Form 3160-5
(August 2007)

OCD Artesia

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OMB NO. 1004-0135
Expires: July 31, 2010

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE - Other instructions on reverse side.

5. Lease Serial No.
NMLC029435A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☒ Oil Well ☐ Gas Well ☐ Other

8. Well Name and No.
RAVEN FEDERAL 17H

2. Name of Operator
APACHE CORPORATION
Contact: SORINA FLORES
E-Mail: sorina.flores@apachecorp.com

9. API Well No.
30-015-40914-00-X1

3a. Address
303 VETERANS AIRPARK LANE SUITE 3000
MIDLAND, TX 79705

3b. Phone No. (include area code)
Ph: 432-818-1167

10. Field and Pool, or Exploratory
CEDAR LAKE

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
Sec 7 T17S R31E NENE 662FNL 1000FEL

11. County or Parish, and State
EDDY COUNTY, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☒ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☒ Other Change to Original APD
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

BLM-CO-1463 NATIONWIDE / NMB000736

Apache proposes to change the csg/cmt for the Raven Federal #17H as follows:

CSG PROGRAM:

HOLE	DEPTH	OD CSG	WT	GRADE	COLLAR	COLLAPSE	BURST	TENSION
17-1/2"	0-405'	13-3/8"	54.5#	J55	STC	5.84	1.49	23.29
12-1/4"	0-3500'	9-5/8"	40#	J55	LTC	2.56	1.44	3.60
8-3/4"	0-4922'	7"	29#	L80	LTC	3.03	2.86	3.85
8-3/4"	4922-5691'	5-1/2"	20#	L80	LTC	3.19	3.41	17.84
7-7/8"	5691-8869'	5-1/2"	20#	L80	LTC	3.19	3.41	17.84

NM OIL CONSERVATION
ARTESIA DISTRICT
JAN 20 2015
RECEIVED

SEE ATTACHED FOR CONDITIONS OF APPROVAL

Accepted for record
NMOCD
2/16/15

14. I hereby certify that the foregoing is true and correct.
Electronic Submission #258717 verified by the BLM Well Information System
For APACHE CORPORATION, sent to the Carlsbad
Committed to AFMSS for processing by JENNIFER MASON on 01/05/2015 (15JAM0170SE)

Name *(Printed/Typed)* SORINA FLORES — Title SUBMITTING CONTACT

Signature (Electronic Submission) — Date 08/27/2014

APPROVED
JAN 14 2015
BUREAU OF LAND MANAGEMENT
CARLSBAD FIELD OFFICE

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved By _____ Title _____ Date

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

**** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ****

Additional data for EC transaction #258717 that would not fit on the form

32. Additional remarks, continued

Production csg will be a tapered string w/7" csg f/surf to KOP(cmtd through a stage tool f/ KOP to 2500'), uncemented 5-1/2" csg f/ KOP to LP, & 5-1/2" csg with packers & sleeves f/ LP to TD. The Glorieta formation will be isolated f/the San Andres w/two hydraulic-set open hole packers in 5-1/2" csg, one 50' above & 50' below the top of Glorieta formation.

Collapse load case for 9-5/8" csg assumes the csg is not fully evacuated. Fluid level drops to 1500' during lost circ.

CMT PROGRAM:
Surf (TOC-Surf) 100% excess cmt; cmt with:
Single Slurry: 520sx CL C w/2% CaCL2(14.8wt, 1.34yld, 6.31 gal wtr/sk)
Comp Strengths: 12hr - 1972psi 24hr - 3168psi

Interm (TOC-surf) 50% excess cmt; cmt with:
Lead: 780sx 35/65 Poz C w/6% gel+5% Salt (12.9wt, 1.92yld, 9.92 gal wtr/sk)
Comp Strengths: 12hr - 820psi 24hr - 1189psi
Tail: 290sx Cl C(14.8wt, 1.33yld, 6.31 gal wtr/sk)
Comp Strengths: 12hr - 1120psi 24hr - 2106psi

Prod (TOC: ~2500' f/surf) 35% excess cmt; cmt with:
Lead:350sx PVL w/1.3% Salt, 0.3% Retarder (13.0wt, 1.48yld, 7.58gal wtr/sk)
Comp Strengths: 12hr - 1100psi 24hr - 1755psi

**** PLEASE SEE ATTACHMENT FOR ADDITIONAL SUNDRY INFORMATION; ADDITIONAL INFORMATION DID NOT FIT ONLINE*****

DRILLING PLAN: BLM COMPLIANCE
(Supplement to BLM 3160-3)

APACHE CORPORATION (OGRID: 873) RAVEN FEDERAL #17H

Lease #: NMLC-029435A Projected TVD: ~5400' MD: ~8869' GL: 3746'
SHL: 662' FNL & 1000' FEL UL: A SEC: 7 BHL: 662' FNL & 330' FWL LOT: 1 SEC: 7
T17S R31E EDDY COUNTY, NM

1. GEOLOGIC NAME OF SURFACE FORMATION: Eolian/Piedmond Alluvial Deposits

2. ESTIMATED TOPS OF GEOLOGICAL MARKERS & DEPTHS OF ANTICIPATED FRESH WATER, OIL OR GAS:

Quaternary Aeolian	Surf	Queen	2445'
Rustler	322'	Grayburg	2819'
Salt Top	544'	San Andres	3170' (Oil)
Salt Bottom	1391'	Glorieta	4638'
Yates	1554'	Yeso (Paddock)	4684' (Oil)
Seven Rivers	1799'	Upper Blinebry	5162' (Oil)
		TVD / MD	~5400' / ~8869'

Avg Depth to Ground Water: ~91'

All fresh water & prospectively valuable minerals, as described by BLM, encountered during drilling, will be recorded by depth and adequately protected. All oil & gas shows within zones of correlative rights will be tested to determine commercial potential. The surface fresh water sands will be protected by setting 13-3/8" csg @ 405' & circ cmt back to surface. All intervals will be isolated by setting 5-1/2" csg to TD & circ cmt above the base of 8-5/8" csg.

3. CASING PROGRAM: All casing is new & API approved

STRING	HOLE SIZE	DEPTH	OD CSG	WEIGHT	COLLAR	GRADE	COLLAPSE	BURST	TENSION
Surface	17-1/2"	0' – 405'	13-3/8"	54.5#	STC	J-55	5.84	1.49	23.29
Intermediate	12-1/4"	0' - 3500'	9-5/8"	40#	LTC	J-55	2.56	1.44	3.60
Production 7"	8-3/4"	0' - 4922'	7"	29#	LTC	L-80	3.03	2.86	3.85
Production 5-1/2"	8-3/4" 7-7/8"	4922' – 5691' 5691' – 8869'	5-1/2"	20#	LTC	L-80	3.19	3.41	17.84

*Production casing will be a tapered string with 7" casing from surface to KOP (cemented through a stage tool from KOP to 2500'), uncemented 5-1/2" casing from KOP to LP and 5-1/2" casing with packers and sleeves from LP to TD.

Collapse load case for 9-5/8" casing assumes that the casing is not fully evacuated. Fluid level drops to 1500' during lost circulation.

4. CEMENT PROGRAM:

A. Surface (TOC – Surface) **100% excess cmt Cmt with:**
Tail: 520 sx Cl C w/1% CACL2 *(14.8 wt, 1.34 yld, 6.31 gal/sk)*
*Compressive Strengths: **12 hr** – 1972 psi **24 hr** – 3168 psi*

B. Intermediate (TOC – Surface) **50% excess cmt. Cmt with:**
Lead: 780 sx 35/65 Poz C w/6% Gel + 5% Salt *(12.9 wt, 1.92 yld, 9.92 gal/sk)*
*Compressive Strengths: **12 hr** – 820 psi **24 hr** – 1189 psi*

Tail: 290 sx Class C (14.8 wt, 1.33 yld, 6.31 gal/sk)
*Compressive Strengths: **12 hr** – 1120 psi **24 hr** – 2106 psi*

C. Production (TOC: ~2500' from Surface) **35% excess cmt Cmt with:**
Lead: 350 sx PVL w/1.3% Salt + 0.3% Retarder *(13.0 wt, 1.48 yld, 7.58 gal/sk)*
*Compressive Strengths: **12 hr** – 1100 psi **24 psi** – 1755 psi*

***** The above cmt volumes could be revised based on fluid caliper measurement in the open hole.** For Surface csg: If cmt does not circ to surface, the appropriate BLM office shall be notified. The TOC shall be determined as directed by the BLM for the specific set of circumstances. Operator will propose a remediation method and request BLM approval.*

5. PROPOSED CONTROL EQUIPMENT

"Exhibit 3" shows an 11" 3M psi WP BOP consisting of an annular bag type preventer, middle pipe rams and bottom blind rams. This BOP will be nippled up on the 13-3/8" surface casing and tested to 70% of casing burst. After the 9-5/8" intermediate csg is set & cmt'd, the 11" 3M BOP will be installed & utilized continuously until TD is reached. The BOP will be tested at 2000 psi, maximum surface pressure is not expected to exceed 2M psi. BHP is calculated to be approximately 2400 psi. *All BOP's & associated equipment will be tested as per BLM *Drilling Operations Order #2*. The BOP will be operated & checked each 24 hr period & blind rams will be operated & checked when the drill pipe is out of the hole. Function tests will be documented on the daily driller's log. *"EXHIBIT 3"* also shows a 3M psi choke manifold with a 3" blow down line. Full opening stabbing valve & Kelly cock will be on derrick floor in case of need. No abnormal pressures or temperatures are expected in this well. No nearby wells have encountered any well control problems.

6. AUXILIARY WELL CONTROL EQUIPMENT / MONITORING EQUIPMENT:

11" x 3000 psi Double BOP (Blind & Pipe Rams) & Annular Preventers (3M BOP/BOPE to be used as 2M system)
4-1/2" x 3000 psi Kelly valve
11" x 3000 psi mud cross – H2S detector on production hole
Gate-type safety valve - 3" choke line from BOP to manifold
2" adjustable chokes – 3" blow down line
Fill up line as per Onshore Order 2

7. PROPOSED MUD CIRCULATION SYSTEM: (Closed Loop System)

INTERVAL	MW (ppg)	VISC (sec/qt)	FLUID LOSS (cc)	MUD TYPE
0' –405'	8.3 – 8.8	28 – 36	NC	FW
405' - 3500'	9.8 – 10.0	28 – 29	NC	Saturated Brine
3500' – 8869'	9.3 – 9.6	28 - 29	NC	Cut Brine

***** Visual mud monitoring equipment shall be in place to detect volume changes. A mud test shall be performed every 24 hrs after mudding up to determine, as applicable: density, visc, gel strength, filtration, and pH. The necessary mud products for weight addition & fluid loss control will be on location at all times.***

8. LOGGING, CORING & TESTING PROGRAM:

A. No cores, DST's, or Open Hole logs are planned at this time.
B. Mudloggers from Intermediate Casing point to TD.
C. Additional testing will be initiated subsequent to setting the 7" & 5-1/2" tapered production casing. Specific intervals will be targeted based on geological sample shows.

9. POTENTIAL HAZARDS:

No abnormal pressures or temperatures are anticipated. In the event abnormal pressures are encountered, however, the proposed mud program will be modified to increase the mud-weight. There is known presence of H_2S in this area. If H_2S is encountered the operator will comply with the provisions of *Onshore Oil & Gas Order No. 6.* All personnel will be familiar with all aspects of safe operation of equipment being used to drill this well. Estimated BHP: ~2400 psi and estimated BHT : 110°.

See COA.

10. ANTICIPATED STARTING DATE AND DURATION OF OPERATIONS:

Road and location construction will begin after BLM has approved APD. Anticipated spud date will be after BLM approval and as soon as rig is available. Move in operations and drilling is expected to take ~16 days. If production casing is run then an additional 90 days will be needed to complete well and construct surface facilities and/or lay flow lines in order to place well on production.

11. OTHER FACETS OF OPERATION:

After running csg, cased hole Gamma Ray, Neutron Collar logs will be run from TD back to all possible productive zones. The Fren; Glorieta-Yeso formation will be stimulated in order to establish production. The well will be tested & potentialed as an oil well.

Apache
EXPLORING WHAT'S POSSIBLE

Project: Eddy County, NM (NAD27 NME)
Site: Raven Federal
Well: #17H
Wellbore: WB1
Design: Plan#3 08-25-12
Rig: Capstar 114

PHOENIX
TECHNOLOGY SERVICES

Azimuths to Grid North
True North: -0.23°
Magnetic North: 7.16°

Magnetic Field
Strength: 48636.6snT
Dip Angle: 60.63°
Date: 08/25/2014
Model: IGRF2010_14

WELL DETAILS

Ground Level: 3745.00

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.00	0.00	674786.70	632075.00	32° 51' 15.60043 N	103° 54' 11.67775 W

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
2	4922.99	0.00	0.00	4922.99	0.00	0.00	0.00	0.00	0.00		KOP, Start 12°/100' Build
3	5691.32	92.20	269.62	5400.10	-3.29	-495.78	12.00	269.62	495.79		LP, Hold 92.20° Inc, 269.62° Azm
4	6856.49	92.20	269.62	5350.00	-11.94	-1799.96	0.00	0.00	1800.00	M1-Raven Fed 17H	Begin 2°/100' Drop
5	7030.29	91.52	269.62	5348.90	-12.16	-1833.74	2.00	-179.88	1833.78		Hold 91.52° Inc, 269.62° Azm
6	8869.04	91.52	269.62	5300.00	-24.40	-3671.80	0.00	0.00	3671.88	BHL Raven Fed 17H	TD at 8869.04

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
BHL Raven Fed 17H	5300.00	-24.40	-3671.80	674762.30	628403.20	32° 51' 15.50490 N	103° 54' 54.72258 W	Point
	- plan hits target center							
M1-Raven Fed 17H	5350.00	-11.94	-1799.96	674774.76	630275.04	32° 51' 15.55435 N	103° 54' 32.77684 W	Point
	- plan hits target center							

Map System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone Name: New Mexico East 3001

Local Origin: Well #17H, Grid North

Latitude: 32° 51' 15.60043 N
Longitude: 103° 54' 11.67775 W

Grid East: 632075.00
Grid North: 674786.70
Scale Factor: 1.000

Geomagnetic Model: IGRF2010_14
Sample Date: 25-Aug-14
Magnetic Declination: 7.39°
Dip Angle from Horizontal: 60.63°
Magnetic Field Strength: 48637

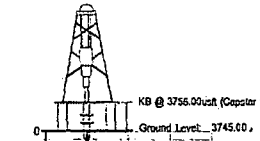
To convert a Magnetic Direction to a Grid Direction, Add 7.16°
To convert a Magnetic Direction to a True Direction, Add 7.39° East
To convert a True Direction to a Grid Direction, Subtract 0.23°

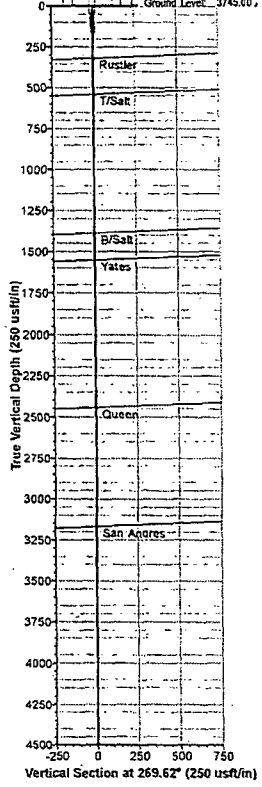
FORMATION TOP DETAILS

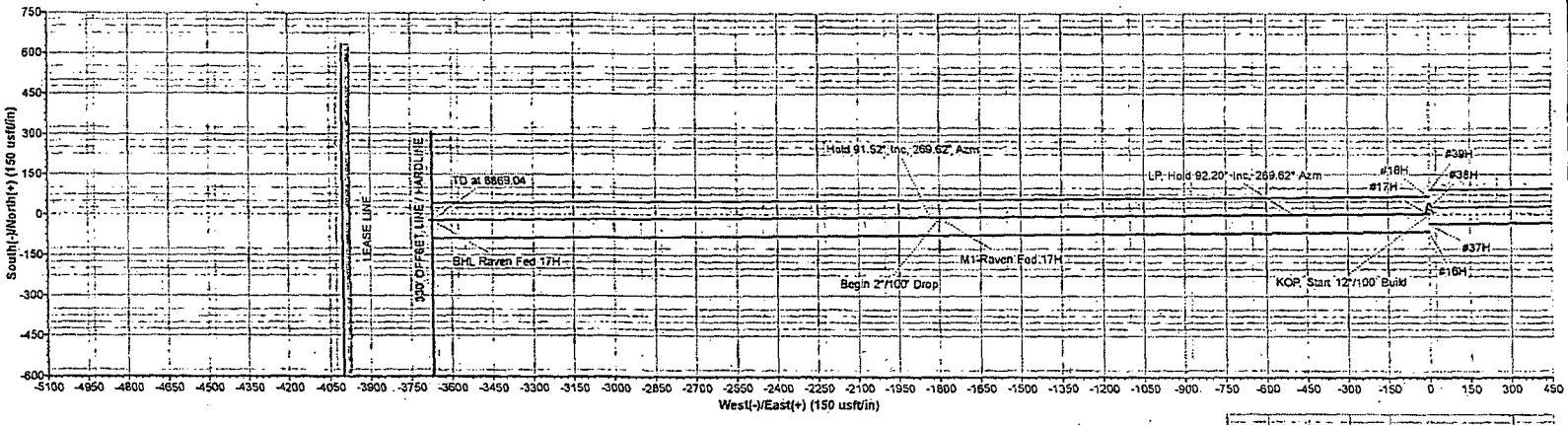
TVDPath	MDPath	Formation	DipAngle	DipDir
322.00	322.00	Rustler	-2.38	269.62
544.00	544.00	T/Salt	-2.38	269.62
1391.00	1391.00	B/Salt	-2.38	269.62
1554.00	1554.00	Yates	-2.38	269.62
2445.00	2445.00	Queen	-2.38	269.62
3170.00	3170.00	San Andres	-2.38	269.62
4638.00	4638.00	Glorieta	-2.38	269.62
4684.00	4684.00	Paddock	-2.38	269.62
5159.40	5170.31	Upper Blinebry	-2.38	269.62

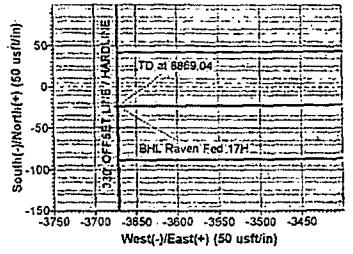
LEGEND

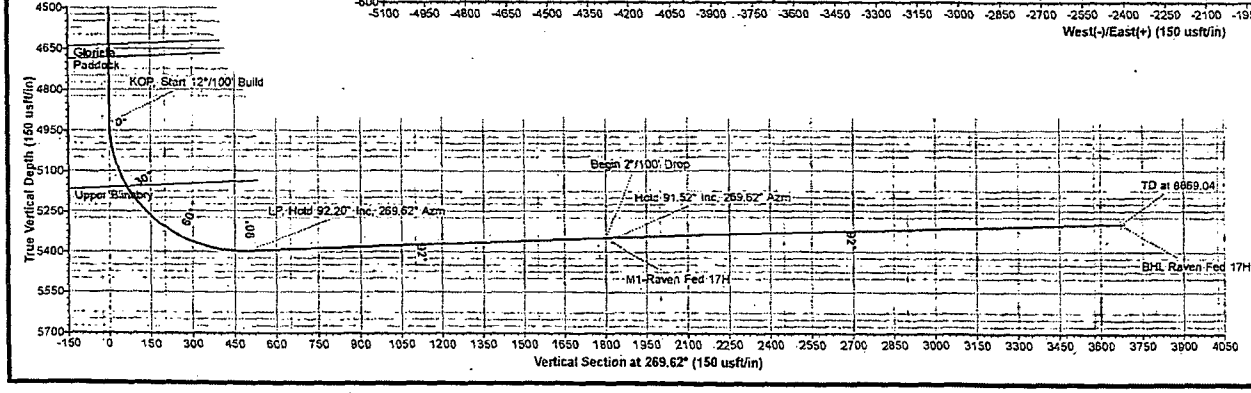
- #18H, WB1, Plan#3 08-25-12 V0
- #16H, WB1, Plan#3 08-25-12 V0
- #38H, WB1, Plan#1 07-19-12 V0
- #37H, WB1, Plan#1 07-19-12 V0
- #39H, Wellbore #1, Plan#1 071912 V0
- Plan#3 08-25-12

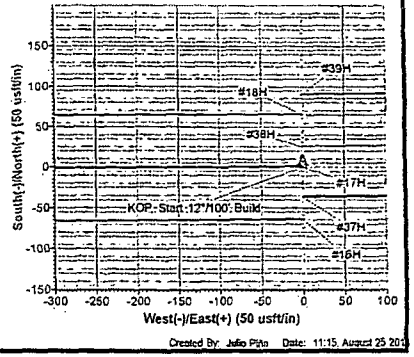












Created By: Julio Pina Date: 11:15, August 25 201

Apache

EXPLORING WHAT'S POSSIBLE

Apache Corporation

Eddy County, NM (NAD27 NME)
Raven Federal
#17H

WB1

Plan: Plan#3 08-25-12

Standard Planning Report

25 August, 2014

PHOENIX
TECHNOLOGY SERVICES

Database:	GCR DB	Local Co-ordinate Reference:	Well #17H
Company:	Apache Corporation	TVD Reference:	KB @ 3756.00usft (Capstar 114)
Project:	Eddy County, NM (NAD27 NME)	MD Reference:	KB @ 3756.00usft (Capstar 114)
Site:	Raven Federal	North Reference:	Grid
Well:	#17H	Survey Calculation Method:	Minimum Curvature
Wellbore:	WB1		
Design:	Plan#3 08-25-12		

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

Well #17H

Well Position	+N/-S	1,547.00 usft	Northing:	674,786.70 usft	Latitude:	32° 51' 15.60043 N
	+E/-W	-1,228.50 usft	Easting:	632,075.00 usft	Longitude:	103° 54' 11.67775 W
Position Uncertainty		0.00 usft	Wellhead Elevation:		Ground Level:	3,745.00 usft

Wellbore WB1

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010_14	08/25/14	7.39	60.63	48,637

Design Plan#3 08-25-12

Audit Notes:			
Version:	Phase:	PLAN	Tie On Depth: 0.00

Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	269.62

Plan Sections

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4,922.99	0.00	0.00	4,922.99	0.00	0.00	0.00	0.00	0.00	0.00	
5,691.32	92.20	269.62	5,400.10	-3.29	-495.78	12.00	12.00	0.00	269.62	
6,996.49	92.20	269.62	5,350.00	-11.94	-1,799.96	0.00	0.00	0.00	0.00	M1-Raven Fed 17H
7,030.29	91.52	269.62	5,348.90	-12.16	-1,833.74	2.00	-2.00	0.00	-179.88	
8,869.04	91.52	269.62	5,300.00	-24.40	-3,671.80	0.00	0.00	0.00	0.00	BHL Raven Fed 17H

Database:	GCR DB	Local Co-ordinate Reference:	Well #17H
Company:	Apache Corporation	TVD Reference:	KB @ 3756.00usft (Capstar 114)
Project:	Eddy County, NM (NAD27 NME)	MD Reference:	KB @ 3756.00usft (Capstar 114)
Site:	Raven Federal	North Reference:	Grid
Well:	#17H	Survey Calculation Method:	Minimum Curvature
Wellbore:	WB1		
Design:	Plan#3 08-25-12		

Planned 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
322.00	0.00	0.00	322.00	0.00	0.00	0.00	0.00	0.00	0.00
Rustler									
544.00	0.00	0.00	544.00	0.00	0.00	0.00	0.00	0.00	0.00
T/Salt									
1,391.00	0.00	0.00	1,391.00	0.00	0.00	0.00	0.00	0.00	0.00
B/Salt									
1,554.00	0.00	0.00	1,554.00	0.00	0.00	0.00	0.00	0.00	0.00
Yates									
2,445.00	0.00	0.00	2,445.00	0.00	0.00	0.00	0.00	0.00	0.00
Queen									
3,170.00	0.00	0.00	3,170.00	0.00	0.00	0.00	0.00	0.00	0.00
San Andres									
4,638.00	0.00	0.00	4,638.00	0.00	0.00	0.00	0.00	0.00	0.00
Glorieta									
4,684.00	0.00	0.00	4,684.00	0.00	0.00	0.00	0.00	0.00	0.00
Paddock									
4,922.99	0.00	0.00	4,922.99	0.00	0.00	0.00	0.00	0.00	0.00
KOP, Start 12°/100' Build									
5,000.00	9.24	269.62	4,999.67	-0.04	-6.20	6.20	12.00	12.00	0.00
5,100.00	21.24	269.62	5,095.97	-0.22	-32.44	32.44	12.00	12.00	0.00
5,170.31	29.68	269.62	5,159.40	-0.42	-62.63	62.63	12.00	12.00	0.00
Upper Blinebry									
5,200.00	33.24	269.62	5,184.72	-0.52	-78.13	78.13	12.00	12.00	0.00
5,300.00	45.24	269.62	5,262.03	-0.94	-141.27	141.27	12.00	12.00	0.00
5,400.00	57.24	269.62	5,324.52	-1.45	-219.10	219.11	12.00	12.00	0.00
5,500.00	69.24	269.62	5,369.46	-2.04	-308.23	308.24	12.00	12.00	0.00
5,600.00	81.24	269.62	5,394.89	-2.68	-404.75	404.76	12.00	12.00	0.00
5,691.32	92.20	269.62	5,400.10	-3.29	-495.78	495.79	12.00	12.00	0.00
LP, Hold 92.20° Inc, 269.62° Azm									
5,700.00	92.20	269.62	5,399.77	-3.35	-504.45	504.46	0.00	0.00	0.00
5,800.00	92.20	269.62	5,395.93	-4.01	-604.38	604.39	0.00	0.00	0.00
5,900.00	92.20	269.62	5,392.09	-4.67	-704.30	704.32	0.00	0.00	0.00
6,000.00	92.20	269.62	5,388.25	-5.33	-804.23	804.24	0.00	0.00	0.00
6,100.00	92.20	269.62	5,384.41	-6.00	-904.15	904.17	0.00	0.00	0.00
6,200.00	92.20	269.62	5,380.58	-6.66	-1,004.07	1,004.10	0.00	0.00	0.00
6,300.00	92.20	269.62	5,376.74	-7.32	-1,104.00	1,104.02	0.00	0.00	0.00
6,400.00	92.20	269.62	5,372.90	-7.98	-1,203.92	1,203.95	0.00	0.00	0.00
6,500.00	92.20	269.62	5,369.06	-8.65	-1,303.85	1,303.87	0.00	0.00	0.00
6,600.00	92.20	269.62	5,365.22	-9.31	-1,403.77	1,403.80	0.00	0.00	0.00
6,700.00	92.20	269.62	5,361.38	-9.97	-1,503.69	1,503.73	0.00	0.00	0.00
6,800.00	92.20	269.62	5,357.54	-10.64	-1,603.62	1,603.65	0.00	0.00	0.00
6,900.00	92.20	269.62	5,353.70	-11.30	-1,703.54	1,703.58	0.00	0.00	0.00
6,996.49	92.20	269.62	5,350.00	-11.94	-1,799.96	1,800.00	0.00	0.00	0.00
Begin 2°/100' Drop - M1-Raven Fed 17H									
7,000.00	92.13	269.62	5,349.87	-11.96	-1,803.47	1,803.51	2.00	-2.00	0.00
7,013.92	91.85	269.62	5,349.38	-12.05	-1,817.38	1,817.42	2.00	-2.00	0.00
M1-Raven Fed 16H									
7,030.29	91.52	269.62	5,348.90	-12.16	-1,833.74	1,833.78	2.00	-2.00	0.00
Hold 91.52° Inc, 269.62° Azm									
7,100.00	91.52	269.62	5,347.05	-12.63	-1,903.42	1,903.47	0.00	0.00	0.00
7,200.00	91.52	269.62	5,344.39	-13.29	-2,003.39	2,003.43	0.00	0.00	0.00

Database:	GCR DB	Local Coordinate Reference:	Well #17H
Company:	Apache Corporation	TVD Reference:	KB @ 3756.00usft (Capstar 114)
Project:	Eddy County, NM (NAD27 NME)	MD Reference:	KB @ 3756.00usft (Capstar 114)
Site:	Raven Federal	North Reference:	Grid
Well:	#17H	Survey Calculation Method:	Minimum Curvature
Wellbore:	WB1		
Design:	Plan#3 08-25-12		

Planned 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)
7,300.00	91.52	269.62	5,341.73	-13.96	-2,103.35	2,103.40	0.00	0.00	0.00
7,400.00	91.52	269.62	5,339.07	-14.62	-2,203.31	2,203.36	0.00	0.00	0.00
7,500.00	91.52	269.62	5,336.41	-15.29	-2,303.27	2,303.32	0.00	0.00	0.00
7,600.00	91.52	269.62	5,333.75	-15.95	-2,403.24	2,403.29	0.00	0.00	0.00
7,700.00	91.52	269.62	5,331.09	-16.62	-2,503.20	2,503.25	0.00	0.00	0.00
7,800.00	91.52	269.62	5,328.43	-17.29	-2,603.16	2,603.22	0.00	0.00	0.00
7,900.00	91.52	269.62	5,325.77	-17.95	-2,703.12	2,703.18	0.00	0.00	0.00
8,000.00	91.52	269.62	5,323.11	-18.62	-2,803.09	2,803.15	0.00	0.00	0.00
8,100.00	91.52	269.62	5,320.45	-19.28	-2,903.05	2,903.11	0.00	0.00	0.00
8,200.00	91.52	269.62	5,317.79	-19.95	-3,003.01	3,003.08	0.00	0.00	0.00
8,300.00	91.52	269.62	5,315.13	-20.61	-3,102.97	3,103.04	0.00	0.00	0.00
8,400.00	91.52	269.62	5,312.47	-21.28	-3,202.94	3,203.01	0.00	0.00	0.00
8,500.00	91.52	269.62	5,309.81	-21.94	-3,302.90	3,302.97	0.00	0.00	0.00
8,600.00	91.52	269.62	5,307.16	-22.61	-3,402.86	3,402.94	0.00	0.00	0.00
8,700.00	91.52	269.62	5,304.50	-23.27	-3,502.82	3,502.90	0.00	0.00	0.00
8,800.00	91.52	269.62	5,301.84	-23.94	-3,602.79	3,602.86	0.00	0.00	0.00
8,869.04	91.52	269.62	5,300.00	-24.40	-3,671.80	3,671.88	0.00	0.00	0.00

TD at 8869.04 - BHL Raven Fed 17H - BHL-Raven Fed 16H

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
BHL Raven Fed 17H - plan hits target center - Point	0.00	0.00	5,300.00	-24.40	-3,671.80	674,762.30	628,403.20	32° 51' 15.50490 N	103° 54' 54.72258 W
M1-Raven Fed 17H - plan hits target center - Point	0.00	0.00	5,350.00	-11.94	-1,799.96	674,774.76	630,275.04	32° 51' 15.55435 N	103° 54' 32.77884 W

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
322.00	322.00	Rustler		-2.38	269.62
544.00	544.00	T/Salt		-2.38	269.62
1,391.00	1,391.00	B/Salt		-2.38	269.62
1,554.00	1,554.00	Yates		-2.38	269.62
2,445.00	2,445.00	Queen		-2.38	269.62
3,170.00	3,170.00	San Andres		-2.38	269.62
4,638.00	4,638.00	Glorieta		-2.38	269.62
4,684.00	4,684.00	Paddock		-2.38	269.62
5,170.31	5,159.40	Upper Blinebry		-2.38	269.62

Database:	GCR DB	Local Co-ordinate Reference:	Well #17H
Company:	Apache Corporation	TVD Reference:	KB @ 3756.00usft (Capstar 114)
Project:	Eddy County, NM (NAD27 NME)	MD Reference:	KB @ 3756.00usft (Capstar 114)
Site:	Raven Federal	North Reference:	Grid
Well:	#17H	Survey Calculation Method:	Minimum Curvature
Wellbore:	WB1		
Design:	Plan#3 08-25-12		

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
4,922.99	4,922.99	0.00	0.00	KOP, Start 12°/100' Build
5,691.32	5,400.10	-3.29	-495.78	LP, Hold 92.20° Inc, 269.62° Azm
6,996.49	5,350.00	-11.94	-1,799.96	Begin 2°/100' Drop
7,030.29	5,348.90	-12.16	-1,833.74	Hold 91.52° Inc, 269.62° Azm
8,869.04	5,300.00	-24.40	-3,671.80	TD at 8869.04

PECOS DISTRICT
CONDITIONS OF APPROVAL

OPERATOR'S NAME:	APACHE CORPORATION
LEASE NO.:	LC029435A
WELL NAME & NO.:	17H-RAVEN FEDERAL
SURFACE HOLE FOOTAGE:	662'/N. & 1000'/E.
BOTTOM HOLE FOOTAGE	662'/N. & 330'/W.
LOCATION:	Section 7, T. 17 S., R. 31 E., NMPM
COUNTY:	Eddy County, New Mexico
API:	30-015-40914

The original COAs still stand with the following drilling modifications:

I. DRILLING

A. DRILLING OPERATIONS REQUIREMENTS

The BLM is to be notified in advance for a representative to witness:

a. Spudding well (minimum of 24 hours)
b. Setting and/or Cementing of all casing strings (minimum of 4 hours)
c. BOPE tests (minimum of 4 hours)

☒ **Eddy County**
Call the Carlsbad Field Office, 620 East Greene St., Carlsbad, NM 88220, (575) 361-2822

1. A Hydrogen Sulfide (H2S) Drilling Plan should be activated 500 feet prior to drilling into the **Grayburg** formation. **As a result, the Hydrogen Sulfide area must meet Onshore Order 6 requirements, which includes equipment and personnel/public protection items. If Hydrogen Sulfide is encountered, please provide measured values and formations to the BLM.**

2. Unless the production casing has been run and cemented or the well has been properly plugged, the drilling rig shall not be removed from over the hole without prior approval. **If the drilling rig is removed without approval – an Incident of Non-Compliance will be written and will be a "Major" violation.**

3. **The record of the drilling rate along with the GR/N well log run from TD to surface shall be submitted to the BLM office as well as all other logs run in the borehole 30 days from completion. If available, a digital copy of the logs is to be submitted in addition to the paper copies. The Rustler top and top and bottom of Salt are to be recorded on the Completion Report.**

B. CASING

Changes to the approved APD casing program need prior approval if the items substituted are of lesser grade or different casing size or are Non-API. The Operator can exchange the components of the proposal with that of superior strength (i.e. changing from J-55 to N-80, or from 36# to 40#). Changes to the approved cement program need prior approval if the altered cement plan has less volume or strength or if the changes are substantial (i.e. Multistage tool, ECP, etc.). The initial wellhead installed on the well will remain on the well with spools used as needed.

Centralizers required on surface casing per Onshore Order 2.III.B.1.f.

Wait on cement (WOC) time prior to drilling out for a primary cement job will be a minimum 18 hours for a water basin, 24 hours in the potash area, or 500 pounds compressive strength, whichever is greater for all casing strings. DURING THIS WOC TIME, NO DRILL PIPE, ETC. SHALL BE RUN IN THE HOLE. Provide compressive strengths including hours to reach required 500 pounds compressive strength prior to cementing each casing string. See individual casing strings for details regarding lead cement slurry requirements.

No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.

Possible water and brine flows in the Salado and Artesia Groups.
Possible lost circulation in the Grayburg and San Andres formations.

1. The **13-3/8** inch surface casing shall be set at approximately **400** feet (**a minimum of 25 feet into the Rustler Anhydrite and above the salt**) and cemented to the surface.

    a. If cement does not circulate to the surface, the appropriate BLM office shall be notified and a temperature survey utilizing an electronic type temperature survey with surface log readout will be used or a cement bond log shall be run to verify the top of the cement. Temperature survey will be run a minimum of six hours after pumping cement and ideally between 8-10 hours after completing the cement job.

    b. Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry.

    c. Wait on cement (WOC) time for a remedial job will be a minimum of 4 hours after bringing cement to surface or 500 pounds compressive strength, whichever is greater.

    d. If cement falls back, remedial cementing will be done prior to drilling out that string.

2. The minimum required fill of cement behind the **9-5/8** inch intermediate casing, which shall be set at **3500** feet, is:

   ☒ Cement to surface. If cement does not circulate see B.1.a, c-d above.

Centralizers required on horizontal leg, must be type for horizontal service and a minimum of one every other joint.

3. The minimum required fill of cement behind the **7 X 5-1/2** inch production casing is:

   ☒ Cement as proposed. Operator shall provide method of verification.

4. If hardband drill pipe is rotated inside casing, returns will be monitored for metal. If metal is found in samples, drill pipe will be pulled and rubber protectors which have a larger diameter than the tool joints of the drill pipe will be installed prior to continuing drilling operations.

C. PRESSURE CONTROL

1. All blowout preventer (BOP) and related equipment (BOPE) shall comply with well control requirements as described in Onshore Oil and Gas Order No. 2 and API RP 53 Sec. 17.

2. Variance approved to use flex line from BOP to choke manifold. Check condition of flexible line from BOP to choke manifold, replace if exterior is damaged or if line fails test. Line to be as straight as possible with no hard bends and is to be anchored according to Manufacturer's requirements. The flexible hose can be exchanged with a hose of equal size and equal or greater pressure rating. **Anchor requirements, specification sheet and hydrostatic pressure test certification matching the hose in service, to be onsite for review. These documents shall be posted in the company man's trailer and on the rig floor.** If the BLM inspector questions the straightness of the hose, a BLM engineer will be contacted and will review in the field or via picture supplied by inspector to determine if changes are required (operator shall expect delays if this occurs).

3. **In the case where the only BOP installed is an annular preventer, it shall be tested to a minimum of 2000 psi (which may require upgrading to 3M or 5M annular).**

4. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be **2000 (2M)** psi.

5. The appropriate BLM office shall be notified a minimum of 4 hours in advance for a representative to witness the tests.

   a. In a water basin, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. The casing cut-off and BOP installation can be initiated four hours after installing the slips, which will be approximately six hours after bumping the plug. For those casing strings not using slips or where the float does not hold, the minimum wait time before cut-off is eight hours after bumping the plug. BOP/BOPE testing can begin after cut-off or once cement reaches 500 psi compressive strength (including lead when specified), whichever is greater. However, if the float does not hold, cut-off cannot be initiated until cement reaches 500 psi compressive strength (including lead when specified).

   b. The tests shall be done by an independent service company utilizing a test plug **not a cup or J-packer**.

   c. The test shall be run on a 5000 psi chart for a 2-3M BOP/BOP, on a 10000 psi chart for a 5M BOP/BOPE and on a 15000 psi chart for a 10M BOP/BOPE. If a linear chart is used, it shall be a one hour chart. A circular chart shall have a maximum 2 hour clock. If a twelve hour or twenty-four hour chart is used, tester shall make a notation that it is run with a two hour clock.

   d. The results of the test shall be reported to the appropriate BLM office.

   e. All tests are required to be recorded on a calibrated test chart. **A copy of the BOP/BOPE test chart and a copy of independent service company test will be submitted to the appropriate BLM office.**

   f. The BOP/BOPE test shall include a low pressure test from 250 to 300 psi. The test will be held for a minimum of 10 minutes if test is done with a test plug and 30 minutes without a test plug. This test shall be performed prior to the test at full stack pressure.

D. DRILL STEM TEST

If drill stem tests are performed, Onshore Order 2.III.D shall be followed.

E. WASTE MATERIAL AND FLUIDS

All waste (i.e. drilling fluids, trash, salts, chemicals, sewage, gray water, etc.) created as a result of drilling operations and completion operations shall be safely contained and disposed of properly at a waste disposal facility. No waste material or fluid shall be disposed of on the well location or surrounding area.

Porto-johns and trash containers will be on-location during fracturing operations or any other crew-intensive operations.

JAM 011415