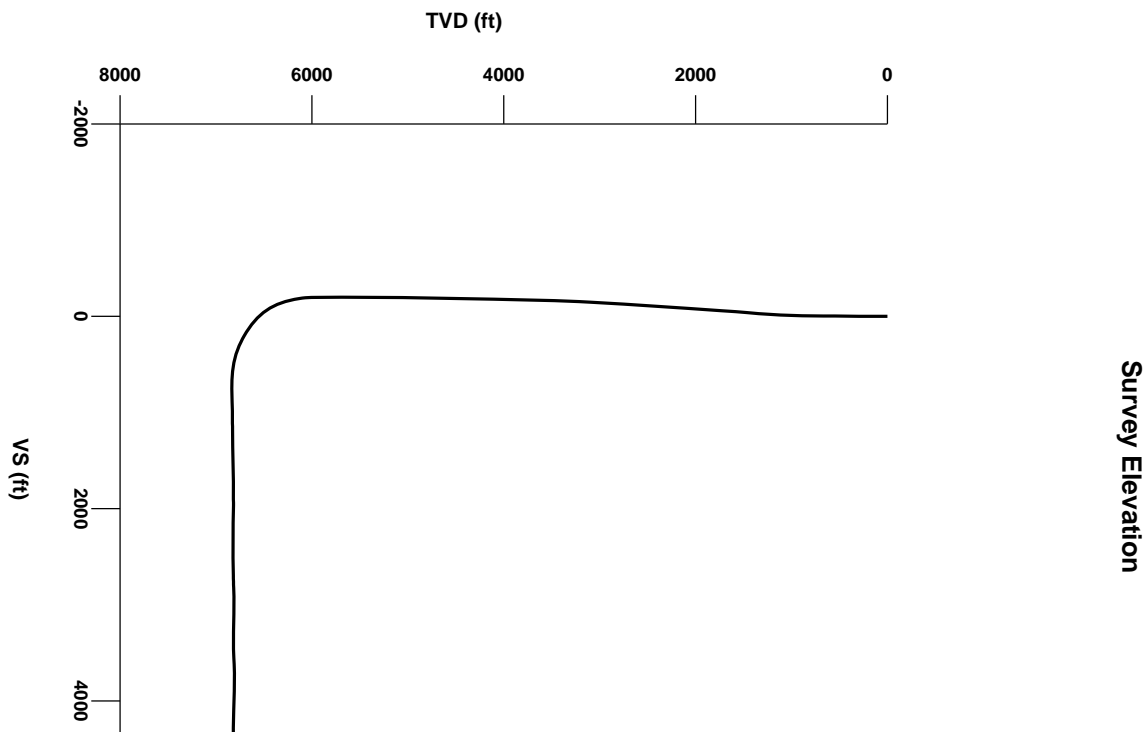
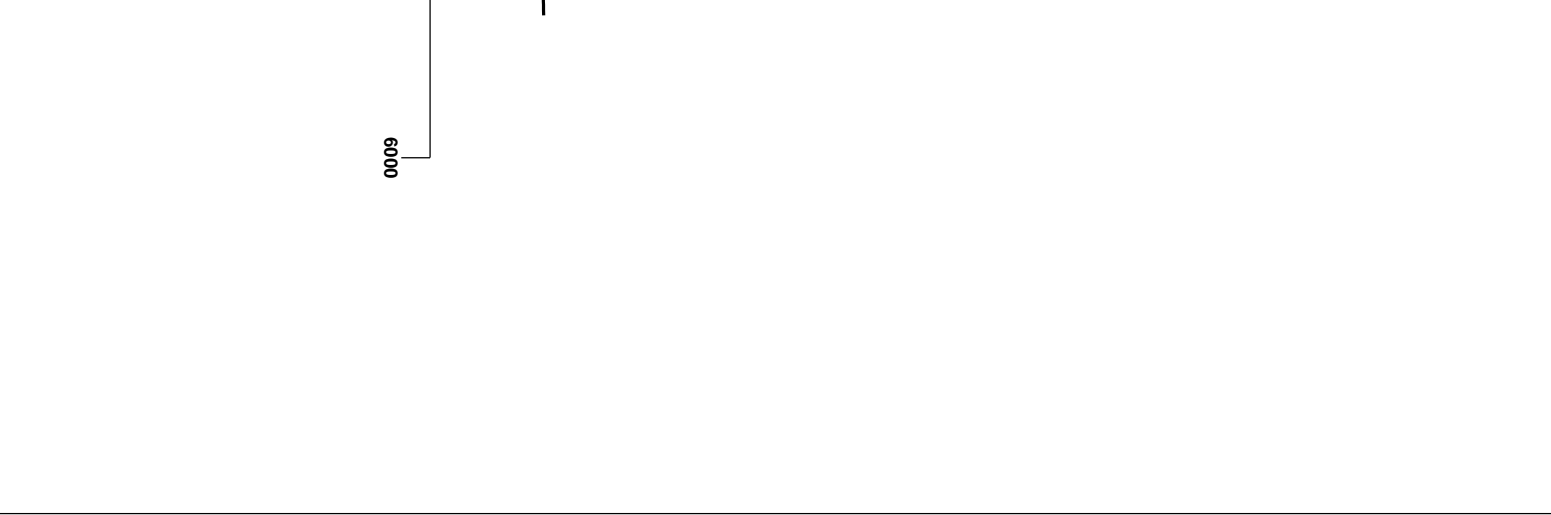
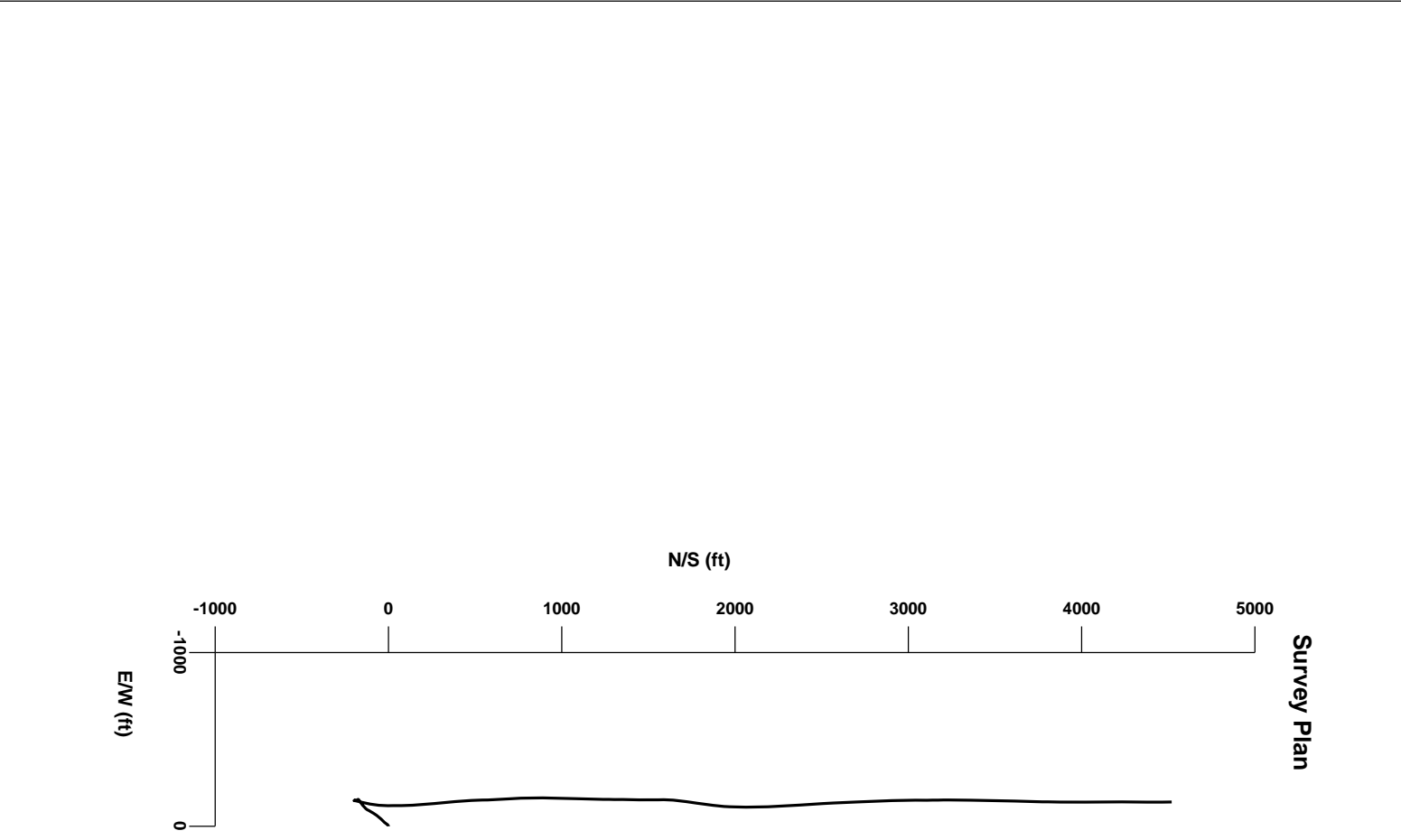


LOG created using Lplot VH Version 3.0, June 13, 2013, Copyright (C) 1999-2009 Pason Systems Corp.

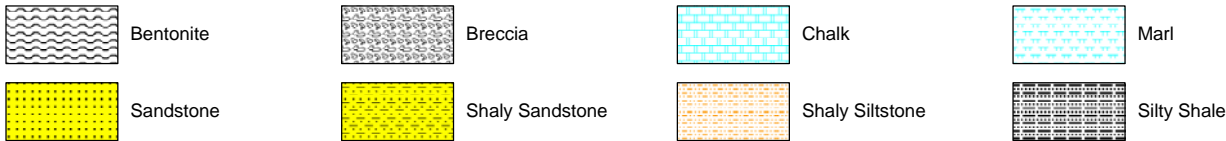
OPERATOR: PDC Energy
WELL: Waste Management 2i-221
LOCATION: SWSW SEC 2, 2N, 64W, 6TH
COUNTY: Weld
STATE: Colorado
SPOT: 230' FSL & 650' FWL
ELEVATION: GL 4,939' KB 4,954'
FIELD: Wattenberg
SPUD DATE: 6/3/2013
TD DATE: 6/12/2013
DATES LOGGED: 6/7/2013 - 6/12/2013
DEPTHS LOGGED: 6,100' - 11,210'
LOGGERS: K. Donahue & S. Hampton
DRILLING FLUID: LSND
DRILLING RIG: ENSIGN 14
API: 05-123-36955-0000
LOG TYPE: BUILD & LATERAL (NIOBRARA)
SCALE: 1:240 (5 inches per 100 feet)
REMARKS: WELLSITE GEOLOGICAL SERVICES PROVIDED BY COLUMBINE LOGGING, INC.



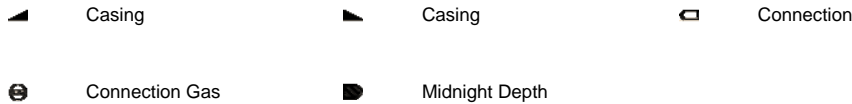
Survey Elevation



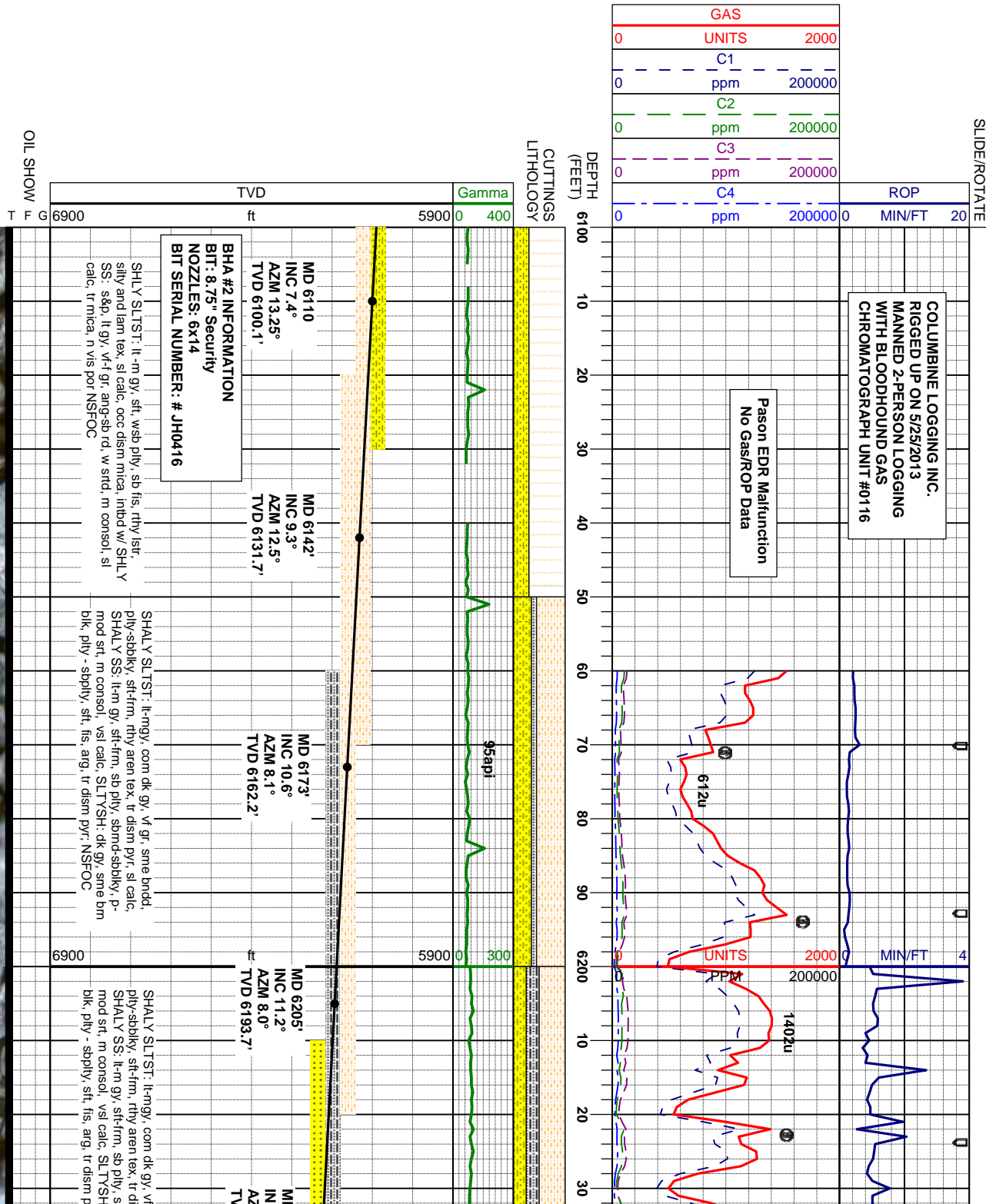
LITHOLOGIES

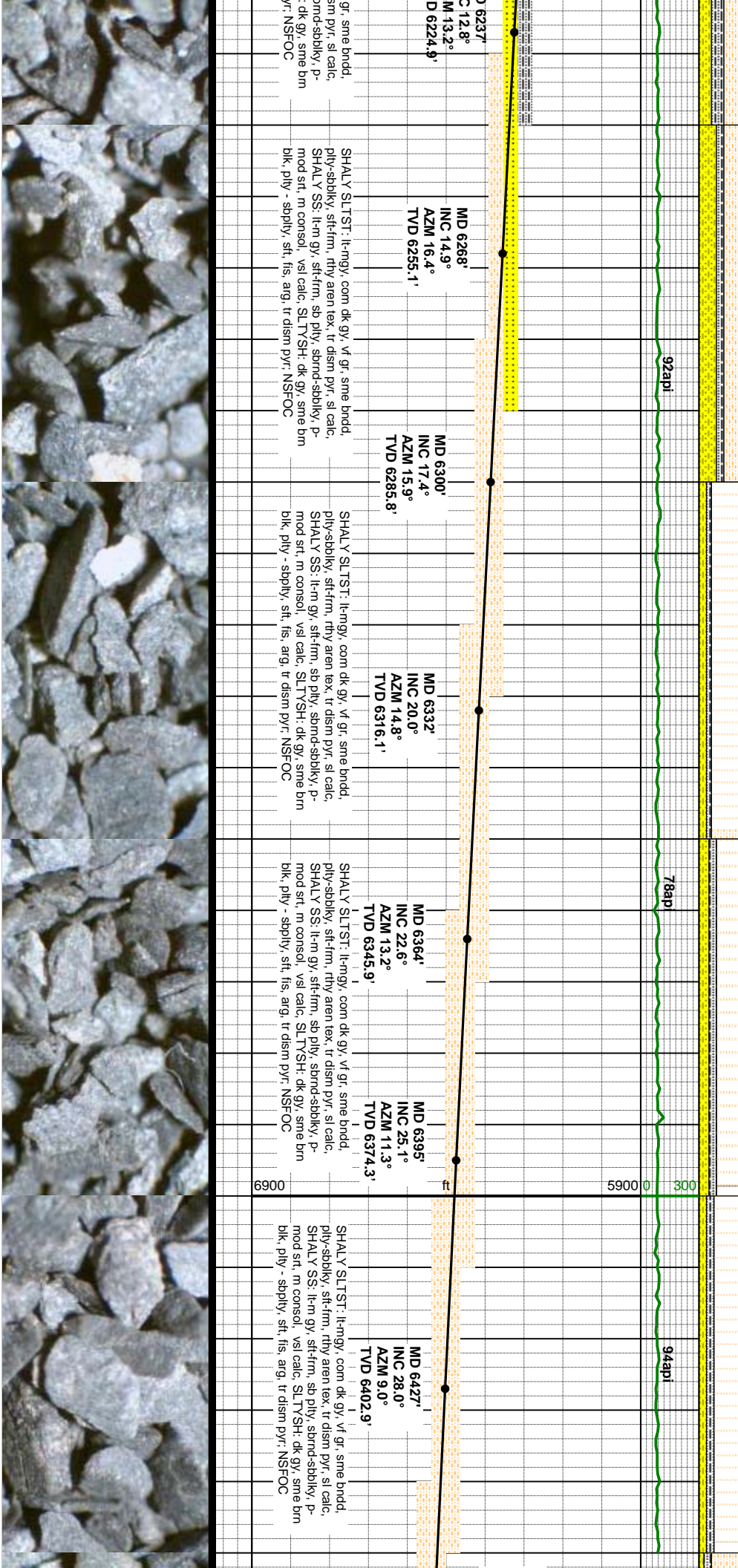


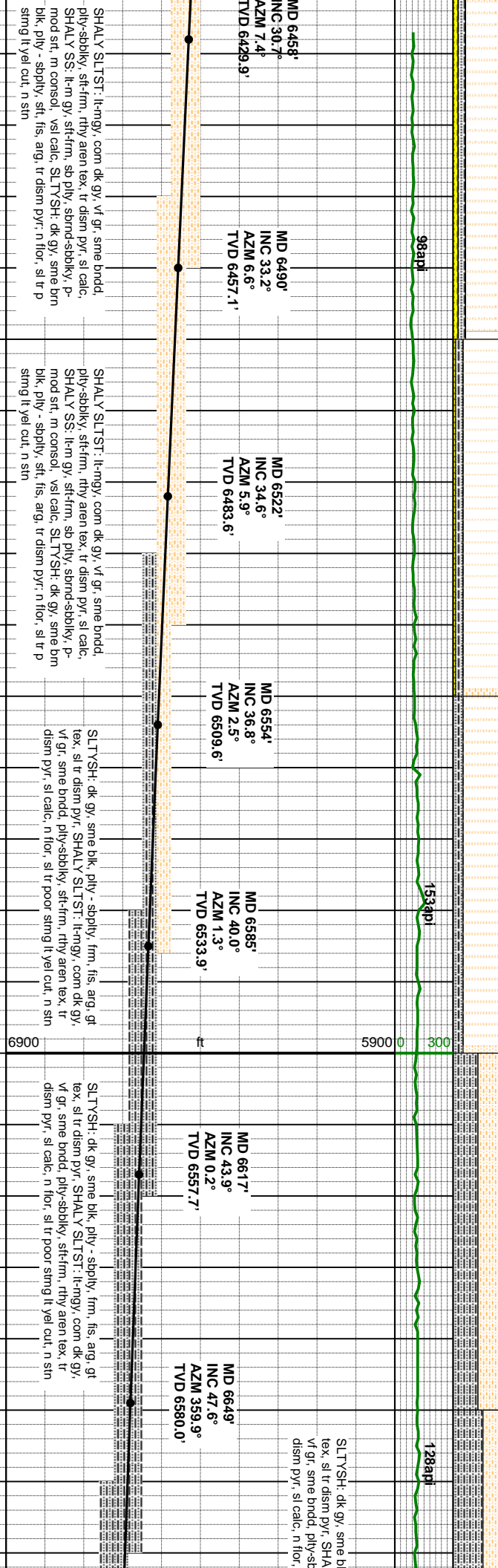
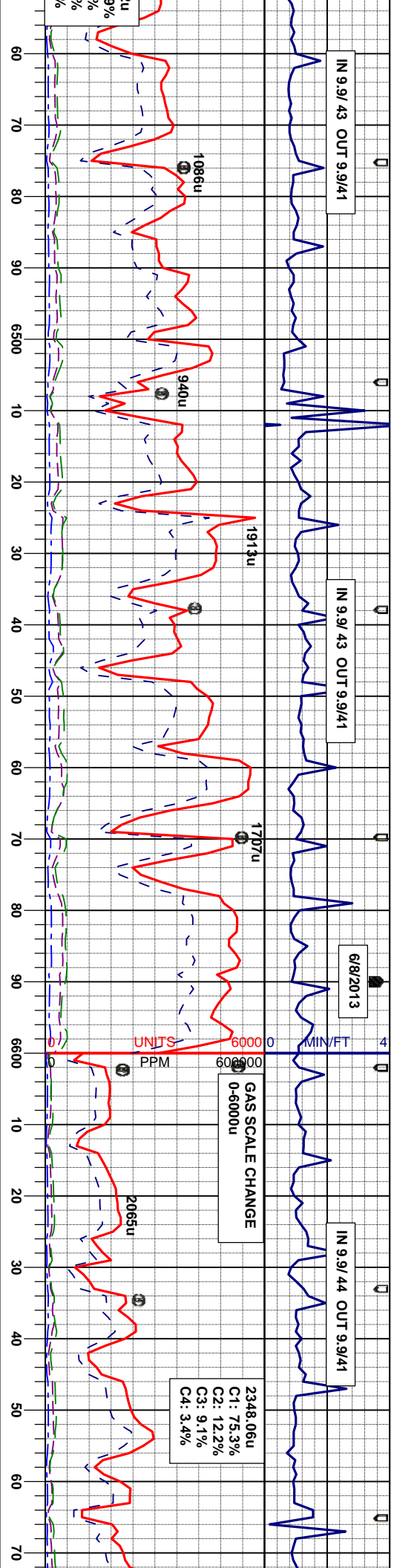
ENGINEERING SYMBOLS

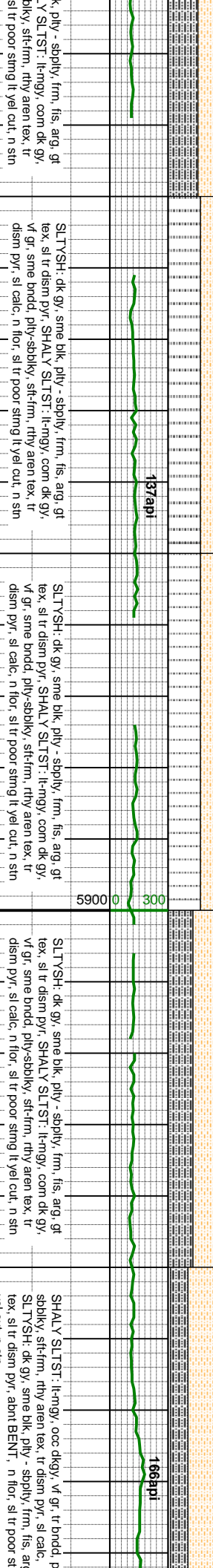
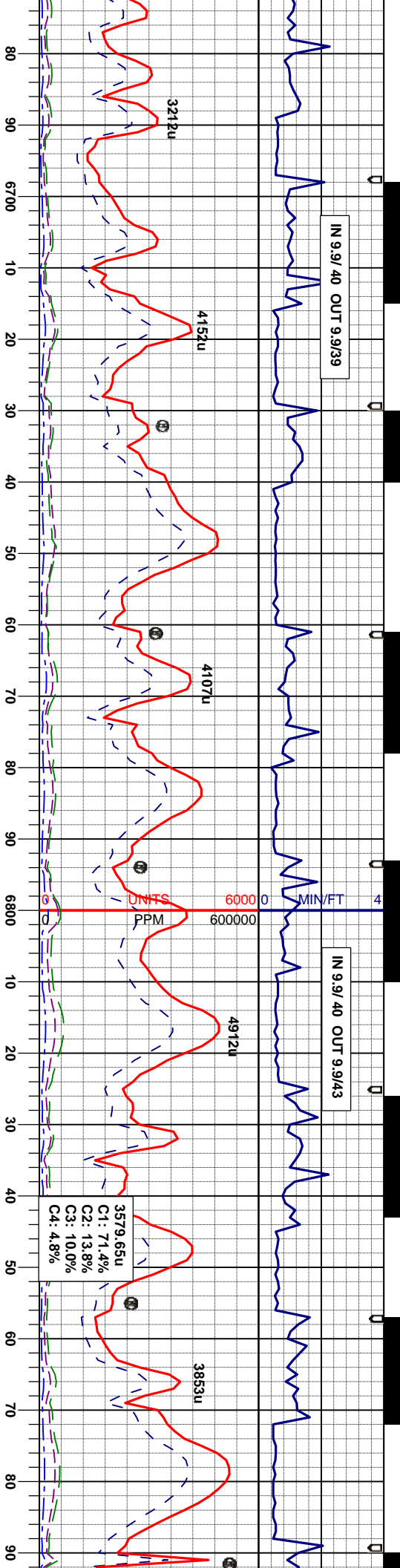


SAMPLE PHOTOS









MD 6680' INC 50.5° AZM 359.2° TVD 6600.3'

MD 6712' INC 52.5° AZM 358.7° TVD 6620.2'

MD 6744' INC 53.9° AZM 358.1° TVD 6639.4'

MD 6776' INC 55.5° AZM 357.3° TVD 6657.9'

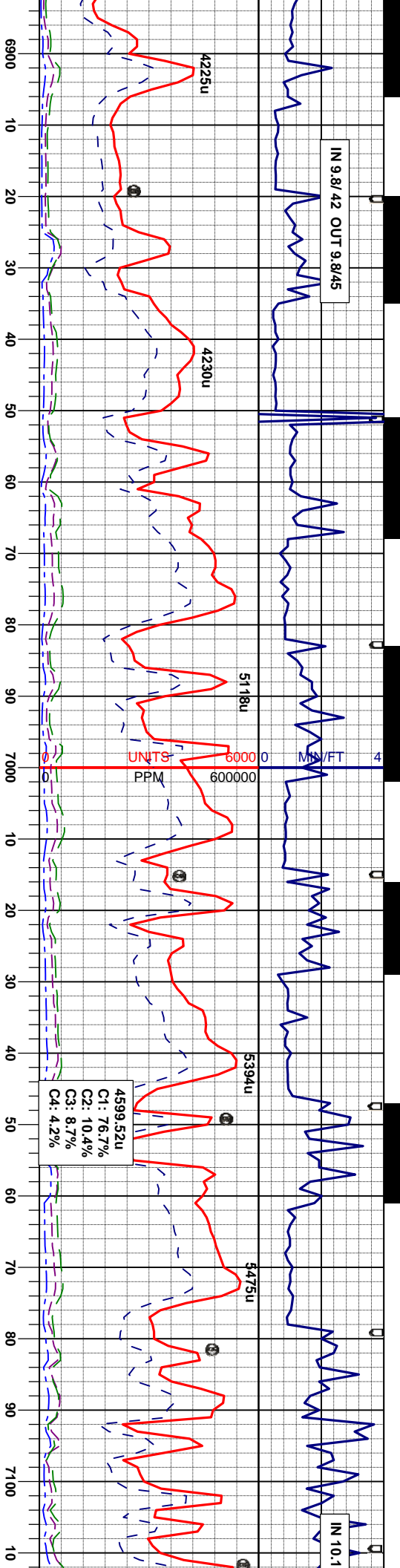
MD 6807' INC 56.8° AZM 357.1° TVD 6675.2'

MD 6839' INC 58.5° AZM 356.2° TVD 6692.3'

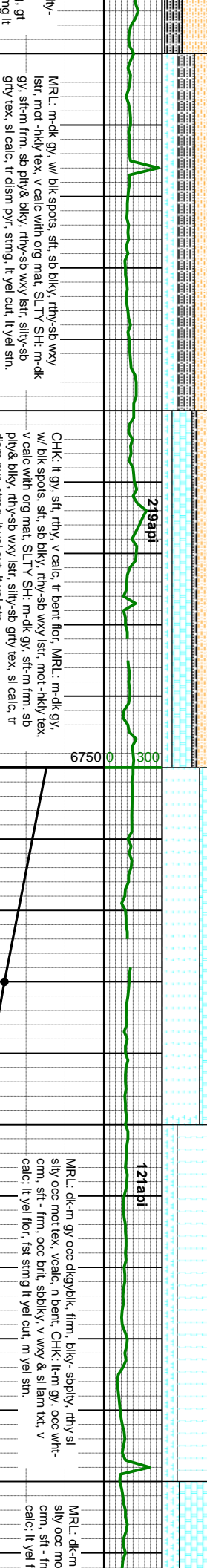
MD 6871' INC 60.3° AZM 356.0° TVD 6708.6'

Sharon Spgs top @ MD6,764' / TVD 6,650'





4599.52u
C1: 76.7%
C2: 10.4%
C3: 8.7%
C4: 4.2%

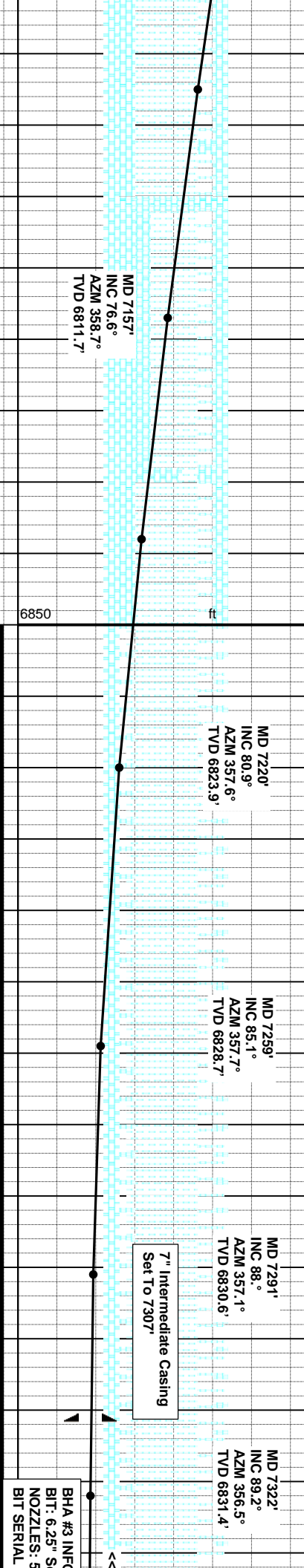
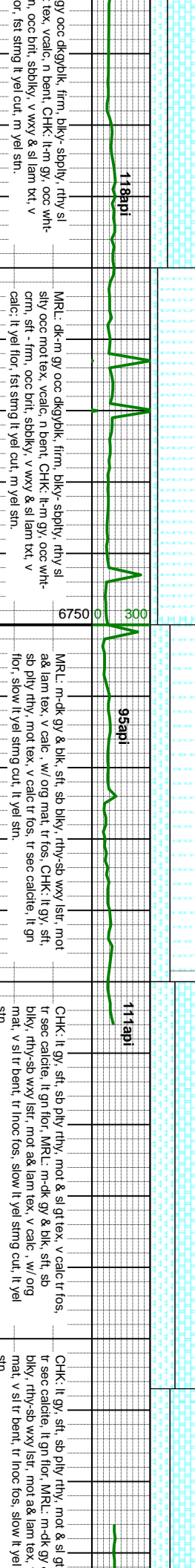
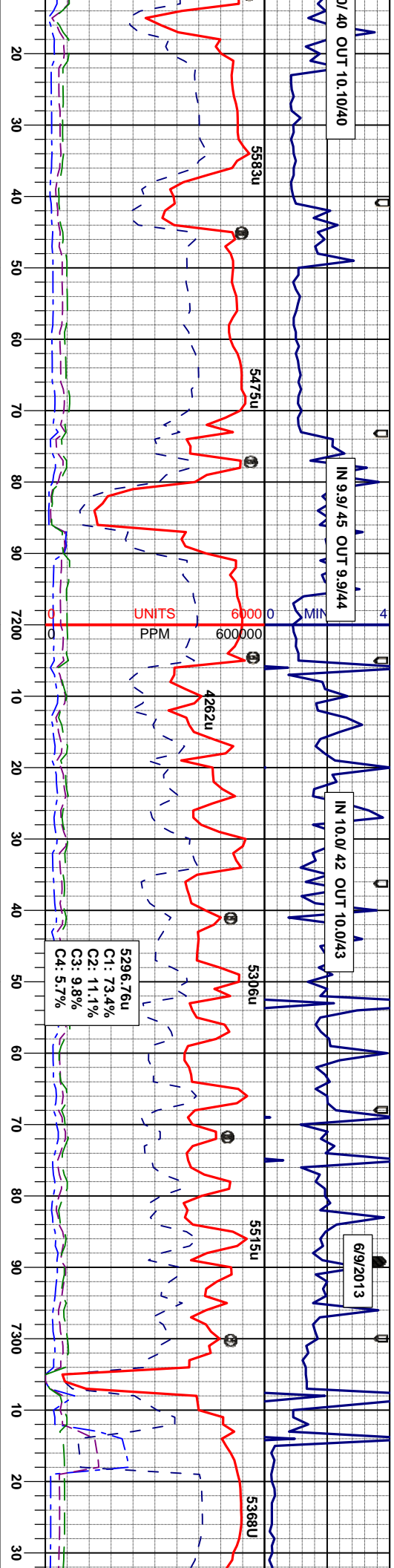


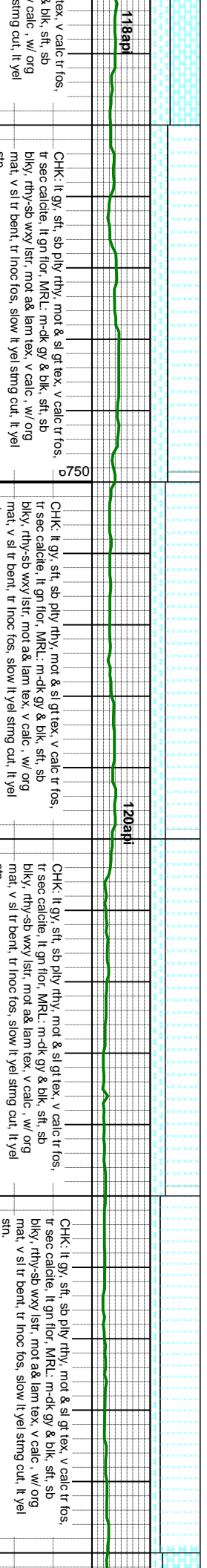
Niobrara top @ MD6,912' TVD 6,728'

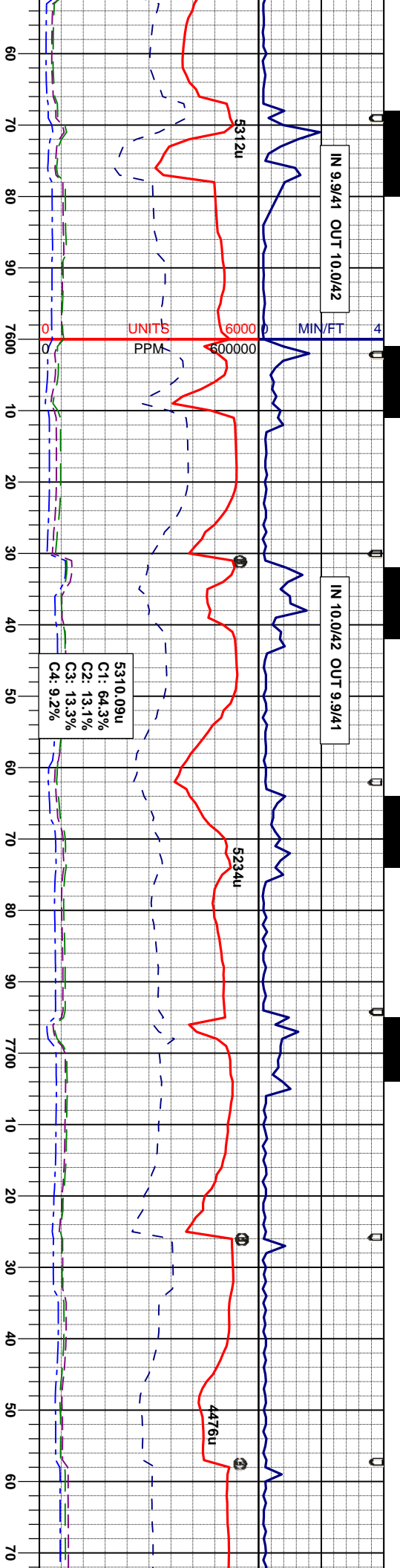
Niobrara A top @ MD6,965' TVD 6,751'

SCALE CHANGE
1 White Block On TVD Scale = 10' TVD
Target Zone represented by Chalk









CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc tr fos, tr sec calcite, lt gn flr, MRL: m-dk gy & blk, sft, sb blkly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, v sl tr bent, tr inoc fos, mod-fast lt yel string cut, lt yel sin.

CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc tr fos, tr sec calcite, lt gn flr, MRL: m-dk gy & blk, sft, sb blkly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, v sl tr bent, tr inoc fos, mod-fast lt yel string cut, lt yel sin.

CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc tr fos, tr sec calcite, lt gn flr, MRL: m-dk gy & blk, sft, sb blkly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, v sl tr bent, tr inoc fos, mod-fast lt yel string cut, lt yel sin.

MD 7576'
INC 92.2°
AZM 359.8°
TVD 6833.3'

MD 7608'
INC 92.3°
AZM 1.3°
TVD 6832.1'

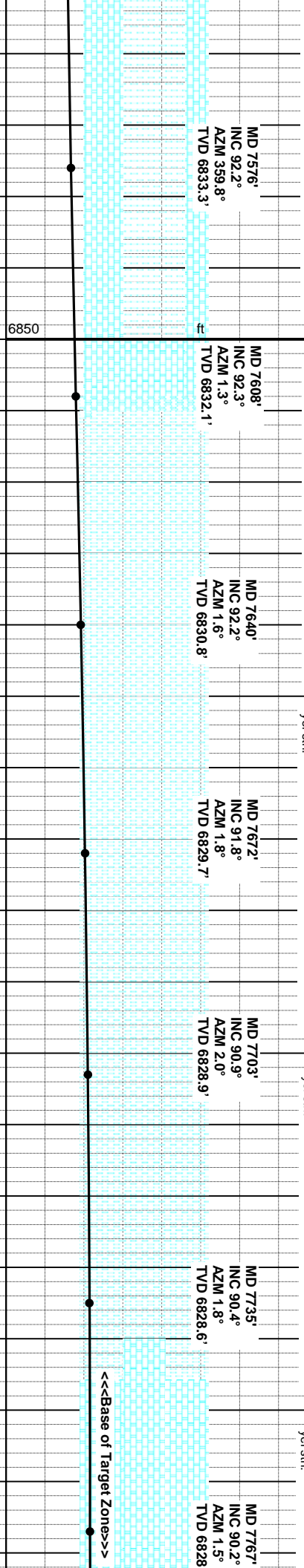
MD 7640'
INC 92.2°
AZM 1.6°
TVD 6830.8'

MD 7672'
INC 91.8°
AZM 1.8°
TVD 6829.7'

MD 7703'
INC 90.9°
AZM 2.0°
TVD 6828.9'

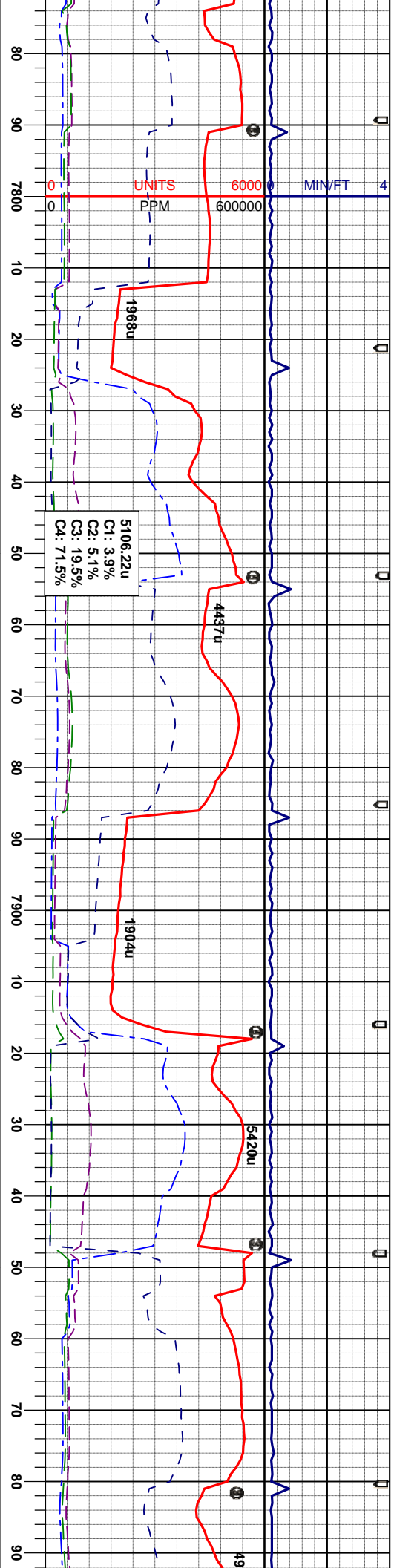
MD 7735'
INC 90.4°
AZM 1.8°
TVD 6828.6'

MD 7767'
INC 90.2°
AZM 1.5°
TVD 6828



<<<Base of Target Zone>>>





Y. mot & sl gt tex, v calc tr fos,
R.L. m-dk gy & blk, sft, sb
a& lam tex, v calc, w/ org
mat, mod-fast lt yel string cut, lt

CHK: lt gy, sft, sb pily rthy, mot & sl gt tex, v calc tr fos,
tr sec calcite, lt gn flor, MRL: m-dk gy & blk, sft, sb
biky, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org
mat, mod-fast lt yel string cut, lt yel sin.

CHK: lt gy, sft, sb pily rthy, mot & sl gt tex, v calc tr fos,
tr sec calcite, lt gn flor, MRL: m-dk gy & blk, sft, sb
biky, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org
mat, mod-fast lt yel string cut, lt yel sin.

CHK: lt gy, sft, sb pily rthy, mot & sl gt tex, v calc tr fos,
tr sec calcite, lt gn flor, MRL: m-dk gy & blk, sft, sb
biky, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org
mat, mod-fast lt yel string cut, lt yel sin.

MD 7799'
INC 90.5°
AZM 1.3°
TVD 6828.2'

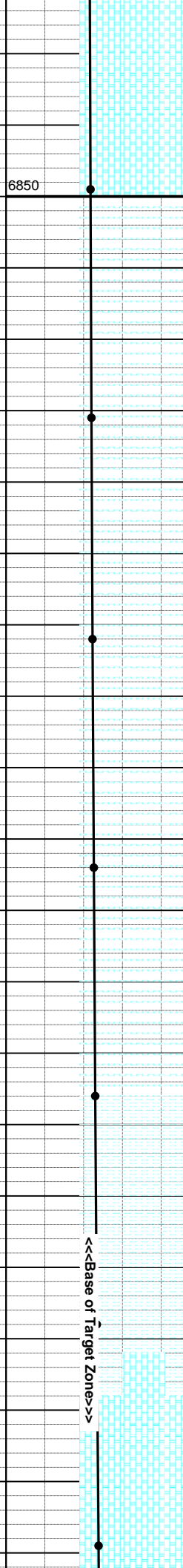
MD 7831'
INC 90.4°
AZM 1.5°
TVD 6827.9'

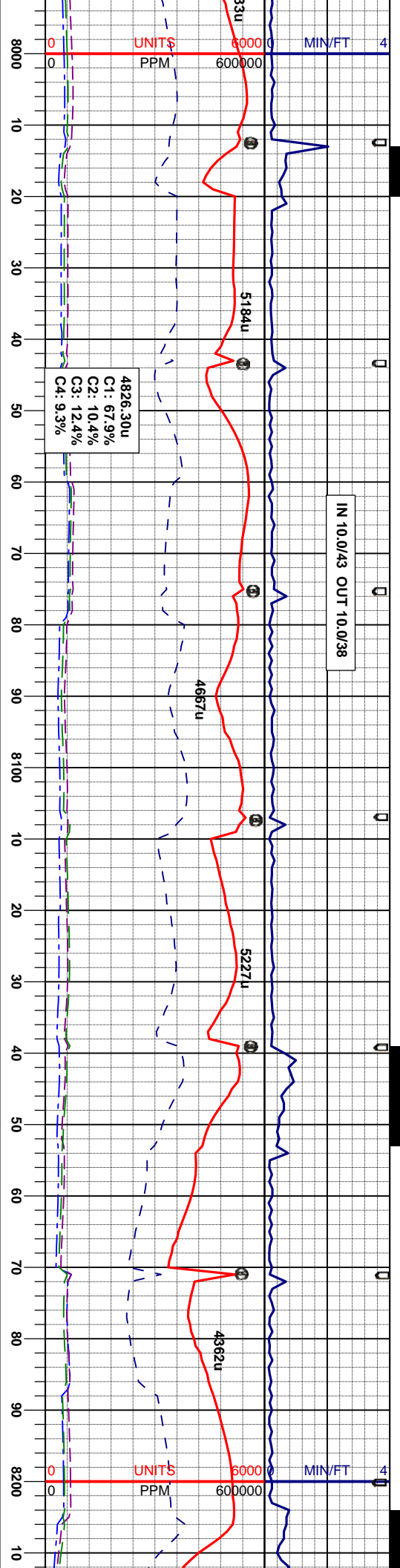
MD 7862'
INC 90.6°
AZM 1.5°
TVD 6827.7'

MD 7926'
INC 90.7°
AZM 0.1°
TVD 6826.9'

MD 7958'
INC 90.8°
AZM 0.6°
TVD 6826.6'

MD 7989'
INC 90.9°
AZM 0.4°
TVD 682



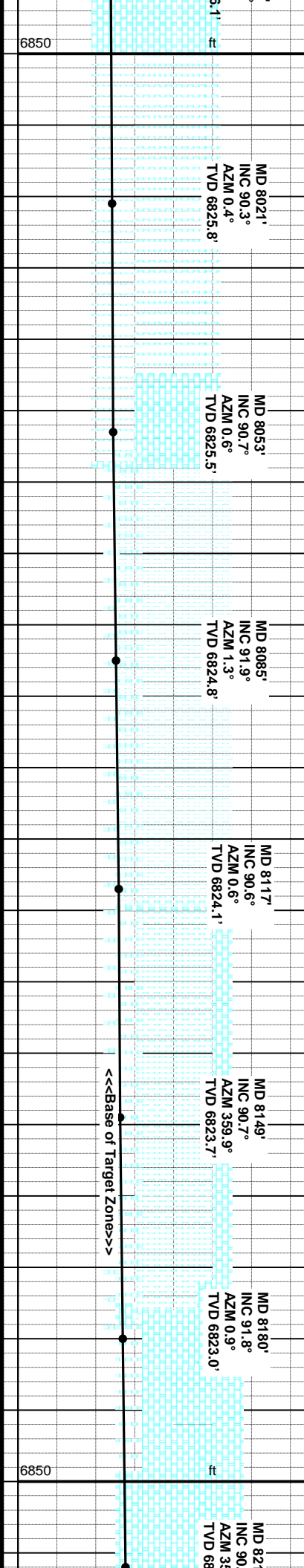


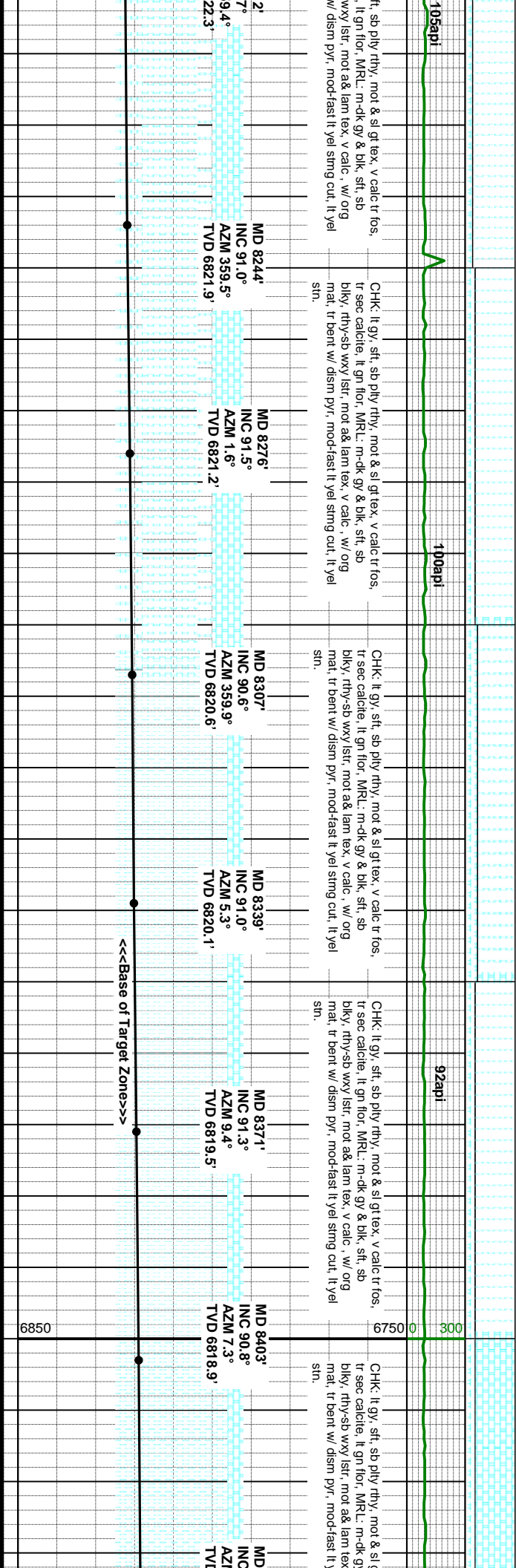
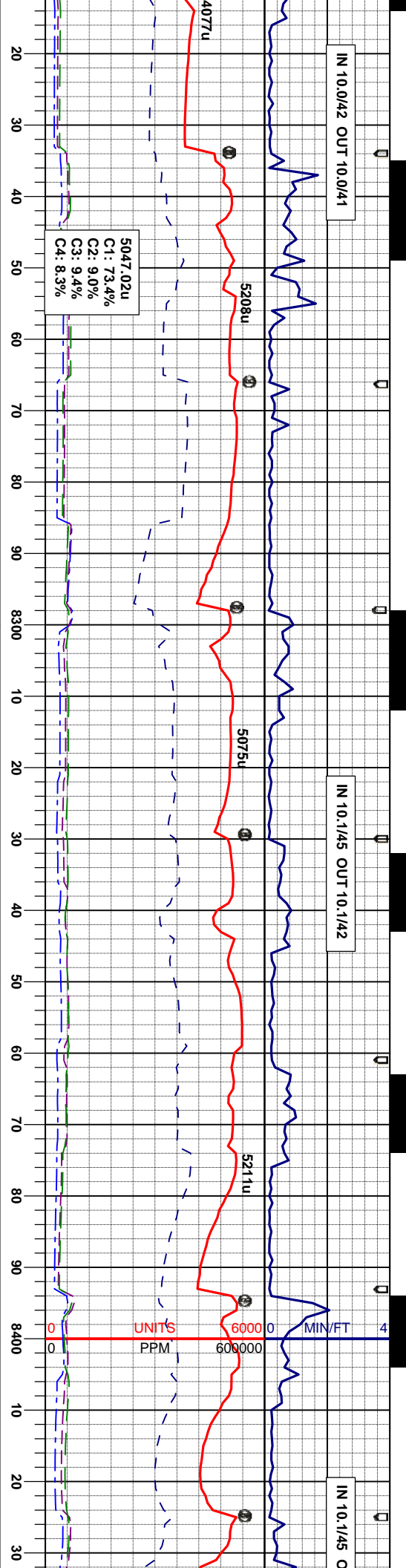
CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc tr fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb blkly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel string cut, It yel stn.

CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc tr fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb blkly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel string cut, It yel stn.

CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc tr fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb blkly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel string cut, It yel stn.

CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc tr fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb blkly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel string cut, It yel stn.

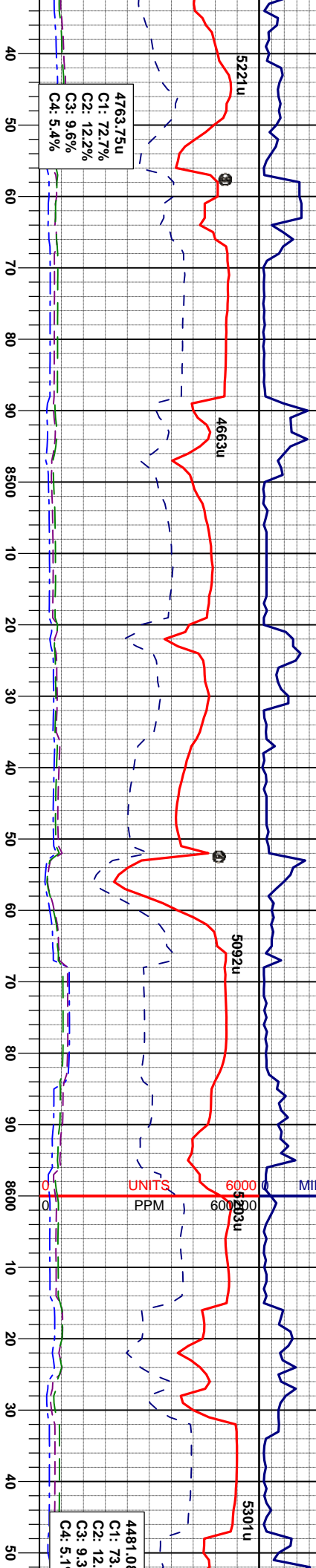




UT 10.2/42

IN 10.0/43 OUT 10.0/40

IN 9.9/44



101api

96api

91api

94api

CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc, tr fos, tr sec calcite, It gn flcr, MRL: m-dk gy & blk, sft, sb biky, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel string cut, It yel sht.

CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc, tr fos, tr sec calcite, It gn flcr, MRL: m-dk gy & blk, sft, sb biky, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel string cut, It yel sht.

CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc, tr fos, tr sec calcite, It gn flcr, MRL: m-dk gy & blk, sft, sb biky, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel string cut, It yel sht.

MD 8466' INC 90.1° AZM 7.8° TVD 6818.2'

MD 8498' INC 90.3° AZM 7.4° TVD 6818.1'

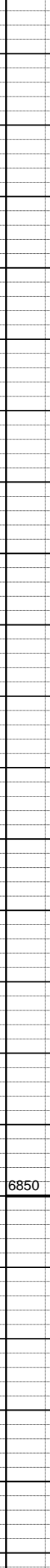
MD 8529' INC 89.5° AZM 6.4° TVD 6818.2'

MD 8561' INC 90.0° AZM 8.5° TVD 6818.3'

MD 8593' INC 90.1° AZM 5.5° TVD 6818.3'

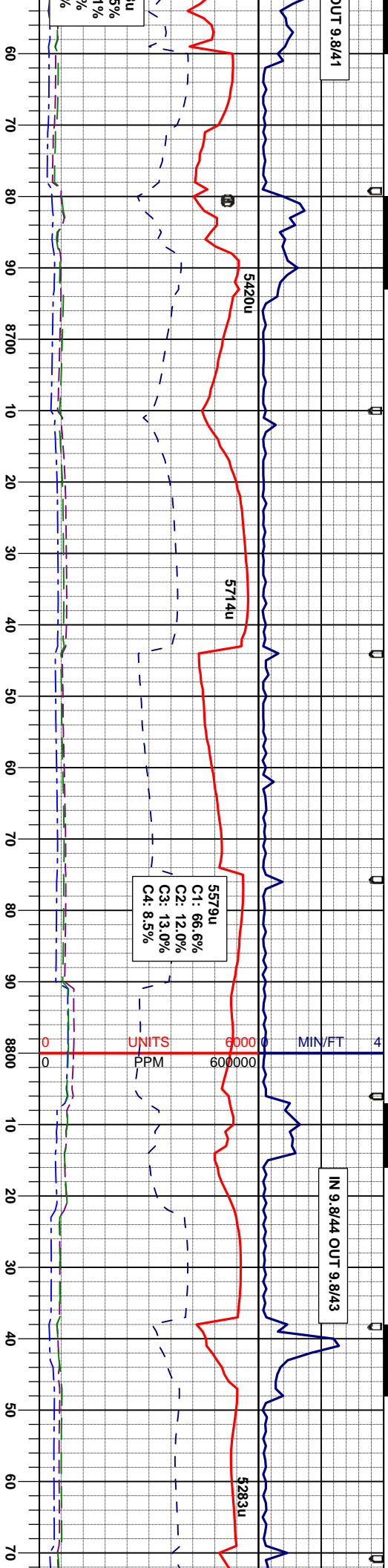
MD 8625' INC 90.4° AZM 5.0° TVD 6818.1'

<<<Base of Target Zone>>>



OUT 9.8/41

IN 9.8/44 OUT 9.8/43



CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc, tr
fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb
biky, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org
mat, tr bent w/ dism pyr, mod-fast It yel string cut, It yel
sn.

CHK: It gy, sft, sb ply rthy, mot & sl gt tex, v calc, tr
fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb
biky, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org
mat, tr bent w/ dism pyr, mod-fast It yel string cut, It yel
sn.

CHK: It gy - mylon, sft, sb ply rthy, mot tex, v calc,
occ fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk,
sft, sb biky, rthy-sb wxy lstr, mot a& lam tex, v calc, w/
org mat, tr bent w/ dism pyr, mod-fast It yel string cut, It
yel sn.

CHK: It gy - mylon, sft, sb ply rthy, mot tex, v calc,
occ fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk,
sft, sb biky, rthy-sb wxy lstr, mot a& lam tex, v calc, w/
org mat, tr bent w/ dism pyr, mod-fast It yel string cut, It
yel sn.

ID 8656' INC 90.6° AZM 1.1° TVD 6817.9'

ID 8668' INC 89.3° AZM 1.1° TVD 6818.1'

ID 8720' INC 89.3° AZM 0.2° TVD 6818.4'

ID 8752' INC 89.1° AZM 0.1° TVD 6818.7'

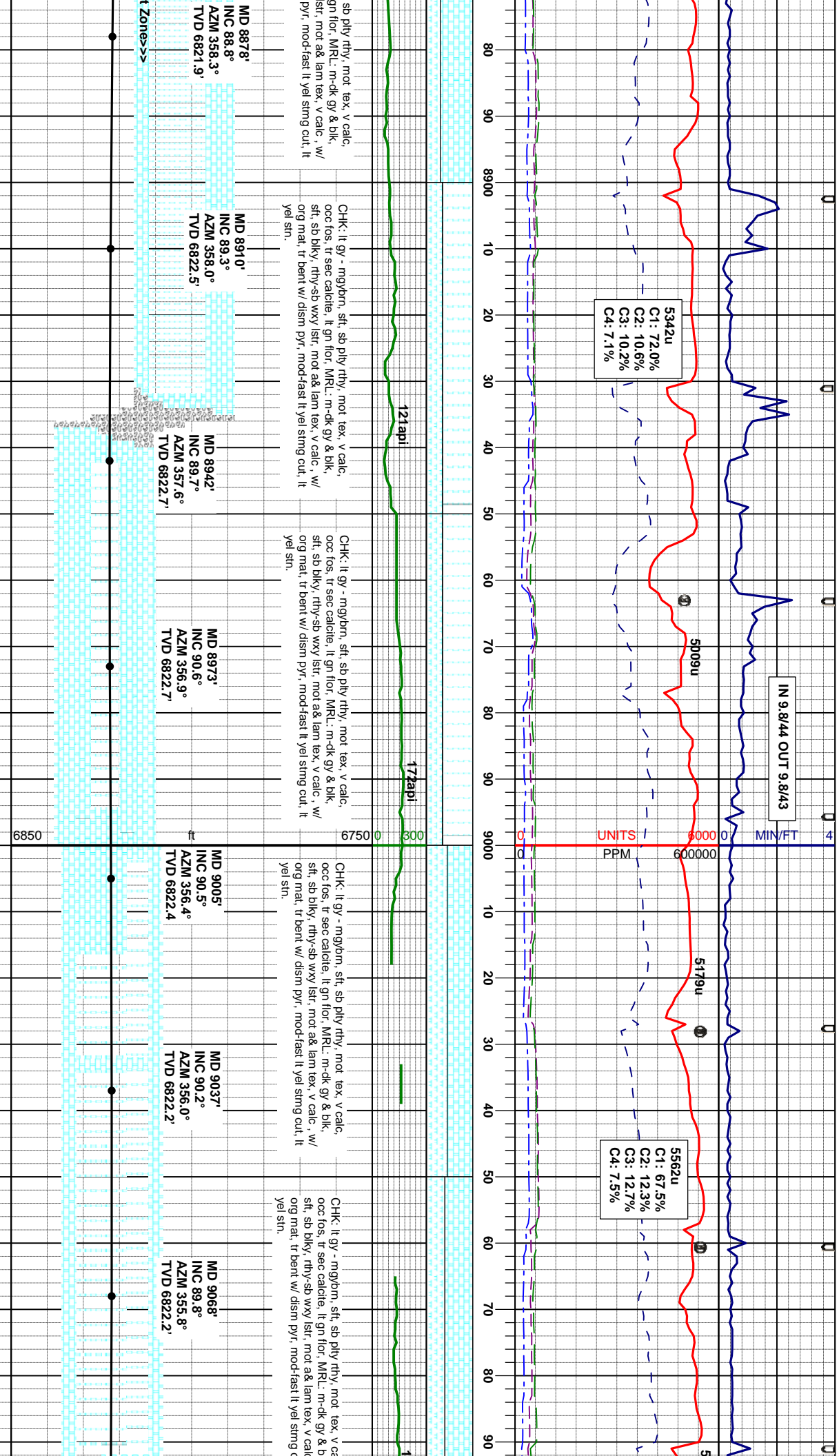
ID 8783' INC 88.8° AZM 0.2° TVD 6819.3'

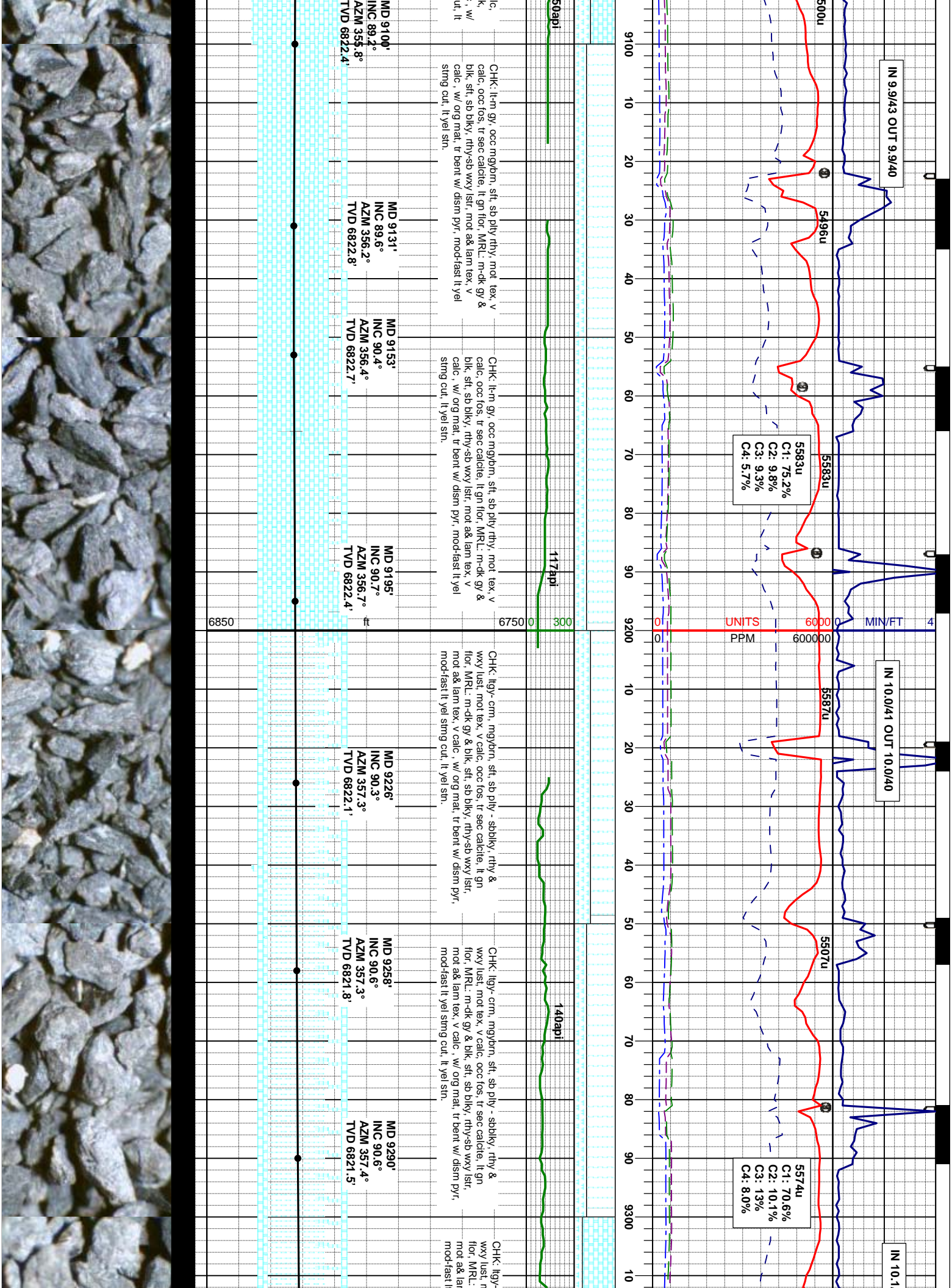
ID 8815' INC 88.6° AZM 359.0° TVD 6820.0'

ID 8847' INC 88.9° AZM 358.5° TVD 6821.3'

<<<Base of Target

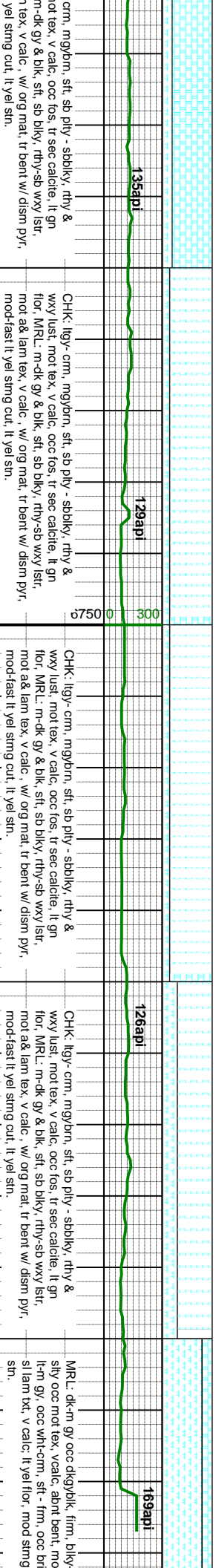
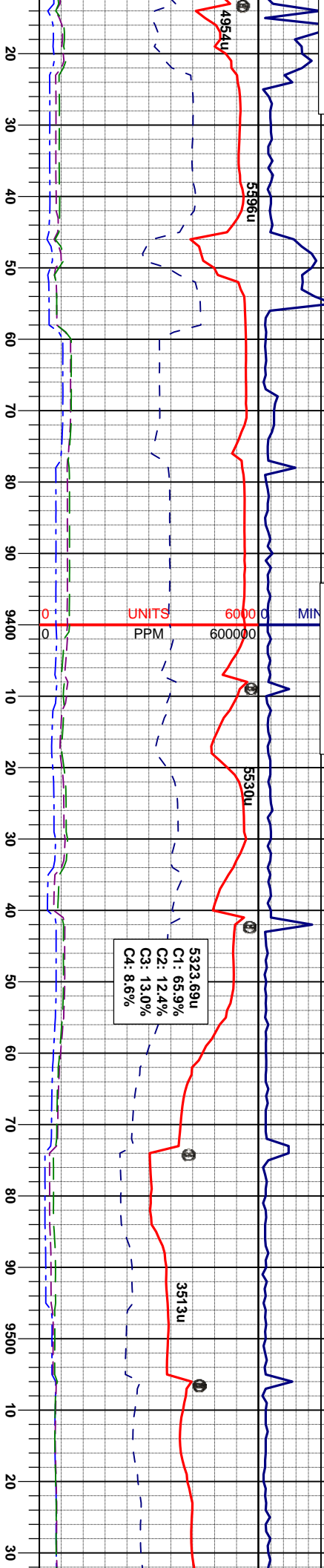






42 OUT 10.1/43

IN 10.1/42 OUT 10.1/43



MD 9321' INC 91.1° AZM 357.3° TVD 6821.0'

MD 9353' INC 91.7° AZM 357.6° TVD 6820.3'

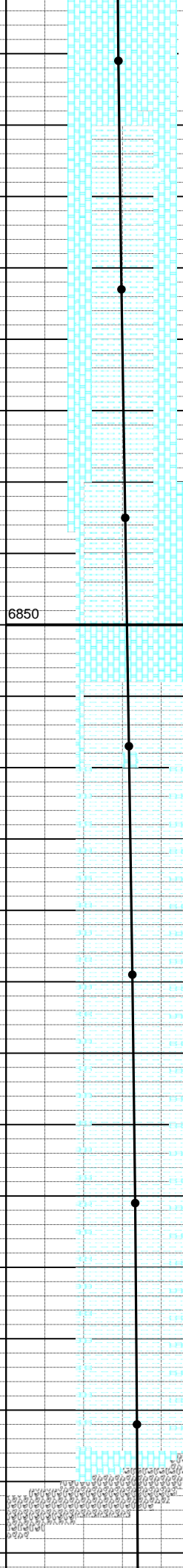
MD 9385' INC 91.8° AZM 358.3° TVD 6819.3'

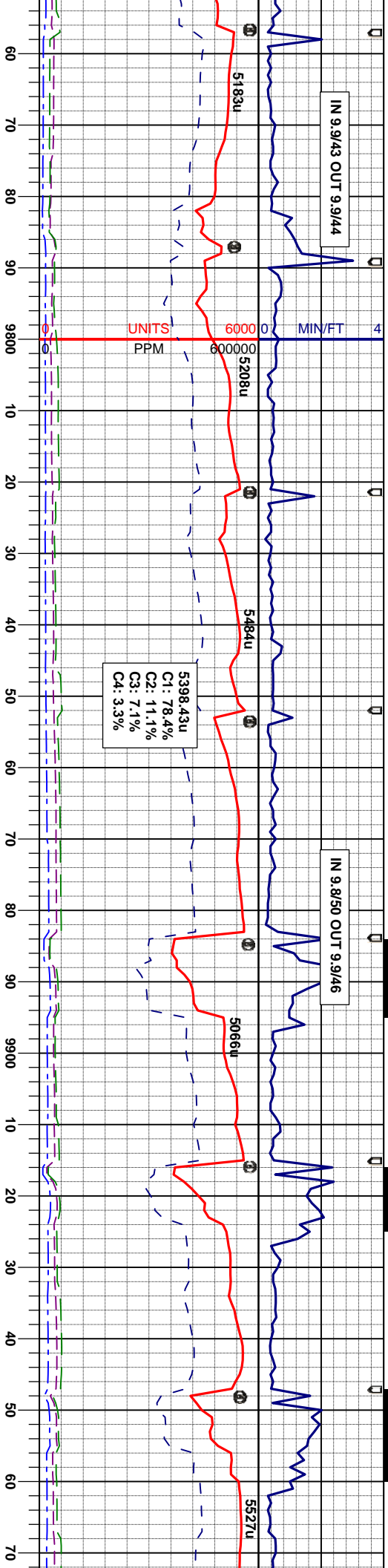
MD 9417' INC 91.6° AZM 358.0° TVD 6818.3'

MD 9449' INC 91.6° AZM 357.8° TVD 6817.4'

MD 9481' INC 91.0° AZM 357.6° TVD 6816.7'

MD 9512' INC 90.7° AZM 357.1° TVD 6816.3'





MD 9767' INC 88.7° AZM 359.9° TVD 6812.5'

MD 9798' INC 88.7° AZM 359.7° TVD 6813.2'

MD 9830' INC 88.5° AZM 359.2° TVD 6814.0'

MD 9861' INC 88.5° AZM 359.2° TVD 6814.8'

MD 9893' INC 88.4° AZM 359.7° TVD 6815.8'

MD 9925' INC 88.9° AZM 0.4° TVD 6816.5'

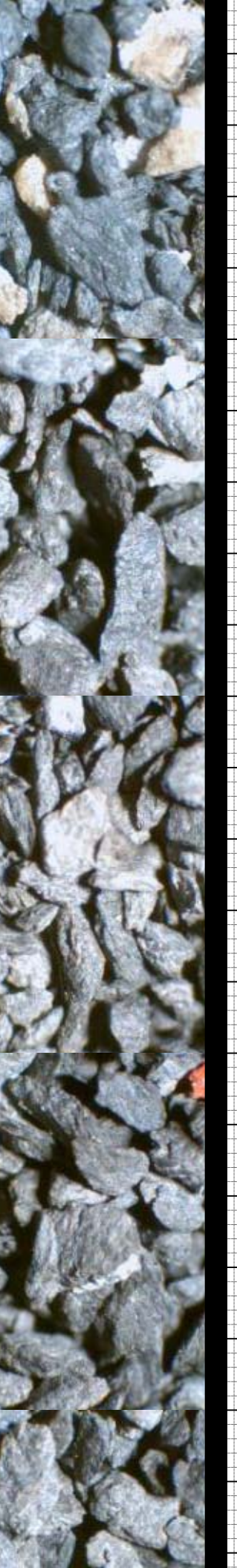
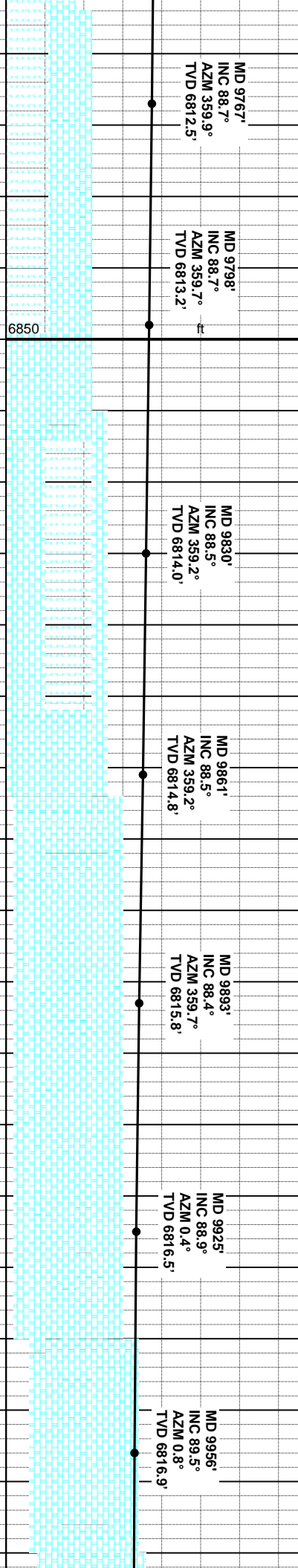
MD 9956' INC 89.5° AZM 0.8° TVD 6816.9'

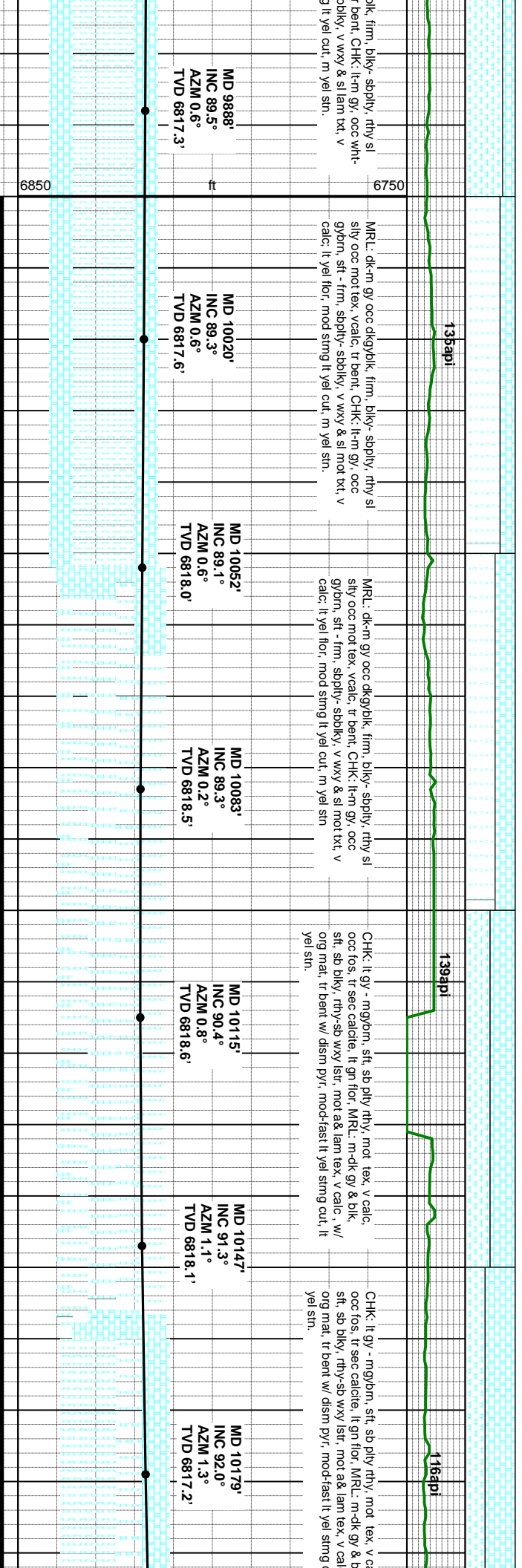
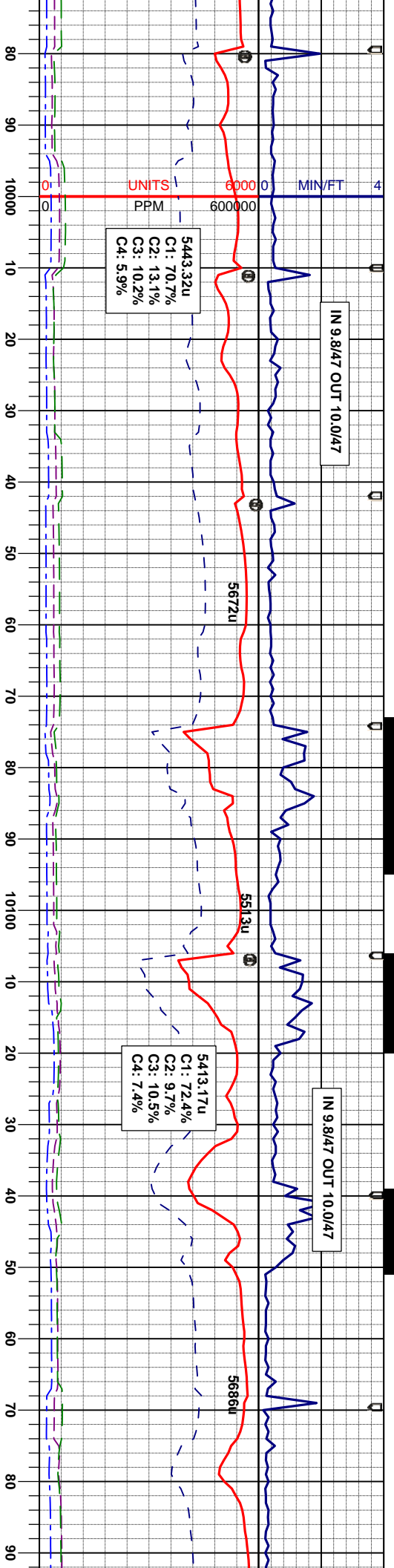
MRL: dk-m gy occ dkgy/bk, firm, bly- spily, rthy sl
sily occ mot tex, vcalc, mod bent, tr-mod pyr, CHK: lt-
m gy, occ wht-crm, sft - frm, occ brt, sbily, v wxy & sl
lam txt, v calc, lt yel flr, mod string lt yel cut, m yel sn.

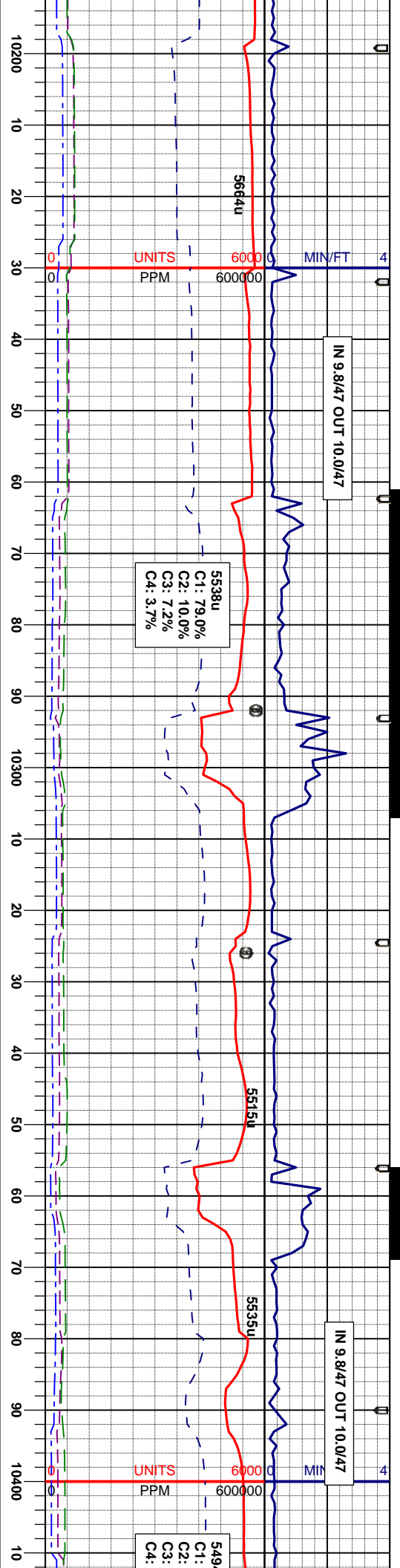
MRL: dk-m gy occ dkgy/bk, firm, bly- spily, rthy sl
sily occ mot tex, vcalc, tr bent, tr pyr, CHK: lt-m gy, occ
wht-crm, sft - frm, occ brt, sbily, v wxy & sl lam txt, v
calc, lt yel flr, mod string lt yel cut, m yel sn.

MRL: dk-m gy occ dkgy/bk, firm, bly- spily, rthy sl
sily occ mot tex, vcalc, tr bent, CHK: lt-m gy, occ wht-
crm, sft - frm, occ brt, sbily, v wxy & sl lam txt, v
calc, lt yel flr, mod string lt yel cut, m yel sn.

MRL: dk-m gy occ dkgy/bk, firm, bly- spily, rthy sl
sily occ mot tex, vcalc, tr bent, CHK: lt-m gy, occ wht-
crm, sft - frm, occ brt, sbily, v wxy & sl lam txt, v
calc, lt yel flr, mod string lt yel cut, m yel sn.





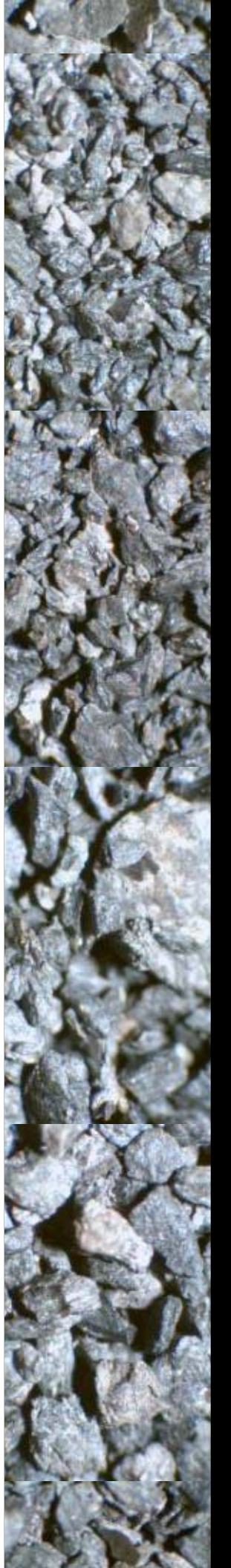
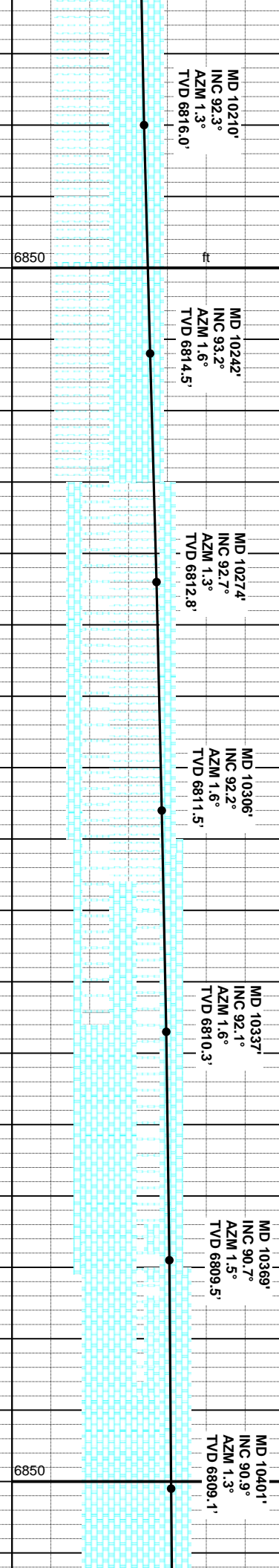


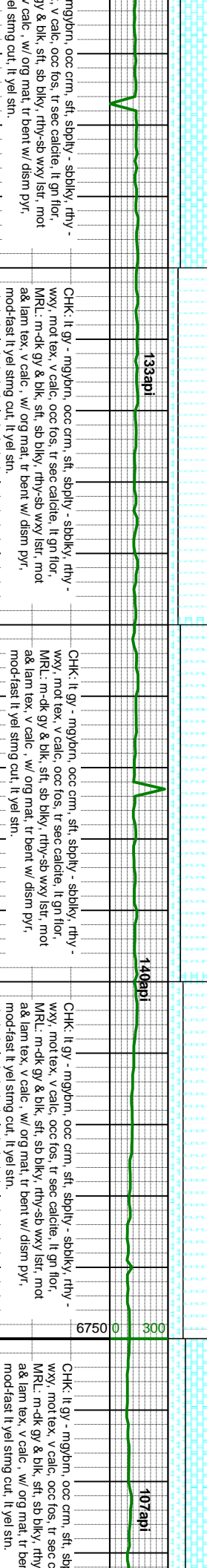
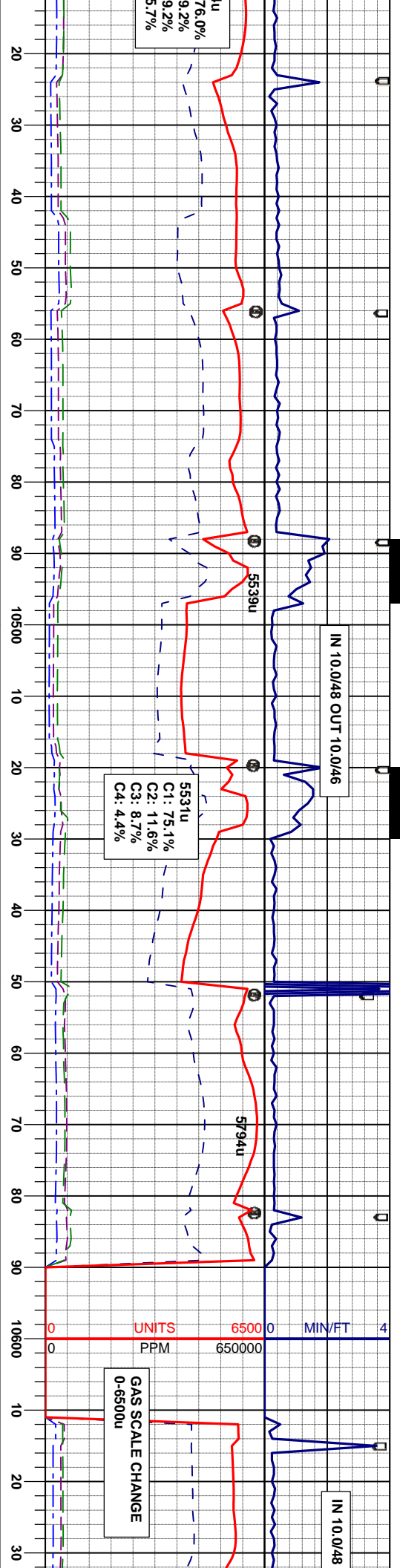
CHK: It gy - mybmn, sft, sb ply rthy, mot tex, v calc, occ tos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb blk, rthy-sb wvy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel sing cut, It yel sin.

CHK: It gy - mybmn, sft, sb ply rthy, mot tex, v calc, occ tos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb blk, rthy-sb wvy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel sing cut, It yel sin.

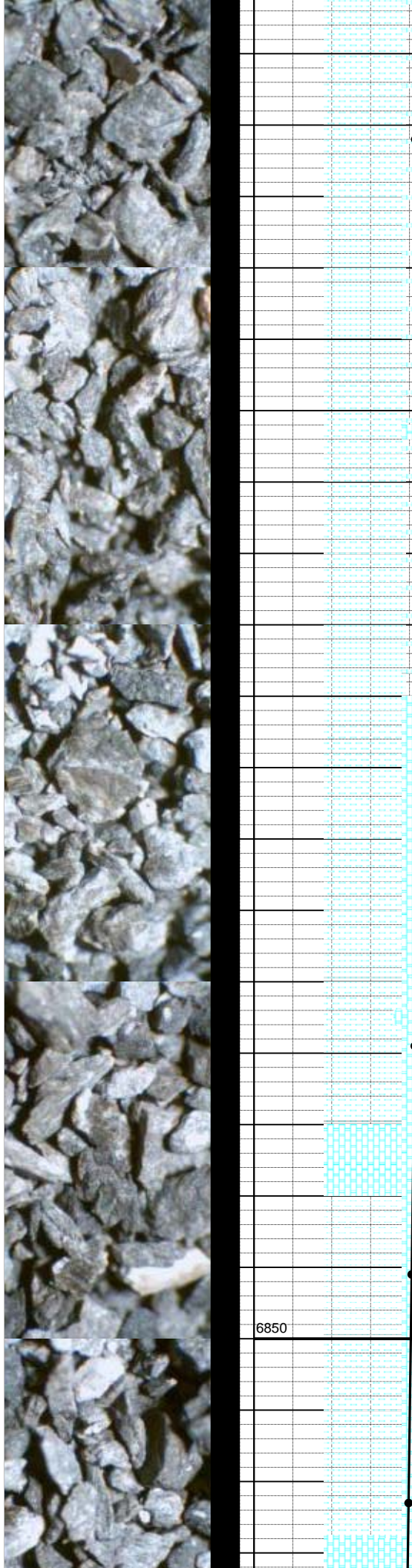
CHK: It gy - mybmn, occ crm, sft, sbply - sbblk, rthy - wxy, mot tex, v calc, occ tos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb blk, rthy-sb wvy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel sing cut, It yel sin.

CHK: It gy - mybmn, occ crm, sft, sbply - sbblk, rthy - wxy, mot tex, v calc, occ tos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb blk, rthy-sb wvy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel sing cut, It yel sin.





MD 10432' INC 91.0° AZIM 1.6° TVD 6810.3'	MD 10464' INC 91.0° AZIM 1.1° TVD 6808.0'	MD 10496' INC 90.0° AZIM 1.1° TVD 6807.7'	MD 10528' INC 89.0° AZIM 0.8° TVD 6808.0'	MD 10559' INC 88.5° AZIM 0.8° TVD 6808.7'	MD 10591' INC 88.7° AZIM 0.4° TVD 6809.4'	MD 10623' INC 88.5° AZIM 0.2° TVD 6810.2'
--	--	--	--	--	--	--



OUT 10.0/46

IN 9.9/47 OUT 9.9/49

5718u
C1: 72.3%
C2: 10.6%
C3: 11.6%
C4: 6.0%

5647u
C1: 75.4%
C2: 10.9%
C3: 9.1%
C4: 4.6%

UNITS
PPM

40 50 60 70 80 90 10700 10 20 30 40 50 60 70 80 90 10800 10 20 30 40 50

141api

94api

CHK: It gy - mgybrn, ooc crm, sft, sbply - sbply, rthy - wxy, mot tex, v calc, ooc fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb bly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel string cut, It yel sn.

MD 10654'
INC 88.6°
AZM 0.1°
TVD 6811.0'

MD 10686'
INC 88.3°
AZM 0.2°
TVD 6811.9'

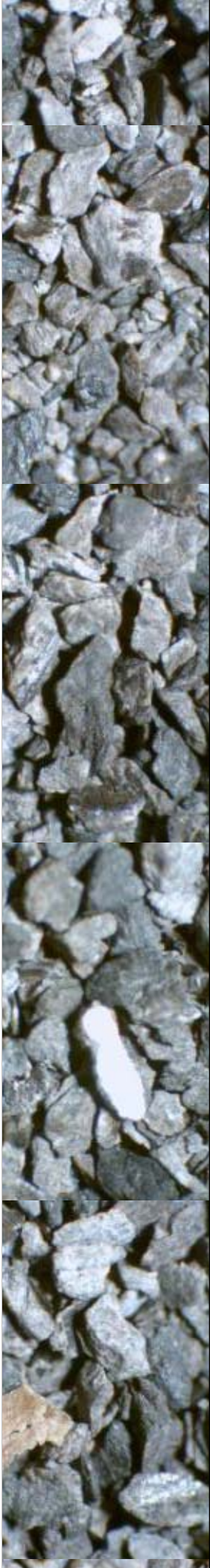
MD 10718'
INC 88.3°
AZM 359.9°
TVD 6812.8'

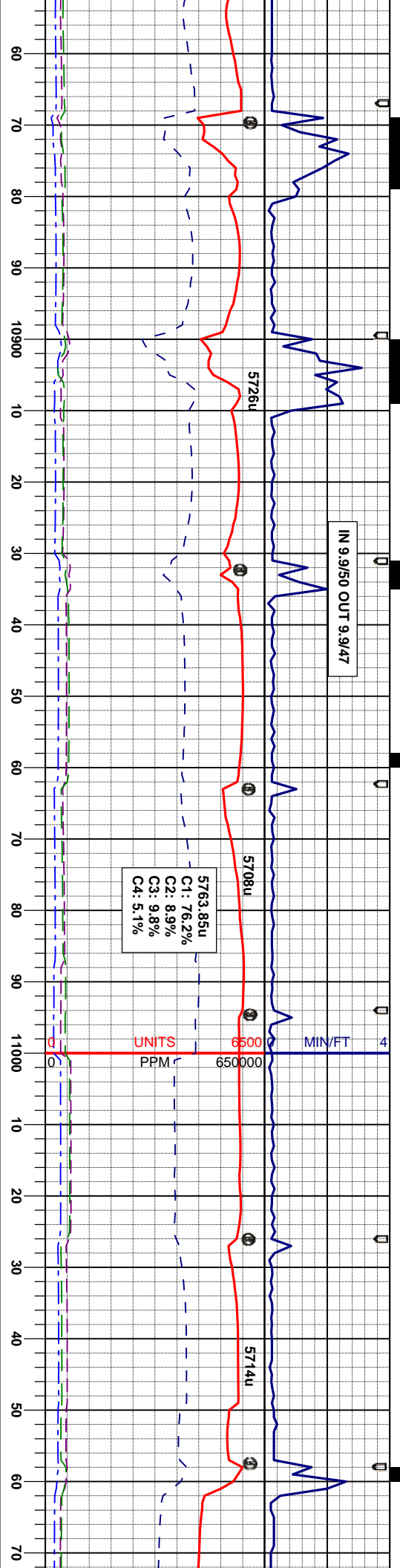
MD 10761'
INC 87.9°
AZM 359.7°
TVD 6814.9'

MD 10813'
INC 87.9°
AZM 359.5°
TVD 6815.9'

MD 10845'
INC 88.1°
AZM 359.4°
TVD 6817.1'

6850





CHK: It gy - mgybrn, occ crm, sft, sbply - sbply, rthy - wxy, mot tex, v calc, occ fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb bly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel stmg cut, It yel sn.

CHK: It gy - mgybrn, occ crm, sft, sbply - sbply, rthy - wxy, mot tex, v calc, occ fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb bly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel stmg cut, It yel sn.

CHK: It gy - mgybrn, occ crm, sft, sbply - sbply, rthy - wxy, mot tex, v calc, occ fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb bly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel stmg cut, It yel sn.

CHK: It gy - mgybrn, occ crm, sft, sbply - sbply, rthy - wxy, mot tex, v calc, occ fos, tr sec calcite, It gn flor, MRL: m-dk gy & blk, sft, sb bly, rthy-sb wxy lstr, mot a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr, mod-fast It yel stmg cut, It yel sn.

MD 10877'
INC 88.0°
AZM 359.5°
TVD 6818.2'

MD 10908'
INC 89.6°
AZM 0.6°
TVD 6818.8'

MD 10940'
INC 89.7°
AZM 0.8°
TVD 6819.0'

MD 10972'
INC 89.8°
AZM 0.8°
TVD 6819.2'

MD 11004'
INC 90.4°
AZM 0.9°
TVD 6819.1'

MD 11035'
INC 90.4°
AZM 0.4°
TVD 6818.8'

MD 11067'
INC 90.8°
AZM 359.5°
TVD 6818.



IN 9.8/46 OUT 9.9/46

5751u

5812u

5449.34u
C1: 73.2%
C2: 8.6%
C3: 11.4%
C4: 6.9%

UNITS
PPM

MIN/FT

4

6500

6500000

80 90 11100 10 20 30 40 50 60 70 80 90 11200 10 20 30 40 50

crn, sft, sbply - sbblky, rthy -
os, it sec calcie, it gn flor,
b bly, rthy-sb wxy lstr, mot
mat, tr bent w/ dism pyr,
yel sin.

CHK: It gy - mybrn, occ crm, sft, sbply - sbblky, rthy -
wxy, mot tex, v calc, occ fos, tr sec calcie, it gn flor,
MRL: m-dk gy & blk, sft, sb bly, rthy-sb wxy lstr, mot
a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr,
mod-fast it yel stmg cut, it yel sin.

CHK: It gy - mybrn, occ crm, sft, sbply - sbblky, rthy -
wxy, mot tex, v calc, occ fos, tr sec calcie, it gn flor,
MRL: m-dk gy & blk, sft, sb bly, rthy-sb wxy lstr, mot
a& lam tex, v calc, w/ org mat, tr bent w/ dism pyr,
mod-fast it yel stmg cut, it yel sin.

MD 11099'
INC 90.8°
AZM 359.7°
TVD 6818.0'

MD 11130'
INC 90.5°
AZM 359.4°
TVD 6817.7'

MD 11156'
INC 90.9°
AZM 359.2°
TVD 6817.3'

MD 11210'
INC 90.9°
AZM 359.2°
TVD 6816.5'

TD 11,210'
@7:10pm 6/12/2013

Thank you for choosing
Columbine Logging, Inc.

6850 ft

6750 0 300

