

# Jeff Christian

PETROLEUM GEOLOGIST  
Wichita, Kansas

## GEOLOGISTS REPORT

DRILLING TIME AND SAMPLE LOGS

OPERATOR: **MURKIN DRILLING COMPANY**  
 LEASE: **PATTI # 1-10**  
 LOCATION: **1820' FINL & 660' FWL**

SEC: **10** TWP: **1 S** RNG: **3 W**  
 COUNTY: **CHEYENNE** STATE: **KANSAS**

CONTRACTOR: **JONES CANNON SE**  
 FIELD: **15-023-21364**  
 ARI: **15-023-21364**

DRILLING STARTED: **04/24/2011** COMPLETED: **05/04/2013**  
 MUD DISP/ACED: **3270'** MUD TYPE: **CHEMICAL**  
 DRILLING TIME KEPT FROM: **3000'** TO: **RTD**  
 SAMPLES SAVED FROM: **3000'** TO: **RTD**  
 SAMPLES EXAMINED FROM: **3000'** TO: **RTD**  
 GEOLOGICAL SUPERVISION FROM: **3179'** TO: **RTD**

MEASUREMENTS FROM: **R/L**  
 CASING RECORD  
 CONDUIT: **NONE**  
 SCALES: **8.5/16 @ 224'**  
**11/16 @ 225'**  
**1 1/2 @ 233'**

ELEVATIONS  
 HGS: **3200'**  
 OIL: **3190'**

FORMATION NAME LOG SAMPLE  
 TOP DATUM TOP DATUM  
 ANHYDRITE 3148' (-482) 3147' (-483)  
 NEVA 3147' (-514) 3142' (-512)  
 FORAKER 3141' (-514) 3134' (-512)  
 TOPEKA 3131' (-523) 3134' (-524)  
 LANSING 4151' (-951) 4149' (-949)  
 STARK 4369' (-1169) 4367' (-1167)  
 BKC 4424' (-1224) 4424' (-1224)  
 PAWNEE 4547' (-1347) 4545' (-1345)  
 CHEROKEE 4634' (-1434) 4634' (-1434)  
 TOTAL DEPTH: 4736' (-1536) 4735' (-1535)

DATE	7:00 AM DEPTH	REMARKS
4/24/13	MIRT	SPUD @ 5:45 pm
4/25/13	227'	WOC dev. 1/2 deg.
4/26/13	2000'	DRL6.
4/27/13	3150'	DRL6.
4/28/13	3722'	CFS dev. 1/2 deg.
4/29/13	3825'	DRL6.
4/30/13	4080'	TIH after DST # 2
5/1/13	4221'	TIH after DST # 3
5/2/13	4372'	CFS
5/3/13	4545'	DRL6. dev. 2 deg. @ 4560'
5/4/13	4665'	DRL6. RTD 4735' @ 9:15 am dev. 3 3/4 deg. Finish Logging @ 7:30 pm

**Remarks**  
 5 1/2" production casing set to further test the Pawnee and Lansing / Kansas City formations.  
 Electric log measurements correlate about the same as rotary measurements.  
 Samples deposited at the Kansas Geological Survey.  
 Respectfully Submitted,  
*Jeff Christian*  
 Jeff Christian

LITH	DRILL TIME (MINFT)	DEPTH	SAMPLE DESCRIPTIONS	REMARKS
		3100		
		3150		ANI-HYDRITE 3147' (-53) E Log 3148' (-52)
		3200		Base ANI-HYDRITE 3179' (-21) E Log 3180' (-20)
		3500	Sh: red-brn, stly-sndy w/ Sst: lt gry, vy fn gm, qtz cmnt, pr vis por, ns  Sh: red-brn, stly-sndy, gummy in part	
		3550	Sh: red-brn, stly-sndy, some gry & gm sh  Sh: red-brn, sli stly-sndy, gummy in part	
		3600	Sh: red-brn, stly-sndy, gummy in part  Dolo: crm-lt gry, fn xln, gmlr, sli foss-mottl, fr intrxn-trc vug por, ns Ls: crm-lt gry, fn xln, part dns, sli foss, pr vis por, ns Sh: red-brn, stly-sndy w/ sct Sst: lt gry-grn/gry, vy fn-gm, sli calc  Some	NEVA 3600' (-400) E Log 3600' (-400)
		3650	Sh: red-brn, gummy, stly-sndy in part	
		3700	Ls: crm-lt gry, fn xln, dolo in part, sli chily, sli foss w/ chrt: ong-red, opq, ns Ls: lt gry-gry, fn xln, dns, sli foss, pr vis por, ns Sh: red-brn, gummy, stly-sndy  Sh: as above, some gry & gm sh	RED EAGLE 3666' (-466) DST # 1 3680' to 3722' 30"-60"-30"-60" IF: Blow Built to 1/8" FF: No Blow RECOVERY: 120' Mud nso FFP: 123-125# FSP: 601# IHP: 1740# FHP: 177# BHT: 124 deg F *Note: HT bridge @ about 1250' had to work through, tool opened
		3750	Ls: lt gry, fn xln, part dns, sli foss-ool, pr pp-vug por, sfo (mostly flaky-inert), no odor, drk brn-bik spdt stn Ls: lt gry-prpl/gry, fn xln, gmlr, chrt, pr vis por, ns Ls: lt gry-gry, fn xln, gmlr, part dns, sli foss, pr vis por, ns Ls: crm-lt gry, fn xln, gmlr, sli ool-micro comld, fr comld por, ns w/ fr amnt wt chlk  Sh: red-brn, stly, gummy in part	FORAKER 3714' (-514) E Log 3714' (-514) Pipe Strap @ 3722': 1.52' short to board Dev. 1 1/2 deg. Morgan Mud: 3722': 4/28/13 Wt: 8.8, Vis: 56, WL: 5.6, Chl: 800, LCM: 6
		3800	Ls: crm-lt gry, fn xln, subchily, part dns, foss, pr vis por, ns  Sh: red-brn, gummy in part, some gm & prpl sh  Sh: as above w/ Ls: lt red, fn xln, sndy, shly, pr vis por, ns  Sh: red-brn, stly, some gummy, some gry & gm sh	
		3850	Ls: crm-lt gry-gm/gry, fn xln, dns, foss-ool in part, pr vis por, ns  Sh: gry w/ Ls: gry, fn xln, dns  Ls: crm-lt gry, fn xln, part dns, ool-sli foss, pr vis por, sct bik spdt dead stn, nso, no odor  Ls: as above, more ool, pr vis por, abndnt blk spdt dead stn, nso, no odor  Ls: wt-crm-lt gry, fn xln, chily in part, part dns, ool in part, sct dead stn, pr vis por, nso  Ls: lt gry, fn xln, dns, sli foss-ool, pr vis por, ns  Sh: red-brn, some gry & gm sh  Ls: as above  Sh: red-brn, stly in part, gummy in part  Some	Morgan Mud: 3865': 4/29/13 Wt: 8.8, Vis: 63, WL: 5.6, Chl: 800, LCM: 6
		3900	Ls: crm-lt gry, fn xln, dns, chily in part, sli foss, trc chrt, pr vis por, ns  Ls: as above w/ intrbed red sh in part  Sh: red-brn, stly  Ls: crm-lt gry, fn xln, dns, sli foss w/ intrbed red sh  Some  Sh: red-brn, stly, some lt prpl, calc  Sh: as above, some gry & gm sh, trc sst	TOPEKA 3935' (-735) E Log 3935' (-735)
		4000	Ls: lt brn-lt gry, fn xln, sli ool, micro comld, fr por, ns Ls: crm-lt gry, yell-brn, fn xln, dns, ool in part, pr vis por, ns Sh: lt prpl, calc  Sh: lt red-lt prpl, calc  Sh: gry-grn, some red & brn, calc in part	DST # 2 4018' to 4080' 30"-60"-30"-60" IF: Blow Built to 1/8" FF: No Blow RECOVERY: 5' Mud nso FFP: 14-21# FSP: 800# IHP: 19-52# FSP: 939# IHP: 1970# FHP: 2056# BHT: 131 deg F
		4050	Ls: lt gry, fn xln, part dns, sli foss-ool, pr vis por, sct brn sub-stn, trc sst stn, nso, no odor  Ls: lt gry-gry, fn xln, dns w/ vy sct Sst: lt gry, vy fn gm, calc, pr vis por, ns Sst: lt gry, vy fn gm, calc, fri-mathy, pr vis por, bik spdt stn, nso, no odor  Sh: red-brn, gummy in part, stly in part, some gry & gm sh	OREAD 4070' (-870) E Log 4070' (-870) Morgan Mud: 4080': 4/30/13 Wt: 9.4, Vis: 120, WL: 8.4, Chl: 600, LCM: 5
		4100	Ls: lt gry, fn xln, part dns, sli foss-ool, pr vis por, sct brn sub-stn, trc sst stn, nso, no odor  Ls: lt gry-gry, fn xln, dns w/ vy sct Sst: lt gry, vy fn gm, calc, pr vis por, ns Sst: lt gry, vy fn gm, calc, fri-mathy, pr vis por, bik spdt stn, nso, no odor  Sh: red-brn, gummy in part, stly in part, some gry & gm sh	
		4150	Ls: crm-lt gry, fn xln, dns, chily in part, vy sct pcs sli foss, pr-trc fr vug-frac por, vsfo, no odor, drk brn spdt stn Ls: lt brn-lt gry, vy fn xln, dns, pr vis por, ns w/ sct wt chlk  Sh: red-brn, some gry & gm w/ vy sct Sst: lt gry, vy fn gm, fri-subfri, sli calc, pr vis por, ns  Sh: red-brn, sndy, stly  Sh: as above, gummy in part	LANSING 4151' (-951) E Log 4151' (-951) DST # 3 4092' to 4221' 30"-60"-60"-90" IF: 80B/28" ISI: No Return FF: No Blow RECOVERY: 730' total fluid 280' SOCM (10%O,90%W) 360' SOCMW (10%O,35%W,55%W) 90' SOCMW (5%O,65%W,30%W) FFP: 64-207# FSP: 1283# IHP: 2101# FHP: 1936# BHT: 135 deg F CHL: 28.000 ppm (mud man)
		4200	Some  Ls: crm-lt gry, fn xln, foss, pr-fr vug-foss por, gfo, no odor, drk brn spdt-few sub-stn Ls: crm-lt gry, fn xln, dns, bikly, chily in part, dtrs -in show as above  Sh: red-brn, stly, gmlr, dns, foss in part, pr vis por, ns  Sh: red-brn, gummy, some gry & gm sh	Morgan Mud: 4224': 5/1/13 Wt: 9.0, Vis: 72, WL: 5.6, Chl: 800, LCM: 6
		4250	Some  Ls: crm-lt gry, fn xln, foss-ool, fr-pr pp-vug por, sli-fr sfo, no odor, sct brn-bik spdt stn Ls: lt brn-lt gry, fn xln, dns, sli foss, pr vis por, ns  Sh: red-brn, some gry & gm  Ls: lt gry-lt brn, fn xln, dns  Sh: red-brn, stly, gummy in part, some gry & gm sh	DST # 4 4233' to 4278' 30"-60"-30"-60" IF: Blow Built to 1 1/2" FF: No Blow RECOVERY: 0' Mud w/ oil spits FFP: 15-17# FSP: 34# IHP: 17-17# FSP: 27# IHP: 2101# FHP: 1936# BHT: 127 deg F
		4300	Ls: crm-lt gry, fn xln, subchily, part dns, none foss, pr vis por, ns Ls: crm-lt gry, fn xln, subchily, part dns, sli foss, pr vis por, ns Ls: lt gry-gry, fn xln, dns, foss, pr vis por, trc bik spdt stn, 1 pc tanny oil, no odor  Sh: red-brn, gummy, some gm sh  Sh: red-brn, vy gummy	STARK 4369' (-1169) E Log 4369' (-1169) DST # 5 4314' to 4372' 30"-60"-60"-90" IF: Blow Built to 1/2" FF: No Blow RECOVERY: 5' Mud nso FFP: 12-13# FSP: 55# IHP: 13-13# FSP: 31# IHP: 2189# FHP: 2075# BHT: 128 deg F
		4350	Ls: crm-lt gry, fn xln, part dns, part chily, pr vis por, trc fo, no odor, sct brn-bik spdt stn Ls: as above, more chily, nso, vy sct bik spdt stn  Sh: gry-grn  Sh: red-brn-gry-grn, sndy  Sh: red-brn, sndy, some gry & gm sh	Morgan Mud: 4372': 5/2/13 Wt: 9.2, Vis: 72, WL: 6.0, Chl: 800, LCM: 2
		4400	Ls: crm-lt gry, fn xln, dns, sli foss-ool, in part, pr vis por, ns Ls: as above w/ Ls: lt brn, fn xln, dns, ool, pr vis por, ns Sh: red-brn, some gry & gm sh  Ls: crm-lt brn-lt gry, fn xln, dns, chily in part, sli foss, pr vis por, trc dead stn  Sh: red-brn, gummy in part, some gry & gm sh	BKC 4424' (-1224) E Log 4424' (-1224)
		4450	Ls: crm-lt gry, fn xln, dns, sli foss-ool, pr vis por, ns  Sh: red-brn, gummy in part  Ls: lt brn-lt gry, vy fn-fn xln, dns, pr vis por, ns  Sh: red-brn, calc in part  Some  Sh: red-brn, stly, sndy  Sh: as above, vy stly, sndy	DST # 6 4519' to 4560' 30"-60"-30"-60" IF: 80B/30" ISI: 1/4" Return FF: Blow Built to 9.5" FSI: 1/4" Return RECOVERY: 268' total fluid 361' GP 1-CO 89' GACD (25%G,55%O,20%W) 89' GAO (20%G,40%O,40%W) 89' SOCMW (10%G,20%O,10%W,60%W) FFP: 42-75# ISIP: 802# FFP: 136-135# FSP: 751# IHP: 2189# FHP: 2179# BHT: 142 deg F NOTE: Slight Plugging on FF
		4550	Ls: crm-lt brn-lt gry, fn xln, subchily, part dns, sli foss in part, pr vis por, ns Ls: lt gry-gry, fn xln, subchily, part dns, sli angl, pr vis por, ns  Some Sh: gry, some gm  Ls: crm-lt brn-lt gry, fn xln, subchily, part dns, sli foss in part, pr vis por, ns Ls: lt gry-gry, fn xln, sli gmlr, subchily, part dns, pr vis por, ns  Sh: bik, carb	PAWNEE 4547' (-1347) E Log 4547' (-1347) Morgan Mud: 4556': 5/3/13 Wt: 9.1, Vis: 75, WL: 5.6, Chl: 800, LCM: 5
		4600	Ls: crm-lt brn-lt gry, fn xln, dns, part chily, sli ool in part, pr vis por, ns  Sh: red-brn, stly, gummy in part, some gry & gm sh  Ls: crm-lt gry, fn xln, dns, sli foss-ool, pr vis por, ns w/ sct wt chlk Sst: vy fr-fn gm, calc, well cmntd, hrd-subfri, sli glass-drk inclcn, pr por, ns Ls: crm-lt brn, fn xln, part chily, part dns, sndy in part, pr vis por, ns  Ls: lt brn-lt gry, fn xln, dns, wt-crm, chily, pr vis por, ns  Sh: red-brn-gry-prpl/gry-grn  Ls: crm-lt gry, fn xln, dns, chily in part, pr vis por, ns  Sh: red-brn-gry-grn w/ trc Sst: lt gry-grn/gry, fn gm, calc, shly	CHEROKEE 4634' (-1434) E Log 4634' (-1434) Morgan Mud: 4692': 5/4/13 Wt: 9.1, Vis: 67, WL: 6.0, Chl: 900, LCM: 5
		4650	Ls: crm-lt gry, fn xln, dns, sli foss-ool, pr vis por, ns w/ sct wt chlk Sst: vy fr-fn gm, calc, well cmntd, hrd-subfri, sli glass-drk inclcn, pr por, ns Ls: crm-lt brn, fn xln, part chily, part dns, sndy in part, pr vis por, ns  Ls: lt brn-lt gry, fn xln, dns, wt-crm, chily, pr vis por, ns  Sh: red-brn-gry-prpl/gry-grn  Ls: crm-lt gry, fn xln, dns, chily in part, pr vis por, ns  Sst: wt-crm, fr-med grn, calc, fri, trc pyr, sct drk inclcn, fr por, ns Sh: red-brn, vy sndy w/ sct Ls: wt-crm, fn xln, chily, sndy, ns Sh: red-brn-gry-grn-drk prpl, sndy in part w/ sst: crm-lt brn-lt prpl, vy fr-fn-med grn, calc, subfri, pr-fr por, ns	RTD 4735' (-1535) E Log 4736' (-1536)
		4700	Ls: crm-lt gry, fn xln, chily in part  Sst: wt-crm, fr-med grn, calc, fri, trc pyr, sct drk inclcn, fr por, ns Sh: red-brn, vy sndy w/ sct Ls: wt-crm, fn xln, chily, sndy, ns Sh: red-brn-gry-grn-drk prpl, sndy in part w/ sst: crm-lt brn-lt prpl, vy fr-fn-med grn, calc, subfri, pr-fr por, ns	
		4750		

