

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** Cockroft B11-62-1HN VERT

**Location** SEC 14 T5N R64W

**State** COLORADO

**County** WELD

**Country** USA

**Rig Number** H&P 315

**API Number** 05-123-37202-00

**AFE #** 136857

**Region** DJ Basin

**Field** Kersey

**Spud Date** 11/28/2013

**Surface Coordinates** SWSW SEC 11 T5N R64W  
245' FSL; 322' FWL

LAT/LONG: 40.407130/-104.525900

**Bottom Hole Coordinates** SESE SEC 15 T5N R64W  
330' FSL; 535' FEL

**Ground Elevation** 4,599'

**K.B. Elevation** 4,623'

**Logged Interval** 2,000'

**Formation** Niobrara B Chalk

**Type of Drilling Fluid** LSND

## Operator

**Company** Noble Energy Inc

## Geologist

**Name** NATHAN MURPHY, JACK WEINERTH, MARK COLE

**Company** COLUMBINE LOGGING, INC

**Address** 2385 S Lipan St  
Denver, CO 80223

## Rock Types

## Rock Types

SHALY SILTSTONE  
 SHALY SANDSTONE  
 SANDSTONE  
 SILTY SHALE  
 UNKNOWN  
 ANHYDRITE  
 BENTONITE  
 BRECCIA  
 CEMENT

CHALK  
 CHERT  
 CLAY CHOKE SAND  
 CLAYSTONE  
 COAL  
 CONGLOMERATE  
 DOLOMITE  
 GRANITE  
 GYPSUM

IGNEOUS  
 LIMESTONE  
 SIDERITE or LIMONITE  
 MARLSTONE  
 METAMORPHIC  
 NO SAMPLE  
 SALT  
 SALT- PEPPER SAND  
 SHALE

SHALE COLORED  
 SHALE GRAY  
 SILTSTONE  
 TILL  
 TUFF  
 WELDED TUFF

## 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  
 FENESTRAL  
 FRACTURE  
 INTERCRYSTALLINE  
 INTEROOLITIC

### Moldic

ORGANIC  
 PINPOINT  
 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

ANGULAR  
 ROUNDED  
 SUBANG  
 SUBRND

### Textures

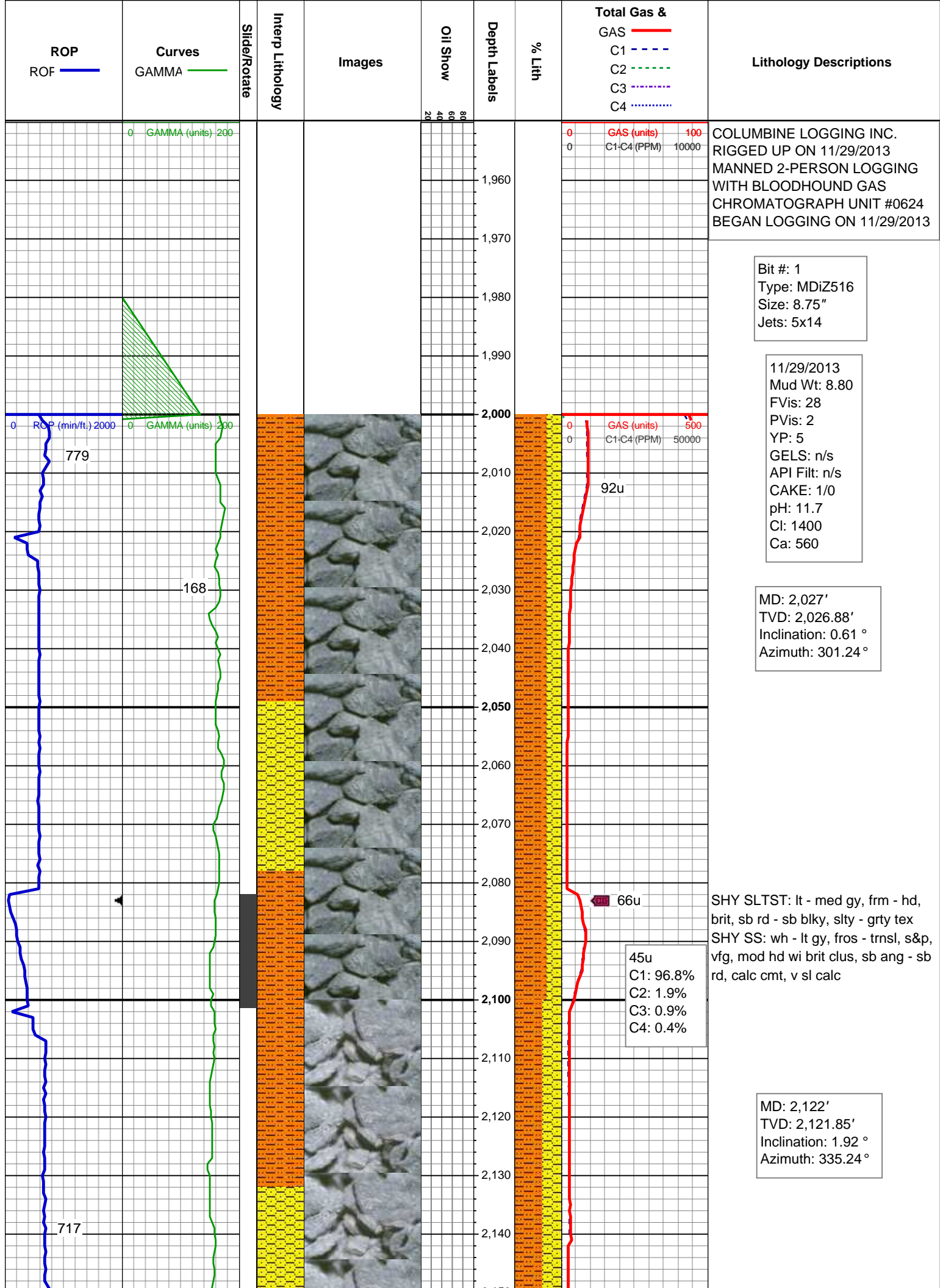
BOUNDSTONE  
 CHALKY  
 CRYPTOXLN

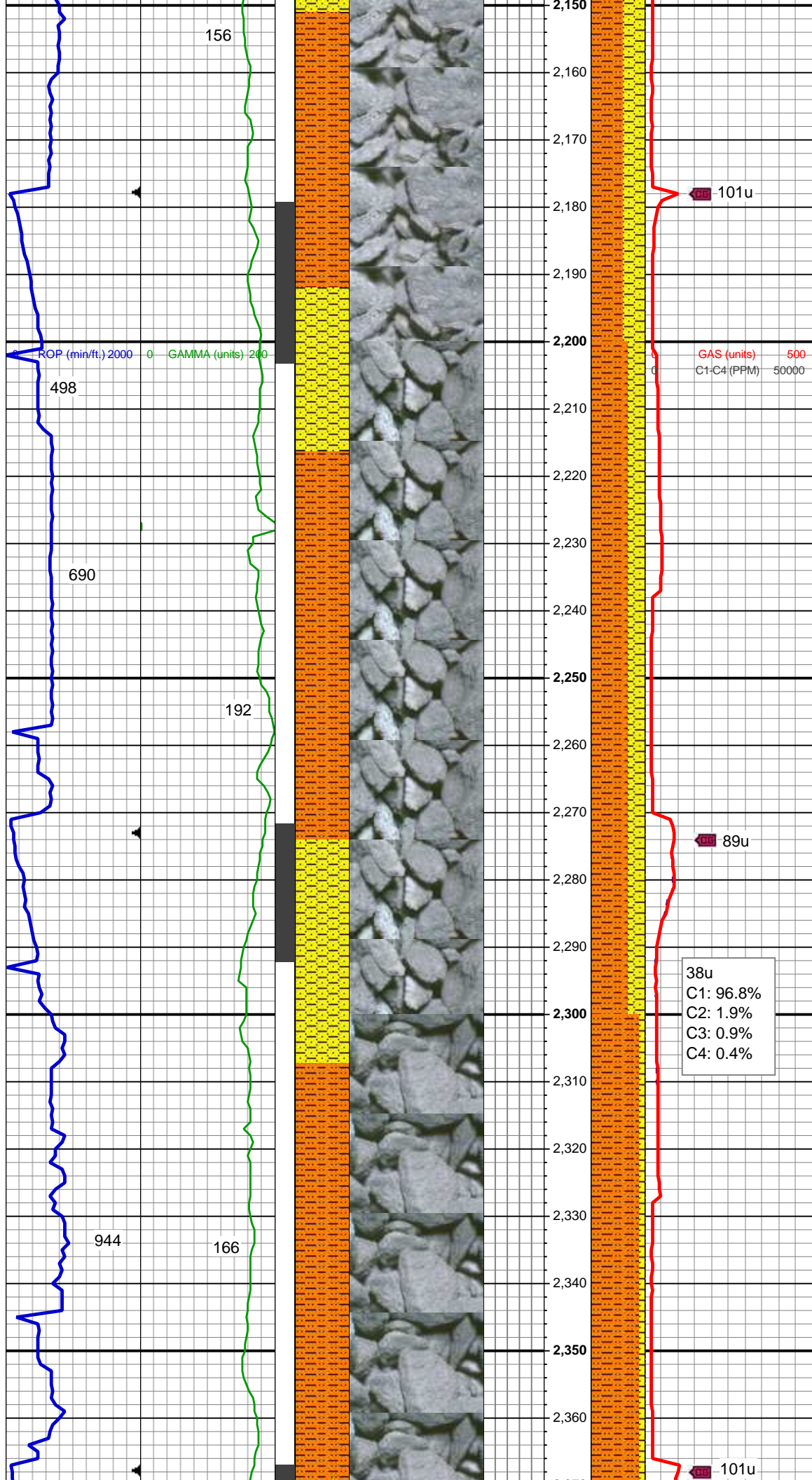
### Earthy

FINELYXLN  
 GRAINSTONE  
 LITHOGRAPHIC  
 MICROXLN  
 MUDSTONE  
 PACKSTONE  
 WACKESTONE

### Sorting

MODERATE  
 POOR  
 WELL





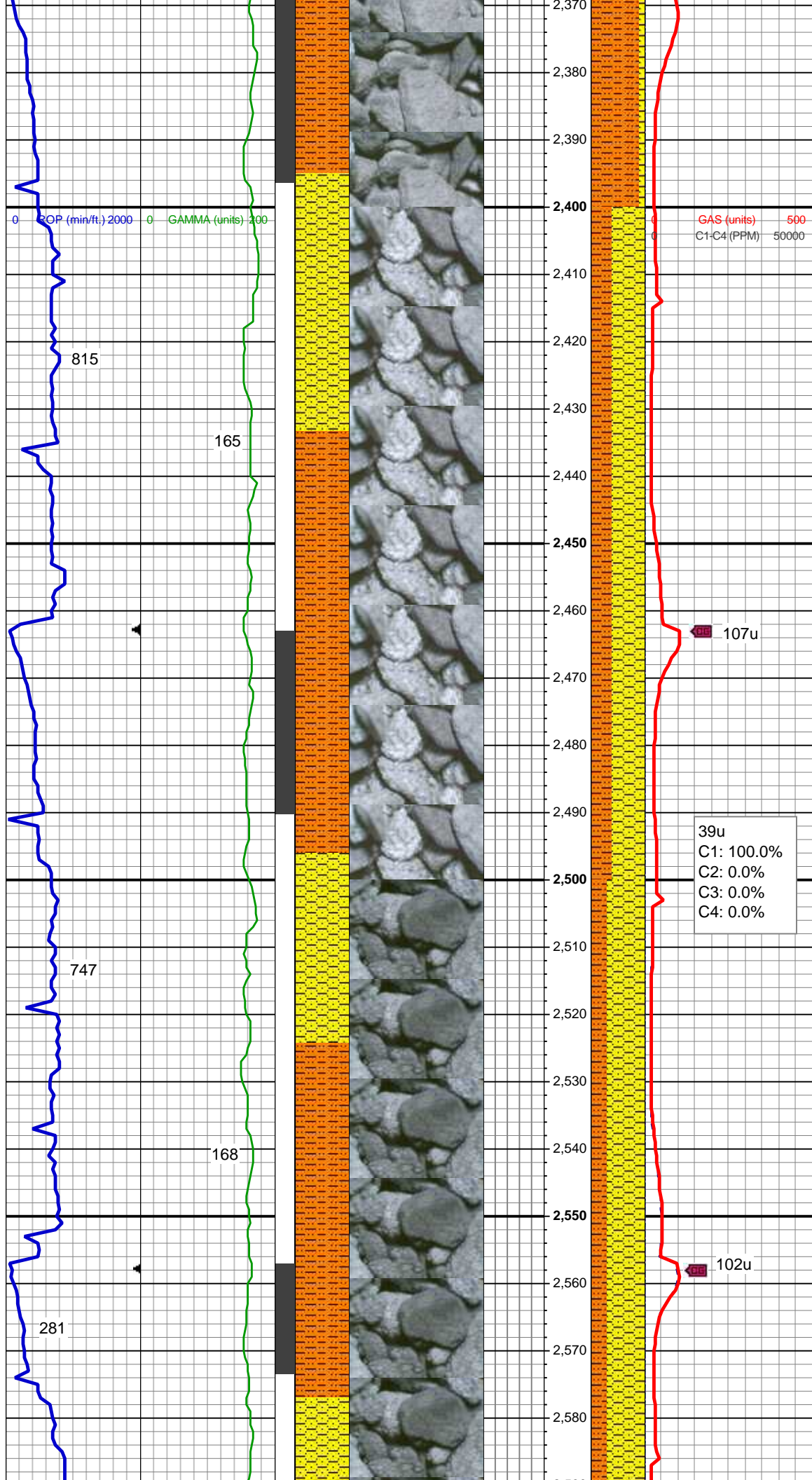
SHY SLTST: lt - med gy, frm - hd, brit, sb rd - sb blk, slty - grty tex, v s calc  
SHY SS: wh - lt gy, fros - trns, s&p, vfg, mod hd wi brit clus, sb ang - sb rd, calc cmt

MD: 2,217'  
TVD: 2,216.72'  
Inclination: 3.99 °  
Azimuth: 319.57 °

SHY SLTST: lt - med gy, frm - hd, brit, sb rd - sb blk, slty - grty tex, v s calc  
SHY SS: wh - lt gy, fros - trns, s&p, vfg, mod hd wi brit clus, sb ang - sb rd, calc cmt

MD: 2,312'  
TVD: 2,311.42'  
Inclination: 5.18 °  
Azimuth: 326.32 °

38u  
C1: 96.8%  
C2: 1.9%  
C3: 0.9%  
C4: 0.4%



SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc  
SHY SS: wh - lt gy, fros - trns, s&p,  
vfg, mod hd, sb ang - sb rd, calc  
cmt

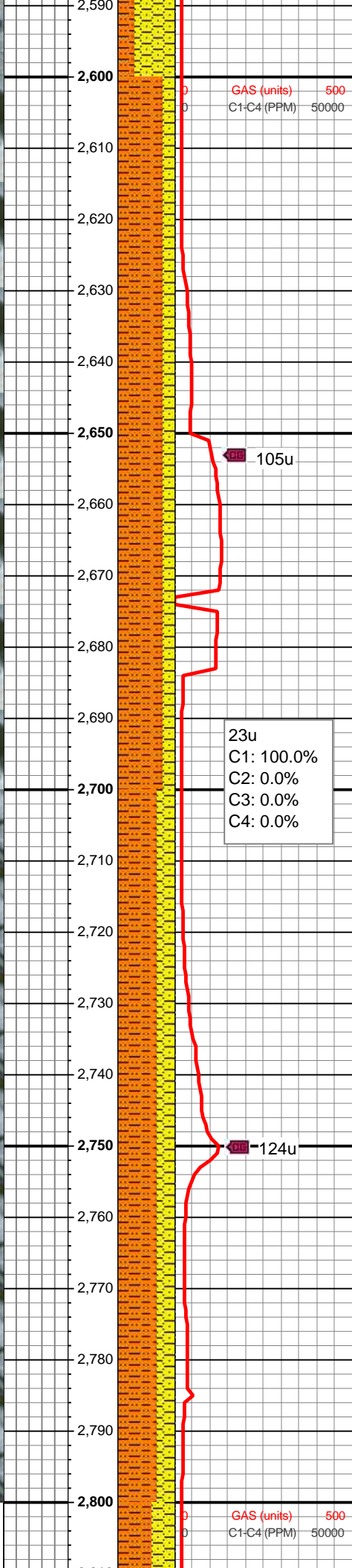
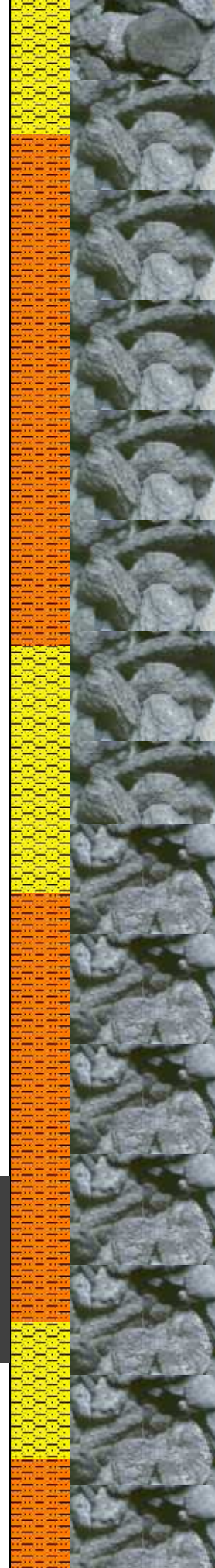
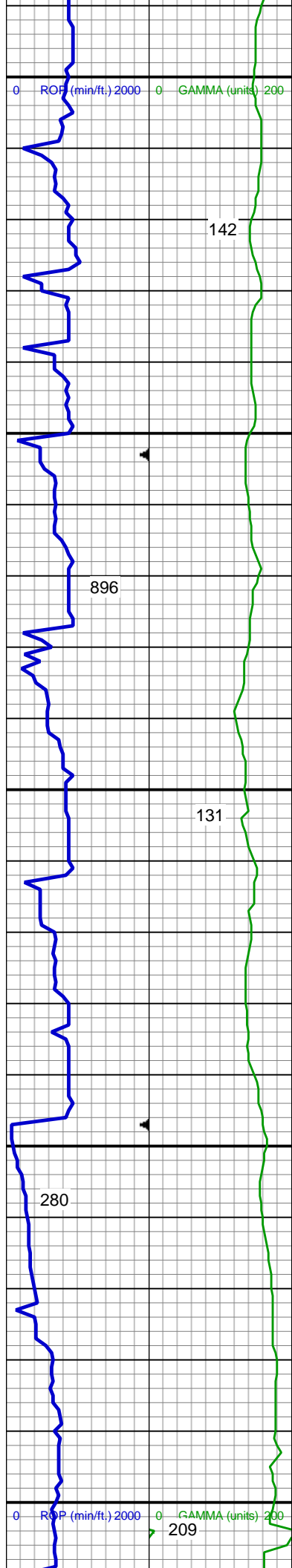
MD: 2,407'  
TVD: 2,405.87'  
Inclination: 7.05 °  
Azimuth: 326.91 °

SHY SS: wh - lt gy, fros - trns, s&p,  
vfg-fg, mod hd wi brit clus, sb ang -  
sb rd, calc cmt  
SHY SLTST: lt - med gy, frm - hd,  
occ brit, sb rd - sb ang, slty - grty  
tex, v sl calc

MUD WT: 8.70/8.75  
VIS: 28/27IN/OUT

MD: 2,502'  
TVD: 2,499.97'  
Inclination: 8.72 °  
Azimuth: 326.68 °

SHY SS: wh - lt gy, fros - trns, s&p,  
vfg-fg, mod hd wi brit clus, sb ang -  
sb rd, calc cmt



SHY SLTST: lt - med gy, frm - hd,  
occ brit, sb rd - sb ang, slty - grty  
tex, v sl calc

MD: 2,597'  
TVD: 2,593.84'  
Inclination: 8.99 °  
Azimuth: 325.25 °

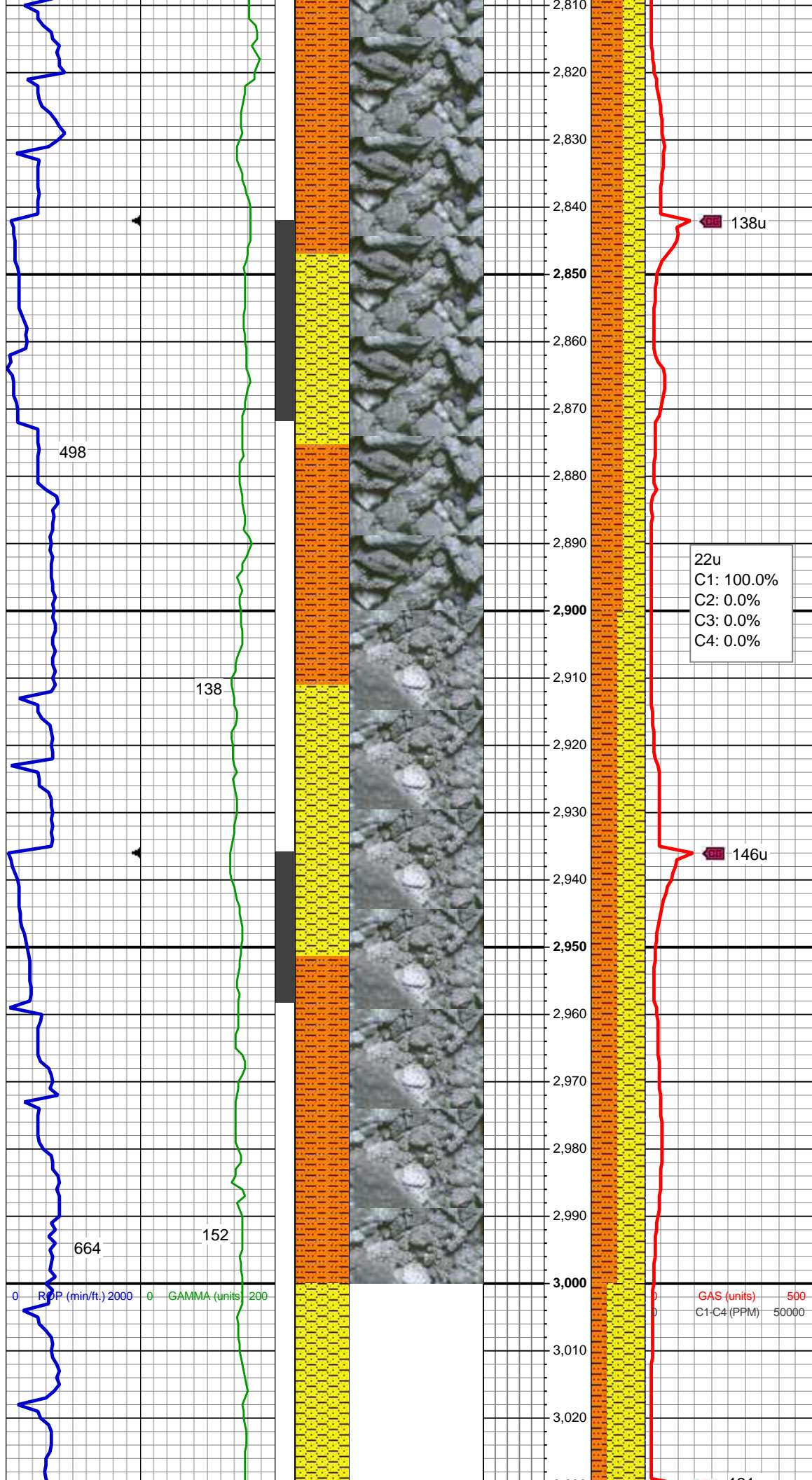
SHY SLTST: lt - med gy, frm - sl hd,  
sb rd - sb blk, slty - grty tex, v sl  
calc

SHY SS: wh - lt gy, occ md gy, fros -  
trns, s&p, vfg, mod hd, sb ang - sb  
rd, calc cmt

MD: 2,692'  
TVD: 2,687.63'  
Inclination: 9.29 °  
Azimuth: 322.37 °

MD: 2,787'  
TVD: 2,781.67'  
Inclination: 6.99 °  
Azimuth: 323.58 °

SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc  
SHY SS: wh - lt gy, fros - trns, s&p,  
vfg, mod hd, sb ang - sb rd, calc  
cmt



MD: 2,881'  
TVD: 2,875.23'  
Inclination: 3.88 °  
Azimuth: 324.74 °

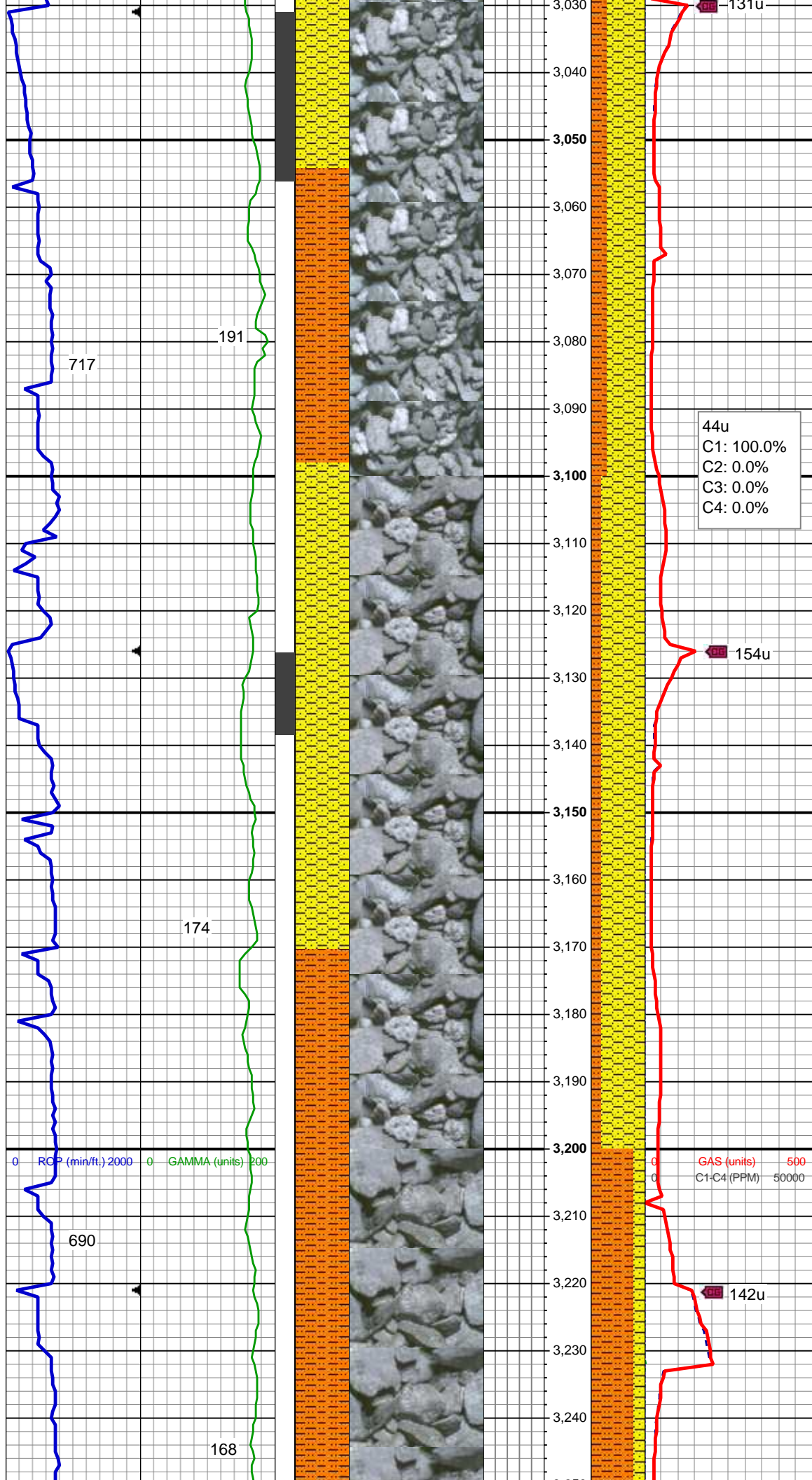
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc  
SHY SS: wh - lt gy, fros - trns, s&p,  
vfg, mod hd, sb ang - sb rd, calc  
cmt

22u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

MD: 2,976'  
TVD: 2,970.11'  
Inclination: 1.97 °  
Azimuth: 315.54 °

SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc  
SHY SS: wh - lt gy, fros - trns, s&p,  
vfg, mod hd, sb ang - sb rd, calc  
cmt

GAS (units) 500  
C1-C4 (PPM) 50000

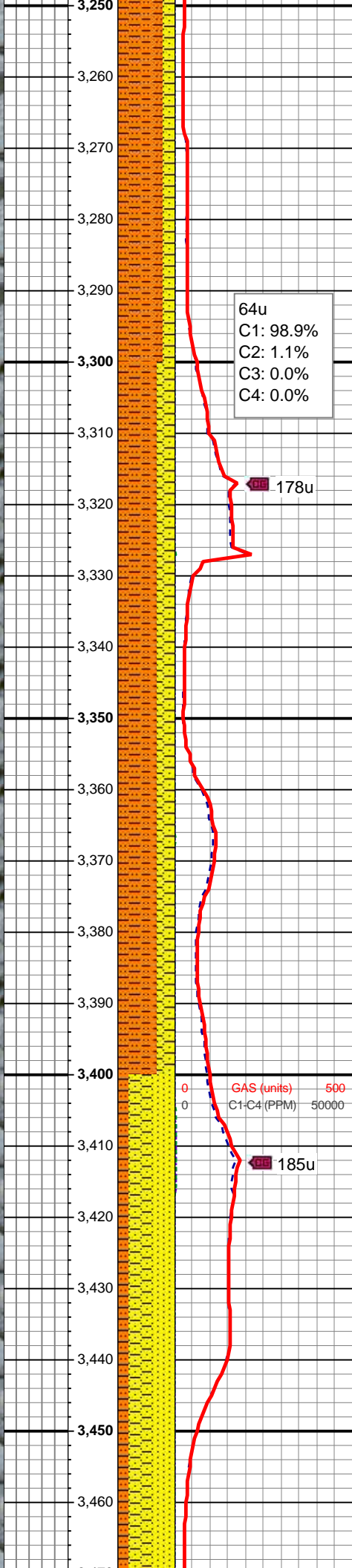
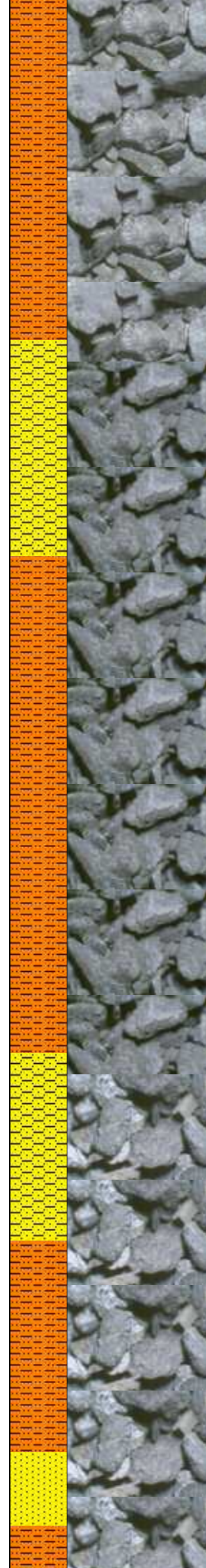
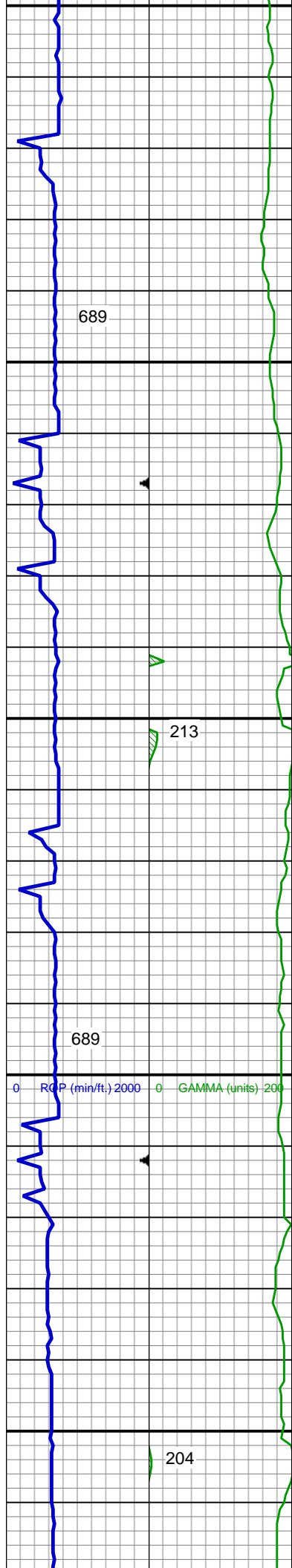


MD: 3,071'  
TVD: 3,065.08'  
Inclination: 1.05 °  
Azimuth: 234.88 °

SHY SS: wh - lt gy, fros - trns, s&p,  
vfg, mod hd, sb ang - sb rd, calc  
cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc

MD: 3,166'  
TVD: 3,160.07'  
Inclination: 0.56 °  
Azimuth: 216.66 °

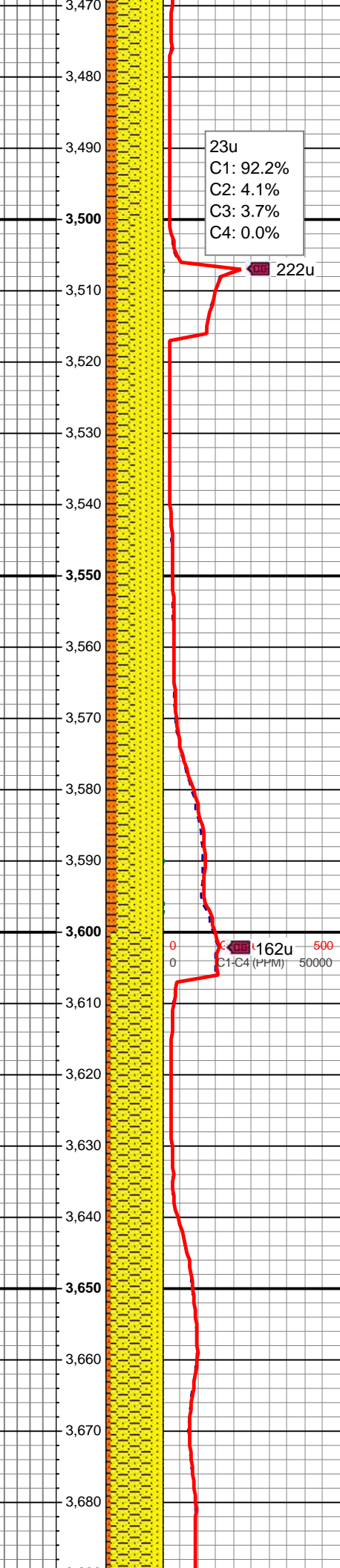
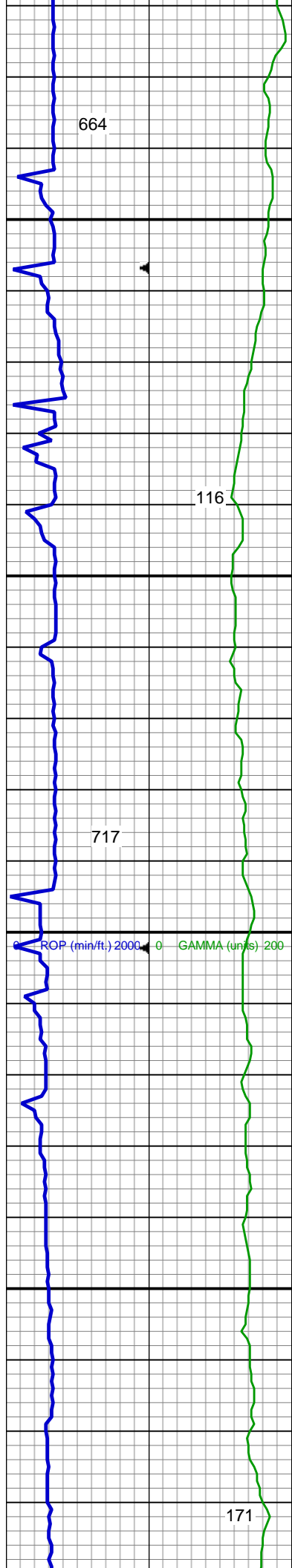
SHY SS: wh - lt gy, fros - trns, s&p,  
vfg, mod hd, sb ang - sb rd, calc  
cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc



SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc  
SHY SS: wh - lt gy, fros - trns, s&p,  
vfg, mod hd, sb ang - sb rd, calc  
cmt

SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc  
SHY SS: wh - lt gy, fros - trns, s&p,  
vfg, mod hd, sb ang - sb rd, calc  
cmt

MD: 3,451'  
TVD: 3,445.07'  
Inclination: 0.4 °  
Azimuth: 305.34 °

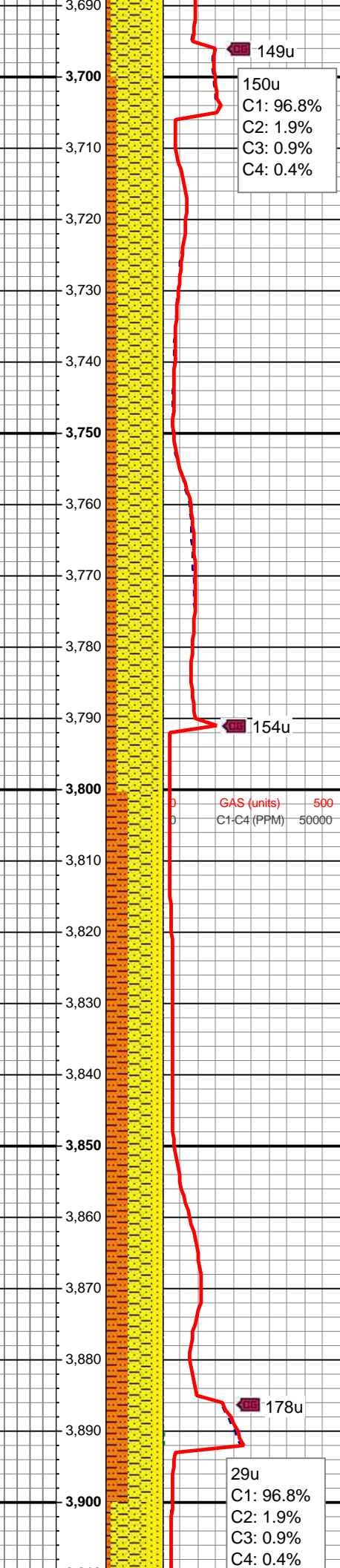
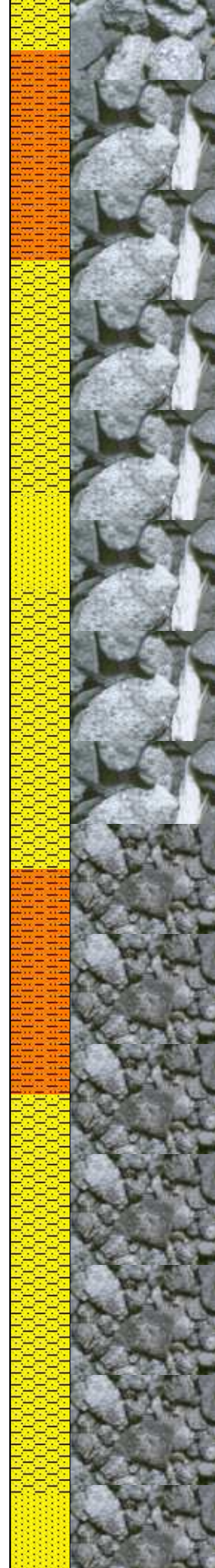
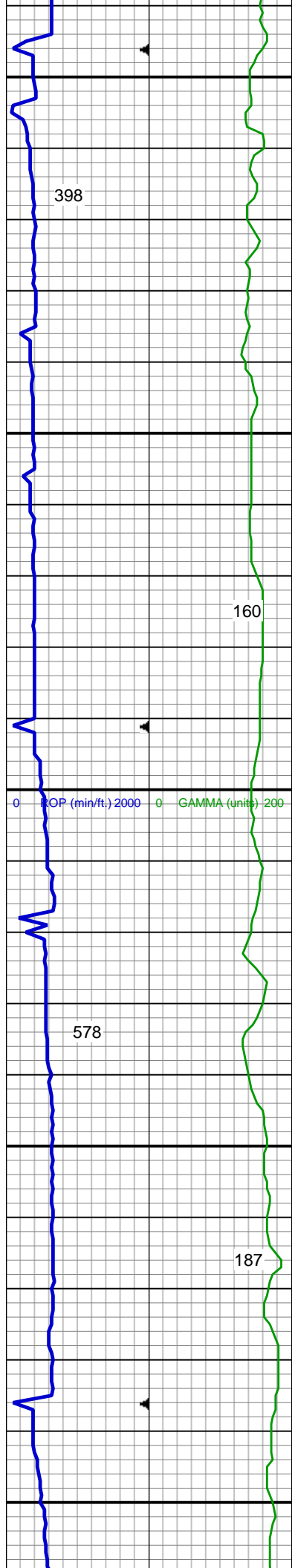


SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc

SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt  
SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc

MUD WT: 8.8/8.6  
VIS: 31/28IN/OUT

SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,

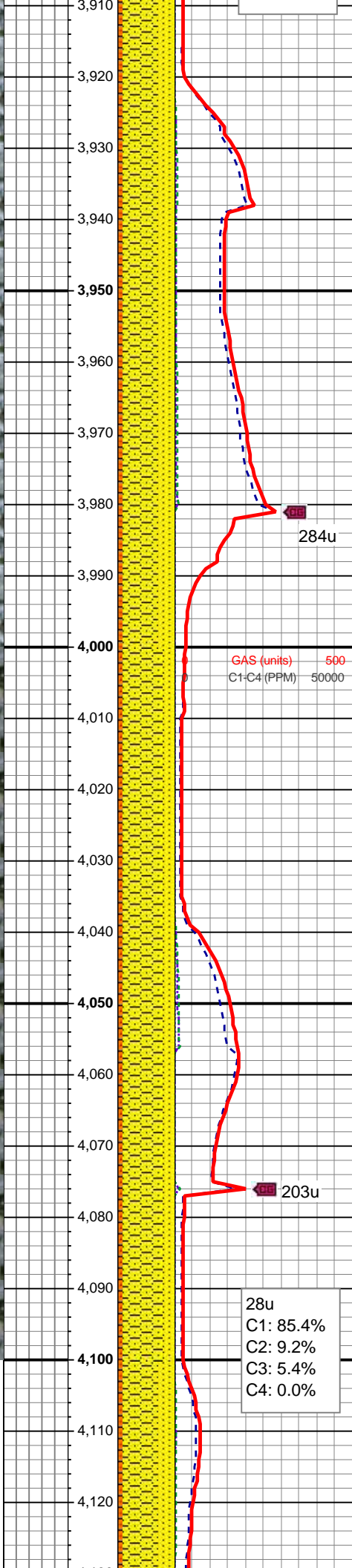
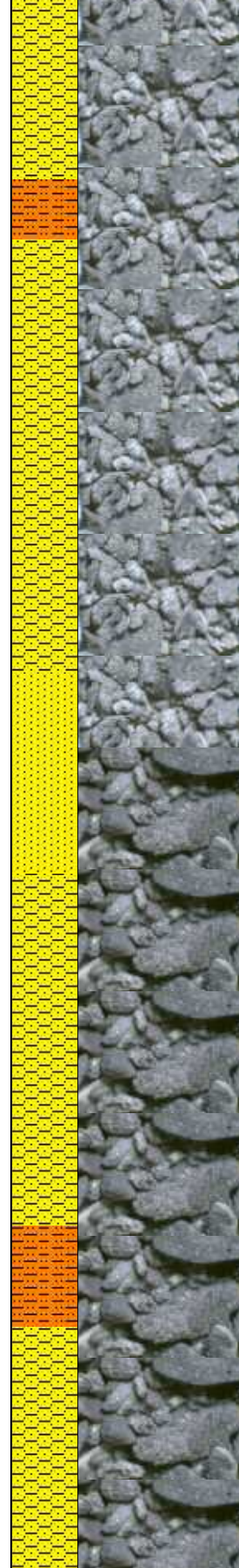
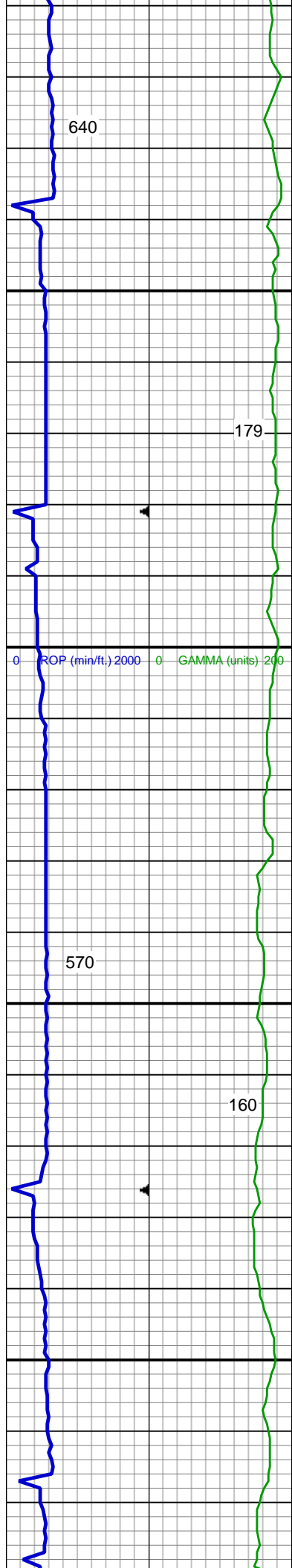


SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blkly, slty - grty tex, v sl calc

MD: 3,736'  
TVD: 3,730.05'  
Inclination: 0.91 °  
Azimuth: 33.98 °

SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blkly, slty - grty tex, v sl calc  
SS: wh - lt gy, fros - trnsl, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt

SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blkly, slty - grty tex, v sl calc  
SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SS: wh - lt gy, fros - trnsl, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt



MUD WT: 8.9/8.6  
VIS: 30/28IN/OUT

SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SS: wh - lt gy, fros - trnsl, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blkly, slty - grty tex, v sl calc

MD: 4,020'  
TVD: 4,014.01'  
Inclination: 1.09 °  
Azimuth: 21.86 °

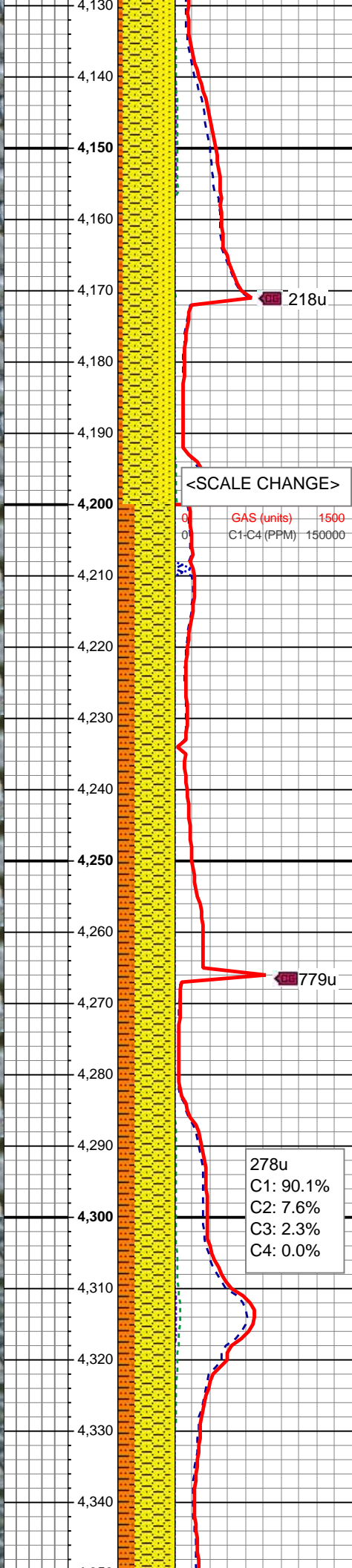
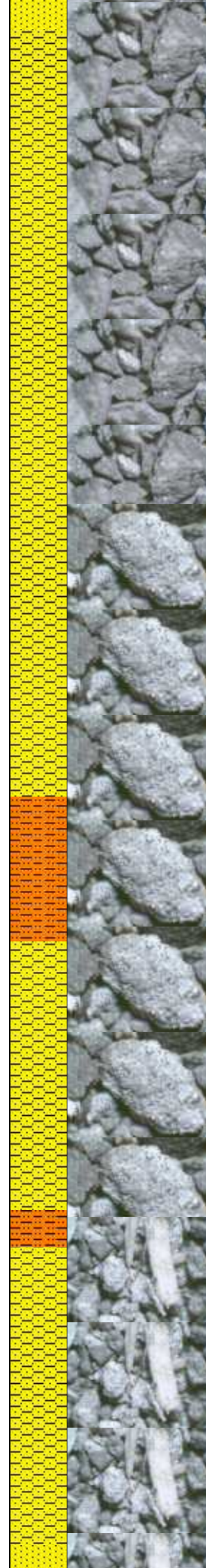
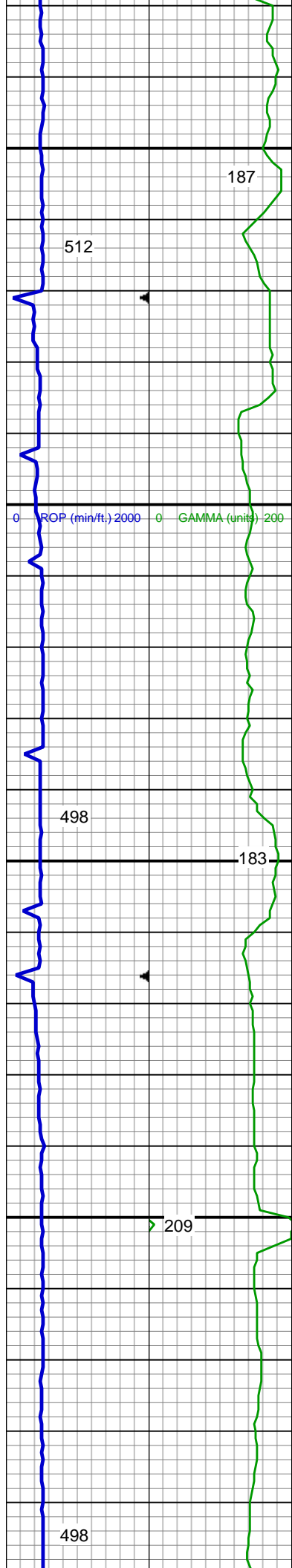
GAS (units) 500  
C1-C4 (PPM) 50000

28u  
C1: 85.4%  
C2: 9.2%  
C3: 5.4%  
C4: 0.0%

SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SS: wh - lt gy, fros - trnsl, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blkly, slty - grty tex, v sl calc

284u

203u

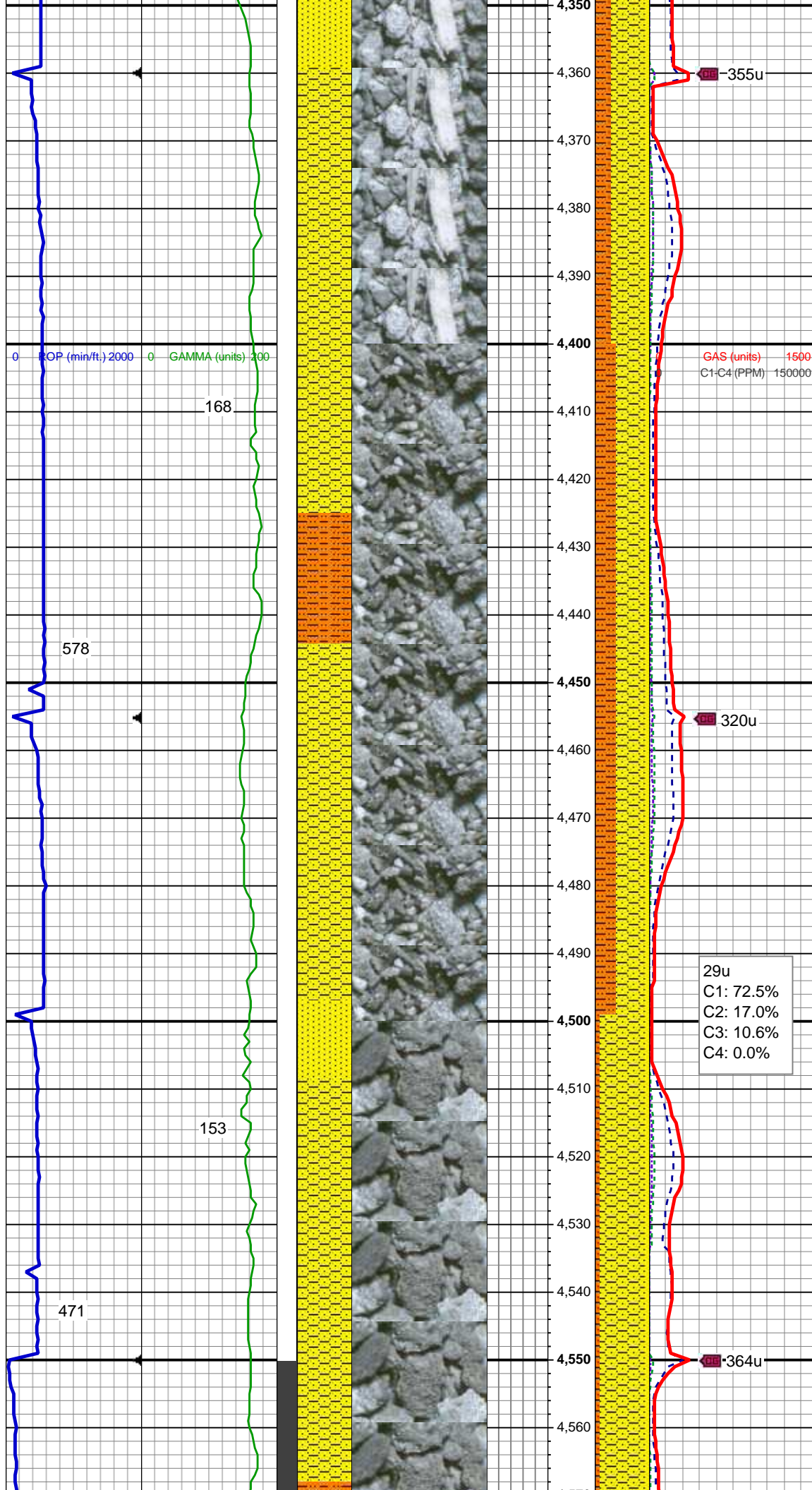


SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc

SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc  
SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt

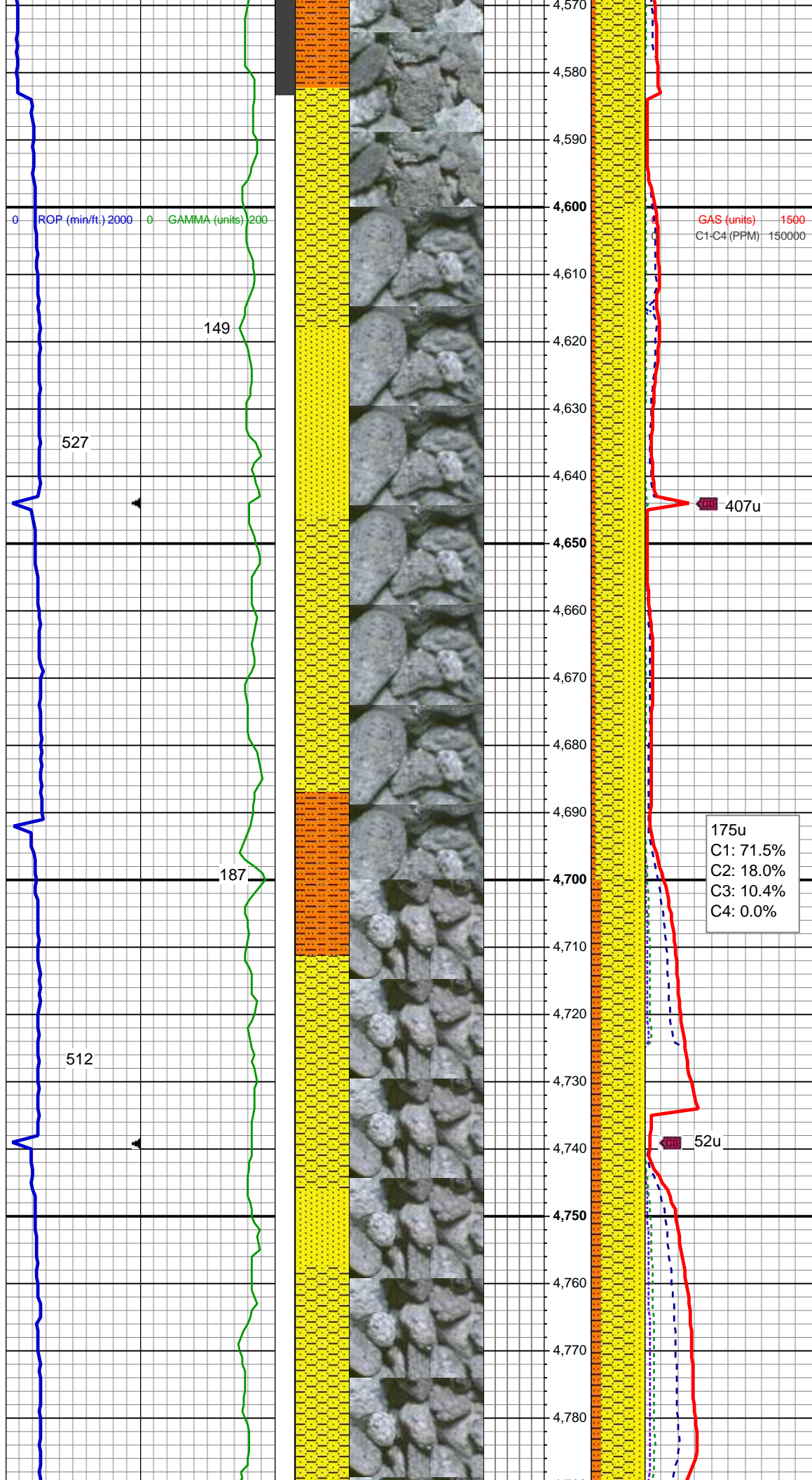
MD: 4,305'  
TVD: 4,298.93'  
Inclination: 1.61 °  
Azimuth: 357.89 °

MUD WT: 8.9/8.6  
VIS: 28/28IN/OUT



SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc  
SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt

SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc  
SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt



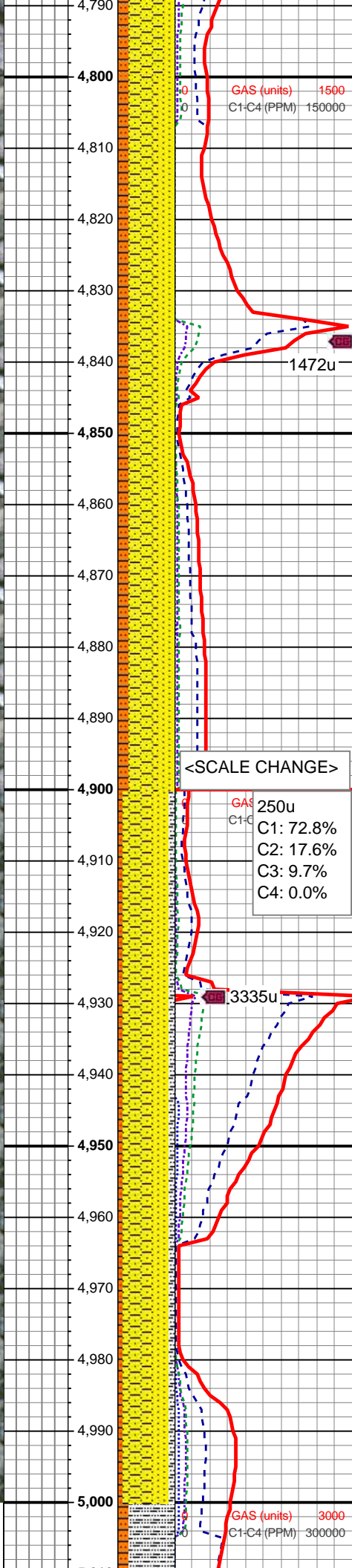
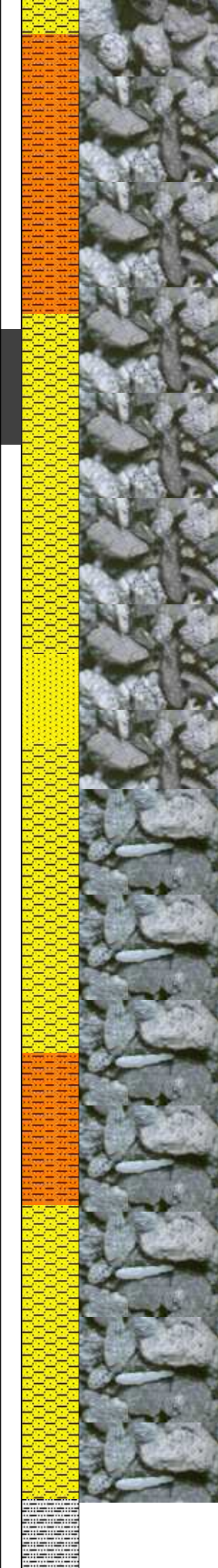
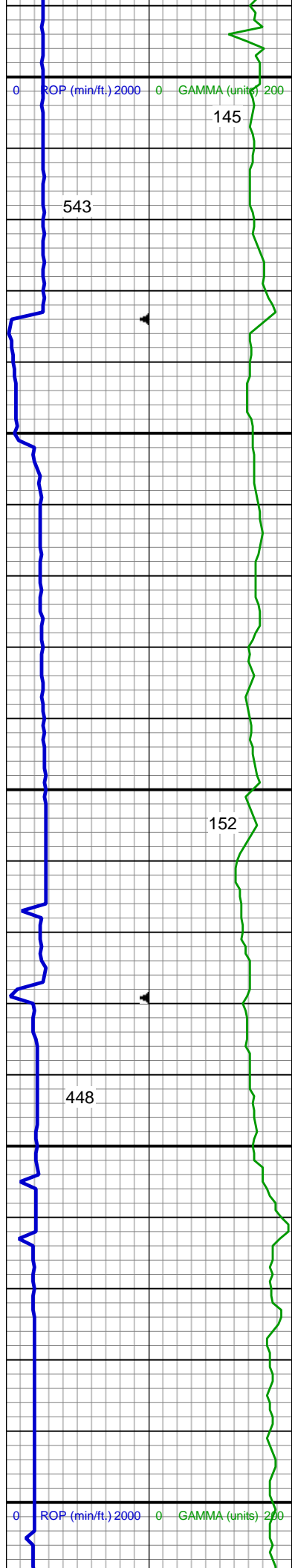
SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc  
SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt

MD: 4,590'  
TVD: 4,583.89'  
Inclination: 0.54 °  
Azimuth: 87.47 °

MUD WT: 8.8/8.6  
VIS: 28/27IN/OUT

SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc

SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,



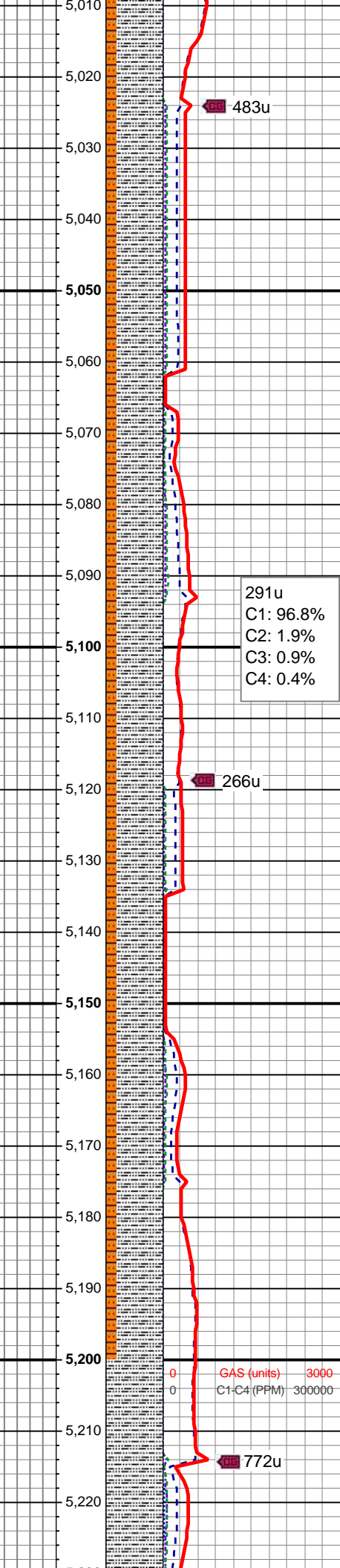
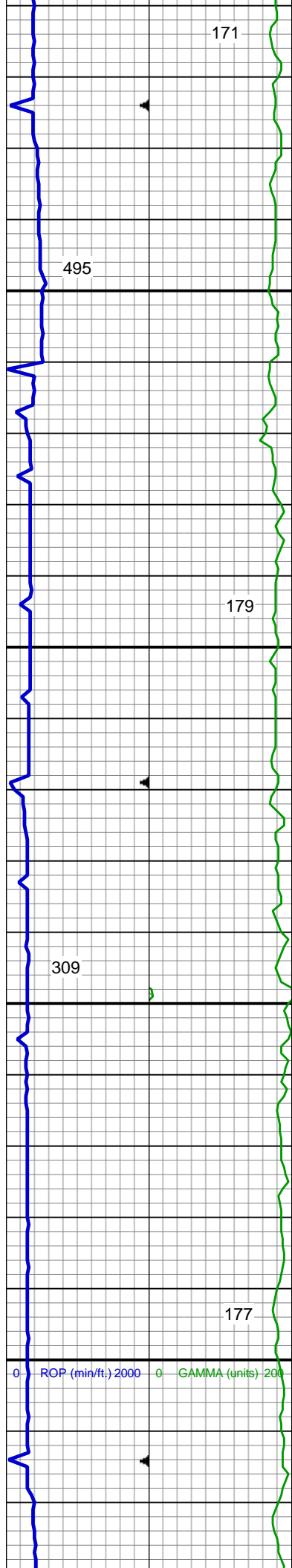
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc

MD: 4,874'  
TVD: 4,867.87'  
Inclination: 1.09 °  
Azimuth: 205.75 °

SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc

MUD WT: 8.8/8.6  
VIS: 28/27IN/OUT

SHY SS: lt gy, s&p, vfg, mod hd wi  
brit clus, sb ang - sb rd, calc cmt  
SS: wh - lt gy, fros - trns, speckl wi  
mica, f gr, hd brit clus, ang - sb ang,  
v calc cmt  
SHY SLTST: lt - med gy, frm - hd, sb  
rd - sb blk, slty - grty tex, v sl calc



483u

291u  
C1: 96.8%  
C2: 1.9%  
C3: 0.9%  
C4: 0.4%

266u

MD: 5,159'  
TVD: 5,152.83'  
Inclination: 0.85 °  
Azimuth: 211.69 °

772u

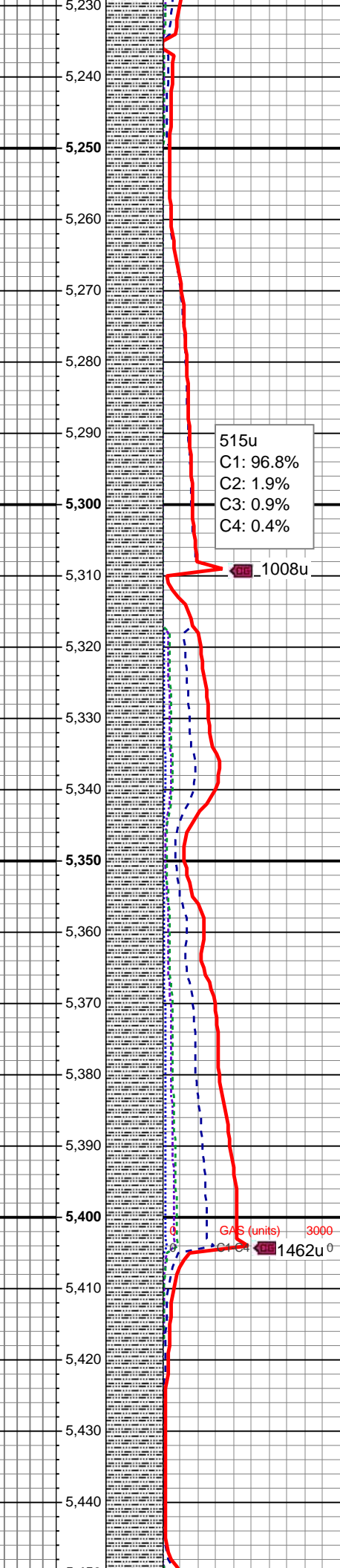
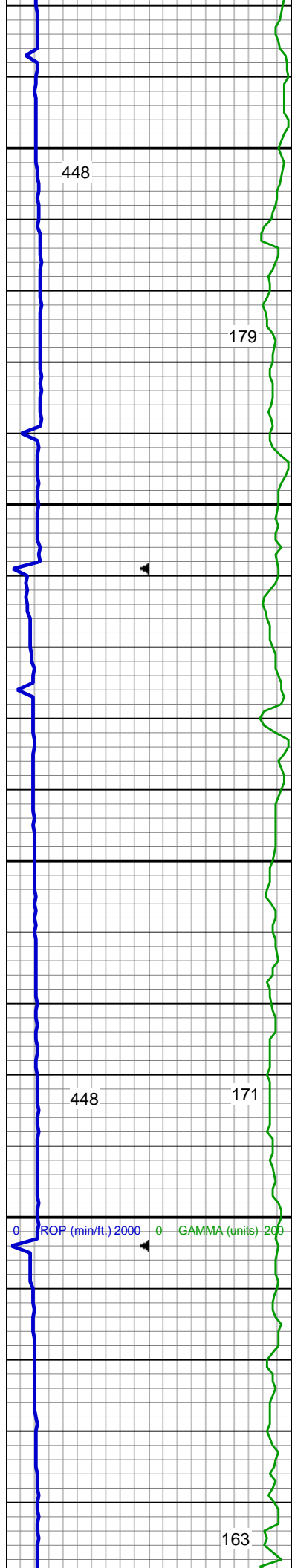
SLTY SH: lt - med gy, occ dk gy, frm - hd, plty - sb plty - sb blkly, slty - grty tex, v sl calc

SHY SLTST: lt - med gy, frm - hd, sb rd - sb blkly, slty - grty tex, v sl calc

SLTY SH: lt - med gy, occ dk gy, frm - hd, plty - sb plty - sb blkly, slty - grty tex, v sl calc

SHY SLTST: lt - med gy, frm - hd, sb rd - sb blkly, slty - grty tex, v sl calc

GAS (units) 3000  
C1-C4 (PPM) 300000



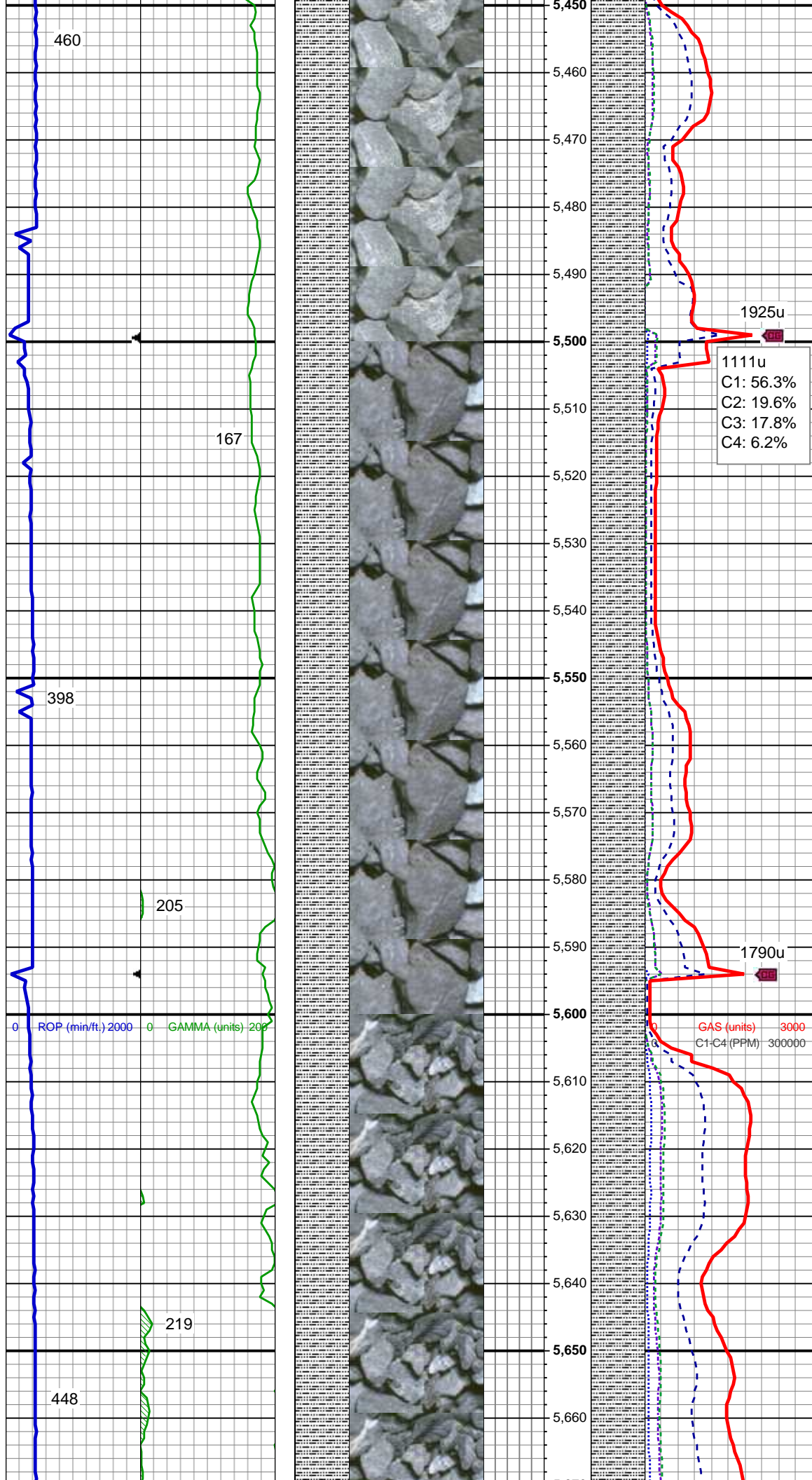
SLTY SH: lt - med gy, occ dk gy, frm  
- hd, plty - sb plty - sb blk, slty - grty  
tex, v sl calc

11/30/2013  
Mud Wt: 8.85  
FVis: 28  
PVis: 4  
YP: 6  
GELS: 2/3/4  
API Filt: 17  
CAKE: 1/0  
pH: 8.8  
Cl: 1400  
Ca: 120

SLTY SH: lt - med gy, occ dk gy, frm  
- hd, plty - sb plty - sb blk, slty - grty  
tex, v sl calc

MUD WT: 9.0/8.8  
VIS: 28/27IN/OUT

MD: 5,444'  
TVD: 5,437.81'  
Inclination: 0.89 °



SLTY SH: lt - med gy, occ dk gy, frm  
- hd, plty - sb plty - sb blkly, slty - grty  
tex, v sl calc

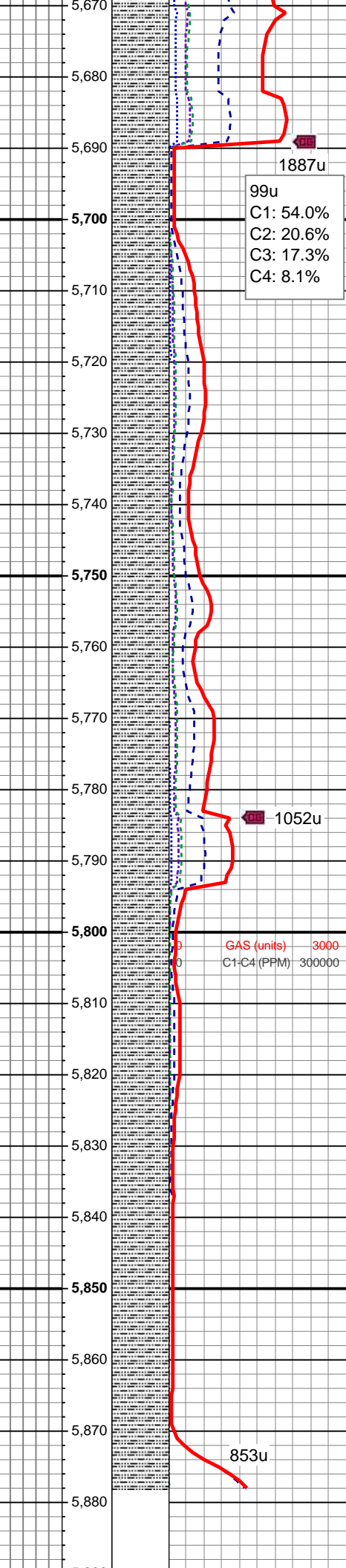
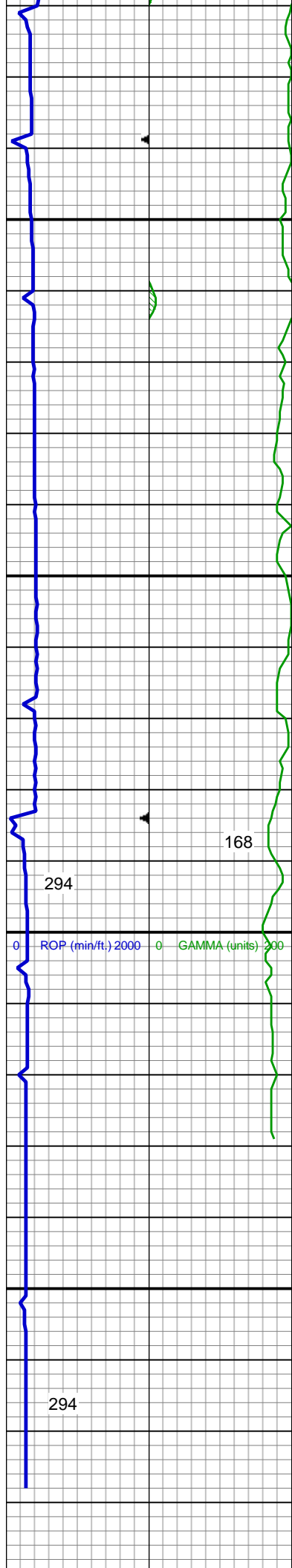
1111u  
C1: 56.3%  
C2: 19.6%  
C3: 17.8%  
C4: 6.2%

1790u

SLTY SH: lt - med gy, occ dk gy, frm  
- hd, plty - sb plty - sb blkly, slty - grty  
tex, v sl calc

GAS (units) 3000  
C1-C4 (PPM) 300000

MUD WT: 9.0/9.1  
VIS: 28/31IN/OUT



SLTY SH: lt - med gy, occ dk gy, frm  
- hd, plty - sb plty - sb blkly, slty - grty  
tex, v sl calc

MD: 5,729'  
TVD: 5,722.79'  
Inclination: 0.34 °  
Azimuth: 60.74 °

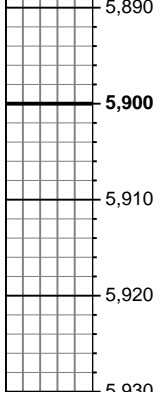
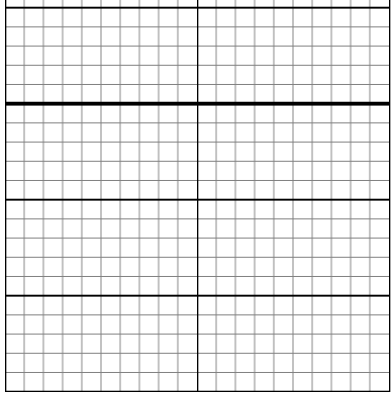
SLTY SH: lt - med gy, occ dk gy, frm  
- hd, plty - sb plty - sb blkly, slty - grty  
tex, v sl calc

MD: 5,822'  
TVD: 5,815.79'  
Inclination: 0.69 °  
Azimuth: 99.57 °

MUD WT: 9.2/9.2  
VIS: 34/31IN/OUT

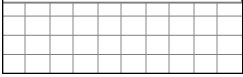
SLTY SH: lt - med gy, occ dk gy, frm  
- hd, plty - sb plty - sb blkly, slty - grty  
tex, v sl calc

MD: 5,878'  
TVD: 5,871.79'  
Inclination: 0.69 °



TD Vertical @ 5,878'  
MD  
on 11/30/2013 @  
16:34 hrs MDT

Wellsite Geological  
Services Provided by  
Columbine Logging



Azimuth: 99.57°