

EXPLORING WHAT'S POSSIBLE

Apache Corporation

Eddy County, NM (NAD27 NME)

Hummingbird Federal Com

#16H

30-015- 43481

NM OIL CONSERVATION

ARTESIA DISTRICT

AUG 16 2017

OH / Job #61124

RECEIVED

Design: Surveys (Trinidad 436)

Standard Survey Report

29 April, 2017

Please provide signature
page for directional survey



Phoenix Technology Services LP

Survey Report



Company: Apache Corporation
Project: Eddy County, NM (NAD27 NME)
Site: Hummingbird Federal Com
Well: #16H
Wellbore: OH / Job #81124
Design: Surveys (Trinidad 436)

Local Co-ordinate Reference: Well #16H
TVD Reference: GL + KB @ 4053.50usft (Trinidad 436)
MD Reference: GL + KB @ 4053.50usft (Trinidad 436)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

Project	Eddy County, NM (NAD27 NME)		
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	Hummingbird Federal Com		
Site Position:		Northing:	677,262.80 usft
From:	Map	Easting:	655,481.80 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 51' 39.07482 N
		Longitude:	103° 49' 37.14798 W
		Grid Convergence:	0.27 °

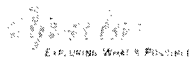
Well	#16H		
Well Position	+N/-S	0.00 usft	Northing: 680,351.80 usft
	+E/-W	0.00 usft	Easting: 654,265.30 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft
		Latitude:	32° 52' 9.69771 N
		Longitude:	103° 49' 51.23729 W
		Ground Level:	4,037.00 usft

Wellbore	OH / Job #81124				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	5/26/2017	7.33	60.83	48,430

Design	Surveys (Trinidad 436)				
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	89.57	

Survey Program	Date 4/29/2017				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
81.77	4,795.00	Phoenix Gyro Surveys (OH / Job #81124)	PHX_SPT_GTD	PHX Continuous north-seeking gyro	
4,847.00	10,073.00	Phoenix MWD Surveys (OH / Job #81124)	MWD+HDGM	OWSG Rev.2 MWD + HDGM	

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
81.77	0.28	245.15	81.77	-0.08	-0.18	-0.18	0.34	0.34	0.00
112.66	0.15	300.89	112.66	-0.09	-0.28	-0.29	0.75	-0.42	180.45
203.35	0.21	292.86	203.35	0.03	-0.54	-0.54	0.07	0.07	-8.85
292.86	0.29	295.03	292.86	0.19	-0.90	-0.89	0.09	0.09	2.42
376.14	0.36	277.08	376.14	0.31	-1.35	-1.34	0.15	0.08	-21.55
477.20	0.18	320.46	477.20	0.47	-1.76	-1.76	0.26	-0.18	42.92
508.40	0.15	177.28	508.40	0.47	-1.79	-1.79	1.00	-0.10	-458.91
570.70	0.39	226.37	570.70	0.24	-1.94	-1.94	0.50	0.39	78.80
633.50	0.86	227.27	633.49	-0.22	-2.44	-2.44	0.75	0.75	1.43



Phoenix Technology Services LP

Survey Report



Company: Apache Corporation
Project: Eddy County, NM (NAD27 NME)
Site: Hummingbird Federal Com
Well: #18H
Wellbore: OH / Job #81124
Design: Surveys (Trinidad 436)

Local Co-ordinate Reference: Well #18H
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North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

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)
696.27	0.84	219.91	696.25	-0.90	-3.08	-3.09	0.18	-0.03	-11.73
758.43	0.78	221.20	758.41	-1.57	-3.65	-3.67	0.10	-0.10	2.08
820.89	0.85	236.20	820.86	-2.14	-4.32	-4.34	0.36	0.11	24.02
882.81	0.77	228.81	882.78	-2.67	-5.01	-5.03	0.21	-0.13	-11.93
945.28	0.69	242.56	945.24	-3.12	-5.66	-5.69	0.31	-0.13	22.01
1,008.18	0.62	259.52	1,008.14	-3.36	-6.33	-6.36	0.33	-0.11	26.96
1,070.58	0.63	264.39	1,070.53	-3.45	-7.01	-7.03	0.09	0.02	7.80
1,133.40	0.59	267.06	1,133.35	-3.50	-7.68	-7.70	0.08	-0.06	4.25
1,195.45	0.60	270.54	1,195.40	-3.52	-8.32	-8.34	0.06	0.02	5.61
1,257.72	0.57	275.88	1,257.66	-3.48	-8.95	-8.98	0.10	-0.05	8.58
1,319.96	0.44	325.82	1,319.90	-3.25	-9.40	-9.42	0.71	-0.21	80.24
1,382.30	0.41	332.62	1,382.24	-2.86	-9.63	-9.65	0.09	-0.05	10.91
1,444.62	0.42	331.98	1,444.56	-2.46	-9.84	-9.86	0.02	0.02	-1.03
1,507.45	0.38	348.47	1,507.39	-2.05	-9.99	-10.01	0.19	-0.06	26.25
1,569.93	0.43	350.65	1,569.86	-1.62	-10.07	-10.08	0.08	0.08	3.49
1,632.51	0.42	356.52	1,632.44	-1.15	-10.12	-10.13	0.07	-0.02	9.38
1,694.92	0.45	0.51	1,694.85	-0.68	-10.14	-10.14	0.07	0.05	6.39
1,757.36	0.48	327.98	1,757.29	-0.21	-10.27	-10.27	0.42	0.05	-52.10
1,819.46	0.49	327.91	1,819.39	0.23	-10.55	-10.55	0.02	0.02	-0.11
1,882.16	0.49	312.61	1,882.08	0.64	-10.89	-10.89	0.21	0.00	-24.40
1,944.67	0.15	303.53	1,944.59	0.87	-11.16	-11.15	0.55	-0.54	-14.53
2,007.00	0.06	291.77	2,006.92	0.92	-11.25	-11.25	0.15	-0.14	-18.87
2,068.89	0.02	177.89	2,068.81	0.92	-11.28	-11.28	0.11	-0.06	-184.00
2,131.36	0.10	119.07	2,131.28	0.89	-11.24	-11.23	0.15	0.13	-94.16
2,193.70	0.24	143.23	2,193.62	0.76	-11.11	-11.10	0.25	0.22	38.76
2,255.48	0.23	118.27	2,255.40	0.59	-10.92	-10.92	0.17	-0.02	-40.40
2,317.86	0.19	123.14	2,317.78	0.48	-10.73	-10.72	0.07	-0.06	7.81
2,388.69	0.24	114.26	2,388.61	0.35	-10.49	-10.49	0.08	0.07	-12.54
2,441.68	0.41	96.31	2,441.60	0.29	-10.20	-10.20	0.37	0.32	-33.87
2,504.01	0.35	105.70	2,503.93	0.21	-9.80	-9.80	0.14	-0.10	15.06
2,566.69	0.35	192.60	2,566.61	-0.03	-9.66	-9.66	0.77	0.00	138.64
2,629.46	0.31	184.90	2,629.38	-0.38	-9.71	-9.71	0.10	-0.06	-12.27
2,691.61	0.08	192.58	2,691.53	-0.59	-9.74	-9.74	0.37	-0.37	12.36
2,753.80	0.21	238.79	2,753.72	-0.70	-9.84	-9.85	0.27	0.21	74.30
2,814.93	0.56	263.24	2,814.85	-0.79	-10.24	-10.24	0.62	0.57	40.00
2,876.87	0.60	262.00	2,876.78	-0.87	-10.86	-10.86	0.07	0.06	-2.00
2,939.13	0.69	264.80	2,939.04	-0.95	-11.55	-11.56	0.15	0.14	4.50
3,001.61	0.72	262.24	3,001.51	-1.04	-12.32	-12.32	0.07	0.05	-4.10
3,064.98	0.79	259.42	3,064.88	-1.17	-13.14	-13.15	0.13	0.11	-4.45
3,127.90	0.68	252.02	3,127.79	-1.37	-13.92	-13.93	0.23	-0.17	-11.76
3,190.46	0.76	251.34	3,190.35	-1.61	-14.67	-14.68	0.13	0.13	-1.09
3,253.54	0.93	251.10	3,253.42	-1.91	-15.55	-15.56	0.27	0.27	-0.38
3,316.59	0.95	247.44	3,316.46	-2.28	-16.52	-16.53	0.10	0.03	-5.80



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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)
3,378.92	0.92	240.67	3,378.78	-2.72	-17.43	-17.45	0.18	-0.05	-10.86
3,440.79	0.98	240.83	3,440.65	-3.22	-18.32	-18.35	0.10	0.10	0.26
3,502.40	0.99	243.60	3,502.25	-3.72	-19.26	-19.29	0.08	0.02	4.50
3,564.81	0.95	239.08	3,564.65	-4.22	-20.19	-20.22	0.14	-0.08	-7.24
3,631.71	0.87	237.37	3,631.54	-4.78	-21.09	-21.13	0.13	-0.12	-2.56
3,691.00	0.88	241.79	3,690.82	-5.24	-21.87	-21.91	0.12	0.02	7.45
3,754.42	0.84	240.45	3,754.24	-5.70	-22.71	-22.75	0.07	-0.06	-2.11
3,817.79	0.69	233.48	3,817.60	-6.15	-23.42	-23.46	0.28	-0.24	-11.00
3,881.14	0.69	230.12	3,880.94	-6.63	-24.02	-24.06	0.06	0.00	-5.30
3,944.41	0.72	218.94	3,944.21	-7.18	-24.56	-24.61	0.22	0.05	-17.67
4,007.77	0.74	229.64	4,007.56	-7.75	-25.12	-25.18	0.22	0.03	16.89
4,071.02	0.77	225.13	4,070.81	-8.32	-25.73	-25.79	0.11	0.05	-7.13
4,134.35	0.75	225.61	4,134.13	-8.91	-26.33	-26.39	0.03	-0.03	0.76
4,197.83	0.75	230.94	4,197.61	-9.46	-26.95	-27.02	0.11	0.00	8.40
4,261.29	0.74	231.62	4,261.06	-9.98	-27.59	-27.67	0.02	-0.02	1.07
4,324.53	0.75	232.34	4,324.30	-10.48	-28.24	-28.32	0.02	0.02	1.14
4,387.88	0.71	232.34	4,387.64	-10.98	-28.88	-28.96	0.06	-0.06	0.00
4,451.23	0.68	234.26	4,450.99	-11.44	-29.50	-29.58	0.06	-0.05	3.03
4,514.44	0.69	248.58	4,514.19	-11.79	-30.15	-30.24	0.27	0.02	22.65
4,576.90	0.68	235.97	4,576.65	-12.14	-30.81	-30.90	0.24	-0.02	-20.19
4,639.00	0.62	236.43	4,638.75	-12.53	-31.40	-31.49	0.10	-0.10	0.74
4,701.25	0.54	239.21	4,700.99	-12.87	-31.93	-32.02	0.14	-0.13	4.47
4,764.38	0.55	238.87	4,764.12	-13.18	-32.44	-32.54	0.02	0.02	-0.54
4,795.00	0.58	128.02	4,794.74	-13.35	-32.45	-32.55	3.04	0.10	-362.02
4,847.00	0.50	240.98	4,846.74	-13.62	-32.44	-32.54	1.73	-0.15	217.23
First Phoenix Survey									
4,910.00	1.40	87.47	4,909.73	-13.72	-31.91	-32.01	2.95	1.43	-243.67
4,972.00	9.44	89.99	4,971.40	-13.69	-26.06	-26.16	12.97	12.97	4.06
5,035.00	18.26	85.41	5,032.51	-12.89	-11.02	-11.12	14.10	14.00	-7.27
5,098.00	26.65	84.66	5,090.69	-10.78	12.92	12.84	13.32	13.32	-1.19
5,160.00	33.18	88.29	5,144.40	-8.98	43.76	43.69	10.93	10.53	5.85
5,223.00	38.13	89.74	5,195.58	-8.38	80.47	80.40	7.97	7.86	2.30
5,286.00	44.05	90.06	5,243.04	-8.31	121.85	121.79	9.40	9.40	0.51
5,348.00	48.36	90.75	5,285.93	-8.64	166.59	166.53	7.00	6.95	1.11
5,410.00	51.46	91.75	5,325.86	-9.68	214.01	213.93	5.15	5.00	1.61
5,473.00	58.81	91.71	5,361.85	-11.24	265.64	265.55	11.67	11.67	-0.06
5,535.00	63.64	91.02	5,391.68	-12.53	319.95	319.85	7.85	7.79	-1.11
5,598.00	66.92	91.27	5,418.03	-13.67	377.16	377.05	5.22	5.21	0.40
5,661.00	75.18	91.22	5,438.47	-14.97	436.68	436.56	13.11	13.11	-0.08
5,686.00	78.80	91.17	5,444.09	-15.47	461.03	460.90	14.48	14.48	-0.20
5,725.00	82.53	91.37	5,450.42	-16.33	499.50	499.36	9.58	9.56	0.51
5,786.00	88.26	90.44	5,455.31	-17.29	560.27	560.12	9.52	9.39	-1.52
5,847.00	88.23	90.24	5,457.18	-17.65	621.24	621.09	0.33	-0.05	-0.33

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5,909.00	88.10	89.86	5,459.17	-17.70	683.20	683.05	0.85	-0.21	-0.61
5,972.00	88.38	89.48	5,461.10	-17.34	746.17	746.02	0.75	0.44	-0.60
6,034.00	90.59	88.48	5,461.66	-16.24	808.16	808.01	3.91	3.56	-1.61
6,096.00	93.11	87.68	5,459.66	-14.16	870.08	869.96	4.26	4.06	-1.29
6,159.00	93.64	88.13	5,455.95	-11.86	932.93	932.82	1.10	0.84	0.71
6,222.00	91.20	90.17	5,453.29	-10.93	995.86	995.75	5.05	-3.87	3.24
6,283.00	90.17	90.96	5,452.56	-11.53	1,056.85	1,056.74	2.13	-1.69	1.30
6,345.00	89.75	90.63	5,452.60	-12.39	1,118.85	1,118.72	0.86	-0.66	-0.53
6,408.00	88.01	90.39	5,453.83	-12.95	1,181.83	1,181.70	2.79	-2.76	-0.38
6,470.00	88.35	90.73	5,455.80	-13.56	1,243.80	1,243.66	0.78	0.55	0.55
6,532.00	88.60	90.89	5,457.45	-14.43	1,305.77	1,305.62	0.48	0.40	0.26
6,594.00	88.93	90.90	5,458.79	-15.40	1,367.74	1,367.59	0.53	0.53	0.02
6,656.00	89.02	90.24	5,459.90	-16.02	1,429.73	1,429.57	1.07	0.15	-1.06
6,718.00	89.11	90.10	5,460.91	-16.20	1,491.72	1,491.56	0.27	0.15	-0.23
6,781.00	87.25	89.46	5,462.91	-15.96	1,554.69	1,554.53	3.12	-2.95	-1.02
6,843.00	87.34	89.80	5,465.84	-15.56	1,616.62	1,616.46	0.57	0.15	0.55
6,905.00	87.43	88.83	5,468.67	-14.82	1,678.55	1,678.39	1.57	0.15	-1.56
6,967.00	86.73	87.67	5,471.82	-12.93	1,740.44	1,740.29	2.18	-1.13	-1.87
7,030.00	87.31	87.70	5,475.10	-10.39	1,803.30	1,803.17	0.92	0.92	0.05
7,092.00	90.00	86.71	5,476.56	-7.36	1,865.20	1,865.10	4.62	4.34	-1.60
7,155.00	88.66	87.09	5,477.29	-3.96	1,928.10	1,928.02	2.21	-2.13	0.80
7,217.00	88.77	87.26	5,478.68	-0.90	1,990.01	1,989.95	0.33	0.18	0.27
7,279.00	89.05	87.19	5,479.86	2.10	2,051.93	2,051.89	0.47	0.45	-0.11
7,341.00	89.37	87.49	5,480.72	4.98	2,113.86	2,113.84	0.71	0.52	0.48
7,403.00	89.52	87.68	5,481.32	7.59	2,175.80	2,175.80	0.39	0.24	0.31
7,466.00	89.81	87.66	5,481.69	10.15	2,238.75	2,238.76	0.46	0.46	-0.03
7,528.00	89.83	87.95	5,481.88	12.52	2,300.70	2,300.73	0.47	0.03	0.47
7,590.00	88.71	87.81	5,482.67	14.82	2,362.65	2,362.70	1.82	-1.81	-0.23
7,652.00	88.80	88.02	5,484.02	17.07	2,424.60	2,424.66	0.37	0.15	0.34
7,714.00	89.27	88.26	5,485.06	19.08	2,486.55	2,486.63	0.85	0.76	0.39
7,776.00	89.44	87.84	5,485.76	21.19	2,548.51	2,548.60	0.73	0.27	-0.68
7,838.00	89.55	87.73	5,486.31	23.59	2,610.46	2,610.57	0.25	0.18	-0.18
7,900.00	89.61	88.01	5,486.76	25.89	2,672.42	2,672.54	0.46	0.10	0.45
7,962.00	89.64	87.84	5,487.17	28.14	2,734.38	2,734.51	0.28	0.05	-0.27
8,025.00	89.69	87.85	5,487.53	30.51	2,797.33	2,797.48	0.08	0.08	0.02
8,087.00	89.91	88.07	5,487.75	32.71	2,859.29	2,859.46	0.50	0.35	0.35
8,149.00	90.17	89.50	5,487.71	34.03	2,921.28	2,921.45	2.34	0.42	2.31
8,211.00	89.94	89.18	5,487.65	34.74	2,983.27	2,983.45	0.64	-0.37	-0.52
8,274.00	88.80	89.82	5,488.34	35.29	3,046.27	3,046.44	2.08	-1.81	1.02
8,336.00	89.05	89.48	5,489.50	35.67	3,108.25	3,108.43	0.68	0.40	-0.55
8,398.00	89.30	89.73	5,490.40	36.10	3,170.25	3,170.43	0.57	0.40	0.40
8,460.00	89.58	90.20	5,491.00	36.14	3,232.24	3,232.42	0.88	0.45	0.76
8,522.00	88.77	91.32	5,491.90	35.32	3,294.23	3,294.40	2.23	-1.31	1.81
8,584.00	88.99	91.03	5,493.11	34.04	3,356.20	3,356.36	0.59	0.35	-0.47

Phoenix Technology Services LP

Survey Report



Company: Apache Corporation
Project: Eddy County, NM (NAD27 NME)
Site: Hummingbird Federal Com
Well: #16H
Wellbore: OH / Job #81124
Design: Surveys (Trinidad 436)

Local Co-ordinate Reference: Well #16H
TVD Reference: GL + KB @ 4053.50usft (Trinidad 436)
MD Reference: GL + KB @ 4053.50usft (Trinidad 436)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

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)
8,647.00	89.44	91.31	5,493.97	32.76	3,419.18	3,419.33	0.84	0.71	0.44
8,709.00	89.72	91.02	5,494.42	31.50	3,481.17	3,481.31	0.65	0.45	-0.47
8,772.00	89.44	91.31	5,494.89	30.22	3,544.16	3,544.28	0.64	-0.44	0.46
8,834.00	89.91	91.40	5,495.24	28.75	3,606.14	3,606.25	0.77	0.76	0.15
8,896.00	90.22	91.44	5,495.17	27.21	3,668.12	3,668.22	0.50	0.50	0.06
8,958.00	89.30	90.59	5,495.43	26.12	3,730.11	3,730.20	2.02	-1.48	-1.37
9,020.00	88.91	90.57	5,496.40	25.49	3,792.10	3,792.18	0.63	-0.63	-0.03
9,083.00	89.08	90.39	5,497.50	24.96	3,855.08	3,855.16	0.39	0.27	-0.29
9,145.00	89.24	90.59	5,498.41	24.43	3,917.07	3,917.15	0.41	0.26	0.32
9,208.00	89.52	90.40	5,499.09	23.89	3,980.07	3,980.14	0.54	0.44	-0.30
9,270.00	90.03	90.24	5,499.34	23.54	4,042.07	4,042.13	0.66	0.82	-0.26
9,332.00	88.35	89.08	5,500.21	23.91	4,104.06	4,104.12	3.29	-2.71	-1.87
9,395.00	88.52	88.90	5,501.93	25.02	4,167.02	4,167.09	0.39	0.27	-0.29
9,457.00	88.49	88.71	5,503.55	26.31	4,228.99	4,229.07	0.31	-0.05	-0.31
9,519.00	88.48	88.48	5,505.18	27.83	4,290.95	4,291.04	0.37	0.00	-0.37
9,582.00	88.63	88.45	5,506.77	29.52	4,353.91	4,354.00	0.23	0.22	-0.05
9,645.00	88.80	88.40	5,508.18	31.25	4,416.87	4,416.98	0.28	0.27	-0.08
9,707.00	88.96	88.55	5,509.39	32.90	4,478.83	4,478.95	0.35	0.26	0.24
9,770.00	89.05	88.84	5,510.49	34.44	4,541.80	4,541.93	0.20	0.14	0.14
9,833.00	88.99	88.37	5,511.56	36.09	4,604.77	4,604.91	0.44	-0.10	-0.43
9,895.00	89.11	88.94	5,512.59	37.54	4,666.75	4,666.90	0.94	0.19	0.92
9,957.00	89.47	89.19	5,513.36	38.55	4,728.73	4,728.89	0.71	0.58	0.40
10,006.00	89.75	89.91	5,513.69	38.94	4,777.73	4,777.89	1.58	0.57	1.47
Final Phoenix MWD Survey									
10,073.00	89.75	89.91	5,513.99	39.04	4,844.73	4,844.89	0.00	0.00	0.00
Projection to TD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
4,847.00	4,846.74	-13.62	-32.44	First Phoenix Survey
10,006.00	5,513.69	38.94	4,777.73	Final Phoenix MWD Survey
10,073.00	5,513.99	39.04	4,844.73	Projection to TD