

Robert L. Milford

PETROLEUM GEOLOGIST
Wichita, Kansas

GEOLOGISTS' REPORT

DRILLING TIME AND SAMPLE LOG

OPERATOR **Murfin Drilling Company, Inc.**
LEASE **Ruder 'A' #3-1**
LOC. SPOT **40'N & 70' W of C E2 E2 E2**

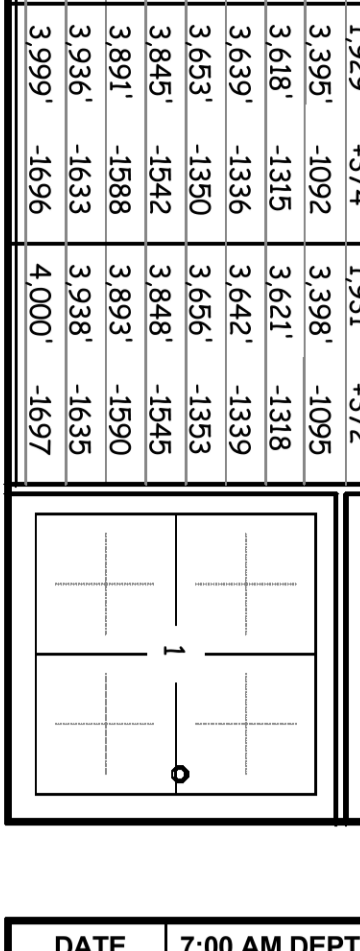
LOC. FOOTAGE **2,600' FNL 400 FEL**
SEC. **1** TWP. **11S** R. **24W**
COUNTY **Trego** STATE **Kansas**

API **15-195-22866-00-00**
CONTRACTOR **Murfin Drilling Co., Inc.** RIG NO. **16**
DRILLING STARTED **6-18-2013** COMPLETED **6-24-2013**
MUD DISPLACED **2,985'** MUD TYPE **Chemical**
DRILLING TIME KEPT FROM **3,290'** TO **RTD**
SAMPLES SAVED FROM **3,290'** TO **RTD**
SAMPLES EXAMINED FROM **3,290'** TO **RTD**
GEOLOGICAL SUPERVISION FROM **3,144'** TO **RTD**

MEASUREMENTS FROM IGA
CASING RECORD
Conductor _____
Surface **8.5/8" @ 219'**
w/ 150 sacks cement
Production **5-1/2" @ 3989'**
w/ 150 sacks cement

ELEVATIONS
KB **2,303'**
GL **2,298'**

FORMATION NAME	LOG TOP DATUM	SAMPLE TOP DATUM
Stone Corral	1,887'	+416
Base Stone Corral	1,929'	+374
Topeka	3,395'	-1092
Heebner	3,618'	-1315
Toronto	3,639'	-1336
Lansing	3,653'	-1350
Stark	3,845'	-1542
B/KC	3,891'	-1588
Marmaton	3,936'	-1633
Total Depth	3,999'	-1696



DATE	7:00 AM DEPTH	REMARKS
6-18-13	0'	Spud @ 8:30 am. Plug down @ 12:45 pm. Drilled out plug @ 8:45 pm. Dev. 0.25° @ 220'
6-19-13	1,140'	Cut 1,140' in last 24 hrs. Dev. 0.75° @ 2636'
6-20-13	2,760'	Cut 1,620' in last 24 hrs; 21.75 hrs drlg.
6-21-13	3,651'	Cut 891' in last 24 hrs; 22 hrs drlg. DST #1 @ 3720'
6-22-13	3,748'	Cut 97' in last 24 hrs; 4.5 hrs drlg. DST #2 @ 3748', DST #3 @ 3870'
6-23-13	3,870'	Cut 122' in last 24 hrs; 7 hrs drlg. RTD 4000' @ 11:19 pm
6-24-13	4,000'	Cut 130' in last 24 hrs; 6.5 hrs drlg. Ran production casing

Remarks

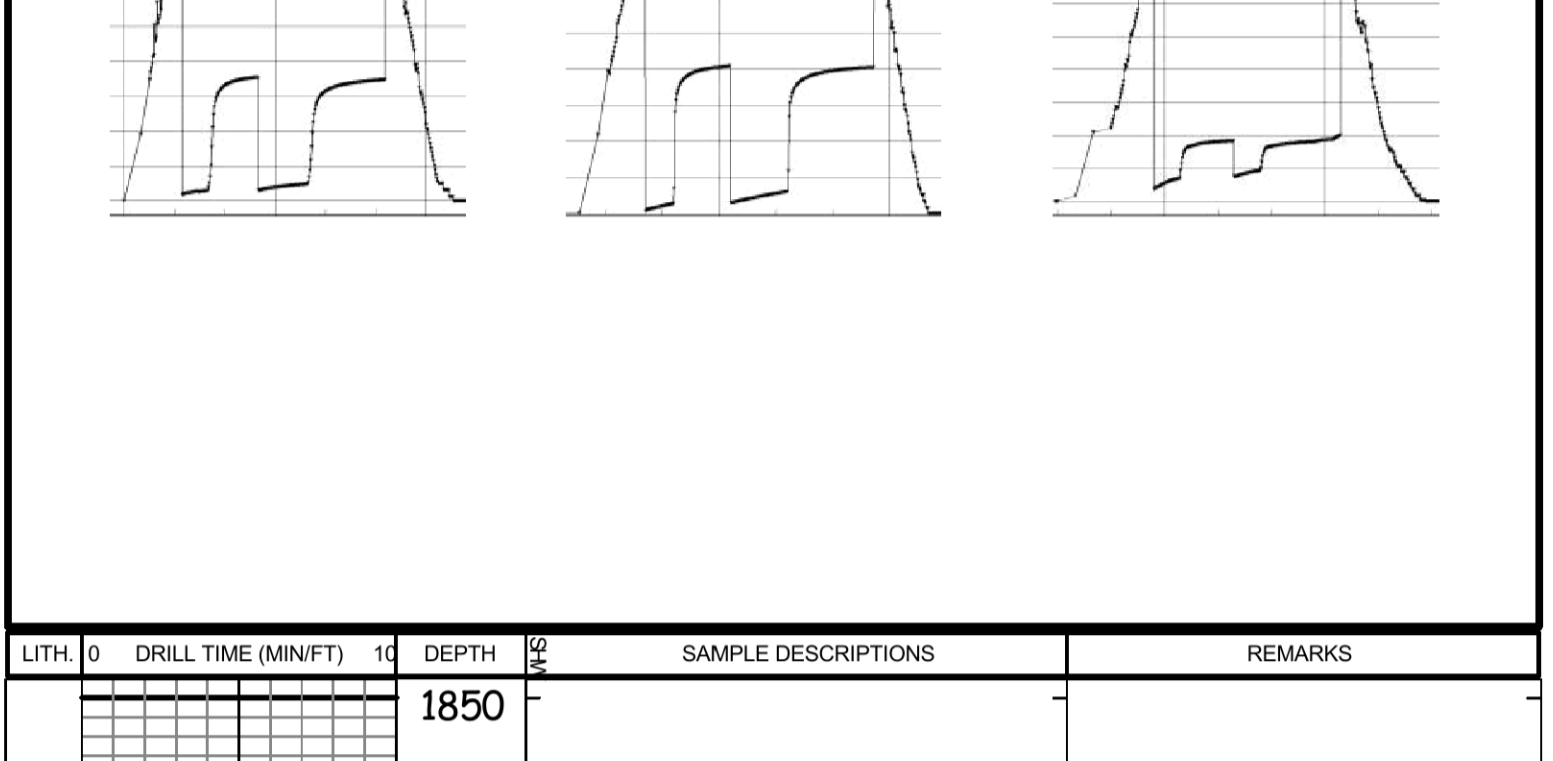
The electric log measurements correlate from 2' to 3' higher to the drilling measurements.

Formation tops and lithology on this report have been corrected to the electric log.

The drilling samples were deposited at the Kansas Geological Survey office in Wichita.

Respectfully submitted,

Robert L. Milford



LITH.	DRILL TIME (MIN/FT)	DEPTH	SAMPLE DESCRIPTIONS	REMARKS
		1850		Stone Corral 1887' (+416) EL
		1929		B/Stone Corral 1929' (+374) EL

		3300	<p>LS: wh-gry, fxln, fos in prt, some sdy, vry chky-sub chky, pr por, NS</p> <p>Sh: gry, some red-brn & grn</p> <p>LS: wh-tan, fxln, fos in prt, vry chky-sub chky, pr por, NS</p> <p>LS: A.A., mstly crm-tan, dcrs chky-vry chky, pr por, NS</p> <p>Sh: mstly gry, some grn & red-brn</p> <p>LS: crm-tan, fxln, fos-ool in prt, sub chky-prtly dns w/ some chky-vry chky, pr por, NS</p> <p>Sh: gry-grn, some soft & gummy, some red-brn</p>	
		3350	<p>LS: tan-gry, fxln, fos in prt, sub chky-prtly dns, pr por, NS</p> <p>LS: A.A.</p> <p>Sh: lt-med gry, some red-brn & grn</p>	
		3400	<p>LS: tan-gry, fxln, sli fos, shly, some mottled, sub chky, pr por, NS</p> <p>Sh: mstly med gry, some red-brn</p> <p>LS: crm-tan, fxln, ool-fos in prt, sub chky-prtly dns, pr por, NS</p>	Topeka 3395' (-1092) EL
		3450	<p>LS: A.A. w/ some LS: gry, fxln, sli fos, some mottled, sub chky-prtly dns, pr por, NS</p> <p>LS: crm-gry, fxln, fos, some blk mineralization, sub chky-prtly dns w/ some chky, pr por, NS</p> <p>Sh: med-drk gry</p> <p>LS: wh-tan, fxln, fos-ool in prt, sli chty, vry chky-prtly dns, pr w/ tr fr intrprtcl por, NS</p> <p>LS: crm-gry, fxln, fos in prt, some blk mineralization, sub chky-prtly dns, pr por, NS</p> <p>LS: wh-tan, fxln, fos-ool in prt, vry chky-prtly dns, pr w/ tr fr intrprtcl por, NS</p> <p>LS: A.A., sli chty (crm-tan), pr w/ tr fr intrprtcl por, NS</p> <p>LS: wh-gry, fxln, fos-ool in prt, vry chky-prtly dns, pr w/ tr fr intrprtcl por, NS</p> <p>Sh: Black Carb</p> <p>Sh: gry-grn</p> <p>Sh: gry, some red-brn & grn</p> <p>LS: wh-tan, fxln, fos-ool in prt, sli chty, vry chky-prtly dns, pr w/ tr fr intrprtcl por, NS</p> <p>LS: crm-gry, fxln, sli fos, sub chky-prtly dns, pr por, NS</p> <p>Sh: gry</p> <p>LS: A.A.</p> <p>Sh: drk gry</p> <p>LS: wh-tan, fxln, fos-ool in prt, sli chty, vry chky-prtly dns, pr por, NS</p> <p>LS: A.A.</p>	
		3500	<p>LS: wh-tan, fxln, ool-fos in prt, sli chty, vry chky-prtly dns, pr w/ some fr intrprtcl por, NS</p> <p>LS: A.A., gd amnt chky-vry chky, pr por, NS</p>	
		3550	<p>Sh: Black Carb</p> <p>LS: crm-lt brn, fxln, sli fos, sub chky-prtly dns, pr por, NS</p> <p>Sh: gry w/ some red-brn</p>	Heebner 3618' (-1315) EL
		3600	<p>LS: wh-tan, fxln, ool-fos in prt, sli chty, vry chky-prtly dns w/ some chky-vry chky, pr por, NS</p> <p>LS: A.A., gd amnt chky-vry chky, pr por, NS</p>	
		3650	<p>Sh: Black Carb</p> <p>LS: crm-lt brn, fxln, sli fos, sub chky-prtly dns, pr por, NS</p> <p>Sh: gry w/ some red-brn</p> <p>LS: wh-crm, fxln, fos-ool in prt, sli chty, vry chky-prtly dns w/ some chky-vry chky, pr por, NS</p> <p>LS: crm-gry, fxln, sli fos, sub chky-prtly dns, pr por, NS</p> <p>Sh: gry</p> <p>LS: A.A.</p> <p>Sh: drk gry</p> <p>LS: wh-tan, fxln, fos-ool in prt, sli chty, vry chky-prtly dns, pr por, NS</p> <p>LS: A.A.</p>	Toronto 3639' (-1336) EL
		3700	<p>LS: wh-tan, fxln, ool-fos in prt, sli chty, vry chky-prtly dns, pr w/ some fr intrprtcl por, NS</p> <p>LS: A.A., gd amnt chky-vry chky, pr por, NS</p> <p>Sh: gry & red-brn</p> <p>LS: crm, fxln, ool-fos in prt, chty (tan), sub chky-prtly dns, some pr-fr intrprt-vug por, vry scat lt-med brn sptd-sub sat stn, SSFO, no odor</p> <p>LS: crm, fxln, ool-fos in prt, sli chty, tr calcite, sub chky-prtly dns, pr-fr w/ some gd intrprtcl-vug por, scat lt-med brn sptd-sub sat stn, S-FSFO, no odor</p> <p>LS: crm, fxln, sli fos, sub chky-prtly dns, pr por, NS</p> <p>LS: wh-crm, fxln, fos-ool in prt, vry chky-prtly dns (abund vry chky, soft & gummy), pr-fr intrprt por, scat lt brn sptd-sub sat stn, SSFO, fr odor</p> <p>LS: wh-crm, fxln, sli ool-fos, chty (wh-ong), chky-prtly dns w/ some vry chky, pr w/ some fr intrprt por, scat lt-drk brn sptd-sub sat stn & blk sptd sptd stn, VSSFO, fnt odor</p> <p>LS: wh-crm, fxln, ool-fos in prt, vry chky-prtly dns, pr por, NS</p> <p>LS: wh-crm, fxln, sli fos, sub chky-dns w/ some chky-vry chky, pr por, NS</p> <p>LS: lt-med gry, fxln, mstly prtly dns, pr por, NS</p> <p>Sh: Black Carb</p> <p>LS: tan-brn, fxln, sli fos, mstly dns, pr por, NS</p> <p>Sh: gry & red-brn, some grn</p> <p>LS: crm-brn, fxln, sli fos, some shly, sli chty (crm-tan), sub chky-prtly dns w/ some chky-vry chky, pr por, tr blk dead (some tarry) sptd stn & rare brn sptd-sub sat stn, 4 pcs w/ VSSFO (pin point beads), no odor</p> <p>LS: crm-tan, fxln, sli fos, sub chky-dns, tr fr vug por, scat mstly lt brn w/ some med-drk brn sptd-sub sat & edge stn, SSFO, no odor</p> <p>Sh: lt-med gry, soft & gummy in prt, some grn</p> <p>LS: A.A. w/ drk gry & some red-brn</p> <p>LS: wh-crm, fxln, sli fos, sub chky-prtly dns, pr w/ some fr fos & vug por, scat lt-drk brn sptd-sub sat stn & blk asph sptd-sub sat stn, S-FSFO, no odor</p> <p>Sh: gry & red-brn</p> <p>LS: wh-crm, fxln, sli ool-fos, sub chky-prtly dns w/ some chky, pr w/ tr fr intrprtcl & vug por, vry scat brn-blk sptd-sub sat stn, some blk asph stn, SSFO, no odor</p> <p>LS: wh-tan, fxln, fos in prt, some shly (red-brn, mottled), vry chky-dns, pr por, NS</p>	<p>Mud displaced from 2985' to 3000'</p> <p>Morgan Mud check @ 3035': 59 Vis, 8.6 Wt, 7.2 WL, 1,800 ppm Chl, 0# LCM</p> <p>Call depth 2990' @ 11:20 am on 6-20-13</p> <p>Samples start 3290' @ 7:41 pm on 6-20-13</p> <p>DST #1 3649'-3720' LKC 'A'-D' zns IF: BOB in 19" IS: 1.125" blow back died back to surface FF: BOB in 9" FS: 2.5" blow back died back to 1.5" Rec: 661' GIP & 218' TOTAL FLUID: 94' GO (20% G, 80% O) 63' OCGWM (15% G, 15% O, 70% W, 60% M) Oil Gravity 29° API Chl ppm: 31,000 DST; 3,200 Mud IFP: 17-74#/30" ISIP: 879#/60" FFP: 76-123#/60" FSIP: 869#/90"</p> <p>Ran 20 stand short trip prior to DST #1 Straight Hole Survey @ 3720': 0.5° Dev.</p> <p>Ran another bit (re-run) @ 3720'</p> <p>DST #2 3718'-3748' LKC 'E'-F' zns IF: BOB in 25" IS: no blow back FF: BOB in 29" FS: no blow back Rec: 303' MW w/ oil spots (70% W, 30% M) Chl ppm: 48,000 DST; 3,200 Mud IFP: 17-74#/30" ISIP: 1022#/60" FFP: 78-157#/60" FSIP: 1013#/90"</p> <p>Pipe Strap @ 3748': Strap long 0.27'</p> <p>Morgan Mud check @ 3748': 50 Vis, 9.2 Wt, 8.0 WL, 2,900 ppm Chl, 1# LCM</p>
		3750	<p>LS: wh-crm, fxln, ool-fos in prt, vry chky-prtly dns, pr por, NS</p> <p>LS: wh-crm, fxln, sli fos, sub chky-dns w/ some chky-vry chky, pr por, NS</p> <p>LS: lt-med gry, fxln, mstly prtly dns, pr por, NS</p> <p>Sh: Black Carb</p> <p>LS: tan-brn, fxln, sli fos, mstly dns, pr por, NS</p> <p>Sh: gry & red-brn, some grn</p> <p>LS: crm-brn, fxln, sli fos, some shly, sli chty (crm-tan), sub chky-prtly dns w/ some chky-vry chky, pr por, tr blk dead (some tarry) sptd stn & rare brn sptd-sub sat stn, 4 pcs w/ VSSFO (pin point beads), no odor</p> <p>LS: crm-tan, fxln, sli fos, sub chky-dns, tr fr vug por, scat mstly lt brn w/ some med-drk brn sptd-sub sat & edge stn, SSFO, no odor</p> <p>Sh: lt-med gry, soft & gummy in prt, some grn</p> <p>LS: A.A. w/ drk gry & some red-brn</p> <p>LS: wh-crm, fxln, sli fos, sub chky-prtly dns, pr w/ some fr fos & vug por, scat lt-drk brn sptd-sub sat stn & blk asph sptd-sub sat stn, S-FSFO, no odor</p> <p>Sh: gry & red-brn</p> <p>LS: wh-crm, fxln, sli ool-fos, sub chky-prtly dns w/ some chky, pr w/ tr fr intrprtcl & vug por, vry scat brn-blk sptd-sub sat stn, some blk asph stn, SSFO, no odor</p> <p>LS: wh-tan, fxln, fos in prt, some shly (red-brn, mottled), vry chky-dns, pr por, NS</p>	<p>DST #3 3777'-3870' LKC 'H'-K' zns IF: BOB in 3" IS: blow built to 2.75", died back to 2" FF: BOB in 4" FS: no blow back Rec: 1.107' GIP & 497' TOTAL FLUID: 497' GMACO (50% G, 35% O, 15% M) IFP: 94-174#/30" ISIP: 459#/60" FFP: 190-234#/30" FSIP: 502#/90"</p>
		3800	<p>LS: wh-crm, fxln, sli fos, sub chky-prtly dns, pr w/ some fr fos & vug por, scat lt-drk brn sptd-sub sat stn & blk asph sptd-sub sat stn, S-FSFO, no odor</p> <p>Sh: gry & red-brn</p> <p>LS: wh-crm, fxln, sli ool-fos, sub chky-prtly dns w/ some chky, pr w/ tr fr intrprtcl & vug por, vry scat brn-blk sptd-sub sat stn, some blk asph stn, SSFO, no odor</p> <p>LS: wh-tan, fxln, fos in prt, some shly (red-brn, mottled), vry chky-dns, pr por, NS</p> <p>Sh: lt gry (soft & gummy) & red-brn (some soft & gummy) w/ some med-drk gry</p> <p>Sd: gry-grn, fn-vry fn grain, sli calc, sli mic, shly, semi fri, pr vis por, NS</p> <p>Sh: mstly red-brn, some soft & gummy, some sdy, some gry & grn</p> <p>LS: crm-lt gry, sli fos, sub chky-prtly dns, pr por, NS</p> <p>Sh: red-brn (some soft & gummy) w/ gry-grn</p>	
		3850	<p>LS: crm-lt gry, fxln, some sdy (vry fn grain), sub chky-prtly dns w/ some chky, pr por, NS</p> <p>Sh: red-brn & gry, some grn</p> <p>Sh: mstly red-brn, gd amnt soft & gummy, some gry-grn</p> <p>LS: crm-lt gry, fxln, sdy in prt (fn grain), sub chky-prtly dns, pr por, NS</p> <p>Sh: A.A.</p> <p>LS: crm-lt gry, fxln, chty (mstly org, some crm), sub chky-prtly dns w/ some chky, pr por, NS</p> <p>Sh: red-brn, soft & gummy in prt, some gry & grn</p>	Stark 3845' (-1542) EL
		3900	<p>LS: wh-tan, fxln, fos in prt, some shly (red-brn, mottled), vry chky-dns, pr por, NS</p> <p>Sh: lt gry (soft & gummy) & red-brn (some soft & gummy) w/ some med-drk gry</p> <p>Sd: gry-grn, fn-vry fn grain, sli calc, sli mic, shly, semi fri, pr vis por, NS</p> <p>Sh: mstly red-brn, some soft & gummy, some sdy, some gry & grn</p> <p>LS: crm-lt gry, sli fos, sub chky-prtly dns, pr por, NS</p> <p>Sh: red-brn (some soft & gummy) w/ gry-grn</p>	B/KC 3891' (-1588) EL
		3950	<p>LS: crm-lt gry, fxln, some sdy (vry fn grain), sub chky-prtly dns w/ some chky, pr por, NS</p> <p>Sh: red-brn & gry, some grn</p> <p>Sh: mstly red-brn, gd amnt soft & gummy, some gry-grn</p> <p>LS: crm-lt gry, fxln, sdy in prt (fn grain), sub chky-prtly dns, pr por, NS</p> <p>Sh: A.A.</p> <p>LS: crm-lt gry, fxln, chty (mstly org, some crm), sub chky-prtly dns w/ some chky, pr por, NS</p> <p>Sh: red-brn, soft & gummy in prt, some gry & grn</p>	Marmaton 3936' (-1633) EL
		4000	<p>LS: wh-tan, fxln, fos in prt, some shly (red-brn, mottled), vry chky-dns, pr por, NS</p> <p>Sh: lt gry (soft & gummy) & red-brn (some soft & gummy) w/ some med-drk gry</p> <p>Sd: gry-grn, fn-vry fn grain, sli calc, sli mic, shly, semi fri, pr vis por, NS</p> <p>Sh: mstly red-brn, some soft & gummy, some sdy, some gry & grn</p> <p>LS: crm-lt gry, sli fos, sub chky-prtly dns, pr por, NS</p> <p>Sh: red-brn (some soft & gummy) w/ gry-grn</p>	<p>Ran 8 stand short trip @ TD, prior to CFS</p> <p>L.T.D. 3999' (-1696)</p> <p>R.T.D. 4000' (-1697)</p> <p>Straight Hole Survey @ 4000': 0.875° Dev.</p>