190.67	-39.62	190.57	14.88	13.44	-8.75
7,870.00	51.50	180.60	7,805.33	-214.51	-40.06	214.42	8.06	7.74	-2.90
7,902.00	54.90	180.20	7,824.49	-240.13	-40.23	240.03	10.67	10.63	-1.25
7,933.00	58.50	178.90	7,841.51	-266.03	-40.02	265.94	12.13	11.61	-4.19
7,965.00	62.20	176.90	7,857.34	-293.82	-39.00	293.73	12.77	11.56	-6.25
7,996.00	65.80	174.80	7,870.93	-321.60	-36.97	321.51	13.11	11.61	-6.77
8,028.00	70.20	174.40	7,882.91	-351.13	-34.18	351.05	13.80	13.75	-1.25
8,059.00	73.90	174.70	7,892.46	-380.48	-31.38	380.41	11.97	11.94	0.97
8,091.00	77.50	172.80	7,900.37	-411.30	-28.00	411.23	12.64	11.25	-5.94
8,123.00	81.00	172.00	7,906.34	-442.46	-23.84	442.40	11.21	10.94	-2.50
8,154.00	84.70	171.90	7,910.19	-472.91	-19.54	472.86	11.94	11.94	-0.32
8,218.00	89.00	173.40	7,913.71	-536.27	-11.36	536.24	7.11	6.72	2.34
8,249.00	89.20	173.60	7,914.20	-567.07	-7.86	567.05	0.91	0.65	0.65
8,344.00	90.90	175.40	7,914.11	-661.62	1.25	661.62	2.61	1.79	1.89
8,439.00	91.30	178.70	7,912.29	-756.46	6.14	756.48	3.50	0.42	3.47
8,533.00	92.00	179.90	7,909.58	-850.42	7.28	850.43	1.48	0.74	1.28
8,628.00	90.00	180.00	7,907.92	-945.40	7.37	945.41	2.11	-2.11	0.11
8,723.00	89.70	180.80	7,908.17	-1,040.39	6.70	1,040.41	0.90	-0.32	0.84
8,817.00	90.00	181.00	7,908.42	-1,134.38	5.23	1,134.39	0.38	0.32	0.21
8,912.00	89.50	181.10	7,908.83	-1,229.36	3.49	1,229.37	0.54	-0.53	0.11
9,006.00	89.70	181.70	7,909.49	-1,323.33	1.19	1,323.33	0.67	0.21	0.64
9,101.00	89.10	182.00	7,910.49	-1,418.28	-1.88	1,418.27	0.71	-0.63	0.32
9,196.00	89.90	182.50	7,911.31	-1,513.20	-5.61	1,513.18	0.99	0.84	0.53
9,290.00	90.90	183.30	7,910.66	-1,607.08	-10.36	1,607.05	1.36	1.06	0.85
9,385.00	93.70	182.10	7,906.85	-1,701.88	-14.83	1,701.84	3.21	2.95	-1.26
9,480.00	95.90	179.50	7,898.90	-1,796.53	-16.16	1,796.48	3.58	2.32	-2.74
9,575.00	92.80	178.20	7,891.69	-1,891.22	-14.26	1,891.18	3.54	-3.26	-1.37
9,669.00	95.10	180.00	7,885.21	-1,984.97	-12.78	1,984.94	3.10	2.45	1.91
9,764.00	96.40	184.30	7,875.69	-2,079.41	-16.32	2,079.36	4.71	1.37	4.53
9,861.00	91.30	177.00	7,869.17	-2,176.08	-17.40	2,176.04	9.16	-5.26	-7.53
9,956.00	86.90	175.70	7,870.66	-2,270.85	-11.35	2,270.82	4.83	-4.63	-1.37
10,051.00	85.60	176.60	7,876.88	-2,365.43	-4.99	2,365.41	1.66	-1.37	0.95
10,145.00	88.80	178.30	7,881.47	-2,459.21	-0.81	2,459.20	3.85	3.40	1.81
10,240.00	88.10	178.50	7,884.04	-2,554.14	1.84	2,554.14	0.77	-0.74	0.21
10,334.00	88.40	178.80	7,886.91	-2,648.07	4.05	2,648.07	0.45	0.32	0.32
10,429.00	89.20	178.70	7,888.90	-2,743.03	6.12	2,743.03	0.85	0.84	-0.11
10,523.00	88.00	180.80	7,891.20	-2,836.99	6.53	2,837.00	2.57	-1.28	2.23
10,618.00	89.50	181.00	7,893.27	-2,931.95	5.04	2,931.96	1.59	1.58	0.21
10,713.00	86.80	180.10	7,896.34	-3,026.89	4.13	3,026.89	3.00	-2.84	-0.95
10,807.00	86.10	180.00	7,902.16	-3,120.71	4.05	3,120.71	0.75	-0.74	-0.11

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Design: MWD 84' - 12819' PTB 12869'

Local Co-ordinate Reference: Well No. 1H
TVD Reference: Well @ 3309.00usft (GL: 3284' + KB: 25' (H&P498))
MD Reference: Well @ 3309.00usft (GL: 3284' + KB: 25' (H&P498))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
10,902.00	86.50	180.00	7,908.29	-3,215.51	4.05	3,215.51	0.42	0.42	0.00
10,997.00	87.60	180.90	7,913.18	-3,310.38	3.30	3,310.38	1.50	1.16	0.95
11,091.00	87.90	181.20	7,916.87	-3,404.29	1.58	3,404.28	0.45	0.32	0.32
11,185.00	86.30	181.20	7,921.62	-3,498.15	-0.39	3,498.14	1.70	-1.70	0.00
11,280.00	86.70	181.30	7,927.42	-3,592.95	-2.45	3,592.93	0.43	0.42	0.11
11,375.00	87.10	180.80	7,932.56	-3,687.79	-4.19	3,687.77	0.67	0.42	-0.53
11,469.00	87.30	181.00	7,937.15	-3,781.67	-5.67	3,781.64	0.30	0.21	0.21
11,563.00	87.60	181.40	7,941.33	-3,875.55	-7.63	3,875.52	0.53	0.32	0.43
11,658.00	85.30	180.80	7,947.21	-3,970.35	-9.45	3,970.31	2.50	-2.42	-0.63
11,753.00	85.40	180.90	7,954.92	-4,065.02	-10.86	4,064.99	0.15	0.11	0.11
11,847.00	86.70	180.30	7,961.39	-4,158.79	-11.84	4,158.75	1.52	1.38	-0.64
11,942.00	87.00	177.90	7,966.61	-4,253.63	-10.35	4,253.59	2.54	0.32	-2.53
12,037.00	90.90	177.20	7,968.35	-4,348.51	-6.29	4,348.48	4.17	4.11	-0.74
12,132.00	91.40	176.70	7,966.45	-4,443.35	-1.24	4,443.34	0.74	0.53	-0.53
12,226.00	91.00	176.90	7,964.48	-4,537.19	4.01	4,537.18	0.48	-0.43	0.21
12,320.00	91.00	177.70	7,962.84	-4,631.07	8.44	4,631.07	0.85	0.00	0.85
12,415.00	88.70	178.60	7,963.09	-4,726.01	11.50	4,726.02	2.60	-2.42	0.95
12,510.00	89.40	179.60	7,964.66	-4,820.98	12.99	4,821.00	1.28	0.74	1.05
12,604.00	87.60	180.00	7,967.12	-4,914.95	13.32	4,914.96	1.96	-1.91	0.43
12,699.00	88.40	180.20	7,970.44	-5,009.89	13.16	5,009.90	0.87	0.84	0.21
12,794.00	89.30	180.30	7,972.34	-5,104.87	12.74	5,104.88	0.95	0.95	0.11
12,819.00	89.80	180.40	7,972.54	-5,129.86	12.59	5,129.88	2.04	2.00	0.40
Last Survey: 12819' MD, 7972.54' TVD									
12,869.00	89.80	180.40	7,972.71	-5,179.86	12.24	5,179.88	0.00	0.00	0.00
PTB: 12869' MD, 7972.71' TVD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
12,819.00	7,972.54	-5,129.86	12.59	Last Survey: 12819' MD, 7972.54' TVD
12,869.00	7,972.71	-5,179.86	12.24	PTB: 12869' MD, 7972.71' TVD



on Oil
Eddy County, NM
Bootlegger 21 Fed Com
No. 1H
Plan #8 - FINAL PVA
GL: 3284' + KB: 25' (H&P498)

US State Plane 1927 (Exact solution)
NAD 1927 (NADCON CONUS)
Clarke 1866
New Mexico East 3001
Mean Sea Level

RKB Elevation: Well @ 3309.00ush (GL: 3284' + KB: 25' (H&P498))

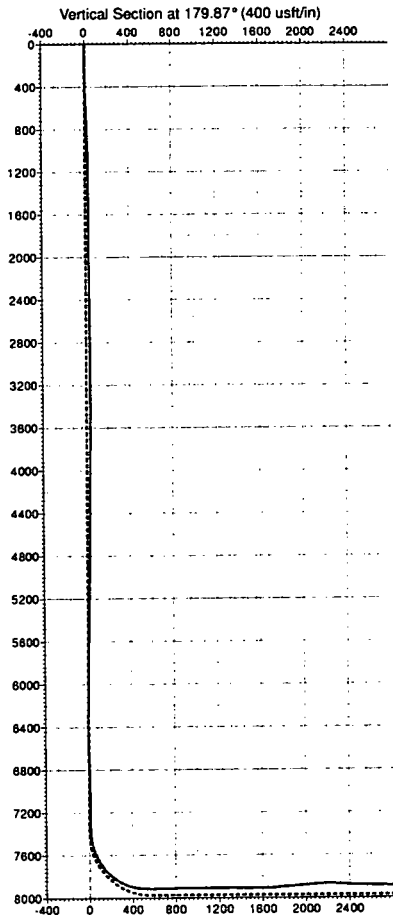
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Spot
0.00	0.00	569997.10	580471.50	32.5667577	-104.0721243	

SECTION DETAILS

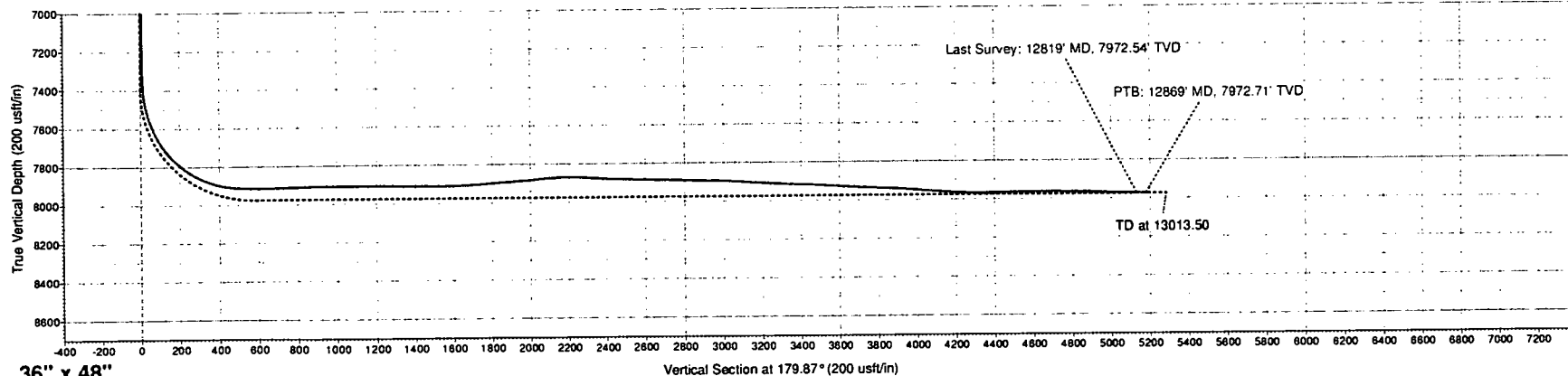
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	VSect
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	7402.04	0.00	0.00	7402.04	0.00	0.00	0.00	0.00
3	8302.04	90.00	179.87	7975.00	-572.96	1.34	10.00	572.96
4	13013.50	90.00	179.87	7975.00	-5284.40	12.37	0.00	5284.41

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

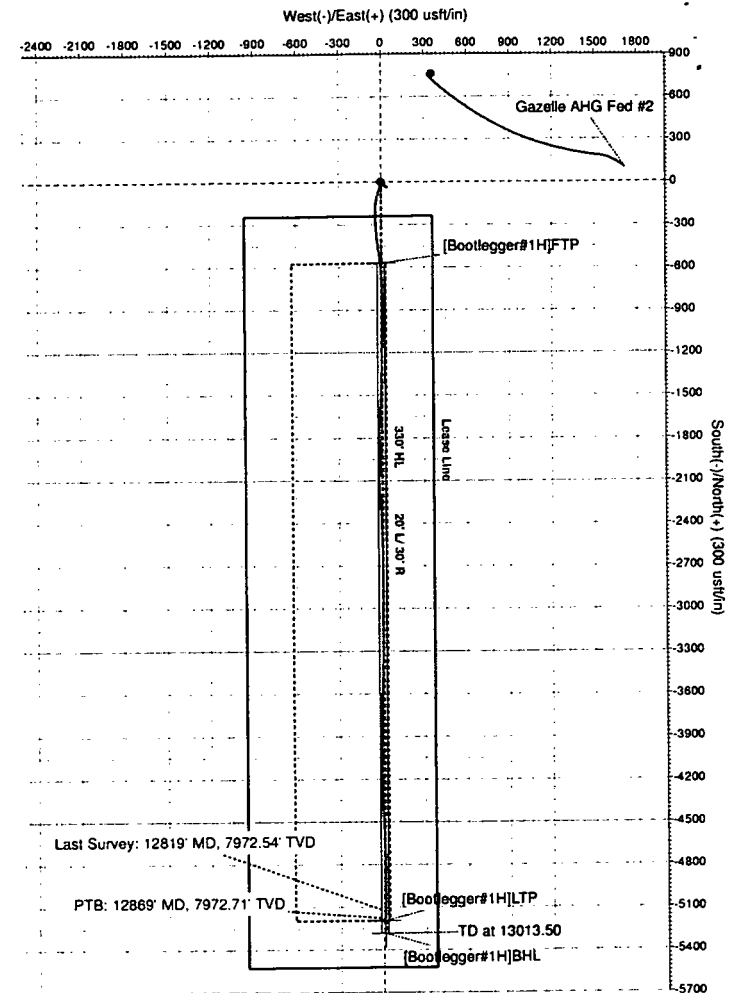
Name	TVD	+N/-S	+E/-W	Northing	Easting
[Bootlegger#1H]FTP	0.00	-569.97	1.30	569427.13	580472.80
[Bootlegger#1H]LTP	0.00	-5194.41	12.16	564802.69	580483.66
[Bootlegger#1H]BHL	7975.00	-5284.40	12.37	564712.70	580483.67



Target Line: 7975' TVD @ 0° VS, 90° INC



36" x 48"



Azimuths to Grid North
True North: -0.14°
Magnetic North: 7.28°
Magnetic Field
Strength: 48217 ZmT
Dip Angle: 66.43°
Date: 5/26/2017
Model: HDGM

Azimuth Corrections

Total Magnetic Corr. (M to G): 7.28°

Declination (M to T): 7.42° East