



Apache Corporation

Eddy County, NM (NAD27 NME)

Raven Federal

#17H

WB1 / Job #1411574

NM OIL CONSERVATION

ARTESIA DISTRICT

JUN 20 2016

RECEIVED

Design: Surveys (Capstar 114)

Standard Survey Report

24 May, 2015

API: 30-015-40914

A-07 178-31E 662 FNL 1000 FEL



PHOENIX
TECHNOLOGY SERVICES

Company:	Apache Corporation	Local Co-ordinate Reference:	Well #17H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3757.00usft (Capstar 114)
Site:	Raven Federal	MD Reference:	KB @ 3757.00usft (Capstar 114)
Well:	#17H	North Reference:	Grid
Wellbore:	WB1 / Job #1411574	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	Compass 5000 GCR

Project:	Eddy County, NM (NAD27 NME)		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Gao 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	0.00 usft	Northing:	674,786.70 usft	Latitude:	32° 51' 15.60043 N
	+E/-W	0.00 usft	Easting:	632,075.00 usft	Longitude:	103° 54' 11.67775 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	3,748.00 usft

Wellbore:	WB1 / Job #1411574				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	5/8/2015	7.68	60.80	48,589

Design:	Surveys (Capstar 114)			
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth: 0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction
	(usft)	(usft)	(usft)	(°)
	0.00	0.00	0.00	269.62

Survey Program		Date 5/24/2015		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
110.21	4,829.16	Phoenix Gyro Survey (WB1 / Job #141157	PHX_SPT_GTD	PHX Continuous north-seeking gyro
4,855.00	8,772.00	Phoenix MWD Survey (WB1 / Job #14115	PHX+MWD+HDGM	PHX+MWD+HDGM

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	
110.21	1.09	178.33	110.20	-1.05	0.03	-0.02	0.99	0.99	0.00	
195.23	1.38	194.53	195.20	-2.85	-0.20	0.22	0.53	0.34	19.05	
280.26	1.54	171.79	280.21	-4.97	-0.30	0.33	0.70	0.19	-26.74	
365.28	1.55	172.75	365.20	-7.24	0.01	0.04	0.03	0.01	1.13	
450.31	1.84	175.09	450.19	-9.59	0.26	-0.20	0.13	0.11	2.75	
535.34	1.86	183.64	535.19	-12.04	0.29	-0.21	0.29	0.02	10.06	
620.36	1.46	182.29	620.18	-14.35	0.17	-0.07	0.24	-0.24	-1.58	
705.39	1.44	184.38	705.18	-16.49	0.04	0.07	0.07	-0.02	2.46	
790.41	1.10	197.78	790.18	-18.34	-0.29	0.41	0.53	-0.40	15.76	

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Well:	#17H	North Reference:	Grid
Wellbore:	WB1 / Job #1411574	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	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)	
875.44	1.12	207.67	875.19	-19.85	-0.93	1.06	0.23	0.02	11.63	
980.47	0.93	211.99	980.21	-21.17	-1.68	1.82	0.24	-0.22	5.08	
1,045.49	0.82	203.17	1,045.22	-22.32	-2.28	2.43	0.20	-0.13	-10.37	
1,130.52	0.84	195.82	1,130.24	-23.47	-2.69	2.84	0.13	0.02	-8.88	
1,215.55	0.81	193.26	1,215.26	-24.66	-2.99	3.16	0.05	-0.04	-2.78	
1,300.57	0.78	184.17	1,300.27	-25.82	-3.17	3.35	0.15	-0.04	-10.69	
1,365.60	1.09	160.13	1,365.29	-27.16	-2.94	3.12	0.58	0.36	-28.27	
1,470.62	1.17	151.55	1,470.30	-28.68	-2.25	2.44	0.22	0.09	-10.09	
1,555.65	1.04	148.03	1,555.31	-30.10	-1.43	1.63	0.17	-0.15	-4.14	
1,640.68	0.93	146.41	1,640.33	-31.33	-0.64	0.85	0.13	-0.13	-1.91	
1,725.70	0.54	139.20	1,725.34	-32.21	0.00	0.21	0.47	-0.46	-8.48	
1,810.23	0.57	172.31	1,809.87	-32.93	0.32	-0.10	0.38	0.04	39.17	
1,895.76	0.46	180.66	1,895.39	-33.69	0.37	-0.15	0.16	-0.13	9.76	
1,980.78	0.44	182.10	1,980.41	-34.36	0.36	-0.13	0.03	-0.02	1.69	
2,065.81	0.22	184.69	2,065.44	-34.85	0.33	-0.10	0.26	-0.26	3.05	
2,150.83	0.22	224.57	2,150.46	-35.13	0.20	0.03	0.18	0.00	46.91	
2,235.86	0.20	256.94	2,235.49	-35.28	-0.06	0.29	0.14	-0.02	38.07	
2,320.89	0.30	257.53	2,320.52	-35.36	-0.42	0.65	0.12	0.12	0.69	
2,405.91	0.51	282.25	2,405.53	-35.33	-1.00	1.24	0.32	0.25	29.08	
2,490.94	0.48	280.79	2,490.56	-35.18	-1.72	1.96	0.04	-0.04	-1.72	
2,575.97	0.66	283.90	2,575.59	-35.00	-2.55	2.78	0.21	0.21	3.66	
2,660.99	0.69	276.09	2,660.60	-34.82	-3.53	3.77	0.11	0.04	-9.19	
2,746.02	0.69	283.27	2,745.63	-34.65	-4.54	4.77	0.10	0.00	8.44	
2,831.04	0.83	269.90	2,830.64	-34.54	-5.66	5.88	0.26	0.16	-15.73	
2,916.07	0.74	274.21	2,915.66	-34.50	-6.82	7.05	0.13	-0.11	5.07	
3,001.10	0.85	269.44	3,000.68	-34.46	-7.85	8.08	0.13	-0.11	-5.61	
3,086.12	0.69	273.14	3,085.70	-34.44	-8.84	9.07	0.07	0.05	4.35	
3,171.16	0.63	275.40	3,170.73	-34.37	-9.82	10.05	0.08	-0.07	2.66	
3,256.18	0.57	279.89	3,255.75	-34.25	-10.70	10.93	0.09	-0.07	5.28	
3,341.20	0.51	274.11	3,340.76	-34.15	-11.50	11.72	0.10	-0.07	-6.80	
3,426.23	0.52	266.55	3,425.79	-34.14	-12.26	12.48	0.08	0.01	-8.89	
3,511.25	0.43	257.54	3,510.81	-34.24	-12.95	13.18	0.14	-0.11	-10.60	
3,553.77	0.59	274.71	3,553.33	-34.25	-13.33	13.56	0.52	0.38	40.38	
3,638.79	0.65	270.02	3,638.34	-34.22	-14.25	14.47	0.09	0.07	-5.52	
3,723.82	0.74	275.43	3,723.36	-34.17	-15.28	15.50	0.13	0.11	6.36	
3,808.85	0.66	287.31	3,808.39	-33.89	-16.26	16.48	0.33	-0.09	25.73	
3,893.87	0.76	292.70	3,893.40	-33.45	-17.21	17.43	0.14	0.12	-5.42	
3,978.90	0.66	316.78	3,978.43	-32.87	-18.07	18.29	0.37	-0.12	28.32	
4,063.92	0.55	324.68	4,063.44	-32.18	-18.64	18.85	0.16	-0.13	9.29	
4,148.95	0.55	318.70	4,148.47	-31.54	-19.15	19.35	-0.07	0.00	-7.03	
4,233.98	0.47	322.81	4,233.49	-30.96	-19.63	19.83	0.10	-0.09	4.83	
4,319.00	0.49	326.68	4,318.51	-30.38	-20.04	20.24	0.04	0.02	4.55	
4,404.03	0.60	326.22	4,403.54	-29.70	-20.48	20.68	0.13	0.13	-0.54	

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Wellbore:	WB1 / Job #1411574	Survey Calculation Method:	Minimum Curvature
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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)	
4,489.06	0.59	329.16	4,488.56	-28.98	-20.95	21.15	0.04	-0.01	3.48	
4,574.08	0.46	338.77	4,573.58	-28.28	-21.30	21.49	0.18	-0.15	11.30	
4,659.11	0.40	344.98	4,658.61	-27.68	-21.50	21.69	0.09	-0.07	7.28	
4,701.62	0.34	348.00	4,701.12	-27.39	-21.57	21.75	0.15	-0.14	7.15	
4,744.13	0.31	343.35	4,743.62	-27.16	-21.63	21.81	0.09	-0.07	-10.84	
4,786.65	0.36	342.70	4,786.14	-26.92	-21.70	21.88	0.12	0.12	-1.53	
4,829.16	0.31	337.28	4,828.65	-26.69	-21.78	21.86	0.14	-0.12	-12.73	
Tie-on to Phoenix Gyro Survey										
4,855.00	1.00	280.30	4,854.49	-26.58	-22.03	22.21	3.37	2.67	-220.55	
First Phoenix MWD Survey										
4,897.00	5.30	271.00	4,896.42	-26.48	-24.33	24.51	10.28	10.24	-22.14	
4,940.00	11.30	270.80	4,938.95	-26.39	-30.54	30.71	13.95	13.95	-0.47	
4,982.00	17.80	270.00	4,979.58	-26.33	-41.08	41.28	15.48	15.48	-1.90	
5,025.00	24.90	270.60	5,019.60	-26.24	-58.73	56.90	16.52	16.51	1.40	
5,067.00	30.30	271.60	5,056.81	-25.85	-76.17	76.34	12.90	12.86	2.38	
5,110.00	34.40	272.00	5,093.13	-25.12	-99.17	99.33	9.55	8.53	0.93	
5,152.00	38.20	272.30	5,126.97	-24.18	-124.01	124.17	9.06	9.05	0.71	
5,195.00	42.10	270.90	5,159.83	-23.42	-151.72	151.87	8.31	9.07	-3.28	
5,237.00	46.30	271.00	5,189.94	-22.94	-180.99	181.14	10.00	10.00	0.24	
5,280.00	50.30	271.60	5,218.54	-22.20	-213.08	213.22	9.36	9.30	1.40	
5,322.00	54.10	272.10	5,244.27	-21.13	-246.24	246.38	9.10	9.05	1.19	
5,365.00	58.40	272.40	5,268.16	-19.72	-281.96	282.08	10.02	10.00	0.70	
5,407.00	61.90	273.20	5,289.06	-17.94	-318.34	318.45	8.50	8.33	1.90	
5,450.00	64.40	273.50	5,308.48	-15.70	-358.63	358.73	5.85	5.81	0.70	
5,492.00	67.90	273.10	5,325.46	-13.49	-394.98	395.06	8.38	8.33	-0.95	
5,535.00	72.70	272.80	5,339.95	-11.41	-435.39	435.48	11.18	11.16	-0.70	
5,578.00	78.90	273.00	5,350.49	-9.30	-477.01	477.06	14.43	14.42	0.47	
5,620.00	82.50	272.10	5,357.28	-7.46	-518.41	518.44	8.83	8.57	-2.14	
5,663.00	86.60	270.90	5,361.36	-6.34	-561.19	561.22	9.93	9.53	-2.79	
5,704.00	89.10	270.10	5,362.80	-5.98	-602.15	602.18	6.40	6.10	-1.95	
5,747.00	91.70	270.00	5,362.80	-5.94	-645.15	645.17	6.05	6.05	-0.23	
5,790.00	92.10	270.10	5,361.17	-5.91	-688.12	688.15	0.96	0.93	0.23	
5,817.00	91.20	268.80	5,357.52	-7.12	-815.06	815.09	1.24	-0.71	-1.02	
6,045.00	88.50	268.10	5,357.85	-10.59	-943.00	943.05	2.18	-2.11	-0.55	
6,172.00	89.80	268.70	5,359.74	-14.13	-1,069.93	1,070.01	1.13	1.02	0.47	
6,300.00	90.90	268.20	5,358.95	-17.59	-1,197.88	1,197.97	0.94	0.86	-0.39	
6,428.00	90.80	269.90	5,357.06	-19.72	-1,325.85	1,325.95	1.33	-0.08	1.33	
6,556.00	92.60	269.50	5,353.28	-20.39	-1,453.78	1,453.89	1.44	1.41	-0.31	
6,683.00	90.80	269.90	5,349.49	-21.05	-1,580.72	1,580.83	1.45	-1.42	0.31	
6,811.00	88.50	269.50	5,350.27	-21.72	-1,708.71	1,708.81	1.82	-1.80	-0.31	
6,938.00	87.80	271.60	5,354.37	-20.50	-1,835.63	1,835.72	1.74	-0.55	1.65	
7,066.00	88.90	271.50	5,358.06	-17.04	-1,963.53	1,963.60	0.86	0.86	-0.08	
7,194.00	90.10	271.30	5,359.18	-13.91	-2,091.48	2,091.53	0.95	0.94	-0.16	
7,322.00	90.90	270.20	5,358.06	-12.24	-2,219.46	2,219.49	1.06	0.63	-0.86	

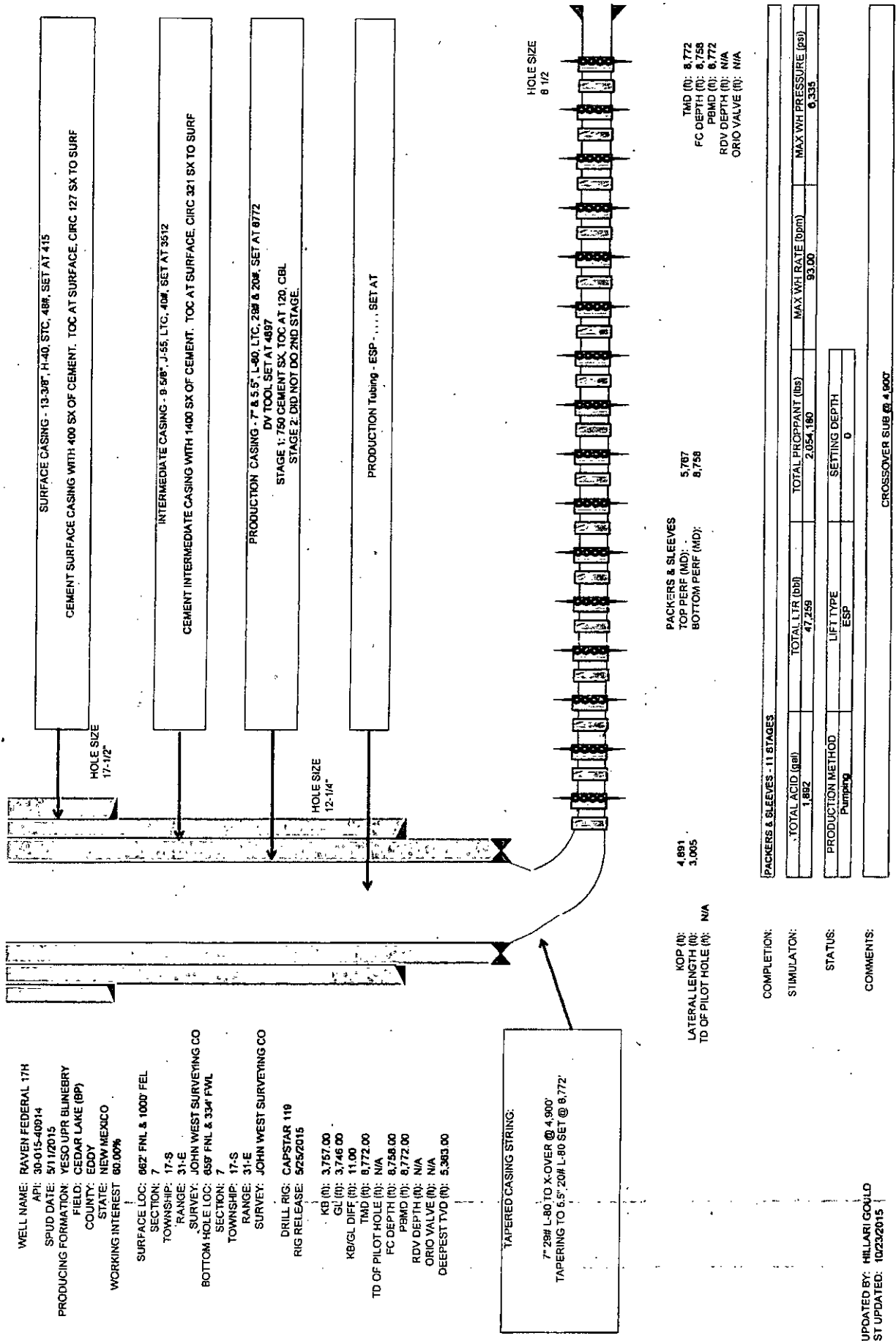
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Wellbore:	WB1 / Job #1411574	Survey Calculation Method:	Minimum Curvature
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Survey										
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7,449.00	91.00	268.50	5,355.95	-13.68	-2,346.43	2,346.47	1.34	0.08	-1.34	
7,577.00	91.20	266.70	5,353.50	-19.04	-2,474.29	2,474.36	1.41	0.16	-1.41	
7,705.00	91.70	289.30	5,350.26	-23.50	-2,602.16	2,602.26	2.07	0.39	2.03	
7,832.00	92.50	268.80	5,345.60	-25.61	-2,729.06	2,729.16	0.74	0.63	-0.39	
7,960.00	91.70	269.60	5,340.91	-27.39	-2,856.95	2,857.07	0.88	-0.63	0.63	
8,088.00	91.80	269.50	5,337.00	-28.40	-2,984.89	2,985.01	0.11	0.08	-0.08	
8,215.00	90.50	270.30	5,334.45	-28.62	-3,111.86	3,111.98	1.20	-1.02	0.63	
8,343.00	89.40	271.00	5,334.57	-27.17	-3,239.85	3,239.86	1.02	-0.86	0.55	
8,471.00	90.20	270.70	5,335.01	-25.27	-3,367.83	3,367.93	0.67	0.63	-0.23	
8,598.00	91.50	270.90	5,333.13	-23.50	-3,494.81	3,494.88	1.04	1.02	0.16	
8,702.00	92.80	270.60	5,329.23	-22.14	-3,598.72	3,598.79	1.28	1.25	-0.29	
Final Phoenix MWD Survey										
8,772.00	92.80	270.60	5,325.81	-21.40	-3,668.63	3,668.69	0.00	0.00	0.00	
Projection to TD										

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Local Coordinates	
4,829.16	4,828.65	-26.69	-21.78	Tie-on to Phoenix Gyro Survey	
4,855.00	4,854.49	-28.58	-22.03	First Phoenix MWD Survey	
8,702.00	5,329.23	-22.14	-3,598.72	Final Phoenix MWD Survey	
8,772.00	5,325.81	-21.40	-3,668.63	Projection to TD	

Checked By: _____ Approved By: _____ Date: _____

30 015 40914



WELL NAME: RAVEN FEDERAL 17H
API: 30-015-40914
SPUD DATE: 5/11/2015
PRODUCING FORMATION: YESO UPR BLUNEYRY
FIELD: CEDAR LAKE (BP)
COUNTY: EDDY
STATE: NEW MEXICO
WORKING INTEREST: 90.00%

SURFACE LOC: 962' FNL & 1000' FEL
SECTION: 7
TOWNSHIP: 17-S
RANGE: 31-E
SURVEY: JOHN WEST SURVEYING CO
BOTTOM HOLE LOC: 658' FNL & 334' FWL
SECTION: 7
TOWNSHIP: 17-S
RANGE: 31-E
SURVEY: JOHN WEST SURVEYING CO

DRILL RIG: CAPSTAR 119
RIG RELEASE: 5/25/2015

KB (ft): 3,757.00
GL (ft): 3,746.00
KB/GL DIFF (ft): 11.00
TMD (ft): 8,772.00
TD OF PILOT HOLE (ft): N/A
FC DEPTH (ft): 8,758.00
PMD (ft): 8,772.00
RDV DEPTH (ft): N/A
ORIO VALVE (ft): N/A
DEEPEST TVD (ft): 5,363.00

TAPERED CASING STRING:
7" 29# L-80 TO X-OVER @ 4,900'
TAPERING TO 5.5" 20# L-80 SET @ 8,772'

KOP (ft):
LATERAL LENGTH (ft):
TD OF PILOT HOLE (ft):

COMPLETION:
STIMULATION:
STATUS:
COMMENTS:

LAST UPDATED BY: HILLARI GOULD
LAST UPDATED: 10/23/2015