

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** Todd LC25-760

**Location** SESW 25 9N 59W 6 PM

**State** COLORADO

**County** WELD

**Country** USA

**Rig Number** H&P 326

**API Number** 05-123-40675-00

**Field** WATTENBERG

**Region** DJ BASIN

**Drilling Completed** 5/9/2015

**Spud Date** 5/4/2015

**Surface Coordinates** SESW 25 9N 59W 6 PM  
500' FSL 2088' FWL  
LAT / LONG: 40.715800 / -103.927950

**Bottom Hole Coordinates** SESW 25 9N 59W  
330' FNL & 1980' FWL

**Ground Elevation** 4973'

**K.B. Elevation** 5003'

**Logged Interval** 1410' **To** 10695'

**Total Depth** 10695'

**Formation** NIOBRARA A MARL

**Type of Drilling Fluid** H2O, LSND

## Other Symbols

### Oil Show

- DEAD
- EVEN
- QUESTIONABLE
- SPOTTED STAINING

### Porosity

- E EARTHY
- F FENESTRAL
- F FRACTURE
- X INTERCRYSTALLINE
- 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 (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

GASTROPOD

INOCERAMUS

ARGILLITE GRAIN

B BENTONITE

HEAVY MINERAL

K KAOLIN

### Stringer

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

OOLITE  
 OSTRACOD  
 PELECYPOD  
 PELLET  
 PISOLITE  
 PLANT REMAINS  
 PLANT SPORES  
 SCAPHOPOD  
 STROMATOPOROID

## Minerals

ANHYDRITIC  
 ARGILLACEOUS

BITUMENOUS SUBSTANCE  
 BRECCIA FRAGMENTS  
 CALCAREOUS  
 CARBONACEOUS FLAKES  
 CHTDK  
 CHTLT  
 COAL - THIN BEDS  
 DOLOMITIC  
 FELDSPAR  
 FERRUGINOUS PELLET  
 FERRUGINOUS  
 GLAUCONITE  
 GYPSIFEROUS

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

## 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 Suite 2200  
Denver, CO 80202

## Other

**Well Site Logging Company** COLUMBINE LOGGING INC

**Well Site Geologist (Days)** JASON BEACH

**Well Site Geologist (Nights)** JOHN SABROSKE, SHANNA GILBERT

## Zone Color Coding

Oil  
 Note  
 Error  
 Condensate  
 Core  
 Water  
 Gas  
 Pressure  
 Seal

## Geologist

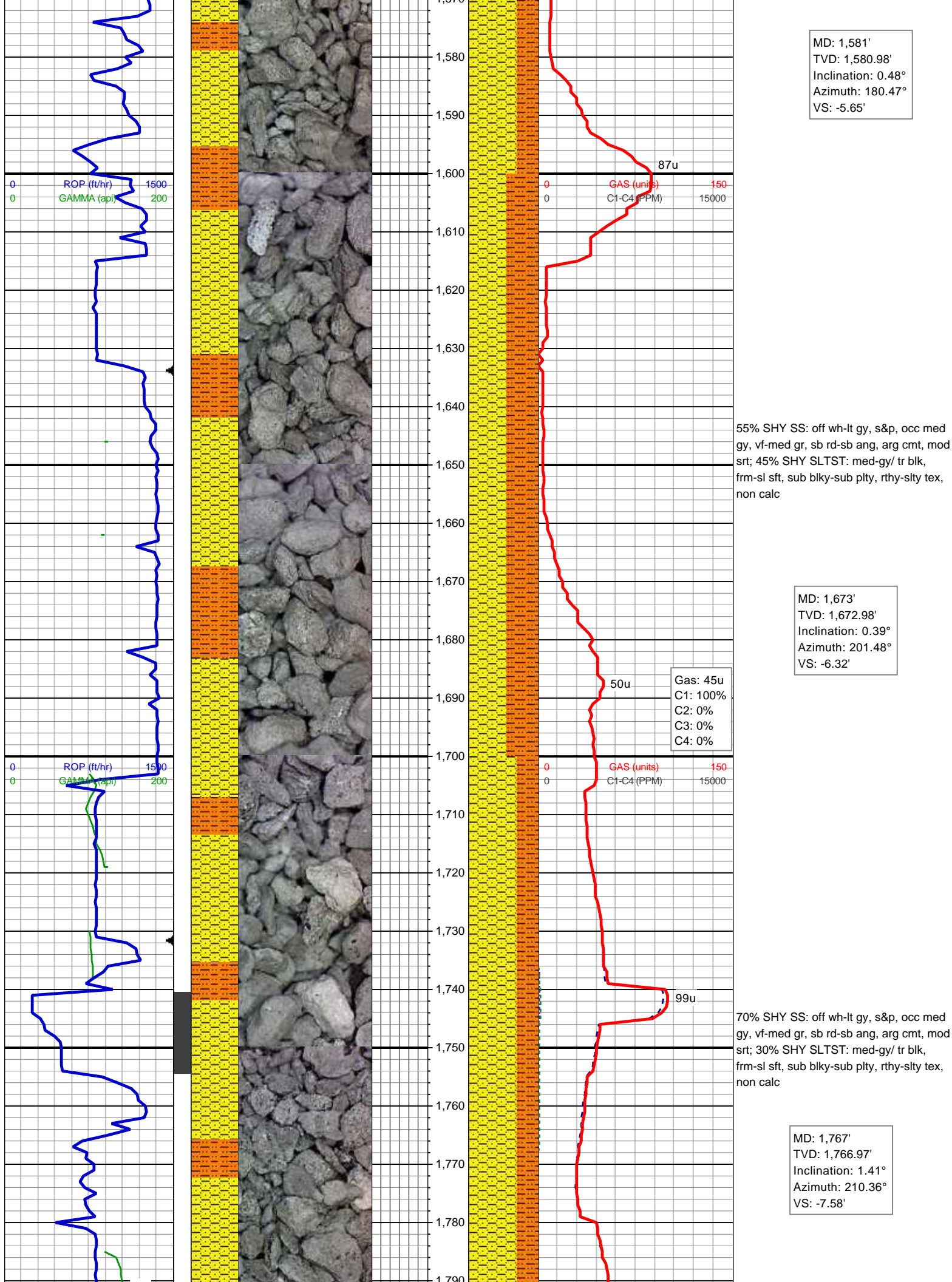
**Name** BRYAN KAPROTH-GERECHT

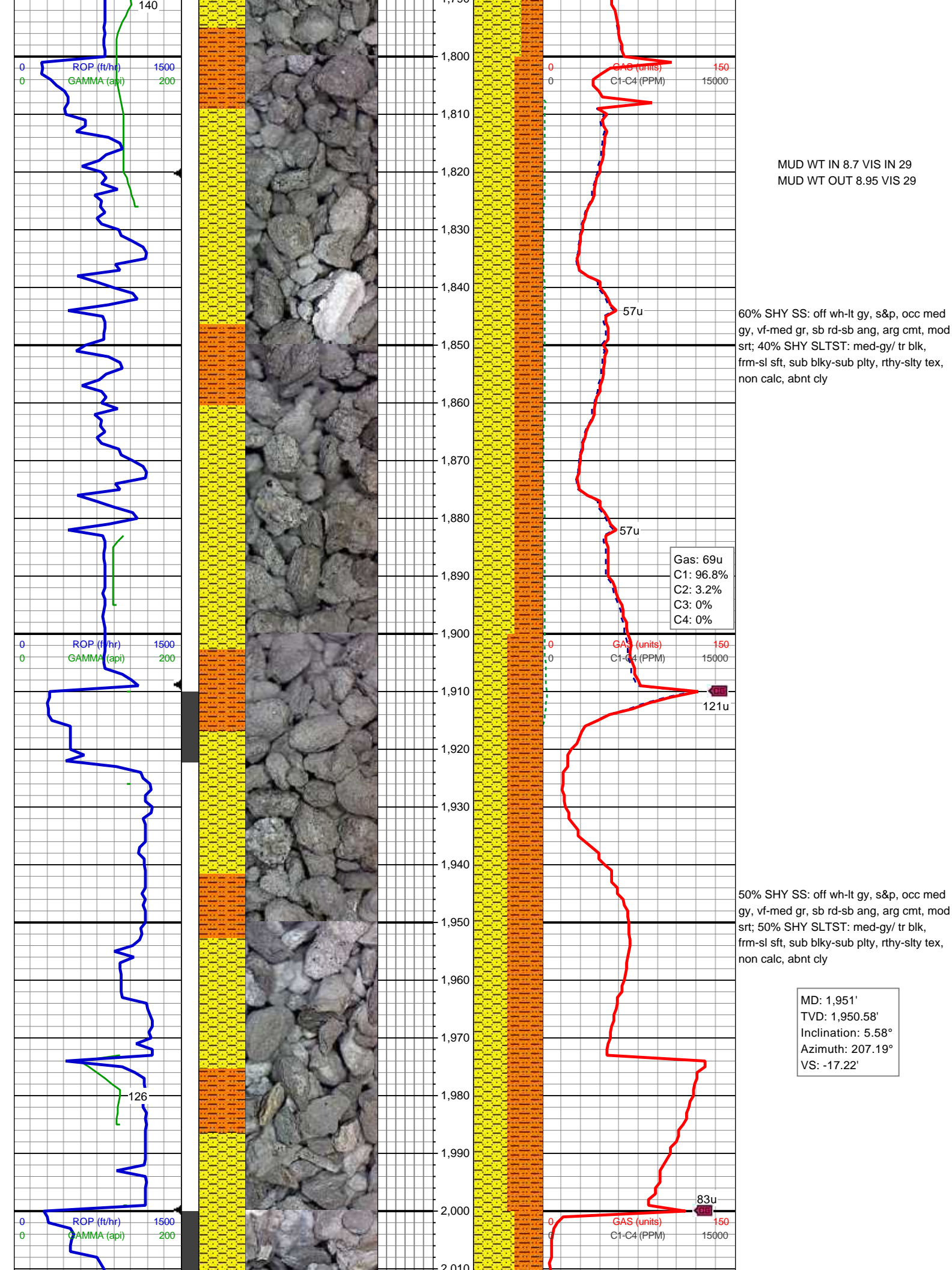
**Company** NOBLE ENERGY INC.

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

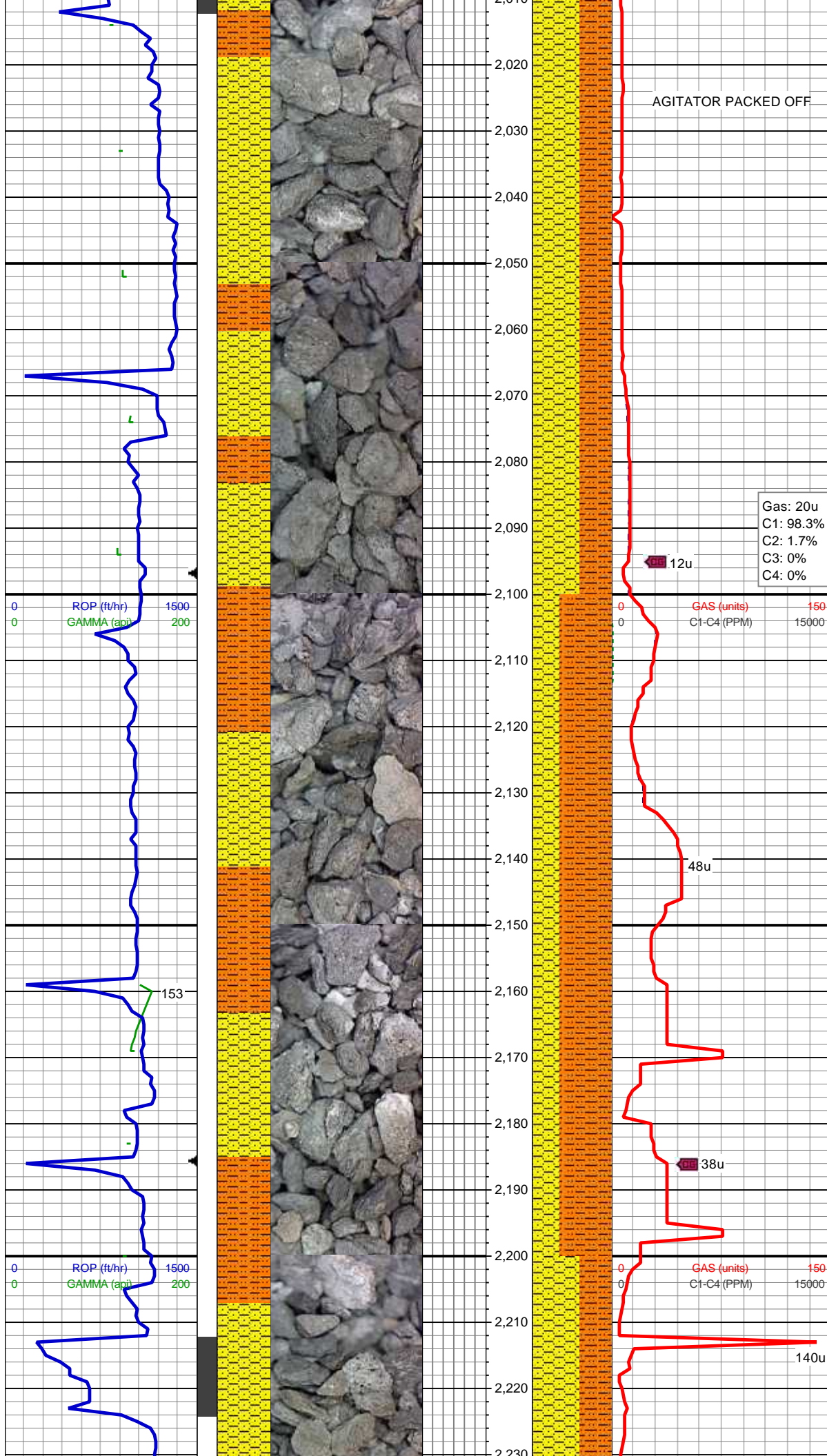












AGITATOR PACKED OFF

60% SHY SS: off wh-lt gy, s&p, occ med gy, vf-med gr, sb rd-sb ang, arg cmt, mod srt; 40% SHY SLTST: med-gy/ tr blk, frm-sl sft, sub blk-sub plty, rthy-slty tex, non calc, abnt cly

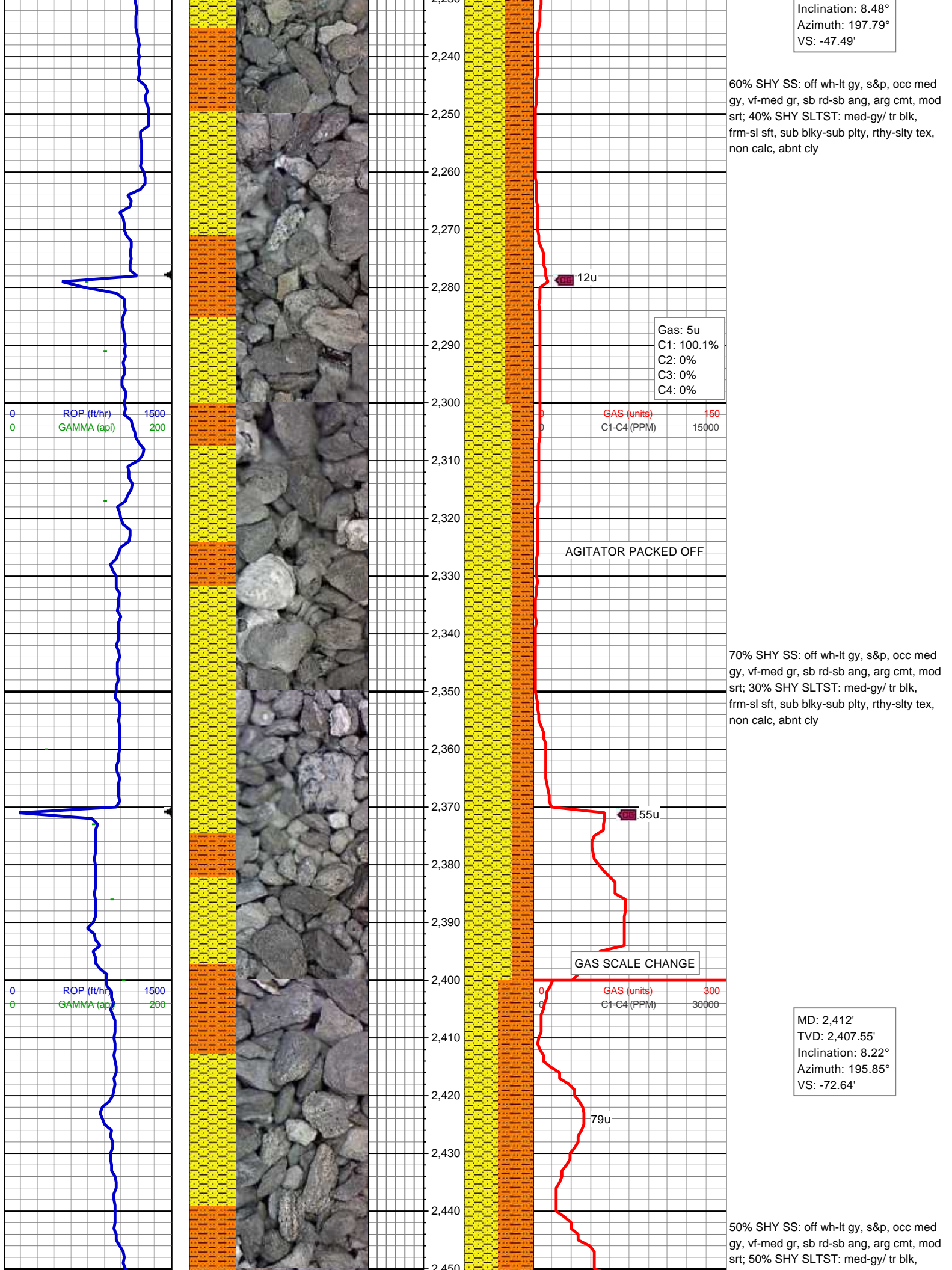
Gas: 20u  
C1: 98.3%  
C2: 1.7%  
C3: 0%  
C4: 0%

MD: 2,136'  
TVD: 2,134.39'  
Inclination: 7.43°  
Azimuth: 202.8°  
VS: -35.78'

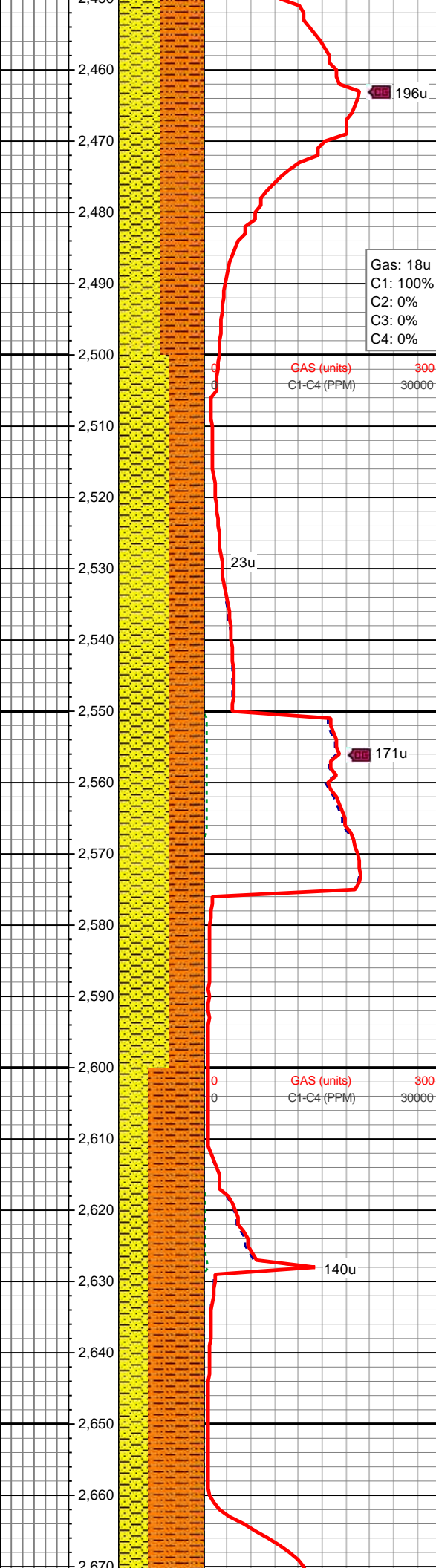
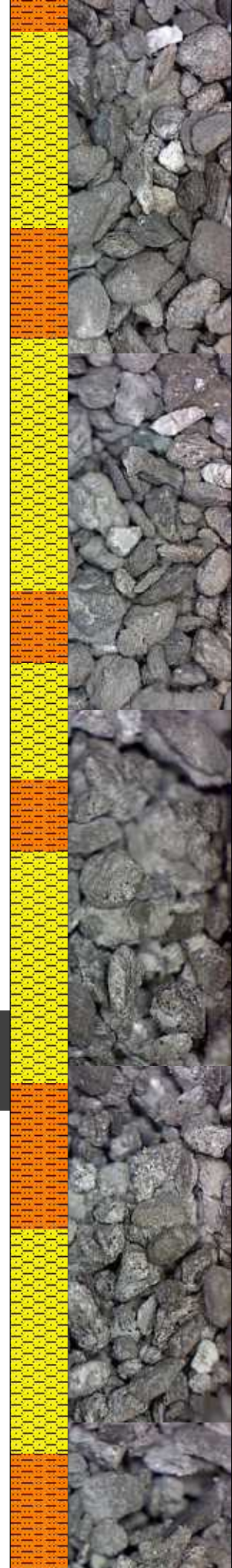
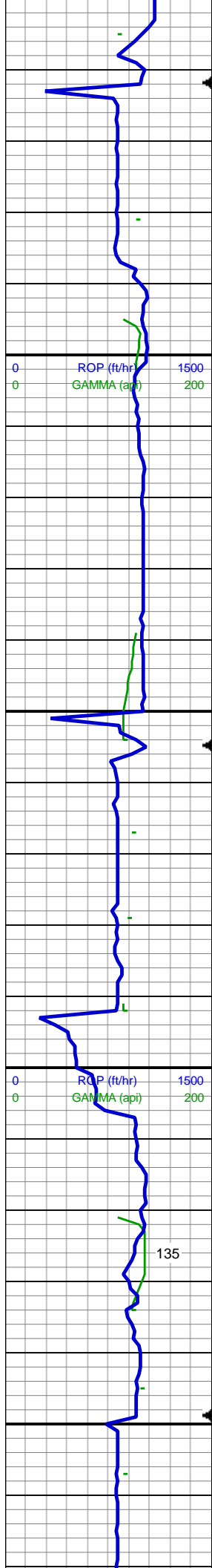
65% SHY SLTST: med-gy/ tr blk, frm-sl sft, sub blk-sub plty, rthy-slty tex, non calc, abnt cly; 35% SHY SS: off wh-lt gy, s&p, occ med gy, vf-med gr, sb rd-sb ang, arg cmt, mod srt

MUD WT 8.8 VIS 28

MD: 2,228'  
TVD: 2,225.5'







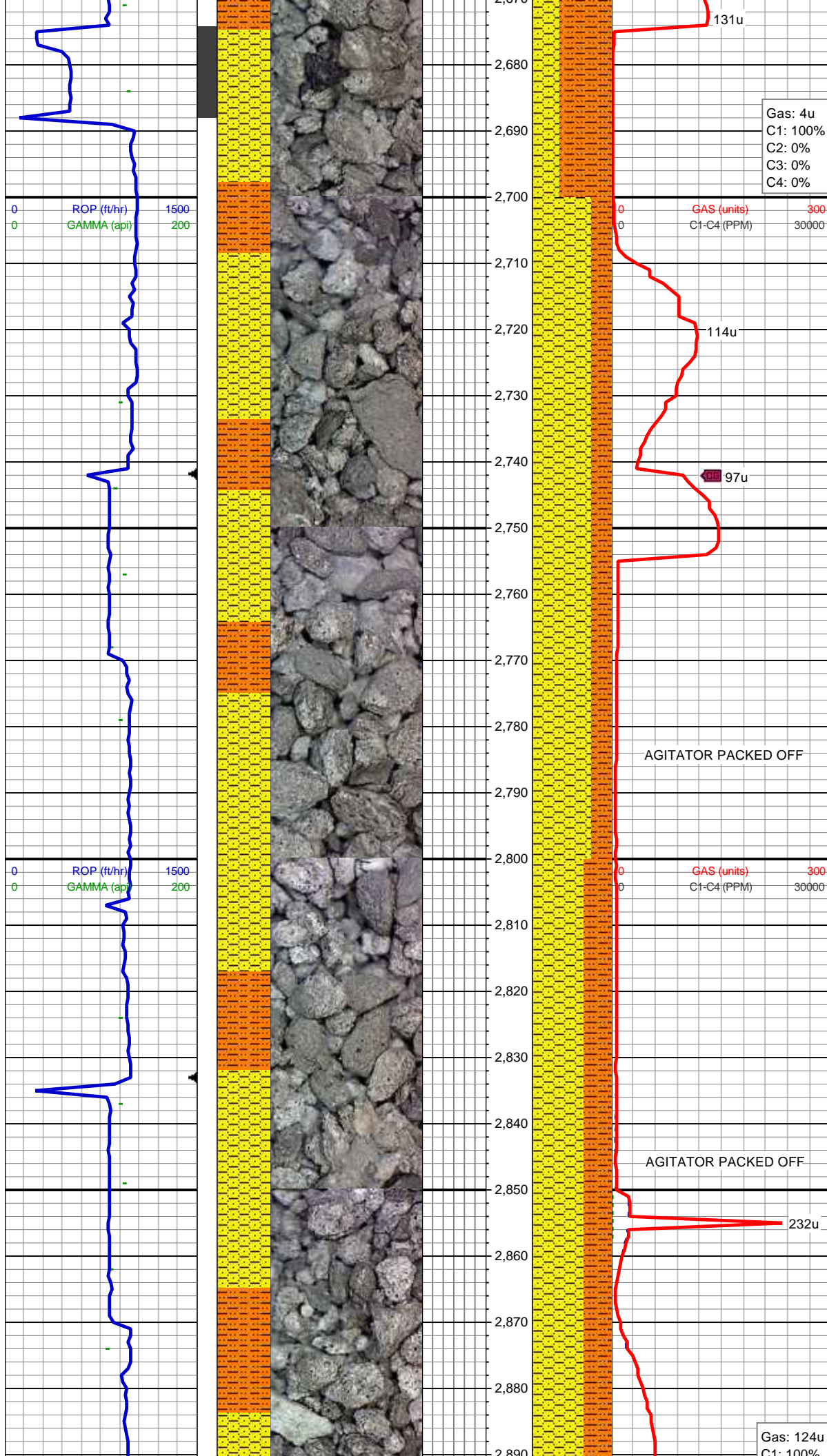
frm-sl sft, sub blkly-sub plty, rthy-slty tex, non calc, abnt cly

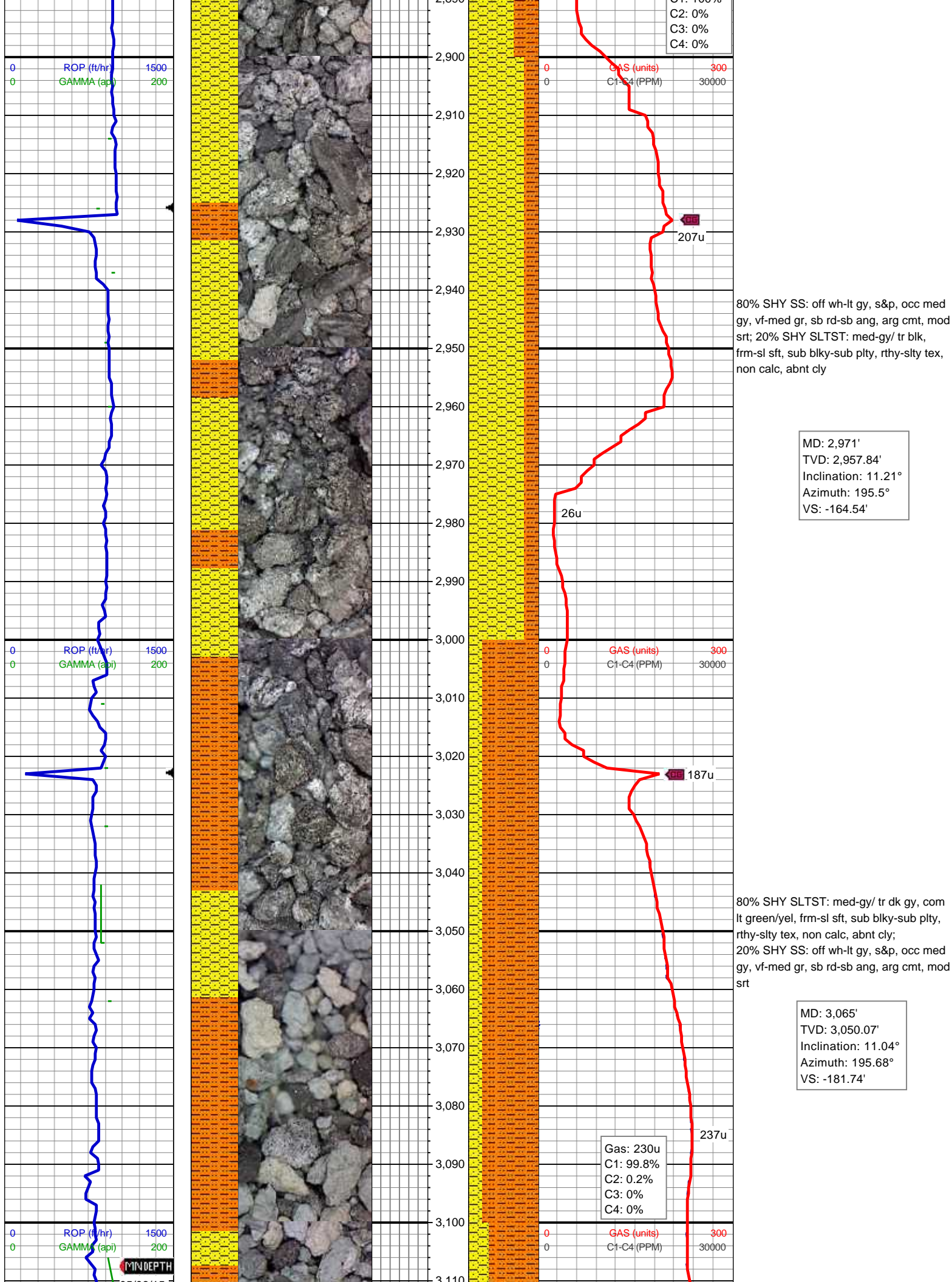
60% SHY SS: off wh-lt gy, s&p, occ med gy, vf-med gr, sb rd-sb ang, arg cmt, mod srt; 40% SHY SLTST: med-gy/ tr blk, frm-sl sft, sub blkly-sub plty, rthy-slty tex, non calc, abnt cly

MD: 2,598'  
TVD: 2,591.58'  
Inclination: 8.48°  
Azimuth: 195.85°  
VS: -98.22'

65% SHY SLTST: med-gy/ tr blk, frm-sl sft, sub blkly-sub plty, rthy-slty tex, non calc, abnt cly; 35% SHY SS: off wh-lt gy, s&p, occ med gy, vf-med gr, sb rd-sb ang, arg cmt, mod srt









05/06/15

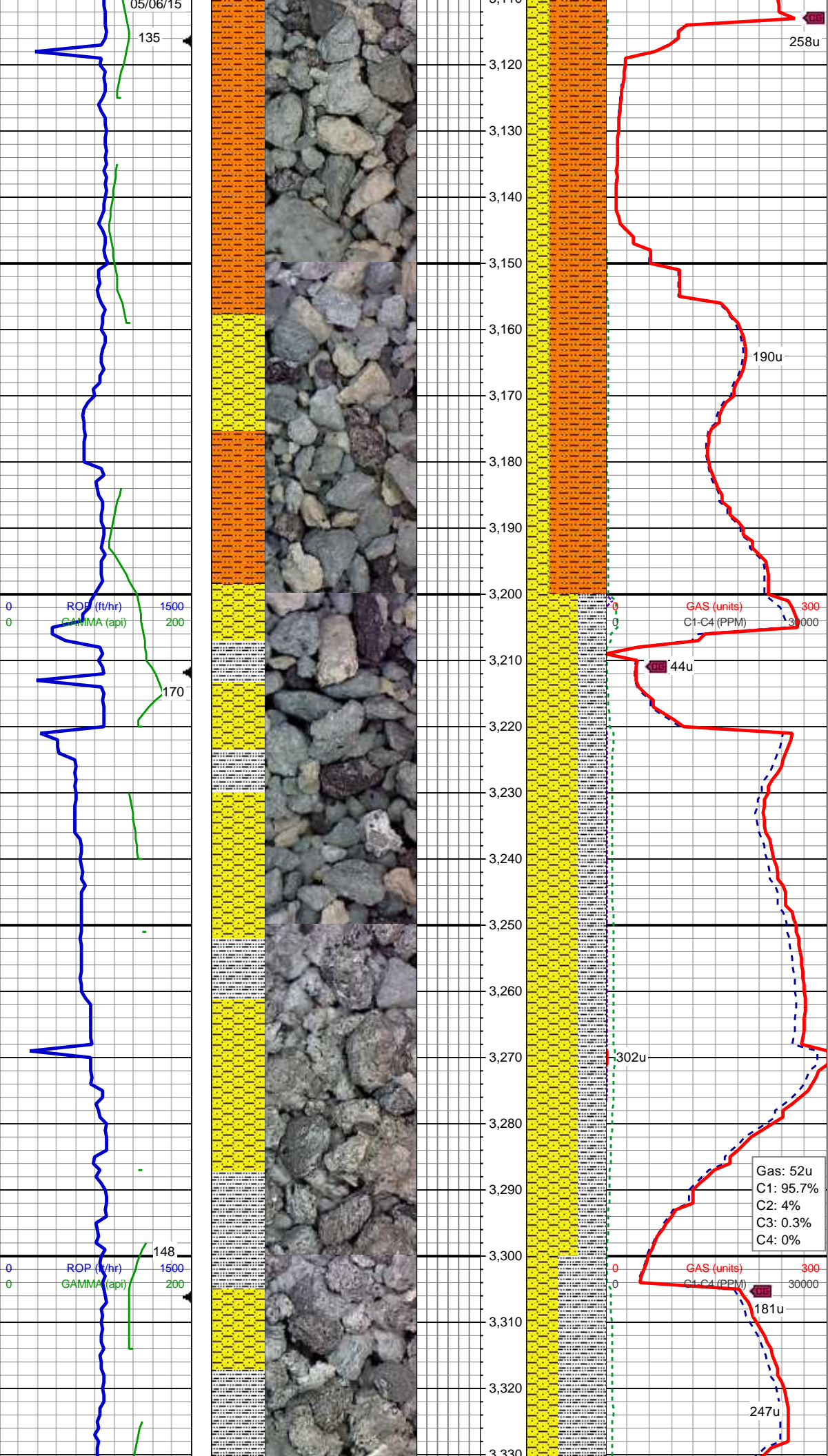
135

ROP (ft/hr) 1500  
GAMMA (api) 200

170

ROP (ft/hr) 1500  
GAMMA (api) 200

148



70% SHY SLTST: med-gy/ tr dk gy, com  
lt green/yel, frm-sl sft, sub blkly-sub plty,  
rthy-sltly tex, non calc, abnt cly;  
30% SHY SS: off wh-lt gy, s&p, occ med  
gy, vf-med gr, sb rd-sb ang, arg cmt, mod  
srt

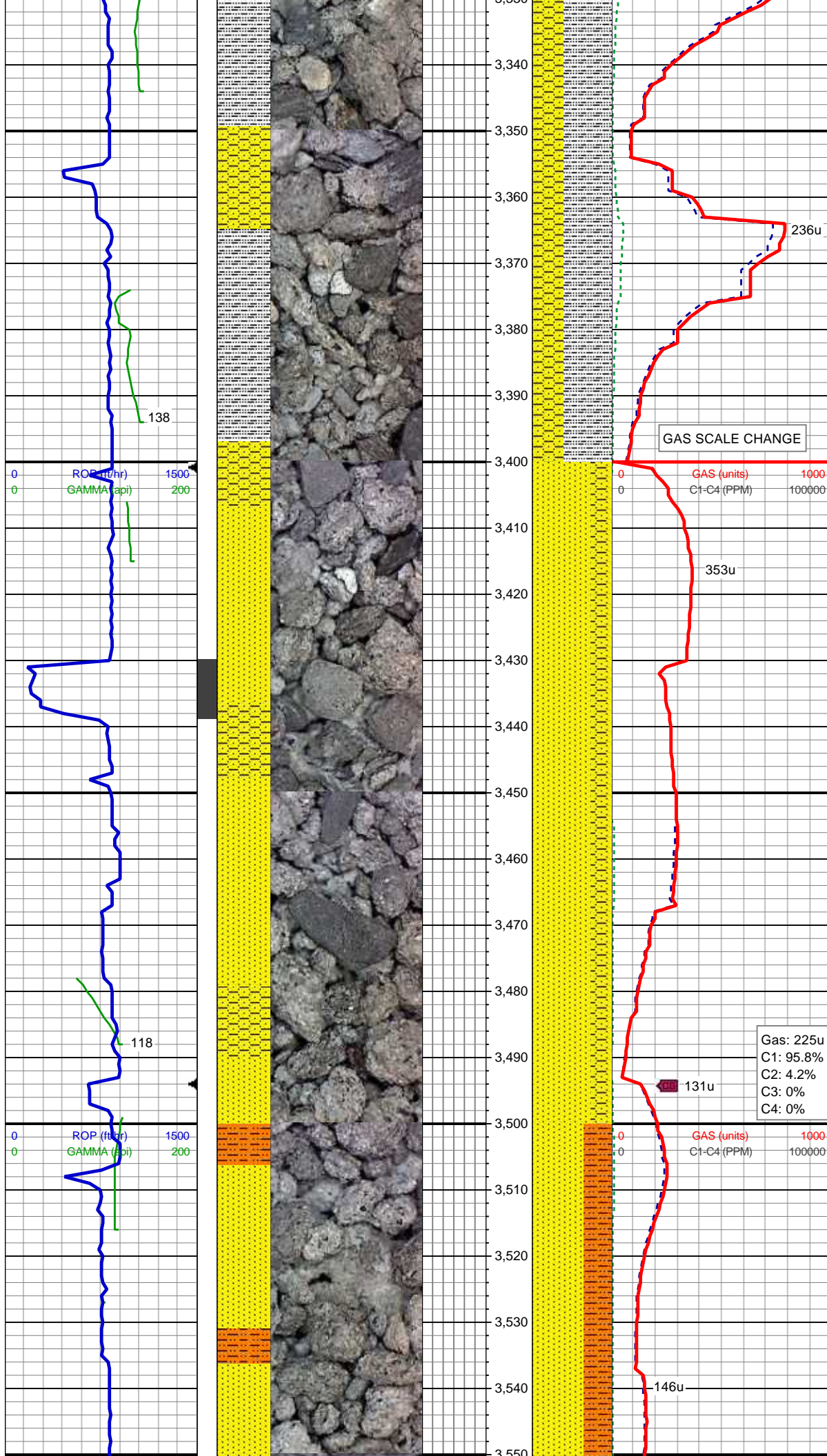
MD: 3,160'  
TVD: 3,143.36'  
Inclination: 10.73°  
Azimuth: 195.24°  
VS: -198.77'

MUD WT 8.9 VIS 28

65% SHY SS: off wh-lt gy, s&p, occ med  
gy, vf-med gr, sb rd-sb ang, arg cmt, mod  
srt; 35% SLTY SH: med-dk gy/ occ blk,  
frm-sl sft, sub blkly-sub plty, rthy-sltly tex

MD: 3,254'  
TVD: 3,235.8'  
Inclination: 10.2°  
Azimuth: 194.54°  
VS: -215.03'

Gas: 52u  
C1: 95.7%  
C2: 4%  
C3: 0.3%  
C4: 0%



60% SLTY SH: med-dk gy/ occ blk, frm-sl  
sft, sub blkly-sub plty, rthy-slty tex; 40%  
SHY SS: off wh-lt gy, s&p, occ med gy,  
vf-med gr, sb rd-sb ang, arg cmt, mod srt

MD: 3,349'  
TVD: 3,329.3'  
Inclination: 10.15°  
Azimuth: 195.06°  
VS: -231.02'

GAS SCALE CHANGE

GAS (units)  
C1-C4 (PPM)

MD: 3,444'  
TVD: 3,422.84'  
Inclination: 9.98°  
Azimuth: 191.81°  
VS: -246.94'

75% SS: lt gy - wh, occ s&p, frm - brit, sb  
rnd-rnd, f-med gr, mod srt,mod w cons;  
25% SHY SS: off wh-lt gy, s&p, occ med  
gy, vf-med gr, sb rd-sb ang, arg cmt, mod  
srt

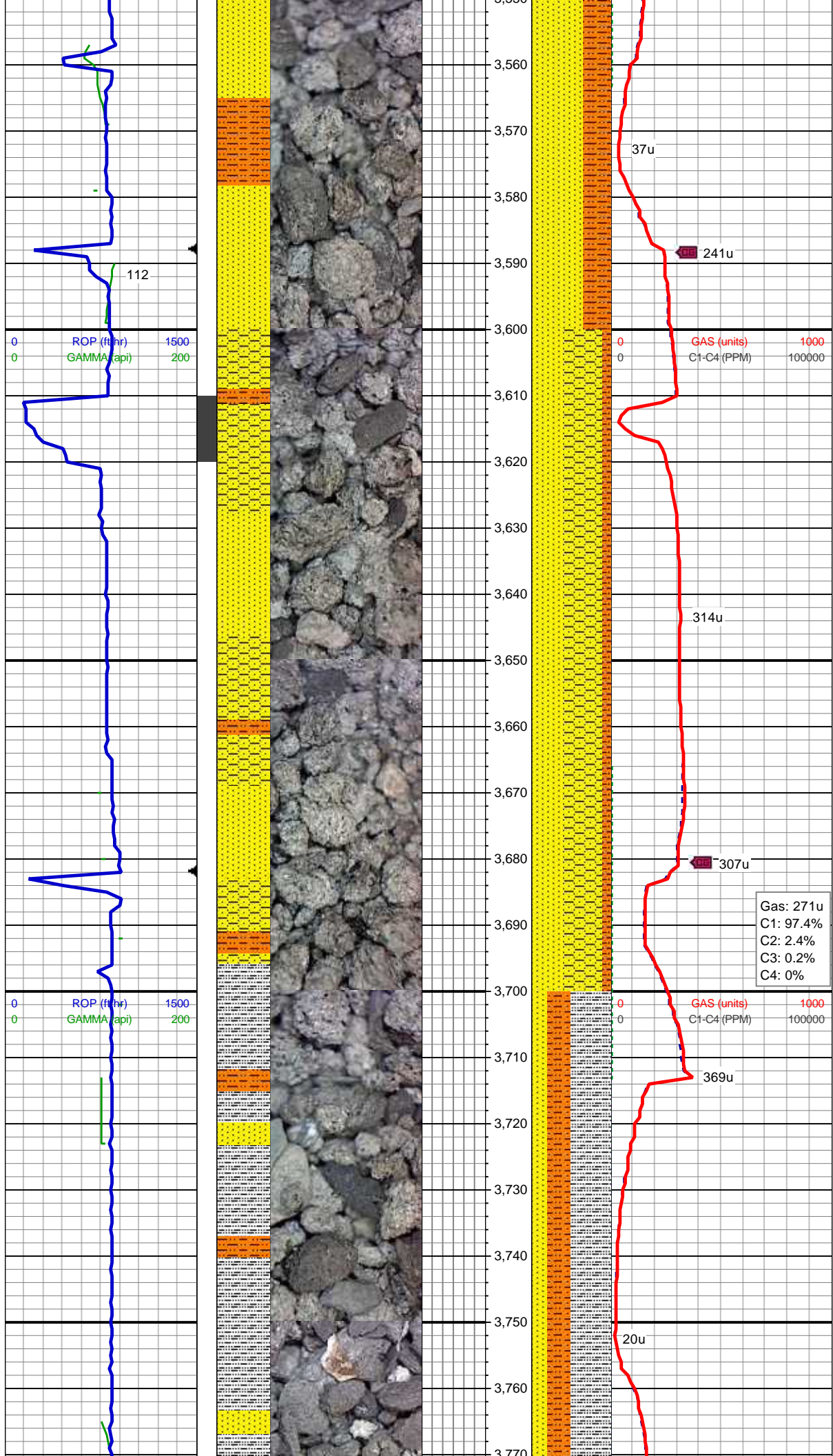
Gas: 225u  
C1: 95.8%  
C2: 4.2%  
C3: 0%  
C4: 0%

GAS (units)  
C1-C4 (PPM)

MD: 3,538'  
TVD: 3,515.4'  
Inclination: 10.11°  
Azimuth: 192.34°  
VS: -262.78'

65% SS: lt gy - wh, occ s&p, frm - brit, sb  
rnd-rnd, f-med gr, mod srt,mod w cons;  
35% SHY SLTST: med-gy/ tr blk, frm-sl





sft, sub blkly-sub plty, rthy-slty tex, non calc, occ cly

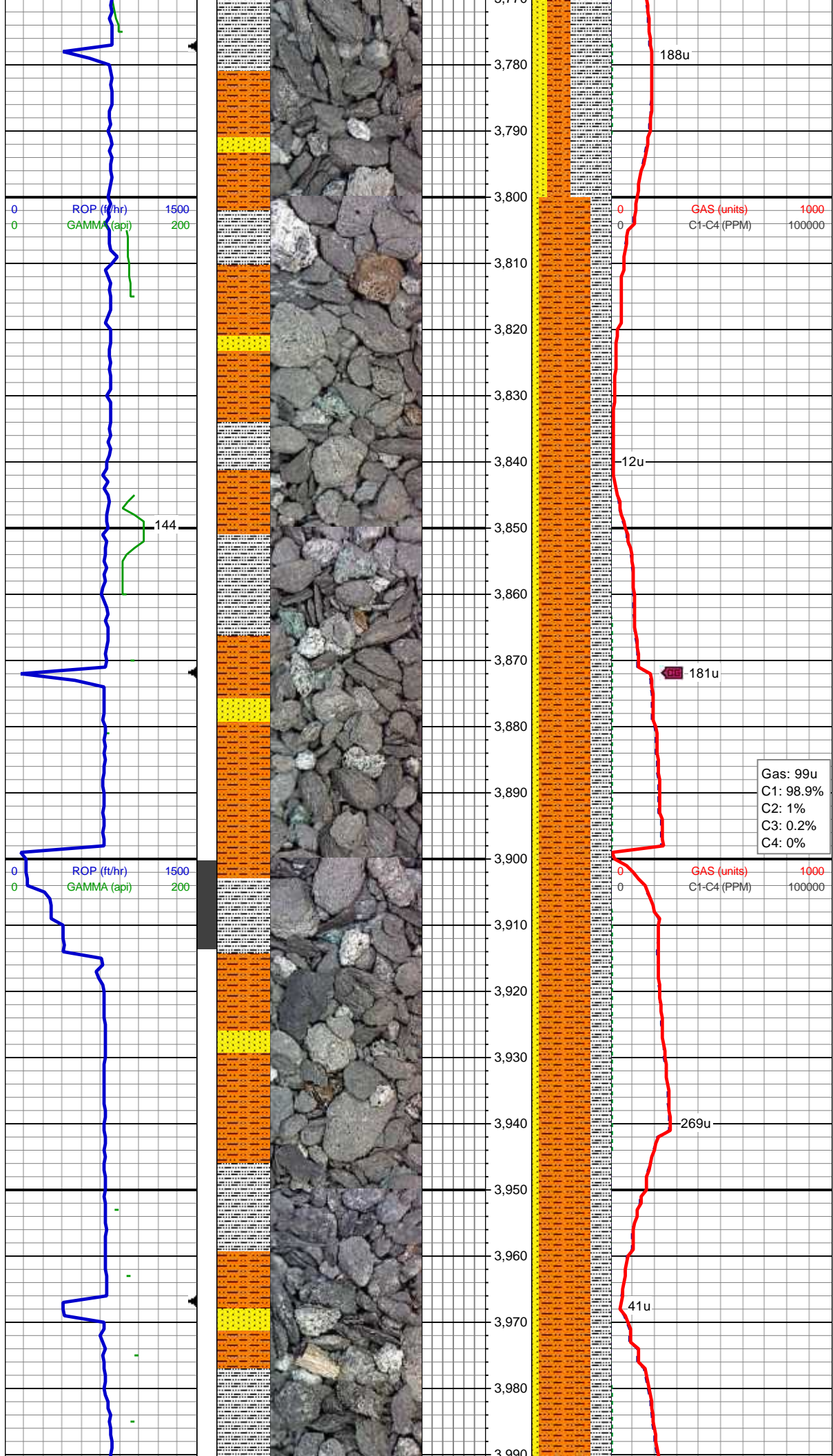
MD: 3,633'  
TVD: 3,608.97'  
Inclination: 9.8°  
Azimuth: 193.22°  
VS: -278.59'

50% SHY SS: off wh-lt gy, s&p, occ med gy, vf-med gr, sb rd-sb ang, arg cmt, mod srt; 40% SS: lt gy - wh, occ s&p, frm - brit, sb rnd-rnd, f-med gr, mod srt,mod w cons; 10% SHY SLTST: med-gy/ tr blk, frm-sl sft, sub blkly-sub plty, rthy-slty tex, non calc, occ cly

Gas: 271u  
C1: 97.4%  
C2: 2.4%  
C3: 0.2%  
C4: 0%

MD: 3,727'  
TVD: 3,701.61'  
Inclination: 9.76°  
Azimuth: 192.25°  
VS: -293.97'

50% SLTY SH: med-dk gy/ occ blk, frm-sl sft, sub blkly-sub plty, rthy-slty tex; 35% SHY SLTST: med-gy/ tr blk, frm-sl sft, sub blkly-sub plty, rthy-slty tex, non calc, occ cly; 20% SS: lt gy - wh, s&p, frm - brit, sb rnd-rnd, f-med gr, mod srt,mod w cons, occ glau



MD: 3,822'  
TVD: 3,795.23'  
Inclination: 9.8°  
Azimuth: 192.25°  
VS: -309.55'

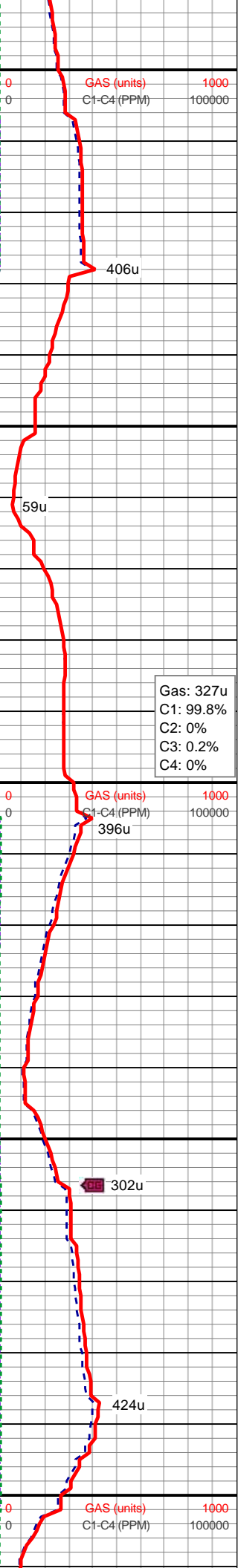
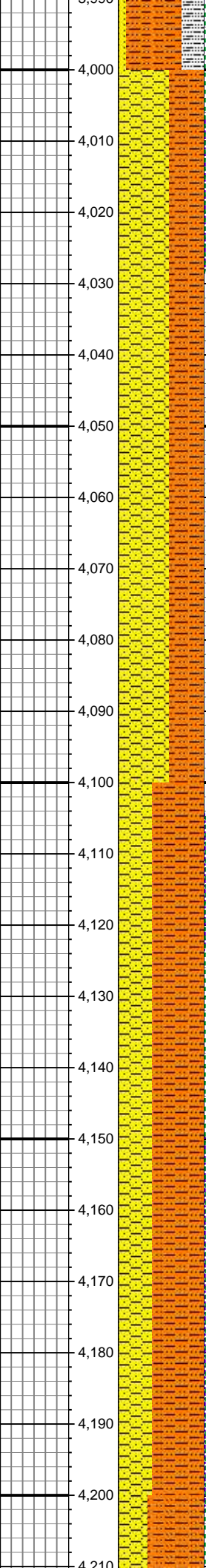
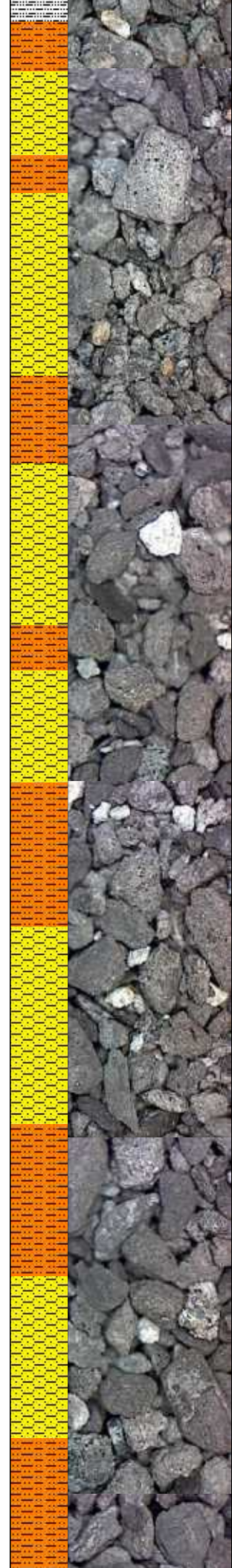
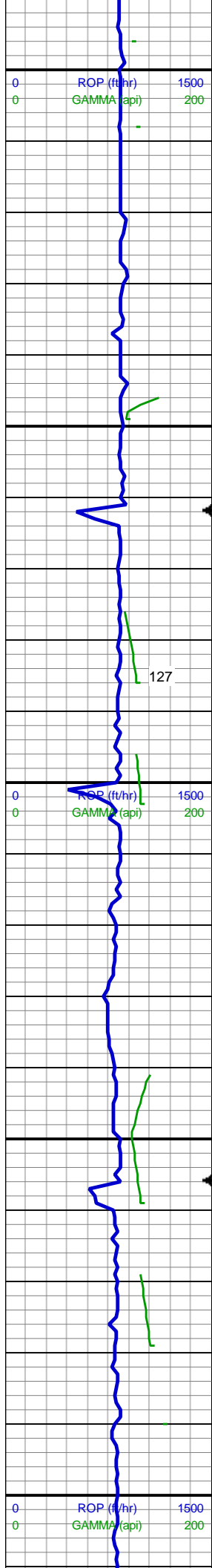
65% SHY SLTST: med-gy/ tr blk, frm-sl sft, sub blk-sub plty, rthy-sltly tex, non calc, occ cly; 25% SLTY SH: med-dk gy/ occ blk, frm-sl sft, sub blk-sub plty, rthy-sltly tex; 10% SS: lt gy - wh, s&p, frm - brit, sb rnd-rnd, f-med gr, mod srt,mod w cons, occ glau

Gas: 99u  
C1: 98.9%  
C2: 1%  
C3: 0.2%  
C4: 0%

MD: 3,916'  
TVD: 3,888.05'  
Inclination: 8.35°  
Azimuth: 189.26°  
VS: -323.94'

65% SHY SLTST: med-gy/ tr blk, frm-sl sft, sub blk-sub plty, rthy-sltly tex, non calc, occ cly; 25% SLTY SH: med-dk gy/ occ blk, frm-sl sft, sub blk-sub plty, rthy-sltly tex; 10% SS: lt gy - wh, s&p, frm - brit, sb rnd-rnd, f-med gr, mod srt,mod w cons, occ glau





MD: 4,011'  
TVD: 3,982.08'  
Inclination: 8.04°  
Azimuth: 189.18°  
VS: -337.18'

60% SHY SS: off wh-lt gy, s&p, occ med gy, vf-med gr, sb rd-sb ang, arg cmt, mod srt, tr ss; 40% SHY SLTST: med-gy/ tr dk gy, com lt green/yel, frm-sl sft, sub blk-sub plty, rthy-slty tex, non calc;

Gas: 327u  
C1: 99.8%  
C2: 0%  
C3: 0.2%  
C4: 0%

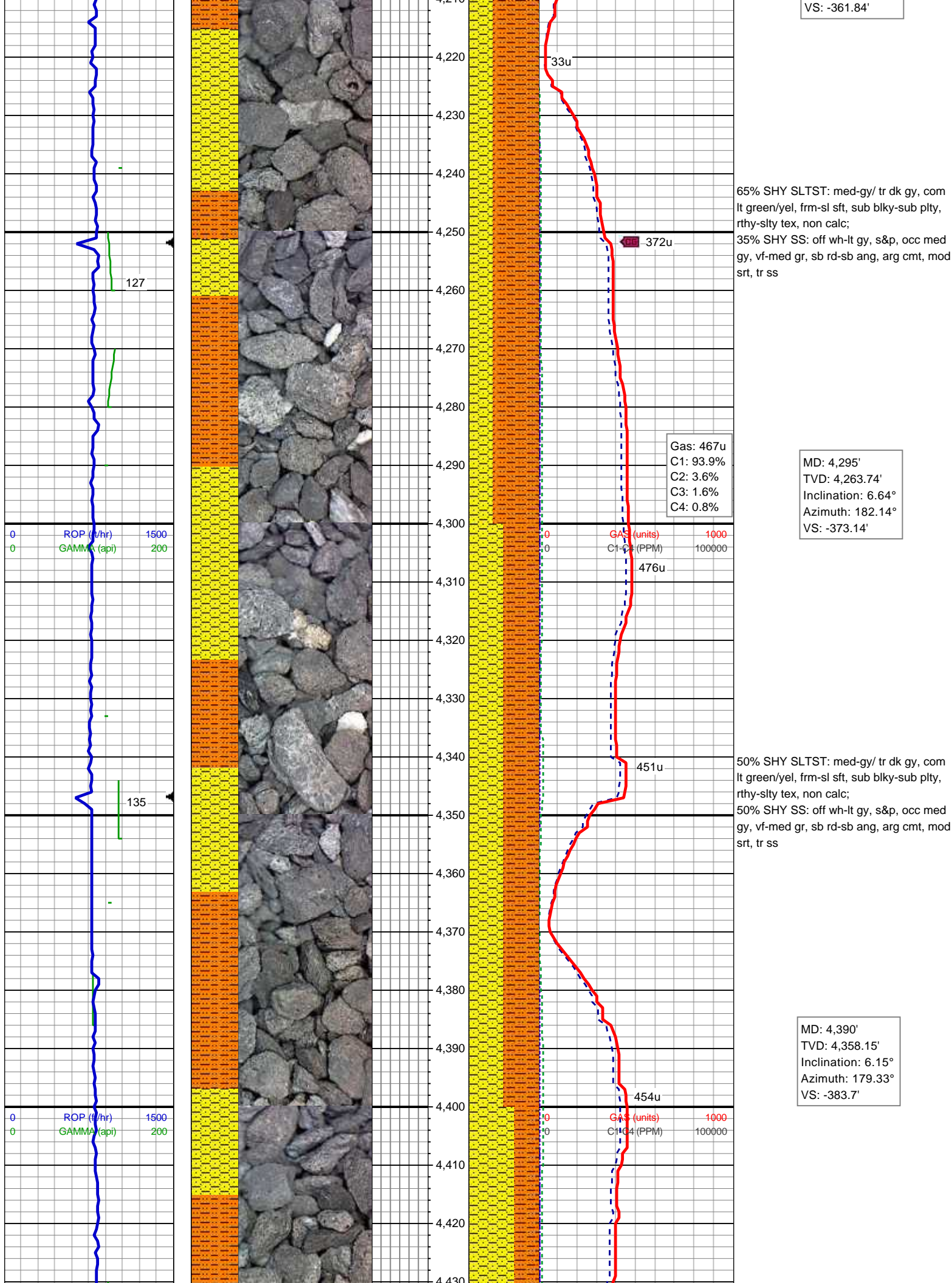
MD: 4,105'  
TVD: 4,075.2'  
Inclination: 7.63°  
Azimuth: 185.9°  
VS: -349.78'

60% SHY SLTST: med-gy/ tr dk gy, com lt green/yel, frm-sl sft, sub blk-sub plty, rthy-slty tex, non calc;  
40% SHY SS: off wh-lt gy, s&p, occ med gy, vf-med gr, sb rd-sb ang, arg cmt, mod srt, tr ss

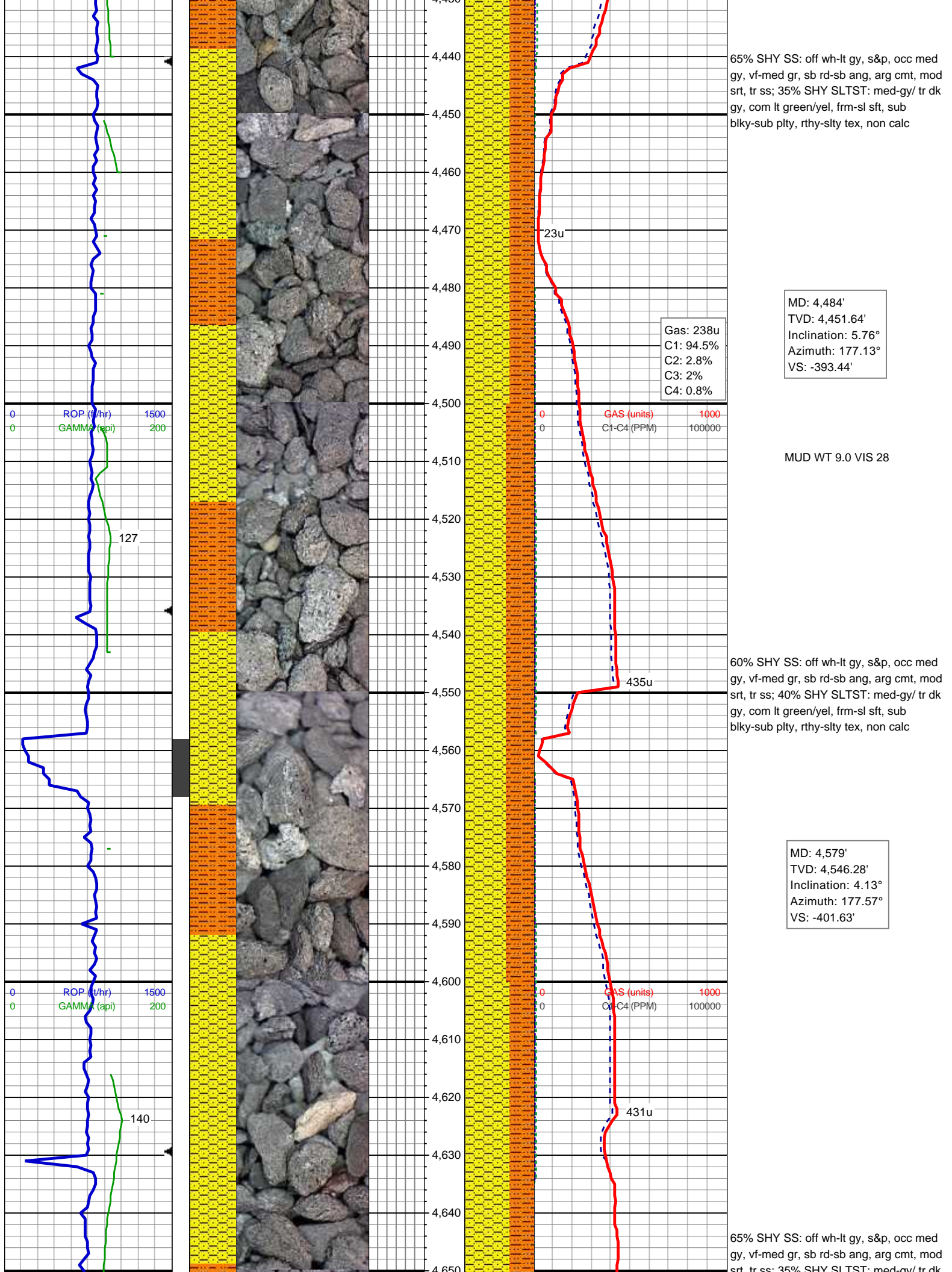
MUD WT 9.0 VIS 28

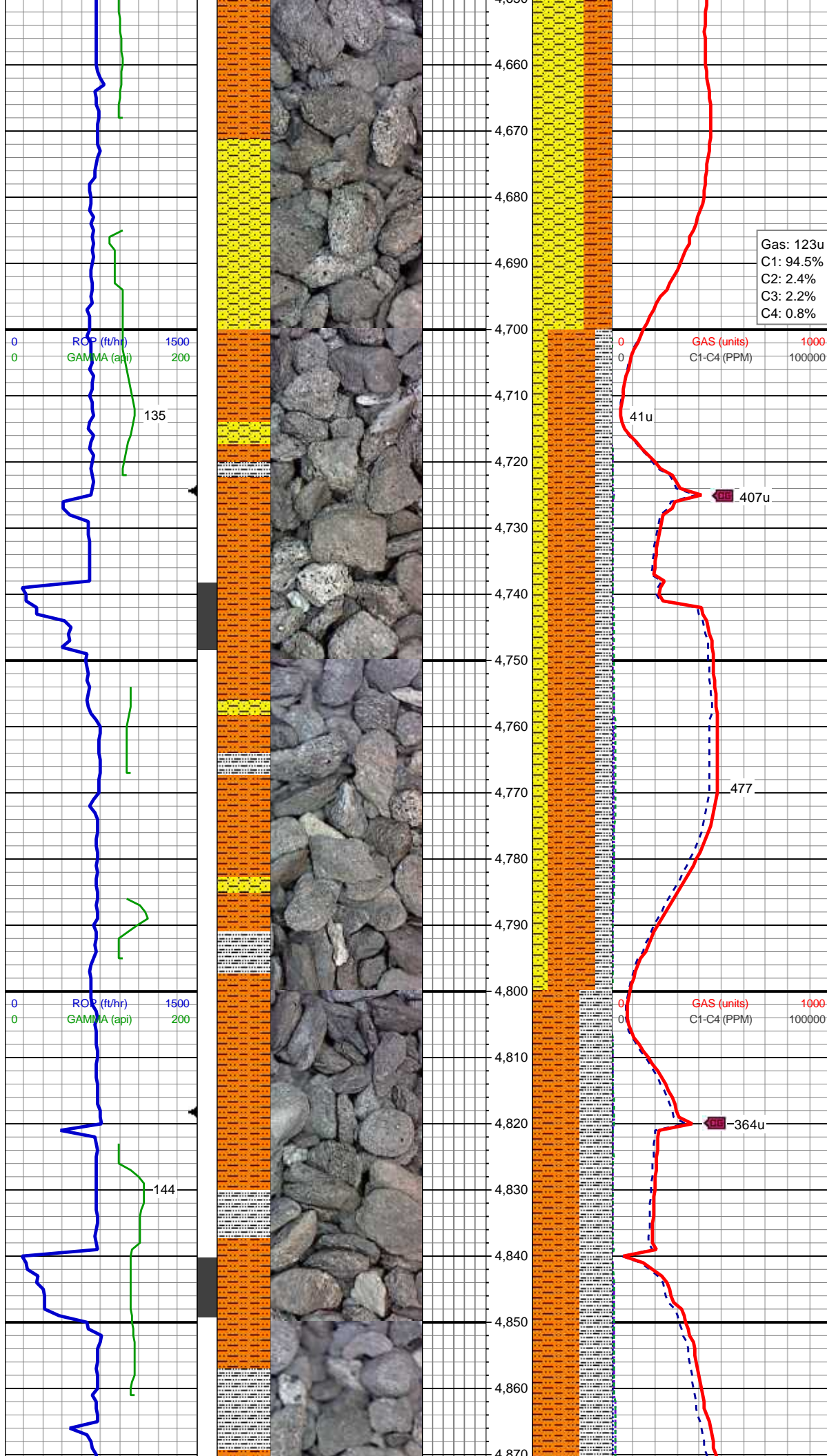
MD: 4,200'  
TVD: 4,169.42'  
Inclination: 7.08°  
Azimuth: 182.58°

VS: -361.84'









SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,  
sb blkgy-sb plty, f-v f gr, gt, v arg, ply srt, gr  
- slty sh

MD: 4,673'  
TVD: 4,640.07'  
Inclination: 3.58°  
Azimuth: 171.13°  
VS: -407.94'

Gas: 123u  
C1: 94.5%  
C2: 2.4%  
C3: 2.2%  
C4: 0.8%

SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,  
sb blkgy-sb plty, f-v f gr, gt, v arg, ply srt, gr  
- slty sh  
SHY SS: wh-lt gy occ lt brn, sl frm -hd, sb  
ang-sb rnd, f -v f gr,rr glau, arg, sl calc  
SLTY SH: med gy-gr brn occ spec blk, sb  
plty-plty, sft- sl frm, slt tex, sl rthy lstr, non  
calc

MD: 4,768'  
TVD: 4,734.89'  
Inclination: 3.47°  
Azimuth: 188.99°  
VS: -413.7'

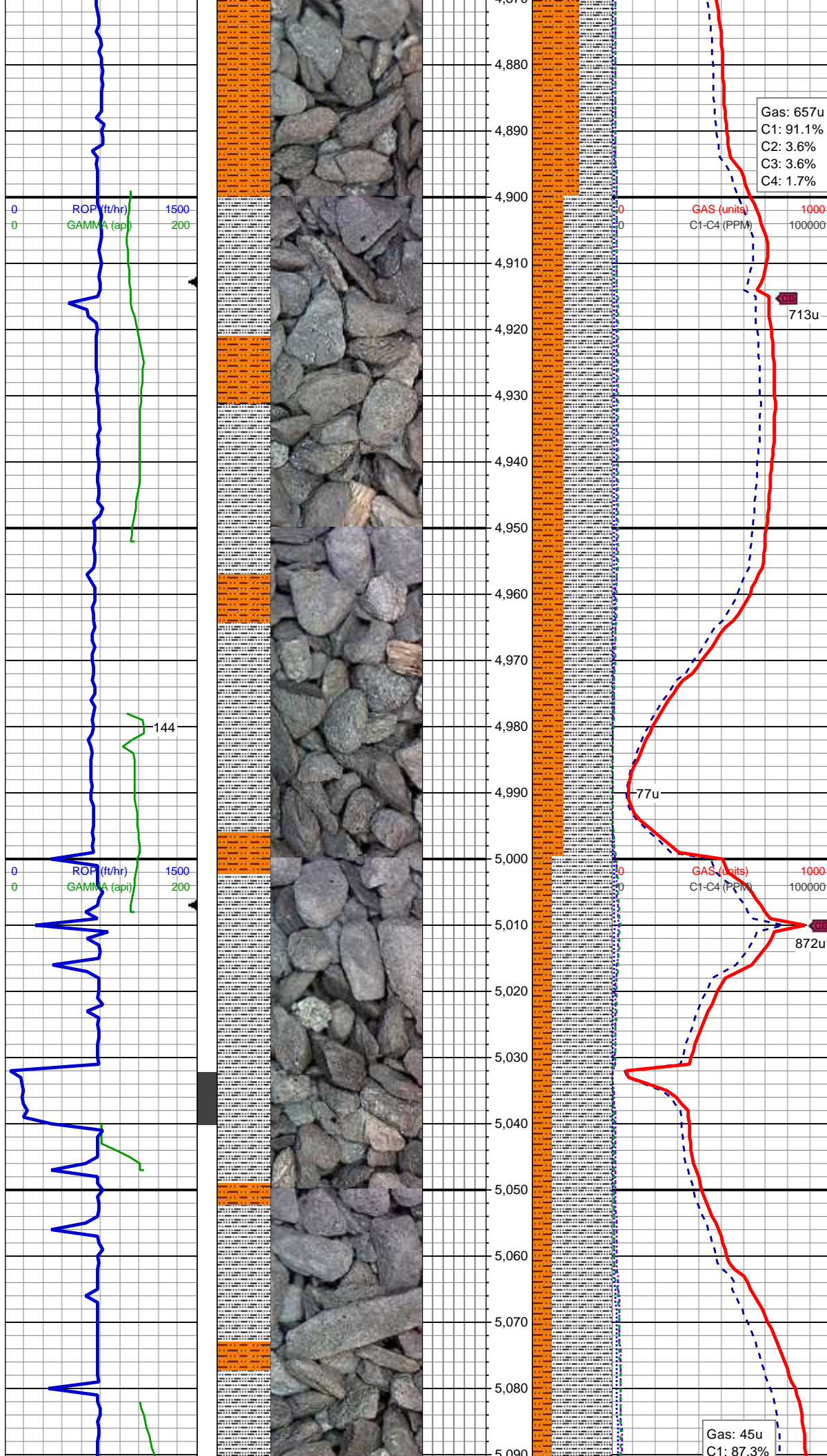
MUD WT 9.1 VIS 28

SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,  
sb blkgy-sb plty, f-v f gr, gt, v arg, ply srt, gr  
- slty sh  
SLTY SH: med gy-gr brn occ spec blk, sb  
plty-plty, sft- sl frm, slt tex, sl rthy lstr, non  
calc

MD: 4,863'  
TVD: 4,829.81'  
Inclination: 1.23°  
Azimuth: 186.27°



VS: -417.52'



Gas: 657u  
C1: 91.1%  
C2: 3.6%  
C3: 3.6%  
C4: 1.7%

GAS (units)  
C1-C4 (PPM)

713u

SLTY SH: med gy-gr brn occ spec blk, sb  
ply-pty, sft- sl frm, slt tex, sl rthy lstr, non  
calc  
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,  
sb blk-ly-sb ply, f-v f gr, gt, v arg, ply srt, gr  
- slty sh

MD: 4,957'  
TVD: 4,923.78'  
Inclination: 1.27°  
Azimuth: 181.09°  
VS: -419.56'

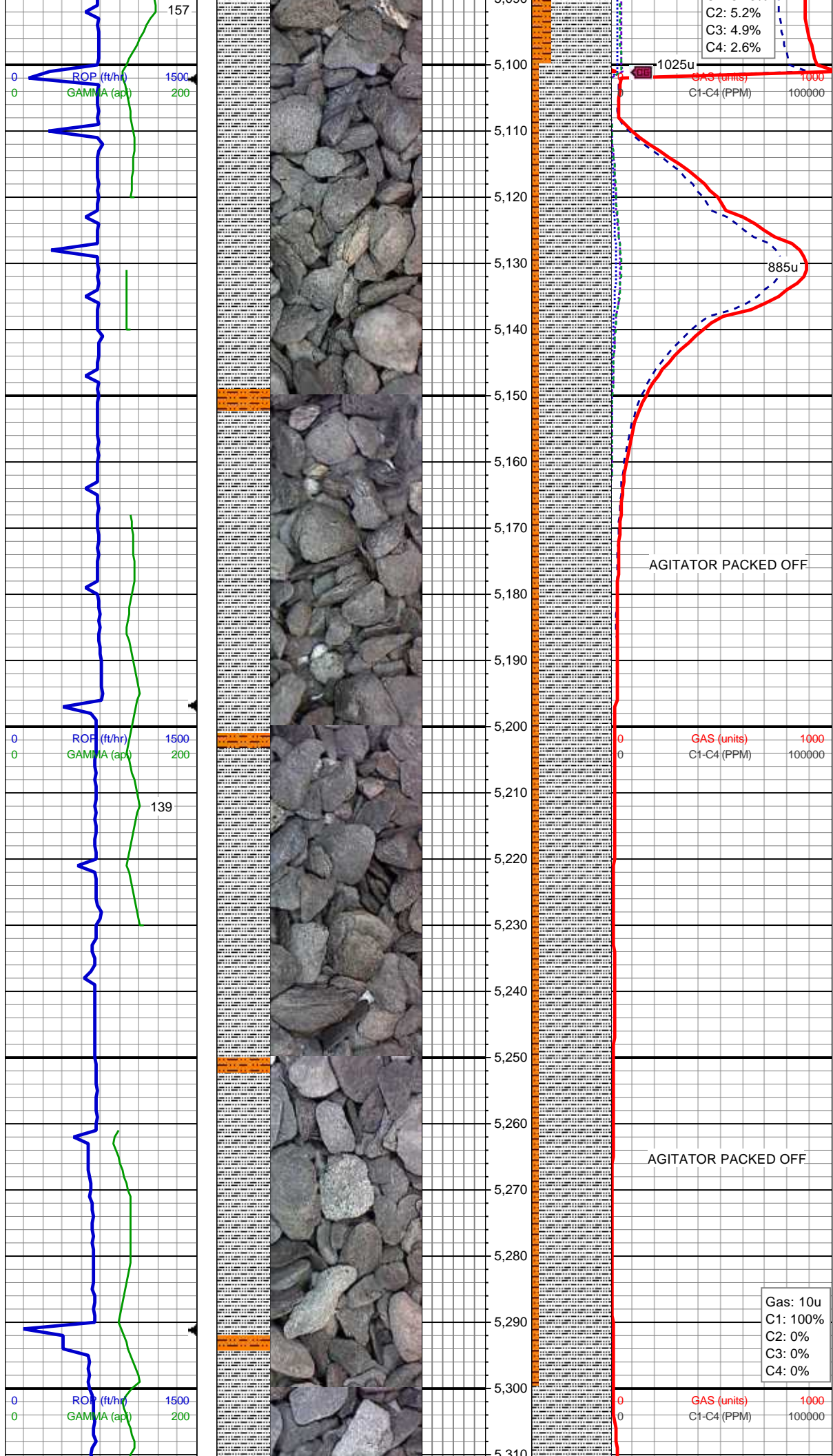
GAS (units)  
C1-C4 (PPM)

872u

SLTY SH: med gy-gr brn occ spec blk, sb  
ply-pty, sft- sl frm, slt tex, sl rthy lstr, non  
calc  
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,  
sb blk-ly-sb ply, f-v f gr, gt, v arg, ply srt, gr  
- slty sh

MD: 5,052'  
TVD: 5,018.77'  
Inclination: 0.62°  
Azimuth: 139.25°  
VS: -421.01'

Gas: 45u  
C1: 87.3%



C2: 5.2%  
C3: 4.9%  
C4: 2.6%

MD: 5,146'  
TVD: 5,112.77'  
Inclination: 0.48°  
Azimuth: 122.29°  
VS: -421.64'

SLTY SH: med gy-gr brn occ spec blk, sb  
ply-pty, sft- sl frm, slt tex, sl rthy lstr, non  
calc  
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,  
sb blk- sb ply, f-v f gr, gt, v arg, ply srt, gr  
- slty sh

AGITATOR PACKED OFF

AGITATOR PACKED OFF

Gas: 10u  
C1: 100%  
C2: 0%  
C3: 0%  
C4: 0%



