

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Wells Ranch AA21-64-1HN(VERT)

Location SEC 21;T6N;R63W

State COLORADO

County WELD

Country USA

Rig Number H&P 322

API Number 05-123-37596-0000

Region DJ BASIN

Field WATTENBERG

Spud Date 2/1/2014

Drilling Completed 2/7/2014

Surface Coordinates LAT: 40.46778°N
LONG: 104.43413°W
1063' FSL
523' FEL

Bottom Hole Coordinates 1650'FSL
535' FWL

Ground Elevation 4730'

K.B. Elevation 4754'

Logged Interval 1000' **To** 6000'

Total Depth 11034'

Formation NIOBRARA "B" MARL

Type of Drilling Fluid MUD;WATER;POLY

Operator

Company Noble Energy Inc

Address 1625 BROADWAY
DENVER, CO 80202
(303) 228-4000

Geologist

Name MIKE GREENE, MOHAMMED ALMUBARAK

Company COLUMBINE LOGGING, INC.

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

Rock Types

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

Accessories

Fossils

ALGAE
AMPHIPORA
BELEMNITE
BIOCLASTIC
BRACHIOIPOD
BRYOZOA
CEPHALOPOD
CORAL
CRINOID
ECHINOID
FISH
FORAMINIFERA

Fossils

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

Minerals

Minerals

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

Minerals

FERRUGINOUS
GLAUCONITE
GYPSIFEROUS
HEAVY MINERAL
KAOLIN
MARLSTONE
MINERAL CRYSTALS
NODULES
PHOSPHATE PELLETS
PYRITE
SALT CAST
SANDY
SILICEOUS
SILTY

Minerals

TUFFACEOUS
ANHYDRITE STRINGER
BENTONITE STRINGER
COAL STRINGER
DOLOMITE STRINGER
GYPSUM 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

EARTHY
FENESTRAL
FRACTURE
INTERCRYSTALLINE
INTEROOLITIC

Oil Show

MOLDIC
ORGANIC
PINPOINT
VUGGY

Engineering

BIT
CONNECTION (LEFT)
CONNECTION (RIGHT)
CONNECTION GAS
CORE - LOST
CORE - RECOVERED
DST INTERVAL

Other Symbols

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

Other Symbols

WIRELINE TESTED - LEFT
WIRELINE TESTED - RT

Rounding

ANGULAR
ROUNDED
SUBANG
SUBRND

Textures

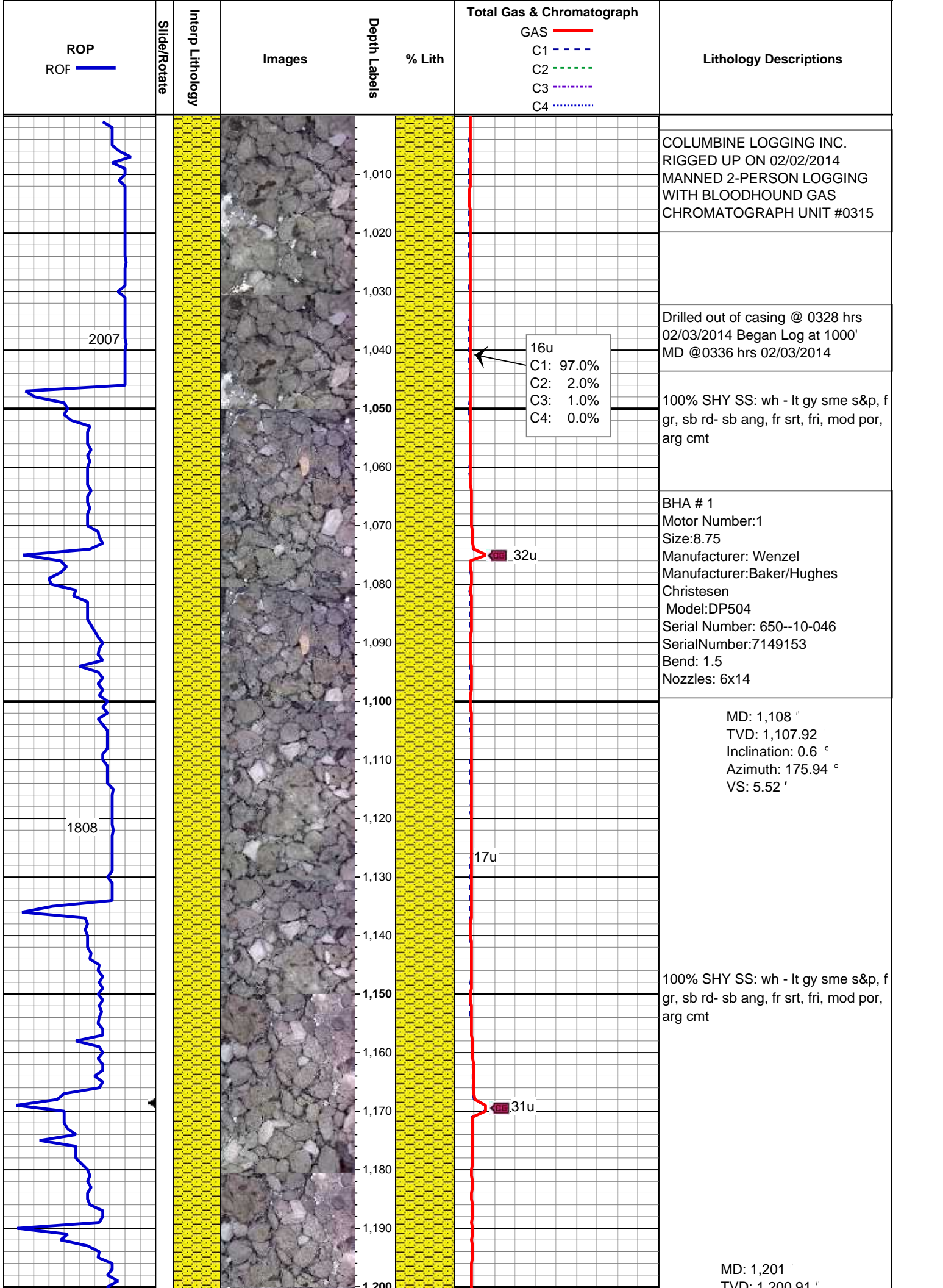
BOUNDSTONE
CHALKY
CRYPTOXLN

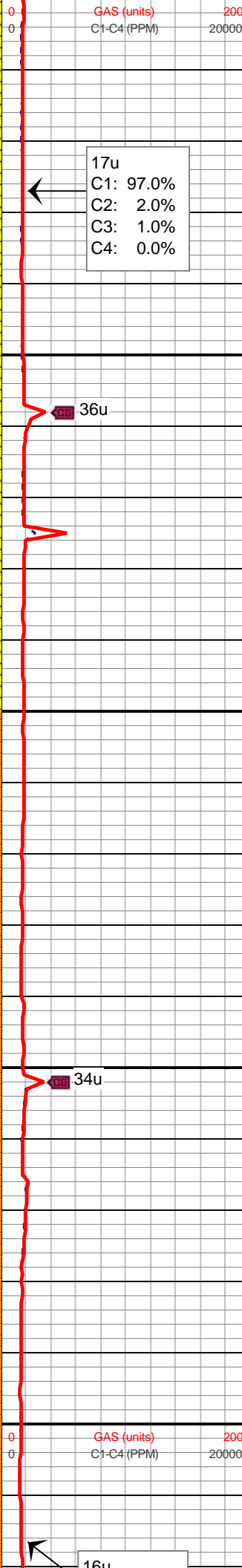
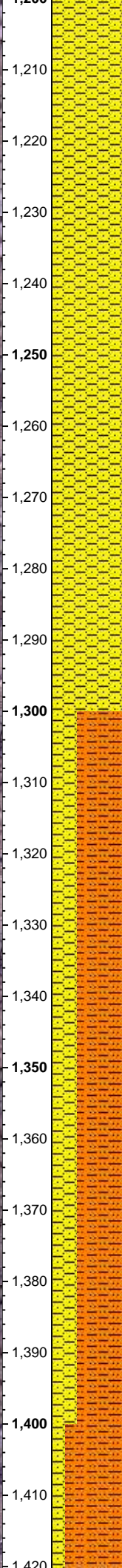
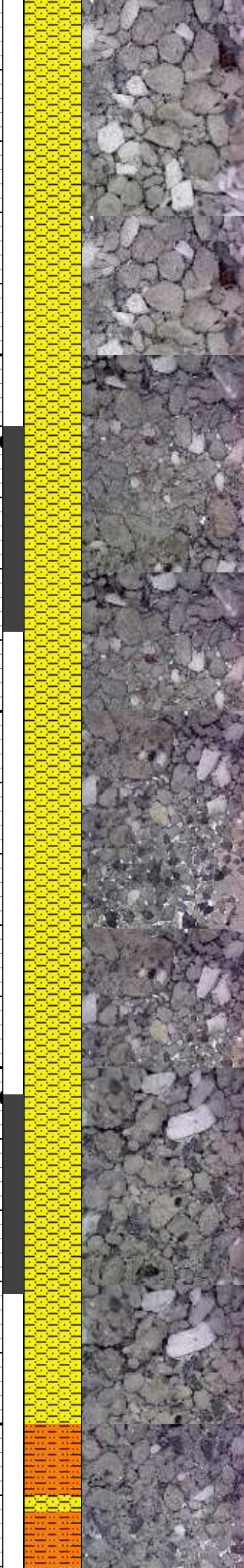
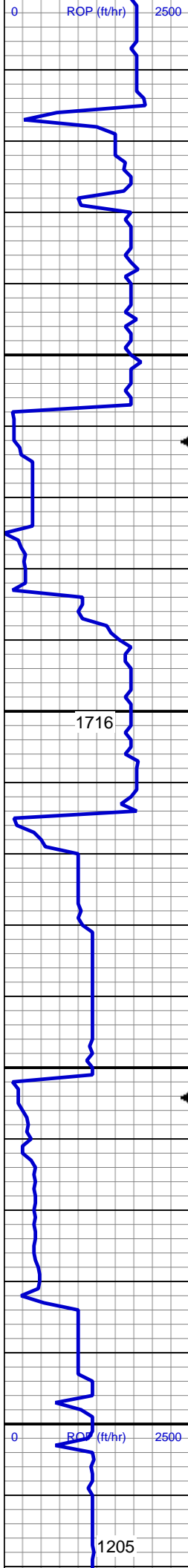
Other Symbols

EARTHY
FINELYXLN
GRAINSTONE
LITHOGRAPHIC
MICROXLN
MUDSTONE
PACKSTONE
WACKESTONE

Sorting

MODERATE
POOR
WELL





TVD: 1,200.31
Inclination: 0.62 °
Azimuth: 154.95 °
VS: 5.15 '

100% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 1,294 '
TVD: 1,293.9 '
Inclination: 1.62 °
Azimuth: 75.61 °
VS: 3.66 '

65% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
35% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 1,387 '
TVD: 1,386.74 '
Inclination: 4.7 °
Azimuth: 63.58 °
VS: -0.73 '

10u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

80% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
20% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 1,480 '
TVD: 1,479.2 '
Inclination: 7.58 °
Azimuth: 59.13 °
VS: -8.74 '

15u

1204

33u

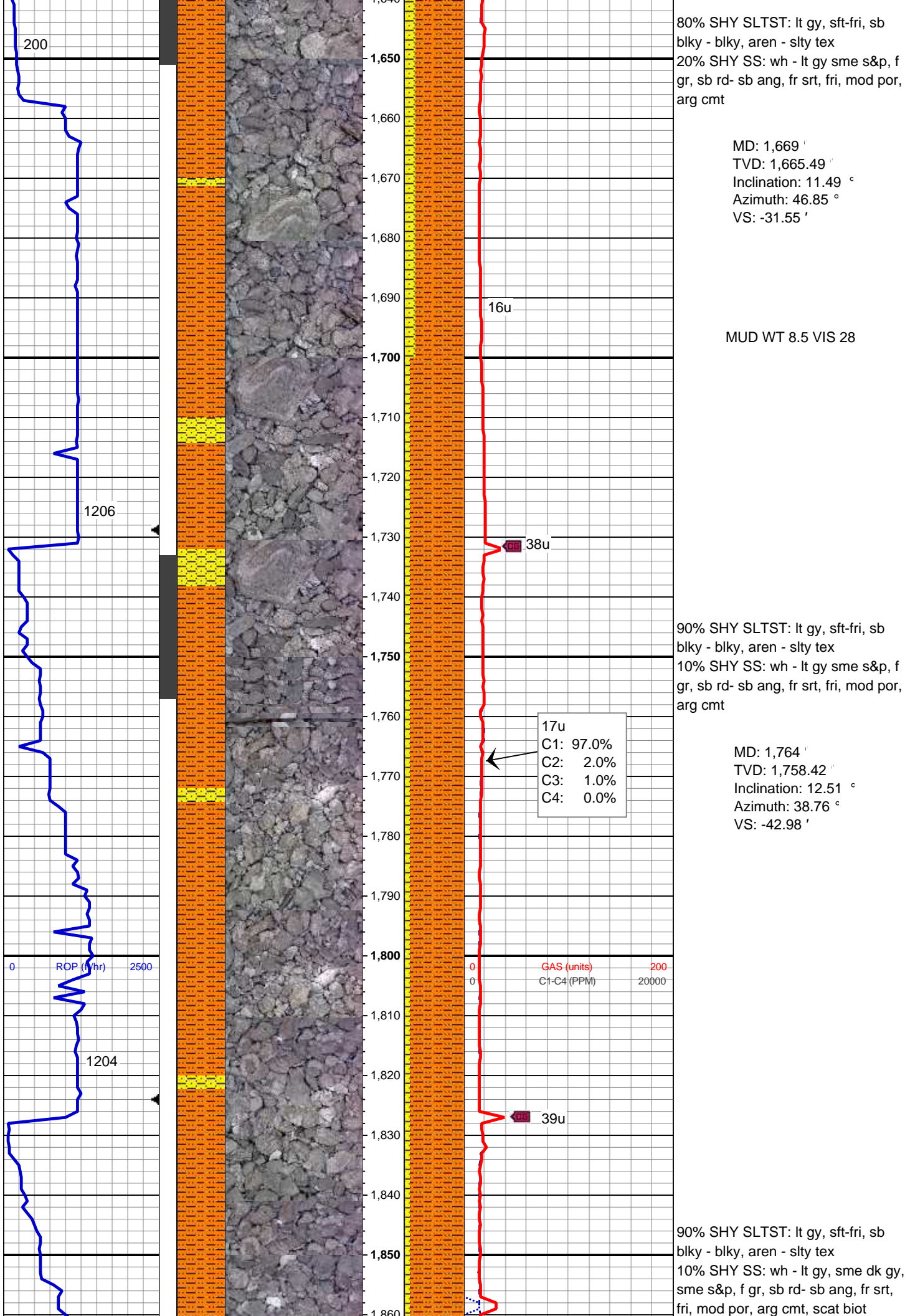
75% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
25% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

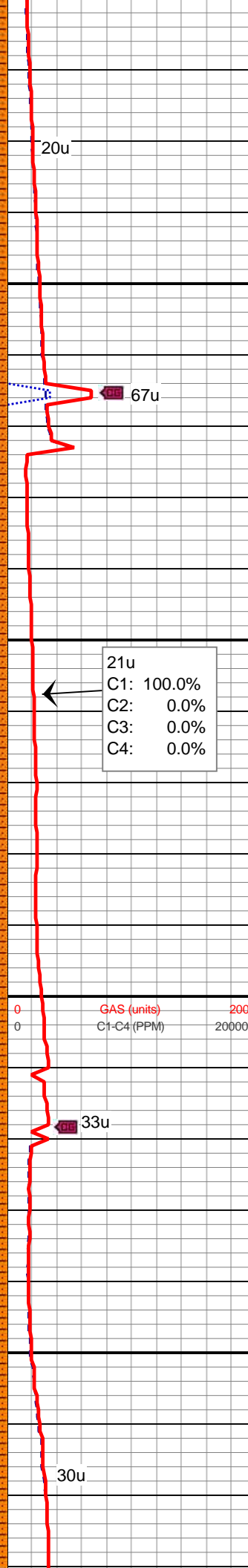
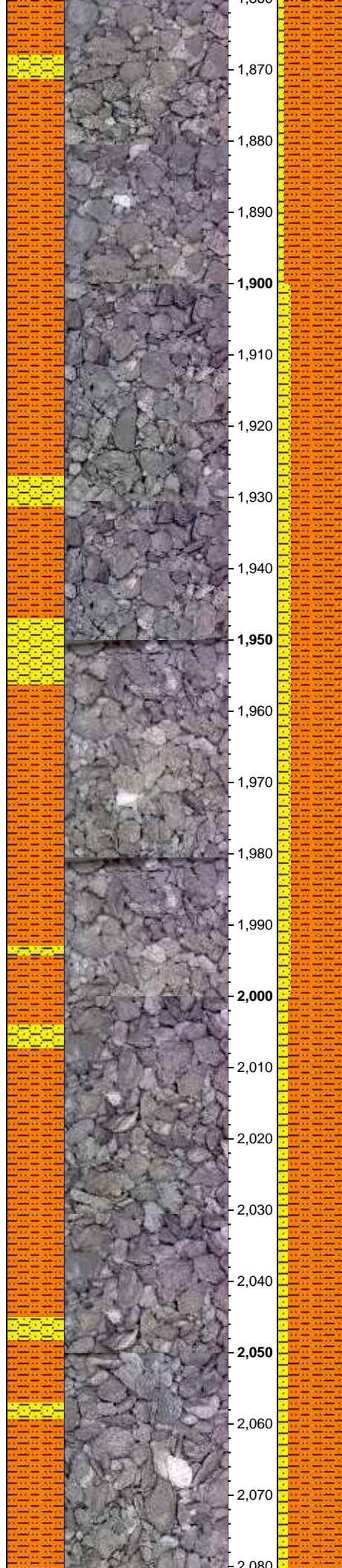
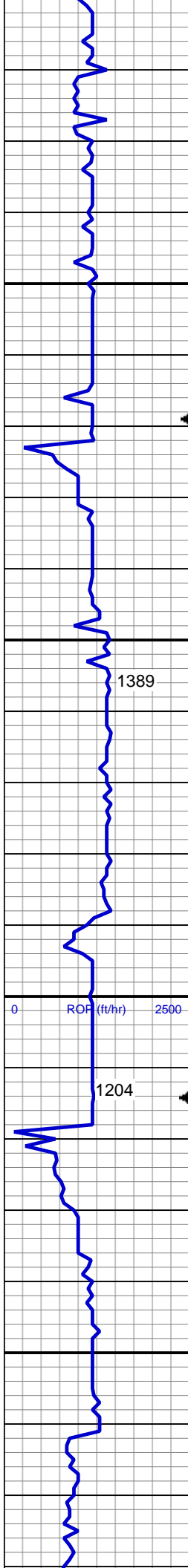
16u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

MD: 1,574 '
TVD: 1,572.12 '
Inclination: 9.77 °
Azimuth: 55.08 °
VS: -19.54 '

0 ROP (ft/hr) 2500

0 GAS (units) 200
0 C1-C4 (PPM) 20000



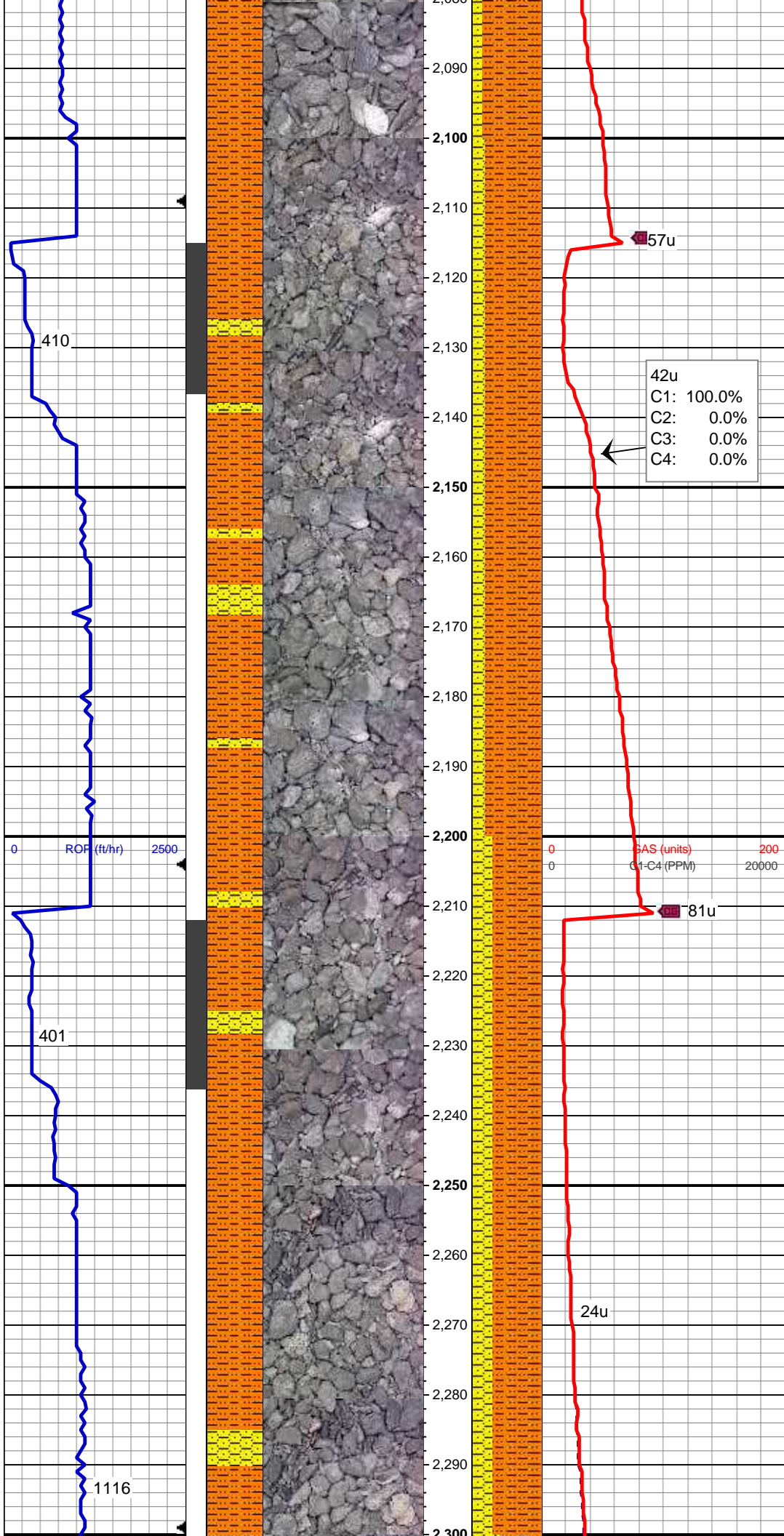


MD: 1,859 '
TVD: 1,850.88 '
Inclination: 14.06 °
Azimuth: 36.29 °
VS: -53.97 '

80% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
20% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt

MD: 1,954 '
TVD: 1,943.07 '
Inclination: 13.89 °
Azimuth: 34.22 °
VS: -64.76 '

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



80% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
20% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt

MD: 2,144 '
TVD: 2,127.75 '
Inclination: 13.88 °
Azimuth: 36.04 °
VS: -84.95 '

MD: 2,239 '
TVD: 2,219.71 '
Inclination: 15.19 °
Azimuth: 33.85 °
VS: -96.03 '

70% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
30% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt

MUD WT 8.5+ VIS 28

MD: 2,333 '
TVD: 2,310.61 '
Inclination: 14.33 °
Azimuth: 31.59 °
VS: -106.36 '

60% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
40% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt

18u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

49u

69u

MD: 2,428 '
TVD: 2,402.48 '
Inclination: 15.17 °
Azimuth: 33.57 °
VS: -116.73 '

65% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
35% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt

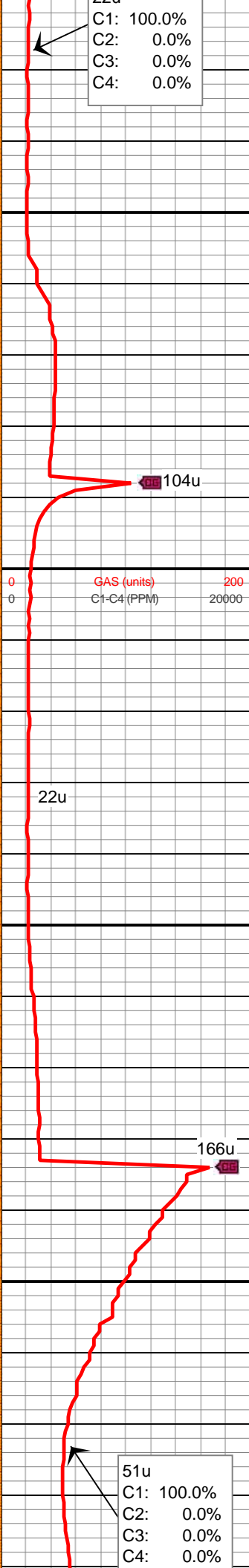
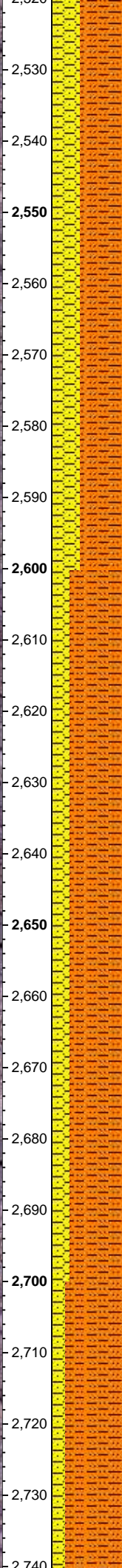
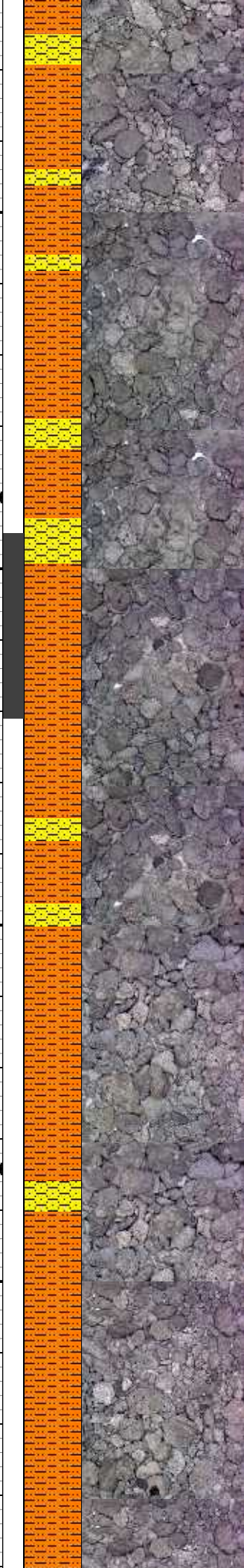
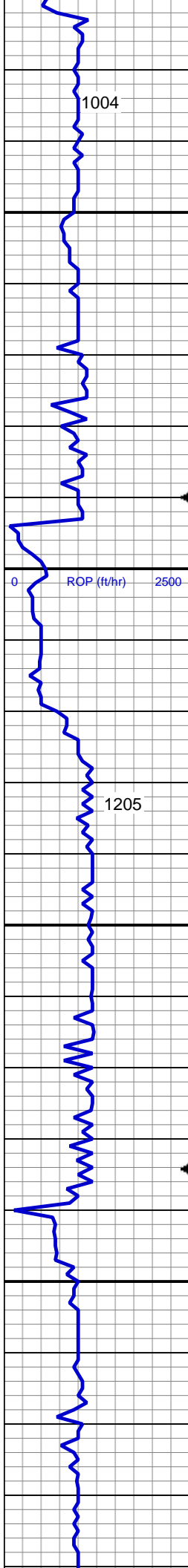
20u

24u

22u

1128

ROP (ft/hr)



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

MD: 2,523 '
TVD: 2,494.41 '
Inclination: 14.04 °
Azimuth: 31.2 °
VS: -126.94 '

60% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
40% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt

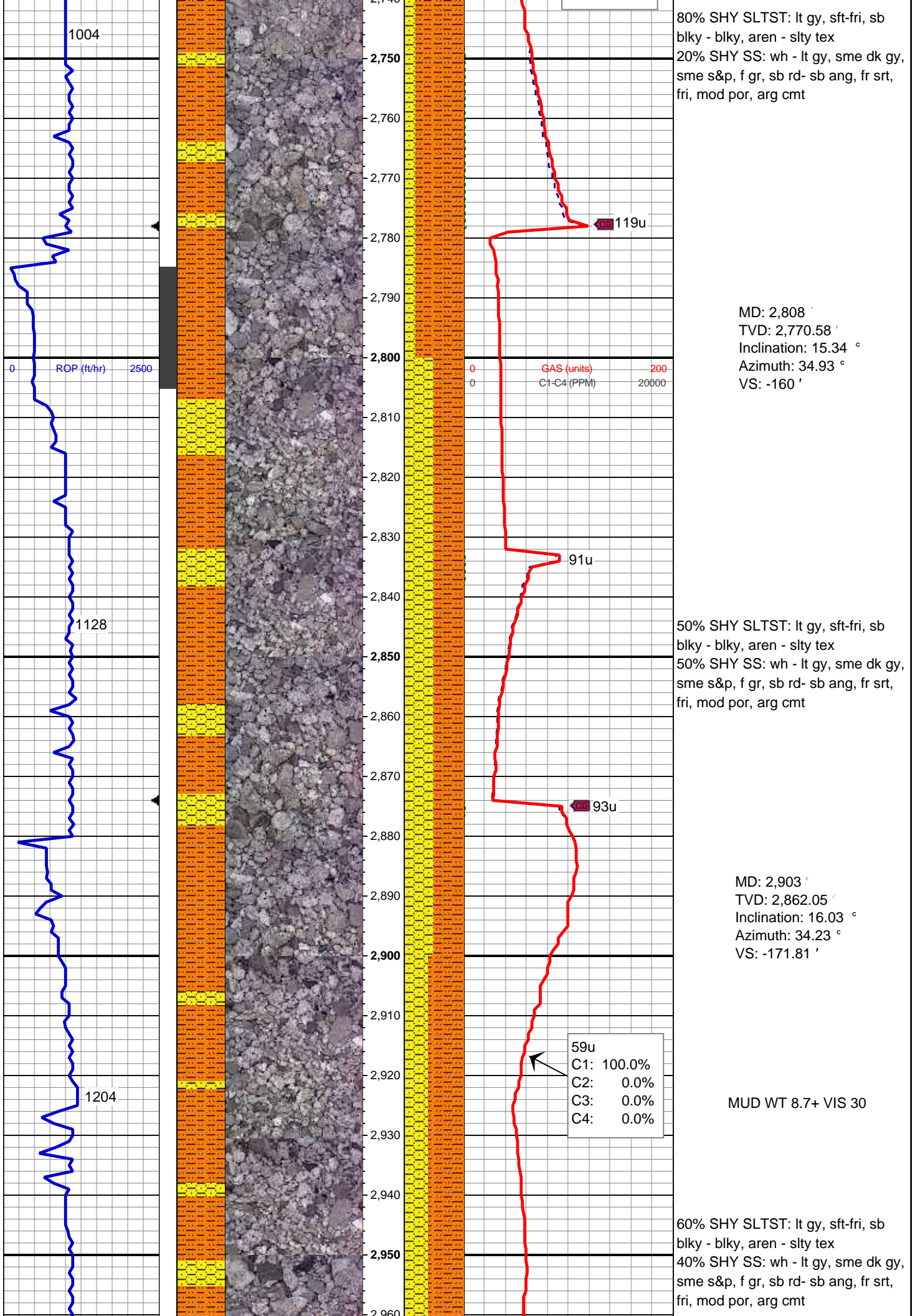
MUD WT 8.6+ VIS 30

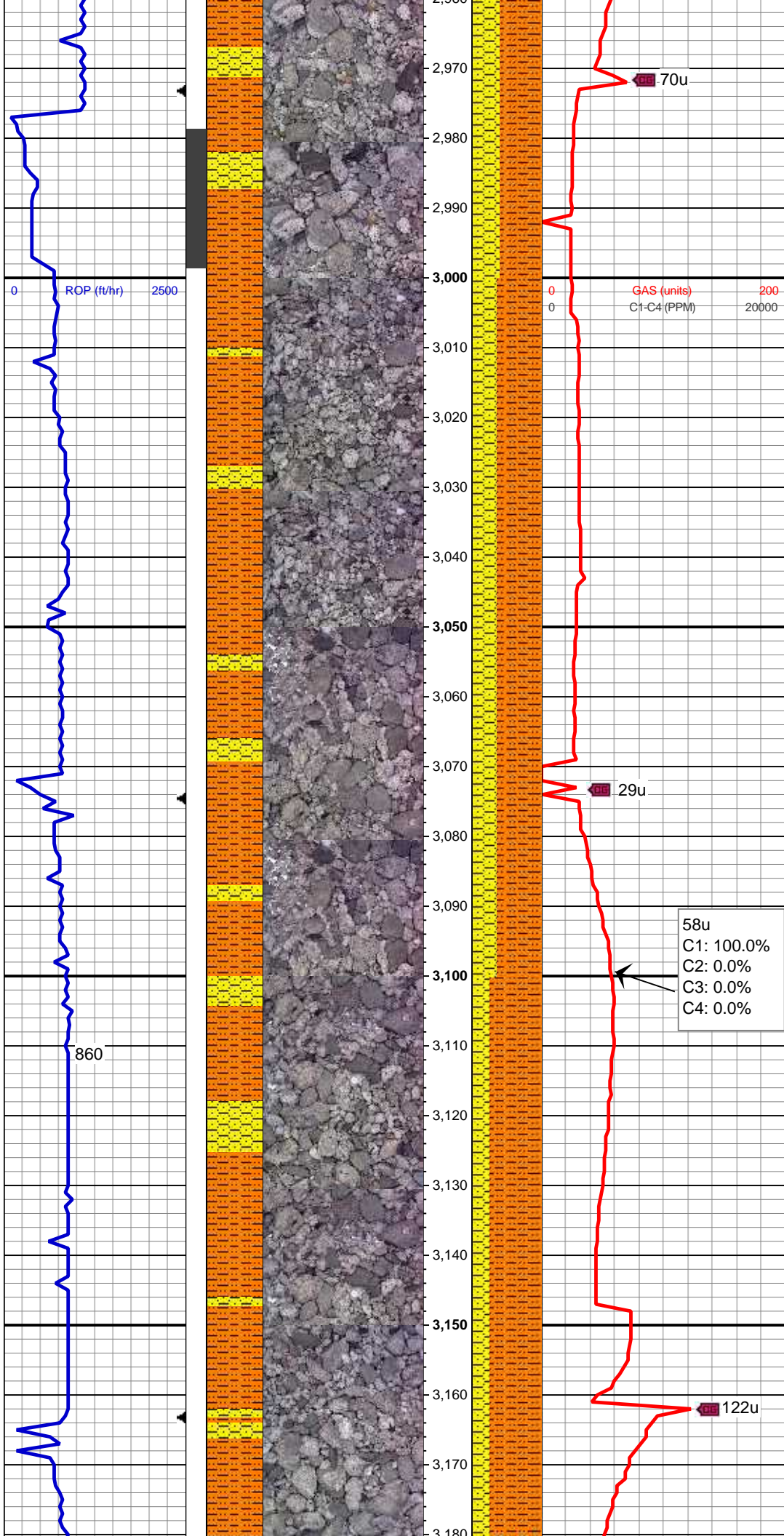
MD: 2,618 '
TVD: 2,586.51 '
Inclination: 14.35 °
Azimuth: 35.46 °
VS: -137.2 '

75% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
25% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt

MD: 2,713 '
TVD: 2,678.65 '
Inclination: 13.84 °
Azimuth: 37.23 °
VS: -148.46 '

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





MD: 2,998 '
TVD: 2,953.35 '
Inclination: 16.1 °
Azimuth: 41.62 °
VS: -185.21 '

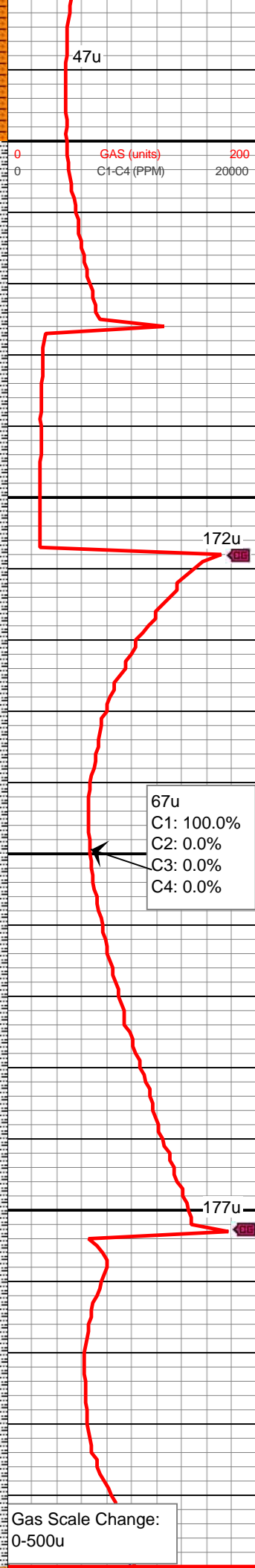
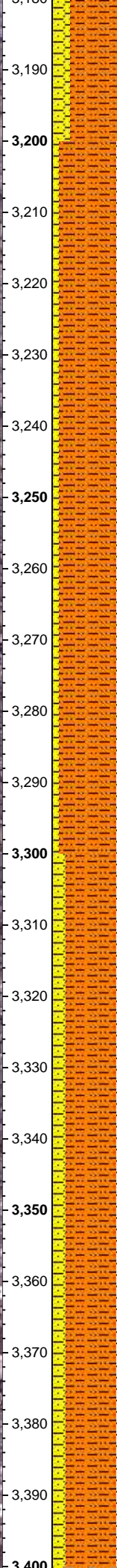
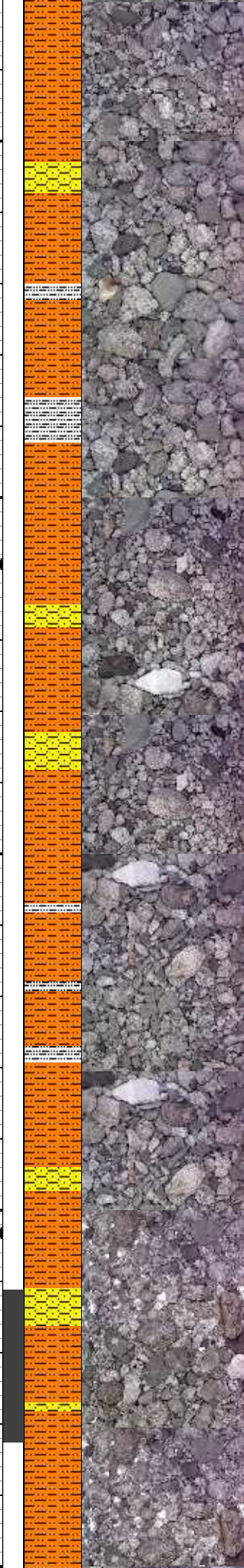
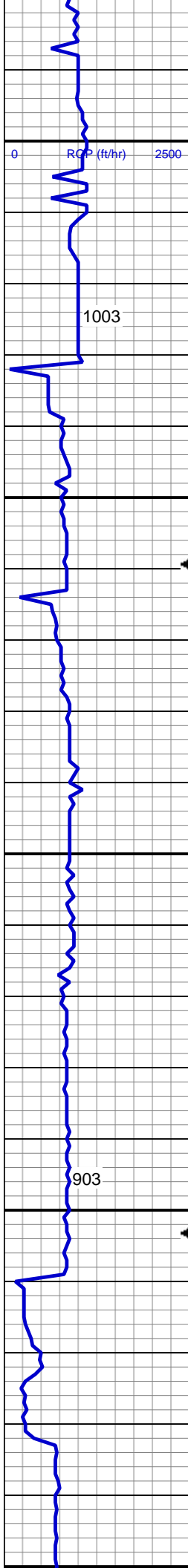
65% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
35% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt

58u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

MD: 3,093 '
TVD: 3,044.73 '
Inclination: 15.6 °
Azimuth: 41.13 °
VS: -199.79 '

75% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
25% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt

MD: 3,188 '
TVD: 3,126.22 '



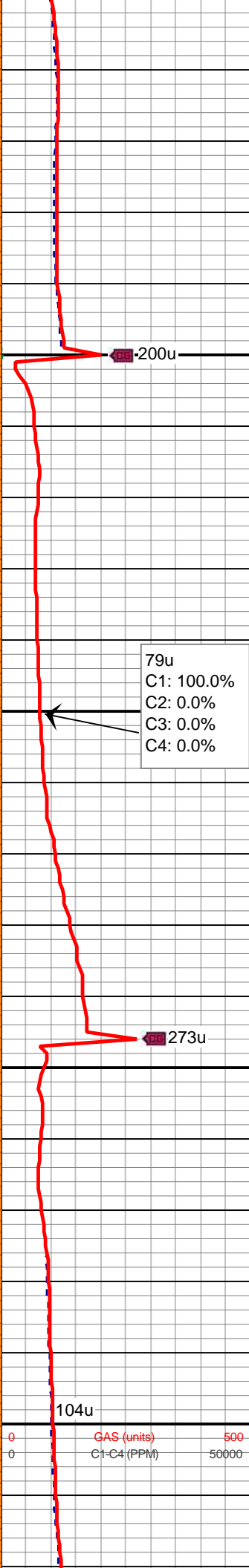
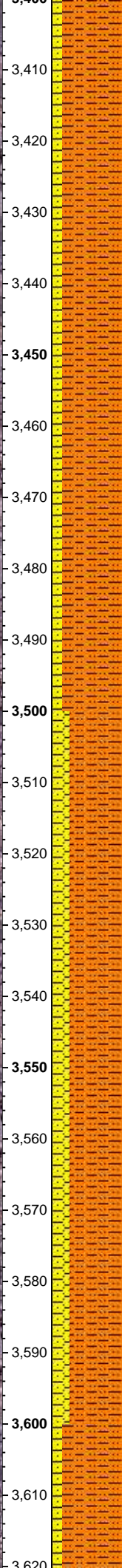
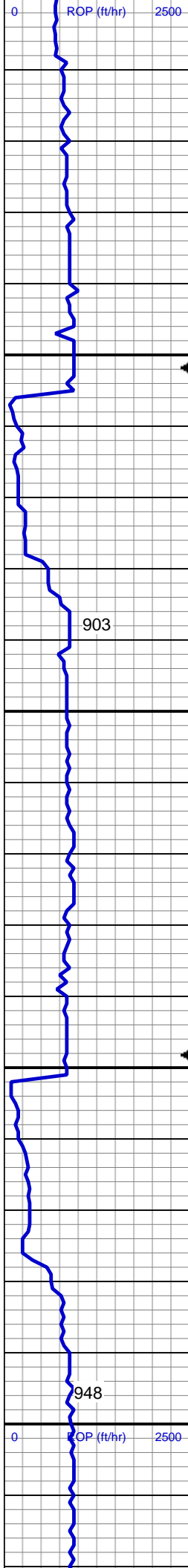
TVD: 3,136.32 '
Inclination: 15.22 °
Azimuth: 41.51 °
VS: -213.95 '

80% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
10% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt
10% SILTY SH: m-dk gy occ gy brn,
firm-sl sft, rthy-sl slty

MD: 3,282 '
TVD: 3,227.34 '
Inclination: 13.69 °
Azimuth: 42.09 °
VS: -227.27 '

70% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
20% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt
10% SILTY SH: m-dk gy occ gy brn,
firm-sl sft, rthy-sl slty

MD: 3,377 '
TVD: 3,319.75 '
Inclination: 13.14 °
Azimuth: 39.92 °
VS: -239.53 '



MUD WT 8.9 VIS 30

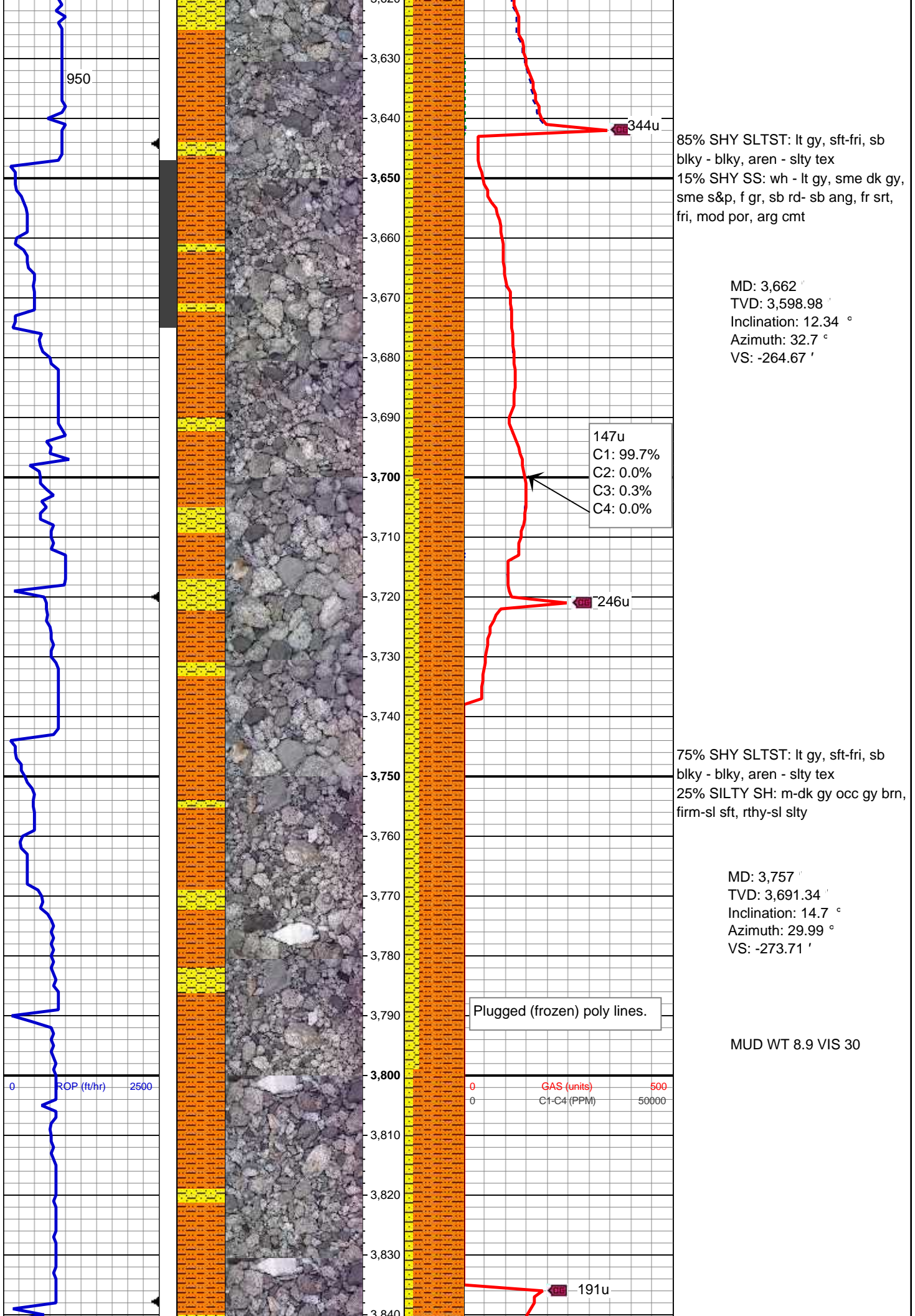
85% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
15% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt

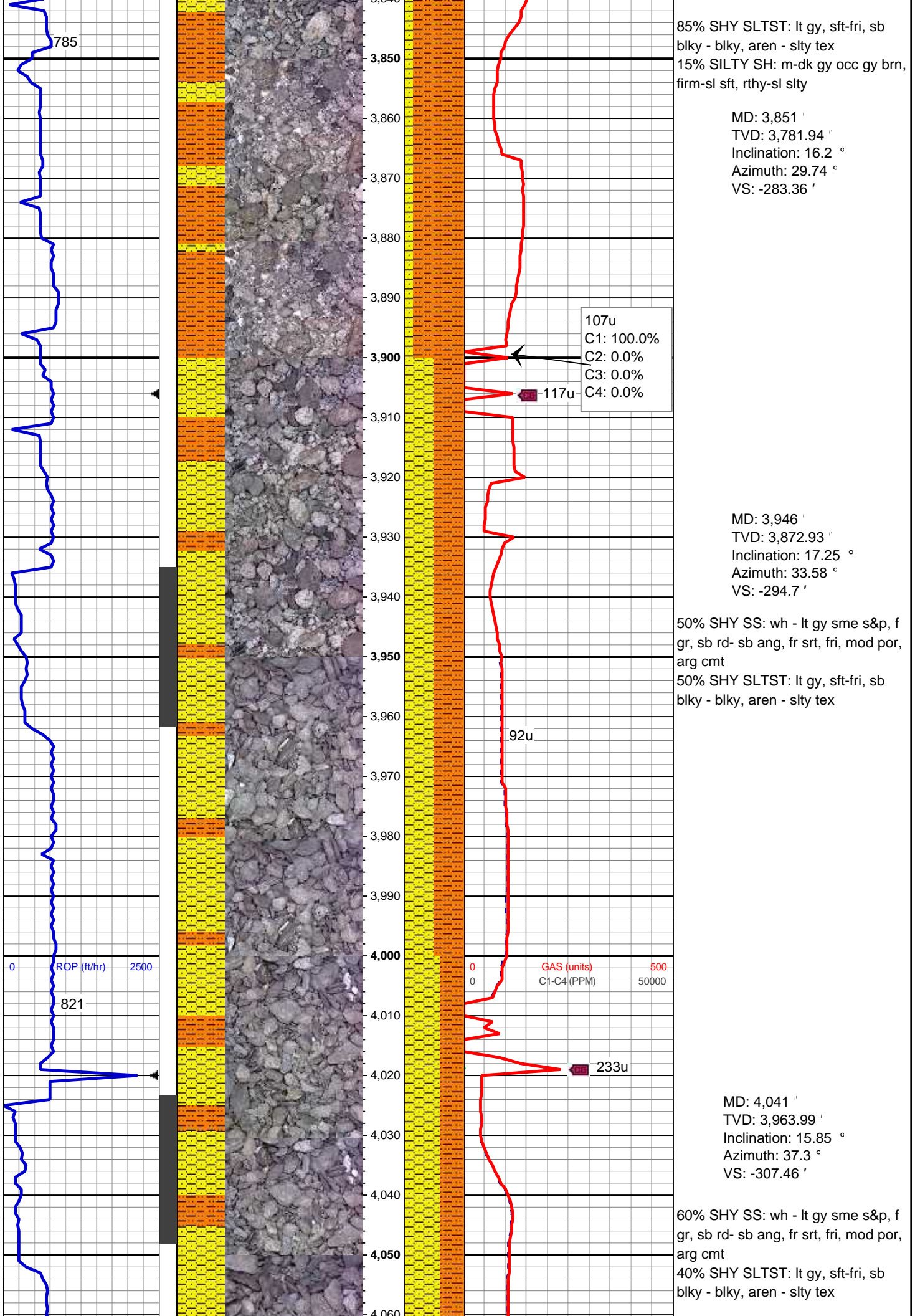
MD: 3,472 '
TVD: 3,412.66 '
Inclination: 10.92 °
Azimuth: 31.14 °
VS: -249.02 '

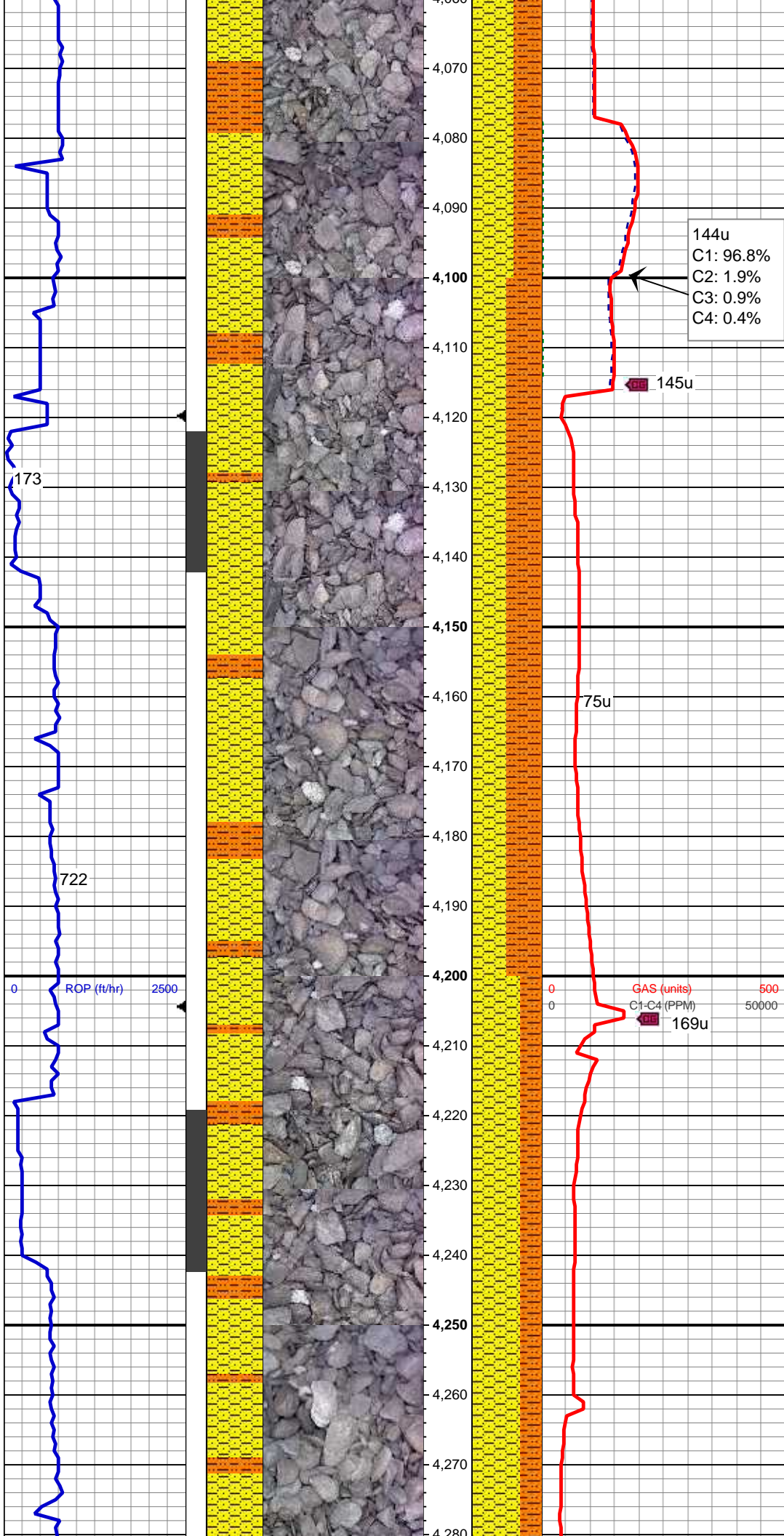
79u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

75% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
25% SHY SS: wh - lt gy, sme dk gy,
sme s&p, f gr, sb rd- sb ang, fr srt,
fri, mod por, arg cmt

MD: 3,567 '
TVD: 3,505.94 '
Inclination: 10.95 °
Azimuth: 32.19 °
VS: -256.49 '







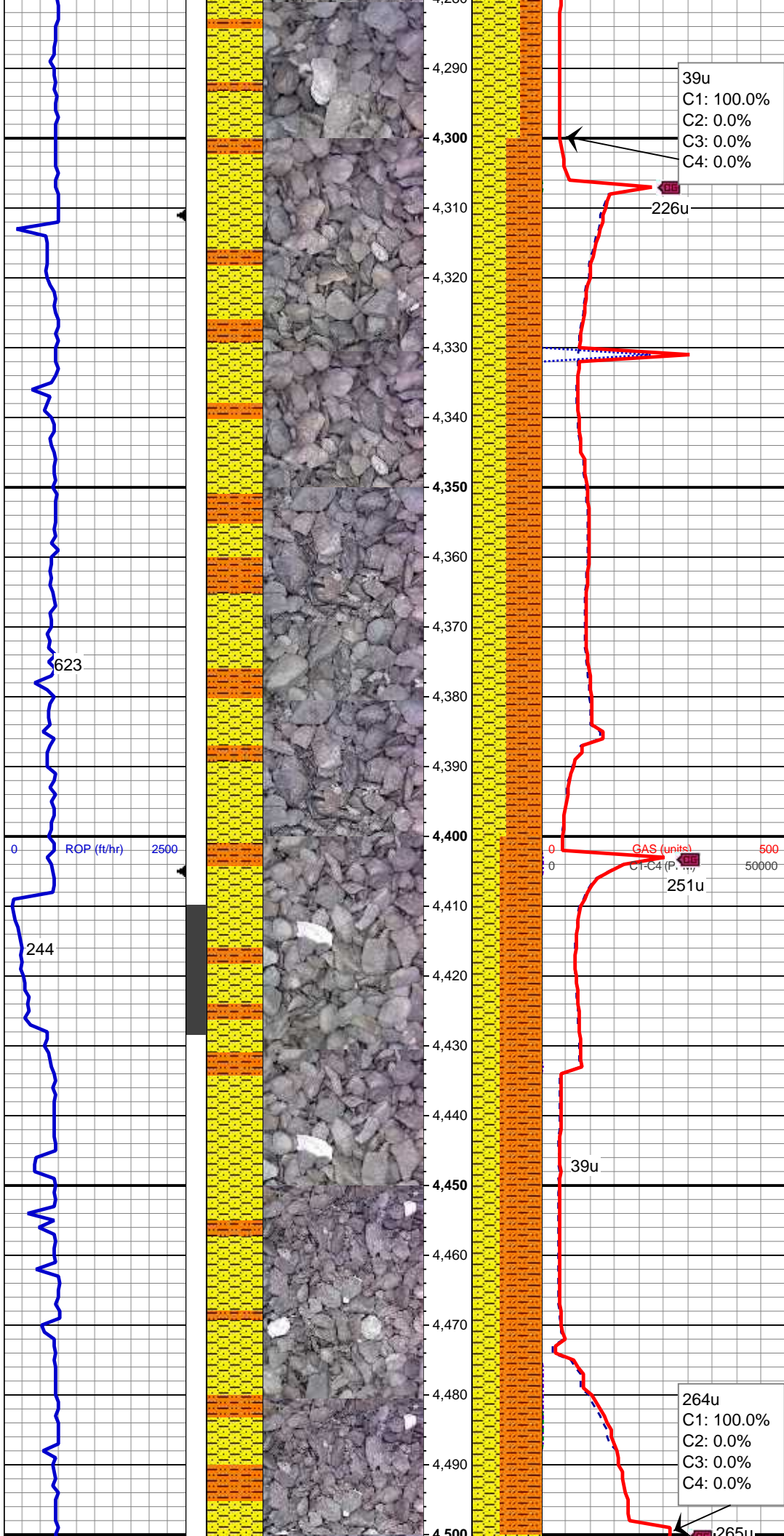
MUD WT 8.8 VIS 28

MD: 4,135 '
TVD: 4,054.82 '
Inclination: 13.99 °
Azimuth: 39.05 °
VS: -319.9 '

50% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
50% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex

MD: 4,230 '
TVD: 4,147.6 '
Inclination: 10.76 °
Azimuth: 41.25 °
VS: -330.93 '

70% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
30% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex



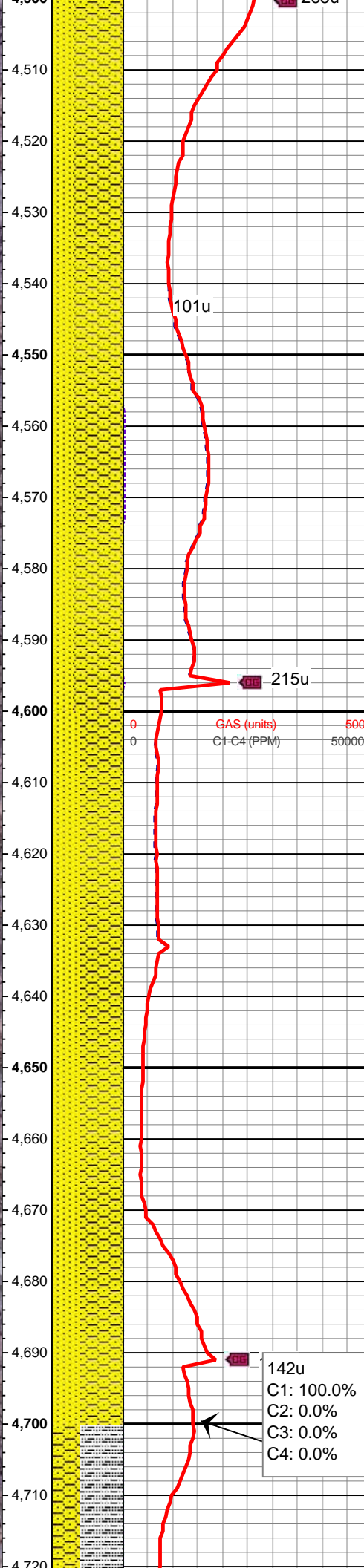
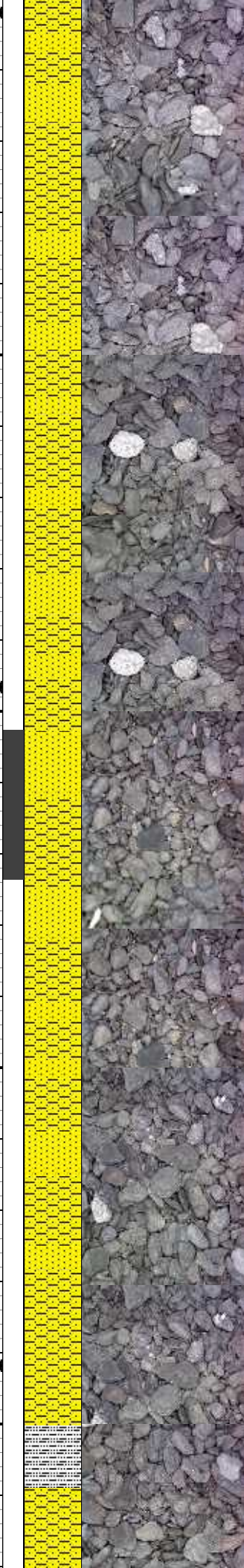
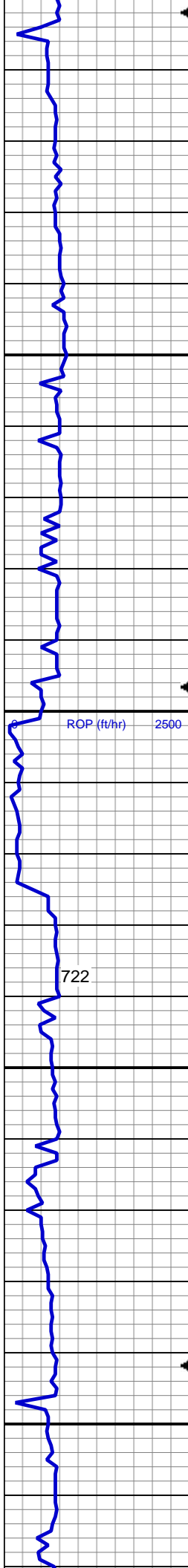
MD: 4,325 '
TVD: 4,241.18 '
Inclination: 9.02 °
Azimuth: 42.06 °
VS: -340.15 '

50% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
50% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex

MD: 4,420 '
TVD: 4,335.26 '
Inclination: 6.97 °
Azimuth: 30.63 °
VS: -346.7 '

60% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
40% SS: lt gy - wh, sme s&p, f gr,
sbrd-sbang, mod srt, fri, p por, arg
cmt

MD: 4,515 '



MD: 4,610 '
TVD: 4,429.67 '
Inclination: 5.84 °
Azimuth: 28.53 °
VS: -350.75 '

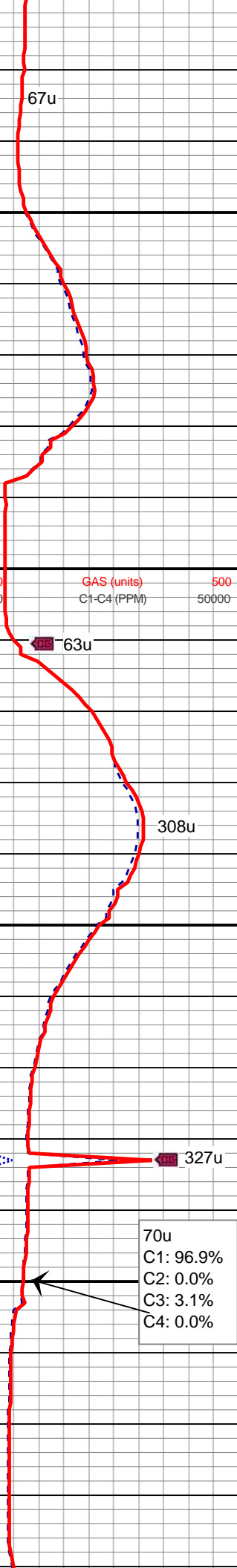
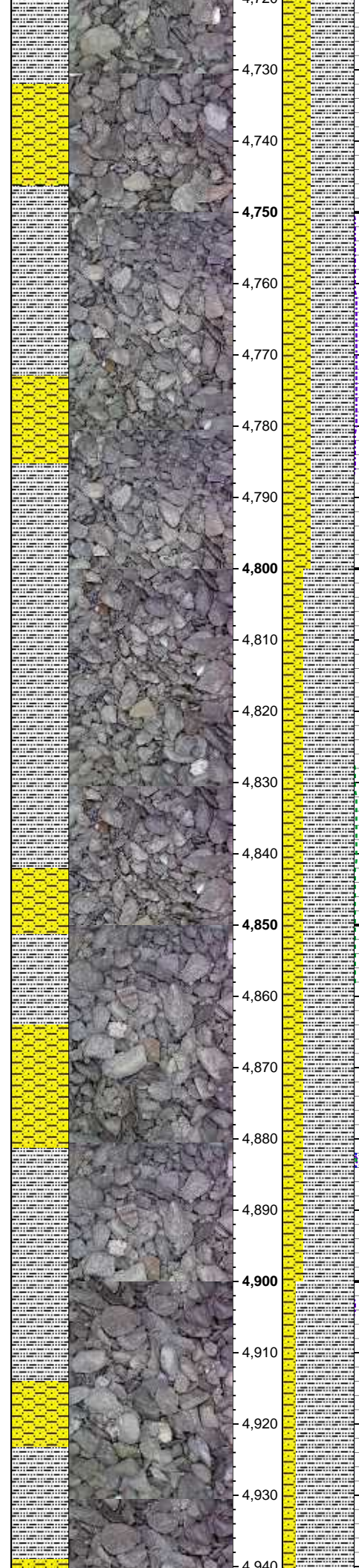
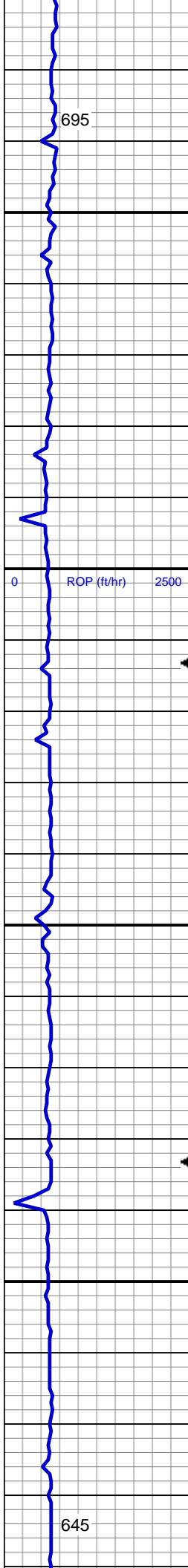
70% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
30% SS: lt gy - wh, sme s&p, f gr,
sbrd-sbang, mod srt, fri, p por, arg
cmt

MUD WT 8.8 VIS 28

MD: 4,610 '
TVD: 4,524.29 '
Inclination: 4.34 °
Azimuth: 34.39 °
VS: -354.15 '

60% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
40% SS: lt gy - wh, sme s&p, f gr,
sbrd-sbang, mod srt, fri, p por, arg
cmt

MD: 4,705 '
TVD: 4,619.12 '
Inclination: 2.55 °
Azimuth: 41.46 °
VS: -356.98 '



60% SLTY SH: m-dk gy occ gy brn,
ply - sb ply firm-sl sft, rthy-sl slty
40% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

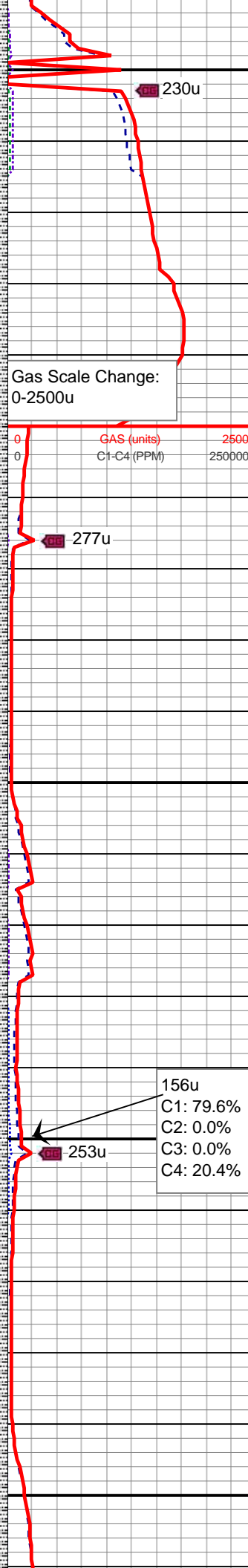
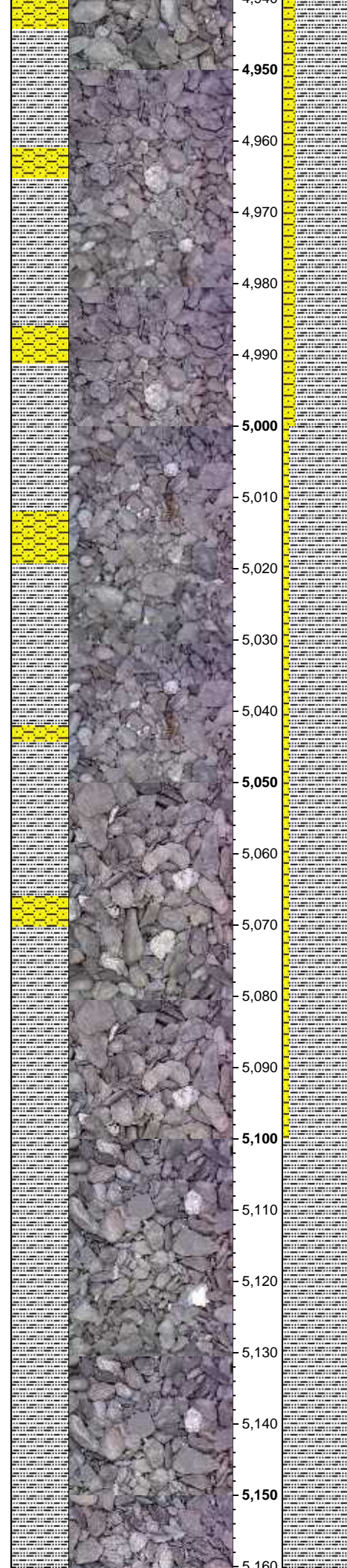
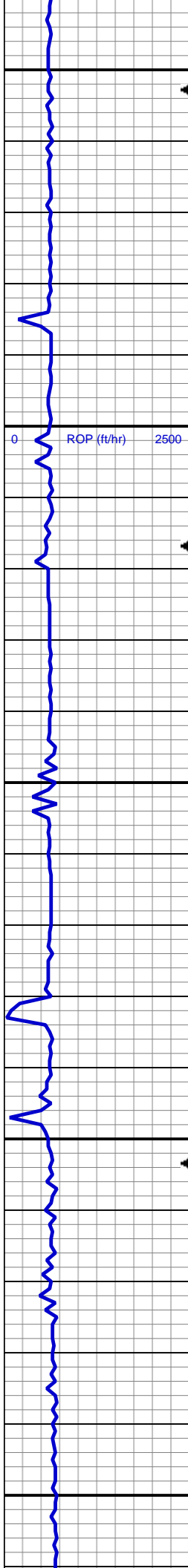
MD: 4,800 '
TVD: 4,714.06 '
Inclination: 1.18 °
Azimuth: 9.45 °
VS: -358.21 '

70% SLTY SH: m-dk gy occ gy brn,
ply - sb ply firm-sl sft, rthy-sl slty
30% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 4,894 '
TVD: 4,808.05 '
Inclination: 1.06 °
Azimuth: 1.05 °
VS: -358.15 '

MUD WT 8.8 VIS 28

70u
C1: 96.9%
C2: 0.0%
C3: 3.1%
C4: 0.0%



80% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty
20% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

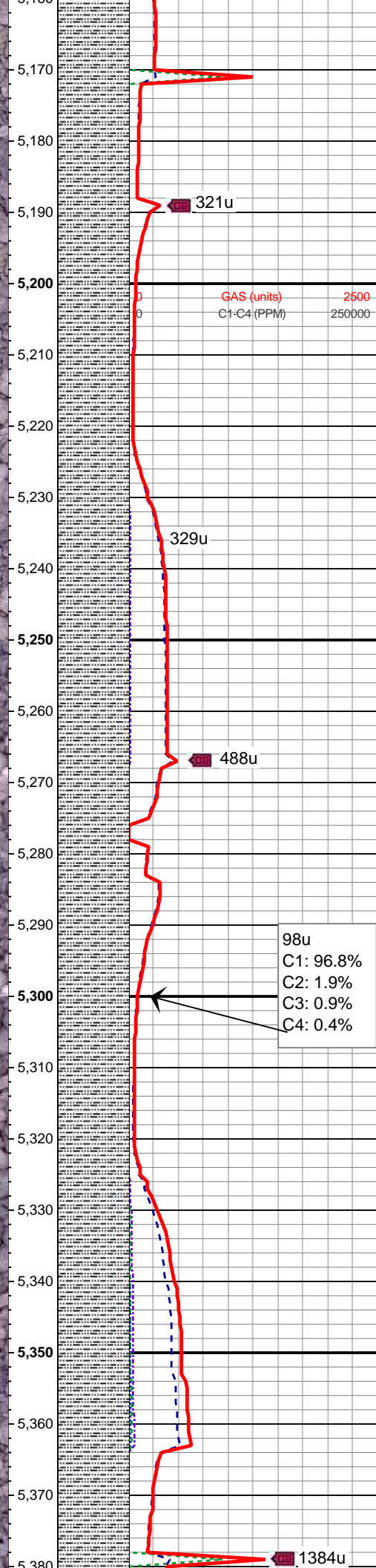
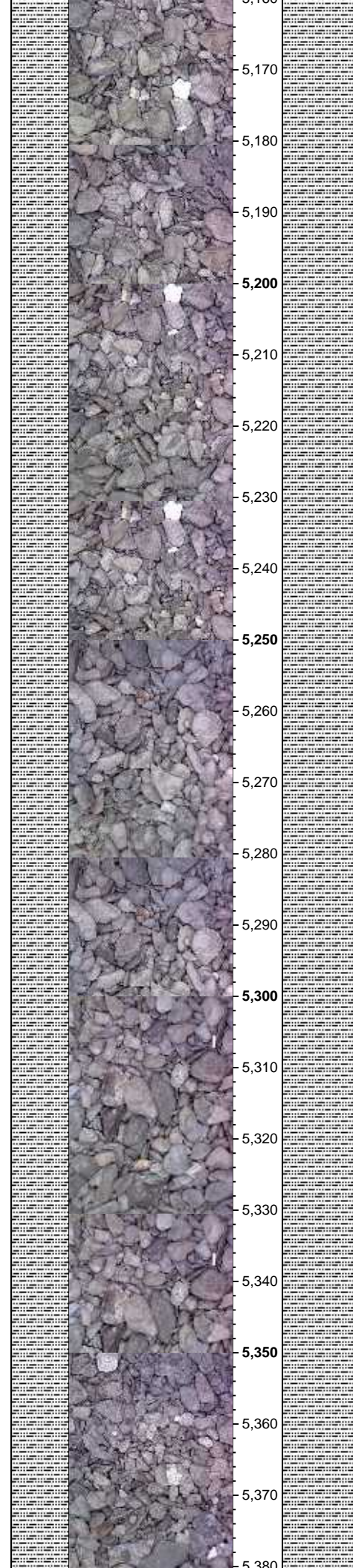
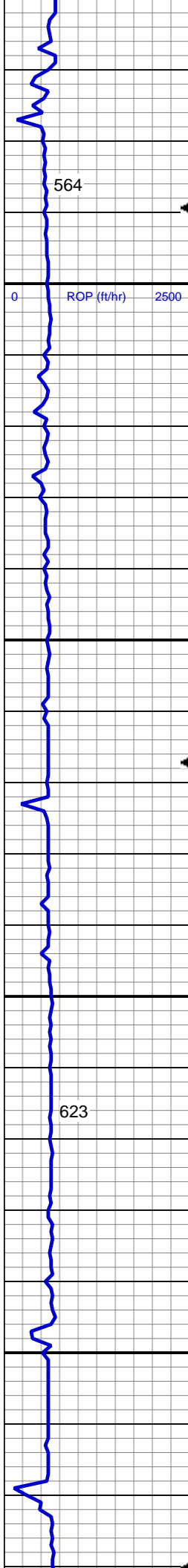
MD: 4,989 '
TVD: 4,903.03 '
Inclination: 1.03 °
Azimuth: 342.84 °
VS: -357.71 '

90% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty
10% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 5,084 '
TVD: 4,998.02 '
Inclination: 0.5 °
Azimuth: 337.16 °
VS: -357.15 '

MUD WT 8.75 VIS 27

100% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty



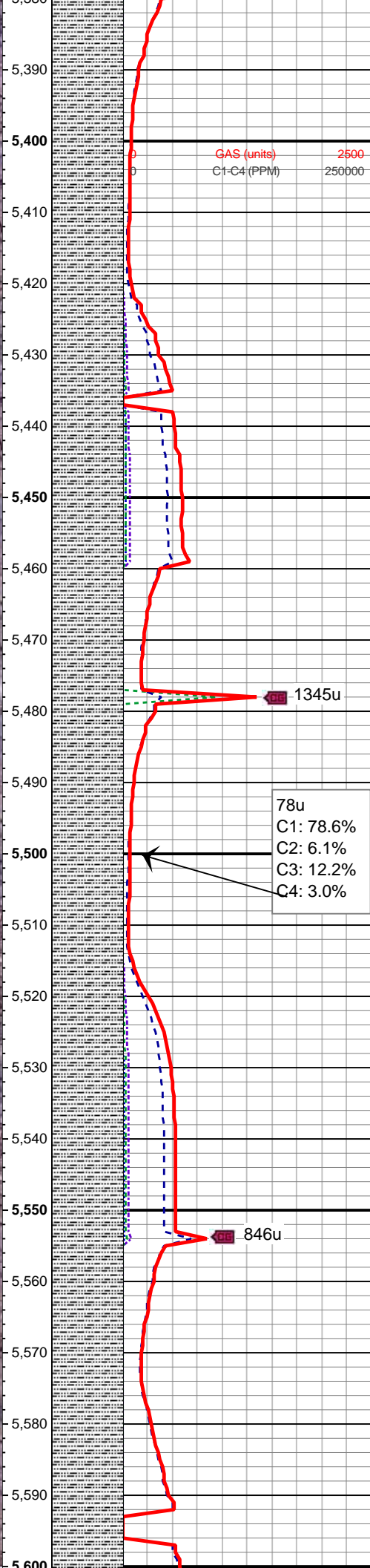
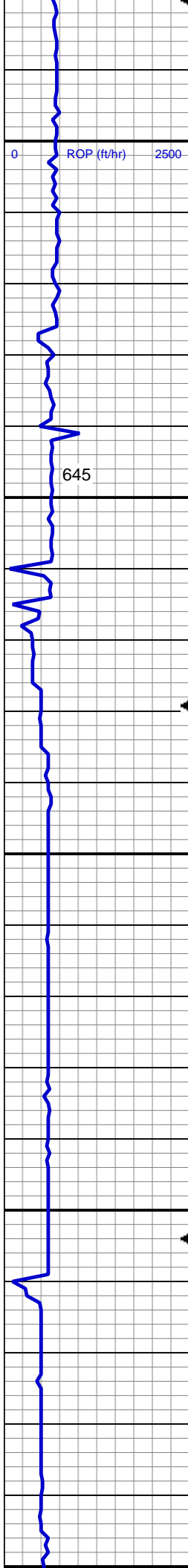
MD: 5,179 '
TVD: 5,093.02 '
Inclination: 0.26 °
Azimuth: 141.94 °
VS: -357.09 '

100% SLTY SH: m-dk gy occ gy brn,
ply - sb ply firm-sl sft, rthy-sl slty

MD: 5,274 '
TVD: 5,188.02 '
Inclination: 0.23 °
Azimuth: 103.08 °
VS: -357.44 '

100% SLTY SH: m-dk gy occ gy brn,
ply - sb ply firm-sl sft, rthy-sl slty

MUD WT 8.7 VIS 28



MD: 5,369 '
TVD: 5,283.02 '
Inclination: 0.53 °
Azimuth: 151.86 °
VS: -357.88 '

MUD WT 8.7 VIS 28

100% SLTY SH: m-dk gy occ gy brn, plty - sb plty firm-sl sft, rthy-sl slty

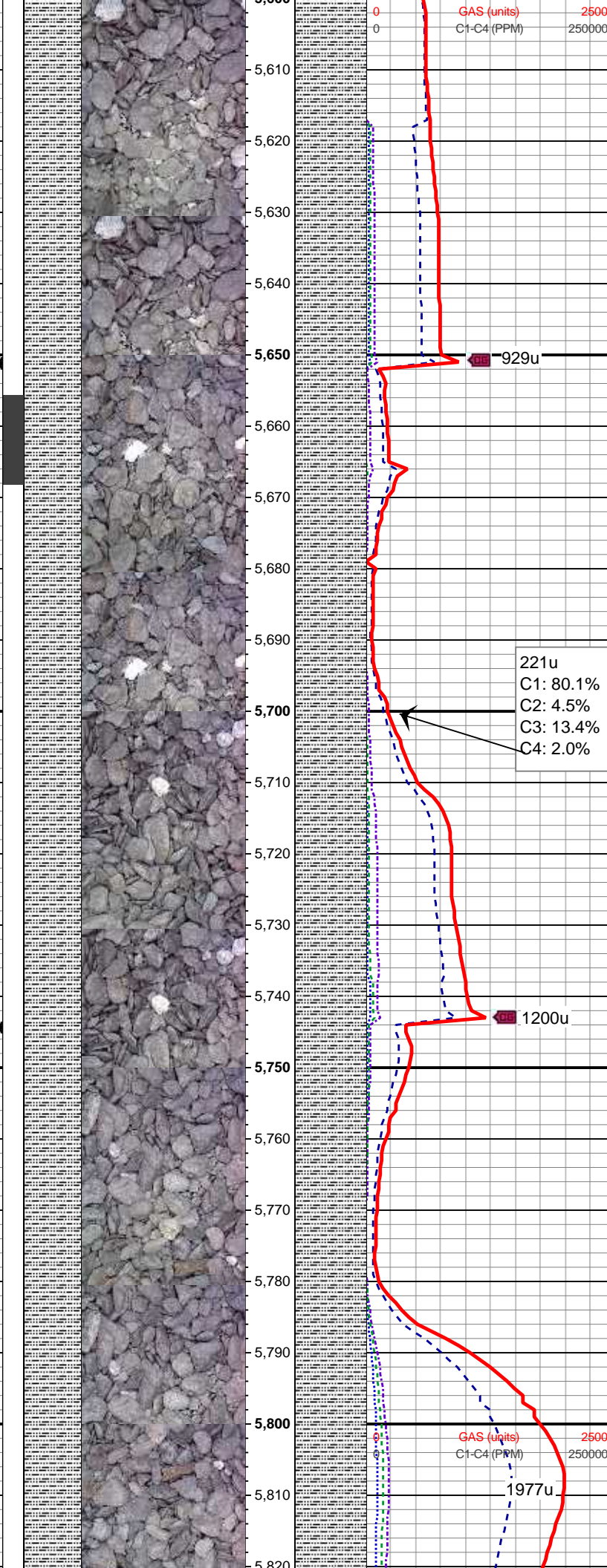
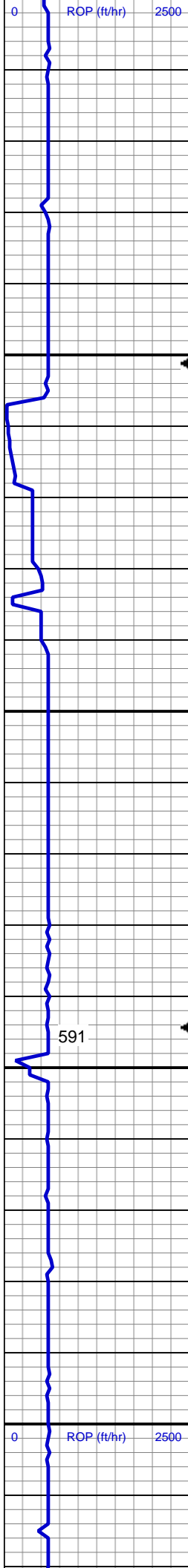
MD: 5,464 '
TVD: 5,378.01 '
Inclination: 0.86 °
Azimuth: 190.61 °
VS: -358.09 '

1345u

846u

100% SLTY SH: m-dk gy occ gy brn, plty - sb plty firm-sl sft, rthy-sl slty

MD: 5,559 '
TVD: 5,473 '
Inclination: 0.87 °
Azimuth: 152.32 °
VS: -358.46 '



100% SLTY SH: m-dk gy occ gy brn,
pty - sb pty firm-sl sft, rthy-sl slty

MD: 5,654 '
TVD: 5,568 '
Inclination: 0.7 °
Azimuth: 244.2 °
VS: -358.39 '

221u
C1: 80.1%
C2: 4.5%
C3: 13.4%
C4: 2.0%

MUD WT 8.8 VIS 28

100% SLTY SH: m-dk gy occ gy brn,
pty - sb pty firm-sl sft, rthy-sl slty

MD: 5,749 '
TVD: 5,662.99 '
Inclination: 0.38 °
Azimuth: 219.77 °
VS: -357.73 '

1977u

MUD WT 8.9 VIS 31

MD: 5,844 '
TVD: 5,757.99 '
Inclination: 0.31 °
Azimuth: 192.25 °
VS: -357.54 '

100% SLTY SH: m-dk gy occ gy brn,
pty - sb pty firm-sl sft, rthy-sl slty

1948u

1698u
C1: 71.2%
C2: 10.0%
C3: 12.5%
C4: 6.2%

MD: 5,938 '
TVD: 5,851.99 '
Inclination: 0.35 °
Azimuth: 137.37 °
VS: -357.74 '

MUD WT 9.1 VIS 31

100% SLTY SH: m-dk gy occ gy brn,
pty - sb pty firm-sl sft, rthy-sl slty

MD: 5,955 '
TVD: 5,868.99 '
Inclination: 0.74 °
Azimuth: 145.98 °
VS: -357.85 '

TD Vertical @ 6015' MD;
2029 hrs 2/3/2014

TOOH For Directional BHA

LOG CONTINUED ON:
WELLS RANCH
AA21-64-1HN(HORZ).mplot

Thank You For Choosing
Columbine Logging Inc.

