

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** Well Ranch AE19-644

**Location** NWSW 20 6N 62W 6 PM

**State** COLORADO

**County** WELD

**Country** UNITED STATES

**Rig Number** H&P 330

**API Number** 05-123-39639

**Field** WATTENBERG

**Region** DJ BASIN

**Drilling Completed** 1/15/2015

**Spud Date** 1/5/2015

**Surface Coordinates** NWSW 20 6N 62W 6 PM  
1685 FSL 65 FWL  
Lat/Long: 40.46958/-104.35586

**Bottom Hole Coordinates** Proposed  
Sec: 24 Twp: 6N 63W  
2240 FFSLL 235 FFELL

**Ground Elevation** 4,786'

**K.B. Elevation** 4,816'

**Logged Interval** 2,000' **To** 11,985'

**Total Depth** 11,985'

**Formation** NIOBRARA

**Type of Drilling Fluid** WATER BASED MUD, LSND

## Other Symbols

### Oil Show

- DEAD
- EVEN
- QUESTIONABLE
- SPOTTED STAINING

### Porosity

- E EARTHY
- F FENESTRAL
- F FRACTURE
- 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

MN DEPTH MN DEPTH (RIGHT)

NORMAL FAULT

OVERTURNED STRATA

REVERSE FAULT

CASING

SIDEWALL CORE (LEFT)

SIDEWALL CORE (RIGHT)

SLIDE

SURVEY

DST 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

ARGILLITE GRAIN

HEAVY MINERAL

### Stringer

## Fossils

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

## Inoceramus

- OOLITE
- OSTRACOD
- PELECYPOD
- PELLET
- PISOLITE
- PLANT REMAINS
- PLANT SPORES
- SCAPHOPOD
- STROMATOPOROID

## Minerals

- ANHYDRITIC
- ARGILLACEOUS

## Bentonite

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

## 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 Suite 2200  
Denver, CO 80202

## Geologist

**Name** Teresa Malesardi

**Company** Noble Energy Inc

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

tmalesardi@nobleenergyinc.com

## Zone Color Coding

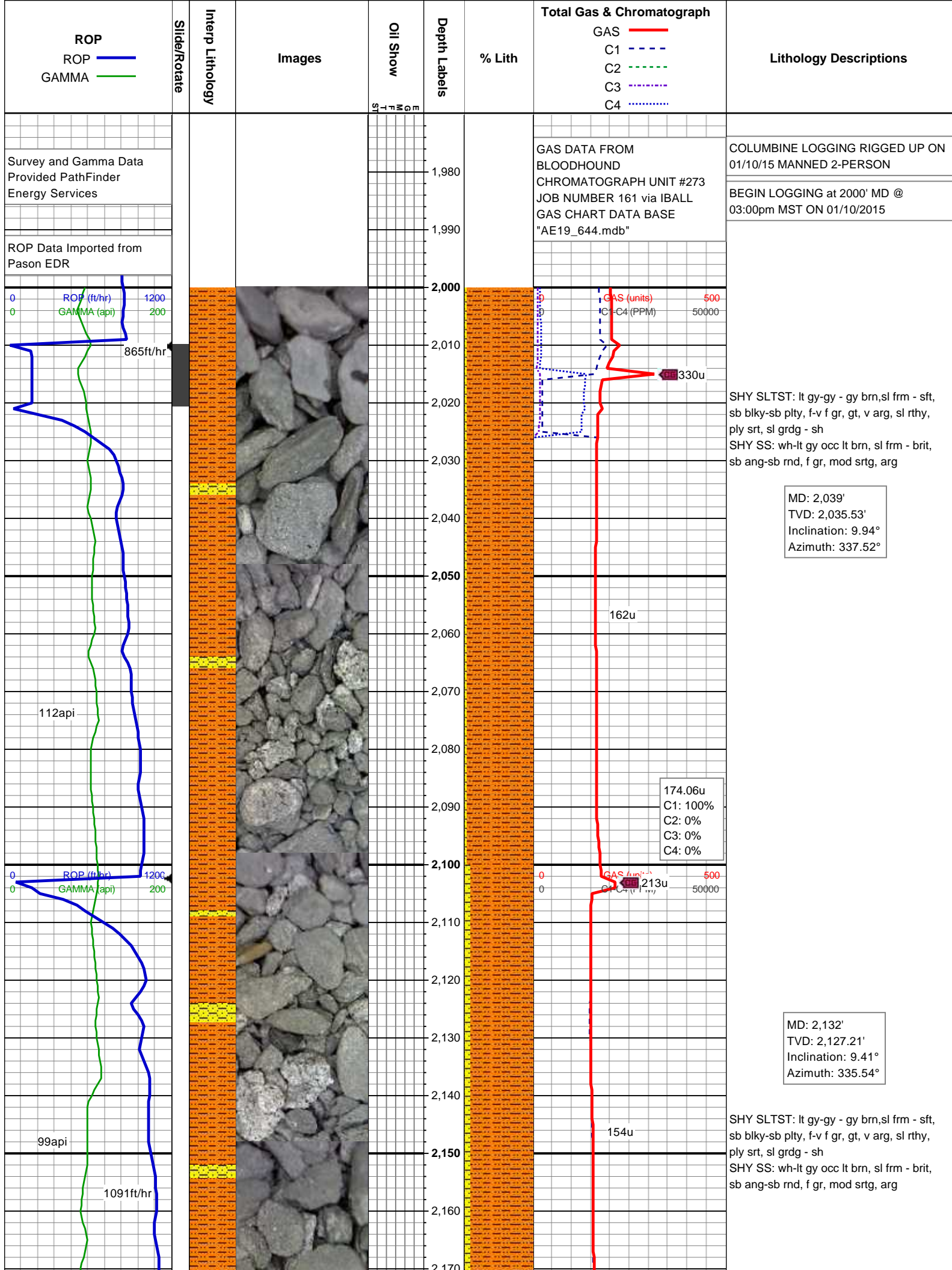
- |       |            |          |
|-------|------------|----------|
| Oil   | Condensate | Gas      |
| Note  | Core       | Pressure |
| Error | Water      | Seal     |

## Other

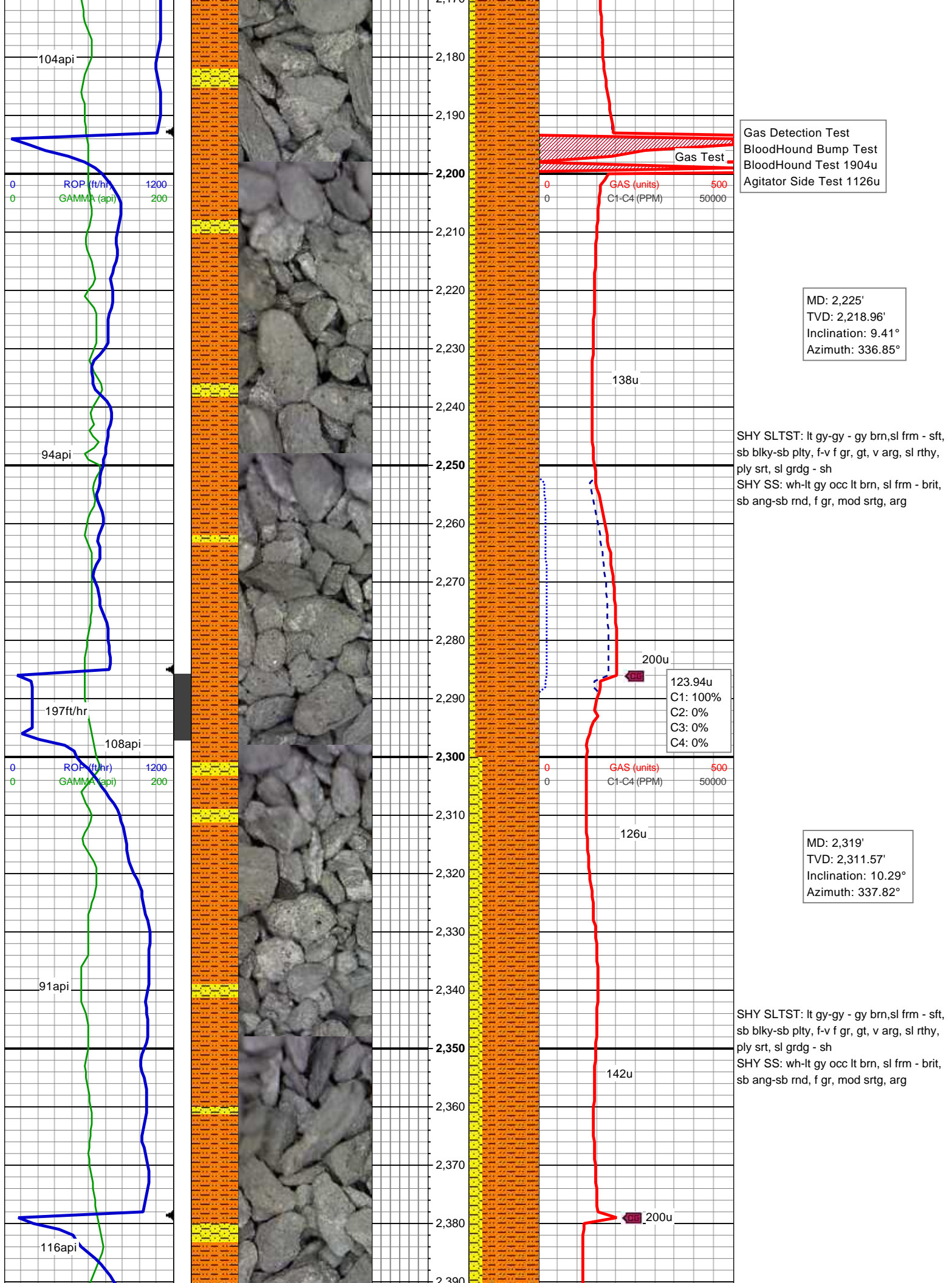
**Well Site Logging Company** Columbine Logging Inc.

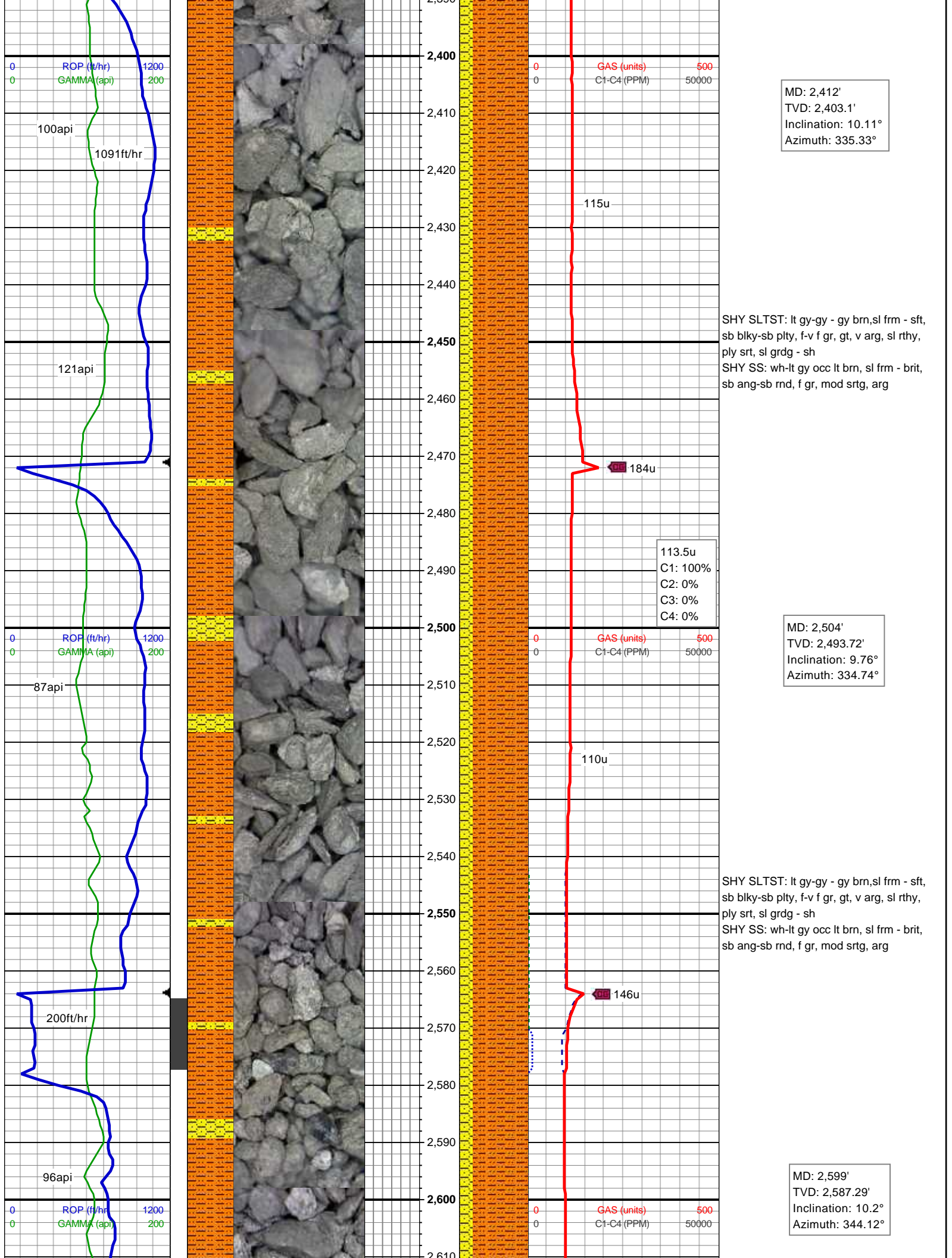
**Well Site Geologist (Days)** Brad Wilson

**Well Site Geologist (Nights)** Jason Bell

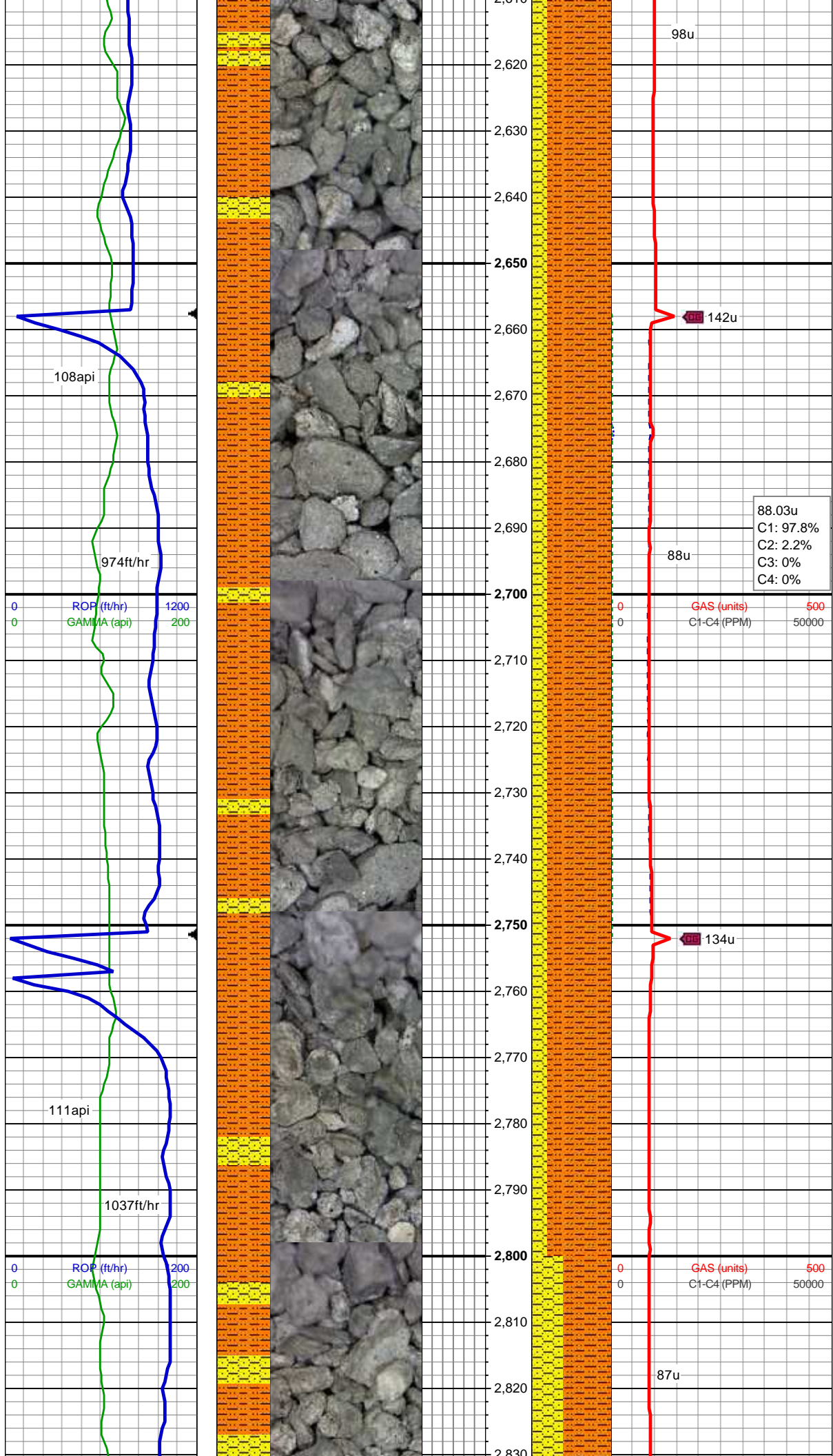










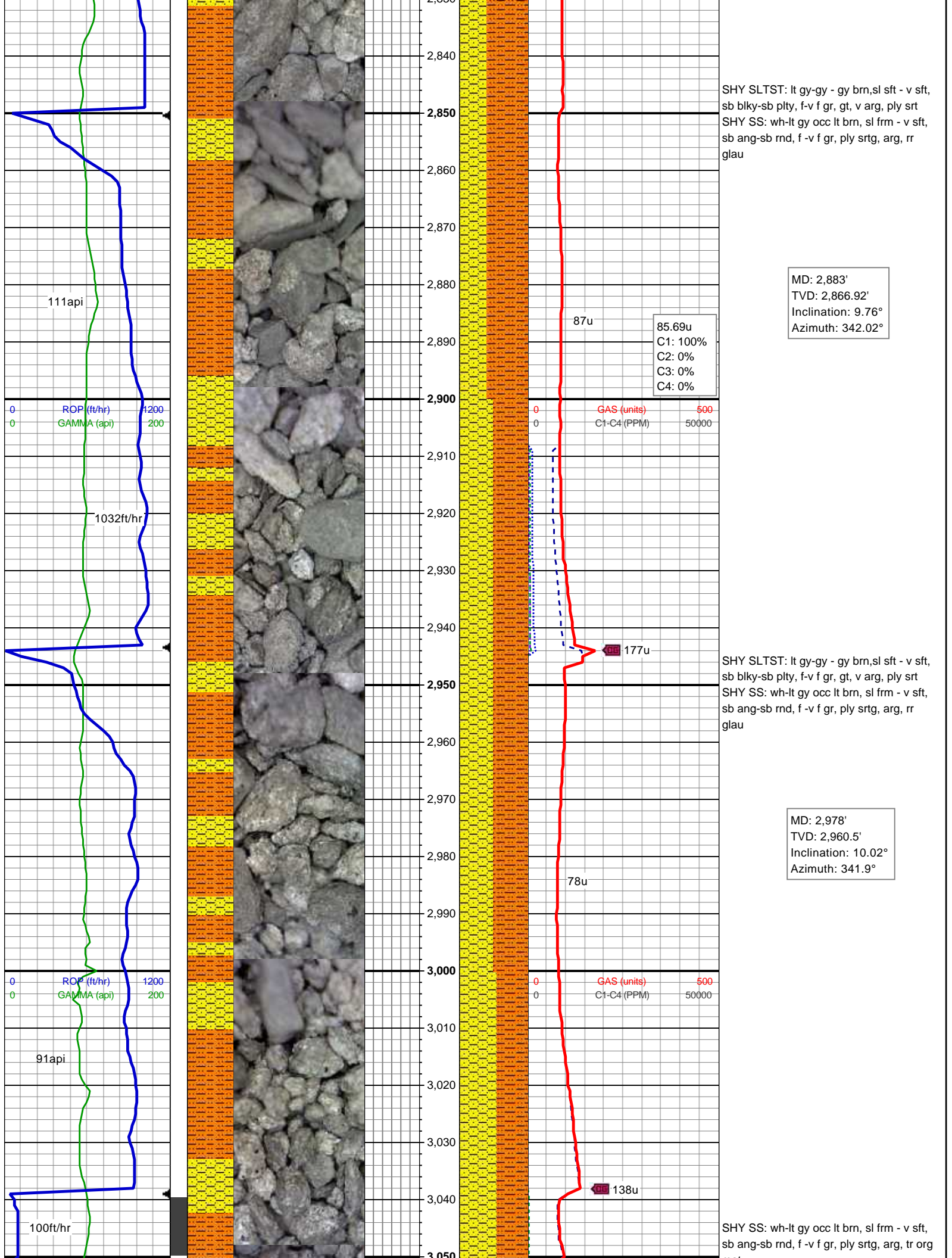


SHY SLTST: lt gy-gy - gy brn,sl frm - sft,  
sb blkly-sb plty, f-v f gr, gt, v arg, sl rthy,  
ply srt, sl grdg - sh  
SHY SS: wh-lt gy occ lt brn, sl frm - brit,  
sb ang-sb rnd, f gr, mod srtg, arg

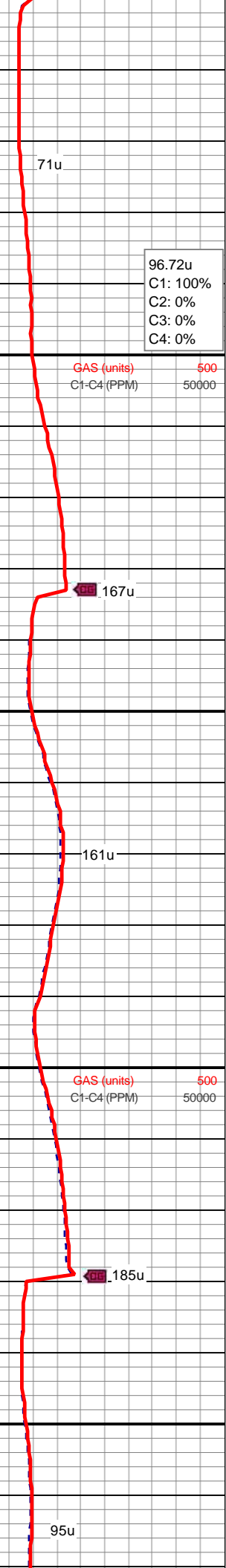
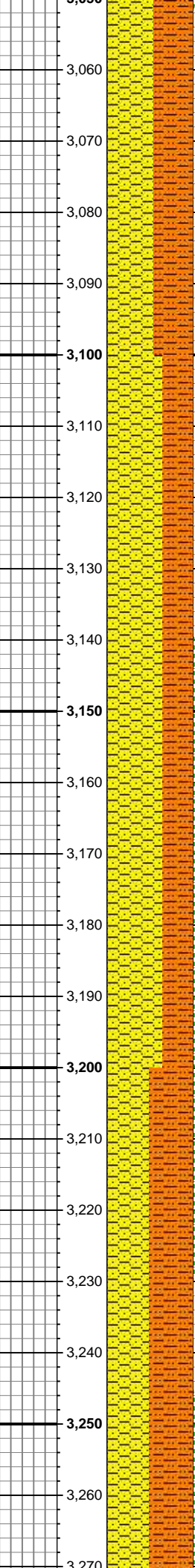
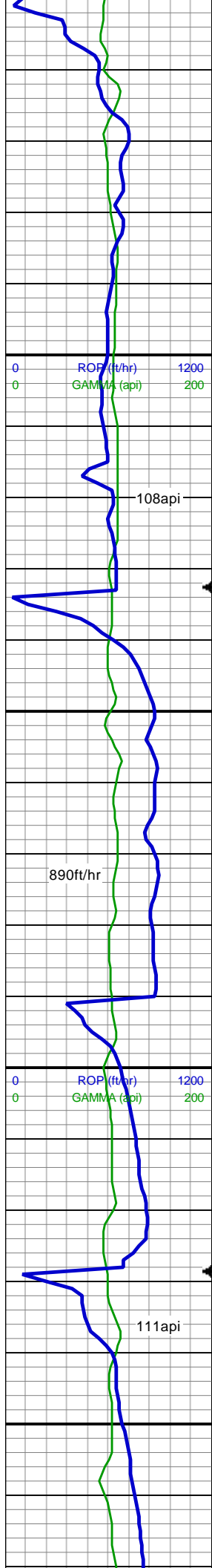
MD: 2,694'  
TVD: 2,680.79'  
Inclination: 10.2°  
Azimuth: 343.65°

SHY SLTST: lt gy-gy - gy brn,sl frm - sft,  
sb blkly-sb plty, f-v f gr, gt, v arg, sl rthy,  
ply srt, sl grdg - sh  
SHY SS: wh-lt gy occ lt brn, sl frm - brit,  
sb ang-sb rnd, f gr, mod srtg, arg

MD: 2,788'  
TVD: 2,773.33'  
Inclination: 10.02°  
Azimuth: 342.19°







mat  
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,  
sb blk-y-sb plty, f-v f gr, gt, v arg, ply srt

MD: 3,073'  
TVD: 3,054.19'  
Inclination: 9.06°  
Azimuth: 349.94°

96.72u  
C1: 100%  
C2: 0%  
C3: 0%  
C4: 0%

SHY SS: wh-lt gy occ lt brn, sl frm - v sft,  
sb ang-sb rnd, f -v f gr, ply srtg, arg, tr org  
mat  
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,  
sb blk-y-sb plty, f-v f gr, gt, v arg, ply srt

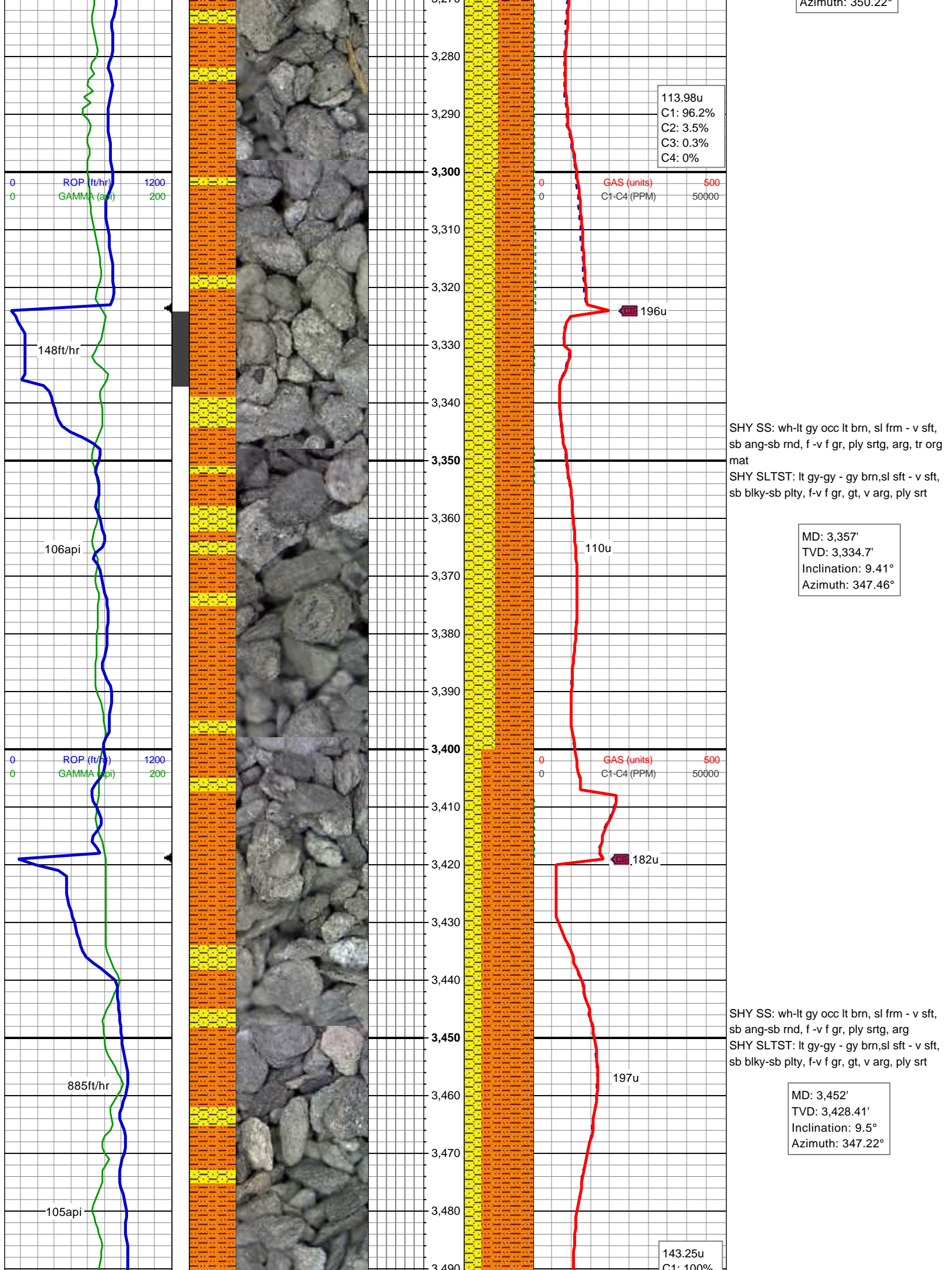
MD: 3,167'  
TVD: 3,146.99'  
Inclination: 9.32°  
Azimuth: 349.85°

SHY SS: wh-lt gy occ lt brn, sl frm - v sft,  
sb ang-sb rnd, f -v f gr, ply srtg, arg, tr org  
mat  
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,  
sb blk-y-sb plty, f-v f gr, gt, v arg, ply srt

MD: 3,262'  
TVD: 3,240.85'  
Inclination: 8.44°  
Azimuth: 350.00°



Azimuth: 350.22°



113.98u  
C1: 96.2%  
C2: 3.5%  
C3: 0.3%  
C4: 0%

GAS (units)  
C1-C4 (PPM)

196u

110u

182u

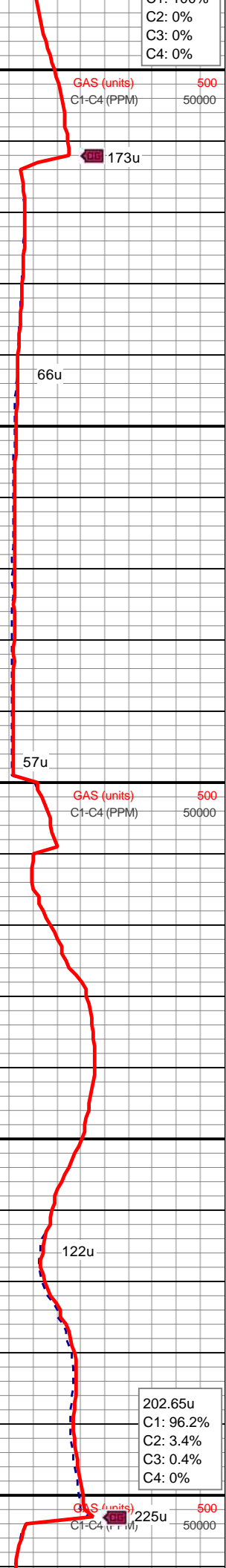
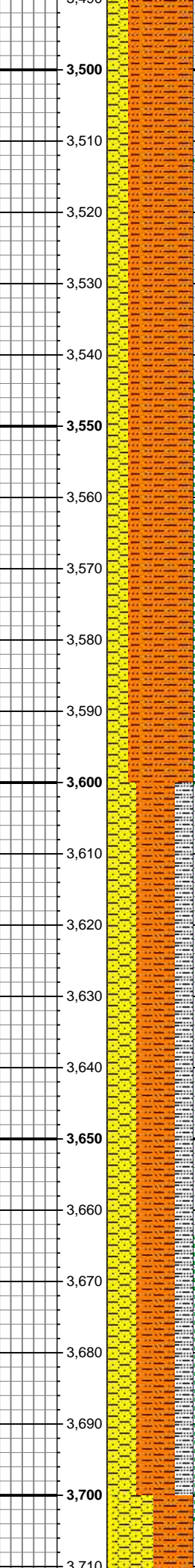
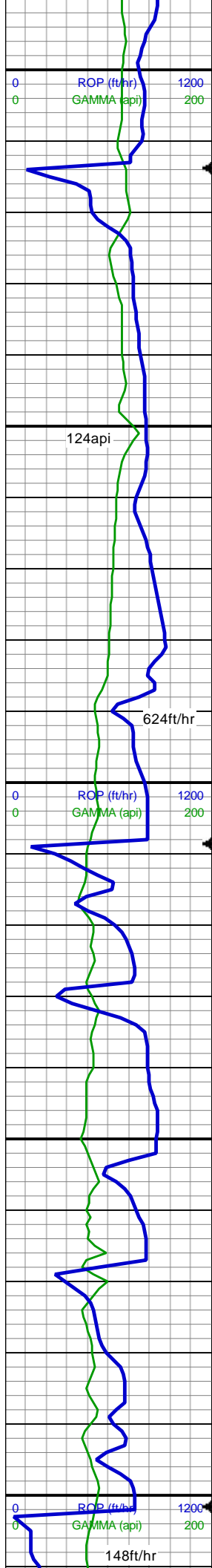
197u

MD: 3,357'  
TVD: 3,334.7'  
Inclination: 9.41°  
Azimuth: 347.46°

SHY SS: wh-lt gy occ lt brn, sl frm - v sft, sb ang-sb rnd, f -v f gr, ply srtg, arg  
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft, sb blk-y-sb plty, f-v f gr, gt, v arg, ply srt

MD: 3,452'  
TVD: 3,428.41'  
Inclination: 9.5°  
Azimuth: 347.22°

143.25u  
C1: 100%

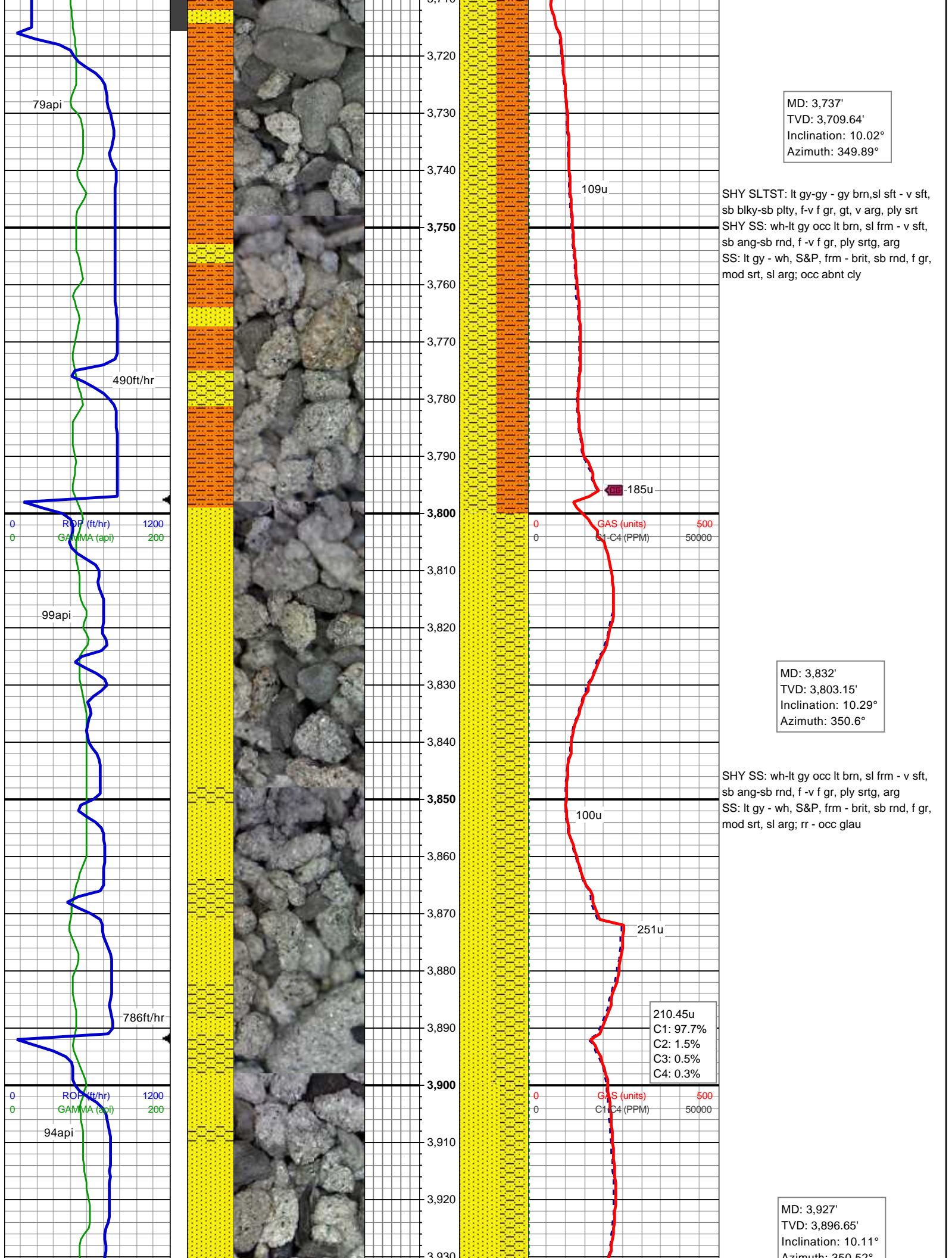


SHY SS: wh-lt gy occ lt brn, sl frm - v sft,  
sb ang-sb rnd, f -v f gr, ply srtg, arg  
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,  
sb blkgy-sb plty, f-v f gr, gt, v arg, ply srt

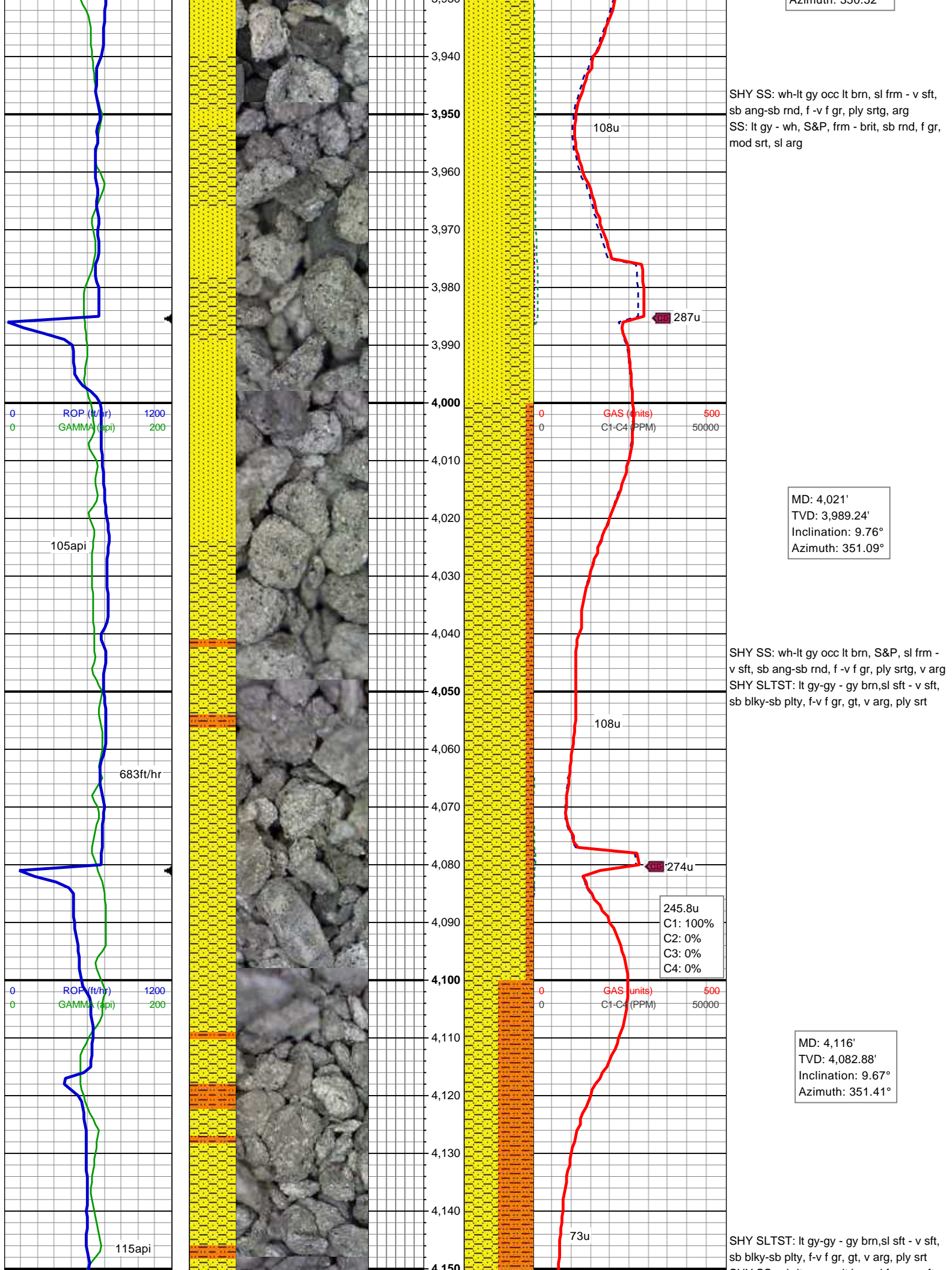
MD: 3,642'  
TVD: 3,615.94'  
Inclination: 8.97°  
Azimuth: 346.36°

SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,  
sb blkgy-sb plty, f-v f gr, gt, v arg, ply srt  
SHY SS: wh-lt gy occ lt brn, sl frm - v sft,  
sb ang-sb rnd, f -v f gr, ply srtg, arg  
SLTY SH: med -dk gy, sb blkgy-sb plty, v  
sft-sl frm, slt tex, sl rthy lstr, sl aren, non  
calc

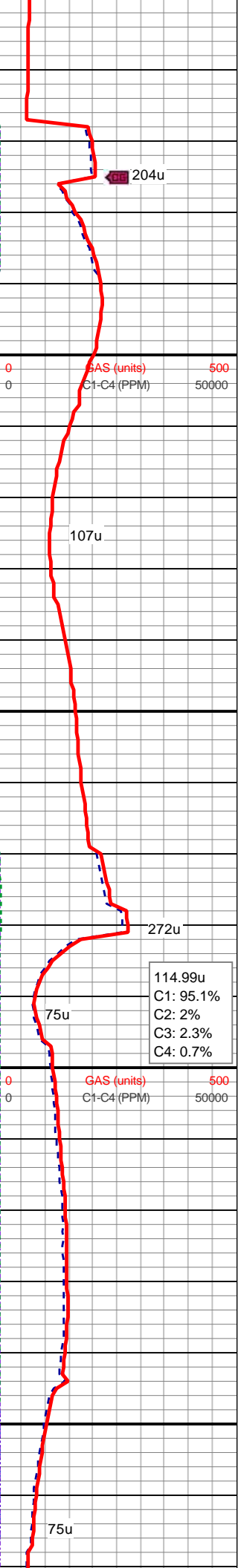
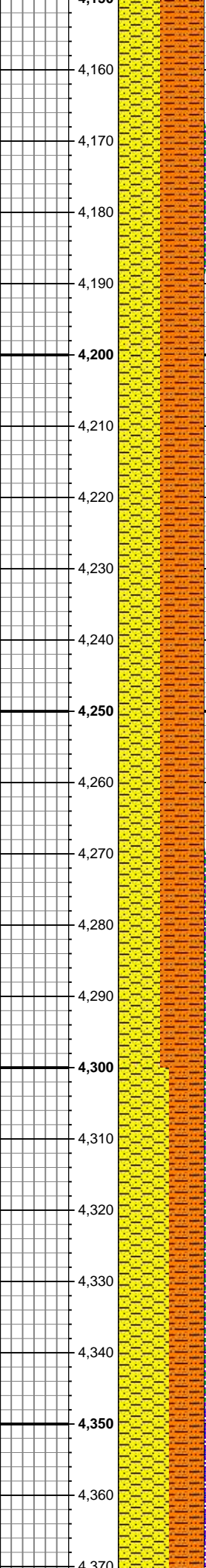
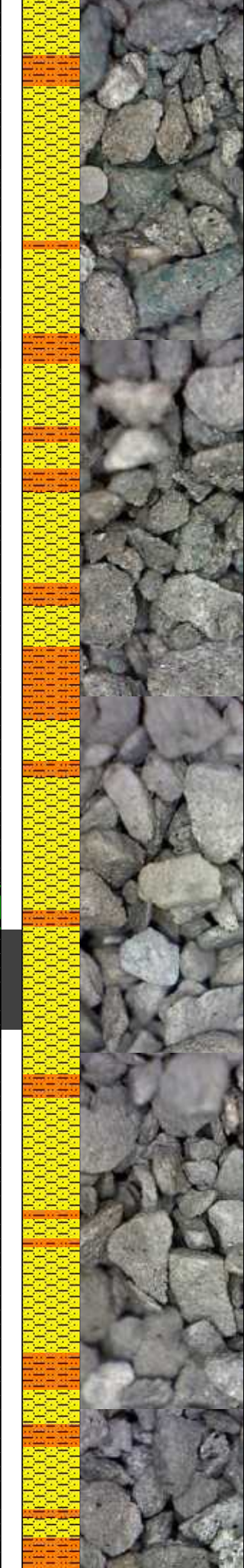
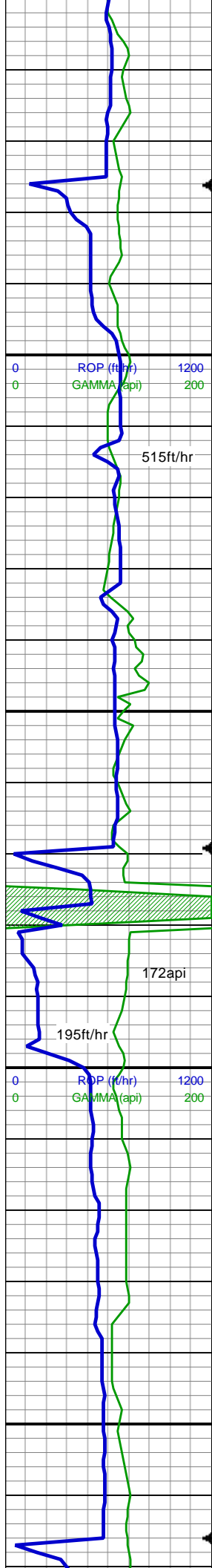




Azimuth: 350.32°







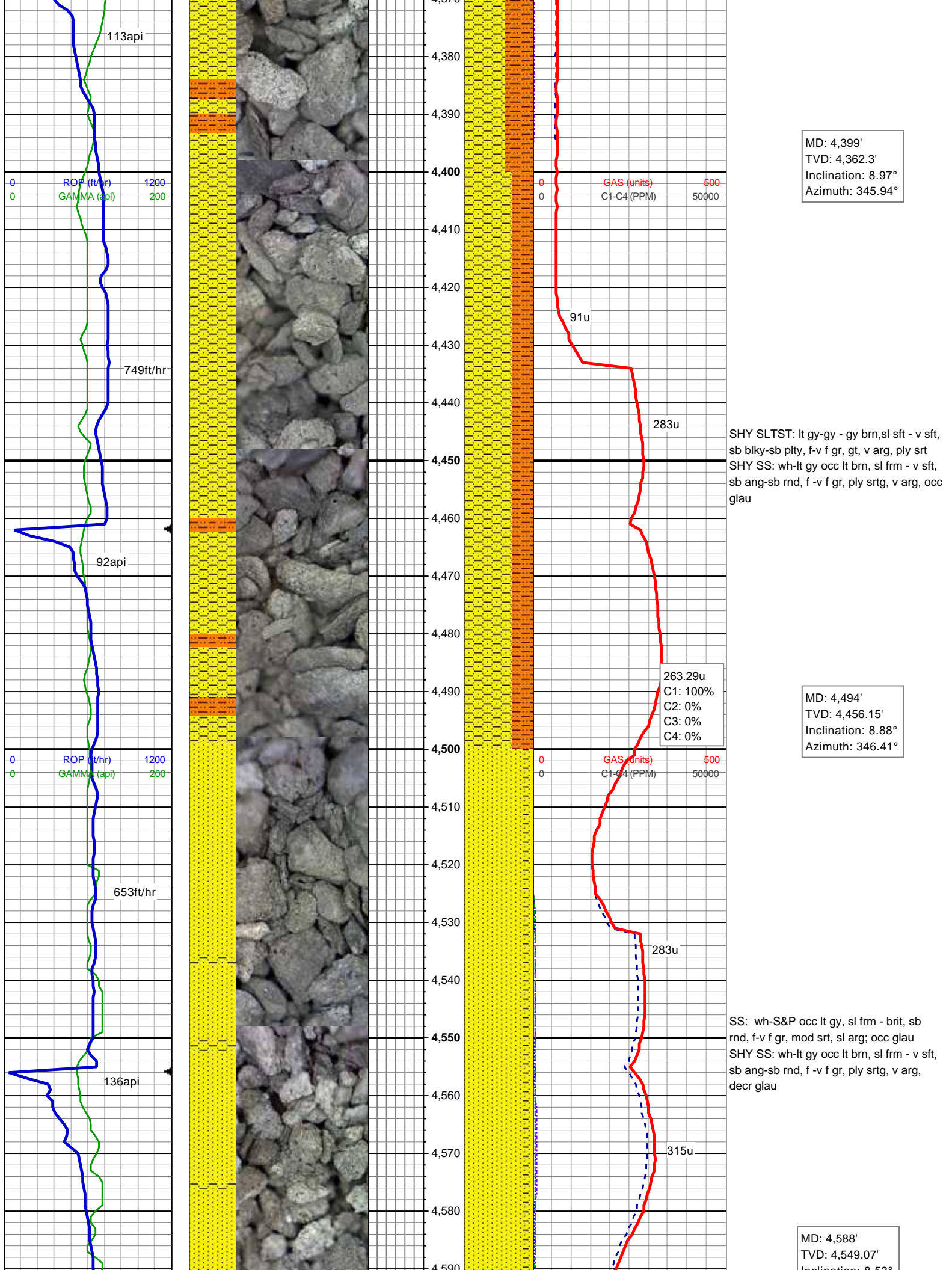
SHY SS: wh-lt gy occ lt brn, sl frm - v sft, sb ang-sb rnd, f -v f gr, ply srtg, v arg, abnt glau

MD: 4,211'  
TVD: 4,176.64'  
Inclination: 8.88°  
Azimuth: 350.23°

SHY SLTST: lt gy-gy - gy brn,sl sft - v sft, sb blkgy-sb plty, f-v f gr, gt, v arg, ply srt  
SHY SS: wh-lt gy occ lt brn, sl frm - v sft, sb ang-sb rnd, f -v f gr, ply srtg, v arg, abnt glau

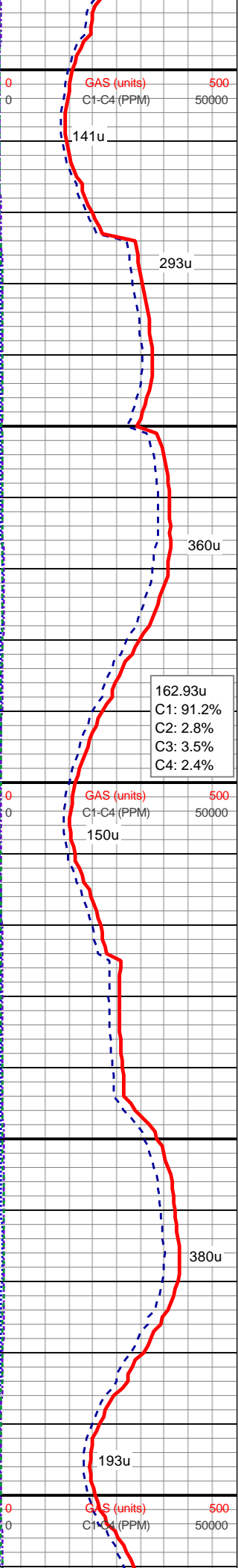
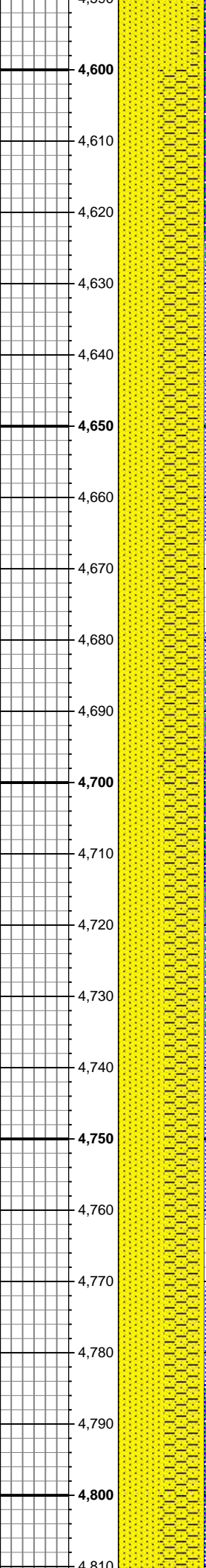
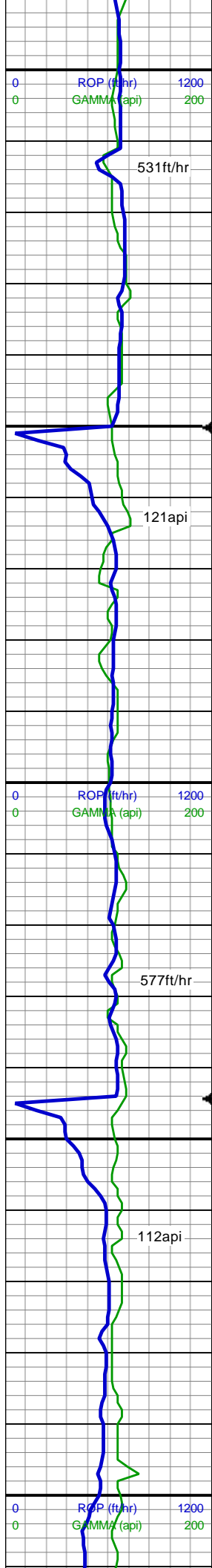
MD: 4,305'  
TVD: 4,269.48'  
Inclination: 9.15°  
Azimuth: 344.38°

SHY SLTST: lt gy-gy - gy brn,sl sft - v sft, sb blkgy-sb plty, f-v f gr, gt, v arg, ply srt  
SHY SS: wh-lt gy occ lt brn, sl frm - v sft, sb ang-sb rnd, f -v f gr, ply srtg, v arg, occ glau





Inclination: 6.33°  
Azimuth: 346.89°

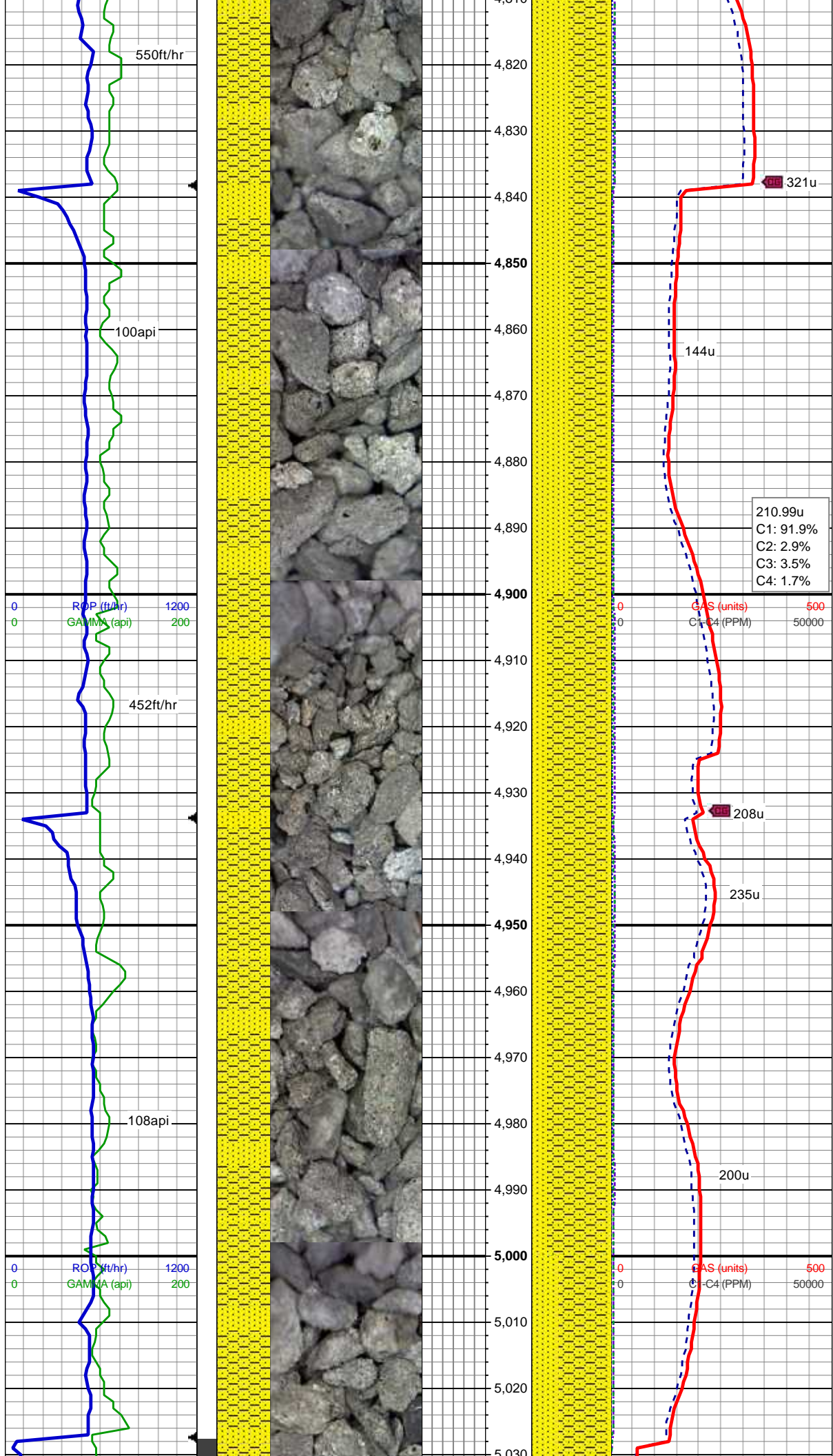


SS: wh-S&P occ lt gy, sl frm - brit, sb  
rnd, f-v f gr, mod srt, sl arg; occ glau  
SHY SS: wh-lt gy occ lt brn, sl frm - v sft,  
sb ang-sb rnd, f -v f gr, ply srtg, v arg,  
decr glau

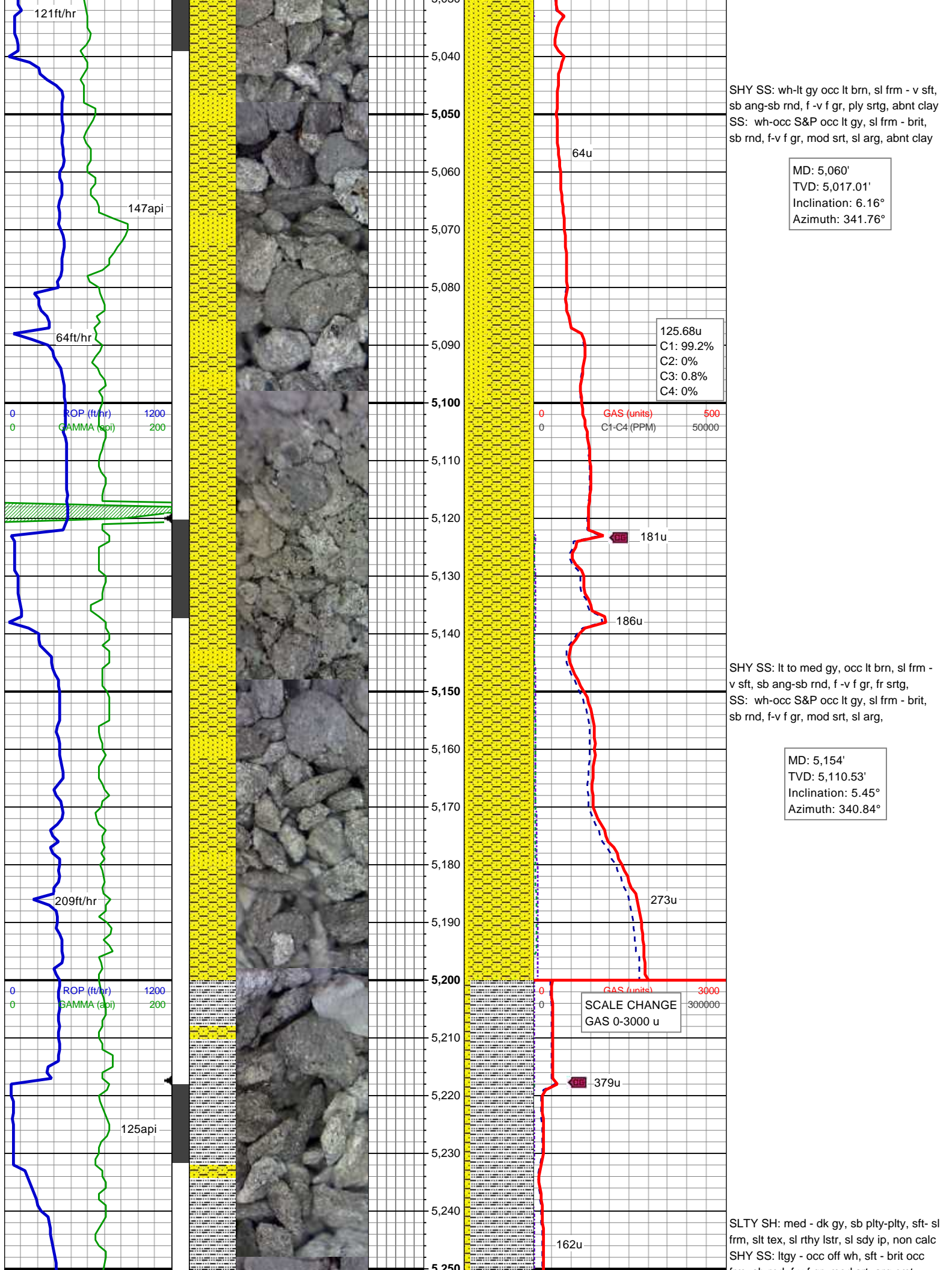
MD: 4,683'  
TVD: 4,643.09'  
Inclination: 7.91°  
Azimuth: 346.86°

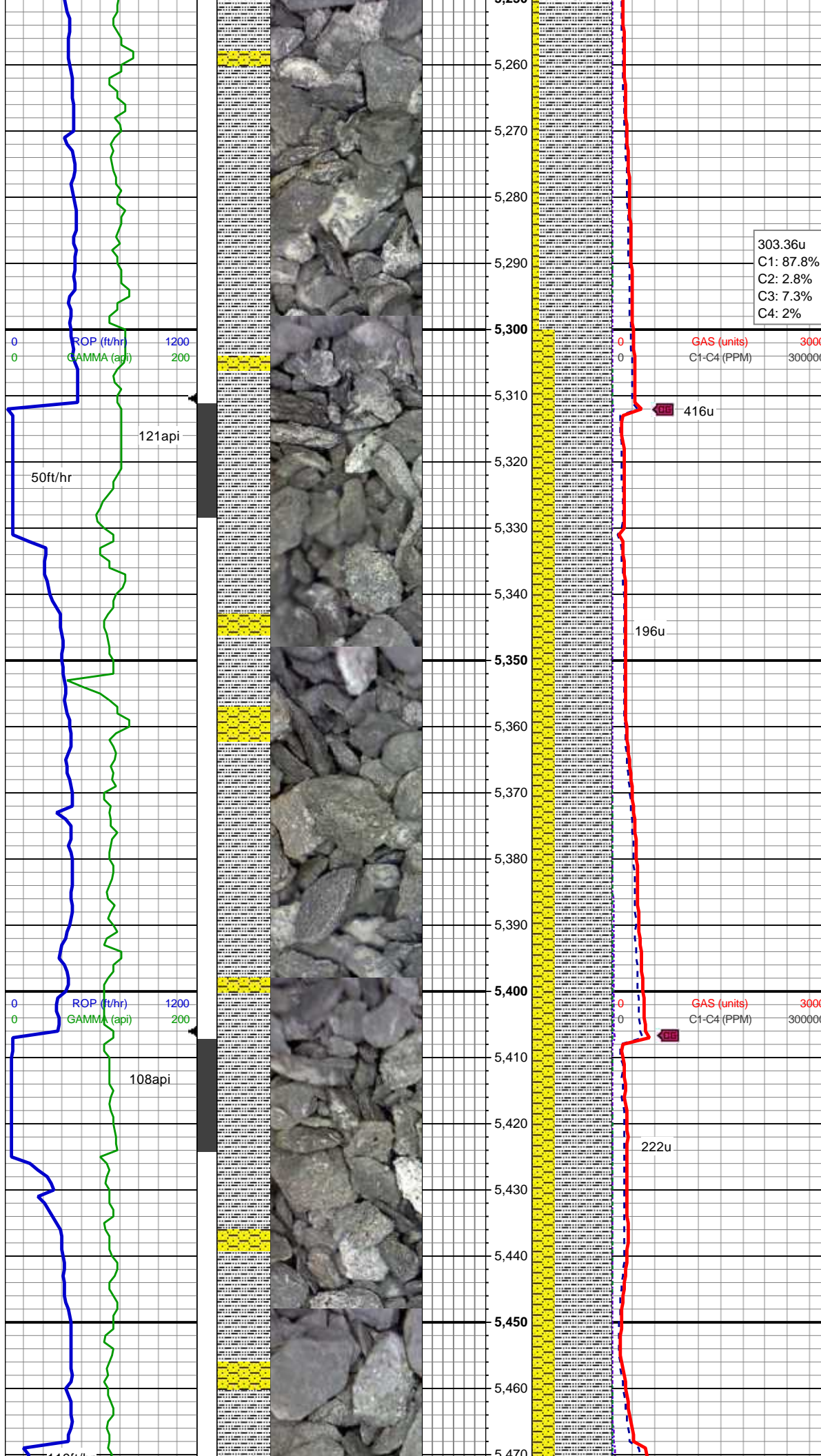
SS: wh-occ S&P occ lt gy, sl frm - brit,  
sb rnd, f-v f gr, mod srt, sl arg  
SHY SS: wh-lt gy occ lt brn, sl frm - v sft,  
sb ang-sb rnd, f -v f gr, ply srtg, v arg

MD: 4,777'  
TVD: 4,736.22'  
Inclination: 7.74°  
Azimuth: 346.31°









MD: 5,248'  
TVD: 5,204.17'  
Inclination: 4.57°  
Azimuth: 341.89°

303.36u  
C1: 87.8%  
C2: 2.8%  
C3: 7.3%  
C4: 2%

MD: 5,343'  
TVD: 5,298.94'  
Inclination: 3.43°  
Azimuth: 346.42°

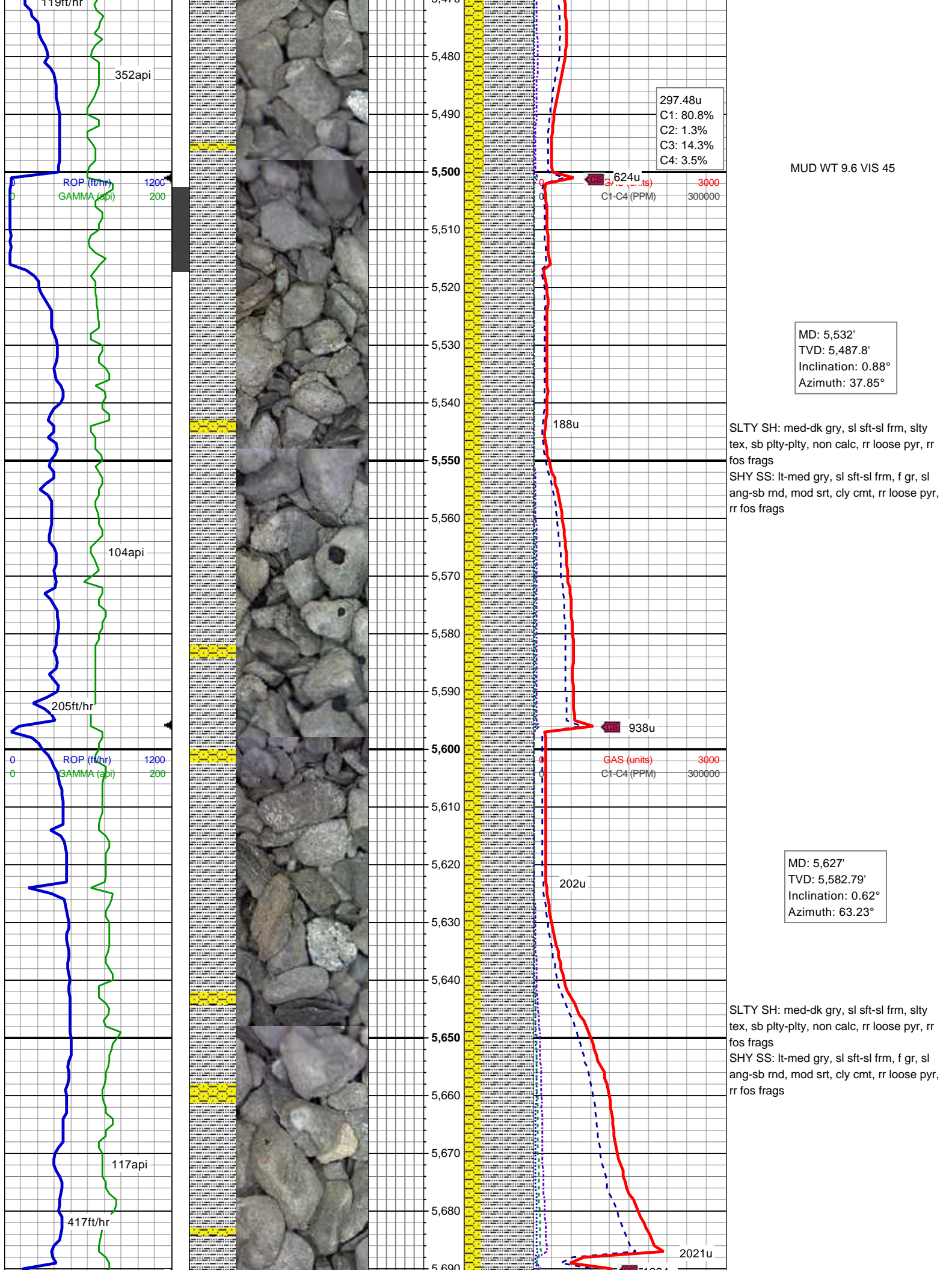
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frm, slt tex, sl rthy lstr, sl sdy ip, non calc  
SHY SS: ltgy-wh, sl sft - brit occ frm, sb  
rnd, f-v f gr, mod srt, arg cmt; rr lse pyr

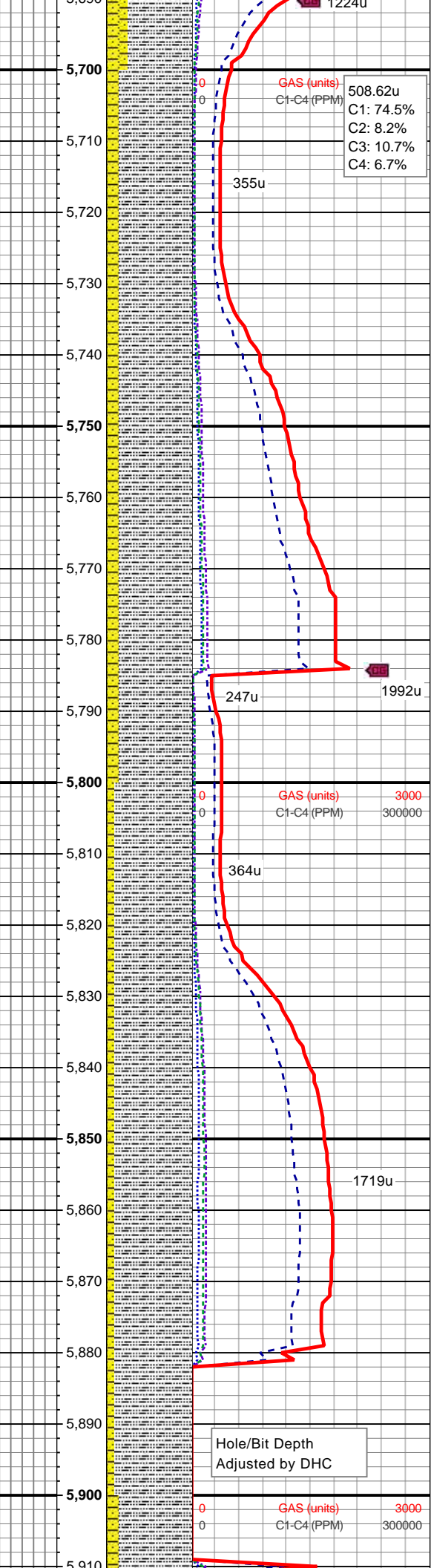
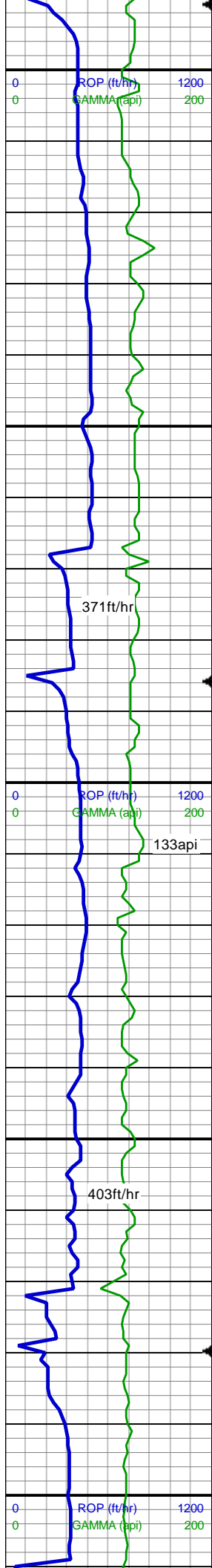
MUD WT 9.45 VIS 50

MD: 5,438'  
TVD: 5,393.83'  
Inclination: 1.93°  
Azimuth: 359.98°

SLTY SH: med - dk gy, sb plty-plty, sft - sl  
frm, slt tex, sl rthy lstr, sl sdy ip, non calc  
SHY SS: ltgy-wh, sl sft - brit occ frm, sb  
rnd, f-v f gr, mod srt, arg cmt; rr lse pyr







MD: 5,722'  
TVD: 5,677.79'  
Inclination: 0.44°  
Azimuth: 68.16°

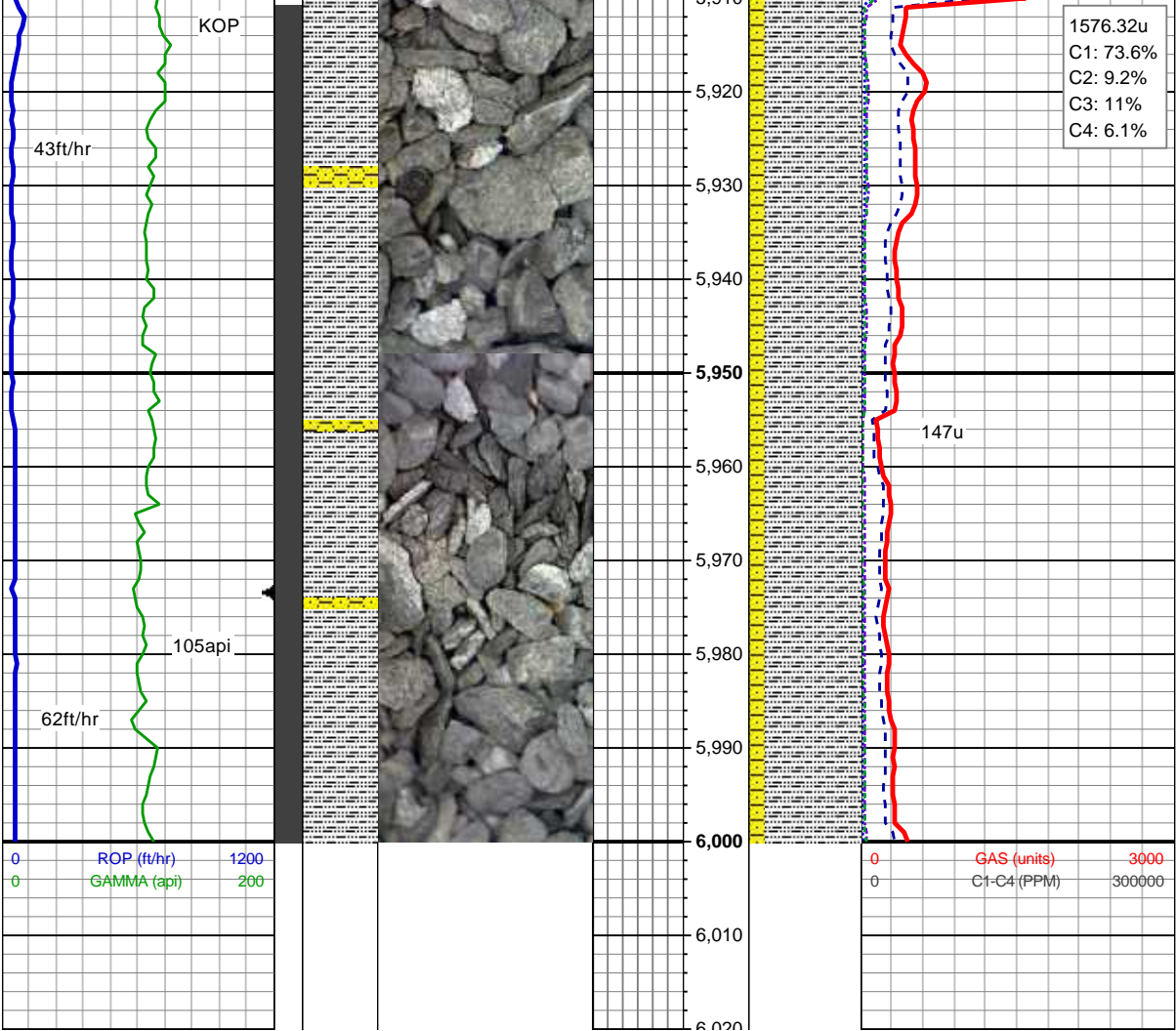
SLTY SH: med-dk gry,sl sft-fm, slty tex,  
sub plty-plty, non calc, rr loose cal  
SHY SS: light-med gry, f gr, sub ang-sub  
rnd,fr srt, cly cmt, rr loose cal

MD: 5,816'  
TVD: 5,771.79'  
Inclination: 0.18°  
Azimuth: 80.75°

SLTY SH: med-dk gry,sl sft-fm, slty tex,  
plty-sub plty, non calc, rr frac filled pyr  
SHY SS: light-med gry, f gr, sub ang-sub  
rnd,fr srt, cly cmt

MD: 5,910'  
TVD: 5,865.79'  
Inclination: 0.35°  
Azimuth: 296.47°





1576.32u  
C1: 73.6%  
C2: 9.2%  
C3: 11%  
C4: 6.1%

MUD WT 10.3 VIS 48

SLTY SH: med-dk gry,sl sft-fm, slty tex,  
plty-sub plty, non calc  
SHY SS: light-med gry, f gr, sub ang-sub  
rnd,fr srt, cly cmt, occ bri yel bl-wh oil  
flor, no bent

147u

MUD WT 10.1 VIS 48

MUDLOG CONTUINES ON  
"Wells Ranch AE19-644  
HORZ.mplot" for Curve and  
Lateral Sections of this Well.