



PHOENIX
TECHNOLOGY SERVICES

October 20, 2014

Oil Conservation Division
State of New Mexico
811 S. First St.
Artesia, New Mexico 88210

NM OIL CONSERVATION
ARTESIA DISTRICT

OCT 24 2014

Dear District 2 - Artesia

Attention: Regulatory Department

RECEIVED

Re: Apache Corporation
Raven Federal #21H
Eddy County, NM
API #30-015-40918
Job No. 1410583

Enclosed please find the Survey Data Certification, and the original Plat and one copy of the Survey Report performed on the above referenced Well by Phoenix Technology Services, Inc. (P-5 No. 664171). Other information required by your office is as follows:

Name & Title of Surveyor	Drain Hole Number	Surveyed Depths		Dates Performed		Type of Survey
		From	To	Start	End	
Jeff Broussard	21H	459	9,053	08/27/14	09/08/14	MWD

A certified plat on which the bottom hole location is oriented both to the surface location and to the lease lines (or unit lines in case of pooling) is attached to the survey report. If any other information is required, please contact the undersigned at the letterhead address and phone number.

Best Regards,

Dana Robinson

Dana Robinson
Operations Administrator
Certified mail receipt number: _____

7011 1570 0001 4365 2490

Phoenix Technology Services SURVEY DATA CERTIFICATION



PHOENIX
TECHNOLOGY SERVICES

PHOENIX JOB NUMBER

1410583

OPERATOR

Apache Corp

WELL NAME

Raven Federal #21H

COUNTY & STATE

Eddy County, NM

API WELL NUMBER

3001540918

PROPOSED DIRECTION

269.94

TIE-IN DATA						
MEASURED	VERTICAL			N-S	E-W	DATA
DEPTH	DEPTH	INCLIN	AZIMUTH	COORD	COORD	SOURCE
410 ft	409.94 ft	1.31	133.7 ft	-4.53 ft	4.62 ft	Gyro

FIRST SURVEY DATE	FIRST SURVEY DEPTH	INCLIN	AZIMUTH
27-Aug-14	459 ft	1.7	142.0

SURVEY INSTRUMENT
TYPE

Phoenix MWD

LAST SURVEY DATE	LAST SURVEY DEPTH	INCLIN	AZIMUTH
8-Sep-14	9,053 ft	91	267.8

TO THE BEST OF MY KNOWLEDGE I
CERTIFY THIS SURVEY DATA TO BE
TRUE AND CORRECT.

PROJECTED TD SURVEY DATE	PROJECTED TD SURVEY DEPTH	INCLIN	AZIMUTH
8-Sep-14	9,121 ft	91	267.8

Jeff Broussard

PRINT YOUR NAME ABOVE

Jeff Broussard

SIGN YOUR NAME ABOVE

8-Sep-14

TODAY'S DATE

MAGNETIC DECLINATION OR TOTAL GRID

TOTAL CORRECTION USED	
	7.16
DECLINATION OR GRID	GRID

MWD SUPERVISOR 1

Jeff Broussard

DIRECTIONAL DRILLER 1

Richard Thurman

MWD SUPERVISOR 2

Shelby Johnson

DIRECTIONAL DRILLER 2

Jon Woodgate

1805 Brittmore Road

Houston, Texas 77043

(713)3370609 (Voice), (713)337-0599 (Fax)

NM OIL CONSERVATION
ARTESIA DISTRICT
OCT 24 2014

DISTRICT I
1625 N. South Dr., Hobbs, NM 88240
Phone: (505) 393-6161 Fax: (505) 393-0720
DISTRICT II
811 S. First St., Aztec, NM 88210
Phone: (505) 748-4881 Fax: (505) 748-9720
DISTRICT III
1000 Rio Brazos Road, Aztec, NM 87410
Phone: (505) 334-6178 Fax: (505) 334-6170
DISTRICT IV
1220 S. St. Francis Dr., Santa Fe, NM 87505
Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
Energy, Minerals & Natural Resources Department
OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, New Mexico 87505

Form C-102
Revised August 1, 2011
Submit one copy to appropriate
District Office

DAMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

API Number 30-015-40918	Pool Code 96831	Pool Name Cedar Lake; Glorieta - Yeso
Property Code 39330	Property Name RAVEN FEDERAL	Well Number 21H
OGRID No. 873	Operator Name APACHE CORPORATION	Elevation 3716'

Surface Location

UL or lot No.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
P	7	17-S	31-E		330	SOUTH	180	EAST	EDDY

Bottom Hole Location If Different From Surface

UL or lot No.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
4	7	17-S	31-E		330	SOUTH	330	WEST	EDDY

Dedicated Acres	Joint or Infill	Consolidation Code	Order No.
151.89			

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION

1 31.57 AC. 2 31.68 AC. 3 31.78 AC. 4 31.89 AC.	GEODETIC COORDINATES NAD 27 NME SURFACE LOCATION Y=670504.1 N X=632919.7 E LAT.=32.842553" N LONG.=103.900550" W LAT.=32' 50' 33" N LONG.=103' 54' 02" W BOTTOM HOLE LOCATION Y=670474.3 N X=628416.4 E	OPERATOR CERTIFICATION I hereby certify that the information herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division. <u>Sorina P. Flores</u> 7/8/12 Signature Date <u>Sorina P. Flores</u> Printed Name <u>sorina.flores@apachecorp.com</u> E-mail Address	
	CORNER COORDINATES TABLE Ⓐ - Y=671462.0 N, X=628083.4 E Ⓑ - Y=671495.1 N, X=633093.9 E Ⓒ - Y=670142.2 N, X=628087.6 E Ⓓ - Y=670175.3 N, X=633101.5 E		SURVEYOR CERTIFICATION I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief. JULY 9, 2012 Date of Survey <u>Ronald J. Eidson</u> Signature & Seal of Professional Surveyor <u>Ronald J. Eidson</u> 07/18/2012 Certificate Number: Gary G. Eidson 12641 Ronald J. Eidson 3239 AF JWSC W.O.: 12.11.1230
	DETAIL 3711.0' 3718.6' 3721.5' 3725.8' 600' 500'		
	HORIZ. DIST. = 4504.4' GRID. AZ. = 269°37'14" 180' S.L. 330' SEE DETAIL		



Apache Corporation

Eddy County, NM (NAD27 NME)

Raven Federal

#21H

WB1/Job #1410583

Survey: Phoenix MWD Survey

Standard Survey Report

08 September, 2014



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #21H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3727.00usft (Capstar 114)
Site:	Raven Federal	MD Reference:	KB @ 3727.00usft (Capstar 114)
Well:	#21H	North Reference:	Grid
Wellbore:	WB1/Job #1410583	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB

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:	Raven Federal		
Site Position:		Northing:	673,239.70 usft
From:	Map	Easting:	633,303.50 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 51' 0.24298 N
		Longitude:	103° 53' 57.35087 W
		Grid Convergence:	0.24 °

Well:	#21H		
Well Position	+N/-S	0.00 usft	Northing: 670,504.10 usft
	+E/-W	0.00 usft	Easting: 632,919.70 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft
		Latitude:	32° 50' 33.18951 N
		Longitude:	103° 54' 1.98123 W
		Ground Level:	3,716.00 usft

Wellbore						WB1/Job #1410583					
Magnetics		Model Name		Sample Date		Declination (°)		Dip Angle (°)		Field Strength (nT)	
		IGRF2010_14		08/21/14		7.39		60.62		48,631	

Design:	Surveys (Capstar 114)			
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	269.94

Survey Program	Date	09/08/14		
From	To	Survey (Wellbore)	Tool Name	Description
(usft)	(usft)			
100.00	410.00	Gyrodata Gyro Survey (WB1/Job #1410583)	NS-GYRO-MS	North sensing gyrocompassing m/s
459.00	9,121.00	Phoenix MWD Survey (WB1/Job #1410583)	PHX+MWD+BGGM	PHX+MWD+BGGM v3: standard declination

Survey									
Measured Depth	Inclination	Azimuth	Vertical Depth	+N/-S	+E/-W	Vertical Section	Dogleg Rate	Build Rate	Turn Rate
(usft)	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(°/100usft)	(°/100usft)	(°/100usft)
410.00	1.31	133.70	409.94	-4.53	4.62	-4.62	0.00	0.00	0.00
Tie on to Gyrodata Survey									
459.00	1.70	142.00	458.92	-5.49	5.47	-5.47	0.91	0.80	16.94
First Phoenix MWD Survey									
588.00	0.90	80.60	587.89	-6.83	7.65	-7.64	1.16	-0.62	-47.60
716.00	1.60	7.20	715.87	-4.89	8.87	-8.86	1.25	0.55	-57.34
844.00	3.10	352.50	843.76	0.31	8.64	-8.64	1.25	1.17	-11.48
976.00	3.50	350.60	975.54	7.83	7.52	-7.52	0.31	0.30	-1.44
1,103.00	4.30	334.80	1,102.25	15.96	4.86	-4.87	1.05	0.63	-12.44

Company:	Apache Corporation	Local Co-ordinate Reference:	Well #21H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3727.00usft (Capstar 114)
Site:	Raven Federal	MD Reference:	KB @ 3727.00usft (Capstar 114)
Well:	#21H	North Reference:	Grid
Wellbore:	WB1/Job #1410583	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB

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)
1,234.00	2.30	309.20	1,233.03	22.06	0.73	-0.75	1.86	-1.53	-19.54
1,365.00	1.20	228.00	1,363.98	22.81	-2.33	2.31	1.85	-0.84	-61.98
1,494.00	1.60	228.20	1,492.94	20.70	-4.68	4.66	0.31	0.31	0.16
1,625.00	1.30	206.40	1,623.90	18.15	-6.70	6.68	0.48	-0.23	-16.64
1,753.00	1.80	187.40	1,751.86	14.86	-7.61	7.59	0.56	0.39	-14.84
1,882.00	1.90	195.20	1,880.79	10.79	-8.43	8.42	0.21	0.08	6.05
2,010.00	1.90	192.20	2,008.72	6.66	-9.43	9.42	0.08	0.00	-2.34
2,138.00	1.20	196.50	2,136.67	3.31	-10.26	10.26	0.55	-0.55	3.36
2,266.00	1.20	206.40	2,264.64	0.82	-11.24	11.24	0.16	0.00	7.73
2,395.00	1.40	224.30	2,393.61	-1.52	-12.94	12.94	0.35	0.16	13.88
2,522.00	0.80	227.40	2,520.59	-3.23	-14.67	14.68	0.47	-0.47	2.44
2,650.00	0.40	331.90	2,648.58	-3.44	-15.54	15.55	0.77	-0.31	81.64
2,779.00	0.70	310.80	2,777.57	-2.53	-16.35	16.35	0.28	0.23	-16.36
2,907.00	1.20	309.50	2,905.56	-1.16	-17.98	17.98	0.39	0.39	-1.02
3,038.00	1.10	300.20	3,036.53	0.34	-20.12	20.12	0.16	-0.08	-7.10
3,167.00	1.20	317.50	3,165.51	1.96	-22.11	22.10	0.28	0.08	13.41
3,295.00	1.20	318.60	3,293.48	3.95	-23.90	23.89	0.02	0.00	0.86
3,460.00	1.30	322.50	3,458.44	6.74	-26.18	26.17	0.08	0.06	2.36
3,584.00	1.30	334.20	3,582.41	9.12	-27.65	27.64	0.21	0.00	9.44
3,712.00	1.80	51.50	3,710.37	11.68	-26.71	26.69	1.54	0.39	60.39
3,841.00	2.50	55.90	3,839.28	14.51	-22.79	22.78	0.56	0.54	3.41
3,969.00	3.30	70.40	3,967.12	17.32	-17.01	16.99	0.84	0.63	11.33
4,097.00	4.00	72.60	4,094.86	19.89	-9.28	9.26	0.56	0.55	1.72
4,226.00	3.00	68.20	4,223.61	22.49	-1.85	1.83	0.80	-0.78	-3.41
4,311.00	1.90	58.60	4,308.53	24.05	1.42	-1.44	1.38	-1.29	-11.29
4,371.00	1.60	293.20	4,368.52	24.89	1.50	-1.52	5.19	-0.50	-209.00
4,414.00	7.00	281.50	4,411.39	25.65	-1.62	1.60	12.66	12.56	-27.21
4,456.00	13.50	281.60	4,452.69	27.15	-8.94	8.91	15.48	15.48	0.24
4,499.00	19.90	280.00	4,493.86	29.43	-21.08	21.05	14.92	14.88	-3.72
4,542.00	25.80	275.40	4,533.47	31.59	-37.62	37.58	14.33	13.72	-10.70
4,584.00	31.00	269.80	4,570.41	32.41	-57.55	57.52	13.90	12.38	-13.33
4,627.00	36.80	269.90	4,606.08	32.35	-81.52	81.49	13.49	13.49	0.23
4,670.00	42.30	273.30	4,639.23	33.16	-108.87	108.84	13.74	12.79	7.91
4,713.00	46.40	275.10	4,669.97	35.38	-138.84	138.80	9.97	9.53	4.19
4,756.00	50.50	274.10	4,698.49	37.95	-170.91	170.87	9.69	9.53	-2.33
4,798.00	55.40	272.30	4,723.79	39.80	-204.37	204.32	12.16	11.67	-4.29
4,841.00	59.60	271.20	4,746.89	40.90	-240.61	240.56	10.00	9.77	-2.56
4,884.00	62.80	272.00	4,767.60	41.96	-278.27	278.22	7.62	7.44	1.86
4,927.00	66.90	271.40	4,785.87	43.11	-317.17	317.12	9.62	9.53	-1.40
4,970.00	72.00	269.70	4,800.96	43.49	-357.41	357.37	12.42	11.86	-3.95
5,012.00	74.50	267.80	4,813.07	42.60	-397.62	397.57	7.36	5.95	-4.52
5,055.00	77.10	267.10	4,823.61	40.75	-439.26	439.21	6.25	6.05	-1.63
5,098.00	80.90	267.70	4,831.82	38.84	-481.41	481.37	8.94	8.84	1.40

Company:	Apache Corporation	Local Co-ordinate Reference:	Well #21H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3727.00usft (Capstar 114)
Site:	Raven Federal	MD Reference:	KB @ 3727.00usft (Capstar 114)
Well:	#21H	North Reference:	Grid
Wellbore:	WB1/Job #1410583	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB

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)
5,141.00	86.60	269.30	4,836.50	37.72	-524.13	524.09	13.76	13.26	3.72
5,187.00	89.60	269.90	4,838.02	37.40	-570.09	570.05	6.65	6.52	1.30
5,315.00	90.30	269.50	4,838.13	36.73	-698.09	698.05	0.63	0.55	-0.31
5,446.00	90.30	268.80	4,837.45	34.79	-829.07	829.04	0.53	0.00	-0.53
5,574.00	90.20	268.40	4,836.89	31.66	-957.03	957.00	0.32	-0.08	-0.31
5,702.00	91.80	268.60	4,834.65	28.31	-1,084.97	1,084.94	1.26	1.25	0.16
5,831.00	92.40	268.70	4,829.93	25.27	-1,213.84	1,213.82	0.47	0.47	0.08
5,962.00	91.30	269.70	4,825.70	23.44	-1,344.76	1,344.73	1.13	-0.84	0.76
6,090.00	91.20	269.30	4,822.91	22.33	-1,472.72	1,472.70	0.32	-0.08	-0.31
6,218.00	91.60	269.00	4,819.78	20.43	-1,600.67	1,600.65	0.39	0.31	-0.23
6,347.00	91.60	268.90	4,816.18	18.07	-1,729.60	1,729.58	0.08	0.00	-0.08
6,474.00	91.70	269.20	4,812.52	15.96	-1,856.53	1,856.51	0.25	0.08	0.24
6,607.00	92.00	268.90	4,808.23	13.76	-1,989.44	1,989.42	0.32	0.23	-0.23
6,736.00	90.40	269.60	4,805.52	12.07	-2,118.40	2,118.38	1.35	-1.24	0.54
6,864.00	90.10	268.90	4,804.97	10.39	-2,246.38	2,246.37	0.59	-0.23	-0.55
6,993.00	89.50	270.00	4,805.42	9.16	-2,375.37	2,375.36	0.97	-0.47	0.85
7,124.00	91.00	270.50	4,804.84	9.73	-2,506.37	2,506.36	1.21	1.15	0.38
7,255.00	91.20	270.60	4,802.33	10.98	-2,637.34	2,637.32	0.17	0.15	0.08
7,383.00	91.30	270.40	4,799.54	12.10	-2,765.30	2,765.29	0.17	0.08	-0.16
7,512.00	91.40	270.00	4,796.50	12.55	-2,894.26	2,894.25	0.32	0.08	-0.31
7,640.00	91.50	269.30	4,793.26	11.77	-3,022.22	3,022.21	0.55	0.08	-0.55
7,768.00	91.60	268.90	4,789.80	9.76	-3,150.16	3,150.15	0.32	0.08	-0.31
7,896.00	91.60	268.60	4,786.22	6.97	-3,278.08	3,278.07	0.23	0.00	-0.23
8,025.00	91.60	267.90	4,782.62	3.03	-3,406.97	3,406.96	0.54	0.00	-0.54
8,153.00	90.40	268.60	4,780.39	-0.88	-3,534.88	3,534.88	1.09	-0.94	0.55
8,282.00	90.90	270.00	4,778.92	-2.45	-3,663.86	3,663.86	1.15	0.39	1.09
8,410.00	89.80	270.70	4,778.14	-1.67	-3,791.85	3,791.85	1.02	-0.86	0.55
8,539.00	89.70	269.80	4,778.70	-1.11	-3,920.85	3,920.85	0.70	-0.08	-0.70
8,666.00	89.70	269.30	4,779.37	-2.11	-4,047.84	4,047.84	0.39	0.00	-0.39
8,794.00	89.90	268.30	4,779.82	-4.79	-4,175.81	4,175.82	0.80	0.16	-0.78
8,925.00	91.40	269.20	4,778.33	-7.64	-4,306.77	4,306.77	1.34	1.15	0.69
9,053.00	91.00	267.80	4,775.65	-10.99	-4,434.69	4,434.70	1.14	-0.31	-1.09
Last Phoenix MWD Survey									
9,121.00	91.00	267.80	4,774.46	-13.60	-4,502.63	4,502.65	0.00	0.00	0.00
Projection to TD									

Survey Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
410.00	409.94	-4.53	4.62	Tie-on to Gyrodata Survey	
459.00	458.92	-5.49	5.47	First Phoenix MWD Survey	
9,053.00	4,775.65	-10.99	-4,434.69	Last Phoenix MWD Survey	
9,121.00	4,774.46	-13.60	-4,502.63	Projection to TD	



Phoenix Technology Services

Survey Report



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #21H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3727.00usft (Capstar 114)
Site:	Raven Federal	MD Reference:	KB @ 3727.00usft (Capstar 114)
Well:	#21H	North Reference:	Grid
Wellbore:	WB1/Job #1410583	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB

Checked By: _____	Approved By: _____	Date: _____
-------------------	--------------------	-------------