

OPERATOR

Company: ARROWHEAD EXPLORATION LLC
 Address: 2919 HALL STREET
 HAYS, KANSAS 67601

Contact Geologist: MATT MORRIS
 Contact Phone Nbr: 785-259-6738
 Well Name: SANDER-WITT UNIT # 1
 Location: SE NE SE NE SEC. 9-T14S-R15W
 API: 15-167-24,064-00-00
 Pool: WILDCAT
 State: KANSAS
 Field:
 Country: USA

Scale 1:240 Imperial

Well Name: SANDER-WITT UNIT # 1
 Surface Location: SE NE SE NE SEC. 9-T14S-R15W
 Bottom Location:
 API: 15-167-24,064-00-00
 License Number: 35439
 Spud Date: 8/8/2017 Time: 7:00 AM
 Region: RUSSELL COUNTY
 Drilling Completed: 8/13/2017 Time: 1:46 PM
 Surface Coordinates: 1800' FNL & 200' FEL
 Bottom Hole Coordinates:
 Ground Elevation: 1869.00ft
 K.B. Elevation: 1877.00ft
 Logged Interval: 1900.00ft To: 3300.00ft
 Total Depth: 3300.00ft
 Formation: LANSING-KANSAS CITY
 Drilling Fluid Type: CHEMICAL

SURFACE CO-ORDINATES

Well Type: Vertical
 Longitude: -98.9845191
 Latitude: 38.8512519
 N/S Co-ord: 1800' FNL
 E/W Co-ord: 200' FEL

LOGGED BY

Company: SOLUTIONS CONSULTING, INC.
 Address: 108 W 35TH
 HAYS, KS 67601

Phone Nbr: (785) 639-1337
 Logged By: GEOLOGIST Name: HERB DEINES

CONTRACTOR

Contractor: SOUTHWIND DRILLING INC.
 Rig #: 3
 Rig Type: MUD ROTARY
 Spud Date: 8/8/2017 Time: 7:00 AM
 TD Date: 8/13/2017 Time: 1:46 PM
 Rig Release: 8/14/2017 Time: 1:45 PM

ELEVATIONS

K.B. Elevation: 1877.00ft Ground Elevation: 1869.00ft
 K.B. to Ground: 8.00ft

NOTES

RECOMMENDATION TO PLUG AND ABANDON WELL BASED ON NEGATIVE RESULTS OF TWO DSTS.

OPEN HOLE LOGGING BY GEMINI WIRELINE: DUAL INDUCTION LOG, COMPENSATED DENSITY/NEUTRON LOG, MICRO RESISTIVITY LOG, BOREHOLE COMPENSATED SONIC LOG

DRILL STEM TESTING BY EAGLE TESTERS: ONE (1) STANDARD TEST, ONE FAILED STRADDLE TEST AND ONE (1) SUCCESSFUL STRADDLE TEST

SANDER WITT #1	SANDER #2 WD	WITT G #61 O
SE NE SE NE	S2 SW NE	NE NW
SEC.9-14S-15W	SEC.9-14-15W	SEC.10-14-15W
1877'KB	KB 1858'	KB 1876'

<u>FORMATION</u>	<u>LOG TOPS</u>	<u>LOG TOPS</u>	<u>LOG TOPS</u>
Anhydrite	903 +974		+ 962
B-Anhydrite	942 +935		+ 924
Dover Lime	2460 - 583		- 586
Tarkio Lime	2502 - 625	- 628	- 629
Topeka	2758 - 881	- 881	- 883
Heebner Sh.	2983-1106	-1108	-1111
Toronto	3002-1125	-1128	-1131
LKC	3036-1159	-1164	-1167
BKC	3266-1389	-1392	-1397
Granite Wash	3267-1390	-1393	
RTD	3300-1423	-1559	-1417

SUMMARY OF DAILY ACTIVITY

8-08-17 Spud 7:00 AM, drilling

8-09-17 900', set 8 5/8" surface casing to 897' w/ 350 sxs Common 2%gel 3%CC, WOC 12 hrs, slope 3/4 degree @900'

8-10-17 1404' drilling

8-11-17 2348', drilling, displaced 2314' to 2337'

8-12-17 2925', drilling, CFS 2940', short trip, TOWB, DST # 1 2922' to 2940', TIWB, drilling

8-13-17 3193' RTD 3300' @1:46 PM, Slope survey 1 degree, TOWB, logs, Straddle test # 2 3010' to 3138'-packer failure, TOWT and reconfigure intervals, Straddle test # 3 3046' to 3137', decision to plug and abandon well.



DRILL STEM TEST REPORT

Arrow head Exploration LLC.

9-14s-15w Russell

2919 Hall Street
Hayas Kansas,67601

Sander Witt Unit #1

ATTN: herb Deines

Job Ticket: 01182 **DST#: 1**

Test Start: 2017.08.12 @ 10:12:00

GENERAL INFORMATION:

Formation: **Oread & Topeka**

Deviated: No Whipstock: ft (KB)

Time Tool Opened: 11:27:00

Time Test Ended: 00:00:00

Test Type: Conventional Bottom Hole (Initial)

Tester: Gene Budig

Unit No: 1-90

Interval: **2922.00 ft (KB) To 2940.00 ft (KB) (TVD)**

Reference Elevations: 1877.00 ft (KB)

Total Depth: 2940.00 ft (KB) (TVD)

1869.00 ft (CF)

Hole Diameter: 7.88 inches Hole Condition: Fair

KB to GR/CF: 8.00 ft

Serial #: 91716 Outside

Press@RunDepth: 120.84 psig @ 2935.00 ft (KB)

Capacity: 5000.00 psig

Start Date: 2017.08.12

End Date: 2017.08.12

Last Calib.: 1899.12.30

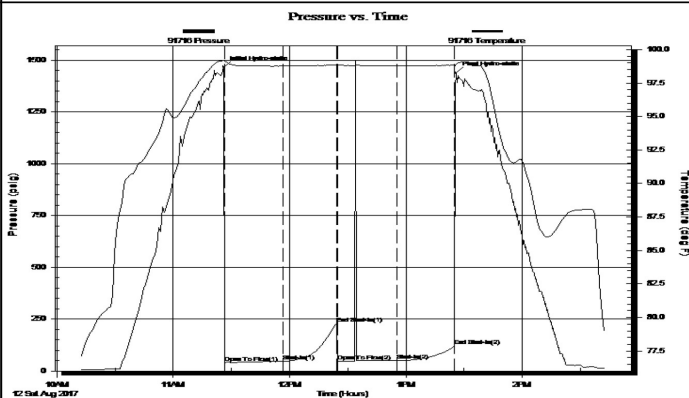
Start Time: 10:12:00

End Time: 14:43:00

Time On Btm: 2017.08.12 @ 11:26:00

Time Off Btm: 2017.08.12 @ 13:26:00

TEST COMMENT: 1st Opening 30 Minutes very weak surface blow
1st Shut-In 30 Minutes no blow back
2nd opening 30 Minutes no blow flushed tool no help
2nd shut-in 30 Minutes no blow back



PRESSURE SUMMARY

Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1466.40	99.20	Initial Hydro-static
1	39.23	99.17	Open To Flow (1)
31	46.70	98.79	Shut-In(1)
59	230.65	98.86	End Shut-In(1)
59	47.66	98.85	Open To Flow (2)
90	49.92	98.81	Shut-In(2)
119	120.84	98.83	End Shut-In(2)
120	1439.41	98.88	Final Hydro-static

Recovery

Length (ft)	Description	Volume (bbl)
25.00	Drilling Mud	0.35

Gas Rates

Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)

Eagle Testers

Ref. No: 01182

Printed: 2017.08.12 @ 15:13:42



DRILL STEM TEST REPORT

Arrow head Exploration LLC.

9-14s-15w Russell

2919 Hall Street
Hayas Kansas,67601

Sander Witt Unit #1

ATTN: herb Deines

Job Ticket: **DST#: 2**

Test Start: 2017.08.14 @ 00:00:00

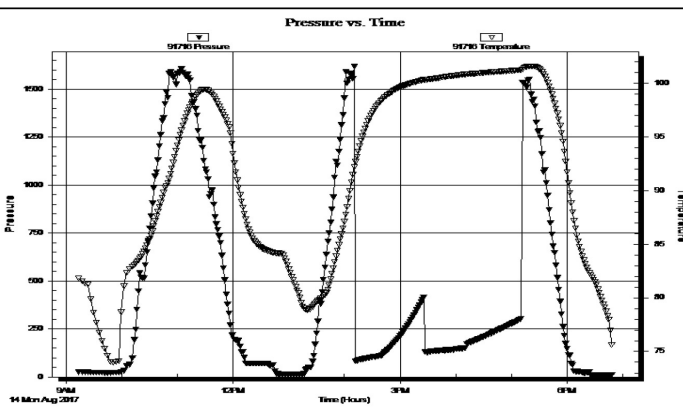
GENERAL INFORMATION:

Formation: No Whipstock: ft (KB) Test Type: (Initial)
 Deviated: No Whipstock: ft (KB) Tester:
 Time Tool Opened: Unit No:
 Time Test Ended: Reference Elevations: 1877.00 ft (KB)
 Interval: ft (KB) To ft (KB) (TVD) 1869.00 ft (CF)
 Total Depth: ft (KB) (TVD) KB to GR/CF: 8.00 ft
 Hole Diameter: 7.88 inches Hole Condition:

Serial #: 91716

Press@RunDepth: psig @ ft (KB) Capacity: psig
 Start Date: 2017.08.14 End Date: 2017.08.14 Last Calib.: 1899.12.30
 Start Time: 09:13:30 End Time: 18:48:29 Time On Btm:
 Time Off Btm:

TEST COMMENT:



PRESSURE SUMMARY			
Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation

Recovery		
Length (ft)	Description	Volume (bbl)
600.00	Drilling Mud	8.42

Gas Rates			
	Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)

Eagle Testers Ref. No: Printed: 2017.08.14 @ 07:51:14

ROCK TYPES

Lmst fw<7	shale, grn	Carbon Sh	Ss	Ignebasic
Lmst fw>7	shale, gry	shale, red	Cgl/Sandy	

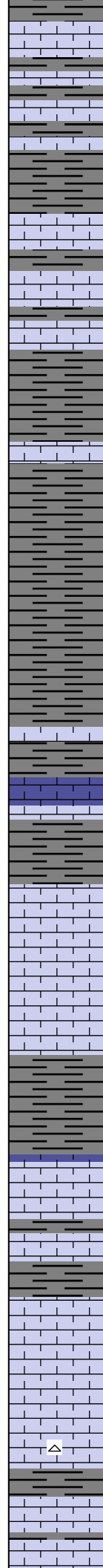
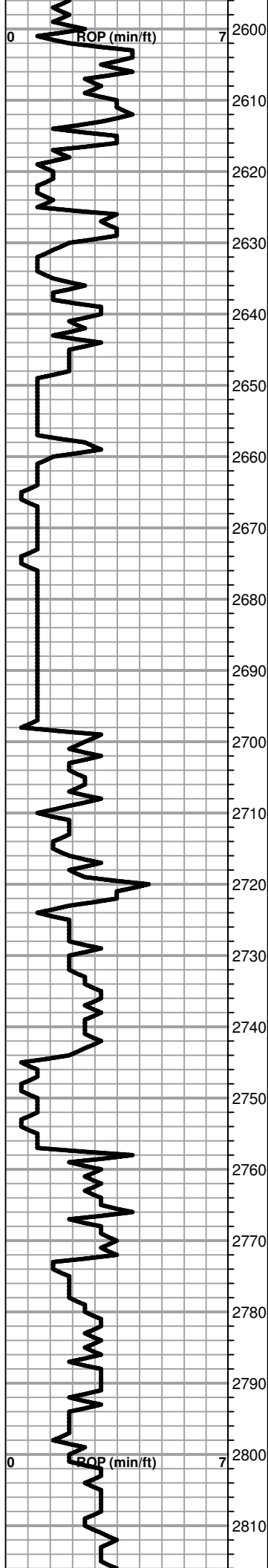
ACCESSORIES

MINERAL
 P Pyrite
 △ Chert White

FOSSIL
 ⚡ Oomoldic

Curve Track #1 ROP (min/ft)	Intervals	ogy	now	Curve Track #3
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1:240 Imperial		Depth	DST	Lithol	Oil S	Geological Descriptions	1:240 Imperial
Cored Interval		DST Interval					
0	ROP (min/ft)	7				BEGIN 1' DRILL TIME FROM 2400' TO RTD BEGIN 10' WET AND DRY SAMPLES FROM 2400' TO RTD	SET 8 5/8" SURFACE CASING TO 897' W/350 SXS COMMON 2%GEL 3%CC
0	ROP (min/ft)	7	2400			ANHYDRITE TOP 903+974 ANHYDRITE BASE 942+935	SLOPE 3/4 DEGREE @ 898'
			2410				
			2420				
			2430			GRAND HAVEN LIME Lime, lt gray, fnxln	
			2440				
			2450		●	1ST TARKIO SAND Sandstone, quartz, fine grained, poorly sorted, micaceous, spotty stain with fair wet cut	
			2460	P		DOVER LIME 2460-583	
			2470		●	2ND TARKIO SAND Sandstone, quartz, finegrained with better sorting in part with lt saturated staining, good streaming wet cut	
			2480				
			2490			Shale, lt-med gray, soft blocky with sticky clumps in part	
			2500			TARKIO LIME/STOTLER 2502-625	
			2510			Lime, lt-med brn, fnxln, slightly fossiliferous, slight bed chalk	
			2520			Lime, lt-med brn, fn-vfxln	
			2530				
			2540			3RD TARKIO SAND	Bit trip-samples lost
			2550			Shale, lt gray, soft sticky mud	
			2560			Lime, lt-med brn, fnxln	
			2570			Lime, lt brn, fnxln, slight bedded chalk	
			2580			Lime, lt brn-lt grayish brn, fn-vfxln	
			2590			Lime, lt brn-lt grayish brn, fn-vfxln slightly fossiliferous	



Lime, lt brn-lt gray, fnxln

Lime, lt brn, fossiliferous-fusulinids

Shale, lt gray, soft sticky

Lime, lt brn, fnxln, chalky

Lime, lt gray, fn-vfxln

Shale, lt gray, soft sticky clumps

Lime, lt-med brn, fn-vfxln

Shale, dove gray, soft mud

Shale, lt gray, soft mud

Lime, offwhite to cream, chalky

Lime, med brn, fn-vfxln

Shale, lt gray, soft sticky

Lime, lt-med brn, fnxln, very chalky

Lime, white-lt brn, fnxln

Lime, lt-med brn, fnxln, chalky

Shale, dove gray, soft sticky mud

TOPEKA 2758-881

Lime, crm-lt brn, fn-micro xln, slightly fossiliferous

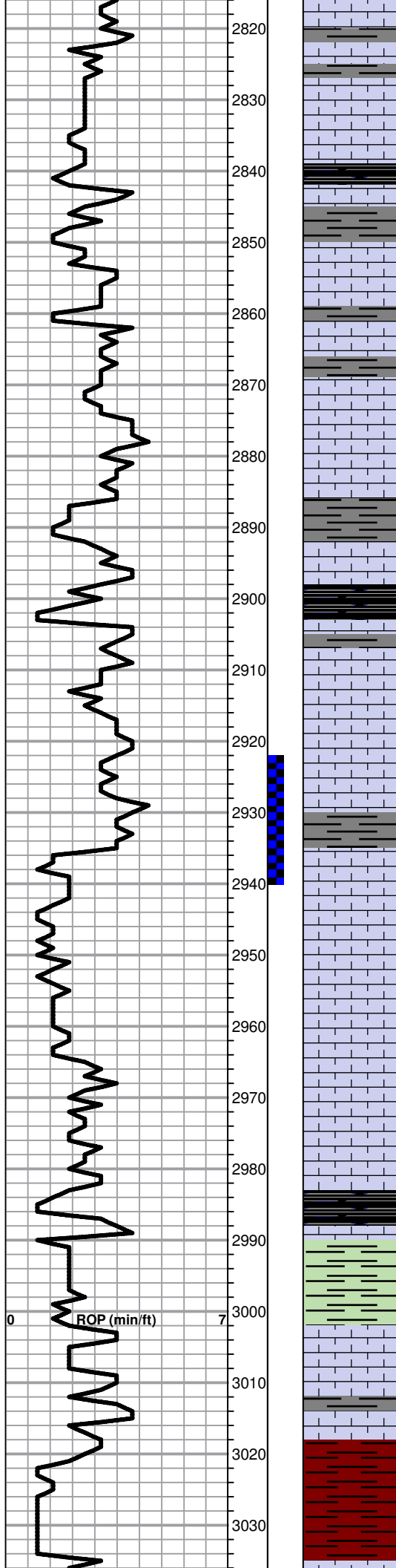
Lime, lt brn-lt grayish brn, fnxln

Lime, lt brn-lt gray, fn-vfxln

Lime, lt brn-lt gray, fnxln

Lime, crm-lt gray, fnxln, slightly fossiliferous

Lime, lt brn-lt gray, fn-micro xln



Lime, lt brn-lt gray, fn-micro xlnz

Lime, crm-lt brn, fnxln

KING HILL SHALE

Shale, black carbonaceous, blocky

Lime, crm, fnxln-micro xln, lithographic in part

○ Lime, crm-tan, fn-vfxln, few chips with trace of lt stain in pinpoint vugs, NFO, no odor

Lime, crm-tan, fn-micro xln

Lime, lt brn-med grayish brn, fn-micro xln

Lime, crm-lt brn-lt gray, fn-micro xln, slightly fossiliferous

Lime, crm-lt brn, fnxln-micro xln

QUEEN HILL SHALE

Shale, black carbonaceous, blocky

○ Lime, crm-lt brn, fn-micro xln , 2 chips with fine scattered vugs with trace of staining, no odor, NFO

Lime, crm-lt brn, fn-micro xln, slightly chalky

Lime, crm-lt brn, fn-micro xln

● Lime, crm-tan, fnxln with zone of fossil fragments and oolites with saturated dark staining, very lt odor, NFO

Lime, offwhite-lt brn, fnxln

Lime, crm-lt brn, fnxln, bedded chalk in part

Lime, crm-lt brn, fn-vfxln

HEEBNER SHALE 2983-1106

Shale, black carbonaceous, fissile, blocky
Lime, med brn, vfxln

Shale, lime green, soft sticky mud

TORONTO 3002-1125

Lime, white-crm, fn-vfxln, bedded chalk, NS

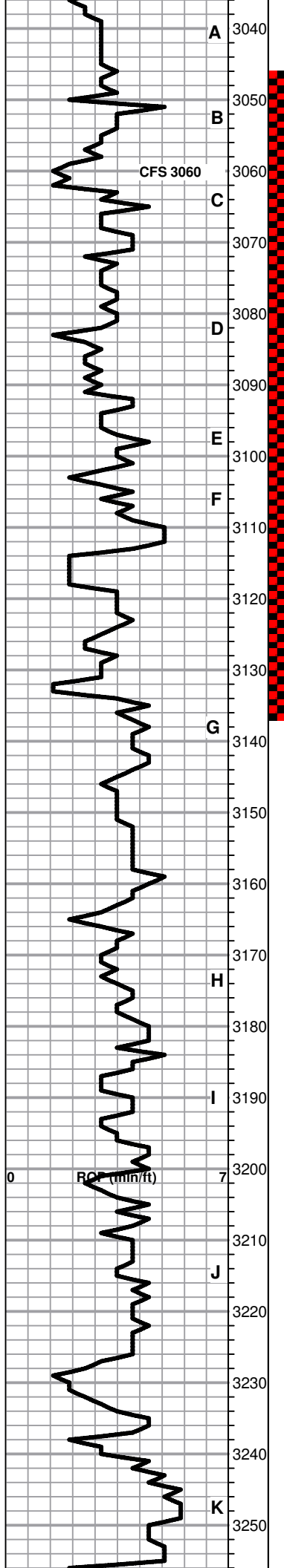
Lime, crm, fnxln

Lime, crm-lt brn, fn-micro xln

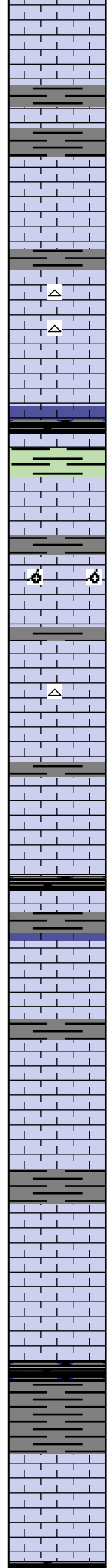
Shale, red soft mud to soft blocky

LKC 3036-1159

DST # 1 2922' TO 2940' SEE
HEADER FOR TEST
SUMMARY



A 3040
 B 3050
 CFS 3060 3060
 C 3070
 D 3080
 E 3090
 F 3100
 G 3110
 3120
 3130
 3140
 H 3150
 3160
 3170
 I 3180
 3190
 J 3200
 3210
 3220
 K 3230
 3240
 3250

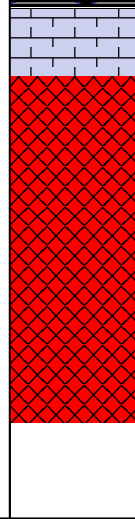
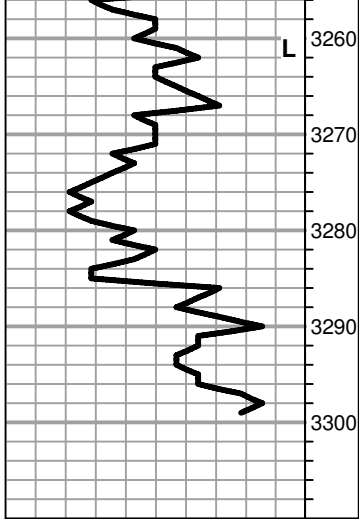


*
 Lime, lt brn, fnxln, lt odor, no staining or SFO, scattered fine vugs.
 Lime, crm-lt brn, fn-vfxln
 Lime, crm-lt brn, fnxln, bedded chalk
 Lime, crm-tan, fnxln, bedded chalk in part, very lt odor, NFO or staining noted
 Lime, white-crm, fn-vfxln
 Lime, crm-lt brn-lt gray, fn-micro xln
 Lime, white-crm, fn-micro xln, 2 chips with trace of staining and very lt odor, NFO
 Shale, gray-black carbonaceous, blocky
 Lime, offwhite, fn-micro xln, few chips with trace of lt staining in fine vugs, very lt odor, NFO
 Lime, white-crm, fn-vfxln, oomoldic in part with trace of lt staining, very lt odor, NFO
 Lime, white-crm, fnxln, bedded chalk
 Lime, white-crm, fn-micro xln
 Lime, white-crm, fn-micro xln
 Lime, white-crm, fn-micro xln
 Shale, gray-black carbonaceous, blocky
 Lime, lt gray-white-crm, fn-micro xln
 Lime, crm-lt brn, fn-micro xln
 Lime, crm-lt brn-gray, fn-vfxln
 Lime, crm-tan, mostly fn-vfxln, trace of light scattered staining, no odor, NFO
 Lime, offwhite-crm, fn-micro xln
 Lime, white-crm, fn-vfxln, slight bedded chalk, NS
 Lime, crm-lt brn, fn-vfxln
 Shale, gray-black carbonaceous, firm blocky
 Lime, crm-lt brn, fn-micro xln
 Lime, lt-med brn, fn-micro xln. lt white chalk wash

DST # 2 STRADDLE TEST-
 PACKER FAILURE

DST # 3 STRADDLE TEST
 3026' TO 3137' SEE HEADER
 FOR TEST SUMMARY

RCP (ohm-in)



Lime, lt-med brn, fn-vfxln

BKC 3266-1389

GRANITE WASH 3267-1390

Quartz, red feldspars and black mica, few specks of green glauconite in part, NS

As Above, NS

As Above, NS

RTD 3300-1423 LTD 3301-1424

1ST PLUG @925' W/ 50 SXS
 2ND PLUG @425' W/100 SXS
 3RD PLUG @40' W/ 10 SXS
 RATHOLE W/30 SXS

ORDERED 190 SXS 60/40 POS
 4%GEL 1/4# FLOCELE PER
 SX

SLOPE 1 DEGREE @3300'