

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** Timbro State LD16-66HN(VERT)

**Location** SE NE SEC. 16, T9N, R58W

**State** COLORADO

**County** WELD

**Country** USA

**Rig Number** H&P 326

**API Number** 05-123-37550

**AFE #** 139486

**Region** DJ BASIN

**Field** WILDCAT

**Spud Date** 11/19/2013

**Ground Elevation** 4755

**K.B. Elevation** 4785

**Logged Interval** 1300

**Formation** NIOBRARA B CHALK

**Type of Drilling Fluid** LSND

## Operator

**Company** Noble Energy Inc

**Address** 1625 Broadway Suite 2200  
Denver, CO 80202

## Geologist

**Name** EVAN HOWELL

**Company** Noble Energy Inc

**Address** 1625 Broadway Suite 2200  
Denver, CO 80202

## Other

RYAN SULLIVAN  
MICHAEL ROOKS

## Rock Types

UNKNOWN	COAL	MARLSTONE	SHALY SANDSTONE
ANHYDRITE	CONGLOMERATE	METAMORPHIC	SHALY SILTSTONE
BENTONITE	DOLOMITE	NO SAMPLE	SILTSTONE
BRECCIA	DOLOMITIC LIMESTONE	SALT	SILTY SHALE
CEMENT	GRANITE	SALT-PEPPER SAND	TILL
CHALK	GYPHUM	SANDSTONE	TUFF
CHERT	IGNEOUS	SHALE	WELDED TUFF
CLAY CHOKE SAND	LIMESTONE	SHALE COLORED	
CLAYSTONE	SIDERITE or LIMONITE	SHALE GRAY	

## Accessories

### Fossils

ALGAE
AMPHIPORA
BELEMNITE
BIOCLASTIC
BRACHIOPOD
BRYOZOA
CEPHALOPOD
CORAL
CRINOID
ECHINOID
FISH
FORAMINIFERA
FOSSIL

GASTROPOD
INOCERAMUS
OOLITE
OSTRACOD
PELECYPOD
PELLET
PISOLITE
PLANT REMAINS
PLANT SPORES
SCAPHOPOD
STROMATOPOROID

### Minerals

ANHYDRITIC
ARGILLACEOUS

ARGILLITE GRAIN
BENTONITE
BITUMENOUS SUBSTANCE
BRECCIA FRAGMENTS
CALCAREOUS
CARBONACEOUS FLAKES
CHTDK
CHTLT
COAL - THIN BEDS
DOLOMITIC
FELDSPAR
FERRUGINOUS PELLET
FERRUGINOUS
GLAUCONITE
GYPHIFEROUS

HEAVY MINERAL
KAOLIN
MARLSTONE
MICACEOUS
MINERAL CRYSTALS
NODULES
PHOSPHATE PELLETS
PYRITE
SALT CAST
SANDY
SILICEOUS
SILTY
TUFFACEOUS

ANHYDRITE STRINGER
BENTONITE STRINGER
COAL STRINGER
DOLOMITE STRINGER
GYPHUM STRINGER
LIMESTONE STRINGER
MARLSTONE (CALC) STRG
MARLSTONE (DOL) STRG
SANDSTONE STRINGER
SHALE STRINGER
SILTSTONE STRINGER

### Stringer

## Other Symbols

### Oil Show

DEAD
EVEN
QUESTIONABLE
SPOTTED STAINING

### Porosity

E EARTHY
FENESTRAL
FRACTURE
INTERCRYSTALLINE
INTEROOLITIC
MOLDIC

ORGANIC
PINPOINT
VUGGY

### Engineering

BIT CHANGE
CONNECTION (LEFT)
CONNECTION (RIGHT)
CONNECTION GAS
TRIP GAS
DOWN TIME GAS
CORE - LOST
CORE - RECOVERED
DST INTERVAL

FAULT
FORMATION TOP
GAS SHOW
OIL SHOW
MN DEPTH
MN DEPTH (RIGHT)
NORMAL FAULT
OVERTURNED STRATA
REVERSE FAULT
CASING
SIDEWALL CORE (LEFT)
SIDEWALL CORE (RIGHT)
SLIDE
SURVEY

DRILL STEM TEST
WIRELINE TESTED - LEFT
WIRELINE TESTED - RT

### Rounding

ANGULAR
ROUNDED
SUBANG
SUBRND

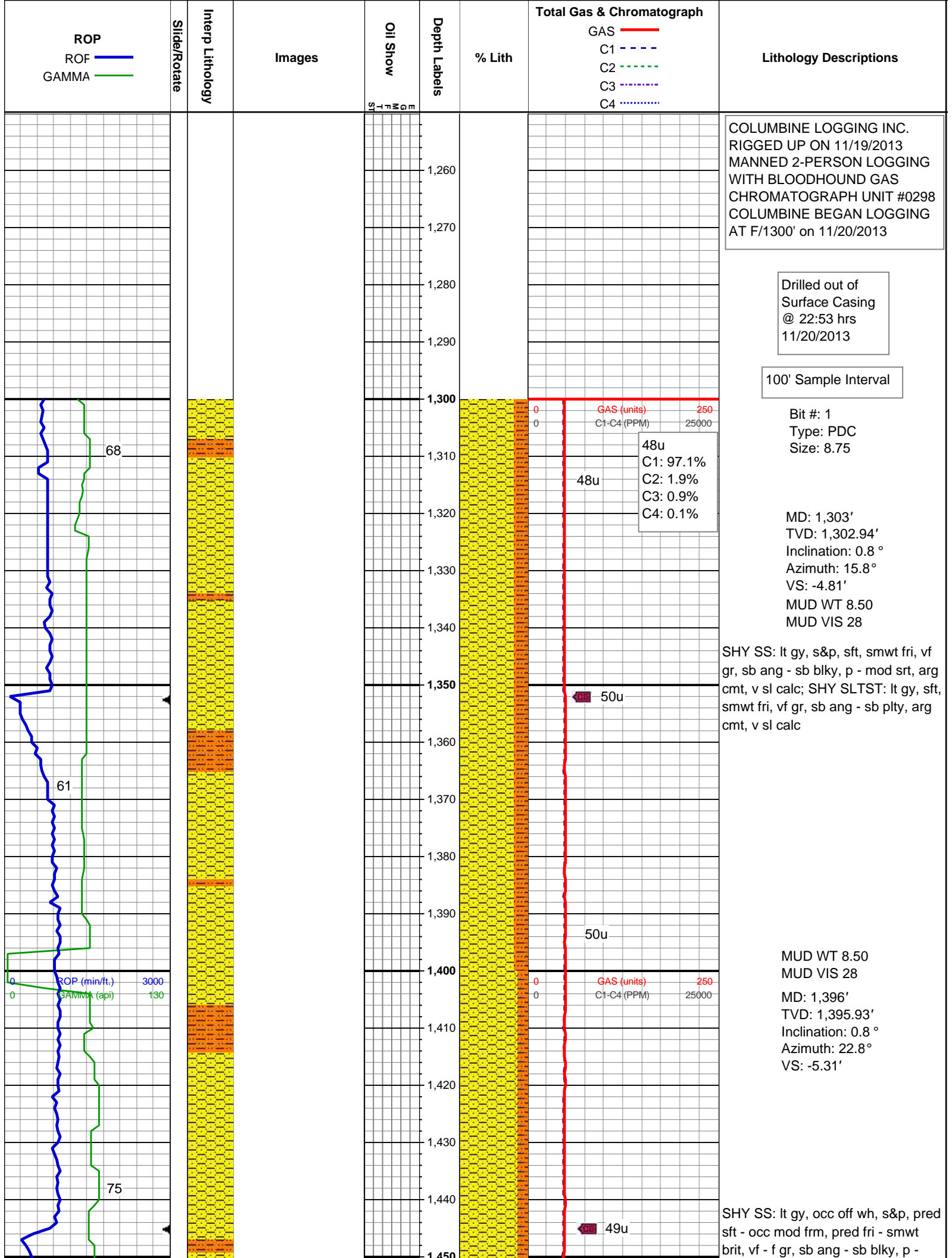
### Textures

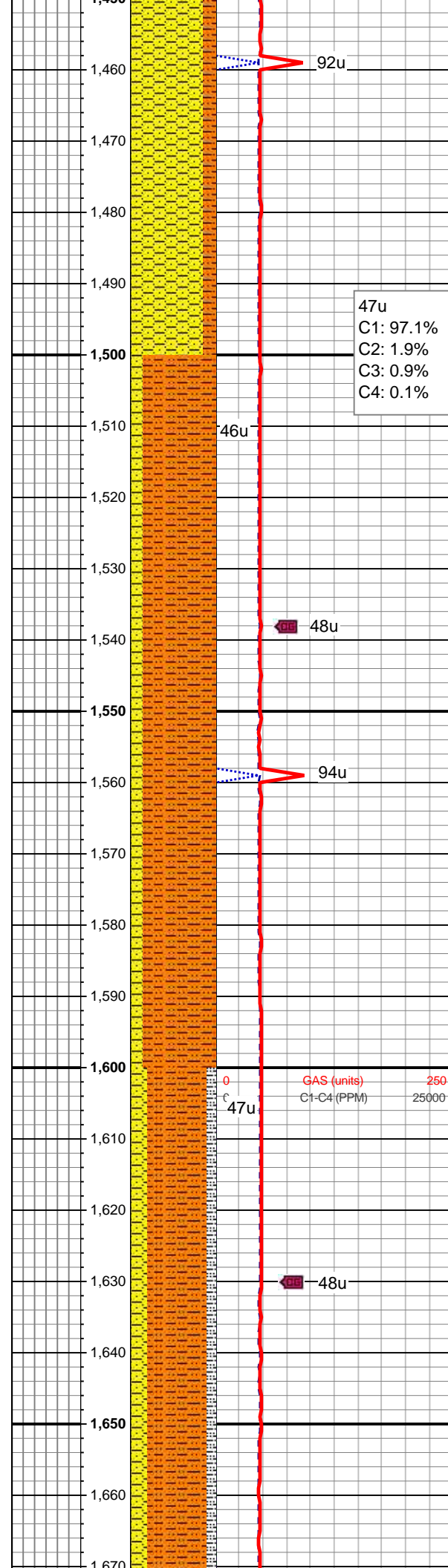
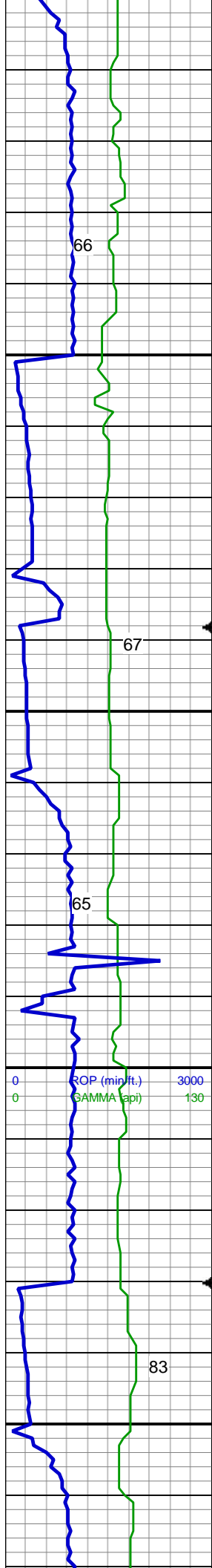
BOUNDSTONE
CHALKY
CRYPTOXLN

E EARTHY
FINELYXLN
GRAINSTONE
L LITHOGRAPHIC
MX MICROXLN
MS MUDSTONE
PS PACKSTONE
WACKESTONE

### Sorting

M MODERATE
P POOR
W WELL





mod srt, arg cmt, v sl calc; SHY  
SLTST: lt gy, mod sft, smwt fri, vf gr,  
sb ang - sb plty, arg cmt, v sl calc

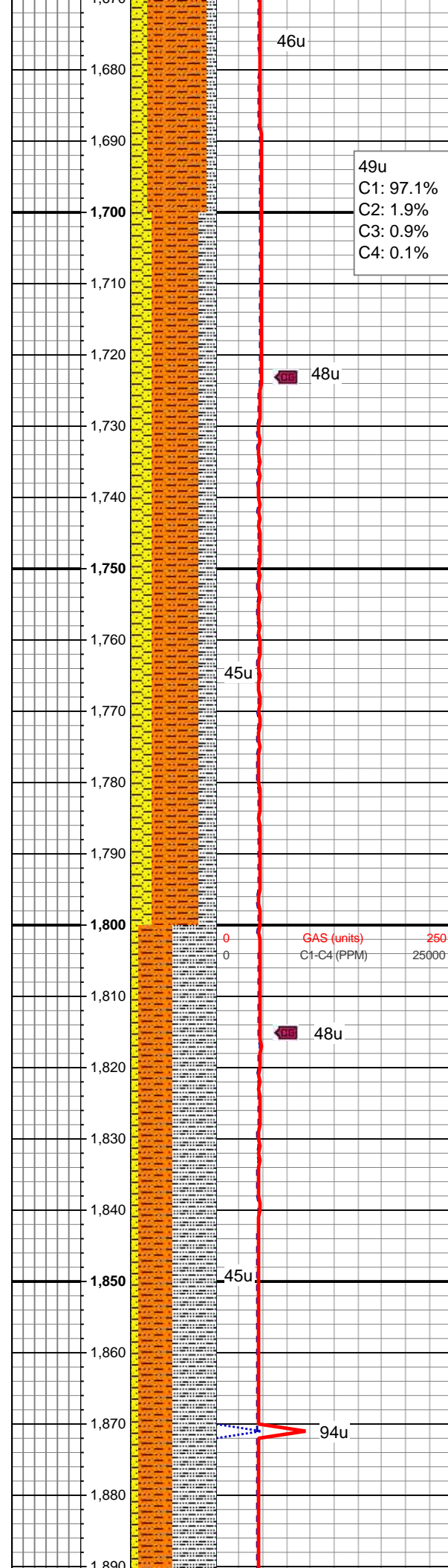
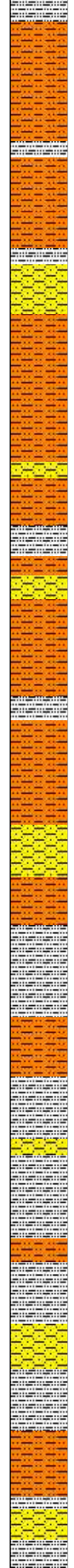
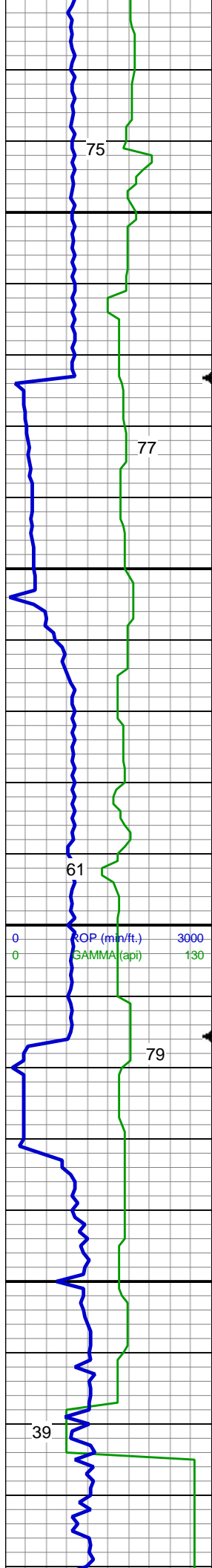
MD: 1,488'  
TVD: 1,487.93'  
Inclination: 0.7 °  
Azimuth: 16.7 °  
VS: -5.78'

SHY SLTST: lt - med gy, sft, smwt  
fri, vf gr, sb ang - sb plty, arg cmt, v  
sl calc; SHY SS: lt gy, pred sft - occ  
mod frm, pred fri - smwt brit, vf - f gr,  
sb ang - sb blk, mod srt, arg cmt, v  
sl calc

MD: 1,581'  
TVD: 1,580.9'  
Inclination: 2.5 °  
Azimuth: 183 °  
VS: -5.75'

SHY SLTST: lt - med gy, mod sft -  
mod frm, vf gr, sb ang - sb plty, arg  
cmt, v sl calc; SHY SS: lt gy - occ  
wh, pred sft - occ mod frm, pred fri -  
smwt brit, vf - f gr, sb ang - sb blk,  
p - mod srt, arg cmt, v sl calc, occ  
sly sh, sme pyr





MD: 1,673'  
TVD: 1,672.76'  
Inclination: 3.9 °  
Azimuth: 177.5 °  
VS: -5.49'

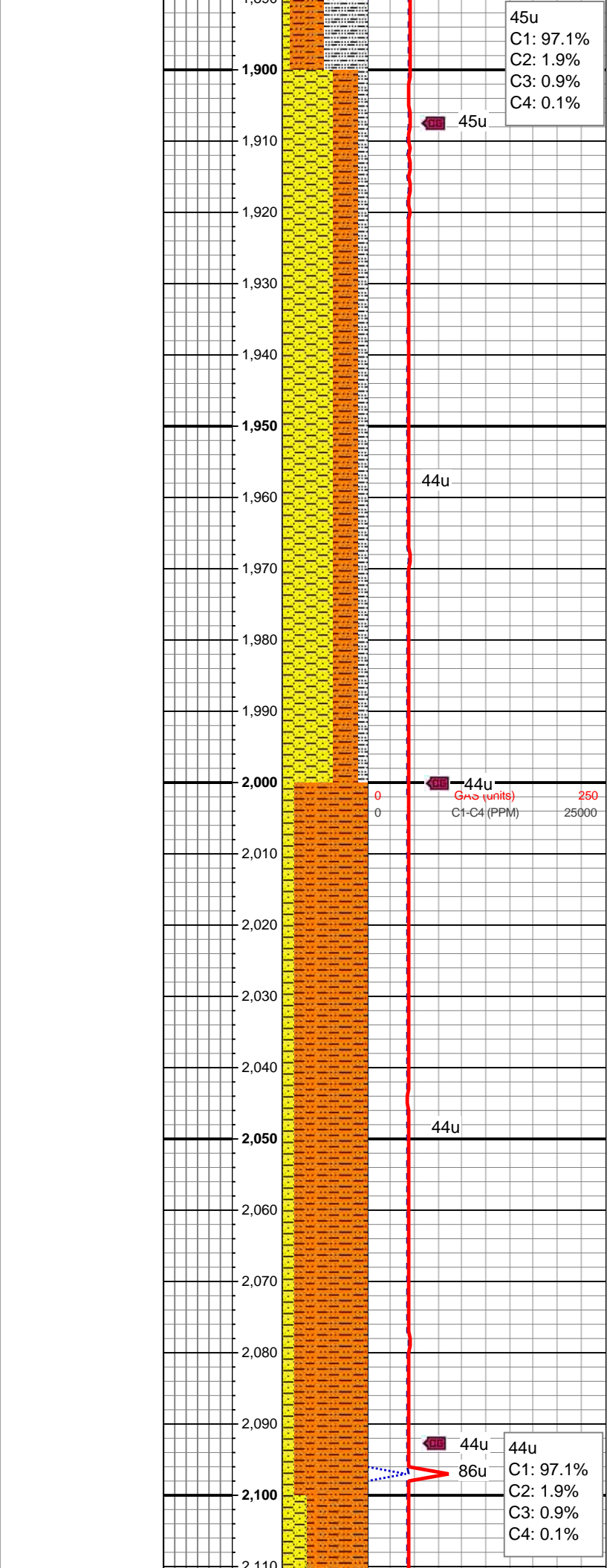
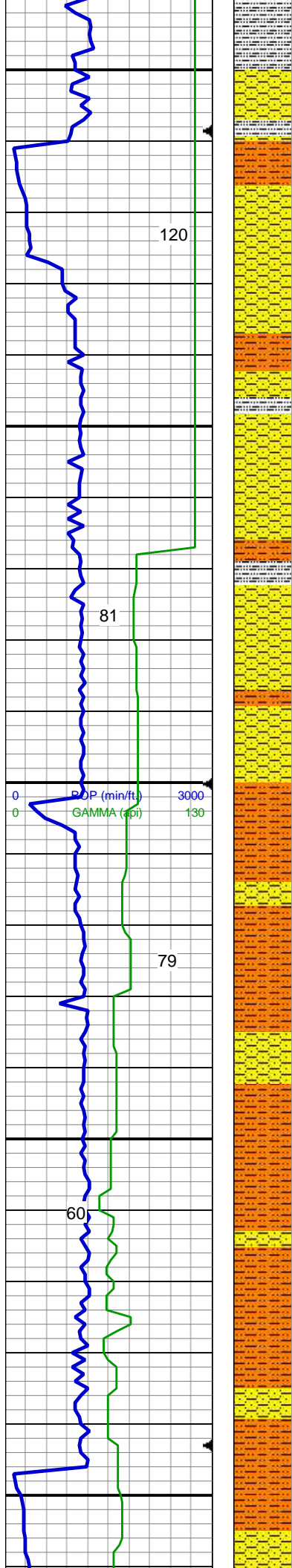
MUD WT 8.65  
MUD VIS 30

SHY SLTST: lt - med gy, mod sft - mod frm, vf gr, sb ang - sb plty, arg cmt, v sl calc; SHY SS: lt gy - occ wh, pred sft - occ mod frm, pred fri - smwt brit, vf - f gr, sb ang - sb blk, p - mod srt, arg cmt, v sl calc; SLTY SH: lt - med gy, mod sft - mod frm, brit - smwt fri ip, vf gr, sb ang - sb plty, arg cmt

MD: 1,766'  
TVD: 1,765.43'  
Inclination: 5.7 °  
Azimuth: 167.5 °  
VS: -6.18'

SLTY SH: lt - med gy, mod sft - mod frm, brit - smwt fri ip, vf gr, sb ang - sb plty, arg cmt; SHY SLTST: lt - med gy, mod sft - mod frm, vf gr, sb ang - sb plty, arg cmt, v sl calc; occ SHY SS: lt gy - sme wh, pred sft - occ mod frm, pred fri - smwt brit, vf - f gr, sb ang - sb blk, p - mod srt, arg cmt, v sl calc

MD: 1,859'  
TVD: 1,857.94'  
Inclination: 6.1 °  
Azimuth: 163.6 °  
VS: -8.03'

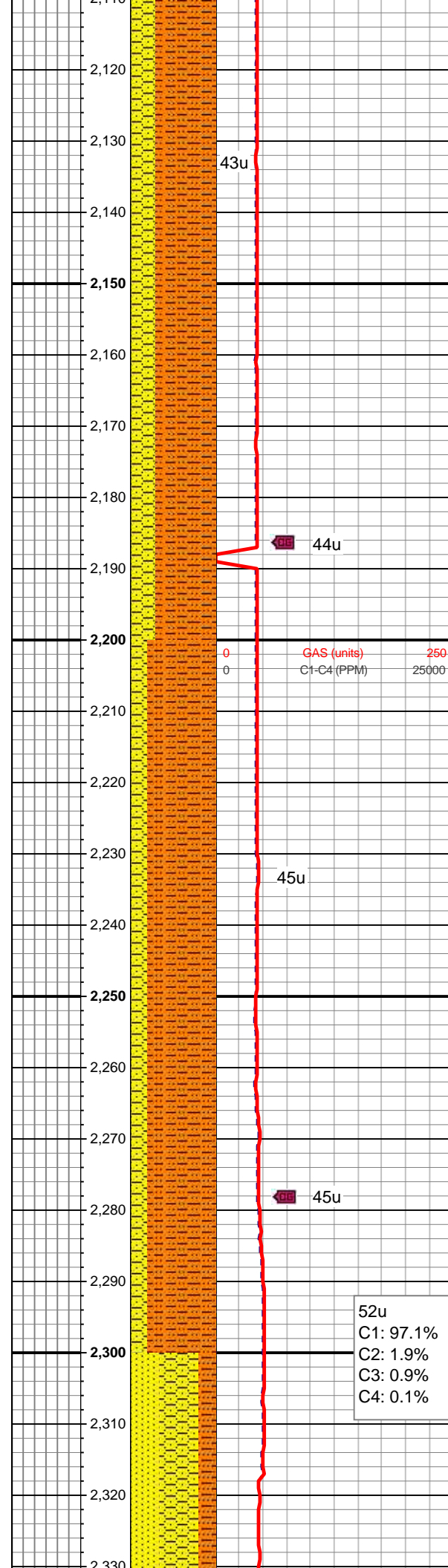
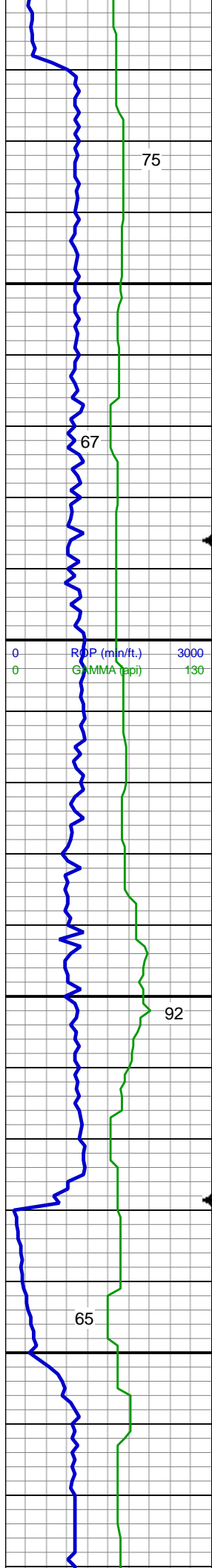


SHY SS: lt gy - sme wh, mod frm, smwt brit, vf - f gr, sb ang - sb blk, p - mod srt, arg cmt, v sl calc; SHY SLTST: lt - med gy, mod sft - mod frm, vf gr, sb ang - sb plty, arg cmt, v sl calc; SLTY SH: lt - med gy, mod sft - mod frm, brit - smwt fri ip, vf gr, sb ang - sb plty, arg cmt

MD: 1,951'  
TVD: 1,949.36'  
Inclination: 6.7 °  
Azimuth: 164.7 °  
VS: -10.25'

MD: 2,044'  
TVD: 2,041.76'  
Inclination: 6.3 °  
Azimuth: 163.5 °  
VS: -12.54'

SHY SLTST: lt - med gy, mod sft - mod frm, vf gr, sb ang - sb plty, arg cmt, v sl calc; SHY SS: lt gy - sme wh, mod frm, brit, vf - f gr, sb ang - sb blk, mod srt, arg cmt, v sl calc



MD: 2,137'  
TVD: 2,134.17'  
Inclination: 6.7 °  
Azimuth: 171.4 °  
VS: -14.2'

SHY SLTST: lt - med gy, mod sft - mod frm, vf gr, sb ang - sb plty, arg cmt, v sl calc; SHY SS: lt gy - sme wh, mod frm, brit, vf - f gr, sb ang - sb blkly, mod srt, arg cmt, v sl calc, occ spec wi glau

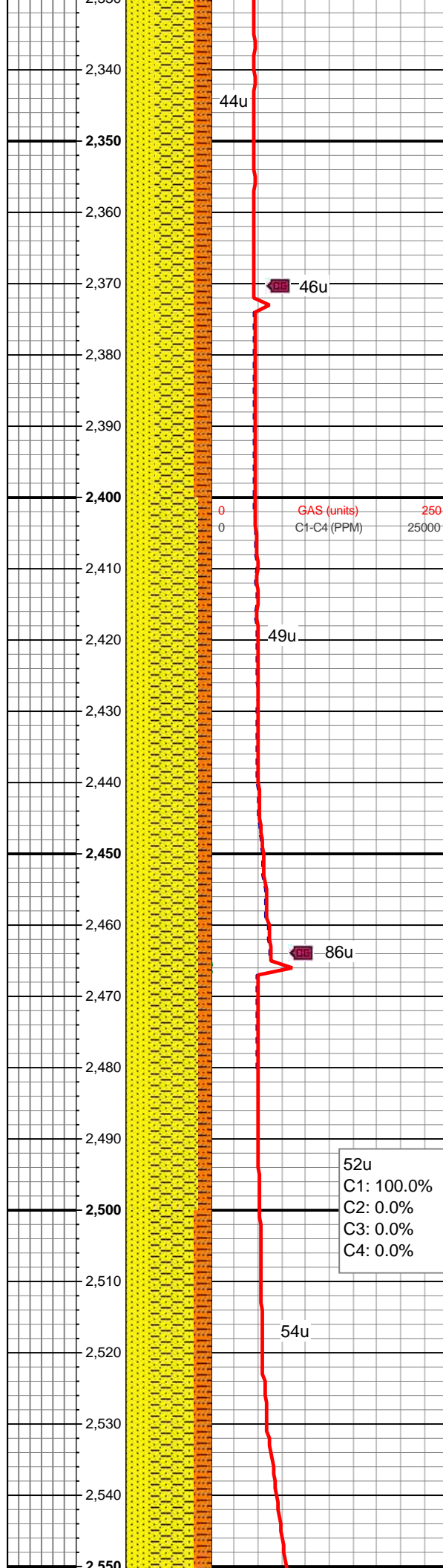
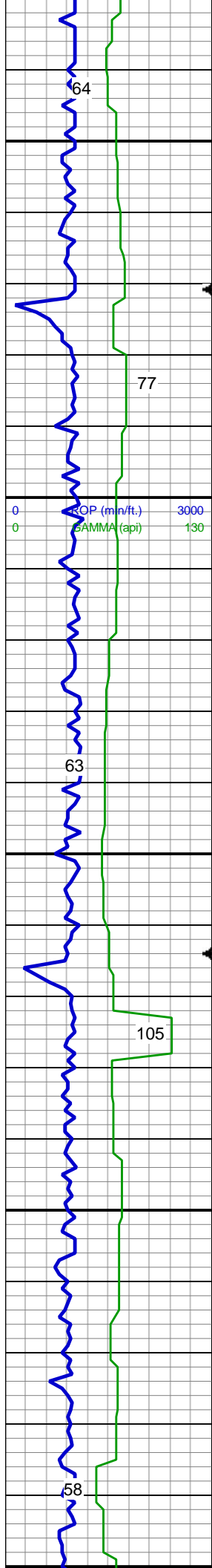
MD: 2,229'  
TVD: 2,225.61'  
Inclination: 5.9 °  
Azimuth: 169.6 °  
VS: -15.27'

SHY SLTST: lt - med gy, mod sft - mod frm, vf gr, sb ang - sb plty, arg cmt, v sl calc; SHY SS: lt gy - sme wh, mod frm, brit, vf - f gr, sb ang - sb blkly, w srt, arg cmt, v sl calc

52u  
C1: 97.1%  
C2: 1.9%  
C3: 0.9%  
C4: 0.1%

MD: 2,322'  
TVD: 2,318.03'  
Inclination: 6.9 °





Azimuth: 174.7°  
VS: -16.05'

SS: off wh - wh, s&p, mod frm - frm, brit, vf - f gr, sb ang - sb blk, mod srt, arg cmt; SHY SS: lt gy, frm, brit, vf gr, sb ang - sb blk, w srt, arg cmt; SHY SLTST: lt - med gy, mod sft, vf gr, sb ang - sb plty, arg cmt; sl calc ip

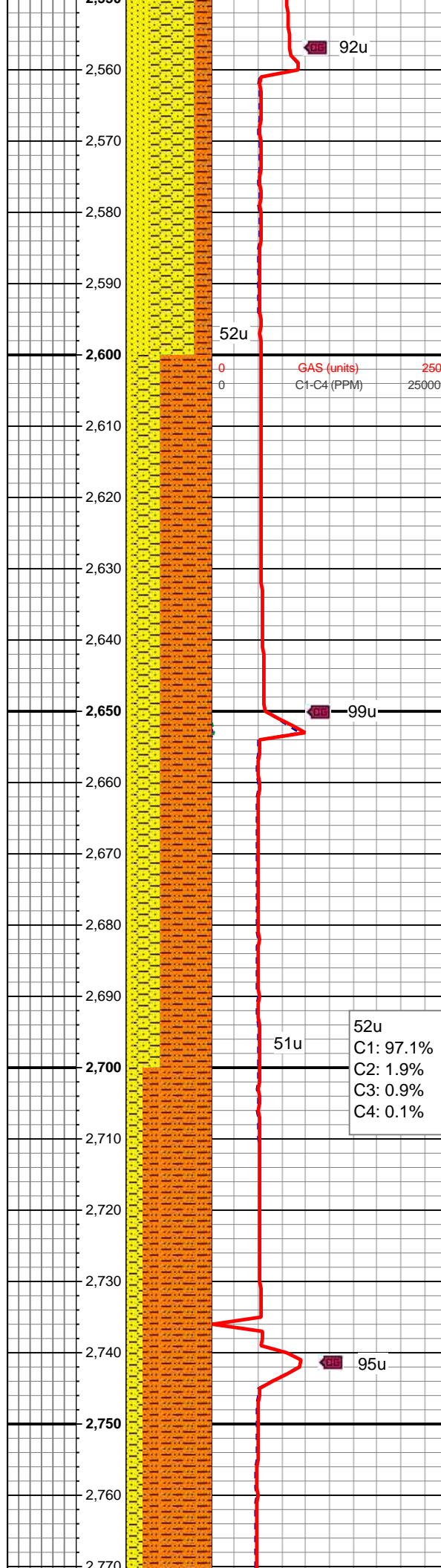
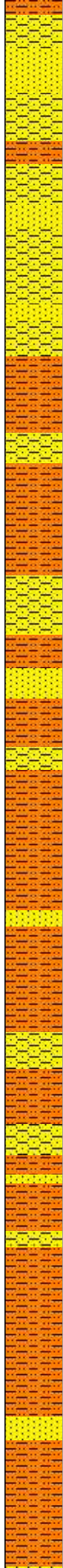
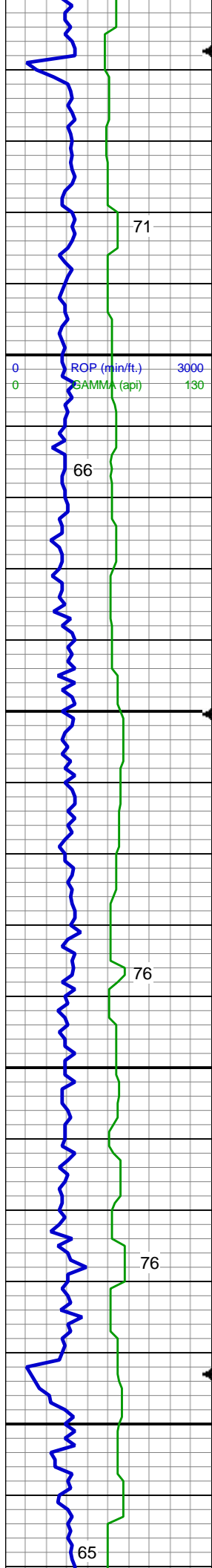
MD: 2,415'  
TVD: 2,410.36'  
Inclination: 6.9°  
Azimuth: 173.6°  
VS: -16.54'

SS: off wh - wh, s&p, mod frm - frm, brit, vf - f gr, sb ang - sb blk, mod srt, arg cmt; SHY SS: lt gy, frm, brit, vf gr, sb ang - sb blk, w srt, arg cmt; SHY SLTST: lt - med gy, mod sft, vf gr, sb ang - sb plty, arg cmt; sl calc ip

MD: 2,508'  
TVD: 2,502.69'  
Inclination: 6.8°  
Azimuth: 172.4°  
VS: -17.25'

SS: off wh - wh, s&p, mod frm - frm, brit, vf - f gr, sb ang - sb blk, mod srt, arg cmt; SHY SS: lt gy, frm, brit, vf gr, sb ang - sb blk, w srt, arg





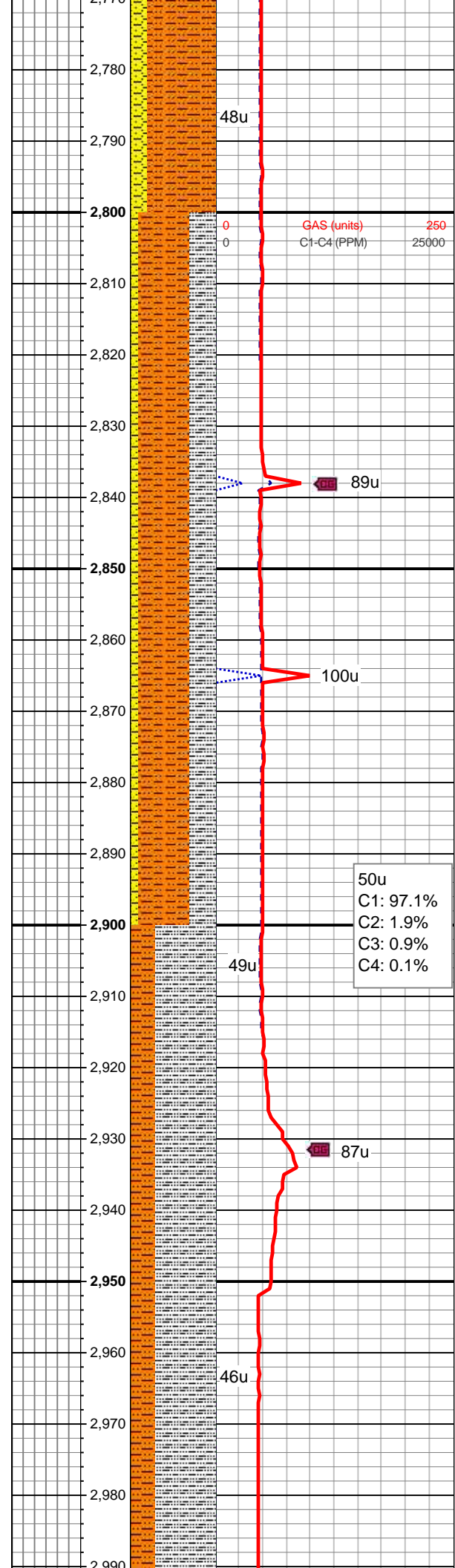
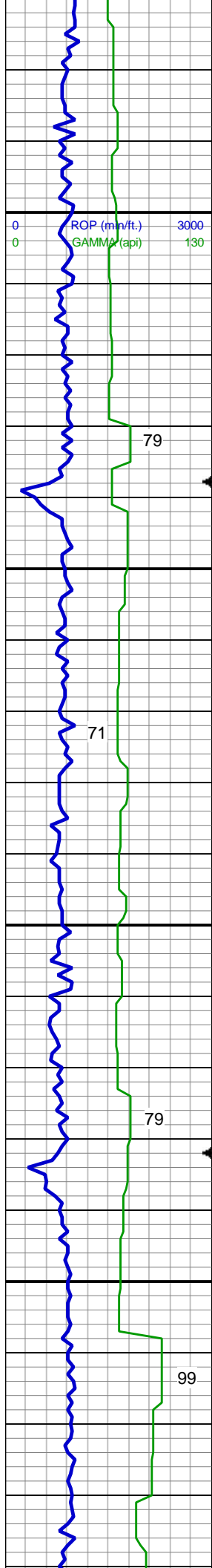
SHY SLTST: lt - med gy, mod sft, vf gr, sb ang - sb plty, arg cmt; sl calc ip

MD: 2,601'  
TVD: 2,595.03'  
Inclination: 6.9 °  
Azimuth: 171.2 °  
VS: -18.2'

SHY SLTST: lt - med gy, mod sft, vf gr, sb ang - sb plty, arg cmt, sl calc ip; SHY SS: lt gy - sm off wh ss, frm, brit, vf gr, sb ang - sb blk, w srt, arg cmt; occ ss

MD: 2,694'  
TVD: 2,687.39'  
Inclination: 6.6 °  
Azimuth: 168.9 °  
VS: -19.45'

SHY SLTST: lt - med gy, mod sft, vf gr, sb ang - sb plty, arg cmt, sl calc ip; SHY SS: lt gy - sm off wh ss, frm, brit, vf gr, sb ang - sb blk, w srt, arg cmt; tr ss



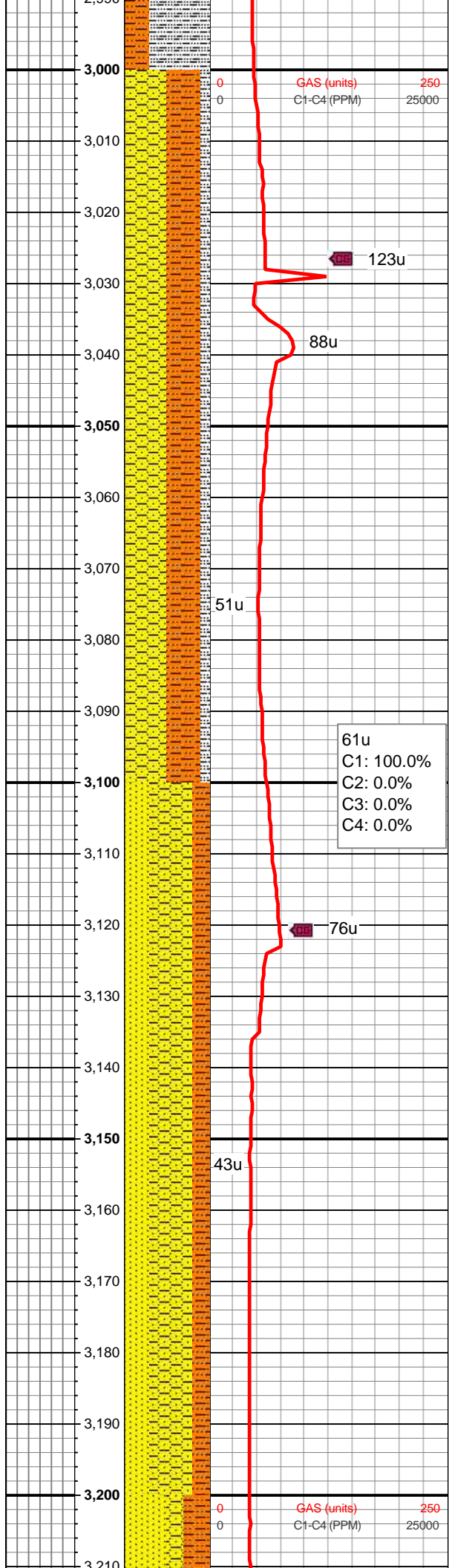
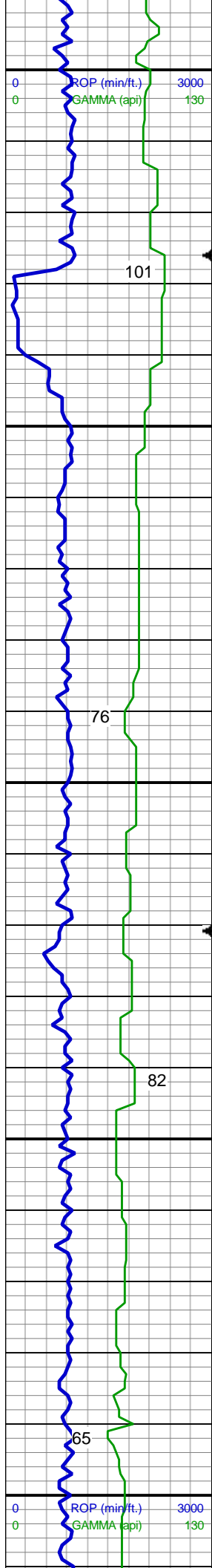
MD: 2,788'  
TVD: 2,780.8'  
Inclination: 6.2 °  
Azimuth: 168 °  
VS: -20.95'

SHY SLTST: lt - med gy, mod frm, vf gr, sb ang - sb plty, arg cmt, sl calc ip; SLTY SH: lt - dk gy, mod frm, brit, vf gr, sb ang - sb plty, arg cmt; SHY SS: lt gy, frm, brit, vf gr, sb ang - sb blkly, w srt, arg cmt; tr ss

MD: 2,883'  
TVD: 2,875.3'  
Inclination: 5.6 °  
Azimuth: 166.8 °  
VS: -22.51'

SHY SLTST: lt - med gy, mod frm, vf gr, sb ang - sb plty, arg cmt, sl calc ip; SLTY SH: lt - dk gy, mod frm, brit, vf gr, sb ang - sb plty, arg cmt

MD: 2,977'  
TVD: 2,968.89'  
Inclination: 5.1 °  
Azimuth: 161.7 °  
VS: -24.38'



SHY SLTST: lt - med gy, mod frm, vf  
gr, sb ang - sb plty, arg cmt, sl calc  
ip; SHY SS: lt - med gy, frm, brit, vf  
gr, sb ang - sb blk, p srt, arg cmt;  
SLTY SH: lt - dk gy, mod frm, brit, vf  
gr, sb ang - sb plty, arg cmt

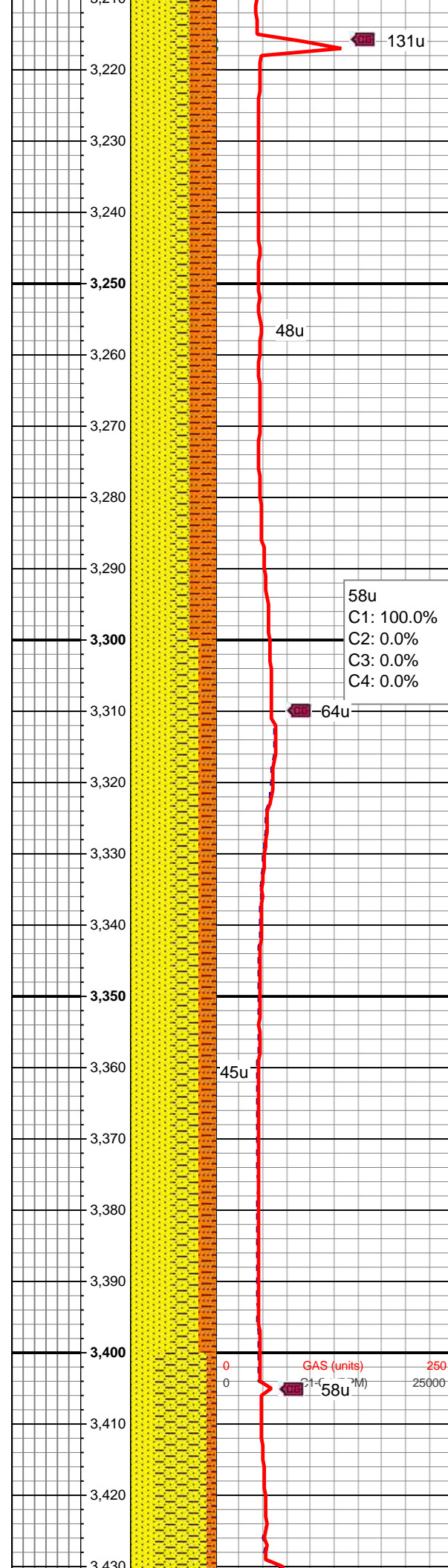
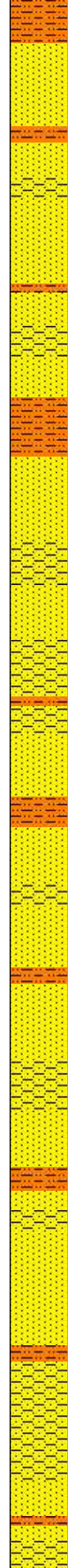
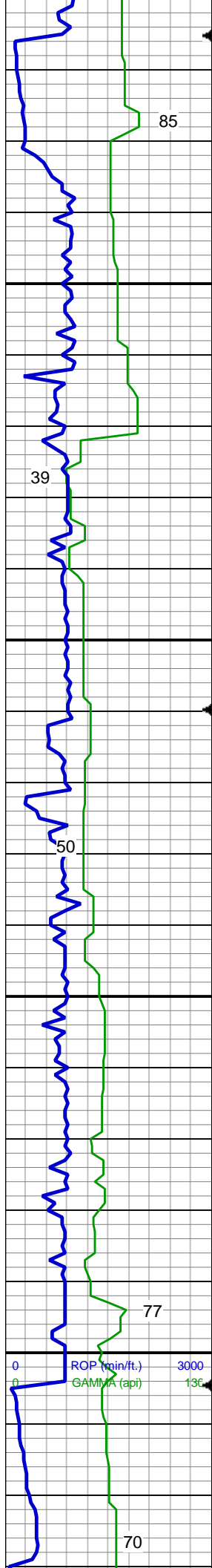
MD: 3,071'  
TVD: 3,062.62'  
Inclination: 3.4 °  
Azimuth: 161.7 °  
VS: -26.18'

61u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

SS: off wh - wh, s&p, mod frm - frm,  
brit, f gr, sb ang - sb blk, w srt, arg  
cmt; SHY SS: lt - med gy, frm, brit, vf  
gr, sb ang - sb blk, p srt, arg cmt;  
SHY SLTST: lt - med gy, mod frm, vf  
gr, sb ang - sb plty, arg cmt, sl calc

MD: 3,166'  
TVD: 3,157.43'  
Inclination: 4 °  
Azimuth: 155.4 °  
VS: -28.11'





SS: off wh - wh, s&p, frm, brit, f - m  
gr, sb ang - sb blk, mod srt, arg  
cmt, spec wi glau; SHY SLTST: lt -  
med gy, mod frm, vf gr, sb ang - sb  
plty, arg cmt, sl calc; SHY SS: lt -  
med gy, frm, brit, vf gr, sb ang - sb  
blk, w srt, arg cmt

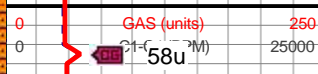
MD: 3,260'  
TVD: 3,251.24'  
Inclination: 3.2 °  
Azimuth: 174.5 °  
VS: -29.4'

MUD WT 8.70  
MUD VIS 32

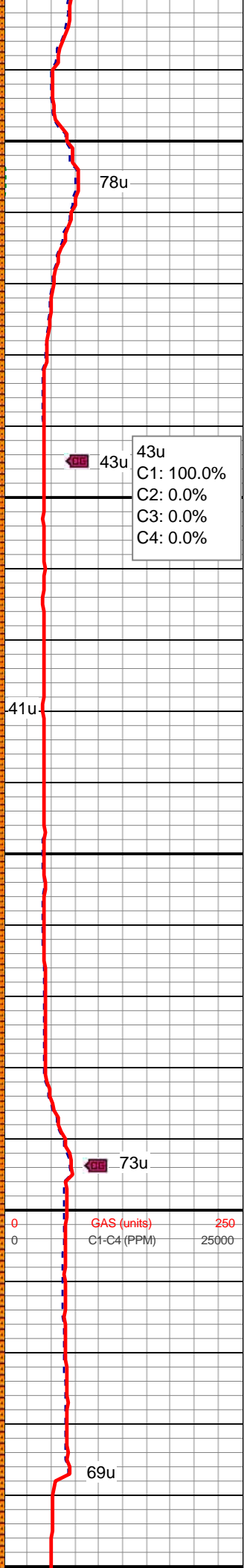
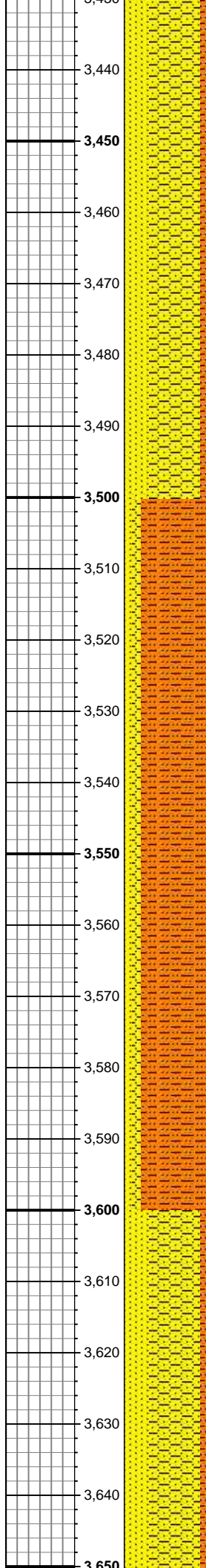
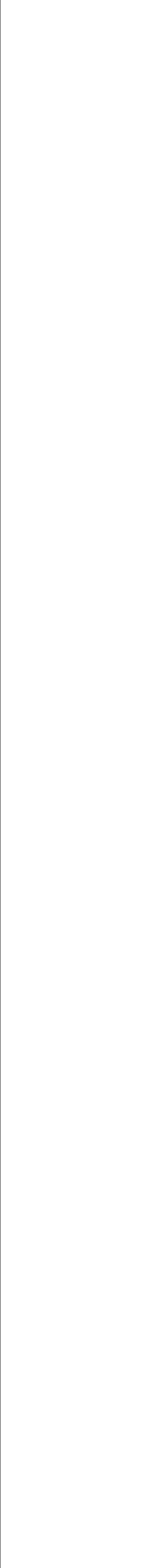
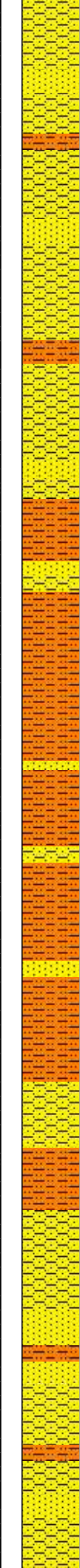
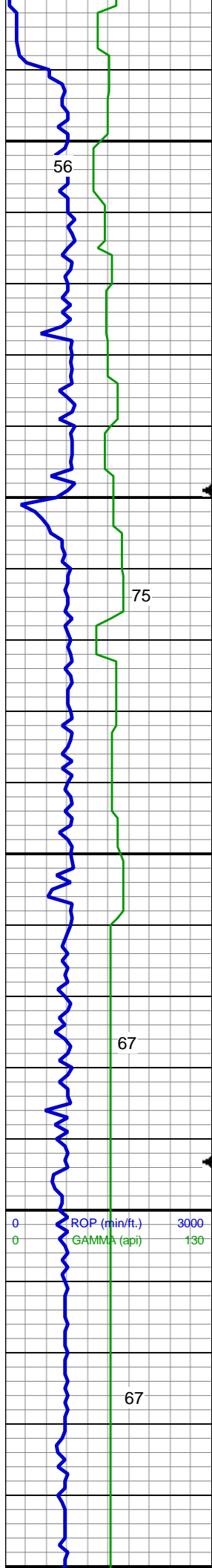
SS: off wh - wh, s&p, frm, brit, f - m  
gr, sb ang - sb blk, mod srt, arg  
cmt, spec wi glau; SHY SS: lt - med  
gy, frm, brit, vf gr, sb ang - sb blk, w  
srt, arg cmt; SHY SLTST: lt - med  
gy, mod frm, vf gr, sb ang - sb plty,  
arg cmt, sl calc

MD: 3,355'  
TVD: 3,346.09'  
Inclination: 3.3 °  
Azimuth: 176.1 °  
VS: -29.53'

MUD WT 8.70  
MUD VIS 32







SS: off wh - wh, s&p, frm, brit, u f - med gr, sb ang - sb blk, mod srt, arg cmt, spec wi glau; SHY SS: lt gy, frm, brit, u f - med gr, sb ang - sb blk, mod srt, arg cmt, mod calc ip; occ shy sltst

MD: 3,450'  
TVD: 3,440.98'  
Inclination: 2.1 °  
Azimuth: 165.2 °  
VS: -29.9'

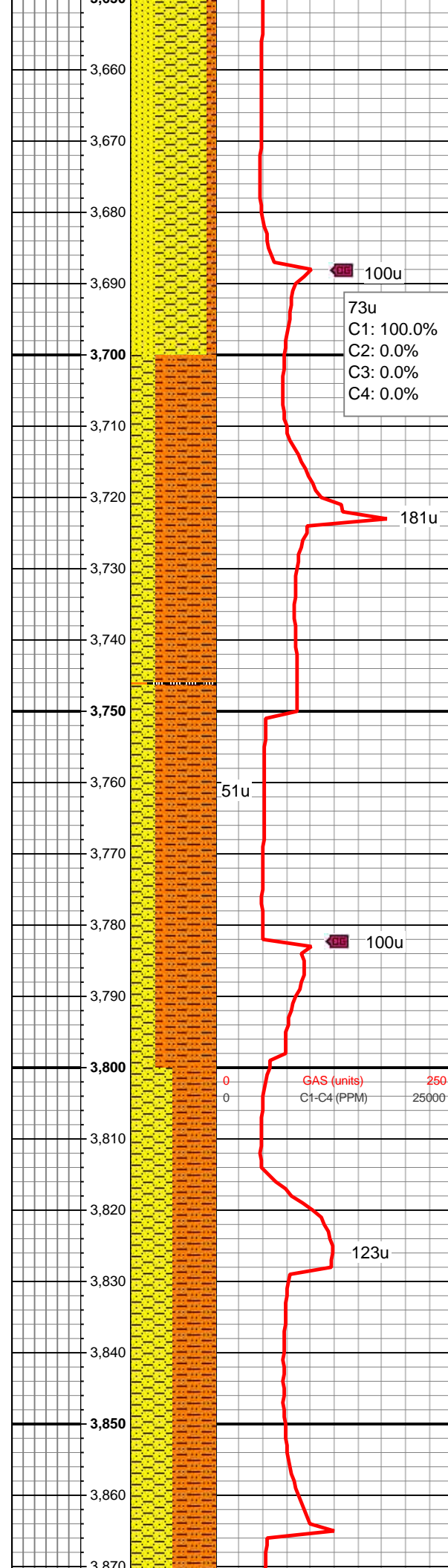
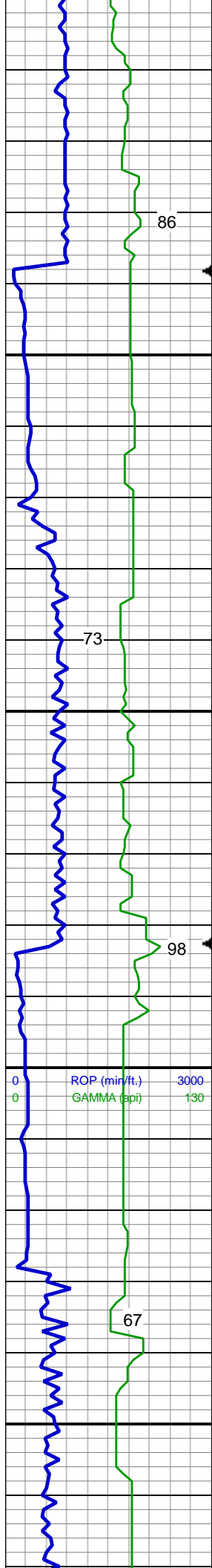
43u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

MD: 3,544'  
TVD: 3,534.91'  
Inclination: 2.3 °  
Azimuth: 166.3 °  
VS: -30.58'

SHY SLTST: med gy, mod frm, vf gr, sb ang - sb plty, arg cmt, non calc; SHY SS: lt - med gy, mod frm, brit, vf gr, sb ang - sb blk, w srt, arg cmt, sl calc; SS: off wh - wh, s&p, frm, brit, f - m gr, sb ang - sb blk, mod - w srt, arg cmt, sl calc, spec wi glau

MD: 3,639'  
TVD: 3,629.83'  
Inclination: 2.6 °  
Azimuth: 164.2 °  
VS: -31.39'

SHY SS: lt gy, frm, brit, u f - med gr, sb ang - sb blk, mod srt, arg cmt, mod calc ip; SS: off wh - gry, s&p,



frm, brit, u f - med gr, sb ang - sb  
blky, mod srt, arg cmt, spec wi glau,  
occ shy sltst

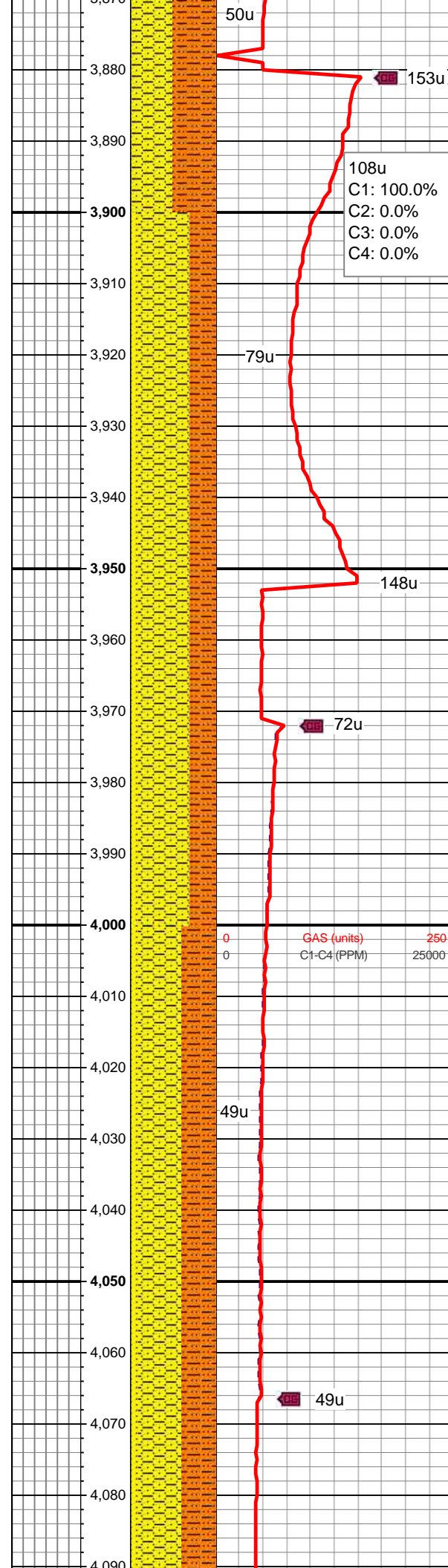
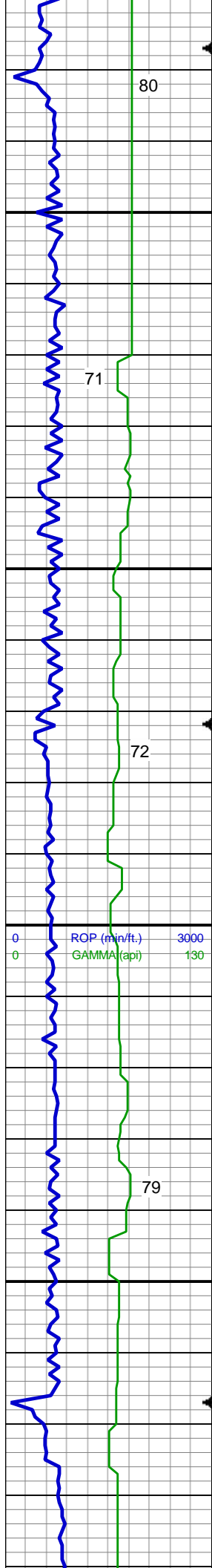
MD: 3,733'  
TVD: 3,723.7'  
Inclination: 3.8 °  
Azimuth: 109.8 °  
VS: -34.71'

SHY SLTST: med gy, mod sft - mod  
frm, vf gr, sb ang - sb plty, arg cmt,  
non calc; SHY SS: lt - med gy, mod  
frm, brit, vf gr, sb ang - sb blky, w  
srt, arg cmt, sme spec wi glau, sl  
calc

MUD WT 8.80  
MUD VIS 32

MD: 3,828'  
TVD: 3,818.61'  
Inclination: 0.9 °  
Azimuth: 126 °  
VS: -38.19'

SHY SLTST: lt - med gy, mod frm -  
frm, vf gr, sb ang - sb plty, arg cmt,  
non calc; SHY SS: lt - med gy, mod  
frm - frm, brit, vf gr, sb ang - sb blky,  
w srt, arg cmt, sl calc



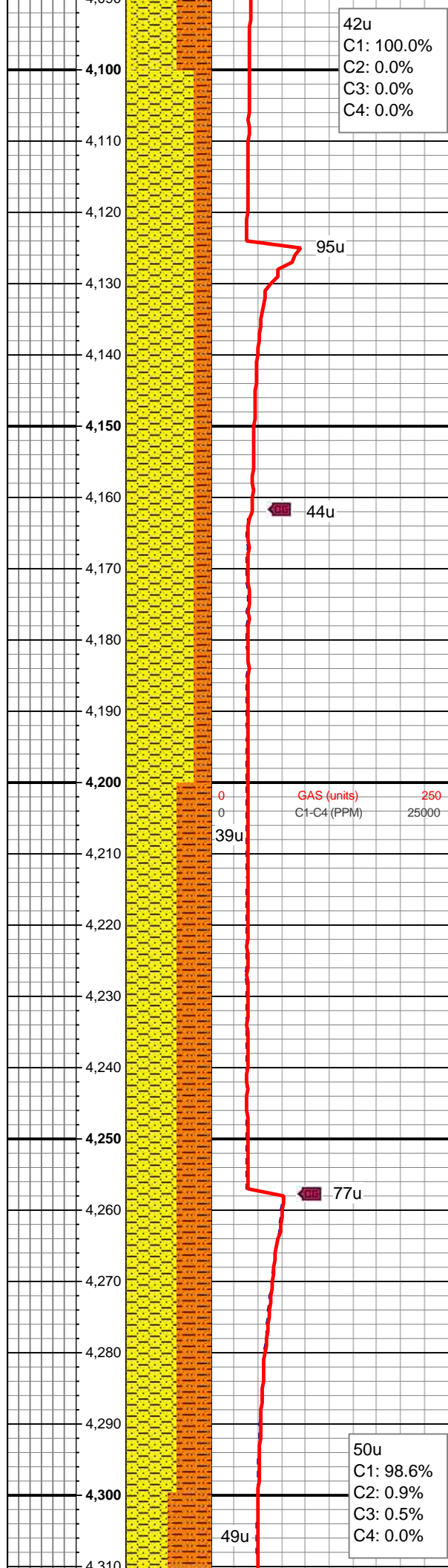
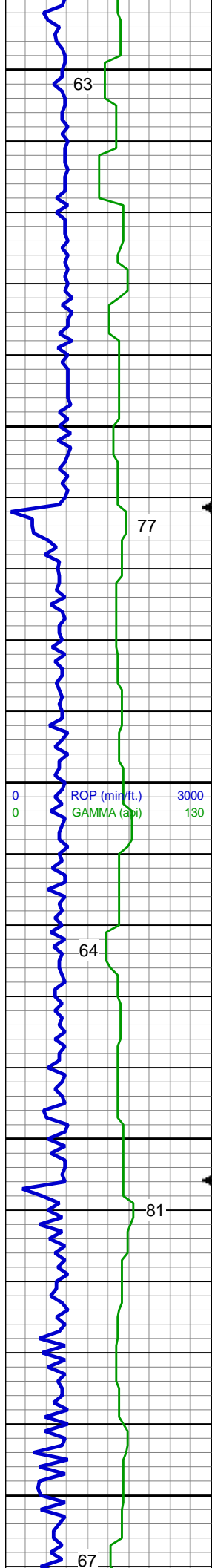
MD: 3,922'  
TVD: 3,912.6'  
Inclination: 0.4 °  
Azimuth: 109 °  
VS: -39.06'

SHY SS: lt - med gy, frm, brit, vf - f  
gr, sb ang - sb blkly, w srt, arg cmt;  
SHY SLTST: lt - med gy, mod frm, vf  
gr, sb ang - sb plty, arg cmt, non  
calc; occ off wh ss

MD: 4,017'  
TVD: 4,007.6'  
Inclination: 0.6 °  
Azimuth: 113.4 °  
VS: -39.81'

SHY SS: lt - med gy, frm, brit, vf - f  
gr, sb ang - sb blkly, w srt, arg cmt;  
SHY SLTST: lt - med gy, mod frm, vf  
gr, sb ang - sb plty, arg cmt, non  
calc; occ off wh ss





MD: 4,111'  
TVD: 4,101.59'  
Inclination: 1 °  
Azimuth: 101.6°  
VS: -41.05'

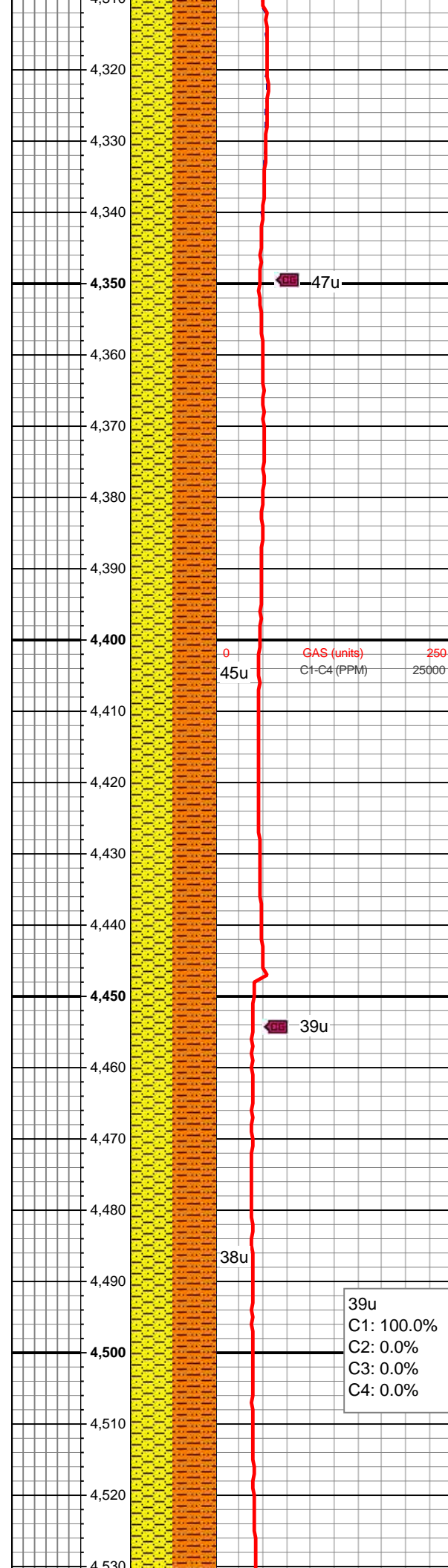
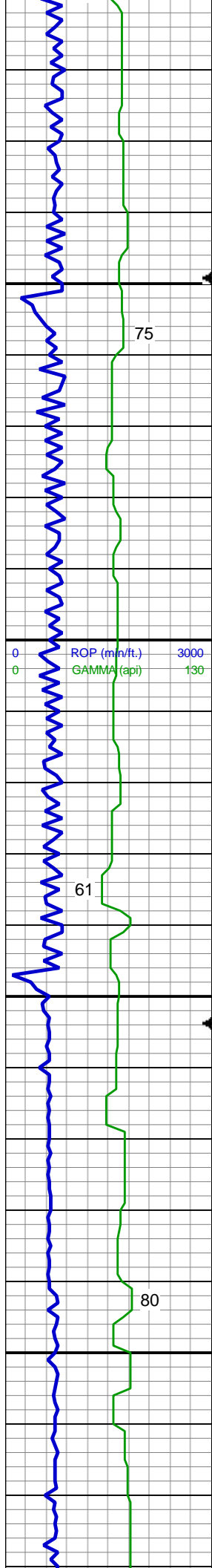
SHY SS: lt - med gy, frm, brit, vf - f  
gr, sb ang - sb blk, w srt, arg cmt;  
SHY SLTST: lt - med gy, mod frm, vf  
gr, sb ang - sb plty, arg cmt, non  
calc

MD: 4,206'  
TVD: 4,196.58'  
Inclination: 0.9 °  
Azimuth: 103.5°  
VS: -42.56'

SHY SS: lt - med gy, frm, brit, vf - f  
gr, sb ang - sb blk, w srt, arg cmt;  
SHY SLTST: lt - med gy, mod frm, vf  
gr, sb ang - sb plty, arg cmt, non  
calc

MD: 4,300'  
TVD: 4,290.57'  
Inclination: 0.8 °  
Azimuth: 86.8°  
VS: -43.92'



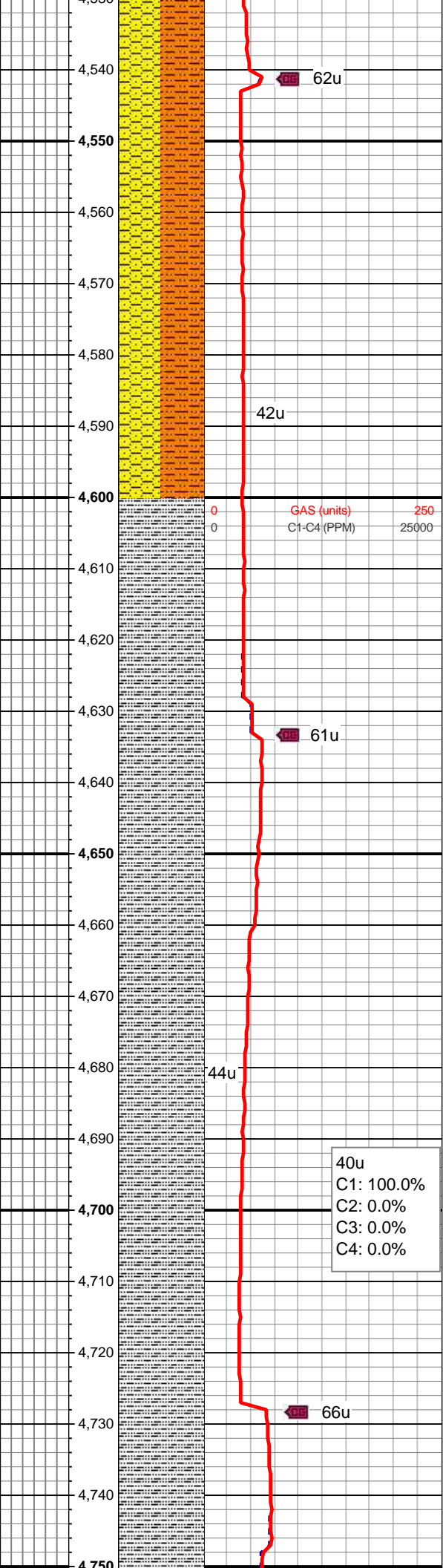
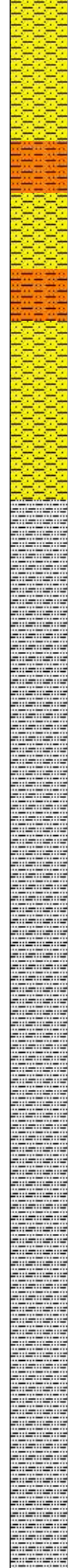
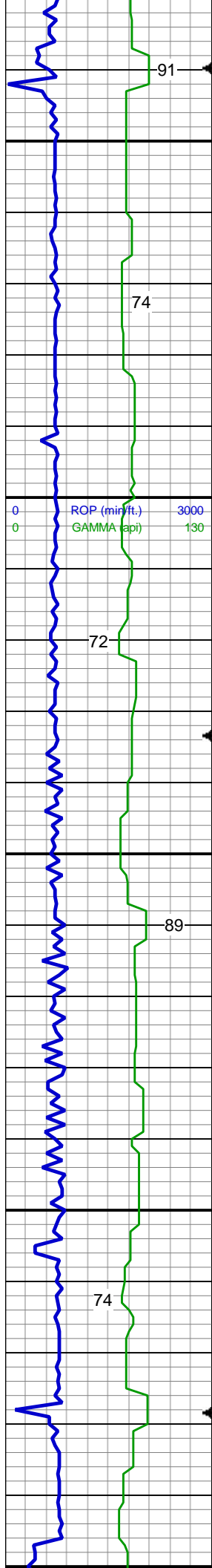


SHY SS: lt - med gy, frm, brit, vf - f  
gr, sb ang - sb blk, w srt, arg cmt;  
SHY SLTST: lt - med gy, mod frm, vf  
gr, sb ang - sb plty, arg cmt, non  
calc

MD: 4,395'  
TVD: 4,385.56'  
Inclination: 0.8 °  
Azimuth: 85.4 °  
VS: -45.25'

SHY SS: lt - med gy, frm, brit, vf - f  
gr, sb ang - sb blk, w srt, arg cmt;  
SHY SLTST: lt - dr gy, mod frm, vf  
gr, sb ang - sb plty, arg cmt, non  
calc

MD: 4,489'  
TVD: 4,479.55'  
Inclination: 0.4 °  
Azimuth: 164.9 °  
VS: -45.97'



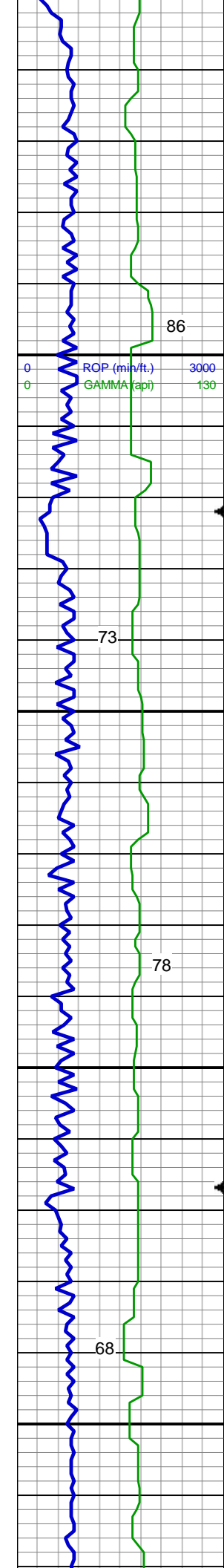
SHY SS: lt - med gy, frm, brit, vf - f  
gr, sb ang - sb blkly, w srt, arg cmt;  
SHY SLTST: lt - dr gy, mod frm, vf  
gr, sb ang - sb plty, arg cmt, non  
calc

MD: 4,584'  
TVD: 4,574.55'  
Inclination: 0.6 °  
Azimuth: 207.2 °  
VS: -45.79'

SLTY SH: Med to dk gy, mod sft -  
mod frm, brit - sm, fri ip, vf gr, sb  
ang - sb plty; tr ss arg cmt

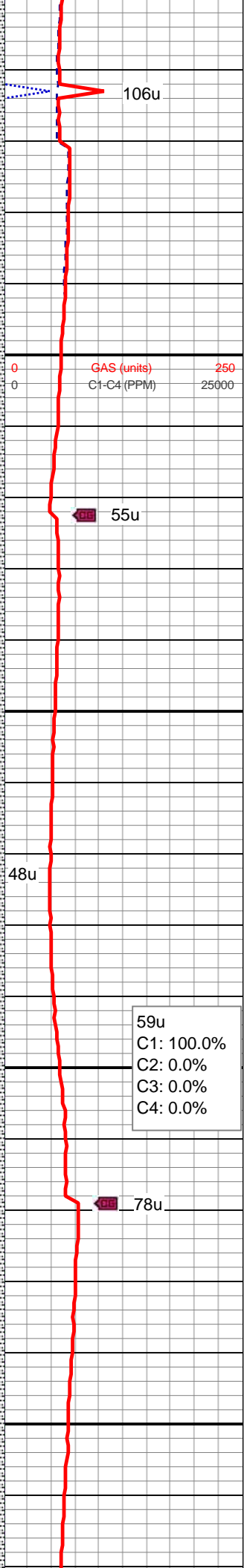
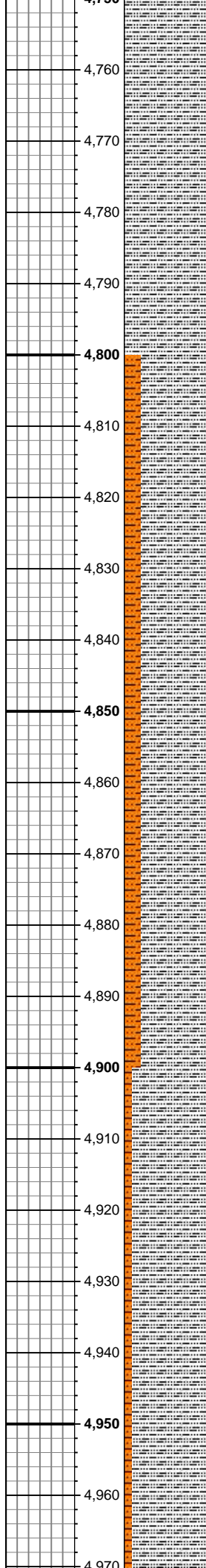
MD: 4,679'  
TVD: 4,669.55'  
Inclination: 0.4 °  
Azimuth: 191.1 °  
VS: -45.45'

SLTY SH: Med to dk gy, mod sft -  
mod frm, brit - sm, fri ip, vf gr, sb



4,750  
4,760  
4,770  
4,780  
4,790  
4,800  
4,810  
4,820  
4,830  
4,840  
4,850  
4,860  
4,870  
4,880  
4,890  
4,900  
4,910  
4,920  
4,930  
4,940  
4,950  
4,960  
4,970

ROP (min/ft.) 3000  
GAMMA (api) 130



mod fm, brit - sm, fri ip, vf gr, sb ang - sb plty; tr ss arg cmt

MD: 4,773'  
TVD: 4,763.54'  
Inclination: 0.4 °  
Azimuth: 207.1 °  
VS: -45.2'

106u

55u

48u

78u

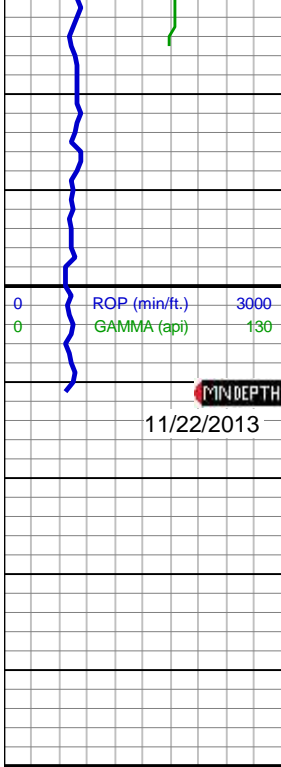
59u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

SLTY SH: med to dk gy, mod sft - mod frm, brit - sm, fri ip, vf gr, sb ang - sb plty, arg cmt; SHY SLTST: lt - med gy, occ blk, sft - mod frm, vf gr, sb blk - sb plty, tr plty, arg cmt; tr ss, non calc

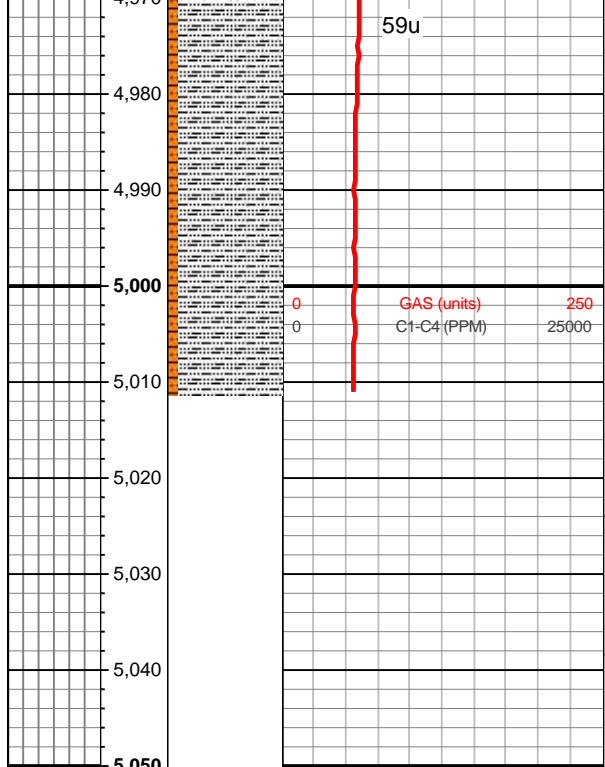
MD: 4,868'  
TVD: 4,858.54'  
Inclination: 0.3 °  
Azimuth: 225.3 °  
VS: -44.85'

SLTY SH: med to dk gy, mod sft - mod frm, brit - sm, fri ip, vf gr, sb ang - sb plty, arg cmt; SHY SLTST: lt - med gy, occ blk, sft - mod frm, vf gr, sb blk - sb plty, tr plty, arg cmt

MD: 4,962'  
TVD: 4,952.54'  
Inclination: 0.2 °  
Azimuth: 207.1 °  
VS: -45.2'



59u



Azimuth: 99.1  
VS: -44.82'

TOOH FOR BHA #2  
LOG CONTINUES ON MPLOT  
"TIMBRO STATE  
LD16-66HN(HORZ)"

Thank you for choosing  
Columbine Logging Inc.