

Robert L. Milford

PETROLEUM GEOLOGIST
WICHITA, KANSAS

GEOLOGISTS REPORT
DRILLING TIME AND SAMPLE LOG

OPERATOR **Murfin Drilling Company, Inc.**
LEASE **Theron #3-10**
LOC SPOT **C SE SE**

ELEVATIONS
KB **3198'**
GL **3193'**

MEASUREMENTS
LOC FOOTAGE **660' FSL 660' FEL**
SEC. **10** TWP **1S** RNG **37W**
COUNTY **Cheyenne** STATE **KANSAS**

CONTRACTOR **Murfin Drilling Co., Inc.** RIG NO. **8**
DRILLING STARTED **7-6-2014** COMPLETED **7-24-2014**
DRILLING TIME **17:22** MUD TYPE **Chemical**
MUD DISPLACEMENT **3.996** TO RTD
DRILLING TIME KEPT FROM **3.990** TO RTD
SAMPLES SAVED FROM **3.990** TO RTD
SAMPLES EXAMINED FROM **3.990** TO RTD
GEOLOGICAL SUPERVISION FROM **3.990** TO RTD

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FORMATION NAME	LOG TOP	LOG BOTTOM	SAMPLE TOP	SAMPLE BOTTOM
Stone Corral	3143'	+85'	3143'	+85'
Neva	3197'	-99'	3198'	-00'
Topeka	3929'	-31'	3930'	-732'
Oread	4066'	-868'	4066'	-868'
Lansing	4148'	-950'	4148'	-950'
Stark	4364'	-1166'	4365'	-1167'
B/KC	4419'	-1221'	4420'	-1222'
Pawnee	4543'	-1345'	4543'	-1345'
Cherokee	4634'	-1436'	4634'	-1436'
Total Depth	4734'	-1536'	4735'	-1537'

DATE	7:00 AM DEPTH	REMARKS
7-16-14	0'	Spud @ 9:00 am. Plug down @ 12:30 pm. Drilled out plug @ 8:30 pm w/ PDC bit
7-17-14	1,395'	Cut 1,395' in last 24 hrs; 9:25 hrs drlg w/ PDC bit. Trip to clean balled bit @ 2868'
7-18-14	3,170'	Cut 1,775' in last 24 hrs; 19:25 hrs drlg. Bit trip @ 3454' (ran button bit)
7-19-14	3,730'	Cut 560' in last 24 hrs; 14:5 hrs drlg. DST #1 @ 4075'
7-20-14	4,075'	Cut 345' in last 24 hrs; 14 hrs drlg. Last circ @ 4093' (down 3.25 hrs). DST #2 @ 4218'
7-21-14	4,218'	Cut 143' in last 24 hrs; 7:75 hrs drlg.
7-22-14	4,365'	Cut 147' in last 24 hrs; 8:25 hrs drlg. DST #3 @ 4365'
7-23-14	4,560'	Cut 195' in last 24 hrs; 10:25 hrs drlg. DST #4 @ 4570'
7-24-14	4,655'	Cut 95' in last 24 hrs; 6 hrs drlg. RTD 4735' @ 10:49 am
7-25-14	4,735'	Cut 80' in last 24 hrs; 3:25 hrs drlg. Ran production casing.

Remarks

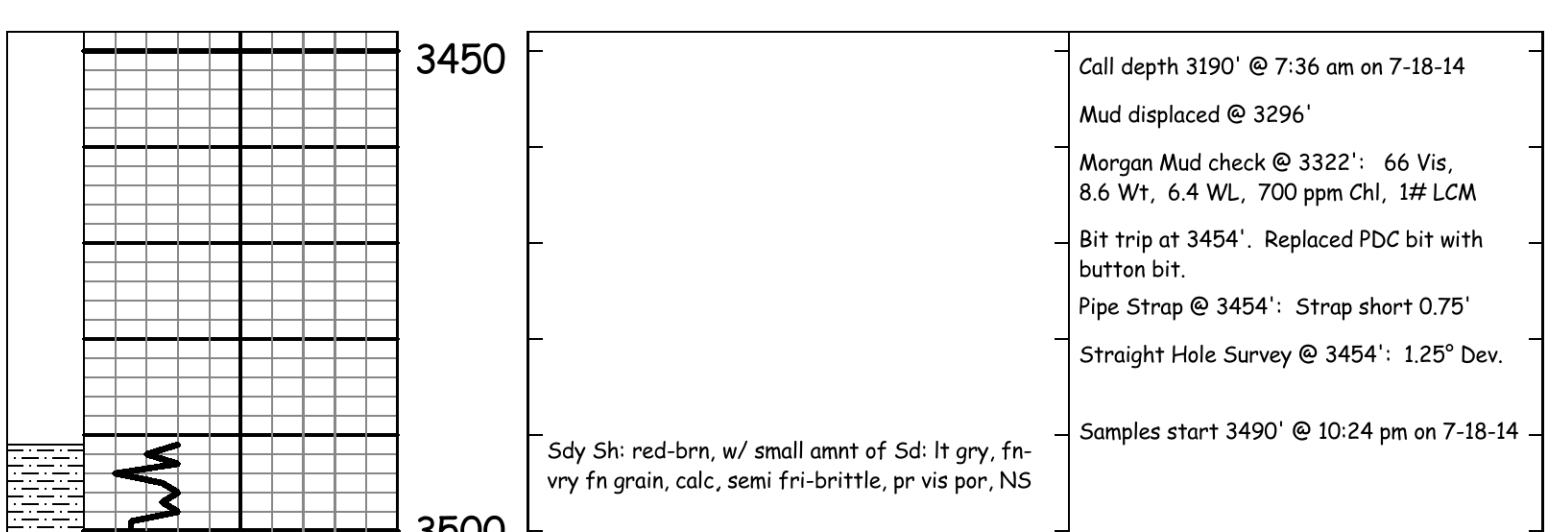
The electric log measurements correlate from even to 1' higher to the drilling measurements.

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

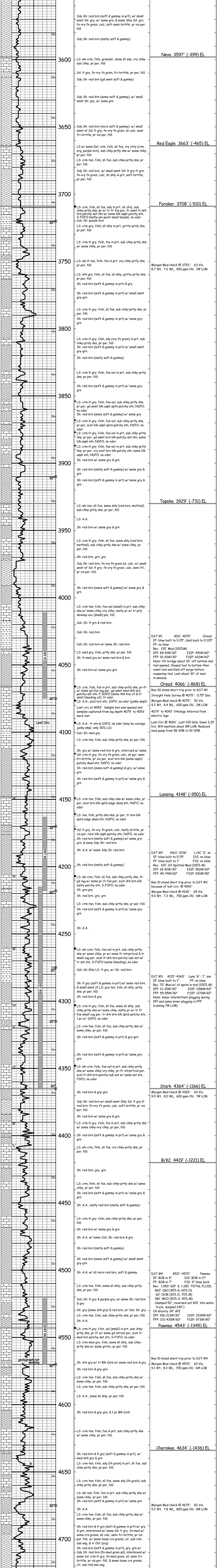
The drilling samples were deposited at the Kansas Geological Survey office in Wichita.

Respectfully submitted,

Robert L. Milford



LITH.	DRILL TIME (MIN/FT)	DEPTH	SAMPLE DESCRIPTIONS	REMARKS
		3150		Stone Corral 3143' (+85) EL
		3200		B/Stone Corral 3173' (+25) EL



Call depth 3190' @ 7:36 am on 7-18-14
Mud displaced @ 3296'
Morgan Mud check @ 3322': 66 Vis, 8.6 Wt, 6.4 WL, 700 ppm Chl, 1# LCM
Bit trip at 3454'. Replaced PDC bit with button bit.
Pipe Strap @ 3454': Strap short 0.75'
Straight Hole Survey @ 3454': 1.25" Dev.

Samples start 3490' @ 10:24 pm on 7-18-14

Sdy Sh: red-brn, w/ small amt of Sd: lt gry, fn-vry fn grain, calc, semi fri-brittle, pr vis por, NS

Sdy Sh: red-brn (small amt soft & gummy), w/ small amt Sd: gry, & some Sd: lt gry, fn-vry fn grain, sli calc, semi fri-brittle, pr vis por, NS

Sdy Sh: red-brn (some soft & gummy), w/ small amt Sd: gry, & small amt Sd: A.A.

Sdy Sh: A.A. w/ incrs amt soft & gummy, & small amt of Sh & Sd: A.A.

Sdy Sh: red-brn (gd amt soft & gummy), w/ small amt of Sd: gry, w/ tr grn

Sdy Sh: red-brn (soft & gummy in prt), w/ small amt Sd: gry, w/ some grn, & some Shly Sd: grn, fn-vry fn grain, calc, soft-semi brittle, pr vis por, NS

Sdy Sh: red-brn (mstly soft & gummy)

LS: wh-crm, fxln, granular, some sli sdy, vry chky-sub chky, pr por, NS

Sd: lt gry, fn-vry fn grain, fri-brittle, pr por, NS

Sdy Sh: red-brn (gd amt soft & gummy)

Sdy Sh: red-brn (some soft & gummy), w/ small amt Sd: gry, w/ some grn

Sdy Sh: red-brn (ncrs soft & gummy), w/ small amt of Sd: lt gry, fn-vry fn grain, sli calc, semi fri-brittle, pr vis por, NS

LS w/ some Dol: crm, fxln, sli fos, vry chy (crm, org, purple-brn), sub chky-prtly dns w/ some chky, pr por, NS

LS: crm-tan, fxln, sli fos, sub chky-prtly dns, pr por, NS

Sdy Sh: red-brn, w/ small amt Sd: lt gry-lt grn, fn-vry fn grain, calc, sli shly in prt, soft-brittle, pr por, NS

LS: crm, fxln, sli fos, sdy in prt, sli chky, sub chky-prtly dns, pr w/ tr fr fos por, fr amt lt-drk brn patchy-sat stn w/ some blk asph patchy stn, S-FSFO (mstly min point-small beads), no odor

Calc: Sh: purple-brn

LS: crm-gry, fxln, sli shly in prt, gritty-prtly dns, pr por, NS

LS: crm-lt gry, fxln, fos in prt, sub chky-prtly dns w/ some chky, pr por, NS

LS: wh-lt tan, fxln, fos in prt, vry chky-prtly dns, pr por, NS

LS: drk gry, fxln, sli fos, sli shly, gritty-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) & gry

Sh: red-brn (soft & gummy in prt) w/ small amt gry-grn

LS: crm-lt gry, fxln, sli fos, sub chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some gry-grn

LS: crm-lt gry, fxln, sdy (vry fn grain) in prt, sub chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ small amt gry-grn

Sh: red-brn (mstly soft & gummy)

LS: crm-lt gry, fxln, fos-ool in prt, sub chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

Sh: red-brn (mstly soft & gummy) w/ some gry & grn

LS: crm-lt gry, fxln, fos-ool (small) in prt, sub chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

LS: crm-lt gry, fxln, fos-ool, sub chky-prtly dns, pr por, gd amt blk asph spdt-patchy stn, NSFO, no odor

Sh: red-brn (some soft & gummy) w/ some gry

LS: crm-lt gry, fxln, fos-ool, sub chky-prtly dns, pr por, scat blk asph spdt-patchy stn, some blk asph stn, NSFO, no odor

LS: crm-lt gry, fxln, fos-ool in prt, sub chky-prtly dns, pr por, vry scat brn-blk patchy stn, some blk asph stn, NSFO, no odor

Sh: red-brn w/ some gry & grn

Sh: red-brn (mstly soft & gummy) w/ some gry & grn

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

LS: crm-lt gry, fxln, sli fos, some shly (red-brn, mottled), sub chky-prtly dns, pr por, NS

LS: A.A.

Sh: red-brn w/ some gry & grn

LS: crm-lt gry, fxln, sli fos, some shly (red-brn, mottled), sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn, grn, gry

Sdy Sh: red-brn, fn-vry fn grain sd, calc, w/ small amt of Sd: lt gry, fn-vry fn grain sd, calc, w/ fr vis por, NS

Sh: red-brn (some soft & gummy) w/ some gry & grn

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

LS: crm-tan, fxln, fos-ool (small) in prt, sub chky-prtly dns w/ some vry-chky, mstly pr w/ tr prly develop ooc (small) por, NS

Calc: Sh: lt grn & red-brn

Calc: Sh: red-brn

Calc: Sh: red-brn w/ some Sh: red-brn

LS: med gry, fxln, prtly dns, pr por, NS

Sh: lt-med gry w/ some red-brn & brn

Sh: red-brn w/ some gry-grn

LS: crm, fxln, fos in prt, sub chky-prtly dns, pr-fr w/ some gd fos-vug por, gd amt med-drk brn patchy-sat stn, S-FSFO (some thk-hvy oil & fr amt bleeding oil), fr odor

LS: A.A., scat brn stn, SFSFO, no odor (junky smell)

Lost circ @ 4093'. Sample box was opened and samples captured from lag depth 4079' to 4093' were lost.

LS: A.A., tr stn & SFSFO, no odor (may be cavings, junky smell, only 30% LS)

Calc: Sh: med gry, sub chky-prtly dns, pr por, NS

Sh: gry w/ some red-brn & grn, interixed w/ some Sd: crm-lt gry, fn-vry fn grain, calc, sli pyr, semi fri-brittle, pr vis por, scat brn-blk (some asph) patchy dead stn, NSFO, no odor

Sh: red-brn (some soft & gummy) & gry, w/ some grn

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

LS: crm-tan, fxln, sub chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some gry-grn

Sh: A.A.

LS: wh-crm, fxln, sli fos, sub chky-prtly dns, fr-gd vug w/ some pr-fr fos por, scat drk brn-blk mstly patchy stn, S-FSFO, no odor

Sh: gry-grn

Sh: red-brn, gry, grn

LS: crm-tan, fxln, sub chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some gry-grn

Sh: A.A.

LS: wh-crm, fxln, fos-ool in prt, sub chky-prtly dns w/ some chky, pr w/ some fr intrptcal & tr small vug por, scat lt-drk brn patchy-sub sat w/ tr sat stn, S-FSFO (some bleeding), no odor

Calc: Sh: Shly-LS: lt gry, w/ Sh: red-brn

Sh: lt gry (soft & gummy in prt) w/ some red-brn, & small amt of LS: gry-tan, fxln, sli shly, prtly dns, pr por, NS

Sh: red-brn & gry

LS: crm-lt gry, fxln, sli fos, some sli shly, sub chky-prtly dns w/ some chky, mstly pr w/ tr fr fos-small vug por, tr drk brn-blk spdt-patchy stn, 1 pc w/ SFSFO, no odor

LS: crm-tan, fxln, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (soft & gummy in prt) & gry-grn

Sh: red-brn (soft & gummy in prt) w/ some gry-grn

LS: wh-crm, fxln, fos-ool in prt, sub chky-prtly dns w/ some chky-vry chky, pr-fr intrptcal por, scat lt-drk brn patchy-sub sat w/ some sat stn, SFSFO, no odor

Sh: red-brn & gry-grn

Sdy Sh: red-brn w/ small amt Shly Sd: lt gry-lt grn, fn-vry fn grain, calc, soft-brittle, pr vis por, NS

Sh: red-brn w/ some gry & grn

LS: crm-lt gry, fxln, fos in prt, sub chky-prtly dns w/ some chky-vry chky, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

LS: wh-crm, fxln, sli fos, vry chky-prtly dns, pr por, NS

Sh: red-brn, gry, grn

LS: crm, fxln, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

Sh: A.A., mstly red-brn (mstly soft & gummy)

LS: crm-lt gry, fxln, sub chky-prtly dns, pr por, NS

Sh: red-brn w/ some gry & grn

Sh: A.A. w/ some Calc: Sh: red-brn & gry

Sh: red-brn (mstly soft & gummy)

Sh: red-brn (some soft & gummy) w/ small amt gry-grn

Sh: A.A. w/ sli incrs red-brn, soft & gummy

LS: crm-tan, fxln, some sli shly, sub chky-prtly dns, pr por, NS

Calc: Sh: lt gry & purple-gry, w/ some Sh: red-brn & gry

Sh: gry (some drk gry) & red-brn, w/ Calc: Sh: gry

LS: crm-tan, fxln, sub chky-prtly dns, pr por, NS

LS: crm-lt gry, fxln, ool (small) in prt, sub chky-prtly dns, pr-fr w/ some chky-vry chky, pr-fr intrptcal por, scat lt-med brn patchy-sat stn, S-FSFO, no odor

LS: crm-med gry, fxln, some sli shly, sub chky-prtly dns w/ some gritty, pr por, NS

Sh: drk gry w/ tr Blk Carb w/ some red-brn & gry

Sh: red-brn & gry-grn

LS: crm-tan, fxln, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

LS: crm-tan, fxln, sub chky-prtly dns, pr por, NS

LS: A.A., some sli shly, pr por, NS

Sh: red-brn & gry-grn, & 1 pc Blk Carb

LS: crm-tan, fxln, fos in prt, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn & lt gry (soft & gummy in prt), w/ med-drk gry & grn

LS: crm-tan, fxln, sdy (fn grain) in prt, sli fos, sub chky-prtly dns, pr por, NS

LS: crm-tan, fxln, sli fos, some sdy (fn grain), sub chky-prtly dns, pr por, NS

LS: wh-tan, fxln, fos in prt, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some grn

Sh: A.A.

LS: crm-tan, fxln, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn & lt gry (soft & gummy in prt) w/ gry & grn, intermixed w/ some Sd: lt gry, fn-med w/ some crs grains, sli calc, semi fri-brittle, pr vis por, NS, w/ some loose crs grains, cir, sub rnd-sub ong, & tr Chl (pr por)

Sh: red-brn (soft & gummy in prt), gry, grn w/ Sdy Sh: red-brn (fn-med grain sd), intermixed w/ some Sd: crm-lt gry, fn-med grain, sli, semi fri-brittle, pr vis por, NS, & some loose crs grains, clr, sub rnd-sub ong

Sdy Sh: red-brn (fn-med grain sd), & Sh: red-brn (some soft & gummy), gry, grn w/ intermixed w/ some Sd clusters and loose grains A.A.

A.A.

A.A.

R.T.D. 4734' (-1536)

R.T.D. 4735' (-1537)

Ran 10 stand short trip @ 4735' after CFS Straight Hole Survey @ 4735': 1.25" Dev.

DST #1 4011'-4075' Oread
IF: blow built to 0.25', died back to 0.125"
FF: no blow
Rec: 135' Mud (100% M)
IFF: 89-91#/30' FSIP: 491#/60'
FFP: 91-93#/30' FSIP: 603#/60'
Note: Hit bridge about 20' off bottom and tool opened. Chased tool to bottom then reset tool and bled off surge before reopening tool. Lost about 30' of mud in annulus.

Oread 4066' (-868) EL
Ran 20 stand short trip prior to DST #1 Straight Hole Survey @ 4075': 0.75" Dev.
Morgan Mud check @ 4075': 52 Vis, 9.2 Wt, 8.4 WL, 600 ppm Chl, 2# LCM
4079' to 4093' lithology inferred from electric logs

LS: crm, fxln, sli fos, sdy in prt, sli chky, sub chky-prtly dns, pr w/ tr fr fos por, fr amt lt-drk brn patchy-sat stn w/ some blk asph patchy stn, S-FSFO (mstly min point-small beads), no odor

Calc: Sh: purple-brn

LS: crm-gry, fxln, sli shly in prt, gritty-prtly dns, pr por, NS

LS: crm-lt gry, fxln, fos in prt, sub chky-prtly dns w/ some chky, pr por, NS

LS: wh-lt tan, fxln, fos in prt, vry chky-prtly dns, pr por, NS

LS: drk gry, fxln, sli fos, sli shly, gritty-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) & gry

Sh: red-brn (soft & gummy in prt) w/ small amt gry-grn

LS: crm-lt gry, fxln, sli fos, sub chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some gry-grn

LS: crm-lt gry, fxln, sdy (vry fn grain) in prt, sub chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ small amt gry-grn

Sh: red-brn (mstly soft & gummy)

LS: crm-lt gry, fxln, fos-ool in prt, sub chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

Sh: red-brn (mstly soft & gummy) w/ some gry & grn

LS: crm-lt gry, fxln, fos-ool (small) in prt, sub chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

LS: crm-lt gry, fxln, fos-ool, sub chky-prtly dns, pr por, gd amt blk asph spdt-patchy stn, NSFO, no odor

Sh: red-brn (some soft & gummy) w/ some gry

LS: crm-lt gry, fxln, fos-ool, sub chky-prtly dns, pr por, scat blk asph spdt-patchy stn, some blk asph stn, NSFO, no odor

LS: crm-lt gry, fxln, fos-ool in prt, sub chky-prtly dns, pr por, vry scat brn-blk patchy stn, some blk asph stn, NSFO, no odor

Sh: red-brn w/ some gry & grn

Sh: red-brn (mstly soft & gummy) w/ some gry & grn

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

LS: crm-lt gry, fxln, sli fos, some shly (red-brn, mottled), sub chky-prtly dns, pr por, NS

LS: A.A.

Sh: red-brn w/ some gry & grn

LS: crm-lt gry, fxln, sli fos, some shly (red-brn, mottled), sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn, grn, gry

Sdy Sh: red-brn, fn-vry fn grain sd, calc, w/ small amt of Sd: lt gry, fn-vry fn grain sd, calc, w/ fr vis por, NS

Sh: red-brn (some soft & gummy) w/ some gry & grn

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

LS: crm-tan, fxln, fos-ool (small) in prt, sub chky-prtly dns w/ some vry-chky, mstly pr w/ tr prly develop ooc (small) por, NS

Calc: Sh: lt grn & red-brn

Calc: Sh: red-brn

Calc: Sh: red-brn w/ some Sh: red-brn

LS: med gry, fxln, prtly dns, pr por, NS

Sh: lt-med gry w/ some red-brn & brn

Sh: red-brn w/ some gry-grn

LS: crm, fxln, fos in prt, sub chky-prtly dns, pr-fr w/ some gd fos-vug por, gd amt med-drk brn patchy-sat stn, S-FSFO (some thk-hvy oil & fr amt bleeding oil), fr odor

LS: A.A., scat brn stn, SFSFO, no odor (junky smell)

Lost circ @ 4093'. Sample box was opened and samples captured from lag depth 4079' to 4093' were lost.

LS: A.A., tr stn & SFSFO, no odor (may be cavings, junky smell, only 30% LS)

Calc: Sh: med gry, sub chky-prtly dns, pr por, NS

Sh: gry w/ some red-brn & grn, interixed w/ some Sd: crm-lt gry, fn-vry fn grain, calc, sli pyr, semi fri-brittle, pr vis por, scat brn-blk (some asph) patchy dead stn, NSFO, no odor

Sh: red-brn (some soft & gummy) & gry, w/ some grn

Sh: red-brn (soft & gummy in prt) w/ some gry & grn

LS: crm-tan, fxln, sub chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) w/ some gry-grn