



Weatherford

Drilling Services
10000 West County Rd. 116
P.O. Box 61028
Midland, TX USA 79711

Tel. (432) 561-8892 Fax (432) 561-8895

Apache Corporation
303 Veterans Airpark Lane
Midland, TX, 79705

Date: July 28, 2018

Attention: John Vacek

Re: Apache Corporation
Well: Thunderbird A 5H
Eddy County, New Mexico

**NM OIL CONSERVATION
ARTESIA DISTRICT**

JAN 23 2019

RECEIVED

Enclosed, please find the original survey performed on the referenced well by Precision Energy Services, Inc. (P-5 No. 676004), a Weatherford company. Other information required by your office is as follows:

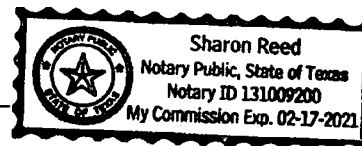
<u>Name & Title Of Surveyor</u>	<u>Well Number</u>	<u>Surveyed Depths</u>	<u>Dates Performed</u>	<u>Type of Survey</u>
Jeff Johnson MWD Supervisor	5H	4,135 MD 12,216 MD	7/23/2018 7/27/2018	Measurement While Drilling

A notarized plan vs. actual is attached to the survey report. If any other information is required, please contact the undersigned at the letterhead address and phone number.

Jeffery Johnson
MWD Ops. Coordinator

On this, the 30th day of July, 2018, before me a notary public, the undersigned officer, personally appeared Jeffery Johnson, known to me (or satisfactorily proven) to be the person whose name is subscribed to the within instrument, and acknowledged that he executed the same for the purposes therein contained.

In witness hereof, I hereunto set my hand and official seal.

Notary Public



5D Survey Report

Apache Corporation

Field Name: *Apache NM (Nad 83 NMEZ)*

Site Name: *Thunderbird A 5H*

Well Name: *Thunderbird A 5H Lat*

File number: *13280620*

Survey: *Definitive survey*

29 July 2018





Thunderbird A 5H Lat

Field Name: Apache N#1 (Nad 83 NMEZ)	Map Units: US ft	Company Name: Apache Corporation	
	Vertical Reference Datum (VRD): Mean Sea Level		
	Projected Coordinate System: NAD83 / New Mexico East (ftUS)		
	Comment:		
Site: Thunderbird A 5H	Units: US ft	North Reference: Grid	Convergence Angle: 0.19
	Elevation above MSL: 3741.00 US ft		
	Comment: Eddy Co., New Mexico		
Slot: Thunderbird A 5H	Slot TVD Reference: Ground Elevation		
	Elevation above MSL: 3741.00 US ft		
	Comment:		
Well: Thunderbird A 5H Lat	Type: Sidetrack	UWI:	
	Parent: Thunderbird A 5H Pilot	Tie Point Method: MD	
	File Number: 13280620	Comment: H&P 482	
	Closure Distance: 7905.57 US ft	Closure Azimuth: 181.27°	
	Vertical Section: Position of Origin (Relative to Slot centre)		
	+N/-S: 0.00 US ft	+E/-W: 0.00 US ft	Az: 181.17°

Drill floor: Survey Name: Definitive Survey

Rig Height (Drill Floor): 26.00 US ft **Elevation above MSL:** 3767.00 US ft **Inclination:** 0.00° **Azimuth:** 0.00°

Survey Name: Definitive Survey

Date: 27/Apr/2018 **Survey Tool:** See Survey Tool Ranges below. **Comment:** **Company:**

Magnetic Model:

Model Name: HDGM **Date:** 23/Jul/2018 **Field Strength:** 48203.0 nT **Declination:** 7.43° **Dip:** 60.65°

Tie Point:

MD: 4013.50 US ft **Inclination:** 0.37° **Azimuth:** 28.85° **TVD:** 4012.75 US ft **North Offset:** 44.96 US ft **East Offset:** 41.74 US ft

SD Survey Report

Survey Tool Ranges:			
Name	Start MD(USFt)	End MD(USFt)	Source Survey
GYRO GC WIR+DPIPE GYD	0.00	4013.50	Phoenix Gyro
MWD	4013.50	4857.00	MWD 1
MWD	4857.00	12285.00	MWD 2

Wellpath created using minimum curvature.

Survey Points: (Relative to Slot centre)(TVD relative to Drill Floor)										
MD (US Ft)	Inc (°)	Az (°)	TVR (US Ft)	VS (US Ft)	N. Offset (US Ft)	E. Offset (US Ft)	DLS (1/100 US Ft)	Lightning (US Ft)	Flowing (US Ft)	Comment
4013.50	0.37	28.85	4012.75	-45.80	44.96	41.74	0.01	683719.66	651468.44	Phoenix Gyro
4135.00	13.49	182.67	4133.16	-31.92	31.08	41.27	11.38	683705.78	651467.97	Tleon Svy
4181.00	20.10	182.82	4177.17	-18.64	17.81	40.63	14.37	683692.51	651467.33	First WFT
4229.00	26.49	182.09	4221.23	0.33	-1.15	39.83	13.33	683673.55	651466.53	MWD Svy
4277.00	31.99	182.47	4263.10	23.76	-24.56	38.89	11.46	683650.14	651465.59	
4325.00	35.72	182.96	4302.96	50.49	-51.27	37.62	7.79	683623.43	651464.32	
4372.00	39.30	182.29	4340.23	79.09	-79.85	36.32	7.67	683594.85	651463.02	
4419.00	42.62	182.28	4375.72	109.89	-110.63	35.09	7.06	683564.07	651461.79	
4466.00	45.62	181.89	4409.46	142.61	-143.33	33.90	6.41	683531.37	651460.60	
4514.00	48.88	181.73	4442.04	177.85	-178.55	32.79	6.80	683496.15	651459.49	
4561.00	52.45	181.72	4471.82	214.19	-214.88	31.69	7.60	683459.82	651458.39	
4608.00	56.29	182.18	4499.20	252.38	-253.05	30.39	8.21	683421.65	651457.09	
4655.00	59.96	183.06	4524.01	292.27	-292.92	28.56	7.97	683381.78	651455.26	
4703.00	64.76	182.93	4546.27	334.76	-335.37	26.34	10.00	683339.33	651453.04	
4750.00	70.00	182.02	4564.34	378.12	-378.70	24.47	11.29	683296.00	651451.17	
4797.00	74.58	180.59	4578.64	422.88	-423.45	23.46	10.17	683251.25	651450.16	
4844.00	80.43	181.06	4588.80	468.74	-469.31	22.80	12.49	683205.39	651449.50	
4857.00	81.44	181.94	4590.85	481.58	-482.14	22.46	10.25	683192.56	651449.16	
4943.00	88.18	182.13	4598.63	567.17	-567.69	19.42	7.84	683107.01	651446.12	
5037.00	88.53	181.65	4601.32	661.12	-661.59	16.32	0.63	683013.11	651443.02	
5132.00	90.07	183.25	4602.49	756.09	-756.50	12.26	2.34	682918.20	651438.96	
5226.00	90.28	183.85	4602.20	850.00	-850.31	6.44	0.68	682824.39	651433.14	
5321.00	89.58	183.54	4602.31	944.91	-945.12	0.32	0.81	682729.58	651427.02	
5415.00	88.88	182.94	4603.58	1038.84	-1038.96	-4.99	0.98	682635.74	651421.71	
5510.00	91.40	184.63	4603.35	1133.73	-1133.74	-11.26	3.19	682540.96	651415.44	
5604.00	91.26	184.48	4601.16	1227.54	-1227.42	-18.72	0.22	682447.28	651407.98	
5699.00	91.05	184.36	4599.25	1322.37	-1322.11	-26.04	0.25	682352.59	651400.66	
5793.00	90.91	184.27	4597.64	1416.21	-1415.83	-33.12	0.18	682258.87	651393.58	
5888.00	90.49	184.15	4596.48	1511.07	-1510.57	-40.09	0.46	682164.13	651386.61	
5982.00	89.65	183.87	4596.37	1604.96	-1604.34	-46.66	0.94	682070.36	651380.04	
6077.00	89.44	184.06	4597.12	1699.84	-1699.11	-53.23	0.30	681975.59	651373.47	
6171.00	88.60	182.78	4598.73	1793.75	-1792.92	-58.84	1.63	681881.78	651367.86	
6266.00	88.88	183.24	4600.82	1888.68	-1887.77	-63.83	0.57	681786.93	651362.87	
6360.00	88.88	182.35	4602.65	1982.62	-1981.64	-68.41	0.95	681693.06	651358.29	
6454.00	89.16	182.59	4604.26	2076.58	-2075.54	-72.46	0.39	681599.16	651354.24	
6549.00	87.34	181.09	4607.16	2171.53	-2170.44	-75.51	2.48	681504.26	651351.19	
6643.00	87.13	180.69	4611.70	2265.42	-2264.32	-76.97	0.48	681410.38	651349.73	
6737.00	87.20	180.72	4616.35	2359.30	-2358.19	-78.12	0.08	681316.51	651348.58	
6832.00	88.95	180.46	4619.54	2454.24	-2453.13	-79.10	1.86	681221.57	651347.60	
6926.00	88.95	180.65	4621.26	2548.21	-2547.11	-80.01	0.20	681127.59	651346.69	
7021.00	88.67	180.29	4623.23	2643.19	-2642.09	-80.79	0.48	681032.61	651345.91	
7116.00	88.60	179.92	4625.50	2738.14	-2737.06	-80.96	0.40	680937.64	651345.74	
7210.00	88.18	179.73	4628.14	2832.08	-2831.02	-80.68	0.49	680843.68	651346.02	
7305.00	87.97	179.30	4631.33	2926.99	-2925.97	-79.87	0.50	680748.73	651346.83	
7399.00	88.81	180.39	4633.97	3020.92	-3019.93	-79.62	1.46	680654.77	651347.08	
7494.00	90.70	180.79	4634.38	3115.91	-3114.92	-80.60	2.03	680559.78	651346.10	
7589.00	90.98	180.11	4632.98	3210.89	-3209.90	-81.34	0.77	680464.80	651345.36	
7683.00	90.98	179.81	4631.38	3304.86	-3303.89	-81.28	0.32	680370.81	651345.42	
7778.00	91.19	179.71	4629.58	3399.81	-3398.87	-80.88	0.24	680275.83	651345.82	

SD Survey Report

Survey Points: (Relative to Slot centre)(TVD relative to Drill Floor)										
HP (US ft)	Inc (°)	Az (°)	TVD (US ft)	VS (US ft)	H. Offset (US ft)	E. Offset (US ft)	HS (%/1000S ft)	Northng (US ft)	Eastng (US ft)	Comment
7872.00	91.68	181.41	4627.22	3493.77	-3492.83	-81.80	1.88	680181.87	651344.90	
7966.00	90.42	182.87	4625.50	3587.74	-3586.75	-85.31	2.05	680087.95	651341.39	
8061.00	89.72	182.98	4625.38	3682.70	-3681.62	-90.15	0.75	679993.08	651336.55	
8155.00	90.07	183.46	4625.56	3776.63	-3775.47	-95.43	0.63	679899.23	651331.27	
8250.00	90.07	184.29	4625.44	3871.53	-3870.25	-101.85	0.87	679804.45	651324.85	
8345.00	89.23	182.89	4626.02	3966.44	-3965.06	-107.80	1.72	679709.64	651318.90	
8439.00	89.16	181.94	4627.34	4060.41	-4058.97	-111.76	1.01	679615.73	651314.94	
8530.00	89.23	181.64	4628.62	4151.39	-4149.92	-114.61	0.34	679524.78	651312.09	
8622.00	89.16	181.70	4629.91	4243.38	-4241.87	-117.29	0.10	679432.83	651309.41	
8715.00	89.02	181.55	4631.39	4336.36	-4334.82	-119.92	0.22	679339.88	651306.78	
8807.00	89.16	181.92	4632.85	4428.35	-4426.76	-122.71	0.43	679247.94	651303.99	
8899.00	89.02	181.93	4634.31	4520.33	-4518.70	-125.80	0.15	679156.00	651300.90	
8991.00	88.74	181.08	4636.11	4612.31	-4610.65	-128.21	0.97	679064.05	651298.49	
9083.00	88.46	178.97	4638.36	4704.26	-4702.62	-128.25	2.31	678972.08	651298.45	
9176.00	88.95	178.28	4640.46	4797.14	-4795.57	-126.02	0.91	678879.13	651300.68	
9267.00	89.09	178.82	4642.02	4888.03	-4886.52	-123.72	0.61	678788.18	651302.98	
9358.00	88.88	178.79	4643.63	4978.94	-4977.49	-121.82	0.23	678697.21	651304.88	
9449.00	89.23	180.13	4645.13	5069.88	-5068.47	-120.97	1.52	678606.23	651305.73	
9541.00	89.93	181.23	4645.80	5161.88	-5160.46	-122.06	1.42	678514.24	651304.64	
9633.00	90.07	181.58	4645.80	5253.88	-5252.43	-124.31	0.41	678422.27	651302.39	
9724.00	90.35	181.69	4645.47	5344.87	-5343.39	-126.91	0.33	678331.31	651299.79	
9816.00	90.21	181.29	4645.02	5436.87	-5435.36	-129.30	0.46	678239.34	651297.40	
9908.00	89.65	180.87	4645.13	5528.87	-5527.35	-131.04	0.76	678147.35	651295.66	
9999.00	89.65	180.87	4645.69	5619.87	-5618.33	-132.42	0.00	678056.37	651294.28	
10092.00	89.58	180.90	4646.31	5712.86	-5711.32	-133.85	0.08	677963.38	651292.85	
10184.00	89.16	180.61	4647.32	5804.85	-5803.31	-135.07	0.55	677871.39	651291.63	
10278.00	89.09	180.68	4648.76	5898.84	-5897.29	-136.12	0.11	677777.41	651290.58	
10369.00	88.60	180.55	4650.59	5989.82	-5988.27	-137.10	0.56	677686.43	651289.60	
10462.00	89.65	181.14	4652.01	6082.80	-6081.24	-138.47	1.30	677593.46	651288.23	
10524.00	89.86	180.85	4652.28	6144.80	-6143.23	-139.55	0.58	677531.47	651287.15	
10618.00	89.93	181.15	4652.45	6238.80	-6237.22	-141.19	0.33	677437.48	651285.51	
10713.00	90.28	180.98	4652.28	6333.80	-6332.20	-142.96	0.41	677342.50	651283.74	
10807.00	90.42	180.91	4651.70	6427.80	-6426.19	-144.51	0.17	677248.51	651282.19	
10902.00	90.77	180.80	4650.72	6522.79	-6521.17	-145.92	0.39	677153.53	651280.78	
10997.00	88.39	181.48	4651.41	6617.78	-6616.14	-147.81	2.61	677058.56	651278.89	
11091.00	88.81	181.09	4653.71	6711.75	-6710.09	-149.92	0.61	676964.61	651276.78	
11186.00	88.88	180.95	4655.63	6806.73	-6805.06	-151.61	0.16	676869.64	651275.09	
11280.00	89.02	180.76	4657.35	6900.72	-6899.03	-153.01	0.25	676775.67	651273.69	
11375.00	88.95	180.45	4659.03	6995.70	-6994.01	-154.02	0.33	676680.69	651272.68	
11469.00	89.09	180.28	4660.64	7089.67	-7087.99	-154.62	0.23	676586.71	651272.08	
11564.00	89.09	179.84	4662.15	7184.64	-7182.98	-154.71	0.46	676491.72	651271.99	
11659.00	90.00	181.33	4662.90	7279.63	-7277.97	-155.68	1.84	676396.73	651271.02	
11753.00	90.35	181.91	4662.61	7373.63	-7371.93	-158.34	0.72	676302.77	651268.36	
11848.00	90.42	181.40	4661.98	7468.62	-7466.89	-161.09	0.54	676207.81	651265.61	
11942.00	90.49	181.71	4661.23	7562.62	-7560.85	-163.64	0.34	676113.85	651263.06	
12037.00	90.63	181.92	4660.30	7657.61	-7655.80	-166.65	0.27	676018.90	651260.05	
12131.00	90.49	182.01	4659.38	7751.59	-7749.74	-169.87	0.18	675924.96	651256.83	
12216.00	90.42	182.29	4658.71	7836.58	-7834.68	-173.06	0.34	675840.02	651253.64	Last WFT MWD Svy
12285.00	90.42	182.29	4658.20	7905.56	-7903.62	-175.81	0.00	675771.08	651250.89	Proj to TD