MIKE ENGELBRECHT
Licensed Geologist No. 334

2513 Spring Meadow
Wichita, KS 67205

Phone: 316-721-9226
Cell: 316-641-8008

# GEOLOGIST'S REPORT
## DRILLING TIME AND SAMPLE LOG

OPERATOR RITCHIE EXPLORATION, INC.
LEASE #1 HAMMEKE 13C
FIELD WILDCAT
LOCATION W/2 NW SW = 1935' FSL & 335' FWL
SEC. 13 TWP. 18 RGE. 28W
COUNTY LANE STATE KS.

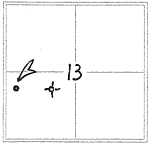
ELEVATION
KB 2728
DF
GL 2723
Measurements Are All From KB 2728

CONTRACTOR W.W. RIG #2
COMM. 10-24-13 COMP. 11-04-13
RTD 4695' LOG TD 4696'
SAMPLES SAVED FROM 3450' TO RTD
DRILLING TIME KEPT FROM 3450' TO RTD
SAMPLES EXAMINED FROM 3450' TO RTD
GEOLOGICAL SUPERVISION FROM 3820' TO RTD
MUD UP DISPL @ 3372 TYPE MUD CHEMICAL
API # 15-101-22,470-00-00

CASING RECORD
SURFACE 8 5/8" @ 232' W/ 170 SXS.
PRODUCTION 5 1/2" @ 4683' PC @ 2069 W/ 170 SXS.

WELL LOG SURVEYS
COMP DENS/NEUTRON
DUAL INDUCTION

| FORMATION | LOG | | SAMPLE | | STRUCT. COMP. |
|---|---|---|---|---|---|
| | TOP | DATUM | TOP | DATUM | |
| ANHYDRITE | 2100 | +628 | 2101 | +627 | +5 |
| BASE | 2132 | +596 | 2136 | +592 | +6 |
| STOTLER | 3544 | -816 | 3545 | -817 | +8 |
| HEEBNER SH | 3947 | -1219 | 3947 | -1219 | +14 |
| LANSING | 3985 | -1257 | 3985 | -1257 | +13 |
| MUNCIE SH | 4156 | -1428 | 4157 | -1429 | +15 |
| STARK SH | 4256 | -1528 | 4256 | -1528 | +18 |
| BKC | 4332 | -1604 | 4328 | -1600 | +17 |
| ALTAMONT | 4374 | -1646 | 4373 | -1645 | +17 |
| PAWNEE | 4446 | -1718 | 4447 | -1719 | +20 |
| FT. SCOTT | 4505 | -1777 | 4505 | -1777 | +19 |
| CHEROKEE SH | 4528 | -1800 | 4528 | -1800 | +20 |
| SAND | 4583 | -1855 | 4582 | -1854 | |
| MISS | 4597 | -1869 | 4596 | -1868 | +24 |



REFERENCE WELL FOR STRUCTURAL COMPARISON ABERCROMBIE DRLG. #1 RINGWALD C NE SW 13-28-28W P&A

| ACTIVITY @ 7:00 A.M. | | BIT & SURVEY RECORD | | | | | | |
|---|---|---|---|---|---|---|---|---|
| DATE | DEPTH | NO | SIZE | MAKE | TYPE | DEPTH OUT | FEET | HOURS |
| 10-24-13 | MIRT / SPUD | | | | | | | |
| 10-25 | DRLG @ 373' | | | | | | | |
| 10-26 | DRLG @ 2170' | | | | | | | |
| 10-27 | DRLG @ 3160' | | | | | | | |
| 10-28 | DRLG @ 3740' | | | | | | | |
| 10-29 | CFS @ 4225' | | | | | | | |
| 10-30 | DST #2 @ 4282' | | | | | | | |
| 10-31 | CFS @ 4320 | | | | | | | |
| 11-1 | DST #5 @ 4430' | | | | | | | |
| 11-2 | DST #6 @ 4550' | | | | | | | |
| 11-3 | CFS @ 4630' | | | | | | | |
| 11-4 | CEMENT CASING | | | | | | | |
| | TEAR DOWN | | | | | | | |

| FORMATION | INTERVAL | DESCRIPTION OF SHOW | LOG ANALYSIS | |
|---|---|---|---|---|
| | | | O | S W |

## DRILL STEM TESTS

| No. | Interval | IFP/Time | ISIP/Time | FFP/Time | FSIP/Time | [illegible] | Recovery |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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REMARKS AND RECOMMENDATIONS IT WAS RECOMMENDED TO RUN 5½" PRODUCTION CASING TO PRODUCE LKC ZONES (J, K, MC, L) AS A RESULT OF POSITIVE DST RECOVERIES, STRUCTURAL POSITION, AND E-LOG EVALUATION.

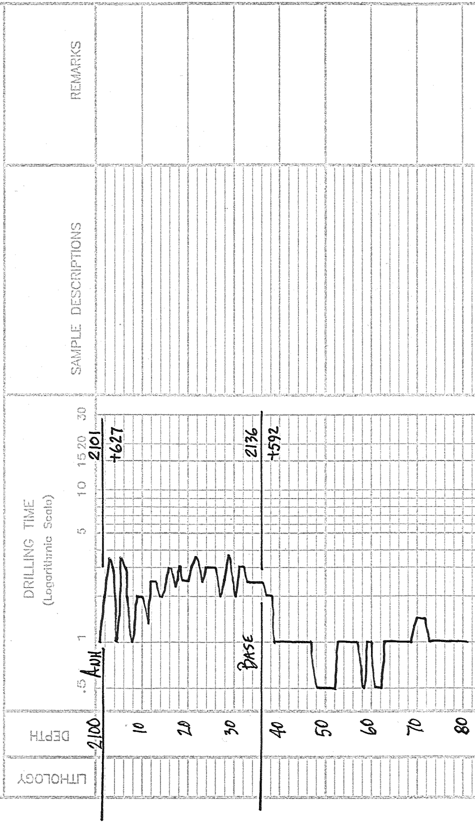
MIKE ENGELBRECHT
GEOLOGIST LIC # 334

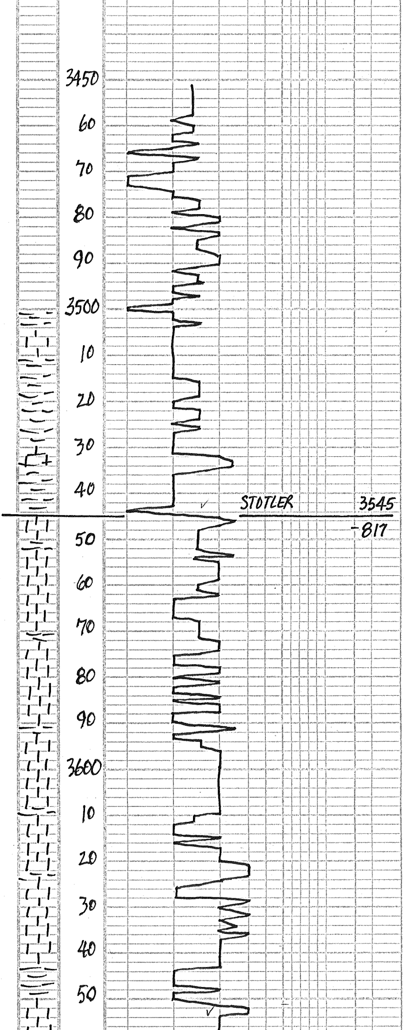
MUD BY MUD-CO.
DST'S BY TRILOBITE TESTING
E-LOGS BY NABORS

ENGEL-11

## LEGEND

Anhydrite · Salt · Sandstone · Shale · Carb sh · Limestone · Ool.Lime · Chert · Dolomite





STOTLER 3545
-817

PRED GRY SEMI-FOSS LS P-F Ø-NS

DISPLACED @ 3372'

80 LS-AA-NS & LOTS GRY SHS LT-DK

00 LT TAN-BUFF SLI-FOSS LS-NS
LOTS GRY SHS

20 LT CRM-BUFF SLI-FOSS LS PTLY CHY
POOR Ø-NS NO ODOR

40 TAN-BUFF FOSS LS W/P-F Ø NS NO ODOR

CRAPPY SPLS - SHLY

60 TONS LT GRY GUMBO SHS - FEW
SILTY

80 CRM-TAN-BUFF SEMI-FOSS LS
P-F Ø-NS NO ODOR LOTS SHS

00 CRM-BUFF NOD-FOSS LS POOR Ø
NS, NO ODOR

TAN-BUFF SEMI-FOSS LS P-F Ø
NS, NO ODOR

20 CRM-LT TAN-BUFF FOSS-NOD LS
POOR Ø - NS

SPLS IMPROVING

WH-LT CRM SLI-SEMI FOSS LS PTLY
CKY - NS NO ODOR

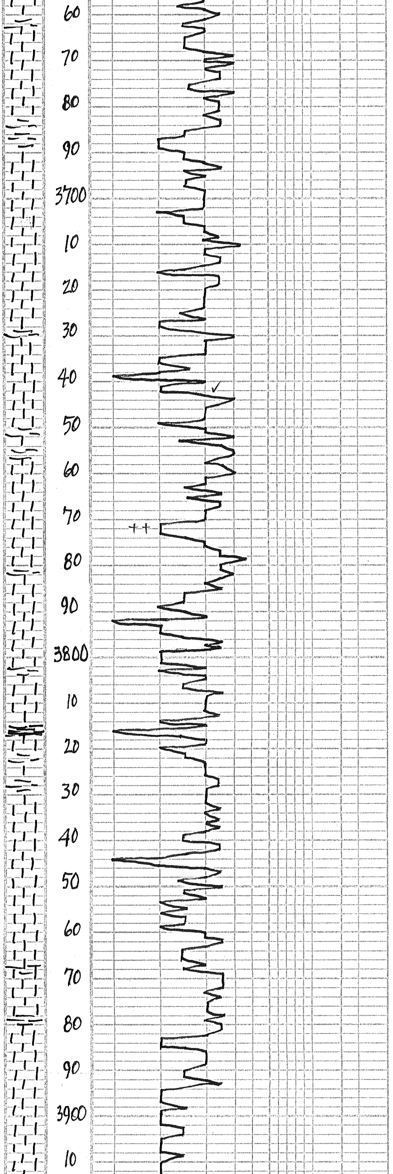
40 LT CRM-BUFF SLI-FOSS LS-NS

VISC: 54
WT: 8.7

LT GRY-TAN-BUFF FN-XLN LS
POOR Ø- NS NO ODOR

60 LT TAN-BUFF SLI-FOSS LS POOR Ø-NS
LOTS GRY SHS FEW BLK

CRM-LT TAN-LT GRY LS-NS



80 LT CRM- LT TAN BUFF SLI-FOSS LS POOR Ø-NS NO ODOR ← VISC:53 WT:8.7

BUFF- LT TAN SLI-FOSS LS - NS

00 LT TAN-BUFF NOD FUSSLD LS P-FØ NS NO ODOR

LOTS LT GRY GUMBO SHS

20 GRY- BUFF SLI-FOSS LS POOR Ø-NS

BUFF-GRY-TAN SLI-FOSS LS -NS LOTS GRY GUMBO SHS

40 LT TAN- BUFF-LT BRN SLI-FOSS LS POOR Ø-NS NO ODOR

LT TAN-BUFF SLI FOSS LS POOR Ø NS

60 LT TAN-BUFF SLI-FOSS FUSSLD LS POOR Ø - NS NO ODOR

LS AA- NS NO ODOR

80 FLOOD LT TAN-BUFF SLI-FOSS LS POOR Ø- NS NO ODOR

LT TAN-BUFF V. FOSS LS P-FØ NS, NO ODOR

00 LS AA- NS NO ODOR

LT BUFF-TAN SLI-FOSS LS W/P-FØ SCAT STN, NO FO, NO ODOR

20 FLOOD LT TAN-BUFF SLI-FOSS LS -NS NO ODOR

NO CALL; I CALLED RIG @ 3:00 AM.

LT TAN-BUFF SLI-FOSS LS POOR Ø SCAT LT STN? NO ODOR SLI CKY

← GEOL. ON LOCATION 10:00 AM MON. 10-28-13

40 LT BRN- BUFF LS SLI-FOSS POOR Ø NS NO ODOR

FLOOD V. LT TAN FN-XLN LS DNSE NS

60 LT TAN SLI-FOSS LS -NS

MUD-CO ✓
VISC: 53 FILT: 6.4
WT: 8.9 CHL: 2,200

FLOOD LT CRM FN-XLN DNSE LS POOR Ø- NS NO ODOR

70

80 WH-CRM- LT TAN SLI-FOSS LS -NS LT SCAT STN IN POOR Ø SLI-CKY ← VISC:53 WT:8.9 LCM:1½#

90 FLOOD LT GRY- BUFF SLI-FOSS LS POOR Ø -NS NO ODOR

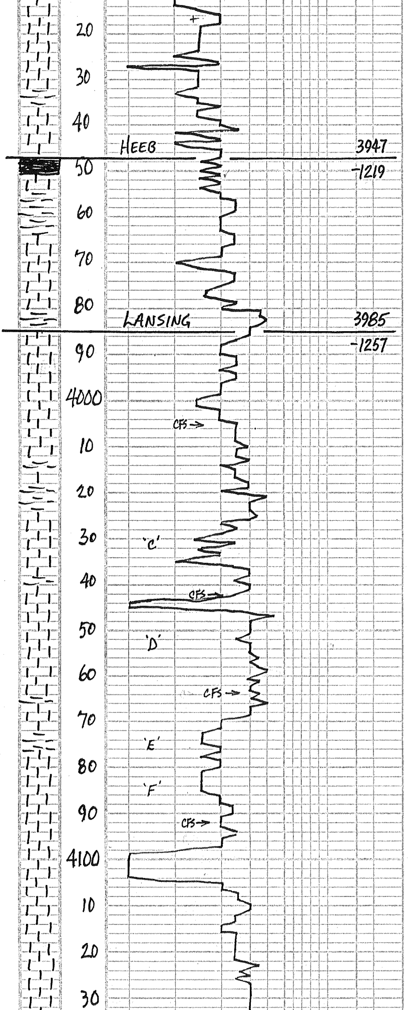
← ADDING PRE-MIX

00 LT TAN FN-XLN LS POOR Ø- NS

10 WH- LT CRM FN-XLN CKY LS POOR Ø- NS NO ODOR

20 LT TAN- BUFF V. FOSS LS FAIR Ø NS, NO ODOR

30 LS AA -NS & LOTS WH CKY



40 LT CRM - V. LT TAN SEMI-FOSS LS
NOD - FUSLD P-FØ - NS NO ODOR

50 LT TAN SEMI-FOSS CKY LS - NS

60 LOTS BLK SHS & WH-BLK CKY LS
POOR Ø - NS NO ODOR

70 LT CRM - LT TAN FN-XLN LS DNSE-
CKY POOR Ø - NS NO ODOR

80 STILL BLK SHS & LT CRM CKY LS
DNSE - SOFT - NS NO ODOR

90 LOTS WH - LT CRM FN-XLN LS
DNSE - CKY POOR Ø NS NO ODOR ← VISC: 60
WT: 9.0
LCM: 2#

00 WH - LT CRM LS PTLY CKY - NS

05 WH - LT CRM FN-XLN LS POOR Ø - NS
NO ODOR INC CKY
20 MIN: WH - LT CRM SEMI-OOL LS
POOR Ø - NS CKY
45 MIN: WH - LT CRM FN-XLN LS
POOR Ø - NS NO ODOR
10 WH - LT CRM FN-XLN LS - NS CKY
20 LT CRM - LT TAN SLI-FOSS LS POOR Ø
NS NO ODOR

30 LT CRM SLI-FOSS LS POOR Ø - NS

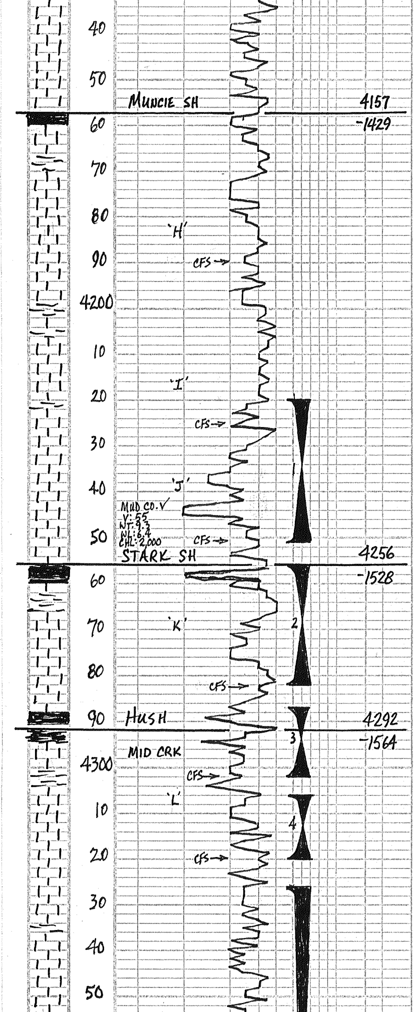
40) LS AA - NS & INC GRY SHS
20 MIN: LT CRM SEMI-FOSS LS FAIR Ø
NS NO ODOR SLI CKY
45 MIN: LT CRM SLI-FOSS LS P-FØ
NS NO ODOR

50 V. LT TAN FN-XLN LS POOR Ø - NS
60 WH - LT CRM FN-XLN DNSE-CKY LS
POOR Ø - NS NO ODOR
64) CRM - LT TAN SLI-FOSS LS P-FØ - NS
NO ODOR
30 MIN:
45 MIN. LT TAN PEACH Δty LS
POOR Ø - NS NO ODOR
70 LT CRM - LT TAN SLI-FOSS LS POOR
Ø - NS NO ODOR
80 LS AA - NS FEW OOC Ø - NS
90) LT CRM SEMI-FOSS LS P-FØ
PTLY CKY NS NO ODOR
20 MIN: WH - LT CRM V. FOSS LS FAIR Ø
Δty - CKY NS NO ODOR
45 MIN: FLOOD WH - V. LT TAN SEMI-FOSS
LS V. CKY SOFT - NS, NO ODOR
10 WH - CRM CKY SUB OOC LS P-FØ
NS NO ODOR
LT TAN SUB OOC CKY LS P-FØ
NS LOTS CKY NO ODOR

20 LT CRM SUB OOC - FOSS LS FAIR Ø
NS NO ODOR LOTS CKY

30 WH - LT TAN SUB OOC LS P-FØ
NS NO ODOR CKY

40 WH - LT CRM FN-XLN CKY LS
POOR Ø - NS NO ODOR



50 WH- LT TAN SLI-FOSS LS -NS

60 WH- LT CRM FN-XLN CKY LS POOR Ø DNSE-CKY -NS NO ODOR

70 FEW DK GRY- DULL BLK SHS PRED WH- CRM FN-XLN CKY LS -NS

80 INC BLK SHS LT CRM SLI-FOSS LS POOR Ø -NS NO ODOR CKY

90) LOTS GRY GUMBO SHS CRM-TAN SLI-FOSS LS DNSE-CKY -NS

20 MIN: LT CRM- LT GRY- LT TAN SLI-FOSS LS PTLY CKY NS NO ODOR

45 MIN: WH-LT CRM FN-XLN CKY LS POOR Ø NS NO ODOR

00 WH- LT CRM FN-XLN CKY LS POOR Ø -NS NO ODOR

10 FEW BLK SHS, WH- LT CRM SLI-FOSS LS PTLY CKY -NS NO ODOR

20 WH- LT CRM SEMI-OOL LS CKY NS

25) LT CRM- LT TAN SEMI-OOL LS POOR Ø -NS NO ODOR

30 MIN: LT CRM SEMI-OOL LS CKY NS NO ODOR

60 MIN: LT CRM- LT TAN FN-XLN LS POOR Ø- NS NO ODOR

40 WH- LT CRM SLI-FOSS CKY LS POOR Ø -NS NO ODOR INC GRY SH

50) PRED LT CRM- LT TAN SLI-FOSS LS POOR Ø -NS NO ODOR

30 MIN: LT CRM- LT TAN OOC LS W/FAIR OOC Ø FEW PCS W/SSLTFO FAIR ODOR PTLY CKY, SCAT STN

60 MIN: CRM- WH FOSS LS AA FEW PCS W/SSLTFO, FAIR ODOR

60 LOTS CRAP FROM TRIP RED BEDS

70 BLK SHS WH-CRM FN-XLN LS POOR Ø -NS

80) LT CRM SLI-FOSS LS P-F Ø SSFO SCAT STN, STRO ODOR LOTS CKY

30 MIN: LT CRM- LT TAN SLI-FOSS CKY LS SCAT STN, SSFO, GD ODOR FEW DK STN, BIG VUG Ø

60 MIN: LT CRM- LT TAN SLI-FOSS CKY LS SCAT STN SSFO, GD ODOR LOTS CKY, DK STN, BIG VUG Ø

90) LOTS DK GRY- BLK SHS

30 MIN: FEW PCS LT TAN SLI-FOSS LS W/P-F SCAT Ø W/ LT STN SSLTGFO FAIR SWEET ODOR

60 MIN: LT TAN LS W/P-F TINY TINY PPT Ø & INTER-XLN Ø W/SSLTGFO FAIR SWEET ODOR CLEAN ROCKS

20) LT CRM, LT TAN SLI-FOSS LS W/POOR FOSS Ø W/ SSLTGFO, FAIR ODOR

30 MIN: FEW LT CRM- LT TAN SLI-FOSS LS W/ FAIR FOSS Ø W/SSLTGFO, FAIR ODOR, SCAT LT STN INC CKY

60 MIN: FEW LT CRM- LT TAN SEMI-FOSS LS W/FAIR FOSS Ø W/ S-FSGFO, FAIR ODOR

40 FLOOD WH- LT CRM FN-XLN CKY LS POOR Ø - NSFO SLI STN 3 PCS

50 LT CRM- LT TAN FN-XLN SLI FOSS LS POOR Ø PTLY CKY- MEALY FEW W/SCAT LT STN, NO FO, LT ODOR

60 LT TAN- ROOTBEER, MD-XLN LS W/P-F INTER-XLN Ø- FEW SCAT LT STN NO FO LT ODOR

65) LT CRM FN-XLN CKY LS POOR Ø NS LT ODOR

SHORT TRIP 15 STANDS

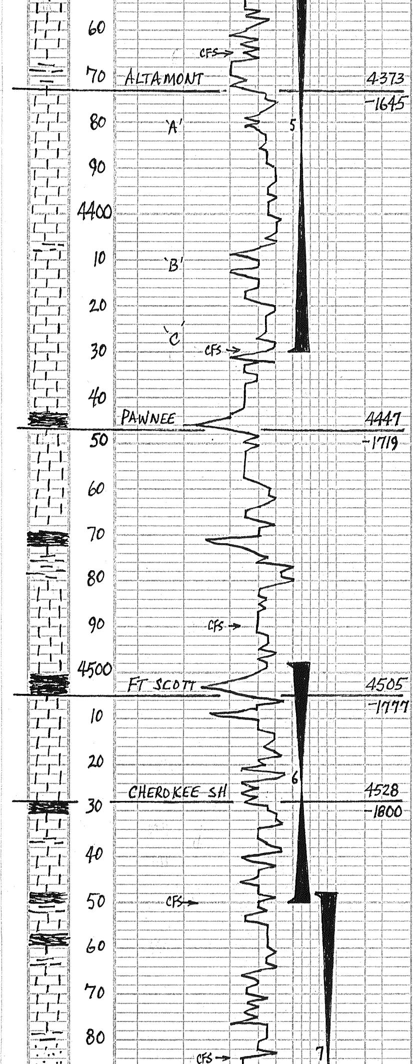
STRAP 1.24' LONG

S.H.T. = 1½° @ 4251'

DST #1 4220-4251
30-45-45-60
IF: BUILT TO BOB 9½ MINS.
FF: BUILT TO BOB 14 MINS.
2" BB ON FINAL 170' GIP
REC: 60' CGO = 40% G, 60% O
110' SGOCM = 5% G, 10% O, 40% M 45
124' OSMW = 15% M, 85% W
369' OSMW = 5% M, 95% W
663' TOTAL CHL = 88K
OIL GRAV = 36°
SIP: 793-789
IFP: 26-174 FFP: 178-317
TEMP: 128°

DST #2 4256-4282
30-45-45-60
IF: STRO BOB IN 2 MINS
FF: STRO BOB IN 1 MIN.
ISI: BB BOB 38 MINS.
FSI: BOB 26 MINS.
REC: 1605' GIP
471' CGO = 25% G, 75% O. 36° G
126' GMCO = 20% G, 30% M, 50% O
126' MCGW = 10% G, 5% M, 85% W
126' GOCW = 30% G, 30% O, 40% W
126' GW = 20% G, 80% W
121' MW = 40% M, 60% W
1096' T.F. CHL = 90K
SIP: 745-746
IFP: 103-341 FFP: 351-539
TEMP: 130°

DST #3 4287-4302'
30-45-45-60
IF: WK BUILT TO 6¼"
FF: WK BUILT TO 8½" NO BB
REC: 62' GIP
62' CGO = 50% G, 50% O
60' GOCM = 20% G, 30% O, 50% M
122' T.F. GRAV = 36°
SIP: 792-806
IFP: 12-33 FFP: 39-54
TEMP: 121



30MIN: WH-LT CRM FN-XLN CKY LS, W/POOR Ø W/SSLTBRNFO FT ODOR & TAN SLI-FOSS LS W/POOR VUG Ø 3 PCS W/SSFO, FT ODOR ON BRK
60MIN: FEW LS AA W/SSFO, FT ODOR PTLY CKY

80 FEW BLK SHS PRED WH-CRM FN-XLN CKY LS POOR Ø-NS NO ODOR

90 WH-LT CRM FN-XLN CKY LS POOR Ø NS NO ODOR

00 LT CRM SLI-FOSS LS W/P-F FOSS Ø 2 PCS W/SSGFO, FT ODOR ON BRK

10 LT TAN FN-XLN DNSE LS-NS POOR Ø

20 LOTS LT GRY GUMBO SHS & WH-CRM LT TAN FN-XLN SLI-FOSS LS 3 PCS W/STN NO FO NO ODOR

30) WH-CRM-LT TAN LS POOR Ø-NS LT ODOR? LOTS CKY
30MIN: WH-LT CRM-LT TAN FN-XLN LS POOR Ø: NS LT-ODOR!
60MIN: LT CRM-LT TAN FN-XLN LS DNSE-CKY-NS NO ODOR

50 PRED WH-LT CRM FN-XLN LS DNSE-CKY POOR Ø-NS NO ODOR

60 INC GRY-GRN SHS PRED WH-LT CRM FN-XLN LS POOR Ø-NS

70 FLOOD WH CKY LS POOR Ø-NS & SEMI-CLEAR-LT GRY SHARP Δ-NS!

80 LOTS GRY-BLK SHS CRM-TAN SLI-FOSS LS POOR Ø-NS NO ODOR PTLY CKY

90) FLOOD BK SHS! CRM-WH FN-XLN CKY LS POOR Ø-NS NO ODOR
30MIN: FLOOD LT GRY-BUFF FN-XLN LS POOR Ø-NS NO ODOR

00 LT TAN FN-XLN LS MOSTLY DNSE POOR Ø-NS NO ODOR

10 PRED V. LT TAN-GRY FN-XLN LS POOR Ø-NS NO ODOR

20 LT TAN V. OOL LS W/ FAIR INTER-OOL Ø W/S-FSLT FO, GD ODOR 10 PCS SOME Bty W/OOL ~~POOR Ø~~ CLEAN

30 DK GRY SLI-FOSS DNSE LS POOR Ø-NS LOTS SHS GRY-BLK

40 TAN SLI-FOSS LS W/P-F FOSS Ø W/SSFO, FT ODOR LOTS BRN SHS

50) LT CRM-LT TAN SEMI-FOSS LS W/P-F Ø-SCAT LT STN NO FO
30MIN: FEW LT CRM SLI-FOSS LS P-F Ø SCAT STN FEW SSFO LT ODOR
60MIN: LT CRM SLI-FOSS LS P-F Ø SCAT LT STN SSFO 3 PCS LT-FAIR ODOR

60 PTLY CKY TAN-BUFF LS-NS

70 CRM-BUFF-LT TAN FN-XLN LS POOR Ø NS NO ODOR

80 FLOOD WH-LT CRM FN-XLN LS DNSE-CKY POOR Ø-NS NO ODOR

84) PRED WH WH CKY LS-2 PCS W/ DK STN, NO FO, NO ODOR
30MIN: CRM LS AA-NS, FEW CLUST LT GRY FN-GR SST POOR Ø-HARD! SCAT DK STN, NO FO NO ODOR
60MIN: FEW V. FN-GR SST POOR Ø FEW (3) DK FLAK STN NO FO, NO ODOR NO LOOSE GRNS

DST #4 4306'-4320'
30-45-45-60
IF: BUILT TO BOB 11½ mins.
FF: FAIR BUILT TO BOB 8 mins.
ISI: 2½" BB FSI: 5½ BB.
REC: 725' GIP
216' CGO = 30% G, 70% O
32' GOCM = 20% G, 30% O, 50% M
248' T.F. 35° GRAV
SIP: 932-922
IFP: 10-48 FFP: 68-85
TEMP: 128

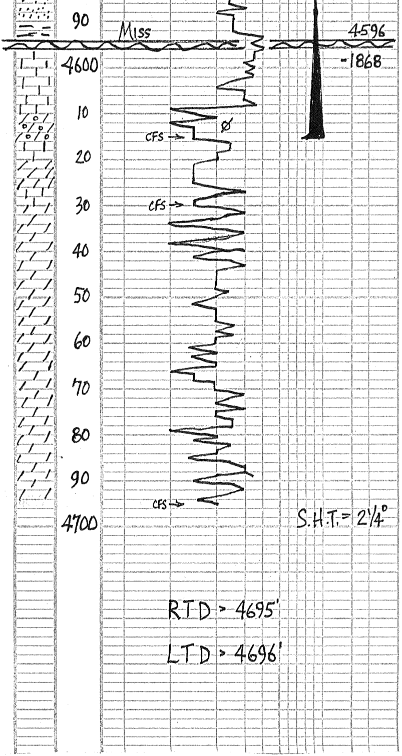
DST #5 4326'-4430'
30-30-30-30
IF: WK DIED IN 25 mins.
FF: NO BLOW-FLUSH-SURGE
REC: 3' MUD + TRACE OIL
SIP: 68-78
IFP: 14-16 FFP: 16-17
TEMP: 116°

ADDING PRE-MIX

DST #6 4498-4550
30-45-45-60
IF: WEAK BUILT TO 2"
FF: 1" BUILT TO 4"
REC: 123' GIP
61' GOCM = 5% G, 25% O, 70% M
SIP: 196-200
IFP: 14-20 FFP: 20-26
TEMP: 121

PULLED TIGHT > 15 STD. S.T.
MUD-CO ✓
VISC: 50 FILT: 6.4
WT: 9.4 CHL: 2,500
ADDING PRE-MIX

VISC: 51
WT: 9.2



RTD > 4695'

LTD > 4696'

00) LOTS BLK SH & LT GRY-CL-FN-GR SST 10 CLUST W/DK STN & SS BRFO, TRACE GAS, FAIR ODOR

10 LOTS SEMI-CL-SST FEW W/SSFO LOTS CKY MATRIX LOTS SEMI CL SHARP Δ

15) FLOOD WH-LT YELL-BUFF FN-XLN LS POOR Ø-NS LOTS WH CK

30 MIN: FLOOD WH-LT CRM FN-MD XLN LS LOTS CKY P-F Ø- NS NO ODOR

60 MIN: FLOOD LT TAN VUG DOLO FAIR Ø- NS NO ODOR

30) LT CRM-LT TAN DOLO & LS P-F VUG Ø - NS NO ODOR

30 MIN: LT TAN DOLO & LS AA - NS

60 MIN: FLOOD LT TAN VUG DOLO FAIR VUG Ø - NS NO ODOR, SL CKY

PRED LT TAN Δty DOLO FAIR VUG Ø NS NO ODOR

50 TAN Δty DOLO W/FAIR Ø - NS SL INC CKY

60 FLOOD LT TAN Δty VUGY DOLO FAIR Ø - NS NO ODOR

70 LT TAN-LT GRY Δty DOLO FAIR Ø NS NO ODOR

80 MED TAN-LT GRY Δty DOLO - NS

90 GRY-TAN Δty DOLO FAIR VUG Ø NS NO ODOR

95) TAN-LT GRY Δty DOLO - NS

30 MINS: LT CRM-LT TAN Δty DOLO FAIR Ø- NS NO ODOR SL CKY

DST#7 4548-4615
30-45-45-60
IF: WK BUILT TO 1½"
FF: WK STEADY SURF BLOW
REC: 30' MUD + OS
SIP: 1104-1088
IFP: 14-20 FFP: 22-29
TEMP: 119