

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** Wells Ranch AE30-69HNB

**Location** Sec 29, T6N, R62W

**State** Colorado

**County** Weld

**Country** USA

**Rig Number** H&P 322

**API Number** 05-123-38675

**AFE #** 140184

**Region** DJ Basin

**Field** Wattenberg

**Spud Date** 4/27/2014

**Drilling Completed** 5/4/2014

**Surface Coordinates** Sec 29, T6N, R62W  
267' FNL, 65' FWL

**Ground Elevation** 4777'

**K.B. Elevation** 4801'

**Logged Interval** 1000' **To** 6000'

**Total Depth** 12113'

**Formation** Niobrara "B" Marl

**Type of Drilling Fl...** Water/Mud/Poly

## Operator

**Company** Noble Energy Inc

## Geologist

**Name** TERRY ACOMB; LIZ VAN DIEPEN

**Company** COLUMBINE LOGGING, INC.

**Address** 2385 S. LIPAN ST  
DENVER, COLORADO 80223  
(303) 289-7764

## Rock Types

? UNKNOWN

ANHYDRITE

BENTONITE

BRECCIA

COAL

CONGLOMERATE

DOLOMITE

GRANITE

METAMORPHIC

NO SAMPLE

SALT

SAI T- PEPPER SAND

SHALY SILTSTONE

SILTSTONE

SILTY SHALE

TILL

	CEMENT		GYPSUM		SANDSTONE		TUFF
	CHALK		IGNEOUS		SHALE		WELDED TUFF
	CHERT		LIMESTONE		SHALE COLORED		
	CLAY CHOKE SAND		SIDERITE or LIMONITE		SHALE GRAY		
	CLAYSTONE		MARLSTONE		SHALY SANDSTONE		

## 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

GYPSIFEROUS

HEAVY MINERAL

KAOLIN

MARLSTONE

MINERAL CRYSTALS

NODULES

PHOSPHATE PELLETS

PYRITE

SALT CAST

SANDY

SILICEOUS

SILTY

TUFFACEOUS

### Stringer

ANHYDRITE STRINGER

BENTONITE STRINGER

COAL STRINGER

DOLOMITE STRINGER

GYPSUM STRINGER

LIMESTONE STRINGER

MARLSTONE (CALC) STRG

MARLSTONE (DOL) STRG

SANDSTONE STRINGER

SHALE STRINGER

SILTSTONE STRINGER

## Other Symbols

### Oil Show

DEAD

EVEN

QUESTIONABLE

SPOTTED STAINING

### Porosity

E EARTHY

F FENESTRAL

F FRACTURE

X INTERCRYSTALLINE

O INTEROOLITIC

MOLDIC

O ORGANIC

P PINPOINT

V VUGGY

### Engineering

BIT

CONNECTION (LEFT)

CONNECTION (RIGHT)

CONNECTION GAS

CORE - LOST

CORE - RECOVERED

DST INTERVAL

FAULT

FORMATION TOP

GAS SHOW

MN DEPTH

NORMAL FAULT

OIL SHOW

OVERTURNED STRATA

REVERSE FAULT

SIDEWALL CORE (LEFT)

SIDEWALL CORE (RIGHT)

SLIDE

SURVEY

TRIP GAS

WIRELINE TESTED - LEFT

WIRELINE TESTED - RT

### Rounding

A ANGULAR

R ROUNDED

S SUBANG

S SUBRND

### Textures

B BOUNDSTONE

C CHALKY

C CRYPTOXLN

E EARTHY

F FINELYXLN

G GRAINSTONE

L LITHOGRAPHIC

M MICROXLN

M MUDSTONE

P PACKSTONE

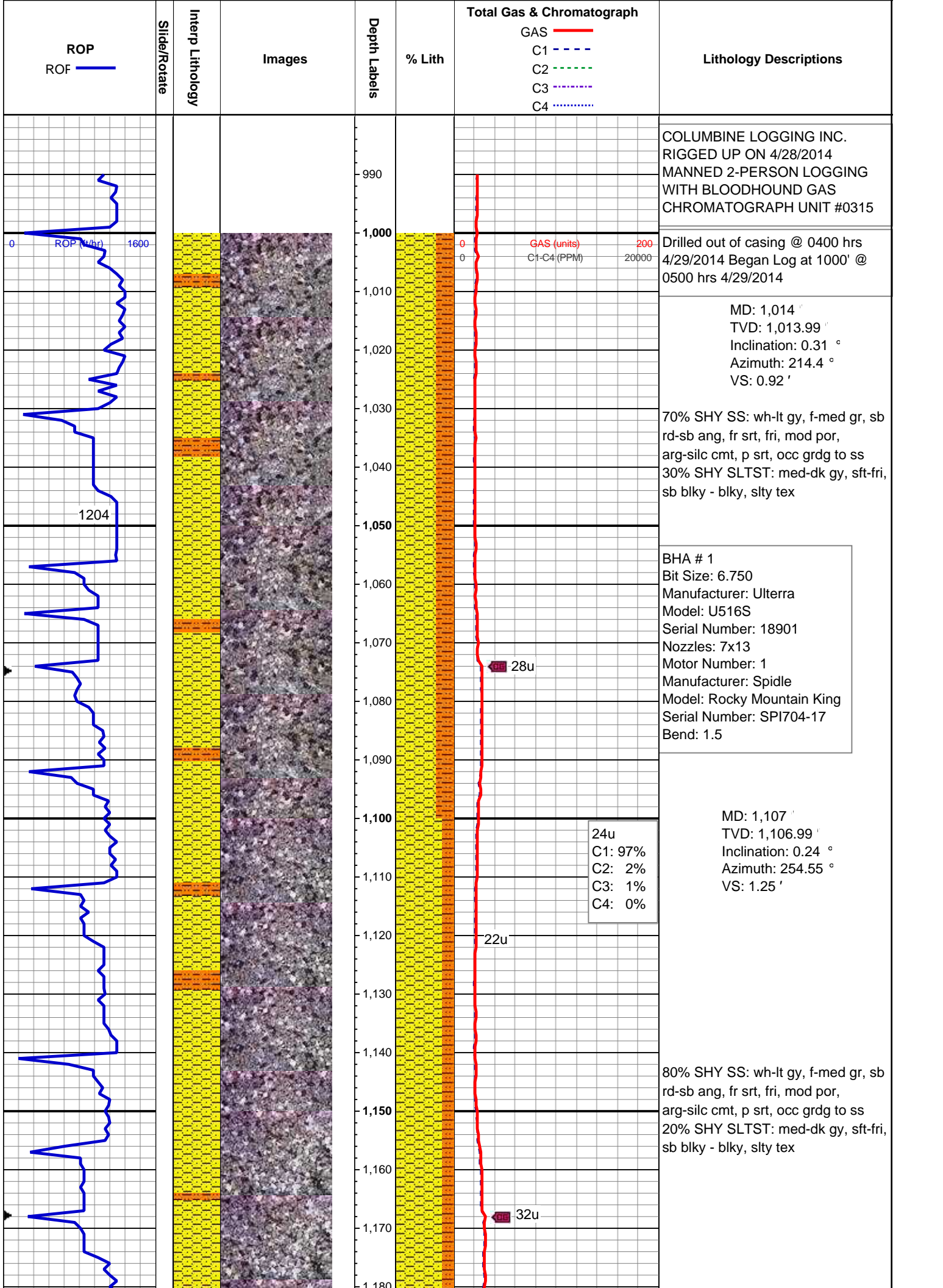
W WACKESTONE

### Sorting

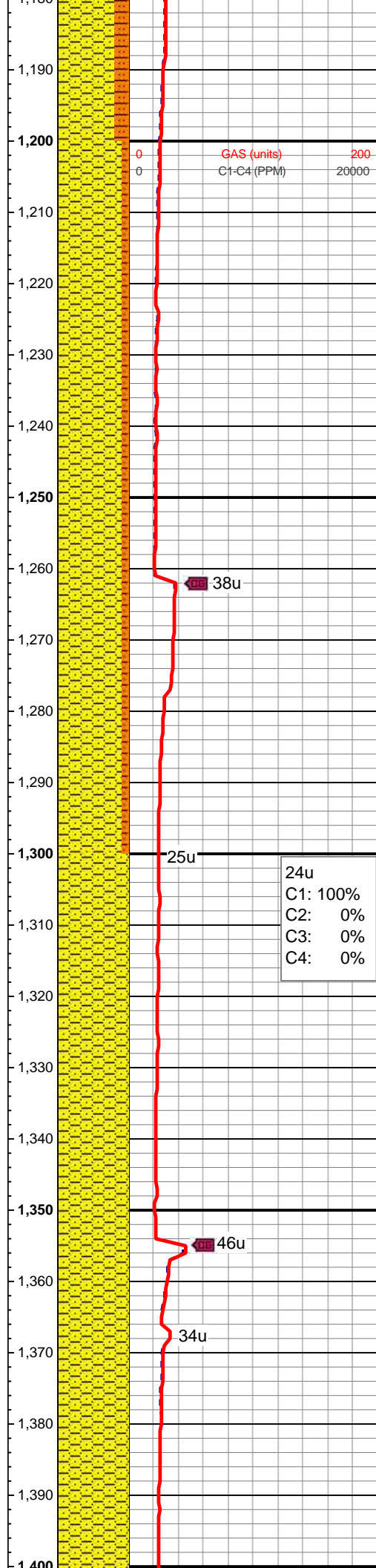
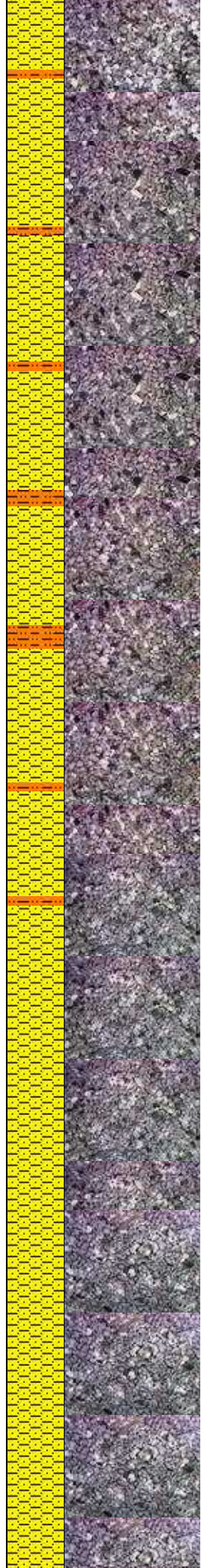
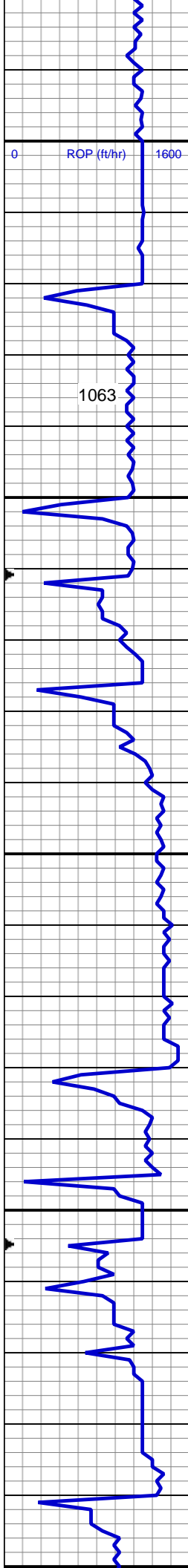
M MODERATE

P POOR

W WELL



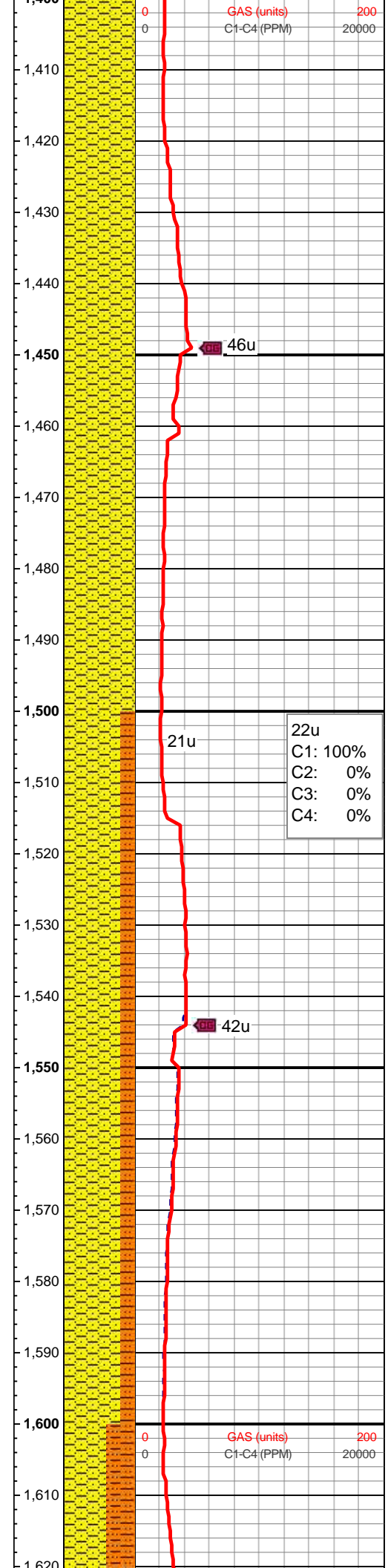
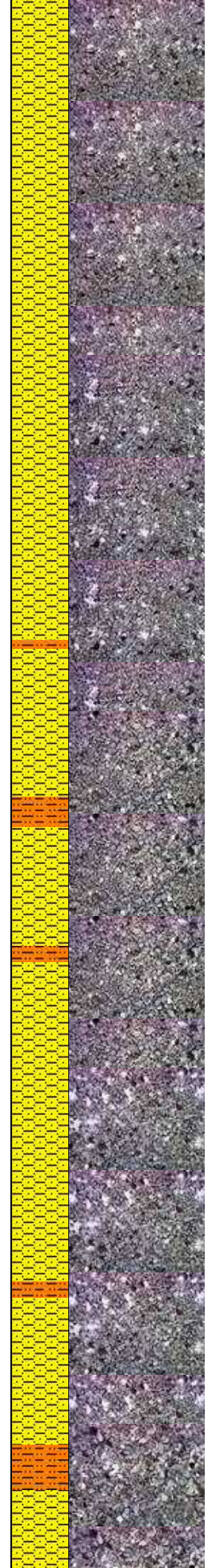
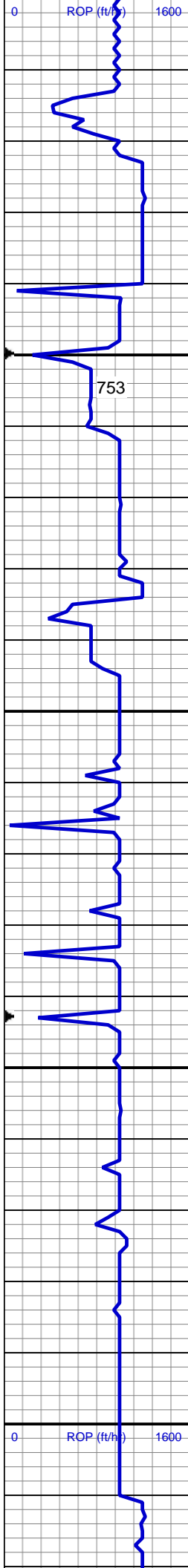




90% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr srt, fri, mod por,  
arg-silc cmt, p srt,  
10% SHY SLTST: med-dk gy, sft-fri,  
sb blk - blk, slty tex

MD: 1,294 '  
TVD: 1,293.99 '  
Inclination: 0.44 °  
Azimuth: 253.93 °  
VS: 2.31 '

100% SHY SS: wh-lt gy, f-med gr,  
sb rd-sb ang, fr srt, fri, mod por,  
arg-silc cmt, p srt, tr glauc, scat shy  
sltst



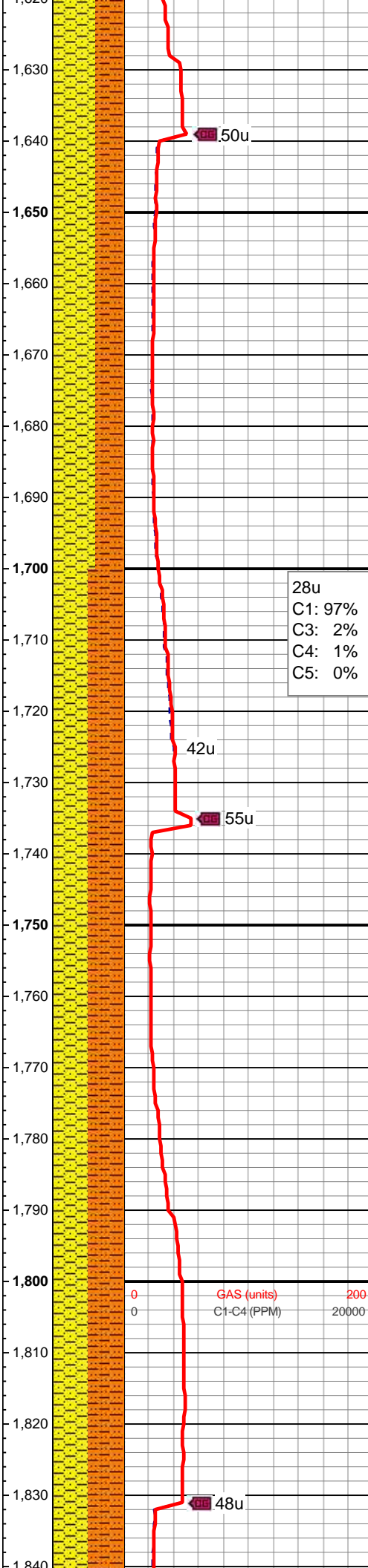
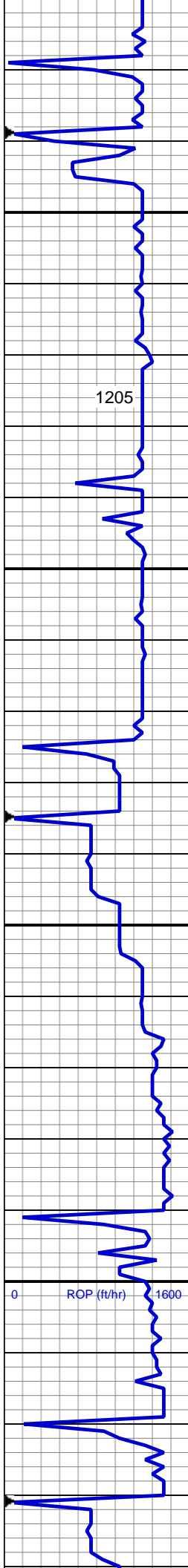
100% SHY SS: wh-lt gy, f-med gr, sb rd-sb ang, fr srt, fri, mod por, arg-silc cmt, p srt, scat glauc, scat shy sltst

MD: 1,480 '  
TVD: 1,479.99 '  
Inclination: 0.34 °  
Azimuth: 248.13 °  
VS: 3.5 '

80% SHY SS: wh-lt gy, f-med gr, sb rd-sb ang, fr srt, fri, mod por, arg-silc cmt, p srt, grdg to 20% SHY SLTST

MD: 1,575 '  
TVD: 1,574.98 '  
Inclination: 0.2 °  
Azimuth: 247.79 °  
VS: 3.91 '





60% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr-p srt, fri, mod por,  
arg-silc cmt, grdg to  
40% SHY SLTST: lt-med gy, occ dk  
gy, sft-fri, sb blkyl-blky, occ sb plty,  
sly tex

MD: 1,669 '  
TVD: 1,668.98 '  
Inclination: 0.36 °  
Azimuth: 208.83 °  
VS: 4.2 '

28u  
C1: 97%  
C3: 2%  
C4: 1%  
C5: 0%

50% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr-p srt, fri, mod por,  
arg-silc cmt, grdg to  
50% SHY SLTST: lt-med gy, occ dk  
gy, sft-fri, sb blkyl-blky, occ sb plty,  
sly tex

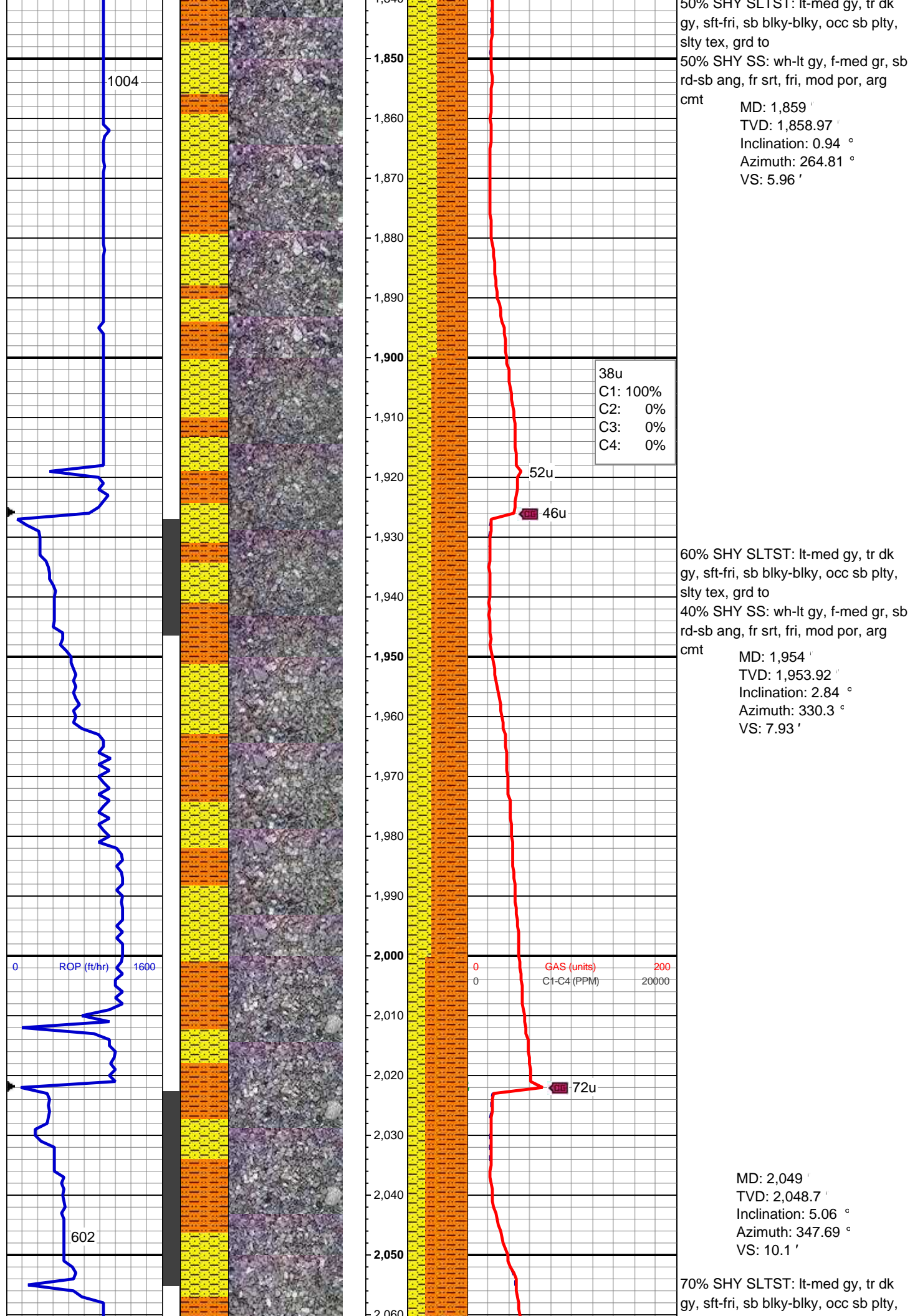
MD: 1,764 '  
TVD: 1,763.98 '  
Inclination: 0.62 °  
Azimuth: 306.19 °  
VS: 4.76 '

50u

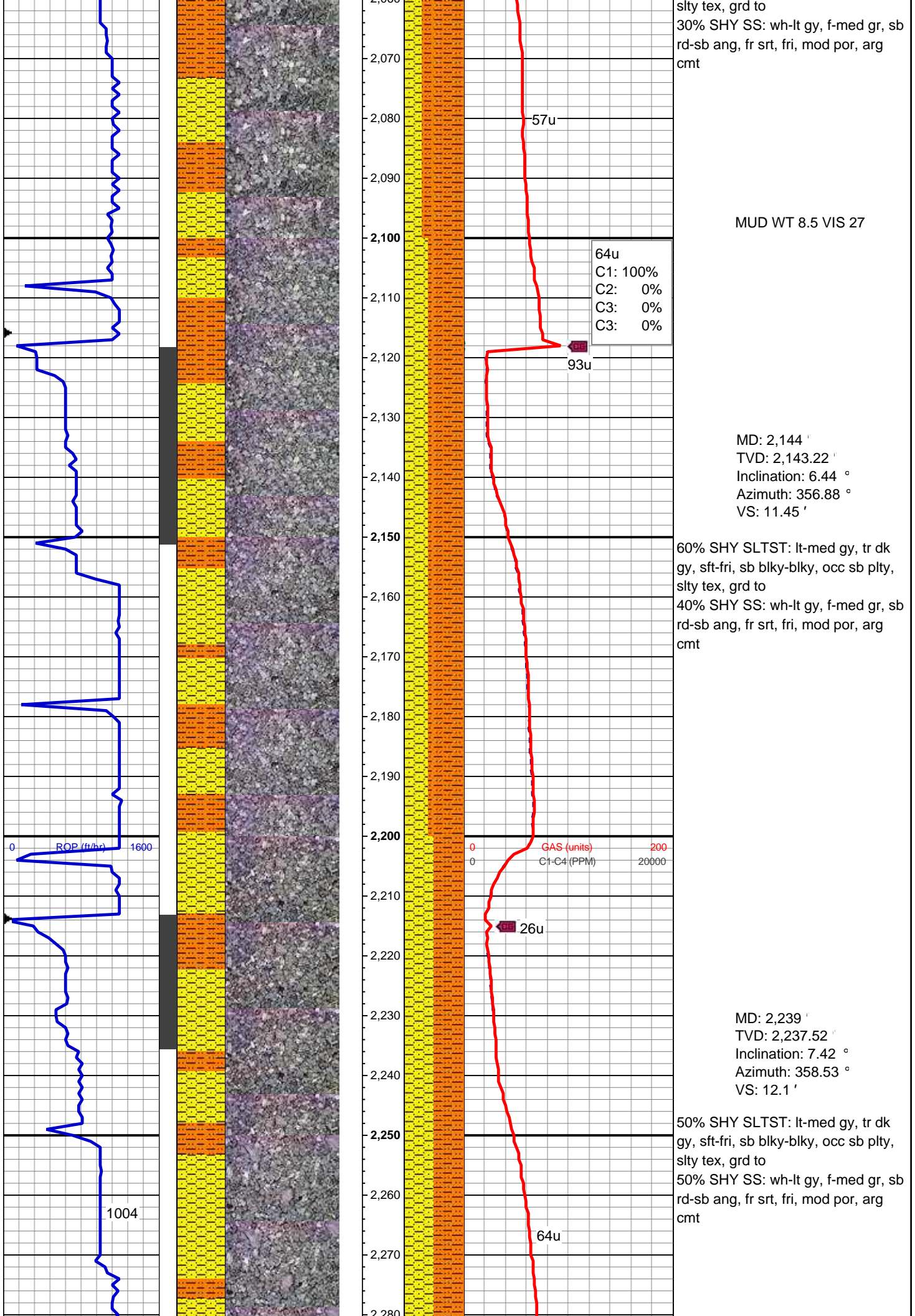
42u

55u

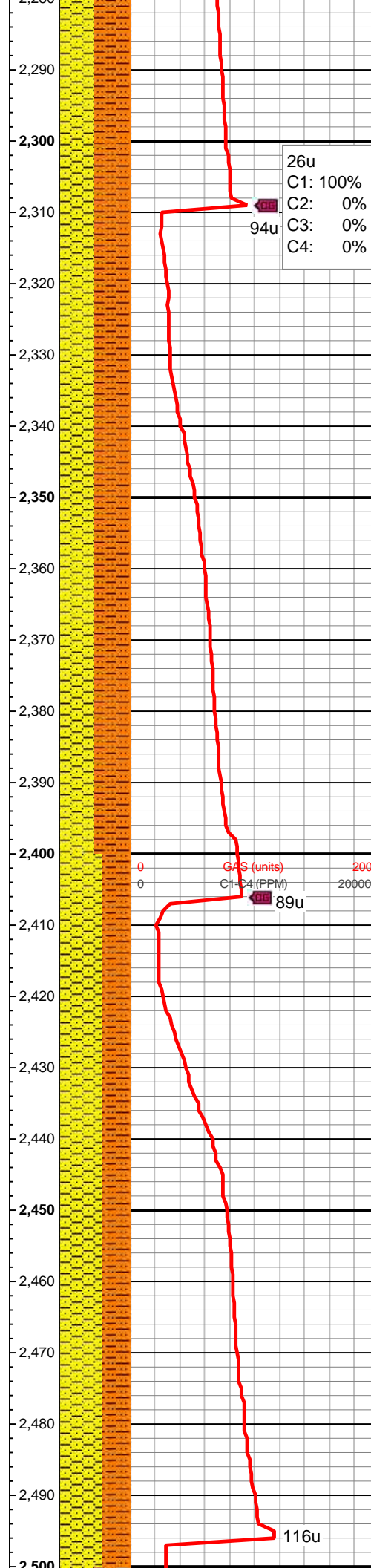
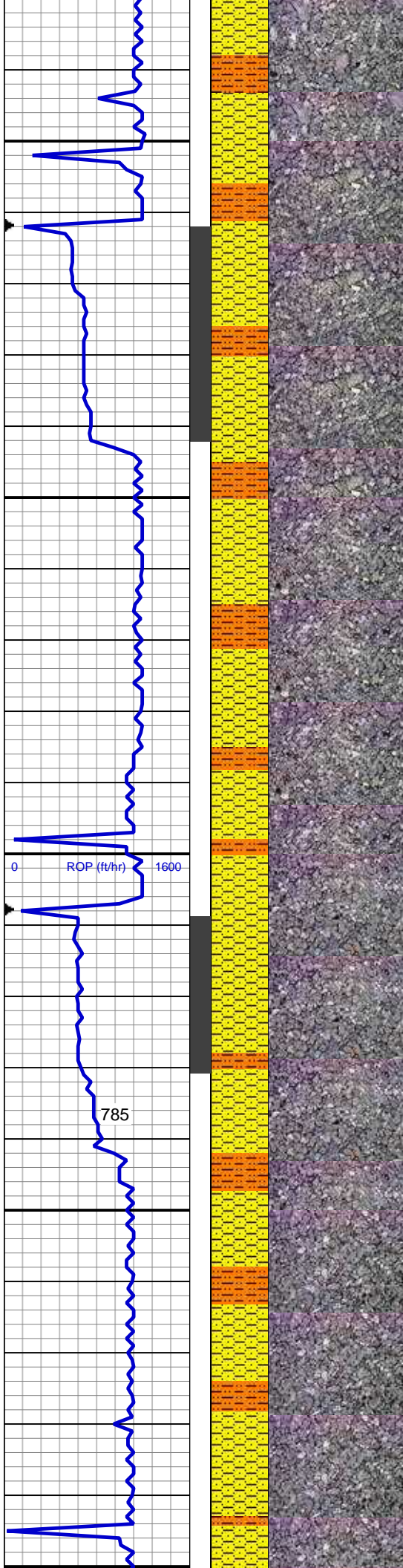
48u









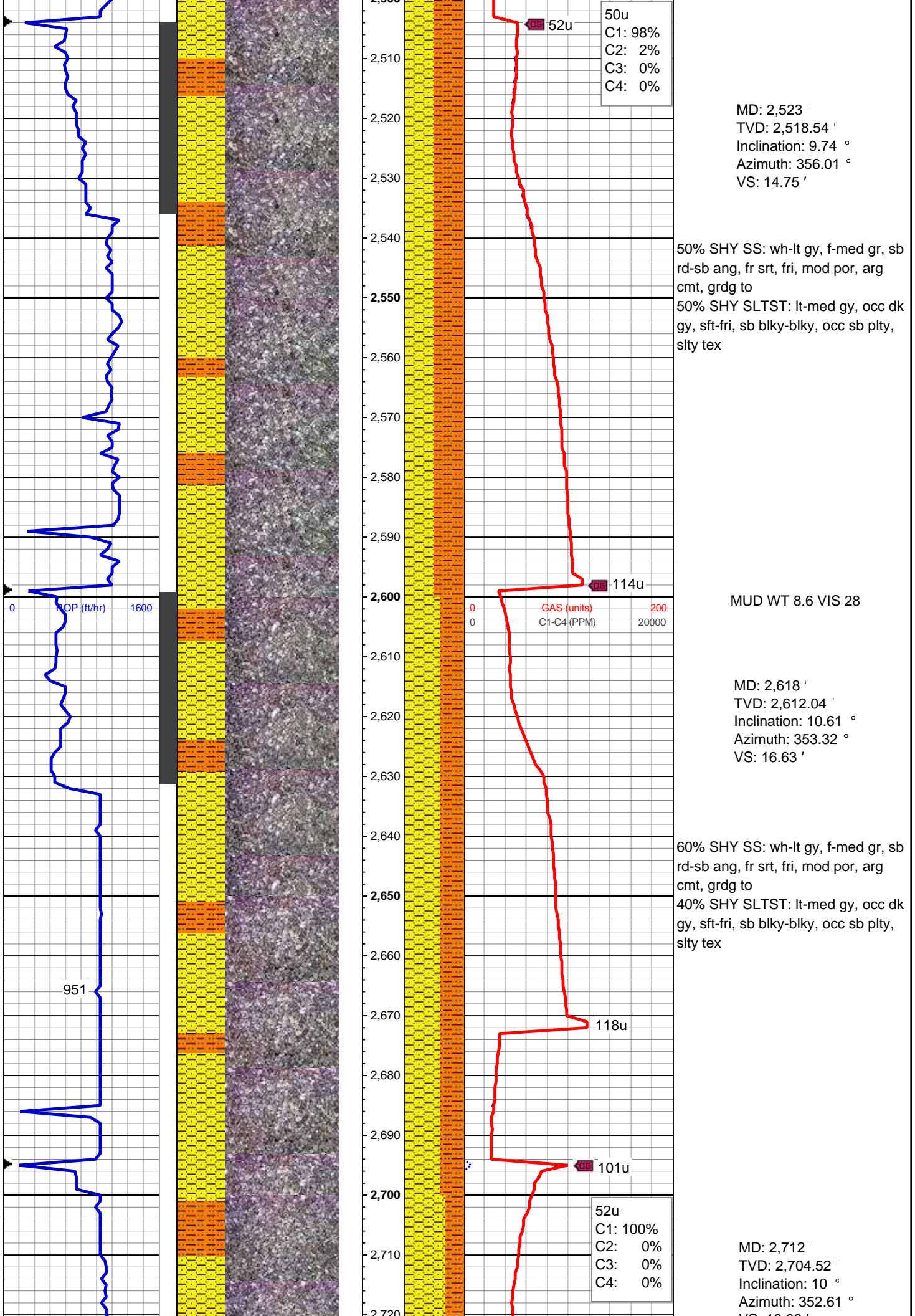


MD: 2,333 '  
TVD: 2,330.67 '  
Inclination: 8.04 °  
Azimuth: 358.54 °  
VS: 12.65 '

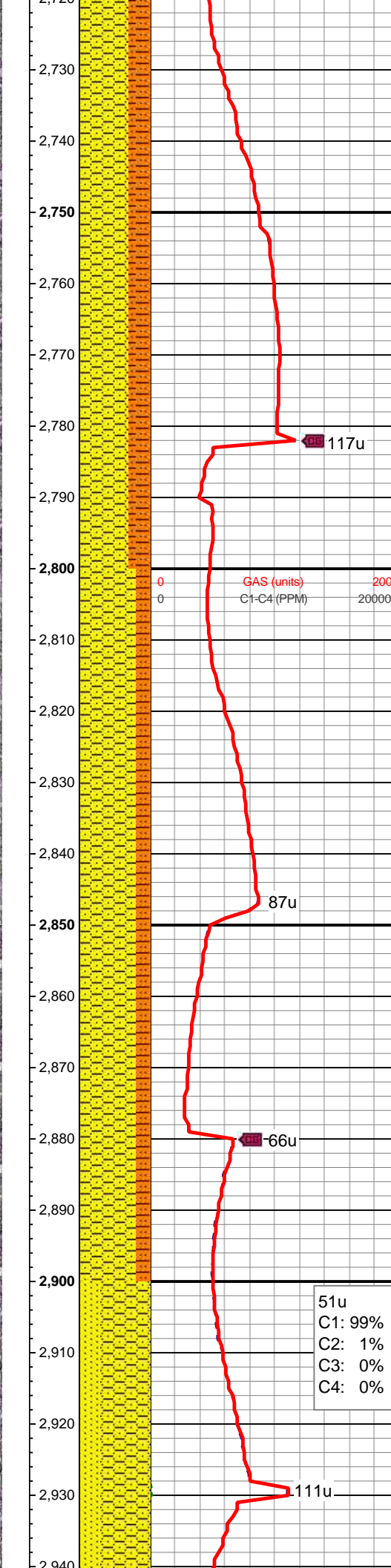
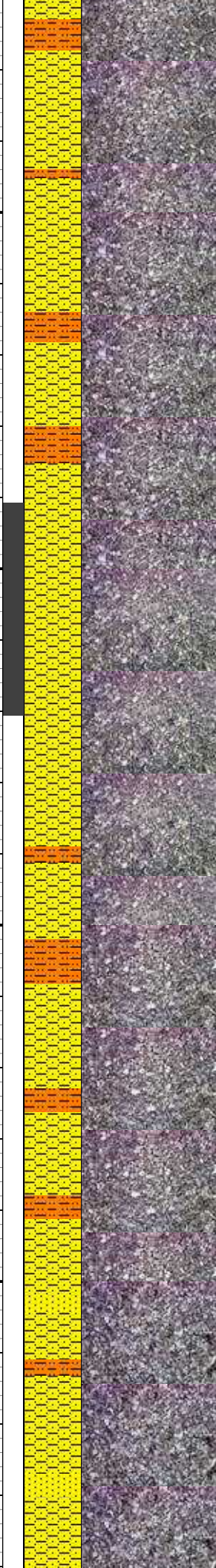
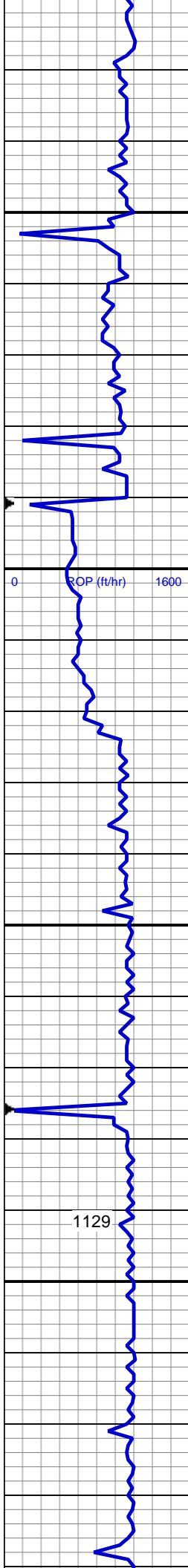
50% SHY SLTST: lt-med gy, tr dk gy, sft-fri, sb blkly-blky, occ sb plty, slty tex, grd to  
50% SHY SS: wh-lt gy, f-med gr, sb rd-sb ang, fr srt, fri, mod por, arg cmt

MD: 2,428 '  
TVD: 2,424.71 '  
Inclination: 8.26 °  
Azimuth: 356.34 °  
VS: 13.5 '

60% SHY SS: wh-lt gy, f-med gr, sb rd-sb ang, fr srt, fri, mod por, arg cmt, grdg to  
40% SHY SLTST: lt-med gy, occ dk gy, sft-fri, sb blkly-blky, occ sb plty, slty tex







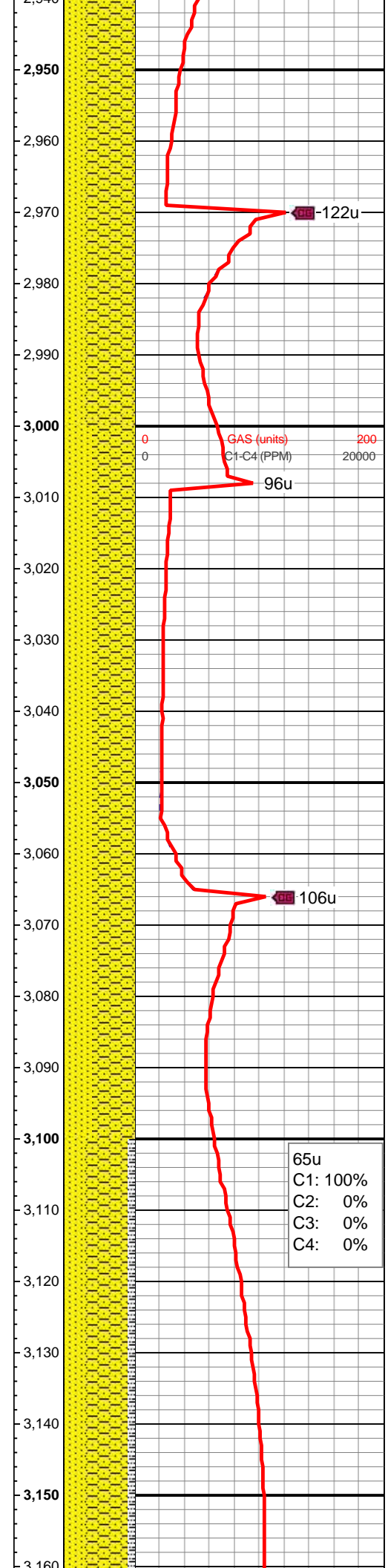
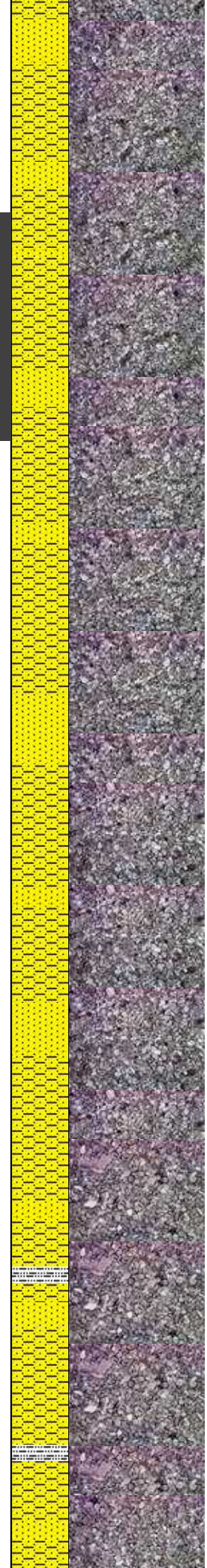
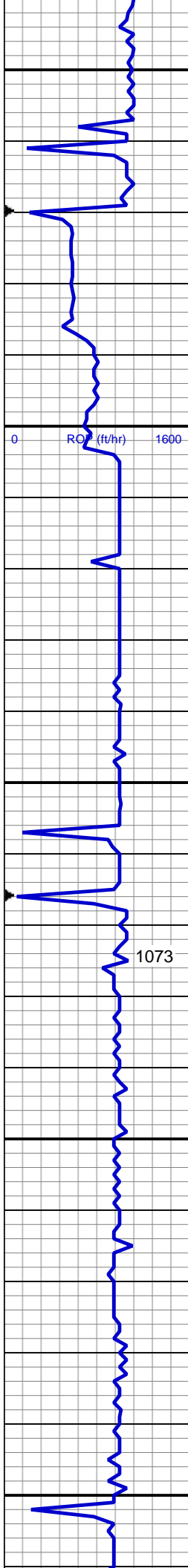
VS: 18.98'

70% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr srt, fri, mod por,  
arg-silc cmt, grdg to  
30% SHY SLTST: lt-med gy, sft-fri,  
sb blkly-blky, occ sb plty, slty tex

MD: 2,807 '  
TVD: 2,798.05 '  
Inclination: 10.26 °  
Azimuth: 357.94 °  
VS: 20.64 '

80% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr srt, fri, mod por,  
arg-silc cmt, occ grdg to ss, grdg to  
20% SHY SLTST: lt-med gy, sft-fri,  
sb blkly-blky, occ sb plty, slty tex

MD: 2,902 '  
TVD: 2,891.64 '  
Inclination: 9.46 °  
Azimuth: 356.92 °  
VS: 21.66 '



70% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr srted, fri, mod por,  
arg-silc cmt, occ shy sltst, grdg to  
30% SS: wh, op, trnsi, s&p, sb  
rd-sb ang, mod-p srted, mod hd,  
mod por, silc cmt

MD: 2,997 '  
TVD: 2,985.18 '  
Inclination: 10.68 °  
Azimuth: 1.48 °  
VS: 22.14 '

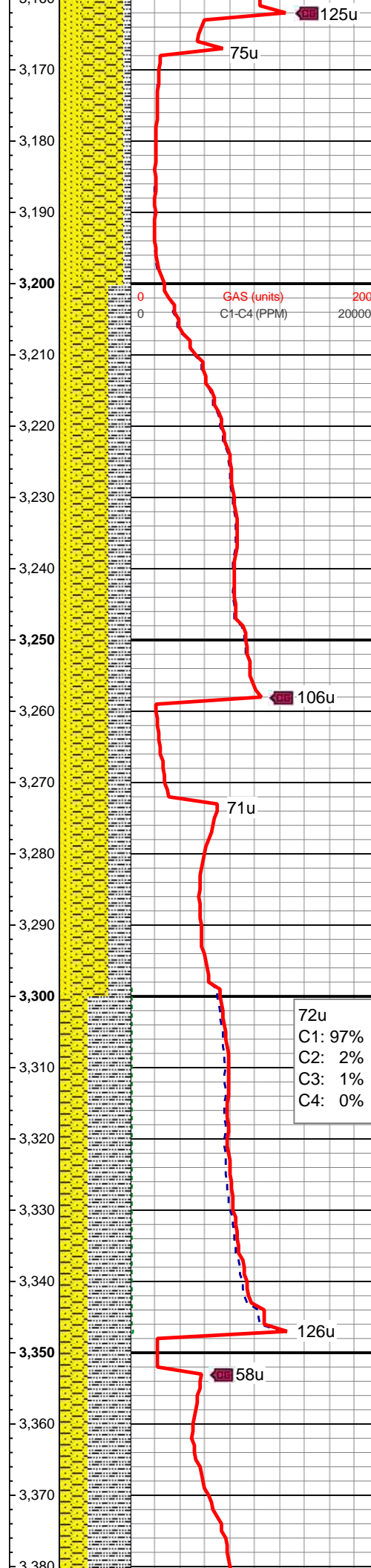
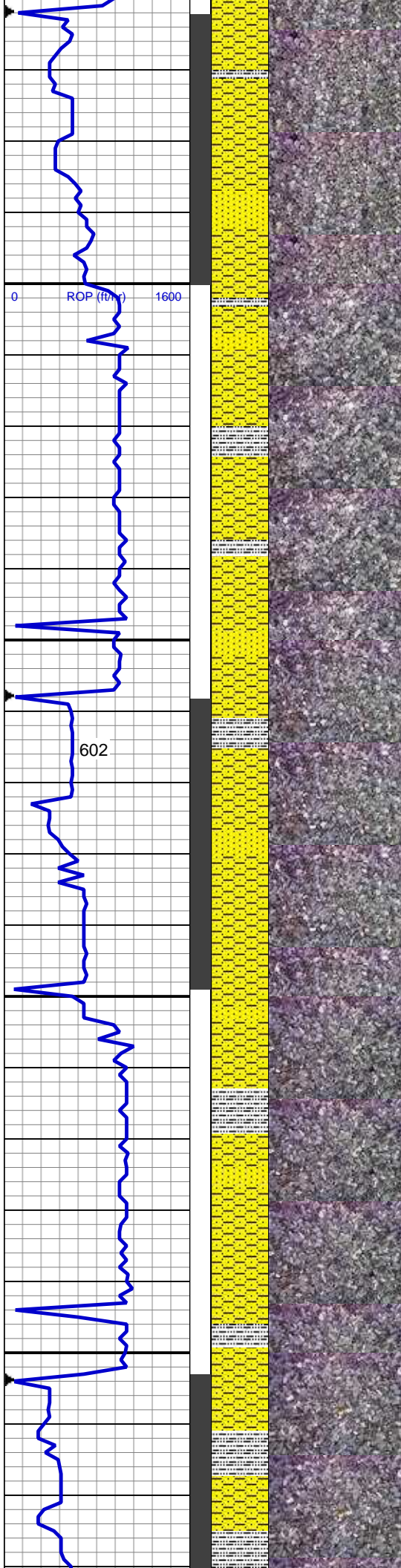
60% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr srted, fri, mod por,  
arg-silc cmt, occ shy sltst, grdg to  
40% SS: wh, op, trnsi, s&p, sb  
rd-sb ang, mod-p srted, mod hd,  
mod por, silc cmt

MD: 3,092 '  
TVD: 3,078.7 '  
Inclination: 9.55 °  
Azimuth: 357.98 °  
VS: 22.49 '

60% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr srted, fri, mod por,  
arg-silc cmt, grdg to  
30% SS: wh, op, trnsi, s&p, sb  
rd-sb ang, mod-p srted, mod hd,  
mod por, silc cmt, scat slty sh

65u
C1: 100%
C2: 0%
C3: 0%
C4: 0%





MD: 3,187 '  
TVD: 3,172.39 '  
Inclination: 9.51 °  
Azimuth: 349.93 °  
VS: 24.42 '

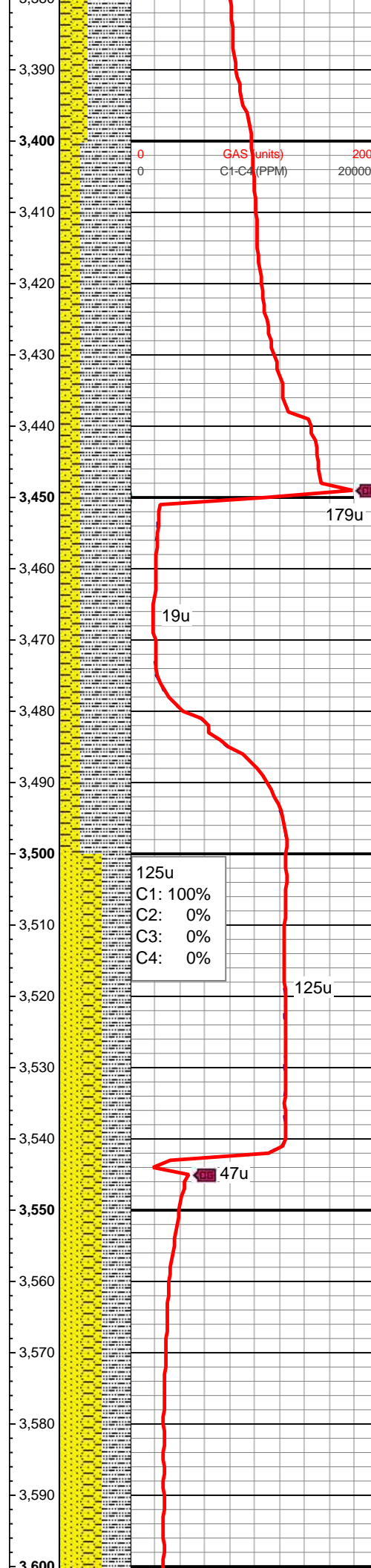
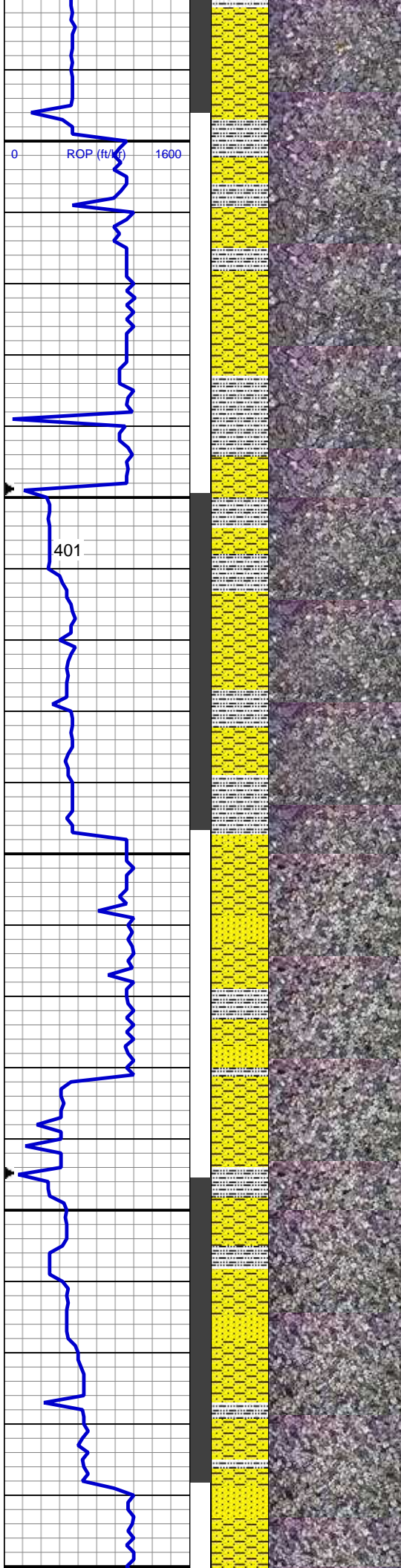
50% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr srted, fri, mod por,  
arg-silc cmt, grdg to ss  
30% SLTY SH: pred med gy, occ lt  
gy, sft-fri, sb plty, occ plty, slty tex

MD: 3,282 '  
TVD: 3,266.45 '  
Inclination: 6.59 °  
Azimuth: 338.12 °  
VS: 28.05 '

MUD WT 8.8 VIS 28

60% SLTY SH: med gy, sft-fri, sb  
blk-sb plty, occ plty, slty tex,  
40% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr srted, fri, mod por, arg  
cmt

MD: 3,377 '  
TVD: 3,360.79 '  
Inclination: 6.92 °



Azimuth: 340.25 °  
VS: 32.2 '

70% SLTY SH: med gy, sft-fri, sb  
blky-sb plty, occ plty, slty tex,  
30% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr srted, fri, mod por, arg  
cmt

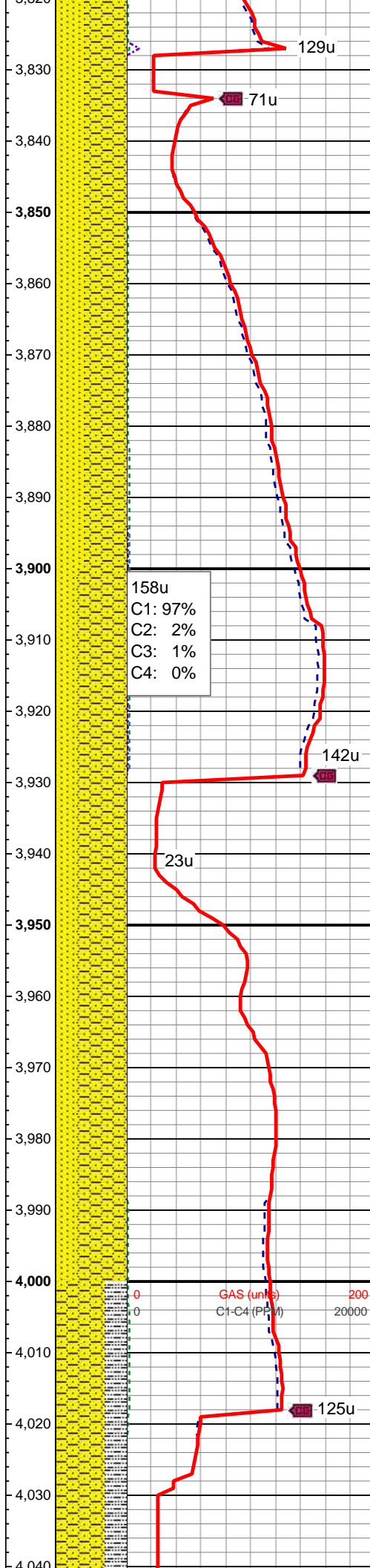
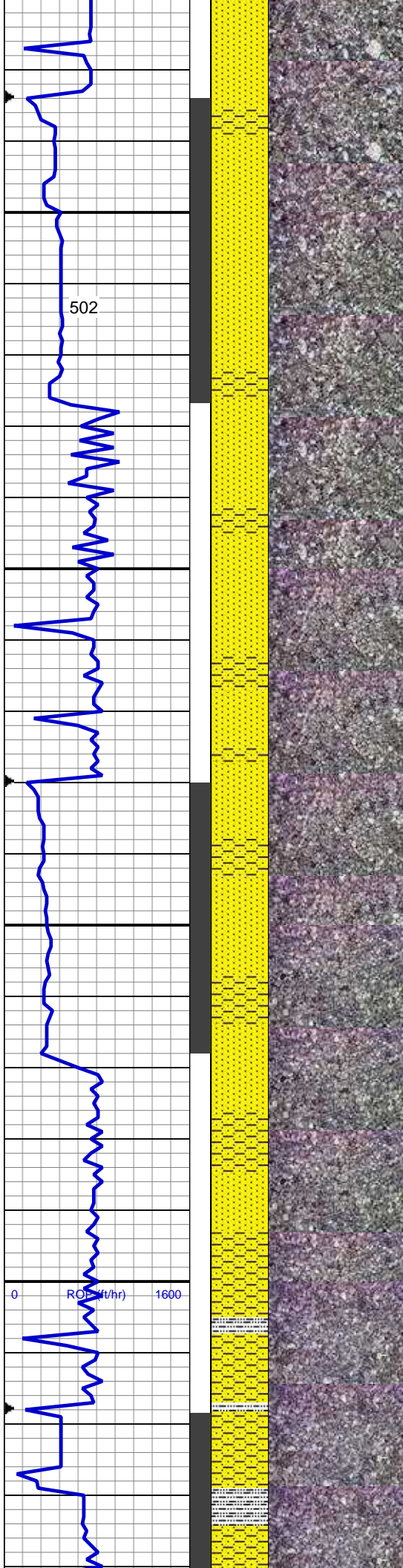
MD: 3,471 '  
TVD: 3,454.17 '  
Inclination: 6.4 °  
Azimuth: 356 °  
VS: 34.67 '

40% SLTY SH: med gy, sft-fri, sb  
blky-sb plty, occ plty, slty tex,  
30% SHY SS: wh-lt gy, f-med gr, sb  
rd-sb ang, fr srted, fri, mod por, arg  
cmt,  
30% SS: wh, op, trns, s&p, sb  
rd-sb ang, mod-p srted, mod hd,  
mod por, silc cmt, tr glauc

MD: 3,566 '  
TVD: 3,548.44 '  
Inclination: 7.73 °  
Azimuth: 358.33 °  
VS: 35.43 '







60% SHY SS: lt gy, f-med gr, sb  
rd-sb ang, p-mod srted, fri, mod por,  
pred arg cmt, grdg to  
40% SS: wh, op, trns, s&p, sb  
rd-sb ang, mod-p srted, mod hd,  
mod por, silc cmt, scat slty sh, occ  
glau, tr pyr

MD: 3,851 '  
TVD: 3,830.38 '  
Inclination: 7.95 °  
Azimuth: 17.24 °  
VS: 36.05 '

158u  
C1: 97%  
C2: 2%  
C3: 1%  
C4: 0%

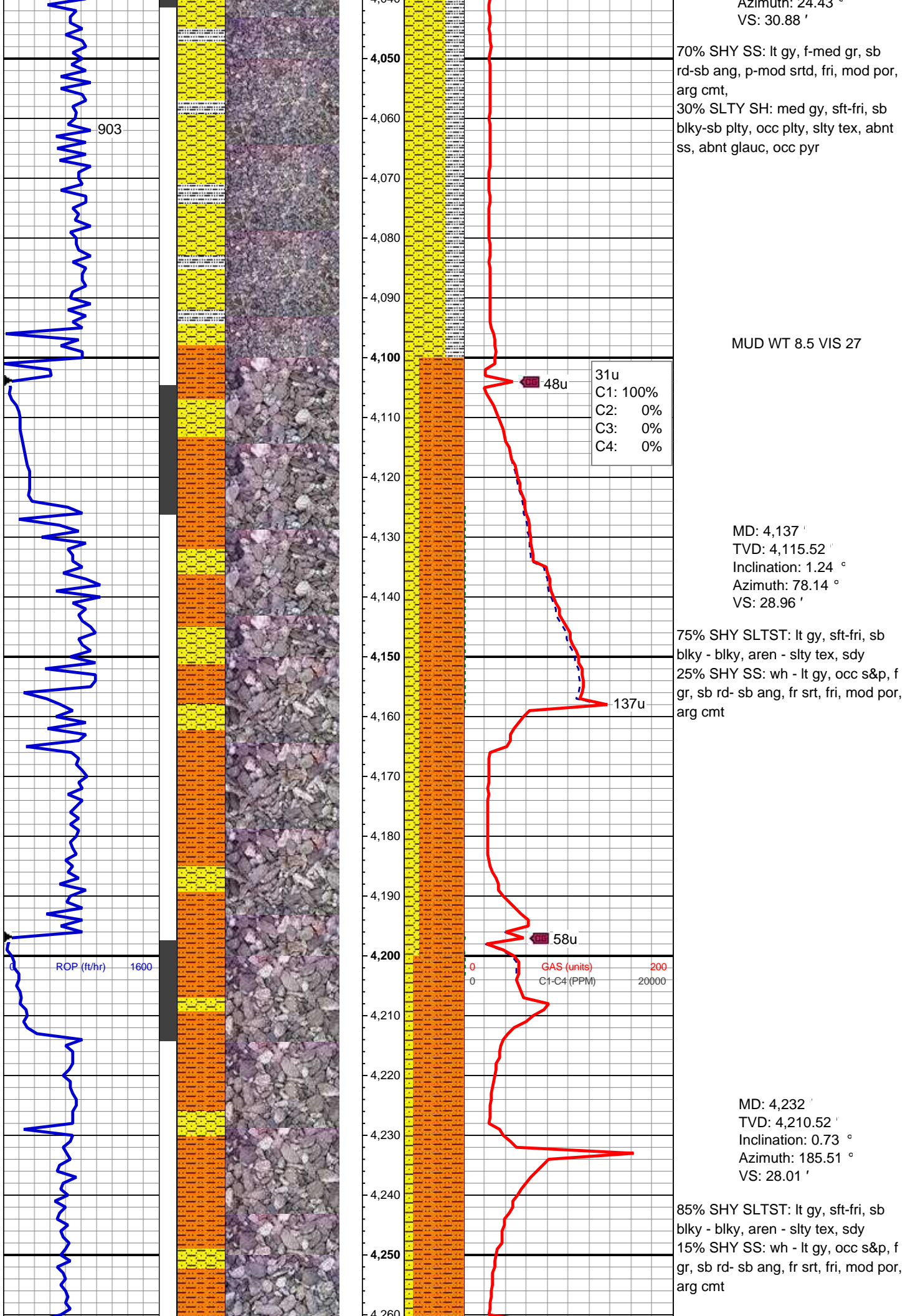
MD: 3,946 '  
TVD: 3,924.78 '  
Inclination: 4.73 °  
Azimuth: 19.14 °  
VS: 33 '

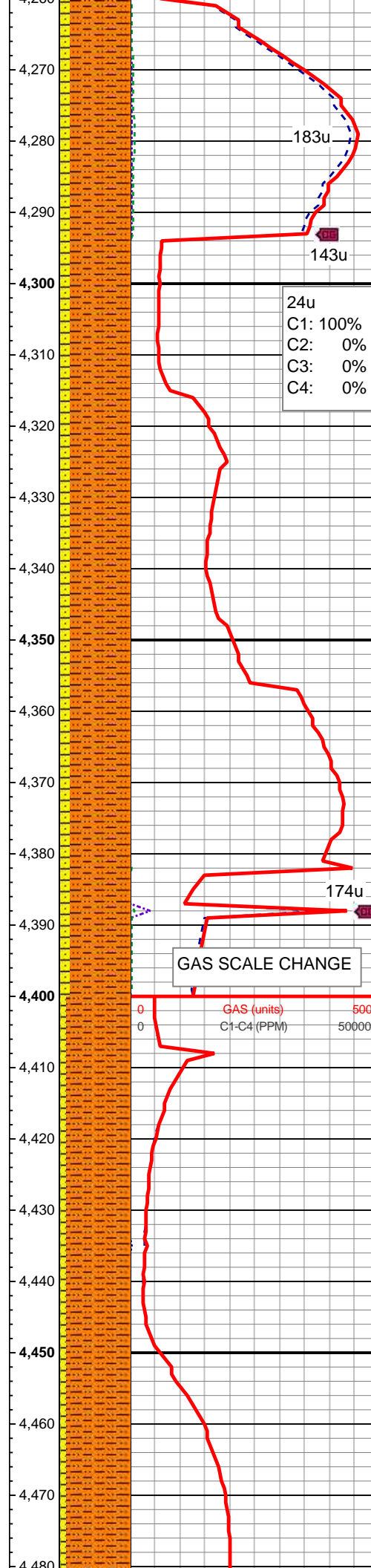
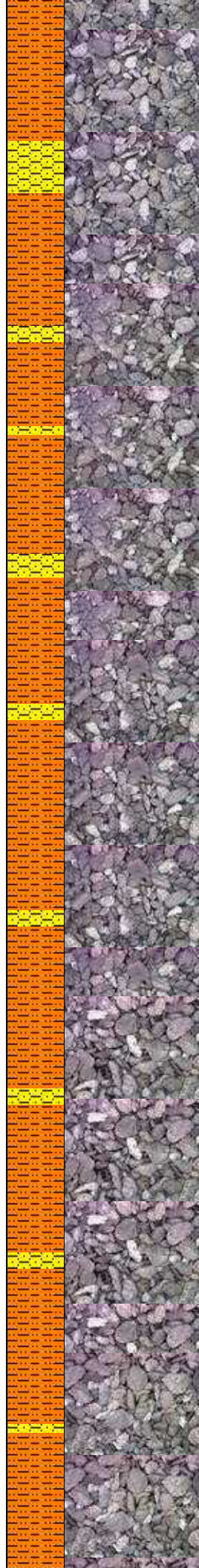
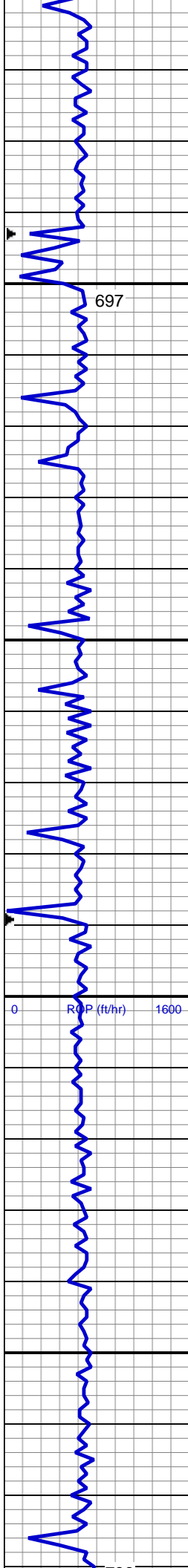
70% SHY SS: lt gy, f-med gr, sb  
rd-sb ang, p-mod srted, fri, mod por,  
pred arg cmt, grdg to  
30% SS: wh, op, trns, s&p, sb  
rd-sb ang, mod-p srted, mod hd,  
mod por, silc cmt, scat slty sh, occ  
glau, tr pyr

GAS (unlts)  
C1-C4 (PPM)

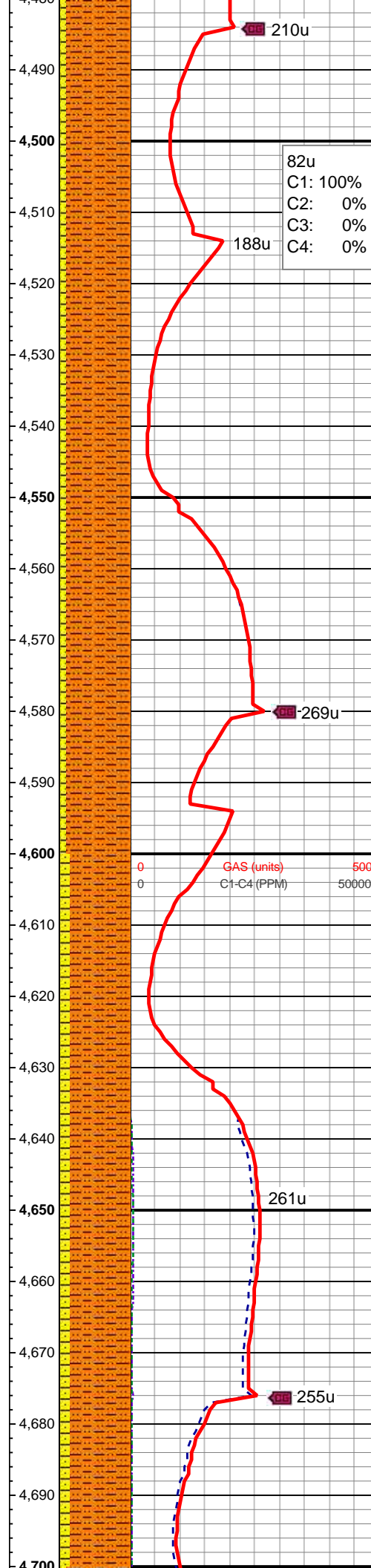
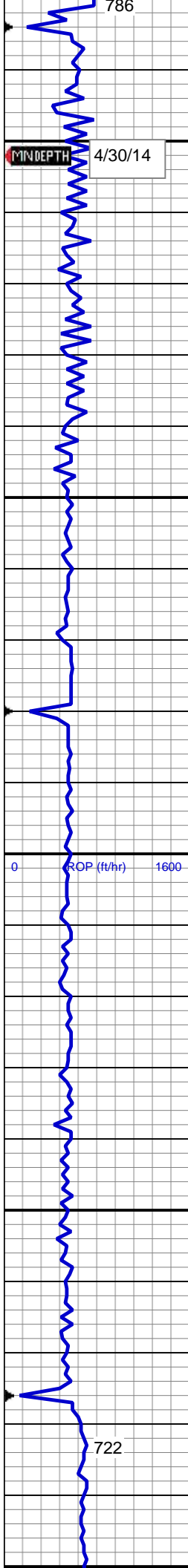
MD: 4,041 '  
TVD: 4,019.58 '  
Inclination: 2.73 °  
Azimuth: 24.42 °









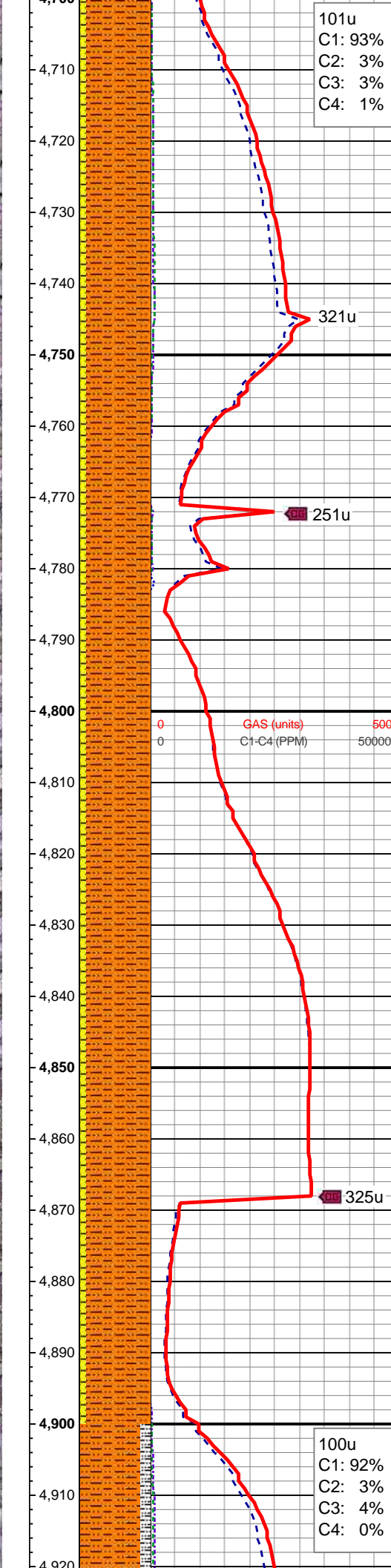
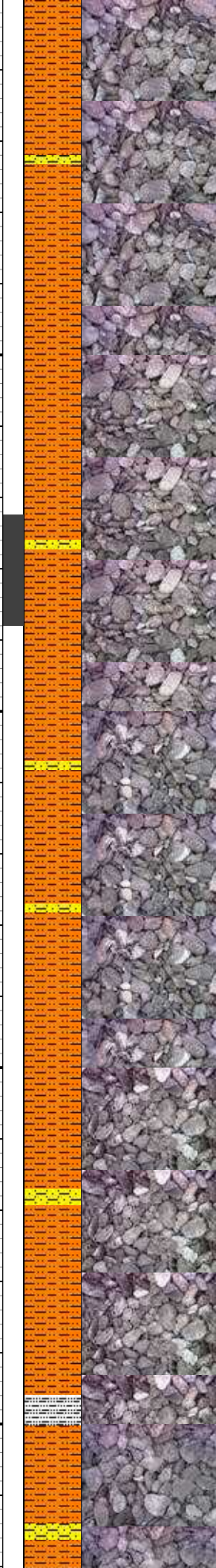
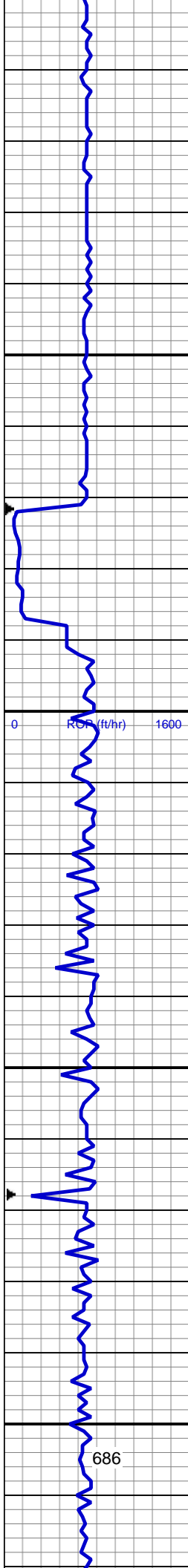


MD: 4,518 '  
TVD: 4,496.49 '  
Inclination: 0.85 °  
Azimuth: 201.65 °  
VS: 28.89 '

90% SHY SLTST: lt gy, sft-fri, sb  
blky - blky, aren - slty tex, sdy  
10% SHY SS: wh - lt gy, occ s&p, f  
gr, sb rd- sb ang, fr srt, fri, mod por,  
arg cmt

MD: 4,614 '  
TVD: 4,592.49 '  
Inclination: 0.56 °  
Azimuth: 238.53 °  
VS: 29.54 '

85% SHY SLTST: lt gy, sft-fri, sb  
blky - blky, aren - slty tex, sdy  
15% SHY SS: wh - lt gy, occ s&p, f  
gr, sb rd- sb ang, fr srt, fri, mod por,  
arg cmt



101u  
C1: 93%  
C2: 3%  
C3: 3%  
C4: 1%

MD: 4,710 '  
TVD: 4,688.48 '  
Inclination: 0.34 °  
Azimuth: 216.96 °  
VS: 30.1 '

90% SHY SLTST: lt gy, sft-fri, sb  
blky - blky, aren - slty tex, sdy  
10% SHY SS: wh - lt gy, occ s&p, f  
gr, sb rd- sb ang, fr srt, fri, mod por,  
arg cmt

321u

251u

MD: 4,805 '  
TVD: 4,783.48 '  
Inclination: 1.17 °  
Azimuth: 136.2 °  
VS: 29.58 '

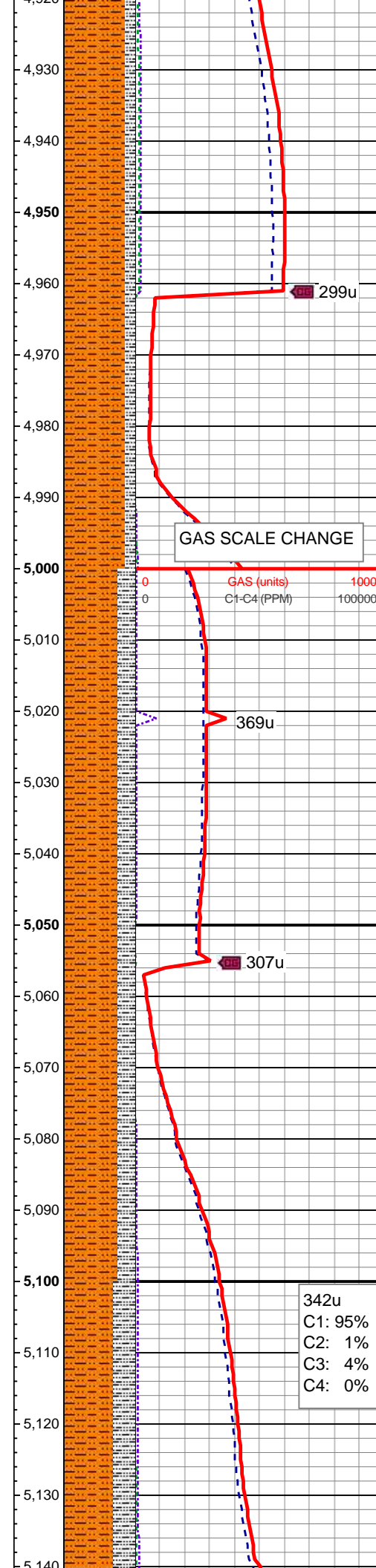
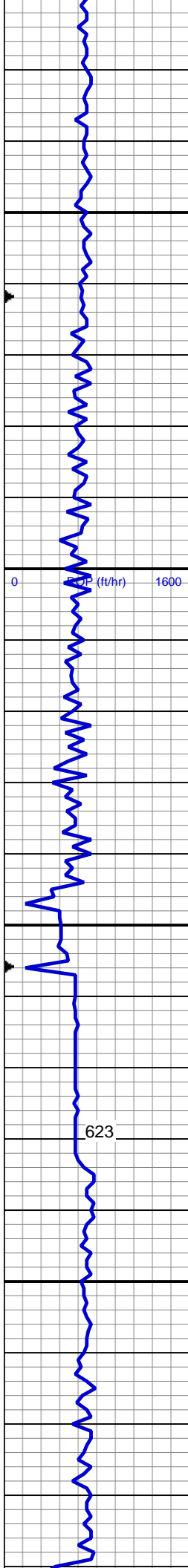
90% SHY SLTST: lt gy, sft-fri, sb  
blky - blky, aren - slty tex, sdy  
10% SHY SS: wh - lt gy, occ s&p, f  
gr, sb rd- sb ang, fr srt, fri, mod por,  
arg cmt

325u

MD: 4,900 '  
TVD: 4,878.47 '  
Inclination: 0.68 °  
Azimuth: 18.62 °  
VS: 28.73 '

100u  
C1: 92%  
C2: 3%  
C3: 4%  
C4: 0%





85% SHY SLTST: lt gy, sft-fri, sb  
blky - blky, aren - slty tex, sdy  
15% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb plty, slty tex, tr ss, v slty

MD: 4,996 '  
TVD: 4,974.47 '  
Inclination: 0.62 °  
Azimuth: 156.29 °  
VS: 28.34 '

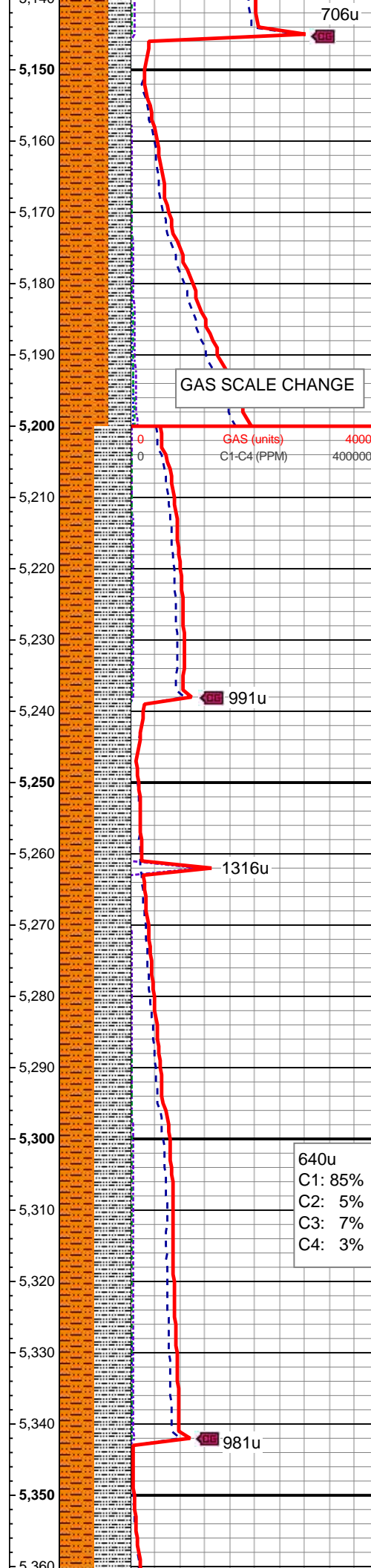
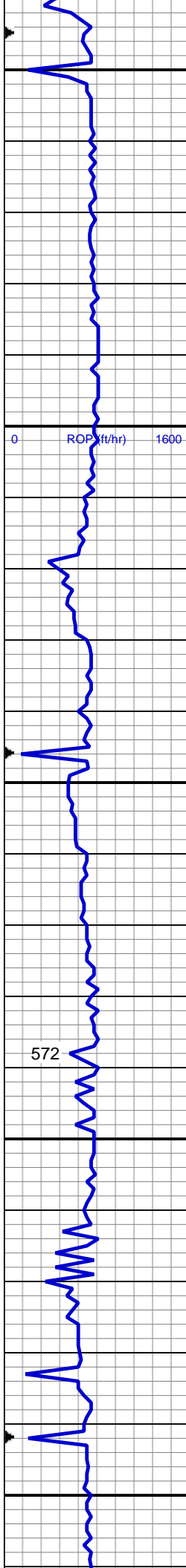
MUD WT 8.65 VIS 27

75% SHY SLTST: lt gy, sft-fri, sb  
blky - blky, aren - slty tex, sdy  
25% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb plty, slty tex, tr ss, v slty

MD: 5,092 '  
TVD: 5,070.46 '  
Inclination: 0.46 °  
Azimuth: 184.72 °  
VS: 28.15 '

342u  
C1: 95%  
C2: 1%  
C3: 4%  
C4: 0%

70% SHY SLTST: lt gy, sft-fri, sb  
blky - blky, aren - slty tex, sdy  
30% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb plty, slty tex, tr ss, v slty

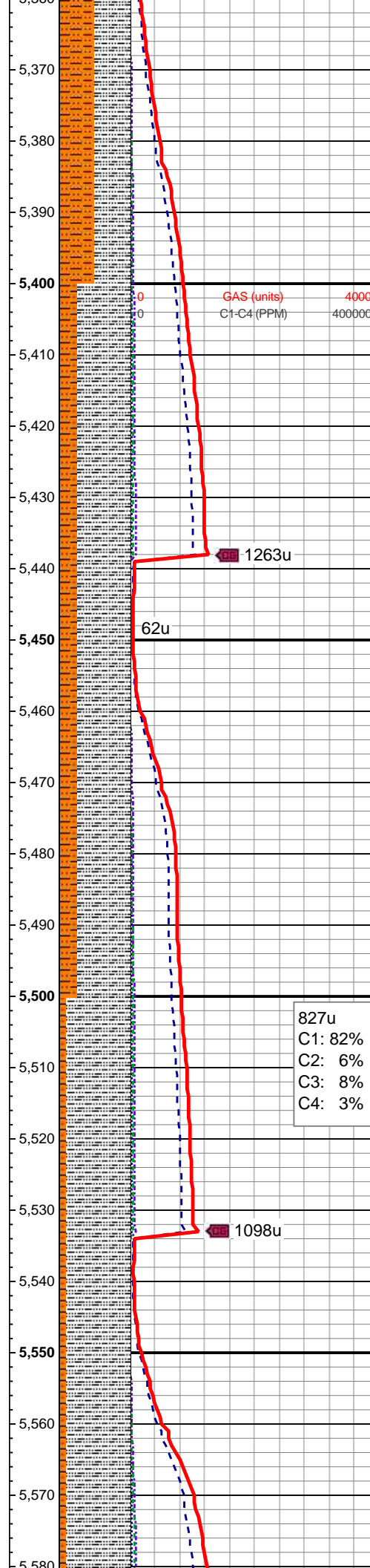
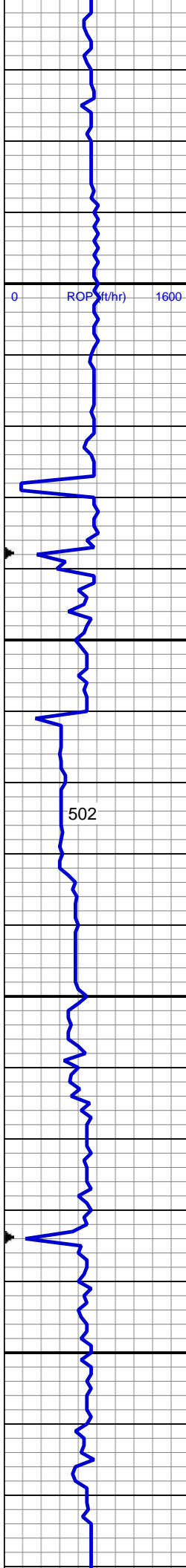


50% SHY SLTST: lt gy, sft-fri, sb  
blky - blky, aren - slty tex, sdy  
50% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb plty, slty tex, tr ss, v slty

MD: 5,283 '  
TVD: 5,261.46 '  
Inclination: 0.64 °  
Azimuth: 238.35 °  
VS: 28.92 '

50% SHY SLTST: lt gy, sft-fri, sb  
blky - blky, aren - slty tex, sdy  
50% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb plty, slty tex, tr ss, v slty



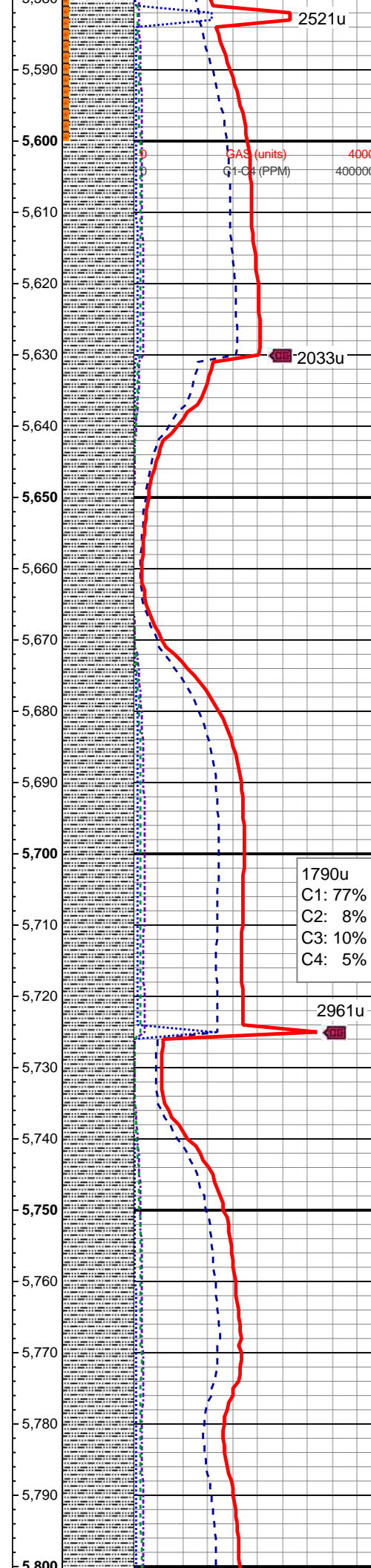
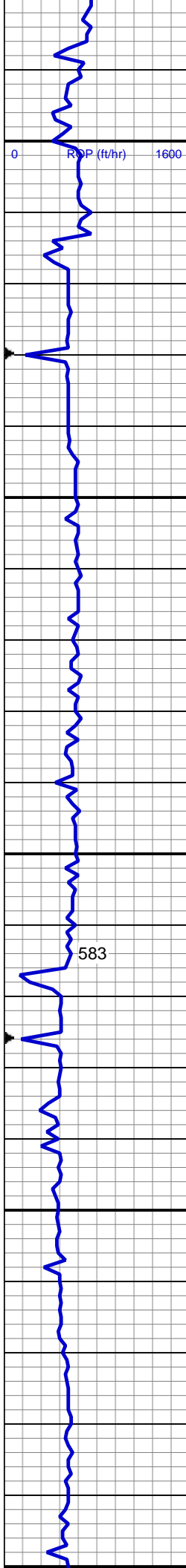


75% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb pty, slty tex, tr ss, v slty  
25% SHY SLTST: lt gy, sft-fri, sb  
blky - blky, aren - slty tex, sdv

MD: 5,474 ' TVD: 5,452.45 ' Inclination: 0.35 ° Azimuth: 125.08 ° VS: 29.07 '

90% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb pty, slty tex, tr ss, v slty  
10% SHY SLTST: lt gy, sft-fri, sb  
blky - blky, aren - slty tex, sdv

MUD WT 8.75 VIS 28



100% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb plty, slty tex, tr ss, v slty

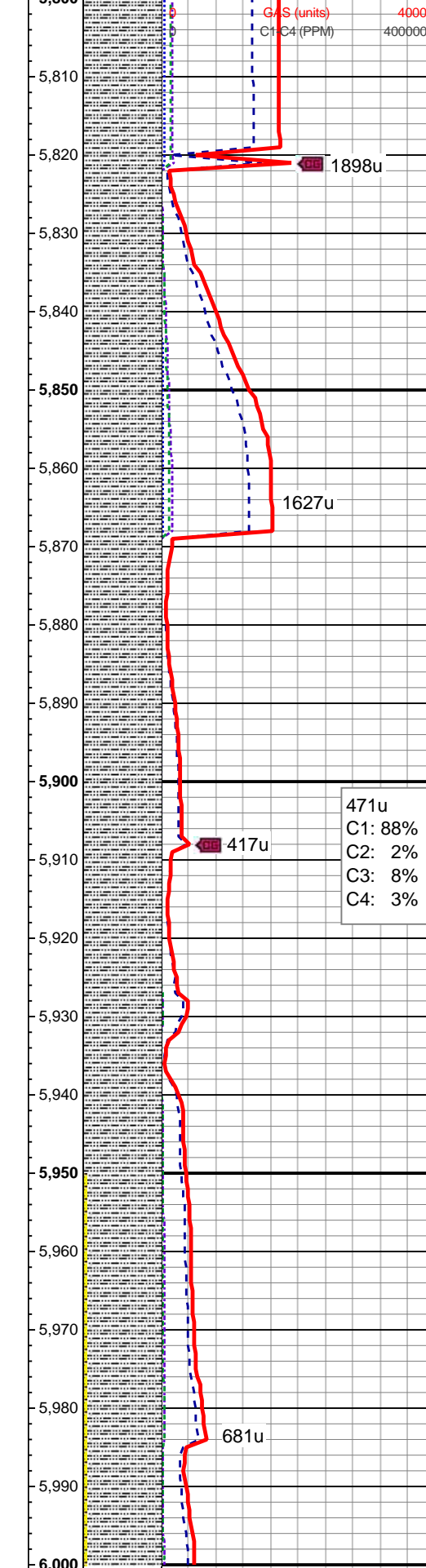
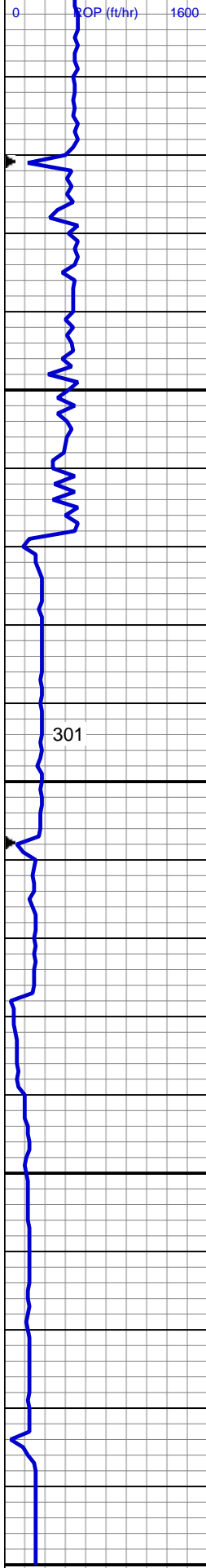
MD: 5,666 '  
TVD: 5,644.44 '  
Inclination: 0.68 °  
Azimuth: 118.84 °  
VS: 27.58 '

MUD WT 8.95 VIS 33

100% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb plty, slty tex, tr ss, v slty

MD: 5,761 '  
TVD: 5,739.43 '  
Inclination: 0.5 °  
Azimuth: 140.7 °  
VS: 26.81 '





MD: 5,808 '  
TVD: 5,786.43 '  
Inclination: 0.49 °  
Azimuth: 107.06 °  
VS: 26.49 '

100% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb plty, slty tex, tr sh

TD Vertical @ 5868' MD; 0400 hrs  
4/30/2014

TOOH For Directional BHA at  
5,868' MD

BHA # 2  
Bit Size: 6.750  
Manufacturer: HDBS  
Model: MMD55M  
Serial Number: 12447711  
Nozzles: 5x16  
Motor Number: 2  
Manufacturer: Sperry Drilling  
Model: SperryDrill  
Serial Number: 675-0109  
Bend: 2

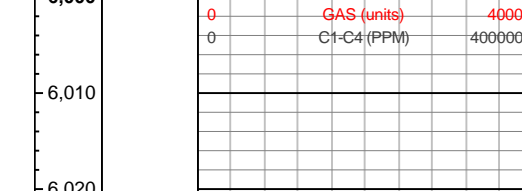
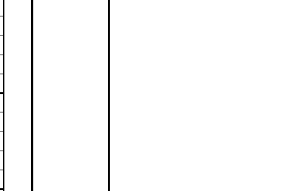
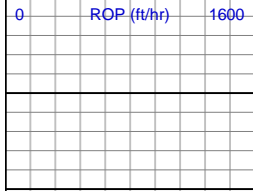
100% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb plty, slty tex, tr sh, occ grd  
to shy ss

MUD WT 9.3 VIS 36

MD: 5,943 '  
TVD: 5,921.38 '  
Inclination: 2.92 °  
Azimuth: 262.3 °  
VS: 29.33 '

100% SLTY SH: lt-med gy, sft-fri, sb  
blky-sb plty, slty tex, tr sh, grd to  
shy ss

MD: 5,990 '  
TVD: 5,968.16 '  
Inclination: 7.72 °  
Azimuth: 265.09 °  
VS: 33.66 '



LOG CONTINUED ON:  
WELLS RANCH  
AE30-69HNB(HORZ).mplot

Thank You For Choosing

