



Marathon Oil

Marathon Oil

Eddy County, NM

Black River 15-10 State Com

No. 3H 30-015-43960
OH

RECEIVED

JUN 18 2018

DISTRICT II-ARTESIA O.C.D.

Design: OH 100'-18958' PTB 19037'

Survey Report

09 April, 2018





Professional Directional
Survey Report



Company: Marathon Oil
Project: Eddy County, NM
Site: Black River 15-10 State Com
Well: No. 3H
Wellbore: OH
Design: OH 100'-18958' PTB 19037'

Local Co-ordinate Reference: Well No. 3H
TVD Reference: Well @ 3255.50usft (GL: 3229' + KB: 26.5' (H&P423))
MD Reference: Well @ 3255.50usft (GL: 3229' + KB: 26.5' (H&P423))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Project Eddy County, NM

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 Black River 15-10 State Com

Site Position:	Northing:	440,358.91 usft	Latitude:	32.2106
From: Map	Easting:	548,621.57 usft	Longitude:	-104.1761
Position Uncertainty: 0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.08 °

Well No. 3H

Well Position	+N/-S	0.00 usft	Northing:	440,358.91 usft	Latitude:	32.2106
	+E/-W	0.00 usft	Easting:	548,621.57 usft	Longitude:	-104.1761
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	3,229.00 usft

Wellbore OH

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	2/21/2018	7.37	59.97	47,991.10

Design OH 100'-18958' PTB 19037'

Audit Notes:

Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	0.31	



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Survey Program		Date	4/9/2018		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	389.00	Survey #1 (OH)	GYD_DP_MS	Gyrodata gyro-compassing and drop	
507.00	19,037.00	Survey #2 (OH)	MWD+IFR1	OWSG MWD + IFR1	

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	440,358.91	548,621.57	
1.15	0.01	314.51	1.15	0.00	0.00	0.00	0.00	314.51	440,358.91	548,621.57	
[BickRvr#3H]FTP: 65' VS											
100.00	0.46	314.51	100.00	0.28	0.28	-0.29	0.40	314.51	440,359.19	548,621.28	
200.00	0.54	352.87	200.00	1.03	1.03	-0.63	1.21	328.52	440,359.94	548,620.94	
300.00	0.76	330.72	299.99	2.07	2.08	-1.01	2.31	333.98	440,360.99	548,620.56	
389.00	1.08	340.49	388.98	3.37	3.38	-1.58	3.73	334.92	440,362.29	548,619.99	
507.00	1.00	346.20	506.96	5.42	5.43	-2.20	5.86	337.95	440,364.34	548,619.37	
599.00	1.00	345.20	598.94	6.97	6.99	-2.60	7.45	339.61	440,365.90	548,618.97	
691.00	1.10	332.20	690.93	8.53	8.54	-3.21	9.13	339.39	440,367.45	548,618.36	
781.00	1.20	328.90	780.91	10.09	10.11	-4.10	10.91	337.92	440,369.02	548,617.47	
873.00	1.00	320.60	872.89	11.53	11.56	-5.11	12.64	336.15	440,370.47	548,616.46	
965.00	1.20	310.50	964.88	12.77	12.81	-6.35	14.29	333.62	440,371.72	548,615.22	
1,055.00	1.50	310.60	1,054.85	14.14	14.18	-7.96	16.27	330.69	440,373.09	548,613.61	
1,150.00	1.70	312.80	1,149.81	15.90	15.95	-9.94	18.80	328.07	440,374.86	548,611.63	
1,244.00	0.80	314.20	1,243.79	17.29	17.36	-11.43	20.78	326.62	440,376.27	548,610.14	
1,339.00	0.70	300.00	1,338.78	18.04	18.11	-12.41	21.95	325.57	440,377.02	548,609.16	
1,433.00	0.60	343.60	1,432.78	18.80	18.87	-13.05	22.94	325.33	440,377.78	548,608.52	
1,527.00	1.90	65.80	1,526.76	19.91	19.98	-11.77	23.19	329.50	440,378.89	548,609.80	
1,622.00	3.40	74.00	1,621.65	21.36	21.40	-7.62	22.72	340.40	440,380.31	548,613.95	
1,716.00	2.60	81.60	1,715.52	22.46	22.48	-2.83	22.66	352.82	440,381.39	548,618.74	



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1,811.00	2.20	102.60	1,810.44	22.40	22.40	1.08	22.42	2.76	440,381.31	548,622.65	
1,906.00	2.10	121.80	1,905.38	21.11	21.08	4.34	21.52	11.62	440,379.99	548,625.91	
2,001.00	2.60	123.70	2,000.30	19.01	18.97	7.61	20.44	21.86	440,377.88	548,629.18	
2,095.00	2.10	110.40	2,094.22	17.25	17.19	11.00	20.40	32.61	440,376.10	548,632.57	
2,190.00	1.10	104.50	2,189.18	16.42	16.35	13.51	21.21	39.57	440,375.26	548,635.08	
2,253.00	1.20	107.70	2,252.17	16.08	16.00	14.73	21.74	42.63	440,374.91	548,636.30	
2,379.00	1.30	116.10	2,378.14	15.06	14.97	17.27	22.85	49.07	440,373.88	548,638.84	
2,473.00	1.30	114.60	2,472.11	14.16	14.06	19.19	23.79	53.78	440,372.97	548,640.76	
2,568.00	1.40	112.30	2,567.09	13.28	13.17	21.25	25.00	58.21	440,372.08	548,642.82	
2,663.00	1.40	214.20	2,662.07	11.88	11.77	21.67	24.66	61.50	440,370.68	548,643.24	
2,758.00	3.00	239.80	2,757.00	9.66	9.56	18.87	21.15	63.14	440,368.47	548,640.44	
2,852.00	3.20	242.00	2,850.86	7.17	7.09	14.42	16.07	63.83	440,366.00	548,635.99	
2,947.00	3.10	240.50	2,945.72	4.63	4.58	9.85	10.86	65.07	440,363.49	548,631.42	
3,041.00	3.00	241.60	3,039.58	2.19	2.16	5.47	5.88	68.49	440,361.07	548,627.04	
3,136.00	4.20	250.20	3,134.40	-0.20	-0.20	0.01	0.20	176.84	440,358.71	548,621.58	
3,230.00	4.40	250.70	3,228.13	-2.60	-2.56	-6.63	7.11	248.87	440,356.35	548,614.94	
3,325.00	6.00	256.70	3,322.74	-4.99	-4.91	-14.90	15.69	251.77	440,354.00	548,606.67	
3,420.00	6.40	257.10	3,417.18	-7.37	-7.23	-24.90	25.93	253.80	440,351.68	548,596.67	
3,515.00	6.10	258.00	3,511.62	-9.65	-9.47	-34.99	36.25	254.87	440,349.44	548,586.58	
3,609.00	7.10	254.80	3,604.99	-12.27	-12.03	-45.49	47.05	255.19	440,346.88	548,576.08	
3,704.00	7.30	254.50	3,699.24	-15.49	-15.18	-56.97	58.95	255.08	440,343.73	548,564.60	
3,799.00	6.80	254.60	3,793.53	-18.65	-18.29	-68.21	70.61	254.99	440,340.62	548,553.36	
3,894.00	6.70	254.70	3,887.87	-21.67	-21.24	-78.97	81.78	254.95	440,337.67	548,542.60	
3,988.00	8.30	253.80	3,981.06	-25.07	-24.58	-90.78	94.05	254.85	440,334.33	548,530.79	
4,083.00	8.40	253.10	4,075.05	-29.07	-28.51	-104.00	107.84	254.67	440,330.40	548,517.57	
4,178.00	8.00	253.10	4,169.08	-33.08	-32.45	-116.97	121.39	254.49	440,326.46	548,504.60	
4,273.00	7.40	252.90	4,263.23	-36.87	-36.17	-129.14	134.11	254.35	440,322.74	548,492.43	



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4,367.00	6.80	252.80	4,356.50	-40.35	-39.60	-140.24	145.72	254.23	440,319.31	548,481.33
4,461.00	6.20	249.20	4,449.90	-43.86	-43.04	-150.30	156.35	254.02	440,315.87	548,471.27
4,556.00	7.10	248.00	4,544.26	-47.93	-47.07	-160.54	167.30	253.66	440,311.84	548,461.03
4,650.00	6.20	248.40	4,637.63	-52.03	-51.11	-170.65	178.14	253.33	440,307.80	548,450.92
4,745.00	7.70	250.80	4,731.93	-56.07	-55.09	-181.43	189.61	253.11	440,303.82	548,440.14
4,840.00	7.70	250.60	4,826.07	-60.35	-59.30	-193.44	202.33	252.96	440,299.61	548,428.13
4,934.00	6.60	249.90	4,919.34	-64.35	-63.25	-204.46	214.02	252.81	440,295.66	548,417.11
5,029.00	6.00	249.80	5,013.76	-68.00	-66.84	-214.24	224.43	252.67	440,292.07	548,407.33
5,124.00	6.70	256.40	5,108.18	-71.07	-69.86	-224.29	234.92	252.70	440,289.05	548,397.28
5,219.00	6.40	257.60	5,202.56	-73.57	-72.30	-234.85	245.72	252.89	440,286.61	548,386.72
5,314.00	5.70	256.80	5,297.03	-75.83	-74.51	-244.61	255.71	253.06	440,284.40	548,376.96
5,408.00	5.40	254.50	5,390.59	-78.13	-76.76	-253.42	264.79	253.15	440,282.15	548,368.15
5,503.00	5.10	252.30	5,485.19	-80.65	-79.24	-261.75	273.48	253.16	440,279.67	548,359.82
5,598.00	4.50	249.00	5,579.86	-83.31	-81.86	-269.25	281.42	253.09	440,277.05	548,352.32
5,693.00	4.20	245.90	5,674.58	-86.10	-84.61	-275.91	288.59	252.95	440,274.30	548,345.66
5,788.00	4.20	246.20	5,769.33	-88.96	-87.44	-282.26	295.50	252.79	440,271.47	548,339.31
5,882.00	4.30	250.60	5,863.07	-91.56	-90.00	-288.74	302.44	252.69	440,268.91	548,332.83
5,977.00	4.10	252.60	5,957.82	-93.79	-92.19	-295.34	309.39	252.66	440,266.72	548,326.23
6,072.00	3.00	246.00	6,052.63	-95.85	-94.22	-300.85	315.26	252.61	440,264.69	548,320.72
6,167.00	2.30	241.90	6,147.53	-97.78	-96.13	-304.80	319.60	252.50	440,262.78	548,316.77
6,261.00	1.40	256.40	6,241.48	-98.95	-97.29	-307.58	322.60	252.45	440,261.62	548,313.99
6,356.00	1.10	302.80	6,336.46	-98.74	-97.07	-309.48	324.34	252.59	440,261.84	548,312.09
6,451.00	2.20	328.40	6,431.42	-96.70	-95.02	-311.20	325.38	253.02	440,263.89	548,310.37
6,546.00	1.40	284.70	6,526.38	-94.87	-93.17	-313.28	326.84	253.44	440,265.74	548,308.29
6,640.00	2.00	274.30	6,620.34	-94.47	-92.76	-316.02	329.36	253.64	440,266.15	548,305.55
6,735.00	0.50	226.70	6,715.31	-94.64	-92.92	-317.98	331.28	253.71	440,265.99	548,303.59
6,829.00	0.20	188.90	6,809.31	-95.08	-93.36	-318.30	331.71	253.65	440,265.55	548,303.27



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6,924.00	0.00	185.40	6,904.31	-95.25	-93.53	-318.33	331.78	253.63	440,265.38	548,303.24	
7,019.00	0.30	280.60	6,999.31	-95.20	-93.48	-318.57	332.00	253.65	440,265.43	548,303.00	
7,113.00	0.70	296.90	7,093.31	-94.90	-93.18	-319.33	332.64	253.73	440,265.73	548,302.24	
7,208.00	1.00	213.40	7,188.30	-95.34	-93.60	-320.30	333.70	253.71	440,265.31	548,301.27	
7,303.00	0.80	193.10	7,283.29	-96.68	-94.94	-320.91	334.66	253.52	440,263.97	548,300.66	
7,398.00	1.50	145.10	7,378.27	-98.34	-96.61	-320.35	334.60	253.22	440,262.30	548,301.22	
7,492.00	1.70	179.60	7,472.23	-100.74	-99.01	-319.63	334.62	252.79	440,259.90	548,301.94	
7,586.00	1.40	192.70	7,566.20	-103.26	-101.53	-319.87	335.60	252.39	440,257.38	548,301.70	
7,681.00	1.10	196.20	7,661.18	-105.27	-103.53	-320.38	336.70	252.09	440,255.38	548,301.19	
7,776.00	1.00	207.20	7,756.16	-106.88	-105.15	-321.02	337.80	251.86	440,253.76	548,300.55	
7,871.00	1.00	207.80	7,851.15	-108.36	-106.62	-321.78	338.99	251.67	440,252.29	548,299.79	
7,966.00	1.60	217.70	7,946.12	-110.15	-108.40	-322.98	340.69	251.45	440,250.51	548,298.59	
8,060.00	1.90	227.40	8,040.08	-112.25	-110.49	-324.93	343.20	251.22	440,248.42	548,296.64	
8,155.00	0.80	169.20	8,135.05	-113.97	-112.21	-325.97	344.74	251.00	440,246.70	548,295.60	
8,250.00	1.90	120.80	8,230.03	-115.42	-113.67	-324.49	343.82	250.69	440,245.24	548,297.08	
8,345.00	1.40	132.90	8,324.99	-117.01	-115.27	-322.29	342.28	250.32	440,243.64	548,299.28	
8,440.00	0.50	9.10	8,419.98	-117.38	-115.65	-321.37	341.54	250.21	440,243.26	548,300.20	
8,535.00	2.10	328.20	8,514.95	-115.50	-113.76	-322.22	341.71	250.55	440,245.15	548,299.35	
8,604.35	8.80	341.98	8,583.95	-109.38	-107.63	-324.53	341.91	251.65	440,251.28	548,297.04	
[BlckRvr#3H]KOP: -115' VS											
8,629.00	11.20	342.90	8,608.23	-105.31	-103.55	-325.82	341.88	252.37	440,255.36	548,295.75	
8,676.00	18.40	344.90	8,653.64	-93.79	-92.01	-329.10	341.72	254.38	440,266.90	548,292.47	
8,724.00	23.00	344.70	8,698.53	-77.44	-75.64	-333.55	342.02	257.22	440,283.27	548,288.02	
8,771.00	27.70	346.10	8,740.99	-58.00	-56.17	-338.60	343.23	260.58	440,302.74	548,282.97	
8,818.00	31.40	349.80	8,781.87	-35.36	-33.50	-343.39	345.02	264.43	440,325.41	548,278.18	
8,865.00	34.00	355.90	8,821.43	-10.21	-8.33	-346.50	346.60	268.62	440,350.58	548,275.07	
8,913.00	36.20	1.80	8,860.71	17.35	19.23	-347.02	347.55	273.17	440,378.14	548,274.55	



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8,960.00	36.80	3.60	8,898.49	45.28	47.15	-345.70	348.90	277.77	440,406.06	548,275.87
9,008.00	40.90	2.70	8,935.87	75.35	77.21	-344.05	352.61	282.65	440,436.12	548,277.52
9,055.00	45.20	1.10	8,970.21	107.41	109.27	-343.01	359.99	287.67	440,468.18	548,278.56
9,102.00	50.20	1.00	9,001.83	142.16	144.01	-342.37	371.43	292.81	440,502.92	548,279.20
9,197.00	57.70	0.00	9,057.70	218.91	220.76	-341.74	406.84	302.86	440,579.67	548,279.83
9,291.00	66.20	358.40	9,101.86	301.77	303.63	-342.94	458.04	311.52	440,662.54	548,278.63
9,386.00	71.60	0.00	9,136.05	390.35	392.22	-344.15	521.80	318.73	440,751.13	548,277.42
9,481.00	78.00	359.50	9,160.95	481.97	483.85	-344.56	593.99	324.54	440,842.76	548,277.01
9,576.00	84.10	0.20	9,175.72	575.77	577.64	-344.80	672.73	329.17	440,936.55	548,276.77
9,592.00	84.80	0.40	9,177.27	591.70	593.57	-344.72	686.41	329.85	440,952.48	548,276.85
9,678.00	88.20	1.00	9,182.51	677.52	679.39	-343.67	761.36	333.17	441,038.30	548,277.90
9,769.00	91.50	1.40	9,182.75	768.50	770.36	-341.76	842.76	336.08	441,129.27	548,279.81
9,858.00	93.60	2.10	9,178.79	857.37	859.22	-339.05	923.70	338.47	441,218.13	548,282.52
9,946.00	90.00	2.30	9,176.03	945.27	947.10	-335.67	1,004.82	340.48	441,306.01	548,285.90
10,038.00	89.50	2.20	9,176.43	1,037.21	1,039.03	-332.06	1,090.80	342.28	441,397.94	548,289.51
10,129.00	91.70	2.60	9,175.48	1,128.14	1,129.94	-328.25	1,176.65	343.80	441,488.85	548,293.32
10,219.00	90.50	2.50	9,173.75	1,218.06	1,219.83	-324.25	1,262.19	345.11	441,578.74	548,297.32
10,309.00	89.40	0.90	9,173.83	1,308.03	1,309.78	-321.58	1,348.68	346.21	441,668.69	548,299.99
10,400.00	89.10	0.80	9,175.02	1,399.01	1,400.77	-320.23	1,436.90	347.12	441,759.68	548,301.34
10,491.00	89.70	0.30	9,175.97	1,490.01	1,491.76	-319.35	1,525.56	347.92	441,850.67	548,302.22
10,581.00	89.60	359.80	9,176.52	1,580.00	1,581.75	-319.27	1,613.65	348.59	441,940.66	548,302.30
10,672.00	89.90	359.40	9,176.92	1,671.00	1,672.75	-319.91	1,703.07	349.17	442,031.66	548,301.66
10,762.00	91.00	359.30	9,176.21	1,760.98	1,762.74	-320.93	1,791.72	349.68	442,121.65	548,300.64
10,851.00	89.60	1.60	9,175.75	1,849.97	1,851.73	-320.23	1,879.21	350.19	442,210.64	548,301.34
10,942.00	90.10	1.40	9,175.99	1,940.95	1,942.70	-317.85	1,968.53	350.71	442,301.61	548,303.72
11,033.00	90.80	1.60	9,175.27	2,031.93	2,033.66	-315.47	2,057.98	351.18	442,392.57	548,306.10
11,127.00	91.00	1.70	9,173.79	2,125.89	2,127.61	-312.76	2,150.48	351.64	442,486.52	548,308.81



Professional Directional Survey Report



Company: Marathon Oil
Project: Eddy County, NM
Site: Black River 15-10 State Com
Well: No. 3H
Wellbore: OH
Design: OH 100'-18958' PTB 19037'

Local Co-ordinate Reference: Well No. 3H
TVD Reference: Well @ 3255.50usft (GL: 3229' + KB: 26.5' (H&P423))
MD Reference: Well @ 3255.50usft (GL: 3229' + KB: 26.5' (H&P423))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)
11,221.00	91.00	1.20	9,172.15	2,219.86	2,221.57	-310.38	2,243.14	352.05	442,580.48	548,311.19
11,316.00	89.90	359.50	9,171.41	2,314.85	2,316.56	-309.80	2,337.18	352.38	442,675.47	548,311.77
11,411.00	91.30	0.30	9,170.41	2,409.84	2,411.55	-309.97	2,431.39	352.68	442,770.46	548,311.60
11,505.00	92.50	1.00	9,167.30	2,503.78	2,505.49	-308.90	2,524.46	352.97	442,864.40	548,312.67
11,600.00	90.60	1.00	9,164.73	2,598.73	2,600.44	-307.24	2,618.52	353.26	442,959.35	548,314.33
11,694.00	90.60	0.30	9,163.74	2,692.73	2,694.42	-306.18	2,711.76	353.52	443,053.33	548,315.39
11,789.00	90.30	0.10	9,163.00	2,787.72	2,789.42	-305.85	2,806.14	353.74	443,148.33	548,315.72
11,883.00	89.10	359.50	9,163.49	2,881.72	2,883.42	-306.18	2,899.63	353.94	443,242.33	548,315.39
11,977.00	88.90	359.20	9,165.13	2,975.69	2,977.40	-307.24	2,993.21	354.11	443,336.31	548,314.33
12,071.00	89.00	359.10	9,166.85	3,069.65	3,071.37	-308.64	3,086.84	354.26	443,430.28	548,312.93
12,166.00	92.20	1.00	9,165.86	3,164.63	3,166.35	-308.55	3,181.35	354.43	443,525.26	548,313.02
12,260.00	92.20	1.00	9,162.25	3,258.56	3,260.26	-306.91	3,274.68	354.62	443,619.17	548,314.66
12,354.00	89.50	1.20	9,160.85	3,352.53	3,354.23	-305.11	3,368.08	354.80	443,713.14	548,316.46
12,447.00	90.30	1.40	9,161.02	3,445.51	3,447.20	-303.00	3,460.49	354.98	443,806.11	548,318.57
12,542.00	90.10	1.20	9,160.68	3,540.50	3,542.18	-300.84	3,554.93	355.15	443,901.09	548,320.73
12,636.00	90.10	0.80	9,160.52	3,634.49	3,636.16	-299.20	3,648.45	355.30	443,995.07	548,322.37
12,730.00	88.70	0.30	9,161.50	3,728.48	3,730.15	-298.30	3,742.06	355.43	444,089.06	548,323.27
12,824.00	88.30	0.40	9,163.97	3,822.45	3,824.12	-297.73	3,835.69	355.55	444,183.03	548,323.84
12,918.00	88.20	359.90	9,166.84	3,916.40	3,918.07	-297.48	3,929.35	355.66	444,276.98	548,324.09
13,013.00	86.40	358.90	9,171.31	4,011.28	4,012.96	-298.47	4,024.04	355.75	444,371.87	548,323.10
13,107.00	90.20	0.20	9,174.10	4,105.21	4,106.89	-299.21	4,117.78	355.83	444,465.80	548,322.36
13,201.00	89.80	359.50	9,174.10	4,199.21	4,200.89	-299.46	4,211.55	355.92	444,559.80	548,322.11
13,295.00	89.40	359.50	9,174.76	4,293.20	4,294.89	-300.28	4,305.37	356.00	444,653.80	548,321.29
13,388.00	89.90	359.70	9,175.32	4,386.19	4,387.88	-300.93	4,398.19	356.08	444,746.79	548,320.64
13,483.00	89.40	0.00	9,175.90	4,481.18	4,482.88	-301.18	4,492.98	356.16	444,841.79	548,320.39
13,576.00	91.10	1.20	9,175.50	4,574.18	4,575.87	-300.20	4,585.70	356.25	444,934.78	548,321.37
13,670.00	92.20	1.30	9,172.79	4,668.12	4,669.80	-298.15	4,679.31	356.35	445,028.71	548,323.42



Professional Directional Survey Report



Company: Marathon Oil
Project: Eddy County, NM
Site: Black River 15-10 State Com
Well: No. 3H
Wellbore: OH
Design: OH 100'-18958' PTB 19037'

Local Co-ordinate Reference: Well No. 3H
TVD Reference: Well @ 3255.50usft (GL: 3229' + KB: 26.5' (H&P423))
MD Reference: Well @ 3255.50usft (GL: 3229' + KB: 26.5' (H&P423))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)
13,765.00	91.00	0.70	9,170.14	4,763.08	4,764.75	-296.49	4,773.97	356.44	445,123.66	548,325.08
13,859.00	89.30	359.00	9,169.89	4,857.07	4,858.74	-296.74	4,867.80	356.51	445,217.65	548,324.83
13,953.00	89.20	359.70	9,171.12	4,951.05	4,952.73	-297.81	4,961.67	356.56	445,311.64	548,323.76
14,048.00	90.10	359.20	9,171.70	5,046.03	5,047.72	-298.72	5,056.55	356.61	445,406.63	548,322.85
14,143.00	91.70	359.80	9,170.21	5,141.01	5,142.70	-299.55	5,151.42	356.67	445,501.61	548,322.02
14,238.00	88.80	1.60	9,169.80	5,235.99	5,237.68	-298.39	5,246.17	356.74	445,596.59	548,323.18
14,332.00	92.10	3.30	9,169.06	5,329.90	5,331.58	-294.37	5,339.70	356.84	445,690.49	548,327.20
14,426.00	89.10	3.90	9,168.07	5,423.73	5,425.37	-288.47	5,433.04	356.96	445,784.28	548,333.10
14,521.00	87.90	2.40	9,170.56	5,518.58	5,520.19	-283.25	5,527.46	357.06	445,879.10	548,338.32
14,615.00	87.30	2.00	9,174.50	5,612.45	5,614.04	-279.65	5,621.00	357.15	445,972.95	548,341.92
14,710.00	86.70	359.60	9,179.47	5,707.30	5,708.89	-278.32	5,715.67	357.21	446,067.80	548,343.25
14,805.00	87.70	358.80	9,184.11	5,802.17	5,803.77	-279.65	5,810.50	357.24	446,162.68	548,341.92
14,899.00	88.90	358.40	9,186.90	5,896.09	5,897.70	-281.94	5,904.43	357.26	446,256.61	548,339.63
14,993.00	91.90	0.20	9,186.24	5,990.05	5,991.67	-283.09	5,998.36	357.29	446,350.58	548,338.48
15,088.00	90.00	357.80	9,184.67	6,085.01	6,086.64	-284.75	6,093.29	357.32	446,445.55	548,336.82
15,182.00	91.00	358.90	9,183.85	6,178.94	6,180.59	-287.45	6,187.27	357.34	446,539.50	548,334.12
15,276.00	91.90	359.10	9,181.47	6,272.89	6,274.54	-289.09	6,281.20	357.36	446,633.45	548,332.48
15,371.00	91.30	0.60	9,178.82	6,367.85	6,369.50	-289.34	6,376.07	357.40	446,728.41	548,332.23
15,466.00	89.30	0.30	9,178.32	6,462.84	6,464.49	-288.60	6,470.93	357.44	446,823.40	548,332.97
15,560.00	87.70	359.10	9,180.78	6,556.80	6,558.46	-289.09	6,564.82	357.48	446,917.37	548,332.48
15,656.00	89.10	0.00	9,183.46	6,652.75	6,654.41	-289.84	6,660.72	357.51	447,013.32	548,331.73
15,750.00	88.90	359.70	9,185.10	6,746.73	6,748.40	-290.09	6,754.63	357.54	447,107.31	548,331.48
15,845.00	89.70	359.90	9,186.26	6,841.72	6,843.39	-290.42	6,849.55	357.57	447,202.30	548,331.15
15,939.00	91.30	1.00	9,185.44	6,935.71	6,937.38	-289.68	6,943.42	357.61	447,296.29	548,331.89
16,034.00	91.30	359.90	9,183.29	7,030.68	7,032.35	-288.94	7,038.28	357.65	447,391.26	548,332.63
16,128.00	90.80	359.50	9,181.56	7,124.66	7,126.33	-289.43	7,132.21	357.67	447,485.24	548,332.14
16,223.00	89.80	0.10	9,181.07	7,219.66	7,221.33	-289.76	7,227.14	357.70	447,580.24	548,331.81



Professional Directional
Survey Report



Company: Marathon Oil
Project: Eddy County, NM
Site: Black River 15-10 State Com
Well: No. 3H
Wellbore: OH
Design: OH 100'-18958' PTB 19037'

Local Co-ordinate Reference: Well No. 3H
TVD Reference: Well @ 3255.50usft (GL: 3229' + KB: 26.5' (H&P423))
MD Reference: Well @ 3255.50usft (GL: 3229' + KB: 26.5' (H&P423))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)
16,316.00	89.30	359.90	9,181.80	7,312.65	7,314.33	-289.76	7,320.06	357.73	447,673.24	548,331.81
16,411.00	92.00	1.10	9,180.72	7,407.63	7,409.31	-288.93	7,414.94	357.77	447,768.22	548,332.64
16,505.00	90.50	1.70	9,178.67	7,501.59	7,503.25	-286.63	7,508.72	357.81	447,862.16	548,334.94
16,599.00	87.90	1.00	9,179.98	7,595.56	7,597.21	-284.42	7,602.53	357.86	447,956.12	548,337.15
16,693.00	87.50	0.60	9,183.75	7,689.48	7,691.12	-283.11	7,696.33	357.89	448,050.03	548,338.46
16,788.00	86.90	0.40	9,188.39	7,784.36	7,786.00	-282.28	7,791.12	357.92	448,144.91	548,339.29
16,882.00	88.10	0.30	9,192.49	7,878.27	7,879.91	-281.71	7,884.95	357.95	448,238.82	548,339.86
16,976.00	88.00	0.00	9,195.69	7,972.22	7,973.86	-281.46	7,978.82	357.98	448,332.77	548,340.11
17,071.00	91.10	359.40	9,196.44	8,067.20	8,068.84	-281.96	8,073.77	358.00	448,427.75	548,339.61
17,166.00	92.40	1.90	9,193.54	8,162.14	8,163.78	-280.88	8,168.61	358.03	448,522.69	548,340.69
17,260.00	91.90	1.60	9,190.01	8,256.05	8,257.67	-278.01	8,262.35	358.07	448,616.58	548,343.56
17,355.00	91.60	2.50	9,187.11	8,350.96	8,352.56	-274.62	8,357.08	358.12	448,711.47	548,346.95
17,449.00	89.00	1.30	9,186.62	8,444.91	8,446.50	-271.50	8,450.86	358.16	448,805.41	548,350.07
17,543.00	89.00	1.00	9,188.26	8,538.88	8,540.47	-269.61	8,544.72	358.19	448,899.38	548,351.96
17,638.00	90.60	2.60	9,188.59	8,633.85	8,635.41	-266.63	8,639.53	358.23	448,994.32	548,354.94
17,732.00	90.70	2.00	9,187.52	8,727.78	8,729.33	-262.86	8,733.29	358.28	449,088.24	548,358.71
17,827.00	89.50	0.20	9,187.36	8,822.77	8,824.31	-261.03	8,828.17	358.31	449,183.22	548,360.54
17,921.00	89.70	359.40	9,188.01	8,916.76	8,918.31	-261.36	8,922.13	358.32	449,277.22	548,360.21
18,016.00	92.30	0.30	9,186.35	9,011.73	9,013.28	-261.61	9,017.08	358.34	449,372.19	548,359.96
18,110.00	89.30	358.80	9,185.04	9,105.70	9,107.26	-262.35	9,111.03	358.35	449,466.17	548,359.22
18,204.00	92.30	0.30	9,183.73	9,199.67	9,201.23	-263.09	9,204.99	358.36	449,560.14	548,358.48
18,298.00	88.90	359.50	9,182.75	9,293.65	9,295.21	-263.25	9,298.94	358.38	449,654.12	548,358.32
18,392.00	88.80	358.80	9,184.63	9,387.61	9,389.18	-264.65	9,392.91	358.39	449,748.09	548,356.92
18,487.00	92.60	0.40	9,183.47	9,482.58	9,484.15	-265.31	9,487.86	358.40	449,843.06	548,356.26
18,581.00	89.10	1.70	9,182.08	9,576.54	9,578.11	-263.59	9,581.73	358.42	449,937.02	548,357.98
18,675.00	90.10	1.90	9,182.73	9,670.51	9,672.06	-260.64	9,675.57	358.46	450,030.97	548,360.93
18,770.00	89.00	2.00	9,183.48	9,765.46	9,767.00	-257.40	9,770.39	358.49	450,125.91	548,364.17



Professional Directional Survey Report



Company: Marathon Oil
Project: Eddy County, NM
Site: Black River 15-10 State Com
Well: No. 3H
Wellbore: OH
Design: OH 100'-18958' PTB 19037'

Local Co-ordinate Reference: Well No. 3H
TVD Reference: Well @ 3255.50usft (GL: 3229' + KB: 26.5' (H&P423))
MD Reference: Well @ 3255.50usft (GL: 3229' + KB: 26.5' (H&P423))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)	
18,864.00	90.40	3.20	9,183.97	9,859.38	9,860.90	-253.14	9,864.15	358.53	450,219.81	548,368.43	
18,958.00	87.90	1.20	9,185.37	9,953.31	9,954.80	-249.53	9,957.93	358.56	450,313.71	548,372.04	
Last Survey: 18958' MD, 9185' TVD - [BickRvr#3H]LTP/BHL: 9988' VS											
19,037.00	87.90	1.20	9,188.26	10,032.25	10,033.73	-247.88	10,036.80	358.58	450,392.64	548,373.69	
PTB: 19037' MD, 9188' TVD											

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
18,958.00	9,185.37	9,954.80	-249.53	Last Survey: 18958' MD, 9185' TVD
19,037.00	9,188.26	10,033.73	-247.88	PTB: 19037' MD, 9188' TVD

Marathon Oil Corporation

Marathon Oil
Eddy County, NM
Black River 16-10 State Com
No. 3H
Plan #2 - FINAL PVA
GL: 3229' + KB: 26.5' (H&P423)

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

RKB Elevation: Well @ 3255.50usft (GL: 3229' + KB: 26.5' (H&P423))

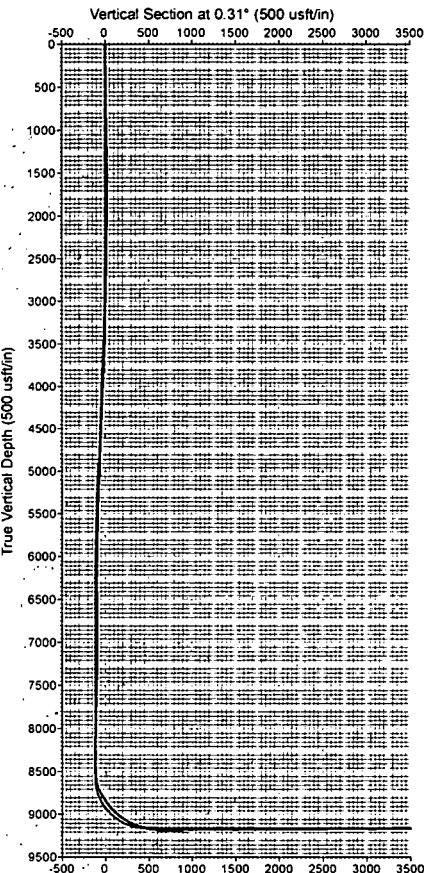
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Spot
0.00	0.00	440358.91	548621.57	32.2106	-104.1781	

SECTION DETAILS

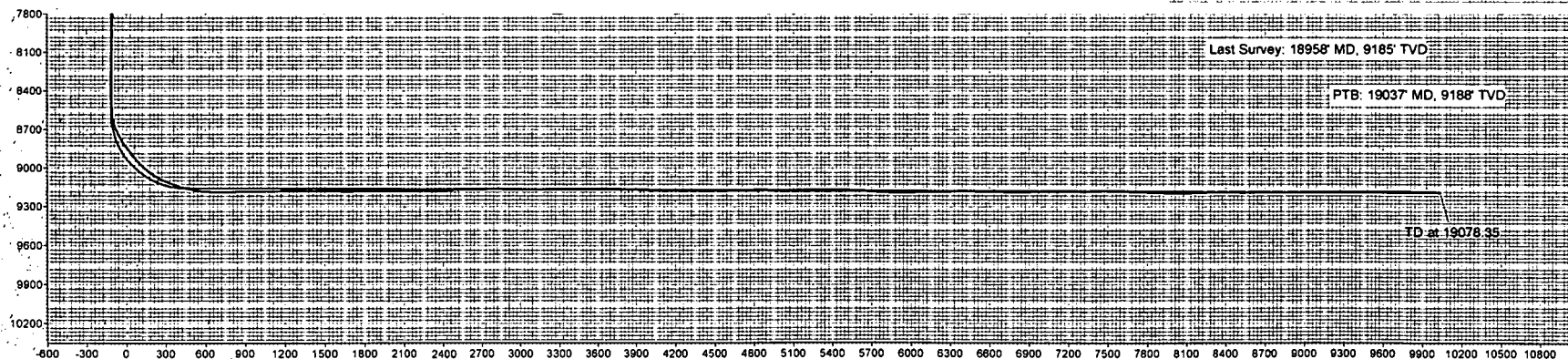
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	VSec
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2600.00	0.00	0.00	2600.00	0.00	0.00	0.00	0.00
3	3533.33	7.00	251.51	3531.01	-18.05	-54.01	0.75	-18.35
4	5640.00	7.00	251.51	5621.98	-89.46	-297.50	0.00	-101.07
5	6340.00	0.00	0.00	6320.24	-113.00	-338.00	1.00	-114.83
6	8603.76	0.00	0.00	8584.00	-113.00	-338.00	0.00	-114.83
7	9501.78	89.80	0.31	9156.95	457.97	-334.91	10.00	456.15
8	19033.35	89.80	0.31	9189.86	9989.34	-283.31	0.00	9987.86
9	19078.35	89.80	0.31	9190.02	10034.34	-283.07	0.00	10032.66

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting
[BickRvr#3H]FTP: 65' VS	0.00	68.78	-337.76	440425.69	548283.81
[BickRvr#3H]KOP: -115' VS	8584.00	-113.00	-338.00	440245.91	548283.57
[BickRvr#3H]LTP/BHL: 9988' VS	9189.86	9989.34	-283.31	450348.25	548338.26

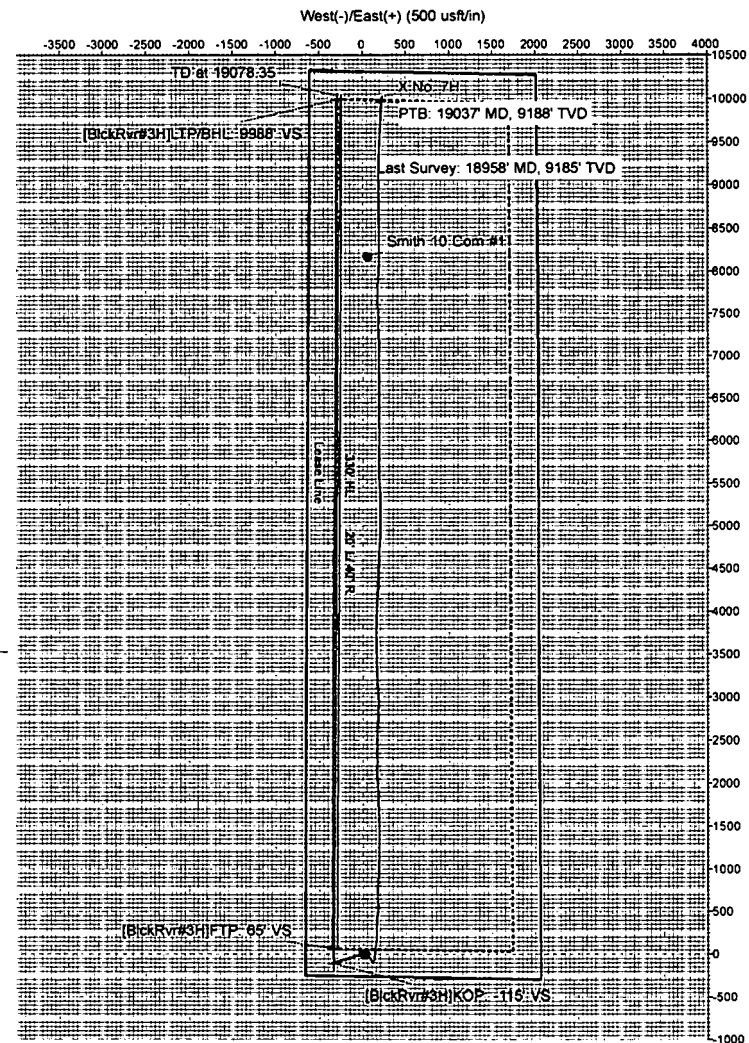


Target Line: 9155' TVD @ 0' VS: 89.8° INC



36" x 48"

Vertical Section at 0.31° (300 usft/in)



Azimuths to Grid North
True North: -0.08°
Magnetic North: 7.28°
Magnetic Field
Strength: 47951.1nT
Dip Angle: 58.97°
Date: 2/21/2018
Model: HDGM

Azimuth Corrections

Total Magnetic Corr. (M to G): 7.28°

Declination (M to T): 7.37° East