

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name 70 Ranch State BB18-681 (VERT)

Location NENE 17 5N 63W

State COLORADO

County WELD

Country USA

Rig Number H&P #273

API Number 05-123-41529

Field WATTENBERG

Region DJ BASIN

Drilling Completed 8/1/2015

Spud Date 7/23/2015

Surface Coordinates LAT:40.40508
LONG: -104.48721
293' FNL
600' FEL

Bottom Hole Coordinates PROJECTED:
380' FNL
535' FWL

Ground Elevation 4699'

K.B. Elevation 4723'

Logged Interval 800' To 16023'

Total Depth 16023'

Formation CODELL SANDSTONE

Type of Drilling Fluid H2O, LSND

Other Symbols

Oil Show

- DEAD
- EVEN
- QUESTIONABLE
- SPOTTED STAINING

Porosity

- E EARTHY
- F FENESTRAL
- F FRACTURE
- X INTERCRYSTALLINE
- Q INTEROOLITIC
- MOLDIC

ORGANIC

P PINPOINT

V 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

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

WS WACKSTONE

Sorting

- M MODERATE
- P POOR
- W WELL

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

MARCASITE
 MARLSTONE
 MICACEOUS
 MINERAL CRYSTALS
 NODULES
 PHOSPHATE PELLETS
 PYRITE
 SALT CAST
 SANDY
 SIDERITE
 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

Rock Types

UNKNOWN
 ANHYDRITE
 BENTONITE
 BRECCIA
 CEMENT
 CHALK
 CHERT
 CLAY CHOKE SAND
 CLAYSTONE

COAL
 CONGLOMERATE
 DOLOMITE
 DOLOMITIC LIMESTONE
 GRANITE
 GYPSUM
 IGNEOUS
 LIMESTONE
 SIDERITE or LIMONITE

MARLSTONE
 METAMORPHIC
 NO SAMPLE
 SALT
 SALT- PEPPER SAND
 SANDSTONE
 SHALE
 SHALE COLORED
 SHALE GRAY

SHALY SANDSTONE
 SHALY SILTSTONE
 SILTSTONE
 SILTY SHALE
 TILL
 TUFF
 WELDED TUFF

Operator

Company NOBLE ENERGY, INC.

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

Geologist

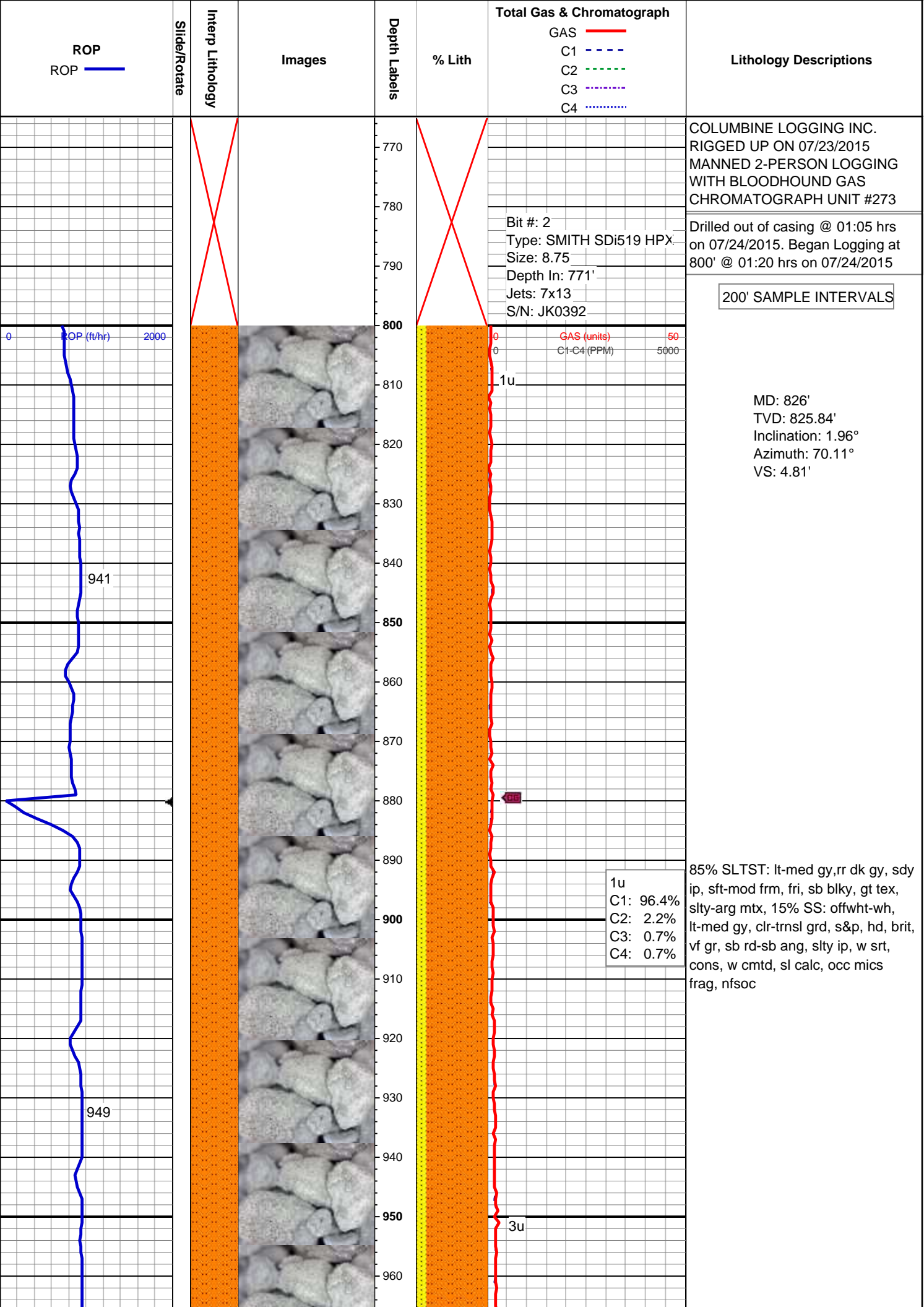
Name MICHAEL ANDERSON, ADAM HARRIS, SHANNA GILBERT

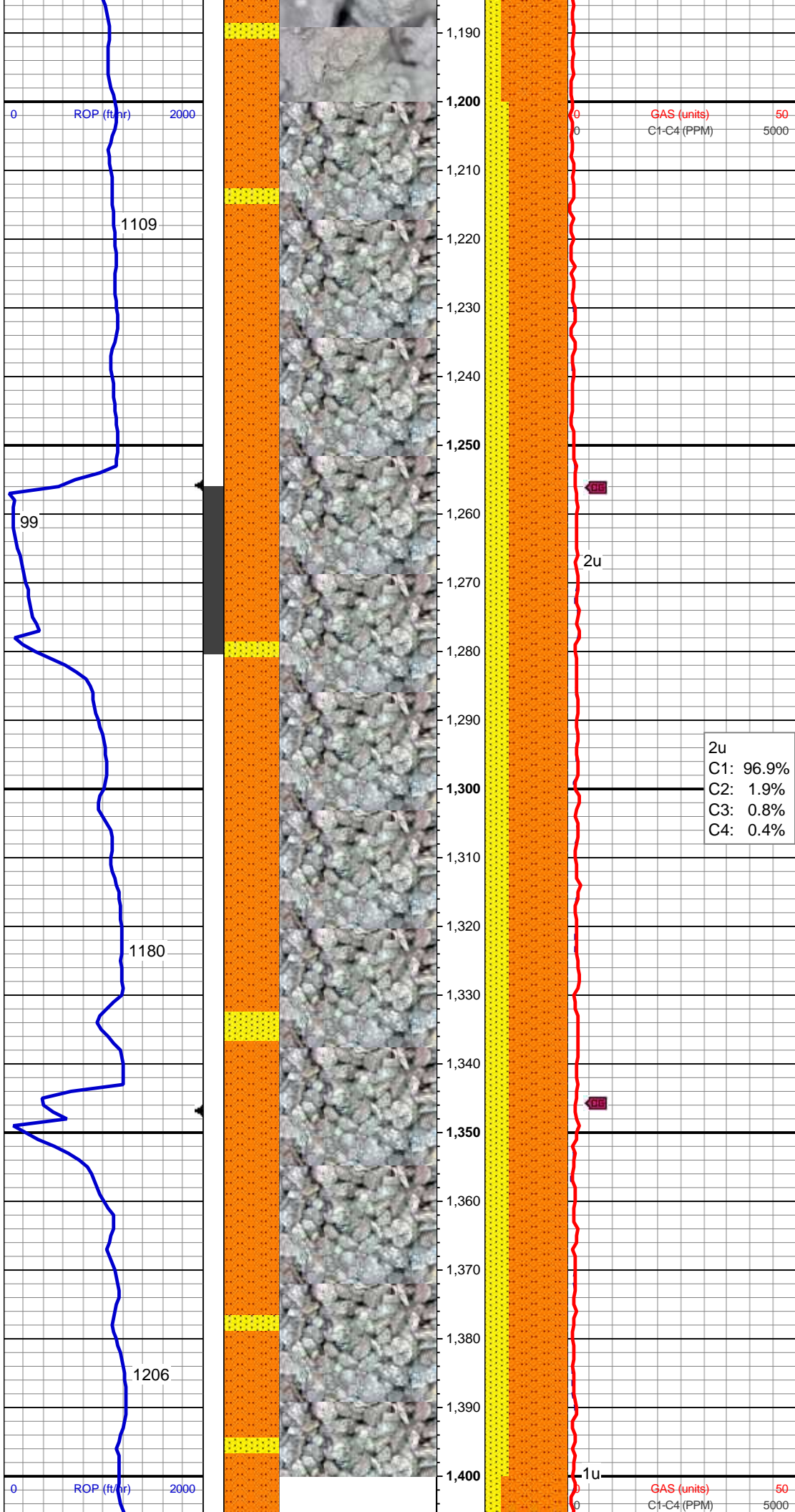
Company COLUMBINE LOGGING, INC.

Address 602 S. LIPAN ST
 DENVER, COLORADO 80223
 (303) 289-7764

Zone Color Coding

Oil
 Condensate
 Gas
 Note
 Core
 Pressure
 Error
 Water
 Seal





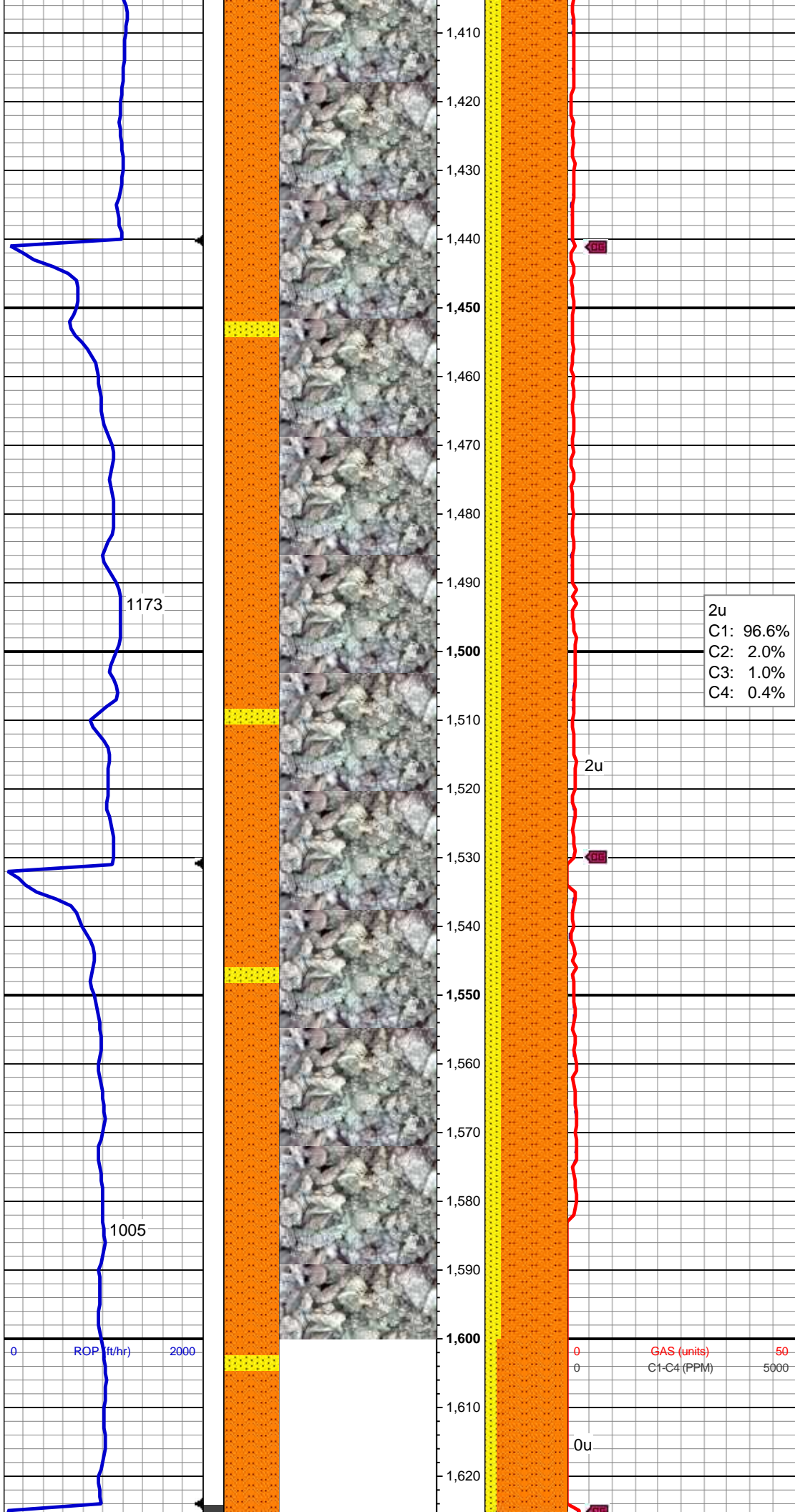
MD: 1,201'
TVD: 1,200.67'
Inclination: 1.36°
Azimuth: 18.02°
VS: -22.73'

MD: 1,293'
TVD: 1,292.62'
Inclination: 1.65°
Azimuth: 105.84°
VS: 7.18'

2u
C1: 96.9%
C2: 1.9%
C3: 0.8%
C4: 0.4%

70% SLTST: lt-med gy,rr dk gy, sdy ip, sft-mod frm, fri, sb blk, gt tex, slty-arg mtx, 30% SS: offwht-wh, lt-med gy, clr-trnsl grd, s&p, hd, brit, vf gr, sb rd-sb ang, slty ip, w srt, cons, w cmt, sl calc, occ mics frag, nfsoc

MD: 1,384'
TVD: 1,383.59'
Inclination: 1.36°
Azimuth: 98.15°
VS: 7.18'



MD: 1,475'
TVD: 1,474.59'
Inclination: 1.55°
Azimuth: 96.59°
VS: -28.95'

2u
C1: 96.6%
C2: 2.0%
C3: 1.0%
C4: 0.4%

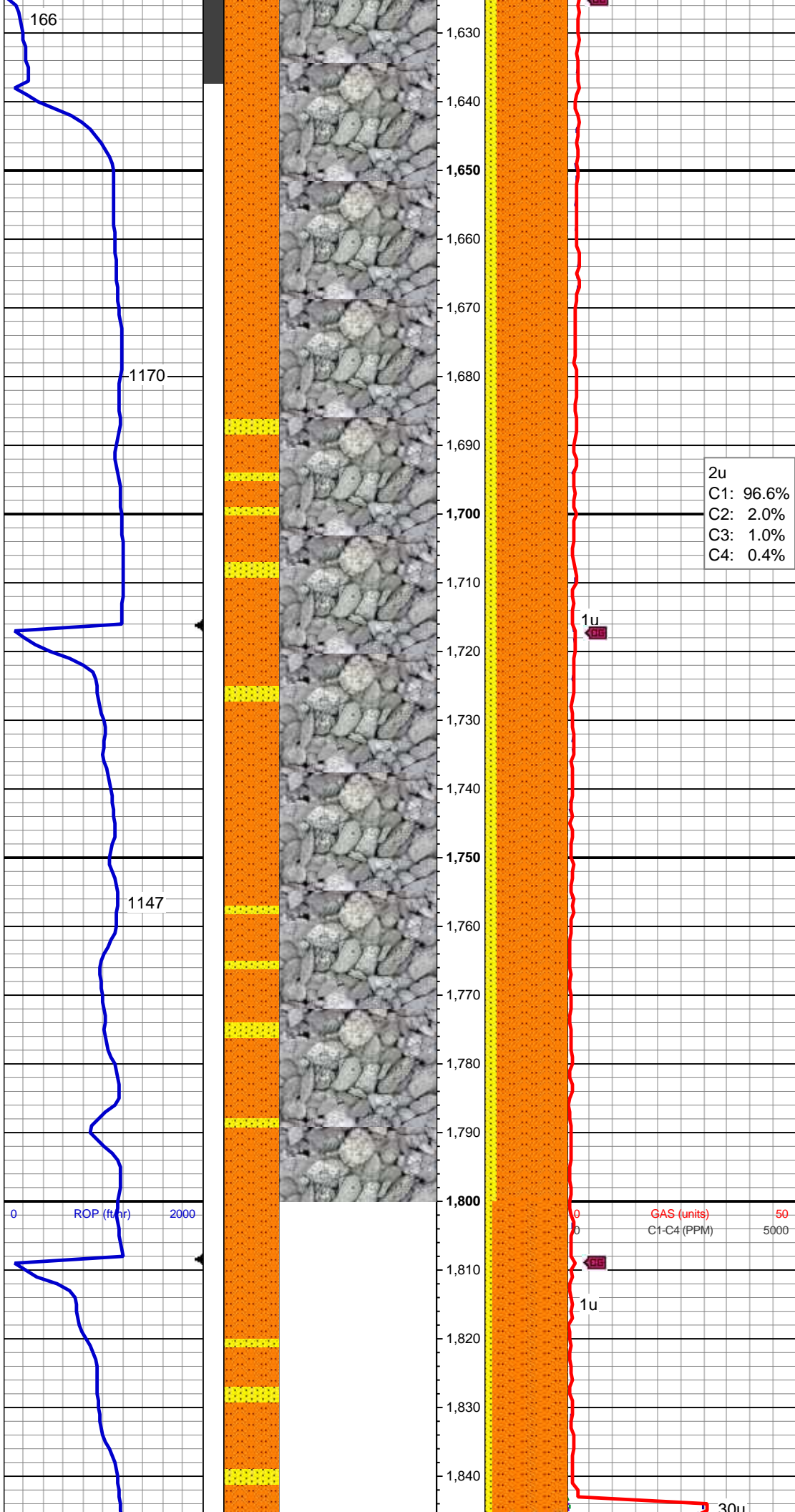
80% SLTST: lt-med gy,rr dk gy, sdy ip, sft-mod frm, fri, sb blk, gt tex, slty-arg mtx, 20% SS: offwht-wh, lt-med gy, clr-trns gr, s&p, hd, brit, vf gr, sb rd-sb ang, slty ip, w srt, cons, w cmt, sl calc, occ mics frag, nfsoc

MD: 1,567'
TVD: 1,566.56'
Inclination: 1.67°
Azimuth: 98.18°
VS: -31.5'

0 ROP (ft/hr) 2000

0 GAS (units) 50
0 C1-C4 (PPM) 5000

0u

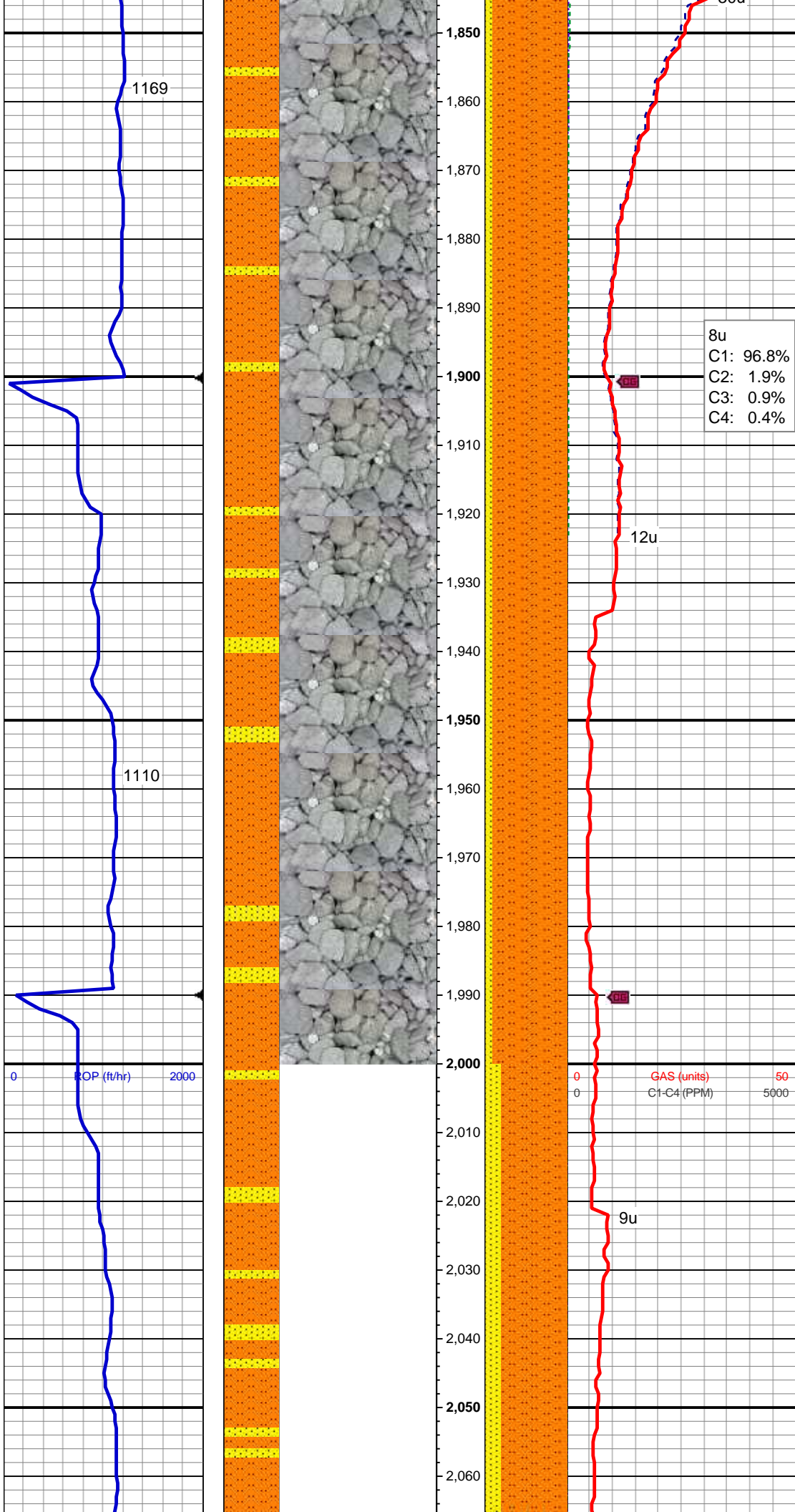


2u
C1: 96.6%
C2: 2.0%
C3: 1.0%
C4: 0.4%

85% SLTST: lt-med gy,rr dk gy, sdy
ip, sft-mod frm, fri, sb blk, gt tex,
sly-arg mtx, 15% SS: offwht-wh,
lt-med gy, clr-trnsl grd, s&p, hd, brit,
vf gr, sb rd-sb ang, sly ip, w srt,
cons, w cmt, sl calc, occ mics
frag, nfsoc

MD: 1,750'
TVD: 1,749.52'
Inclination: 1.25°
Azimuth: 199.65°
VS: -33.44'

MD: 1,841'
TVD: 1,840.5'
Inclination: 0.95°
Azimuth: 218.76°



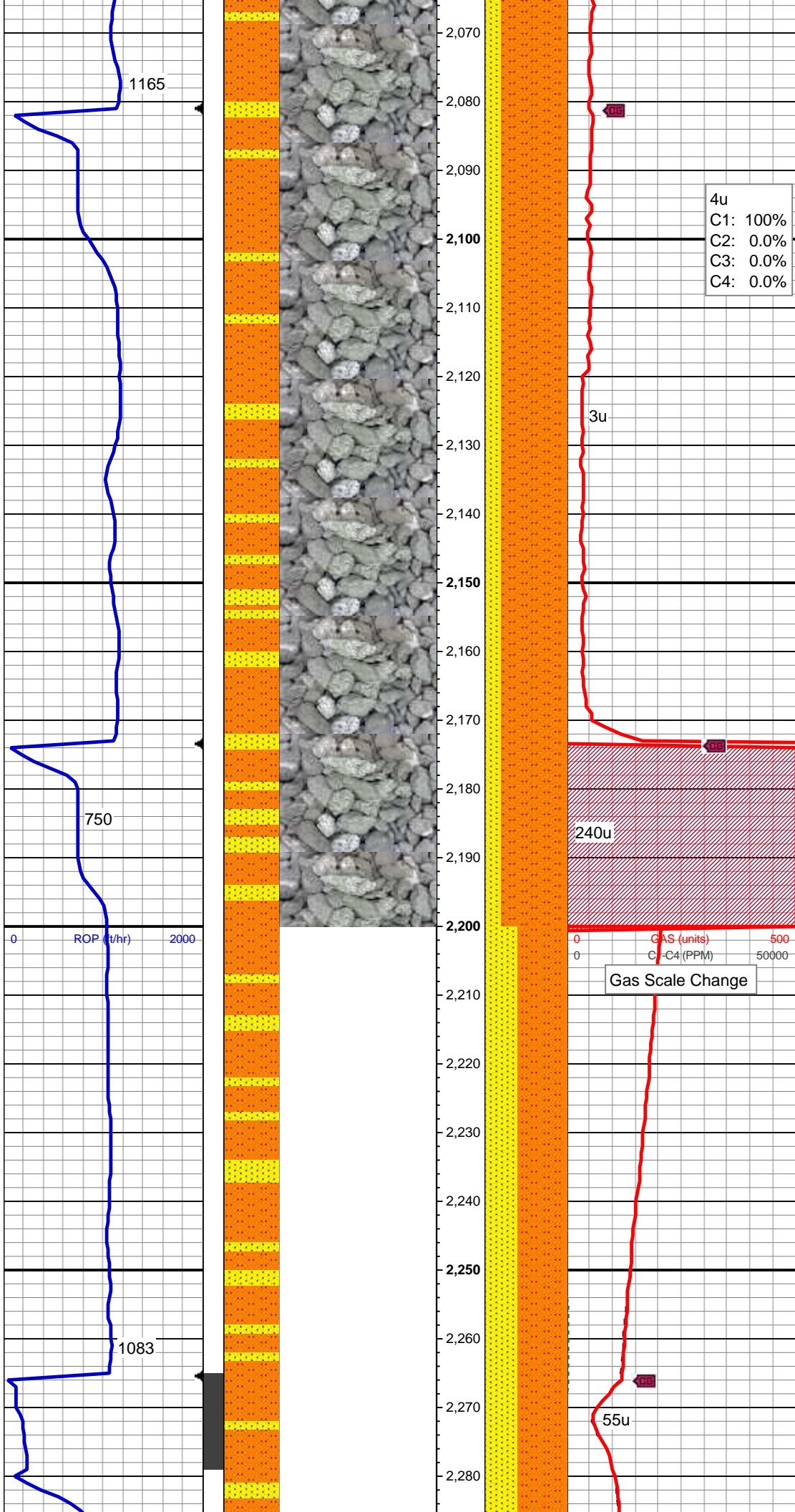
VS: -32.61'

8u
C1: 96.8%
C2: 1.9%
C3: 0.9%
C4: 0.4%

90% SLTST: lt-med gy, rr dk gy, sdy
ip, sft-mod frm, fri, sb blk, gt tex,
sly-arg mtx, v sl calc, occ (10%) fy
intlam ss strgs, tr mics frag, nfsoc

MD: 1,933'
TVD: 1,932.49'
Inclination: 0.92°
Azimuth: 185.7°
VS: -32.04'

MD: 2,025'
TVD: 2,024.48'
Inclination: 0.97°
Azimuth: 186.98°
VS: -31.85'

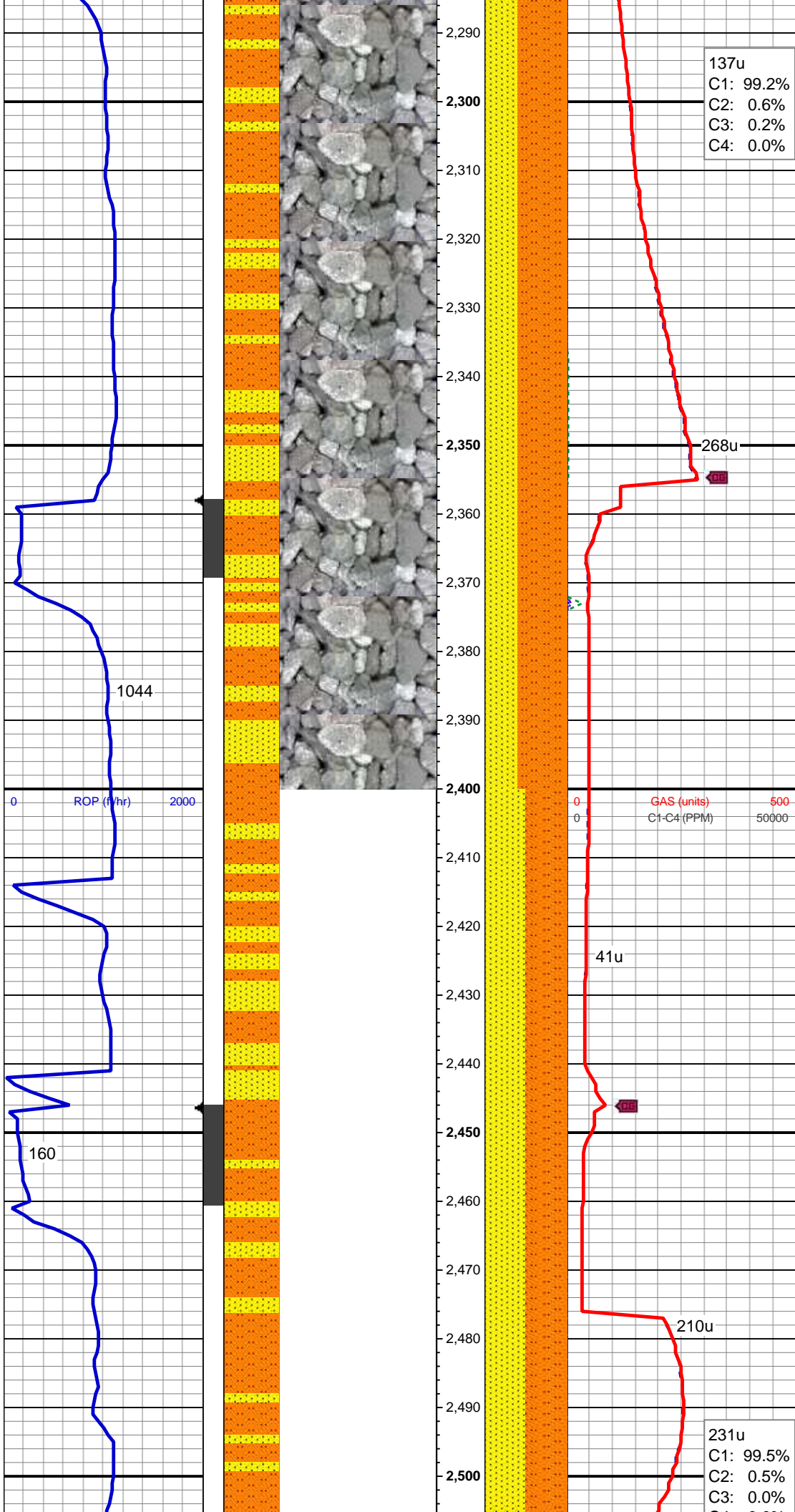


80% SLTST: lt-med gy, lt gy brn, rr dk gy, sdy ip, sft-mod frm, fri, sb blk, gt tex, slty-arg mtx, 20% SS: offwht-wh, lt gy, s&p, clr-trns grd, s&p, hd, brit, vf gr, sb rd-sb ang, w srt, cons, w cmt, non calc, occ mics frag, rr calcite, rr lt bl mnrl flor, no stn od or cut

MD: 2,116'
TVD: 2,115.47'
Inclination: 0.84°
Azimuth: 184.88°
VS: -31.68'

MD: 2,208'
TVD: 2,207.46'
Inclination: 0.69°
Azimuth: 182.85°
VS: -31.58'

MD: 2,301'
TVD: 2,300.43'
Inclination: 2.4°
Azimuth: 97.9°
VS: -33.47'

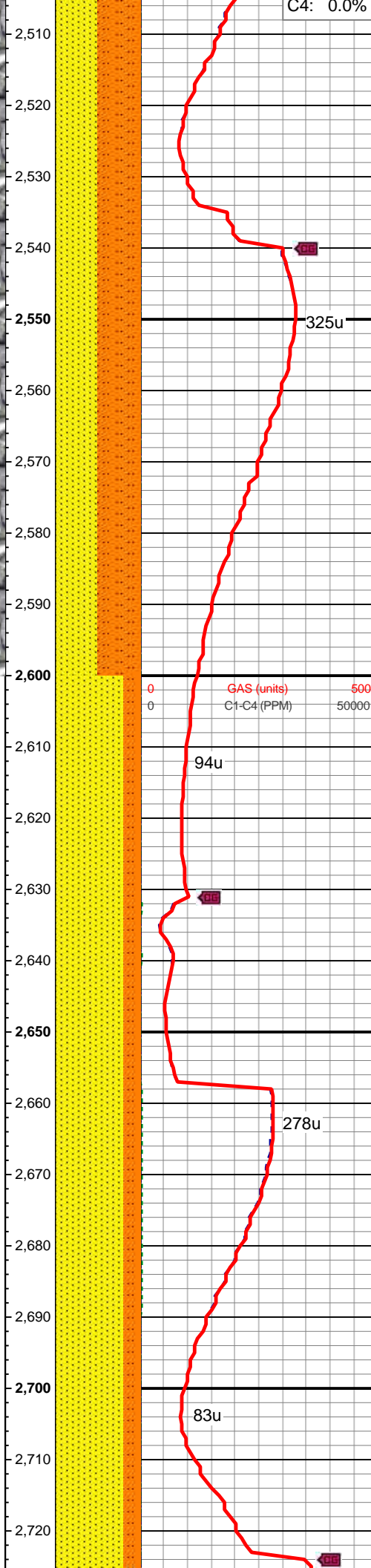
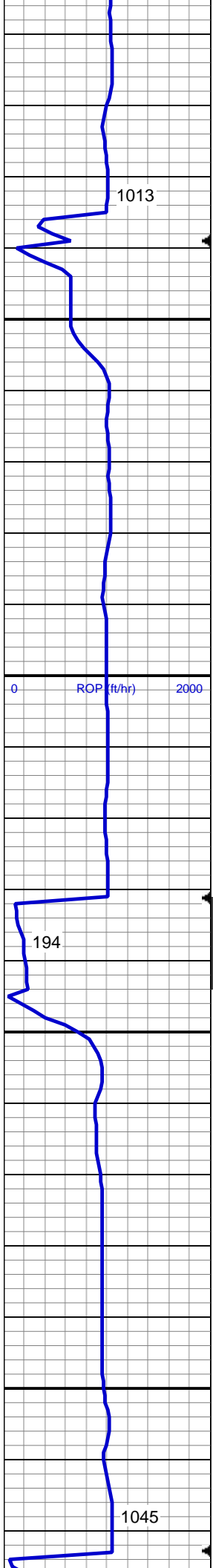


60% SLTST: lt-med gy, lt gy brn, rr dk gy, sdy ip, sft-mod frm, fri, sb plty-sb blk, gt tex, slty-arg mtx, intlaml wi 40% SS: offwht-wh, lt gy, s&p, clr-trnsl grd, s&p, hd, brit, vf gr, sb rd-sb ang, w srt, cons, w cmt, non calc, occ mics frag, nfsoc

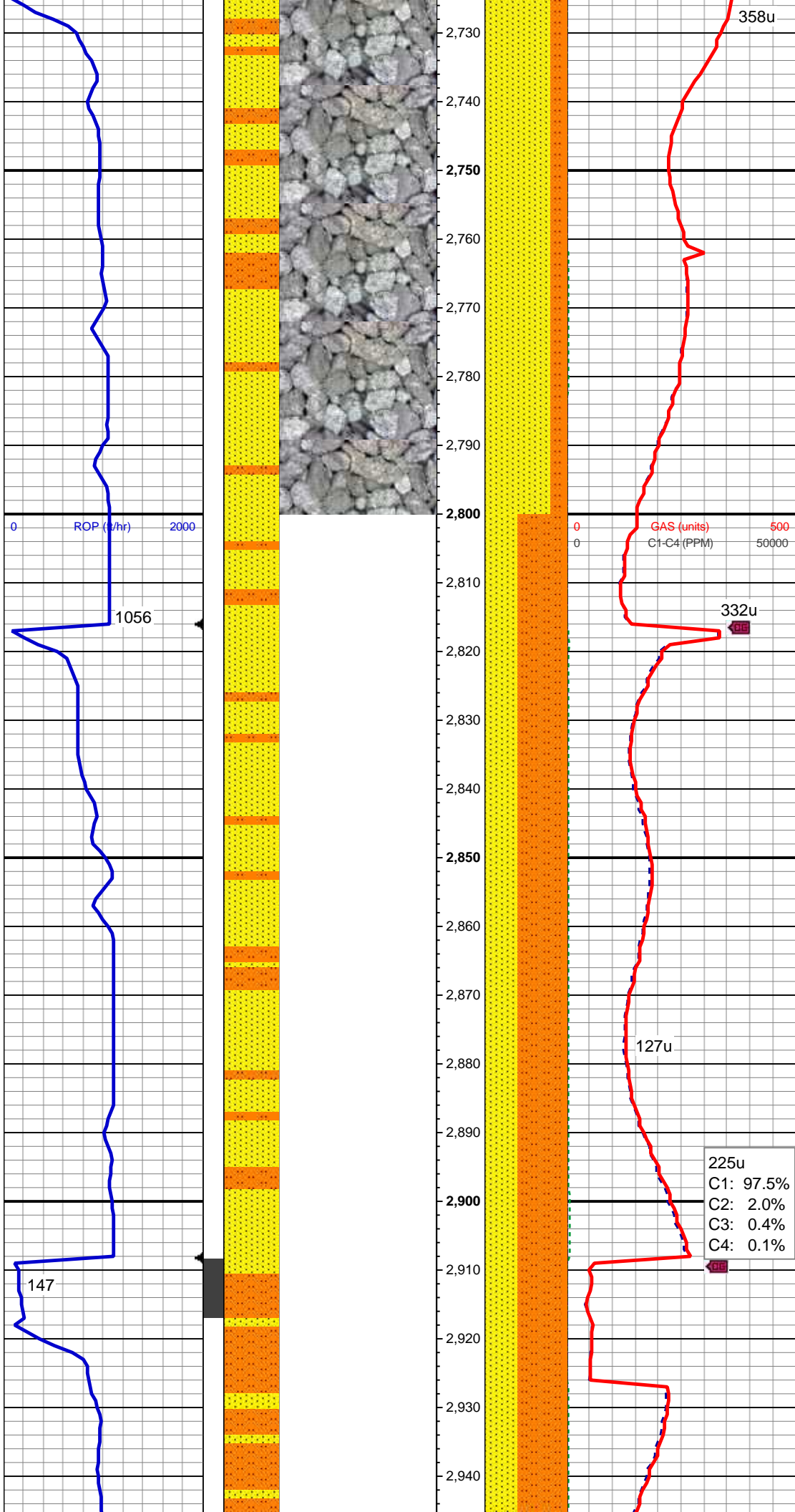
MD: 2,392'
TVD: 2,391.28'
Inclination: 4.15°
Azimuth: 83.85°
VS: -38.63'

MD: 2,484'
TVD: 2,482.93'
Inclination: 5.76°
Azimuth: 80.69°
VS: -46.51'

50% SLTST: lt-med gy, lt gy brn, rr dk gy, sdy ip, sft-mod frm, fri, sb plty-sb blk, gt tex, slty-arg mtx, 50% SS: offwht-wh, lt gy, s&p, clr-trnsl grd, s&p, hd, brit, vf gr, sb rd-sb



80% SS: offwht-wh, lt gy, lt brn, s&p, clr-trnsl grd, s&p, hd, brit, vf-l f gr, sb rd-sb ang, w srt, cons, w cmtd, intlaml wi 20% SLTST: lt-med gy, lt gy brn, sdy ip, sft-mod frm, fri, sb blk, gt tex, slty-arg mtx, non calc, occ glau, occ mics frag, rr calcite, nfsoc

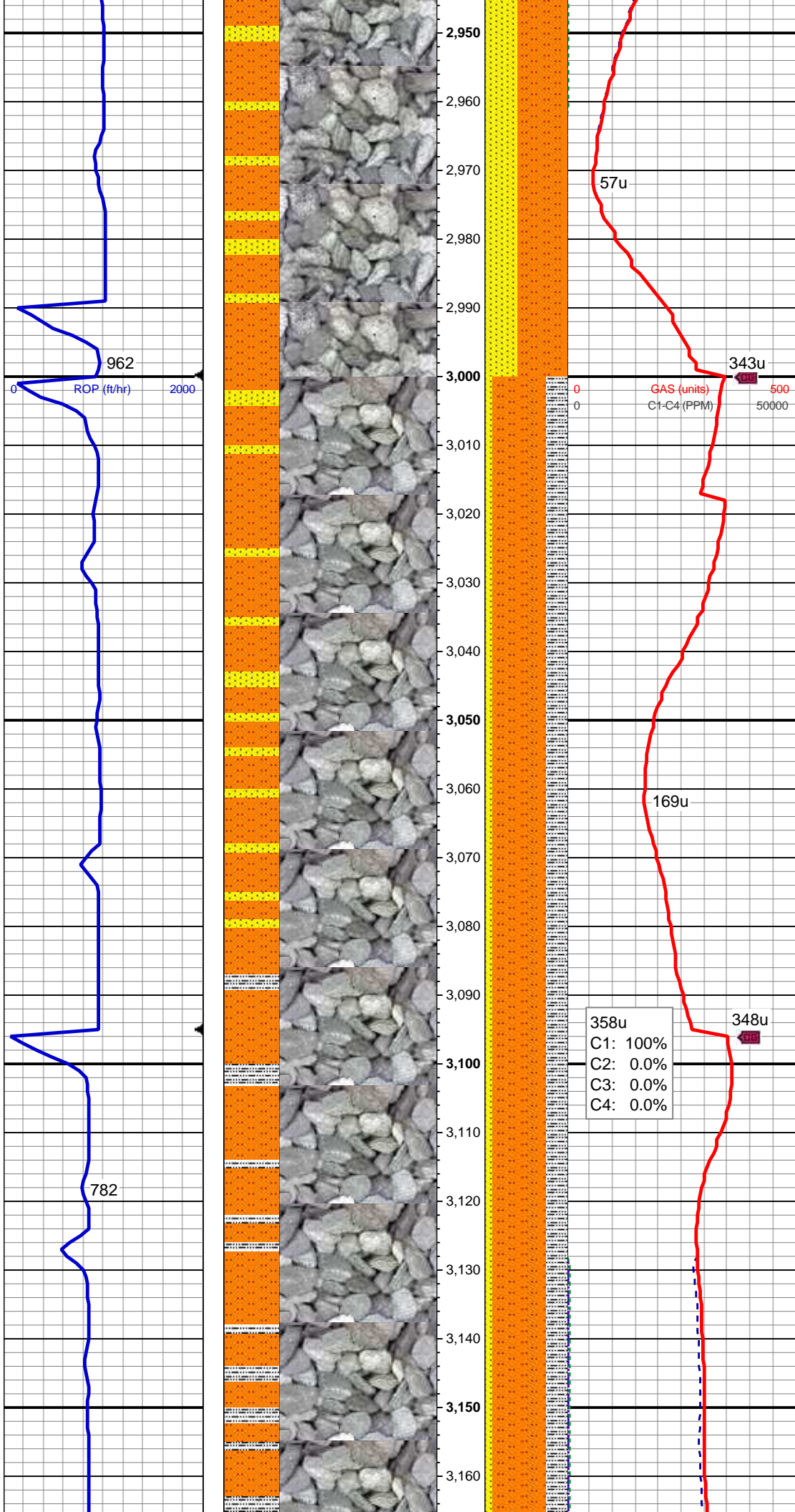


MD: 2,760'
TVD: 2,757.58'
Inclination: 6.44°
Azimuth: 79.55°
VS: -73.5'

MD: 2,851'
TVD: 2,847.99'
Inclination: 6.57°
Azimuth: 78.55°
VS: -83.65'

60% SLTST: lt-med gy, lt gy brn, occ dk gy, sdy ip, sft-mod frm, brit-fri, sb pty-sb blk, gt tex, slty-arg mtx, intlmd wi 40% SS: offwht-wh, lt gy, lt brn, s&p, clr-trnsd grd, s&p, hd, brit, vf gr, sb rd-sb ang, w srt, cons, w cmtd, non calc, tr glau, tr mics frag, tr calcite, tr dissim pyr, nfsoc

MD: 2,942'
TVD: 2,938.34'
Inclination: 7.17°
Azimuth: 80.67°

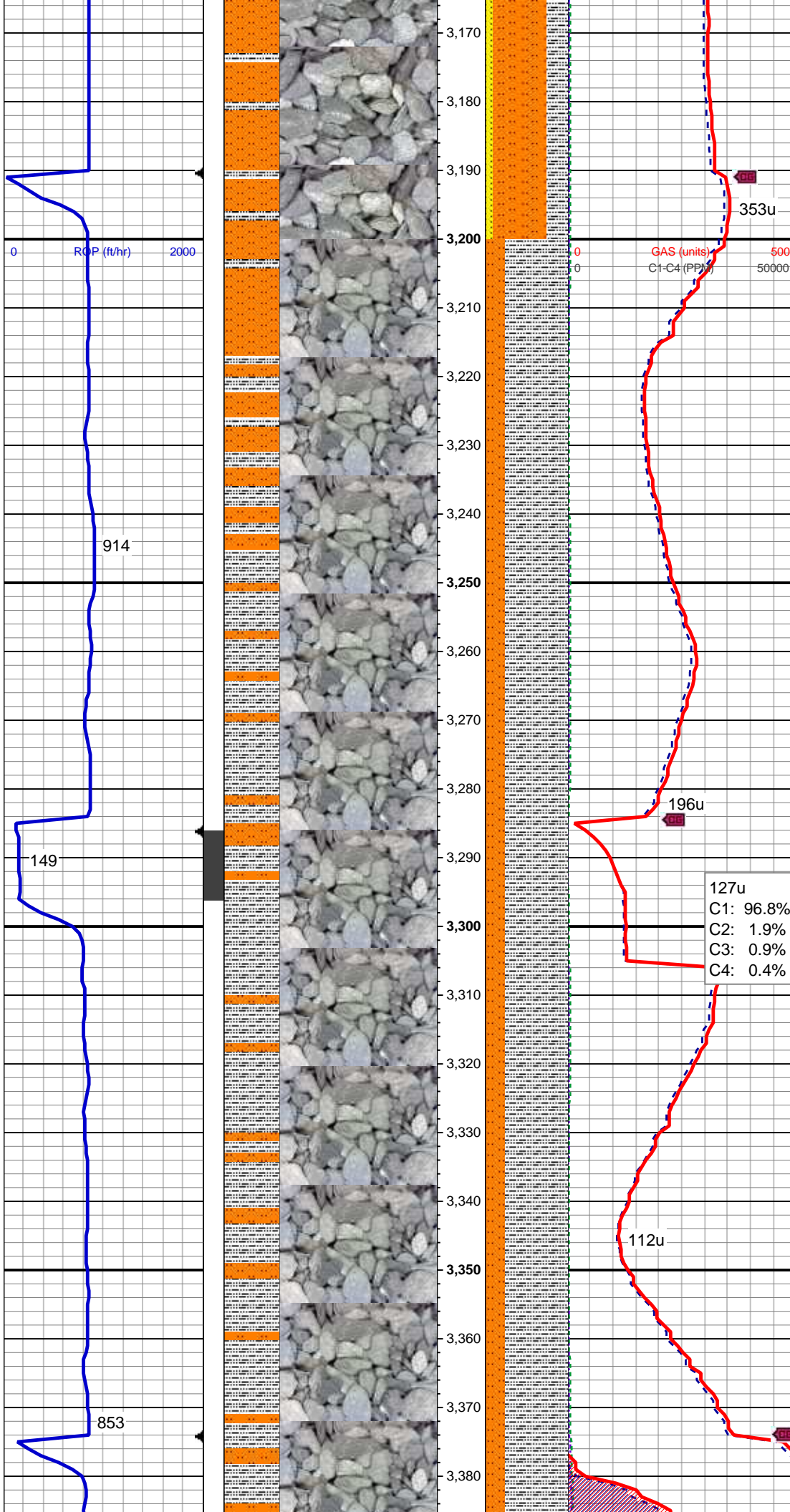


Azimuth: 89.67
VS: -94.45'

MD: 3,036'
TVD: 3,031.64'
Inclination: 6.81°
Azimuth: 82.16°
VS: -105.85'

65% SLTST: lt-med gy, lt gy brn, occ dk gy, sdy ip, sft-mod frm, brit-fri, sb pty-sb blk, gt tex, slty-arg mtx, 25% SLTY SH: med-dk gy, frm, brit, pty - sb pty, occ sb fis, sm - sb wxy tex, arg - slty mtx, non calc, occ (10%) fy intlam ss strgs, rr mics frag, tr dissim & clus pyr, nfsoc

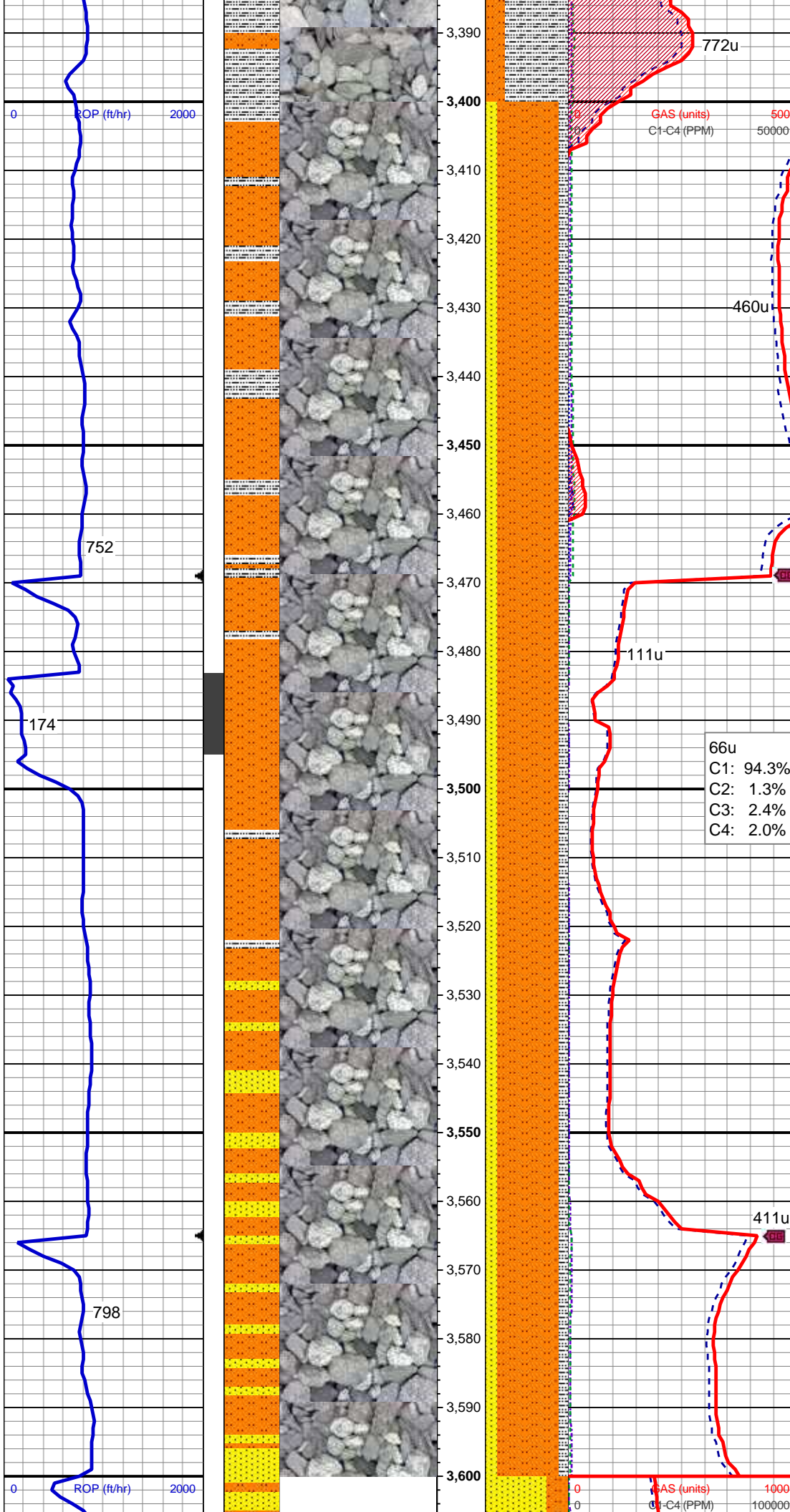
MD: 3,131'
TVD: 3,126.05'
Inclination: 6.05°
Azimuth: 79.77°
VS: -116.38'



MD: 3,226'
TVD: 3,220.57'
Inclination: 5.47°
Azimuth: 75.73°
VS: -125.72'

75% SLTY SH: lt-dk gy, frm, brit, plty
- sb plty, occ sb fis, sm-sb wxy tex,
arg-slty mtx, 25% SLTST: lt-med gy,
sft-mod frm, brit-fri, sb plty-sb blk,
gt tex, slty-arg mtx, non calc, rr mics
frag, tr dissd pyr, nfsoc

MD: 3,320'
TVD: 3,314.14'
Inclination: 5.61°
Azimuth: 94.47°
VS: -134.65'

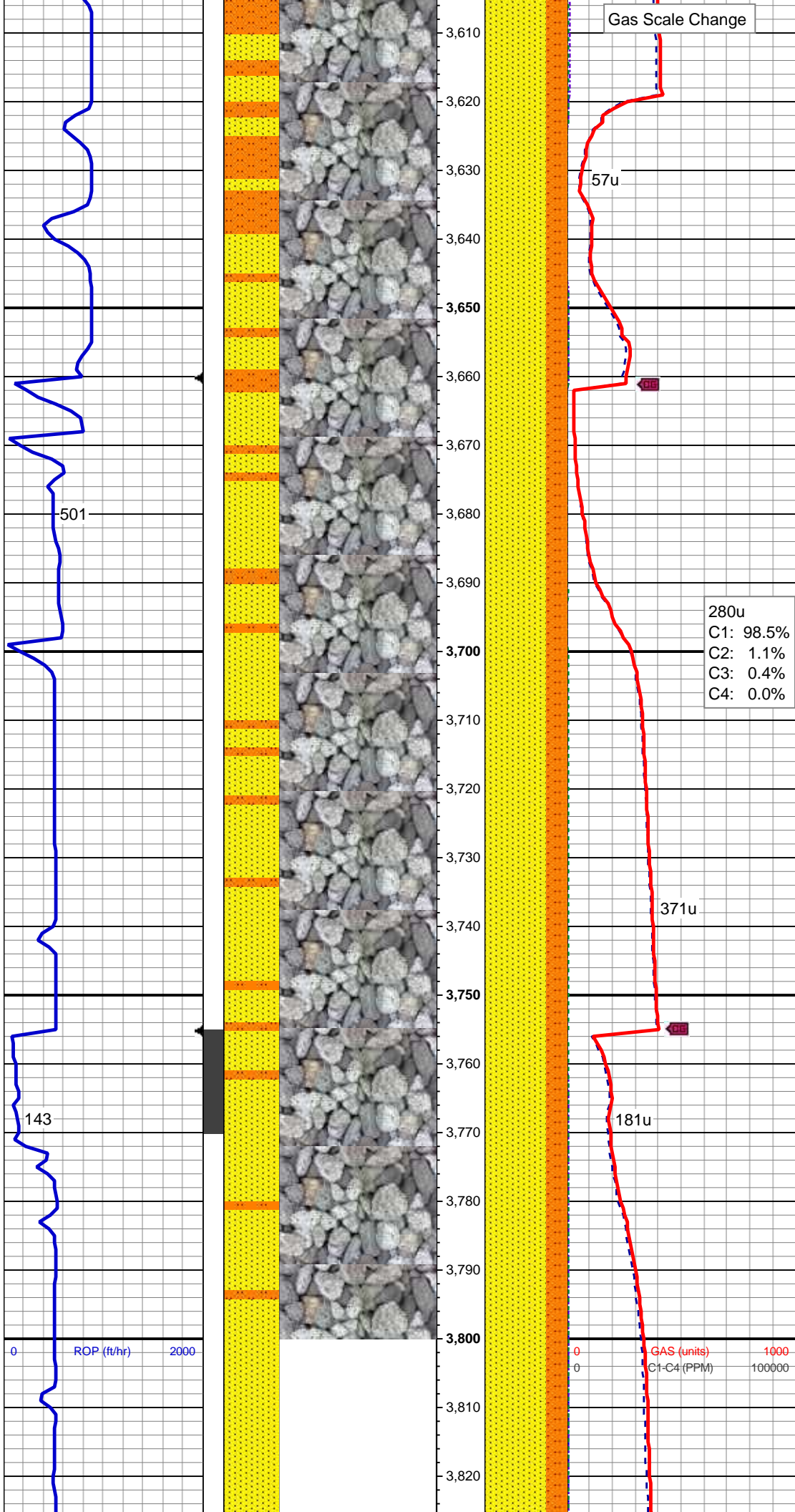


MD: 3,415'
TVD: 3,408.73'
Inclination: 4.99°
Azimuth: 87.2°
VS: -143.41'

75% SLTST: lt-med gy, mod frm, brit, sb plty-sb blkly, gt tex, slty-arg mtx, intlam wi 15% SS: offwht-wh, lt gy, s&p ip, clr-trnsl grd, s&p, mod-v hd, brit - fri ip, vf gr, sb rd-sb ang, w srt, cons, w cmted, non calc, occ (10%) slty sh, tr mics frag, nfsoc

MD: 3,510'
TVD: 3,503.26'
Inclination: 6.33°
Azimuth: 94.5°
VS: -152.75'

MD: 3,604'
TVD: 3,596.73'
Inclination: 5.86°



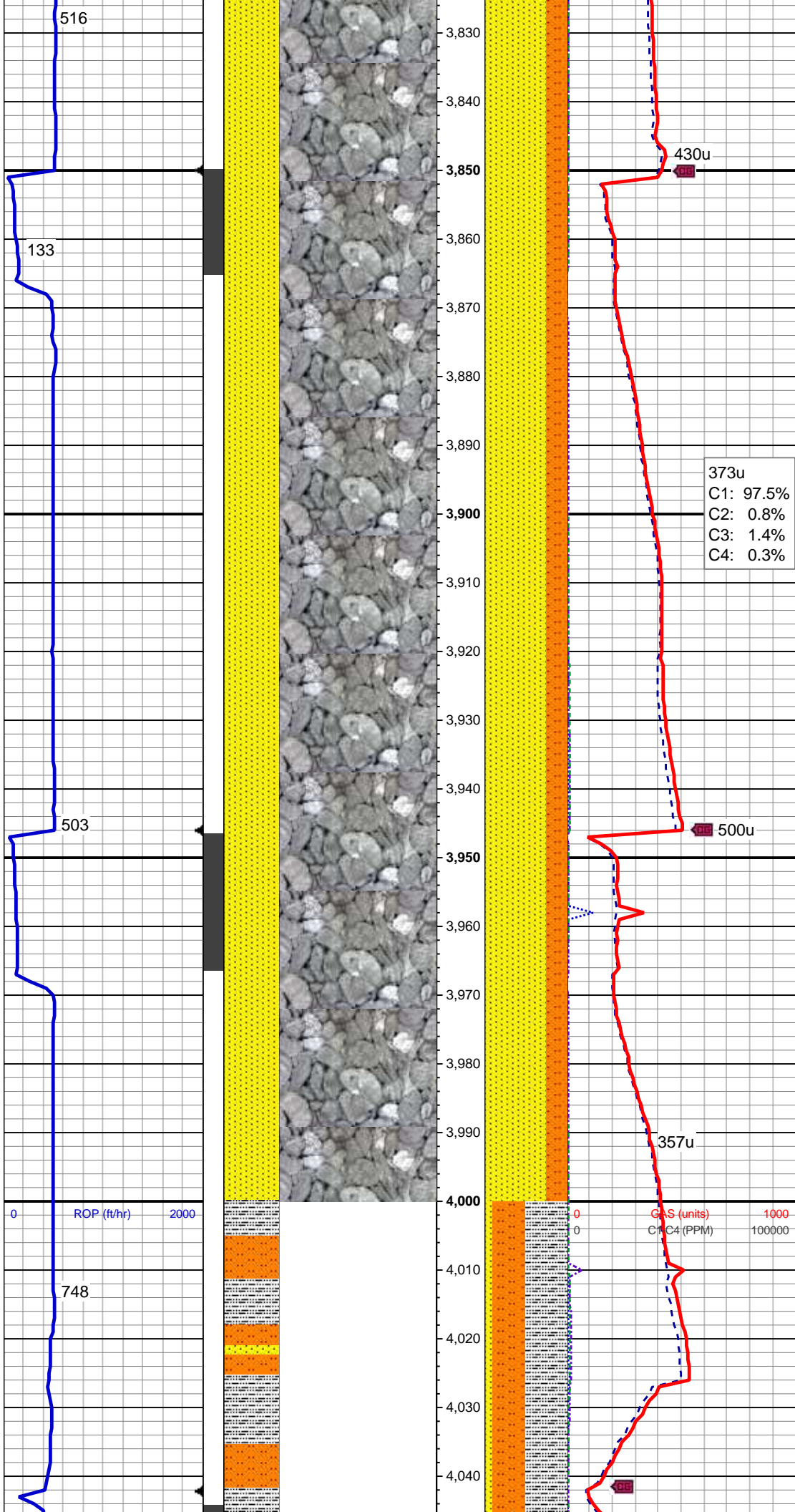
Azimuth: 92.25°
VS: -162.71'

MD: 3,699'
TVD: 3,691.22'
Inclination: 6.11°
Azimuth: 93.51°
VS: -172.59'

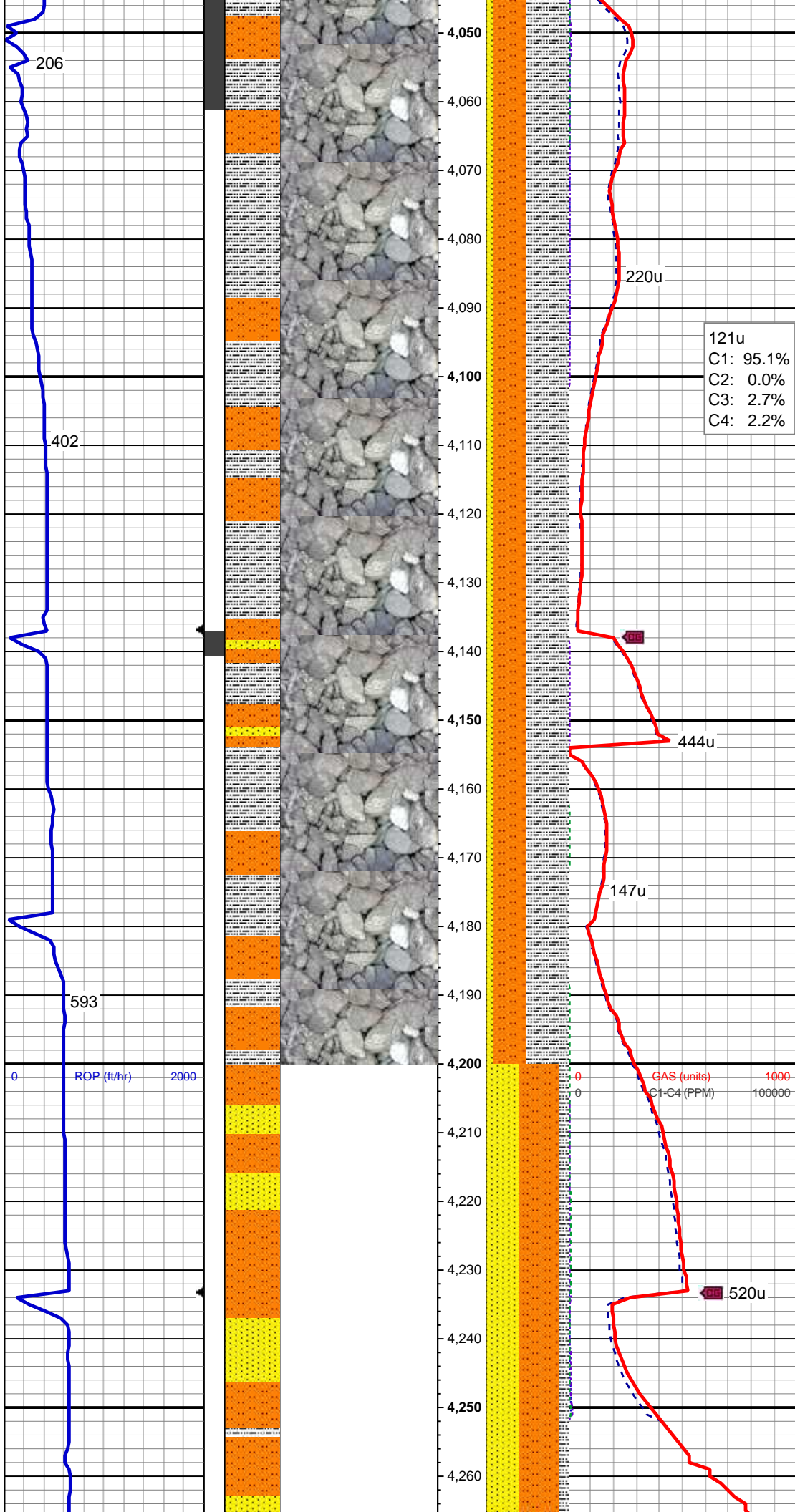
75% SS: offwht-wh, lt gy, s&p ip, clr-trnsl grd, hd, brit, vf gr, sb rd-sb ang, w srt, cons, w cmted, 25% SLTST: lt-med gy, lt brn, occ dk gy, frm, brit, sb plty-sb blk, gt tex, slty-arg mt, sl calc, occ mics frag, rr fos frag, occ ss stnd lt brn, slow difse, v fnt bl wh mky cut, no flor or od

MD: 3,794'
TVD: 3,785.83'
Inclination: 4.19°
Azimuth: 87.92°
VS: -181.1'

GAS (units)
C1-C4 (PPM)



75% SS: offwht-wh, lt gy, s&p ip, clr-trnsl grd, hd, brit, vf gr, sb rd-sb ang, w srt, cons, w cmted, 25% SLTST: lt-med gy, lt brn, occ dk gy, frm, brit, sb plty-sb blkly, gt tex, slty-arg mtx, sl calc, occ mics frag, rr fos frag, occ ss stnd lt brn, slow difse, v fnt bl wh mky cut, no flor or od

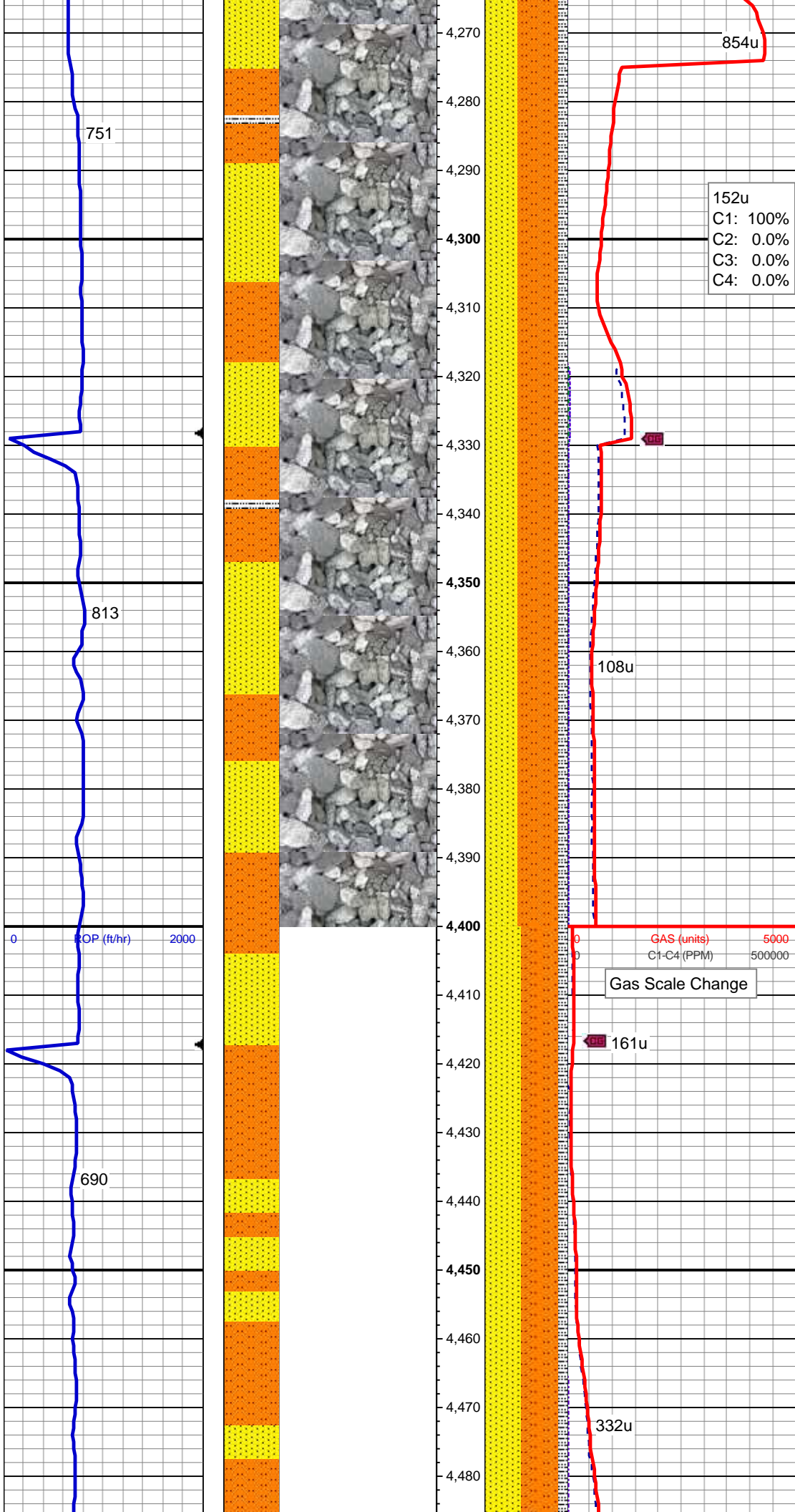


MD: 4,078'
TVD: 4,069.6'
Inclination: 0.44°
Azimuth: 218°
VS: -190.42'

121u
C1: 95.1%
C2: 0.0%
C3: 2.7%
C4: 2.2%

50% SLTY SH: med-dk gy, mod frm, fri ip, plty-sb plty, sl wxy tex, arg-slty mtx, 40% SLTST: lt-med gy, frm, brit, sb blkly, gt tex, slty-arg mtx, sdy ip 10% SS: wh-offwht, lt gy, clr-trnsl gr, s&p, hd, brit, vf-l f gr, slty ip, sb rd-sb ang, mod-w srt, cons, w cmted, v sl calc, nfsoc

MD: 4,267'



TVD: 4,258.58'
Inclination: 1.3°
Azimuth: 212.42°
VS: -188.79'

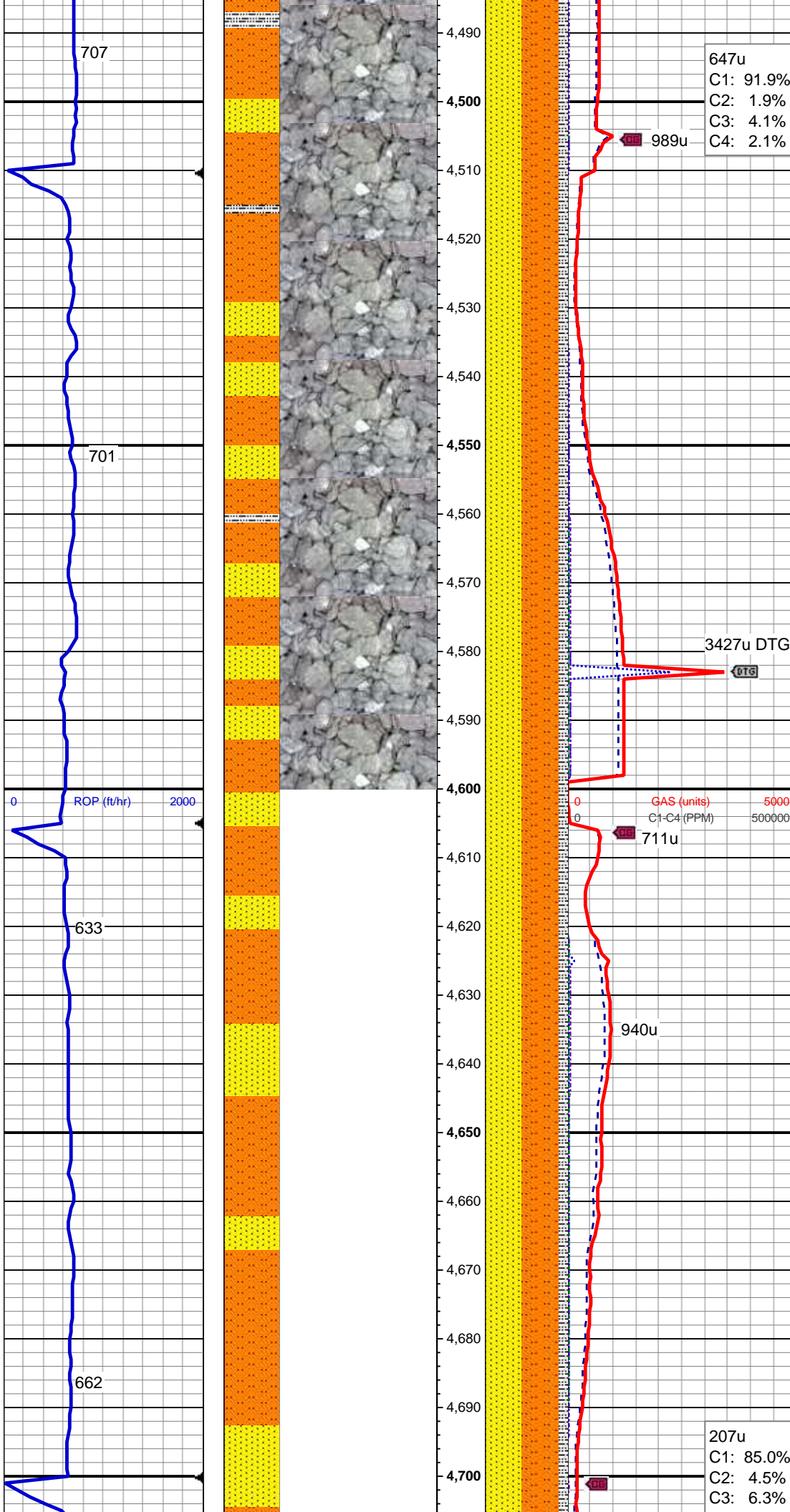
152u
C1: 100%
C2: 0.0%
C3: 0.0%
C4: 0.0%

50% SLTST: lt-med gy, frm, brit, sb
blky, gt tex, slty-arg mtx, sdy ip 40%
SS: wh-offwht, lt gy, clr-trnsl gr, s&p,
hd, brit, vf-l f gr, slty ip, sb rd-sb ang,
mod-w srt, cons, w cmted, v sl calc,
10% SLTY SH: med-dk gy, mod
frm, fri ip, plty-sb plty, sl wxy tex,
arg-slty mtx, nfsoc

MD: 4,362'
TVD: 4,353.55'
Inclination: 1.45°
Azimuth: 207.72°
VS: -187.63'

GAS (units) 5000
C1-C4 (PPM) 500000
Gas Scale Change

MD: 4,457'
TVD: 4,448.52'
Inclination: 1.46°
Azimuth: 210.32°
VS: -186.43'

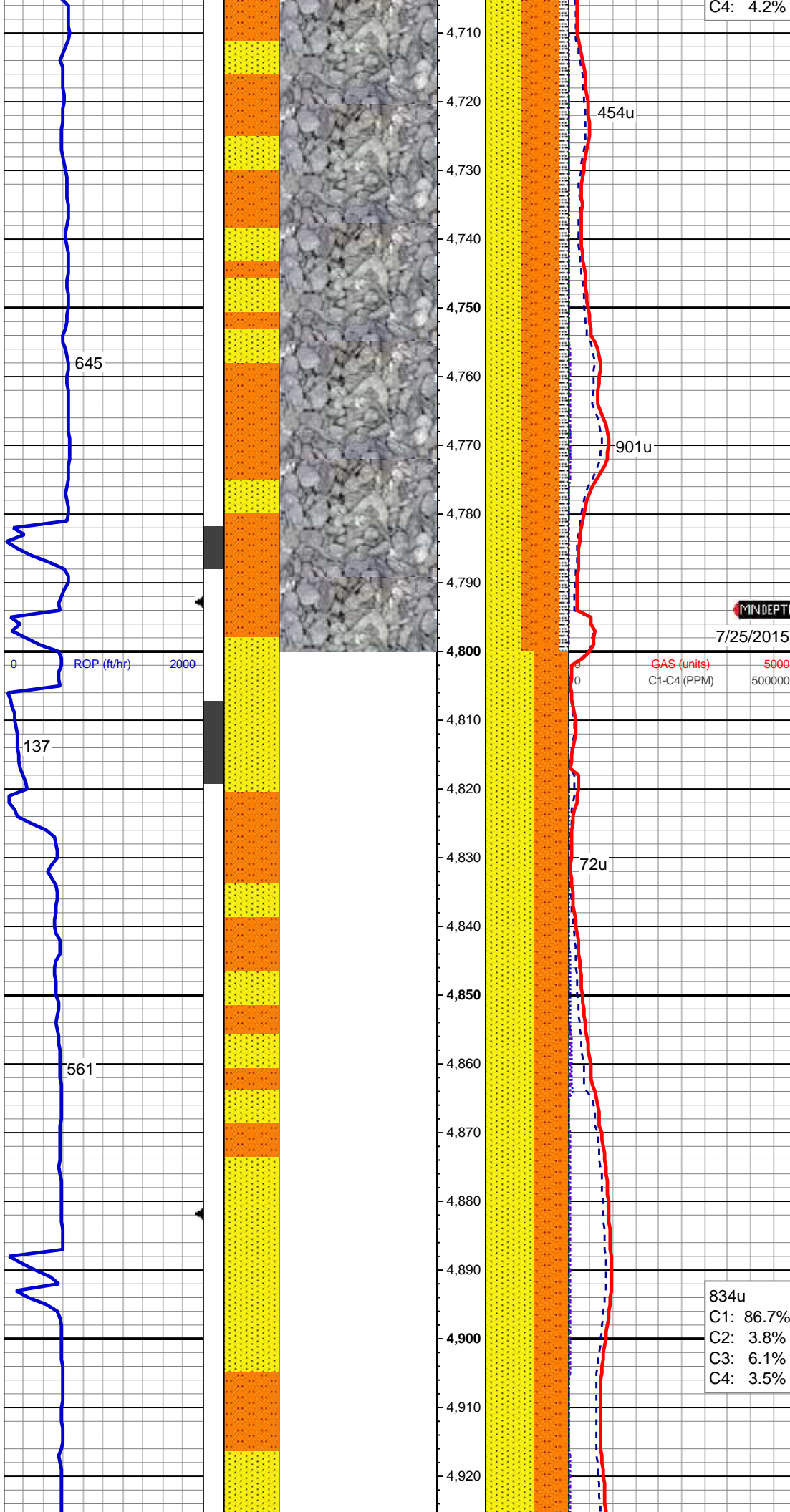


45% SLTST: lt-med gy, frm, brit, sb
blky, gt tex, slty-arg mtx, sdy ip 45%
SS: offwht, lt gy, clr-trnsl gr, s&p, hd,
brit, vf- f gr, slty ip, sb rd-sb ang,
mod-w srt, cons, w cmted, v sl calc,
10% SLTY SH: med-dk gy, mod
frm, fri ip, plty-sb plty, sl wxy tex,
arg-slty mtx, nfsoc

MD: 4,551'
TVD: 4,542.48'
Inclination: 1.68°
Azimuth: 196.1°
VS: -185.41'

MD: 4,645'
TVD: 4,636.44'
Inclination: 1.91°
Azimuth: 194.3°
VS: -184.6'

45% SLTST: lt-med gy, frm, brit, sb
blky, gt tex, slty-arg mtx, sdy ip 45%
SS: offwht, lt gy, clr-trnsl gr, s&p, hd,
brit, vf- f gr, slty ip, sb rd-sb ang,
mod-w srt, cons, w cmted, v sl calc,



C4: 4.2%

10% SLTY SH: med-dk gy, mod
frm, fri ip, plty-sb plty, sl wxy tex,
arg-slty mtz, nfsoc

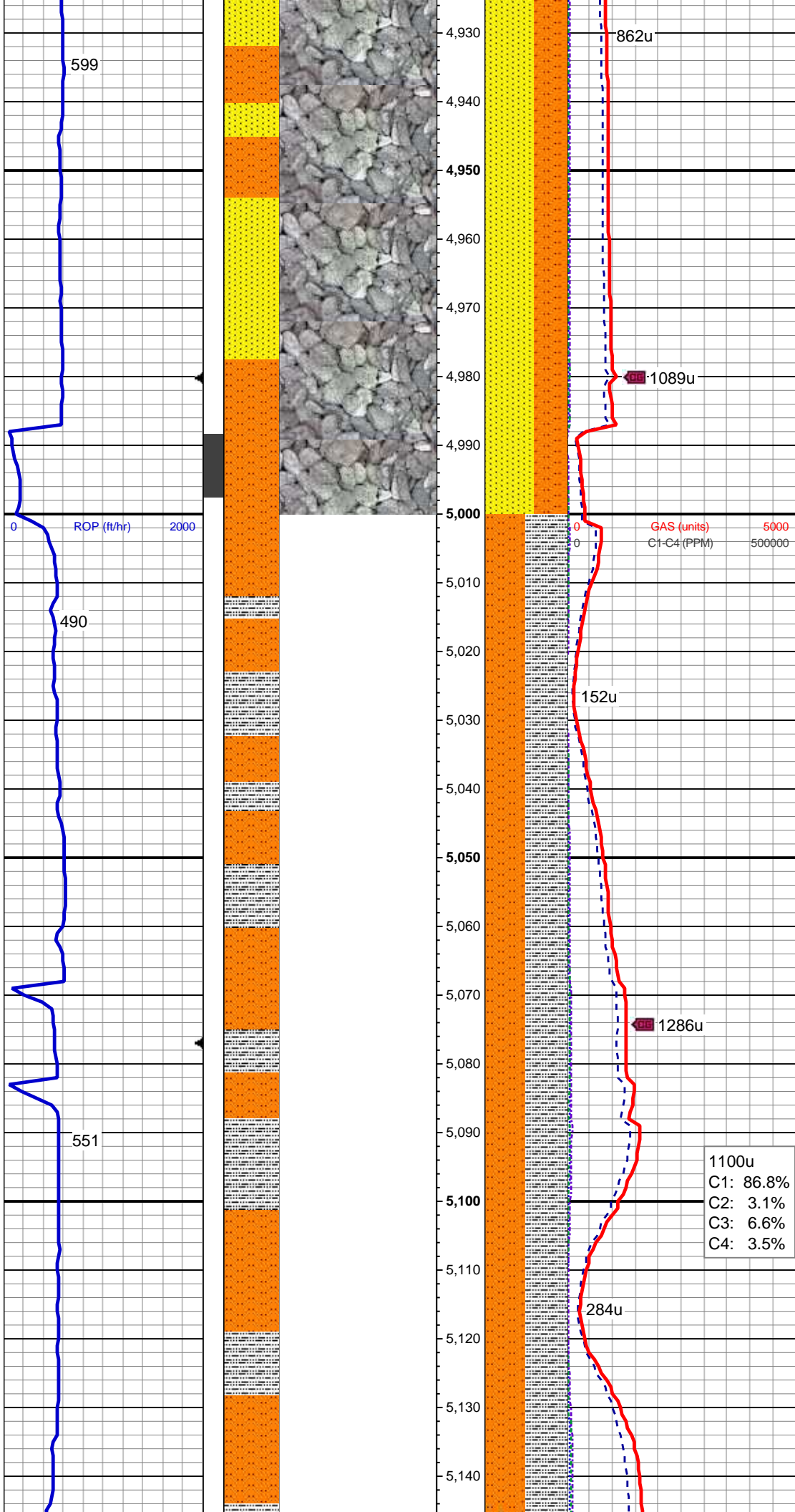
MD: 4,739'
TVD: 4,730.39'
Inclination: 1.84°
Azimuth: 187.46°
VS: -183.97'

MW: 9.25 Vis: 33

MD: 4,834'
TVD: 4,825.35'
Inclination: 1.8°
Azimuth: 269.73°
VS: -182.26'

834u
C1: 86.7%
C2: 3.8%
C3: 6.1%
C4: 3.5%

60% SS: lt gy-offwht, clr-trnsl gr,
s&p, hd, brit, vf- f gr, slty ip, sb rd-sb
ang, mod-w srt, cons, mod cmtd, v
sl calc, 40% SLTST: lt-med gy, frm,
brit, sb blk, gt tex, slty-arg mtz, sdy
ip, occ sl calc, tr bent frags, nfsoc

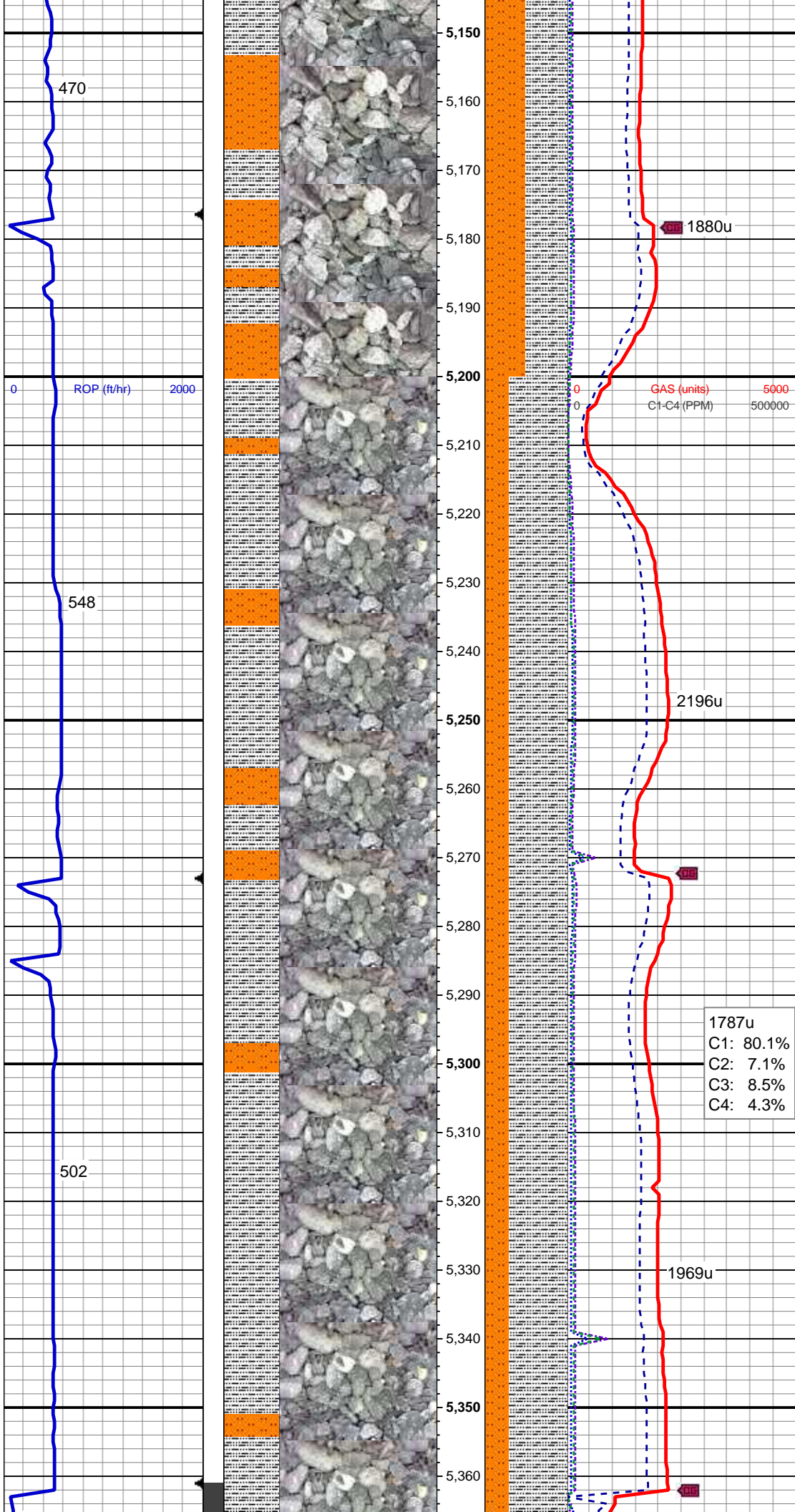


MD: 4,928'
TVD: 4,919.31'
Inclination: 1.5°
Azimuth: 266.32°
VS: -179.55'

MD: 5,023'
TVD: 5,014.29'
Inclination: 1.15°
Azimuth: 322.33°
VS: -177.73'

50% SLTY SH: med-dk gy, mod - v
frm, fri ip, plty - sb plty, sm - sb wxy
tex, arg-sltly mtx, 50% SLTST: lt -
med gy, occ dk gy, mod frm, brit, sb
plty - sb blkly, gt tex, slty - arg mtx, tr
shy ss, rr bent frags, v sl calc, nfsoc

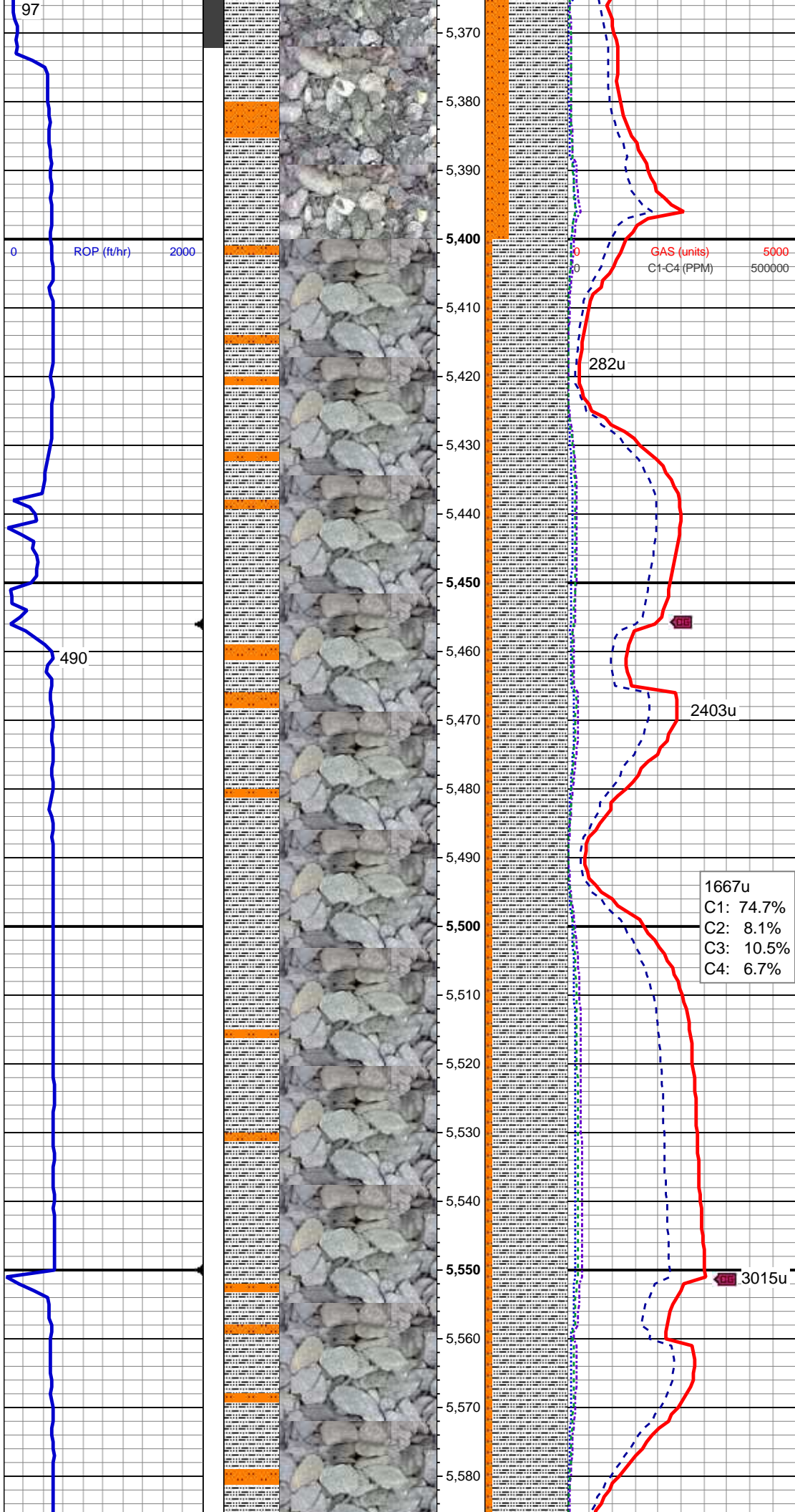
MD: 5,118'
TVD: 5,109.28'
Inclination: 0.83°
Azimuth: 293.57°
VS: -176.54'



MW: 9.3 VIS: 31

MD: 5,307'
TVD: 5,298.25'
Inclination: 0.77°
Azimuth: 281.29°
VS: -173.85'

70% SLTY SH: med-dk gy, mod - v
frm, fri ip, plty - sb plty, sm - sb wxy
tex, arg-sltly mtx, 30% SLTST: lt -
med gy, occ dk gy, mod frm, brit, sb
plty - sb blkly, gt tex, slty - arg mtx, tr
shy ss, rr bent frags, v sl calc, nfsoc



MD: 5,402'
TVD: 5,393.25'
Inclination: 1.04°
Azimuth: 352.54°
VS: -173.32'

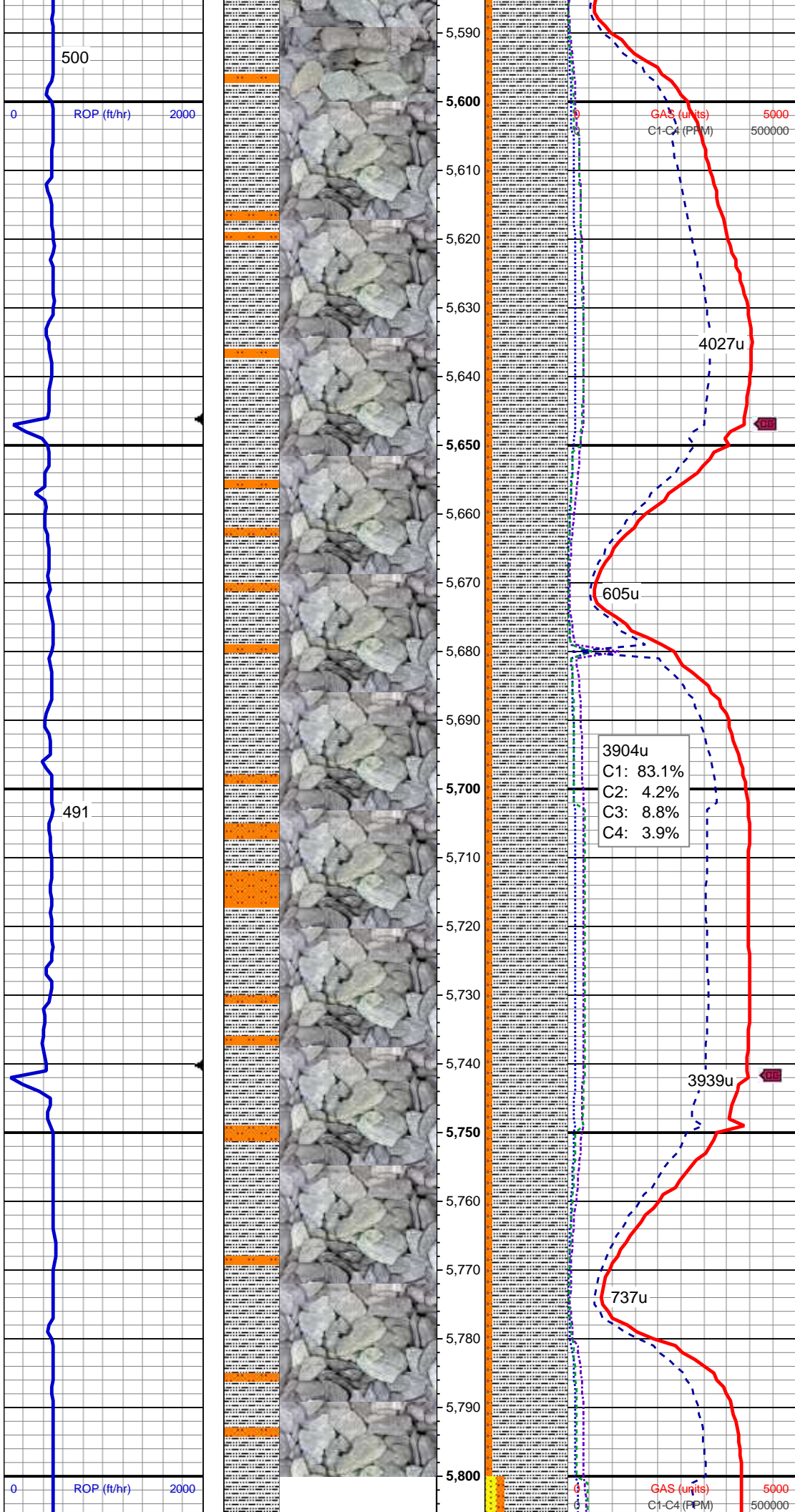
MW 9.55 VIS 34

MD: 5,496'
TVD: 5,487.24'
Inclination: 0.56°
Azimuth: 303.75°
VS: -172.85'

90% SLTY SH: med-dk gy, mod - v
frm, brit, plty - sb plty, sb fis ip,
sm-sb wxy tex, arg-slty mtx, non
calc, occ (10%) sltst, rr ss, tr diss
& clus pyr, rr bent frags, rr bri org
mnrl flr, slow difse, sl strng, bl wh
mky cut, no stn or od

1667u
C1: 74.7%
C2: 8.1%
C3: 10.5%
C4: 6.7%

MD: 5,591'



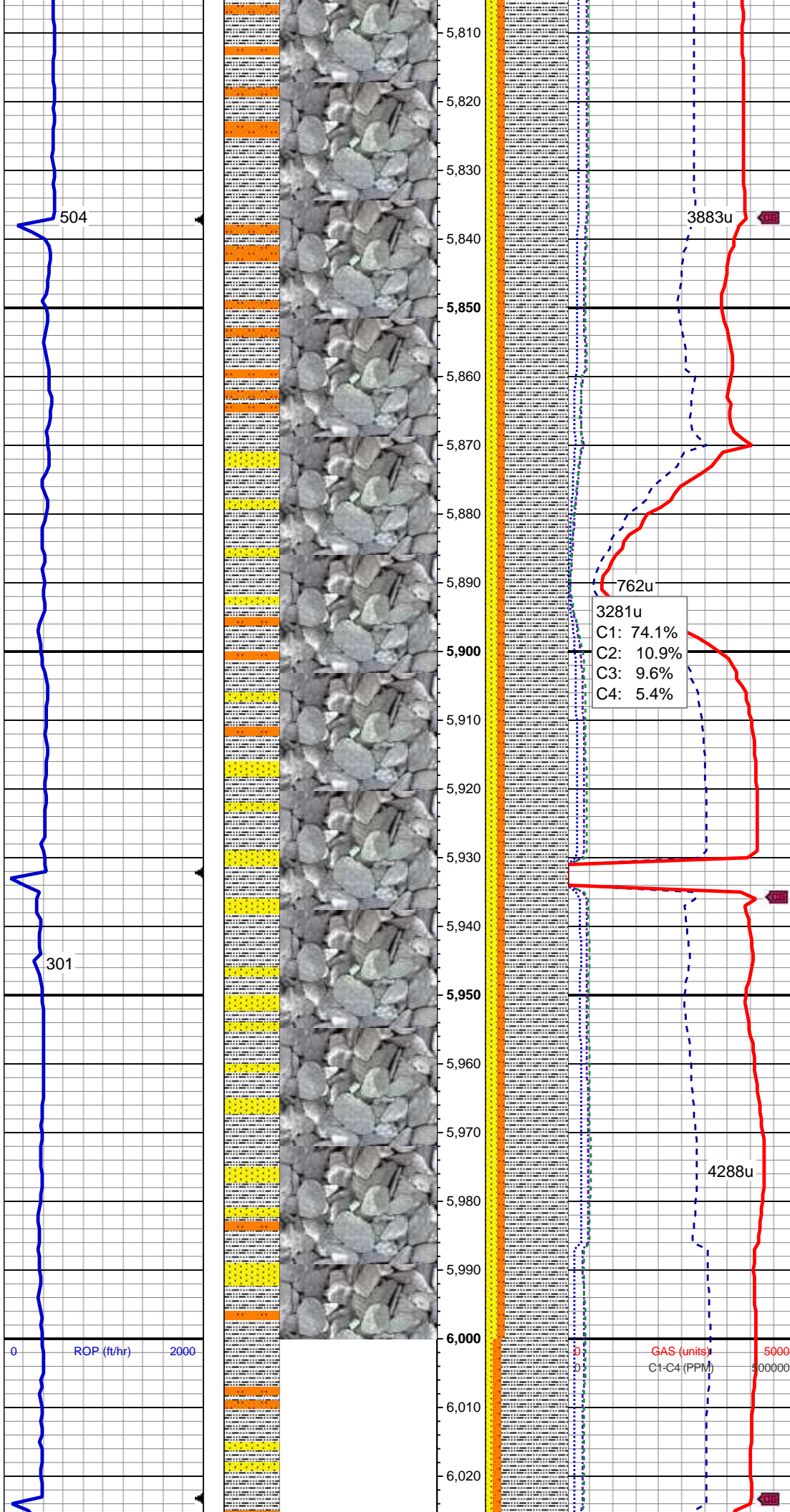
MD: 5,591'
TVD: 5,582.24'
Inclination: 0.23°
Azimuth: 139.89°
VS: -172.59'

MW 9.6 VIS 34

MD: 5,686'
TVD: 5,677.23'
Inclination: 0.31°
Azimuth: 82.41°
VS: -173.34'

90% SLTY SH: med-dk gy, occ lt gy, mod - v frm, brit, plty - sb plty, sb fis ip, sm-sb wxy tex, arg-slty mtx, non calc, occ (10%) sltst, tr dissim pyr, slow difse, sl stmg, bl wh mky cut, no flor stn or od

MD: 5,780'
TVD: 5,771.24'
Inclination: 0.56°
Azimuth: 72.59°
VS: -173.67'

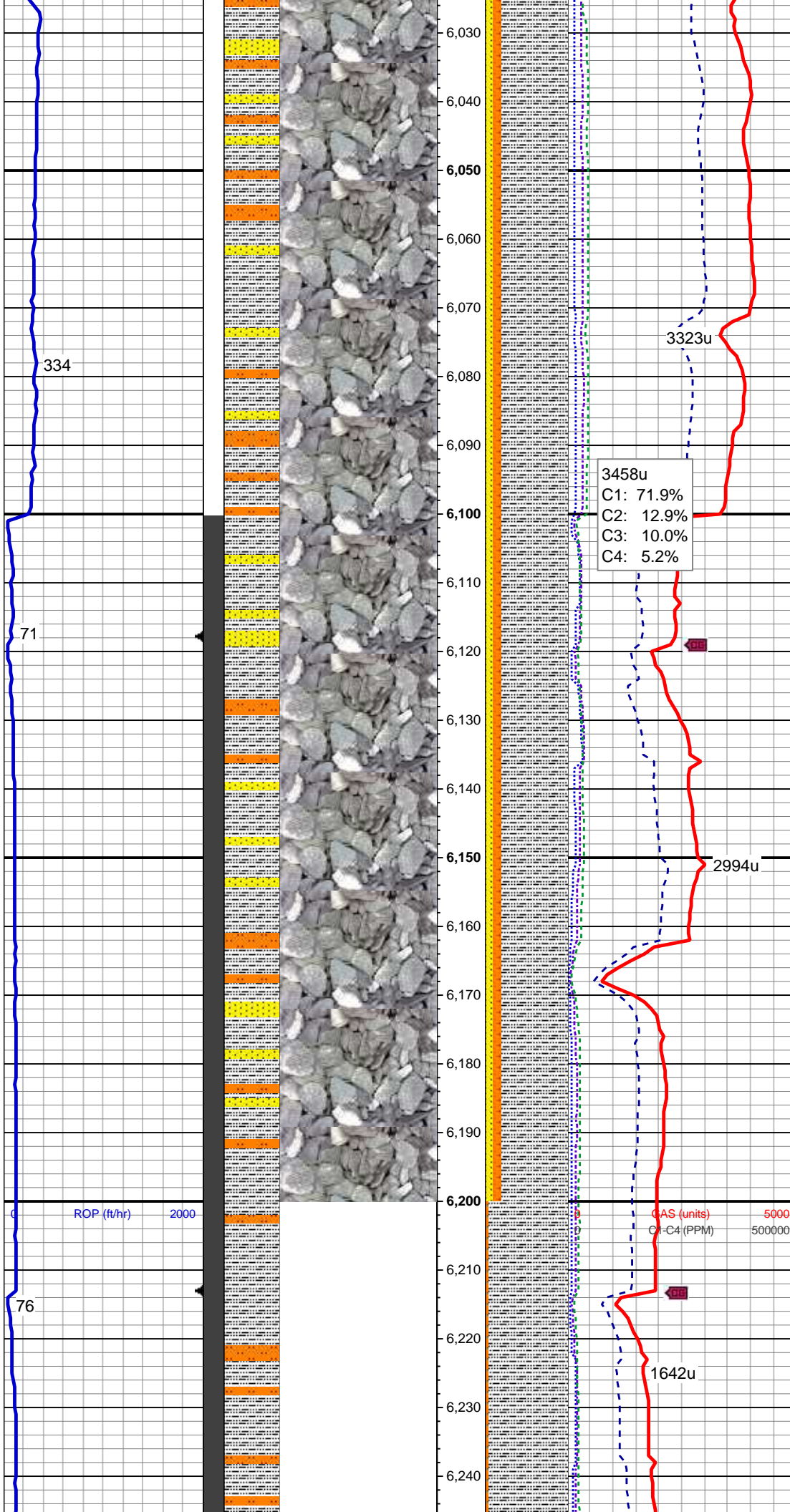


MD: 5,875'
TVD: 5,866.23'
Inclination: 0.4°
Azimuth: 102.35°
VS: -174.44'

75% SLTY SH: med-dk gy, occ lt gy,
mod - v frm, brit, plty - sb plty, sb fis
ip, sm-sb wxy tex, arg-slty mtz, fy
intlaml wi 15% SS: offwht-wh, lt gy,
clr-trnsl gr, s&p ip, v hd, brit, vf gr,
sb rd-sb ang, w srt, cons, w cmtd,
non calc, occ (10%) sltst, tr dissms
pyr, slow difse, sl stmg, bl wh mky
cut, no flr stn or od

MW 9.85 VIS 34

MD: 5,970'
TVD: 5,961.23'
Inclination: 0.49°
Azimuth: 87.83°
VS: -175.17'



MD: 6,065'
TVD: 6,056.23'
Inclination: 0.37°
Azimuth: 95.76°
VS: -175.89'

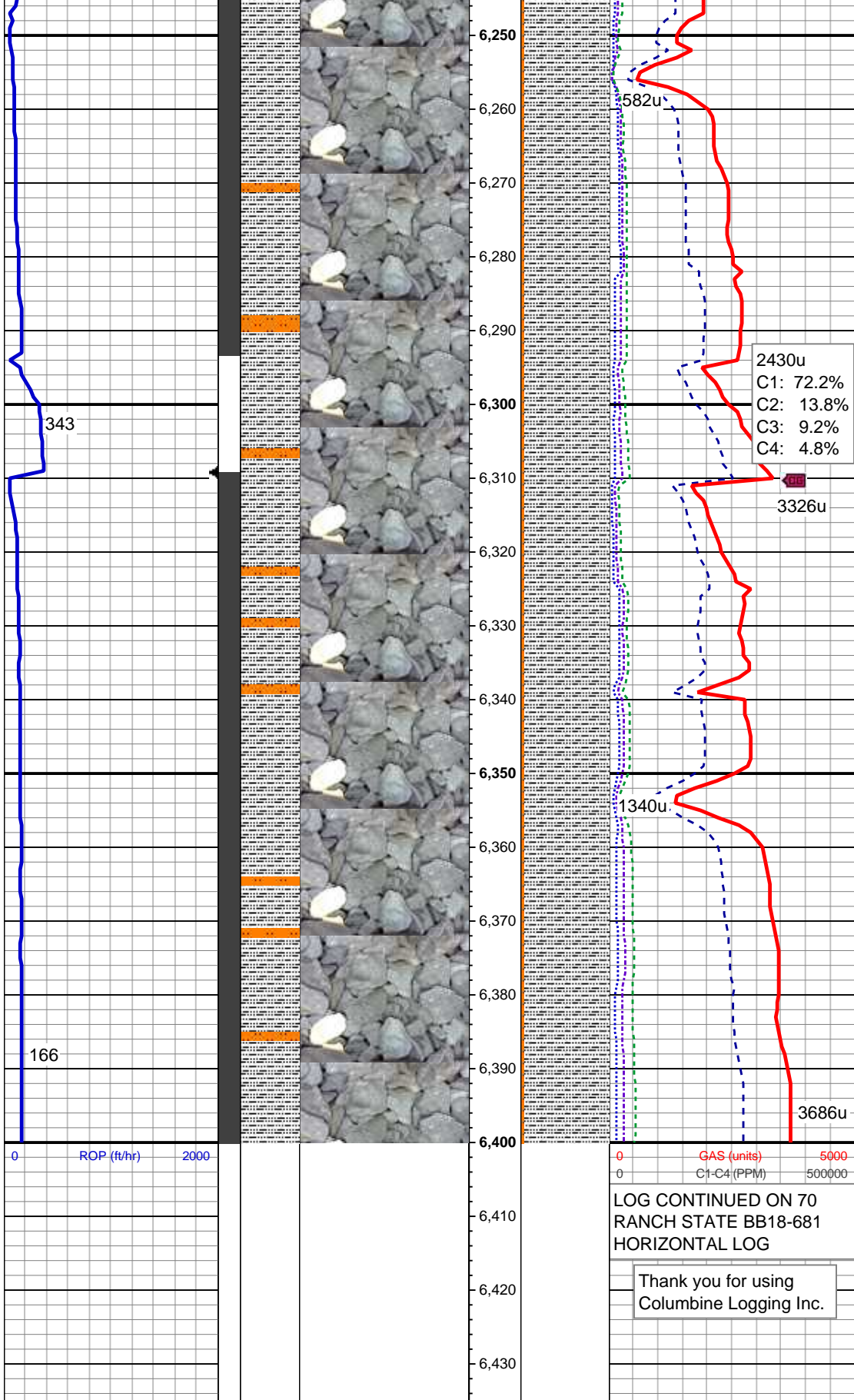
MW 10.4 VIS 35

80% SLTY SH: med-dk gy, occ lt gy, mod - v frm, brit, plty - sb plty, sb fis ip, sm-sb wxy tex, arg-slty mtx, non calc, occ (10%) fy intlam ss strgs, occ (10%) sltst, tr dissd pyr, slow difse, sl stmg, bl wh mky cut, no flr stn or od

KOP @ 6100' MD

MD: 6,159'
TVD: 6,150.06'
Inclination: 6.16°
Azimuth: 268.64°
VS: -171.14'

MW 10.45 VIS 33



MD: 6,254'
TVD: 6,243.46'
Inclination: 14.37°
Azimuth: 272.73°
VS: -154.24'

95% SLTY SH: dk gy-blk, frm, brit,
plty - sb plty, sb fis ip, sm-sb wxy
tex, arg-sltly mtx, non calc, tr (5%)
sltst, occ bent wi dissim pyr, occ bri
yel-orng mnrl flr, slow difse, sl
stmg, bl wh mky cut, no stn or od

MW 10.5 VIS 34

MD: 6,349'
TVD: 6,333.99'
Inclination: 20.73°
Azimuth: 272.83°
VS: -125.66'

LOG CONTINUED ON 70
RANCH STATE BB18-681
HORIZONTAL LOG

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