Jeff Christian

PETROLEUM GEOLOGIST

Wichita, Kansas

GEOLOGIST'S REPORT

DRILLING TIME AND SAMPLE LOG

OPERATOR MURFIN DRILLING COMPANY
LEASE ABELL RANCH # 3-25
LOCATION 2310' FSL & 400' FEL
SEC. 25 TWSP 12 S RNG 31 W
COUNTY GOVE STATE KANSAS
FIELD GAELAND WEST
API 15-063-22241

ELEVATIONS

KB 2852'
GL 2841'
MEASUREMENTS FROM K.B.

CONTRACTOR COMPANY TOOLS RIG NO. 21
DRILLING STARTED 01/12/2015 COMPLETED 01/20/2015
MUD DISPLACED 3216' MUD TYPE CHEMICAL
DRILLING TIME KEPT FROM 3540' TO RTD
SAMPLES SAVED FROM 3540' TO RTD
SAMPLES EXAMINED FROM 3540' TO RTD
GEOLOGICAL SUPERVISION FROM 3540' TO RTD

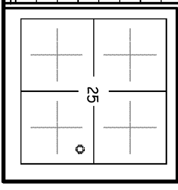
CASING RECORD

Conductor NONE
Surface 8 5/8" @ 222'
W/ 170 SX
Production 5 1/2" @ 4598'
W/ 175 SX

ELECTRICAL SURVEYS:

PIONEER:
DIL
CNL/CDL
MEL
BHCS

FORMATION NAME	LOG TOP	LOG DATUM	SAMPLE TOP	SAMPLE DATUM
ANHYDRITE	2337'	(+515)	2337'	(+515)
TOPEKA	3645'	(-793)	3646'	(-794)
HEEBNER	3867'	(-1015)	3867'	(-1015)
LANSING	3902'	(-1050)	3900'	(-1048)
STARK	4133'	(-1281)	4132'	(-1280)
MARMATON	4259'	(-1407)	4258'	(-1406)
FT. SCOTT	4382'	(-1530)	4382'	(-1530)
CHEROKEE	4410'	(-1558)	4410'	(-1558)
MISSISSIPPIAN	4482'	(-1630)	4479'	(-1627)
TOTAL DEPTH	4602'	(-1750)	4600'	(-1748)



DATE	7:00 AM DEPTH	REMARKS
1/12/15	MIRT	SPUD 6:00 pm
1/13/15	317'	DO 6:00 am dev. 3/4 deg. @ 222'
1/14/15	3070'	DRLG.
1/15/15	3810'	CFS
1/16/15	3958'	DRLG.
1/17/15	4005'	TOH w/ DST # 3
1/18/15	4170'	DRLG. dev. 1/2 deg. @ 4164'
1/19/15	4468'	TIH for DST # 5
1/20/15	4508'	TIH after DST # 6 RTD 4600' @ 10:00 am dev. 1 deg.
		Finish Logging @ 7:30 pm

Remarks

5 1/2" production casing set to further test the Abell Ranch # 3-25.

Electric log measurements correlate about even to 1' low compared to rotary measurements.

Samples deposited at the Kansas Geological Survey.

Respectfully Submitted,

Jeff Christian

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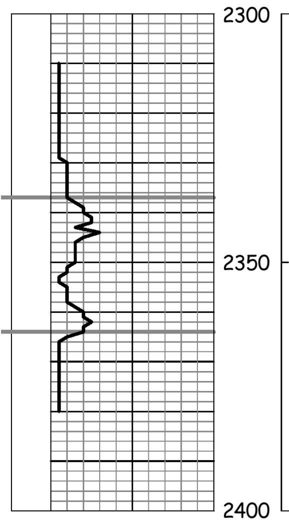
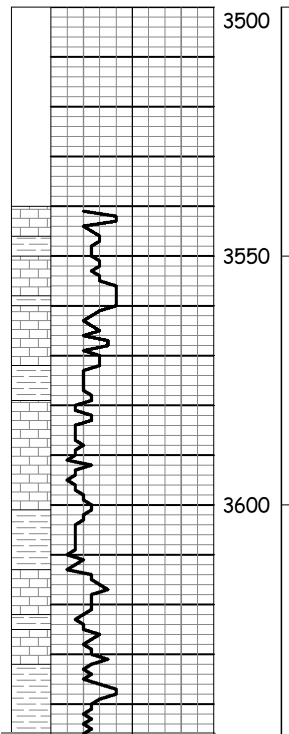
LITH.	0 DRILL TIME (MIN/FT) 10	DEPTH	SHW	SAMPLE DESCRIPTIONS	REMARKS



ANHYDRITE 2337' (+515)
E Log 2337' (+515)

Base ANHYRDITE 2364' (+488)
E Log 2364' (+488)



Morgan Mud: 3398'; 1/14/15
Wt. 8.7, Vis. 92, WL. 5.6, Chl. 1,900, LCM. 1.0

Sh: gry w/ Ls: gry-brn, fn xln, dns, foss, mott

Bit Trip @ 3540'
Pipe Strap: .53' short to board
Dev. 1 deg.

Ls: lt gry-gry, fn xln, subchlky, sli foss, pr vis por, ns

Sh: gry-drk gry, calc

Ls: crm-lt gry, fn xln, sli grnlr, part dns, sli foss, trc ool, pr intrpart por, ns

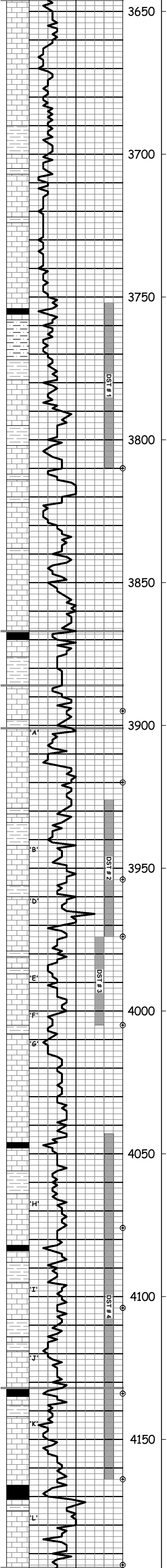
Sh: gry-some grn

Ls: crm-lt gry-lt brn, fn xln, part dns, foss in part, abndnt wt chlk, pr vis por, ns

Ls: crm-lt brn, fn xln, subchlky, foss-ool, pr-fr intrpart por, ns

Sh: gry-red/brn

TOPEKA 3646' (-794)



Ls: crm-lt gry, fn xln, sli grnlr, part dns, part chlky, sli foss, pr pp-intrxln por, ns

Ls: wt-crm-lt gry, fn xln, chlky, chrty, pr vis por, ns

Ls: lt brn-lt gry, fn xln, part dns, foss, pr pp-vug por, ns

Ls: crm-lt brn, fn xln, part chlky, foss, sli chrty, pr pp-vug por, ns

Ls: lt brn-lt gry, fn xln, part dns, sli foss, sli chrty, pr vis por, ns w/ sct wt chlk

Sh: gry-some grn

Ls: crm-lt brn, fn xln, foss-sli ool, fr intrpart-vug por, ns w/ fr amnt wt chlk

Ls: wt-crm-lt brn, fn xln, vy chlky, some foss w/ pr-fr pp-vug por, ns

Sh & mott Ls: (sample appears to be from up hole)

Same

Ls: wt-crm-lt brn, fn xln, chlkysli foss, w/ sct
Dolo Ls: lt brn, fn xln, printrxln por, ns

Sh: blk, carb

Sst/Sltst: lt gry-red/brn, vy fn grn, calc, soft, shly, no vis por, ns

Sh: gry-red/brn

Ls: lt gry, fn xln, ool-sli foss, pr some fr introol-vug por, sli-fr sfo (mostly inert), fnt odor, brn sptd-subsat stn

Ls: crm, fn xln, subchlky, ool-sli foss, pr-fr intrpart-vug por, ssfo (few gssy), sli-fr odor, brn sptd-subsat stn

Ls: lt brn-lt gry, fn xln, dns, pr vis por, nsfo, sli odor, few pcs brn sptd-subsat stn

Ls: crm-lt brn, fn xln, subchlky, sli grnlr, few pcs ool, sli chrty, fr pp-vug-intrxln por, nsfo, fnt odor, trc lt stn

Ls: crm-lt brn, fn xln, sli chlky, foss-ool in part, pr fr intrpart-vug por, nsfo, no odor, trc lt stn

Ls: crm-lt brn-lt gry, fn xln, dns, part chlky, foss-sli mott, pr vis por, ns

Sh: blk, carb

Ls: brn-lt gry, fn xln, dns

Sh: gry-some grn

Ls: wt-crm-lt brn, fn xln, chlky, part dns, chrty, trc foss, pr vis por, trc drk stn, nsfo, no odor

Ls: wt-crm-lt gry, fn xln, chlky, part dns, ool, pr introol por, nsfo, no odor, trc sptd stn

Ls: crm-lt gry, fn xln, dns w/ sct wt chlk, no vis por, ns

Sh: gry-red/brn

Ls: crm-lt brn, fn xln, ool, pr trc fr introol-vug por, ssfo, sli odor, brn subsat-sat stn

Ls: crm-lt gry, fn xln, dns, no vis por, ns

Ls: crm-lt gry, fn xln, dns, sli chlky, sli foss-ool, trc pr vug por, nsfo, no odor, trc stn

Ls: as above, sli chrty, no vis por, trc stn

Sh; red/brn-some gry & grn

Ls: crm-lt brn, fn xln, part dns, part chlky, chrty, sli foss, pr pp-vug por, ssgfo, trc bleeding oil, fr-gd odor, vy sct lt brn-brn sptd-subsat stn

Ls: crm-lt brn, fn xln, part dns, sli foss, pr-trc fr pp-vug por, ssfo, fr-gd odor, lt brn sptd stn

Ls: crm-lt gryfn xln, part grnlr, part dns,sli foss, sct pp-vug-intrxln por, ns w/ fr amnt wt chlk

Ls: wt-crm-lt gry, fn xln, dns, chlky, chrty, sli foss, pr vis por, ns

Ls: lt gry, micro-vy fn xln, dns w/ abndnt wt chlk, no vis por, ns

Ls: lt brn-lt gry,vy fn- fn xln, dns, chlky, chrty, sli foss, no vis por, ns

Sh: blk, carb

Ls: crm-lt brn, fn xln, chlky, part dns, foss-sli mott, pr pp-intrxln por, nsfo, fr odor, sct dull brn sat stn

Sh: gry-grn-blk, carb w/ Ls: crm-lt brn-lt gry, fn xln, chlky, part dns,foss-sli ool-mott, pr vis por, nsfo, fnt odor, trc stn

Ls: crm-lt brn-lt gry, fn xln, subchlky, part dns, few pcs foss-ool, pr-fr intrpart-vug por, vssfo, fnt odor, lt brn sptd-subsat stn

Ls: crm-lt gry, fn xln, dns, subchlky, no vis por, ns

Sh: blk, carb

Ls: brn, fn xln, dns, foss

Sh: gry-grn

Ls: crm-lt gry, fn xln, dns, part chlky, pr vis por, nsfo, fnt odor, trc stn

Ls: as above, sli foss, pr pp-vug por, vssfo, fnt odor, vy sct brn sptd-subsat stn

Sh: gry-grn, some red/brn, gummy

Ls: crm-lt brn, fn xln, foss, chrty, fr pp-vug por, ssfo, fr odor, brn sptd-subsat stn

Ls: crm-lt brn-lt gry, fn xln, dns, chlky, chrty, pr vis por, ns

Sh: blk, carb

Ls: brn, fn xln, dns, foss in part

Ls: crm-lt brn, fn xln, part grnlr, chrty, pr-trc fr pp-vug-intrxln por, abndnt wt chlk, nsfo, sli odor, vy sct lt brn sptd-trc sat stn

Ls: crm-lt brn, fn xln, subchlky, sli grnlr, chrty, mostly pr pp-intrxln por, ns

Sh: blk, carb

Ls: crm-lt gry, fn xln, subchlky, ool-sli foss, pr vis por, nsfo, no odor, trc stn

Ls: as above w/ chrt: lt gry, ool-sli foss, pr vis por, ns

E Log 3645' (-793)

DST # 1 3752' to 3810'
30"-60"-60"-90"
IF: Blow Built to 2.5"   ISI: No Return
FF: Blow Built to 2.5"   FSI: No Return
RECOVERY: 325' WCM w/ oil spts
(30%W, 70%M)
IFP: 15-81#   ISIP: 1169#
FFP: 86-163#   FSIP: 1153#
BHT: 115 deg. F
CHL: 40,000 ppm

Morgan Mud: 3810'; 1/15/15
Wt. 9.0, Vis. 66, WL. 5.6, Chl. 1,400, LCM. 4.0

HEEBNER 3867' (-1015)

E Log 3867' (-1015)

TORONTO 3886' (-1034)

E Log 3887' (-1035)

LANSING 3901' (-1049)

E Log 3902' (-1050)

DST # 2 3926' to 3974'
30"-60"-30"-60"
IF: 1/4" Blow/ Died Back to Surface Blow
FF: No Blow
RECOVERY: 50' VSOCM (1%O, 99%M)
IFP: 16-32#   ISIP: 1166#
FFP: 34-42#   FSIP: 1136#
BHT: 116 deg. F

Morgan Mud: 3974'; 1/16/15
Wt. 9.1, Vis. 50, WL. 6.0, Chl. 1,600, LCM. 4.0

DST # 3 3974' to 4005'
30"-60"-30"-60"
IF: Surface Blow/ Died 5"
FF: No Blow
RECOVERY: 10' Mud w/ oil spts
IFP: 13-17#   ISIP: 1178#
FFP: 18-20#   FSIP: 1158#
BHT: 116 deg. F

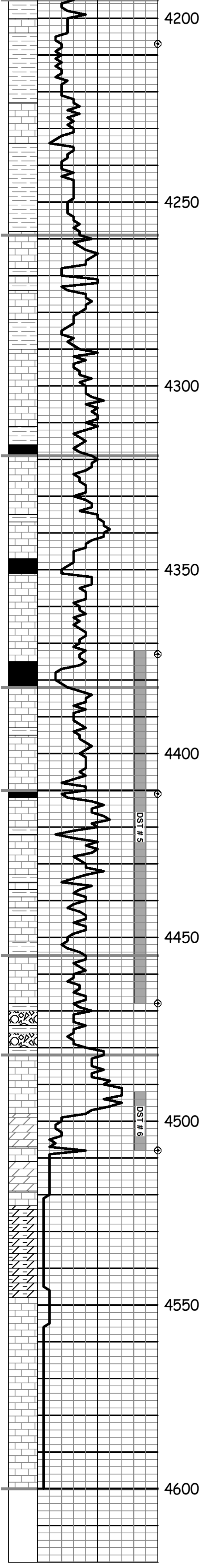
Morgan Mud: 4069'; 1/17/15
Wt. 9.4, Vis. 48, WL. 6.0, Chl. 2,300, LCM. 4

DST # 4 4043' to 4164'
30"-60"-60"-90"
IF: BOB/ 23"   ISI: No Return
FF: BOB/ 50"   FSI: No Return
RECOVERY: 645' MW (55%W, 45%M)
Oil Spts in Tool
IFP: 35-192#   ISIP: 1188#
FFP: 196-312#   FSIP: 1139#
BHT: 121 deg. F
CHL: 72,000

STARK 4132' (-1280)

E Log 4133' (-1281)

BKC 4195' (-1343)



Sh: blk, carb, sh:gry-grn

Ls: crm-lt brn-lt gry, fn xln, part chlky, ool-sli foss, pr vis por, ns

Sh: red/brn, sndy, gummy in part

Ls: crm-lt gry, fn xln, subchlky, foss-sli ool, pr vis por, ns

Ls: wt-crm-lt gry, fn xln, chlky, part dns, sli foss, trc drk brn-blk sptd stn, nsfo, no odor

Sh: red/brn-brn-gry

Sh: red/brn-gry-lt prpl, calc in part

Ls: crm-lt gry, fn xln, dns, chlky in part, sli foss, pr vis por, ns

Sh: red/brn-gry w/ Ls: as above

Ls: crm-lt brn-lt gry, fn xln, dns, sli chlky, sli foss, pr vis por, ns

Ls: as above, argil in part

Sh: gry-some grn, trc blk, carb

Ls: crm-lt brn, fn xln, part dns, ool in part, pr vis por, ns

Ls: crm-lt brn-lt gry, fn xln, dns, sli foss, chrty (lt brn-brn, foss, subtrnslcnt), pr vis por, ns

Ls: lt brn-lt gry-drk gry, fn xln, dns, chrty, sli foss, argil in part, pr vis por, ns

Sh: blk, carb & drk gry

Ls: crm-lt brn, fn xln, part chlky, part dns, chrty, sli foss, pr vis por, trc frac por, trc asph stn, nsfo, no odor

Ls: crm-lt brn-lt gry, fn xln, subchlky, part dns, vy chrty, sli foss, pr vis por, ns

Sh: blk, carb

Ls: lt brn-lt gry, fn xln, subchlky, part dns, ool in part w/ pr-trc fr introol por,vsgfo, brn sptd stn, foss in part w/ fr-trc gd foss-vug por, ssgfo, brn sptd-subsat-trc sat stn, fr odor in cup

Ls: lt gry-lt brn, fn xln, dns, subchlky, chrty, sli foss, pr vis por, ns, no odor

Sh: blk, carb

Ls: crm-lt gry, fn xln, subchlky, part dns, ool in part, pr vis por, ns

Ls: crm-lt gry, fn xln, subchlku, part dns, pr vis por, ns

Ls: crm-lt brn-lt gry, fn xln, dns, chlky in part, sli foss, pr vis por, ns w/ Sh: gry

Ls & Sh: as above

Ls: crm-lt brn-lt gry, fn xln, part chlky, part dns, foss, pr-fr vug por, ssfo, sli odor, brn-drk brn sptd-sat stn

Ls: as above, few pcs w/ oil show

Sh: gry-some grn w/ Chrt: orng-yell-clr, sharp & Sst:wt-lt gry, fn-crs grn, pr srt, fri, fr por, sct gil stn, nsfo, no odor

Ls: lt brn-lt gry, fn xln, part dns, sli chlky, ool, pr vis por, ns

Same

Dolo: lt brn-lt gry, fn xln, fr-gd vug-moldic por, gsgf, sli-fr odor (sli sour), drk brn subsat-sat stn, sct barren por

40": Same, incrs barren por

Dolo: lt brn-lt gry, fn xln, fr-gd vug-moldic por, mostly barren por, few pcs w/ show as above

Dolo Ls: crm-lt brn-lt gry, fn xln, chlky in part, foss-sli ool, pr intrpart por, ns w/ Sh: gry

Ls: crm-lt brn, fn xln, chlky, foss-ool-mott, pr vis por, ns

Ls: as above, sli chrty, pr vis por, ns

Same

E Log 4195' (-1343)

MARMATON 4259' (-1407)

E Log 4259' (-1407)

Morgan Mud: 4282'; 1/18/15
Wt. 9.1, Vis. 54, WL. 6.4, Chl. 2,000, LCM. 4

PAWNEE 4319' (-1467)

E Log 4319' (-1467)

DST # 5 4372' to 4468'
30"-60"-60"-90"
IF: Blow Built to 6" ISI: Surface Blow/Died 20"
FF: Blow Built to 9" FSI: 1/2" Blow/ Died Back to Surface
RECOVERY: 350' total fluid
280' GIP
95' GO (10%G, 90%O)
135' GOCM (10%G, 40%O, 50%M)
120' GO&WCM (15%G, 25%O, 20%W, 40%M)
IFP: 19-87# ISIP: 1063#
FFP: 96-151# FSIP: 1004#
BHT: 126 deg. F
CHL: 32,000 ppm (mud engineer)
Gravity: 25 deg.

FT. SCOTT 4382' (-1530)

E Log 4382' (-1530)

CHEROKEE 4410' (-1558)

E Log 4410' (-1558)

JOHNSON ZN 4455' (-1603)

E Log 4455' (-1603)

Morgan Mud: 4468'; 1/19/15
Wt. 9.3, Vis. 45, WL. 7.2, Chl. 2,100, LCM. 4

Mississippian 4482' (-1630)

E Log 4482' (-1630)

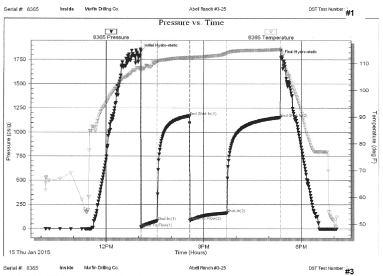
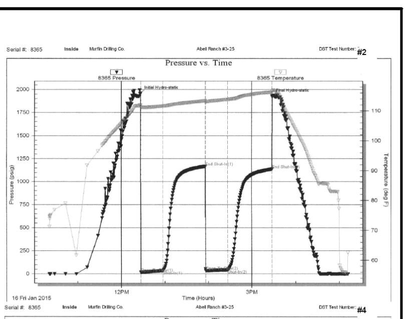
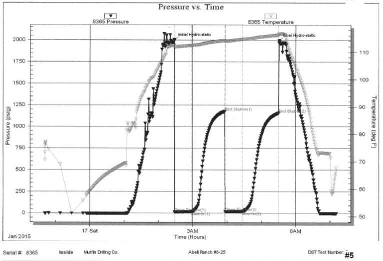
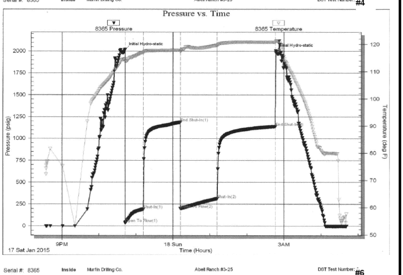
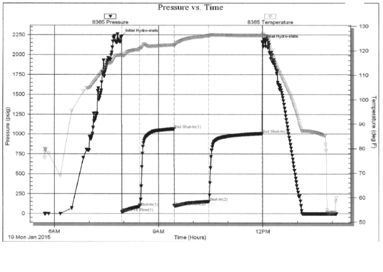
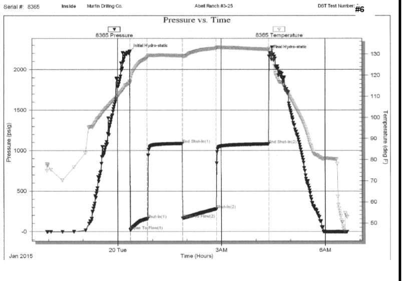
DST # 6 4492' to 4508'
30"-60"-60"-90"
IF: Blow Built to 8" ISI: Surface Blow
FF: Blow Built to 9" FSI: Surface Blow
RECOVERY: 615' total fluid
135' GIP
45' CO (gravity: 29 deg.)
570' VSO&MCW (1%O, 5%M, 94%W)
IFP: 20-159# ISIP: 1085#
FFP: 164-279# FSIP: 1079#
BHT: 136 deg. F

Ran PDC Bit after DST # 6 to RTD

Morgan Mud: 4600'; 1/20/15
Wt. 9.1, Vis. 52, WL. 6.8, Chl. 2,000, LCM. 4

RTD 4600' (-1748)

E Log 4602' (-1750)

Drill Stem Test Charts