

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Wells Ranch AA26-65-1HN

Location Sec25 T6N R63W

State Colorado

County WELD

Country USA

Rig Number H&P 322

API Number 05-123-37569

Region DJ BASIN

Field WATTENBERG

Spud Date 9/26/2013

Drilling Completed 10/4/2013

Surface Coordinates 1787' FSL
153' FWL
LAT: 40.45505°N
LONG: 104.39410°W

Bottom Hole Coordinates 2310' FSL
150' FWL
LAT: 40.45658°N
LONG: 104.41312°W

Ground Elevation 4791'

K.B. Elevation 4815'

Logged Interval 1000' **To** 11204'

Total Depth 11204'

Formation Pierre; Niobrara

Type of Drilling Fluid Mud:Water:Poly

Operator

Company Noble Energy Inc.

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

Geologist

Name John Ready;Mike Greene

Company Columbine Logging Inc.

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

Rock Types

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

Accessories

Fossils

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

Fossils

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 PELLETT

Minerals

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

Minerals

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

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

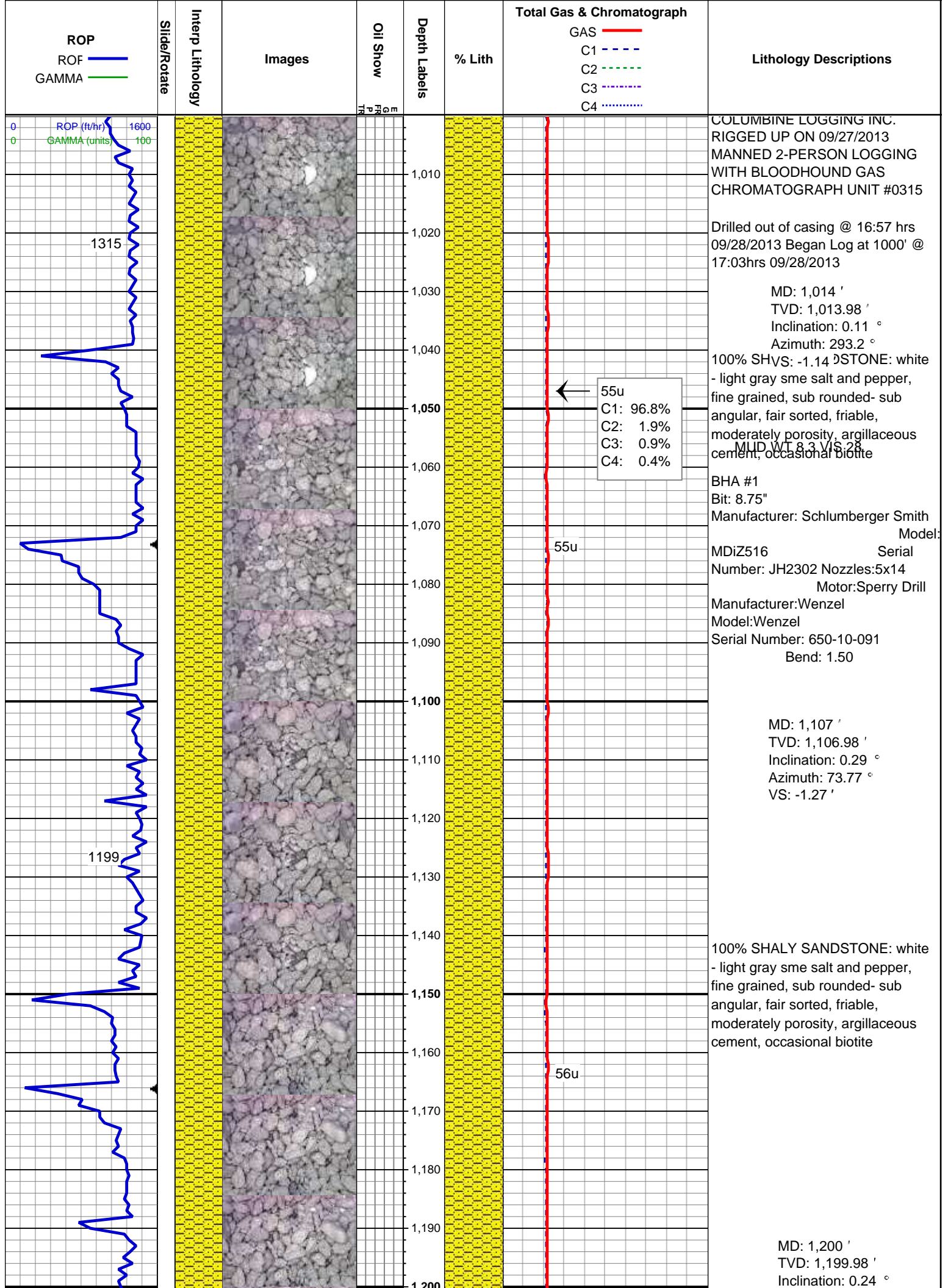
BOUNDSTONE
CHALKY
CRYPTOXLN

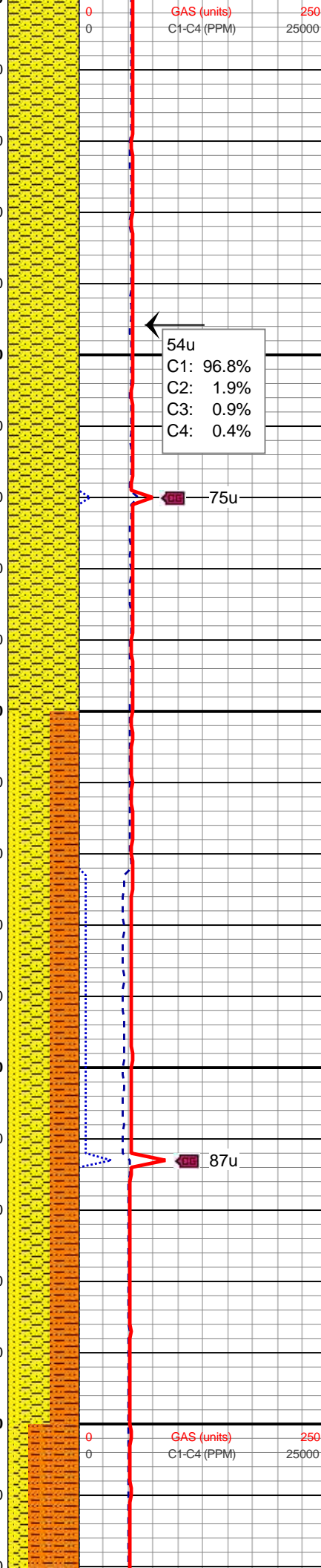
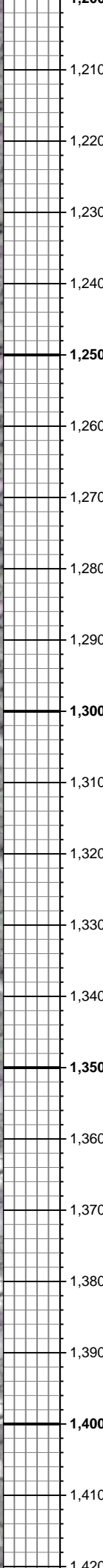
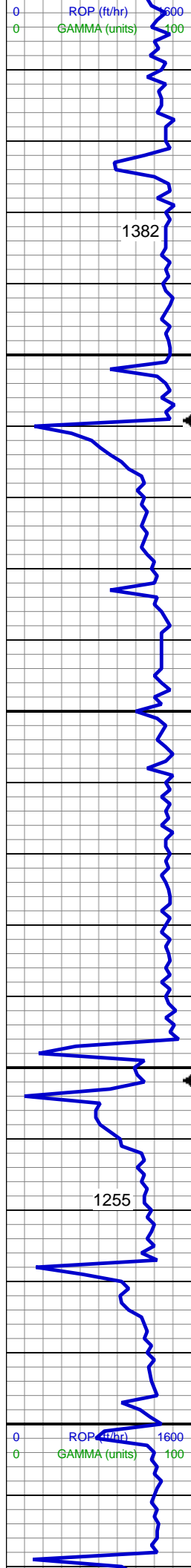
Other Symbols

E EARTHY
FX FINELYXLN
GS GRAINSTONE
L LITHOGRAPHIC
MX MICROXLN
MS MUDSTONE
PS PACKSTONE
WS WACKESTONE

Sorting

M MODERATE
P POOR
W WELL





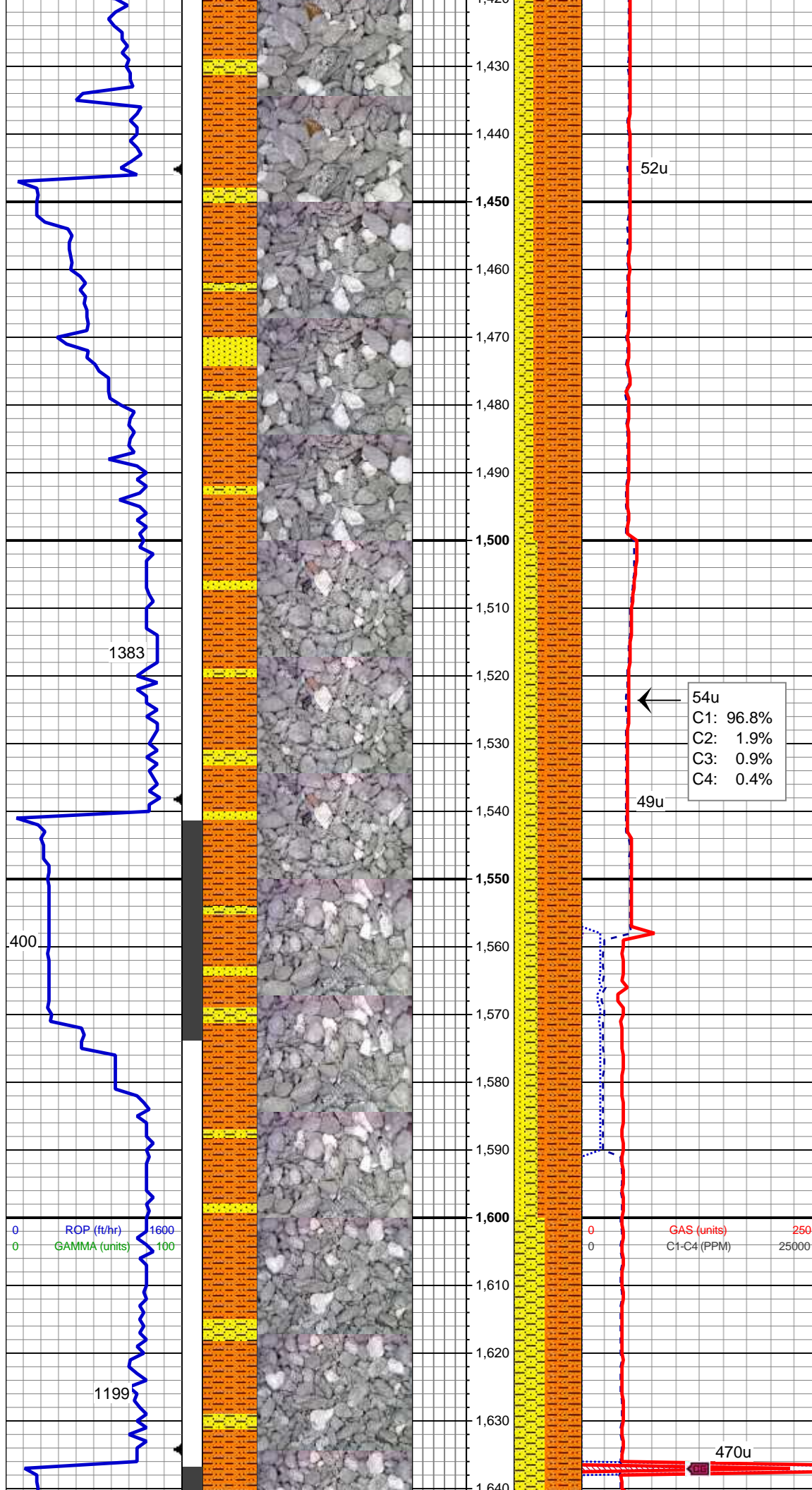
Azimuth: 131.85 °
VS: -1.65 '

100% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement, occasional biotite

MD: 1,293 '
TVD: 1,292.98 '
Inclination: 0.26 °
Azimuth: 335.03 °
VS: -1.7 '

40% SHALY SILTSTONE: light gray, soft-friable, sub blocky - blocky, arenaceous - silty texture
40% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement
20% SANDSTONE: light gray - white, sme salt and pepper, fine grained, sbdr-sbang, moderately sorted, friable, poor porosity

MD: 1,386 '
TVD: 1,385.98 '
Inclination: 0.2 °
Azimuth: 305.56 °
VS: -1.46 '

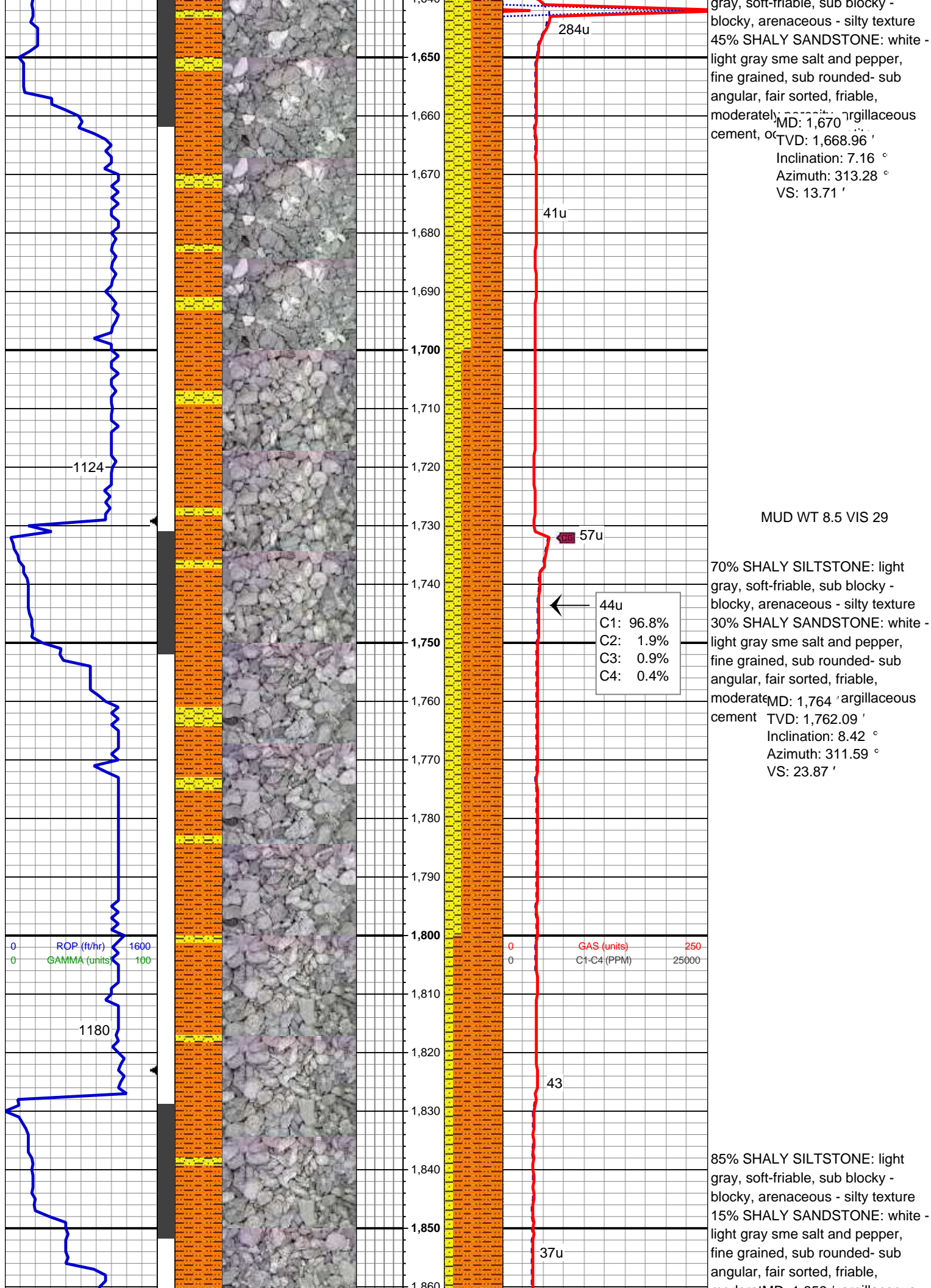


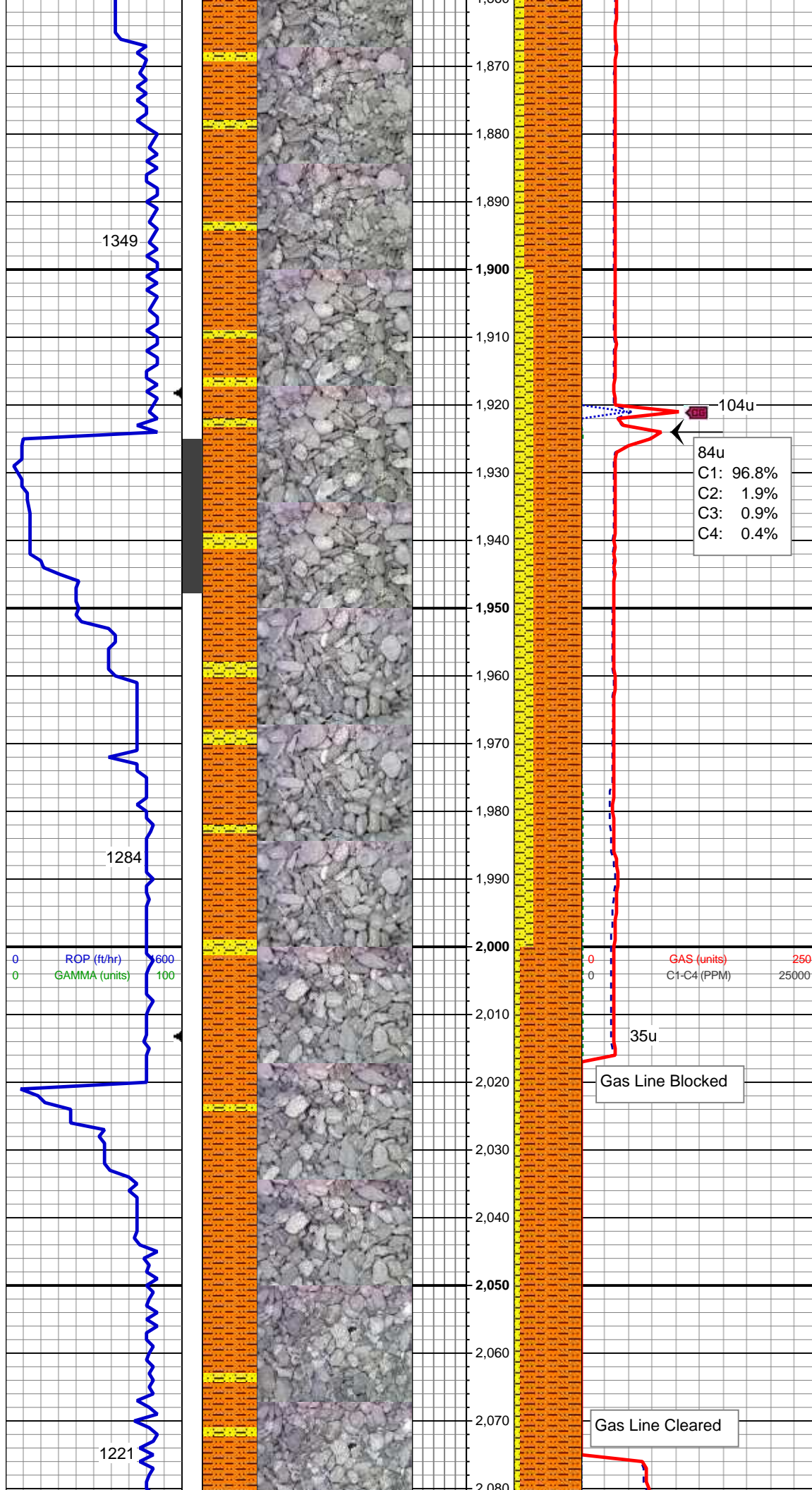
70% SHALY SILTSTONE: light gray, soft-friable, sub blocky - blocky, arenaceous - silty texture
20% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement
10% SANDSTONE: light gray - white, sme salt and pepper, fine grained, sbdr-sbang, moderately sorted
Inclination: 2.99 °
Azimuth: 318.56 °
VS: 0.44 '

54u
C1: 96.8%
C2: 1.9%
C3: 0.9%
C4: 0.4%

65% SHALY SILTSTONE: light gray, soft-friable, sub blocky - blocky, arenaceous - silty texture
20% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement
15% SANDSTONE: light gray - white, sme salt and pepper, fine grained, moderately sorted, friable
Inclination: 6.25 °
Azimuth: 324.65 °
VS: 5.67 '

55% SHALY SILTSTONE: light gray, soft-friable, sub blocky - blocky, arenaceous - silty texture





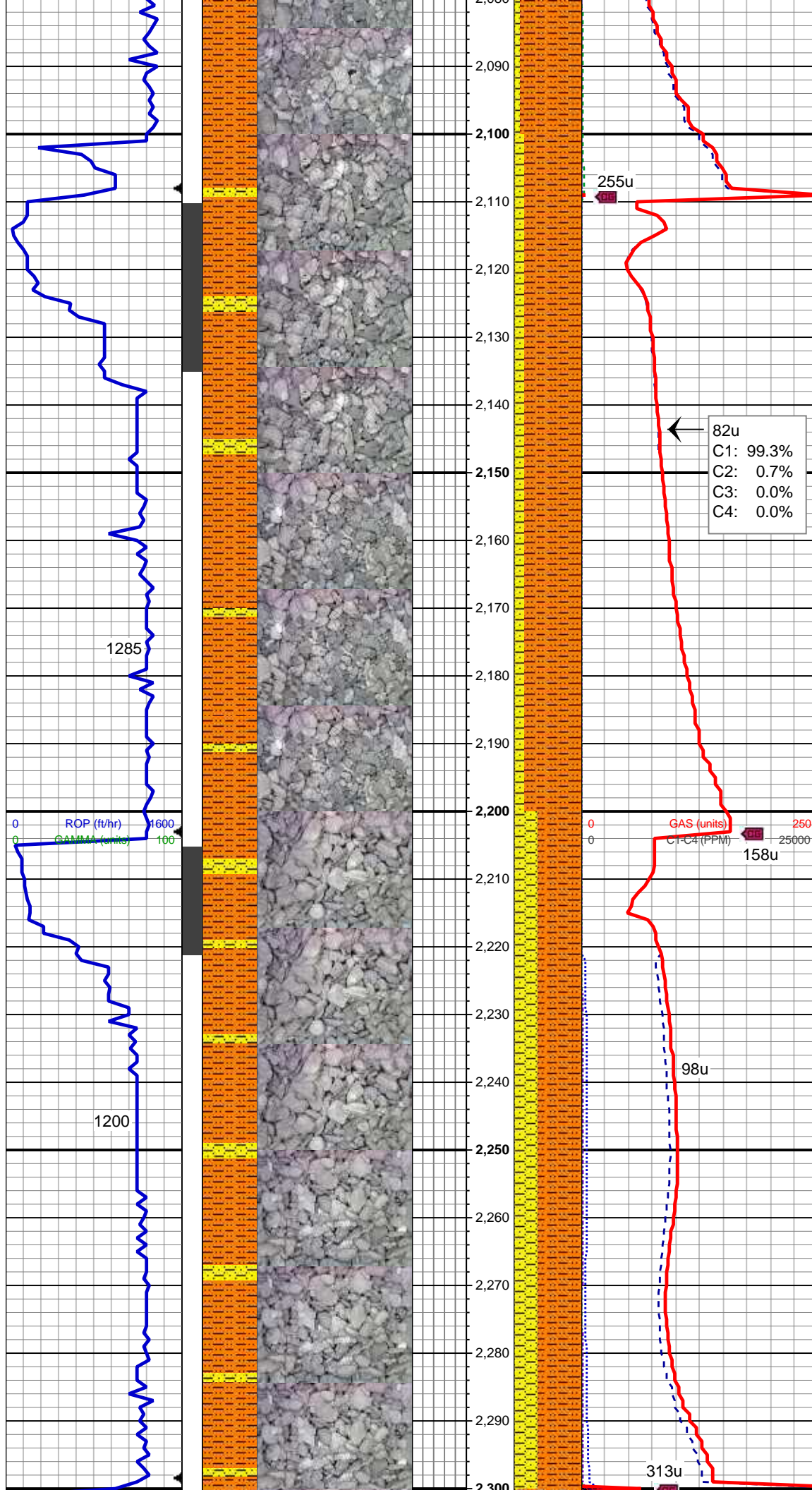
moderate MD: 1,859 ' , argillaceous
cement, TVD: 1,855.81 '
Inclination: 10.41 °
Azimuth: 305.32 °
VS: 36.91 '

MD: 1,954 '
TVD: 1,948.97 '
Inclination: 12.17 °
Azimuth: 307.82 °
VS: 52.79 '

70% SHALE: light gray, soft-friable, sub blocky - blocky, arenaceous - silty texture
30% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement, occasional biotite

90% SHALY SILTSTONE: light gray, soft-friable, sub blocky - blocky, arenaceous - silty texture
10% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted. friable, moderate cement

MD: 2,049 '
TVD: 2,041.9 '
Inclination: 11.77 °
Azimuth: 303.29 °
VS: 69.8 '

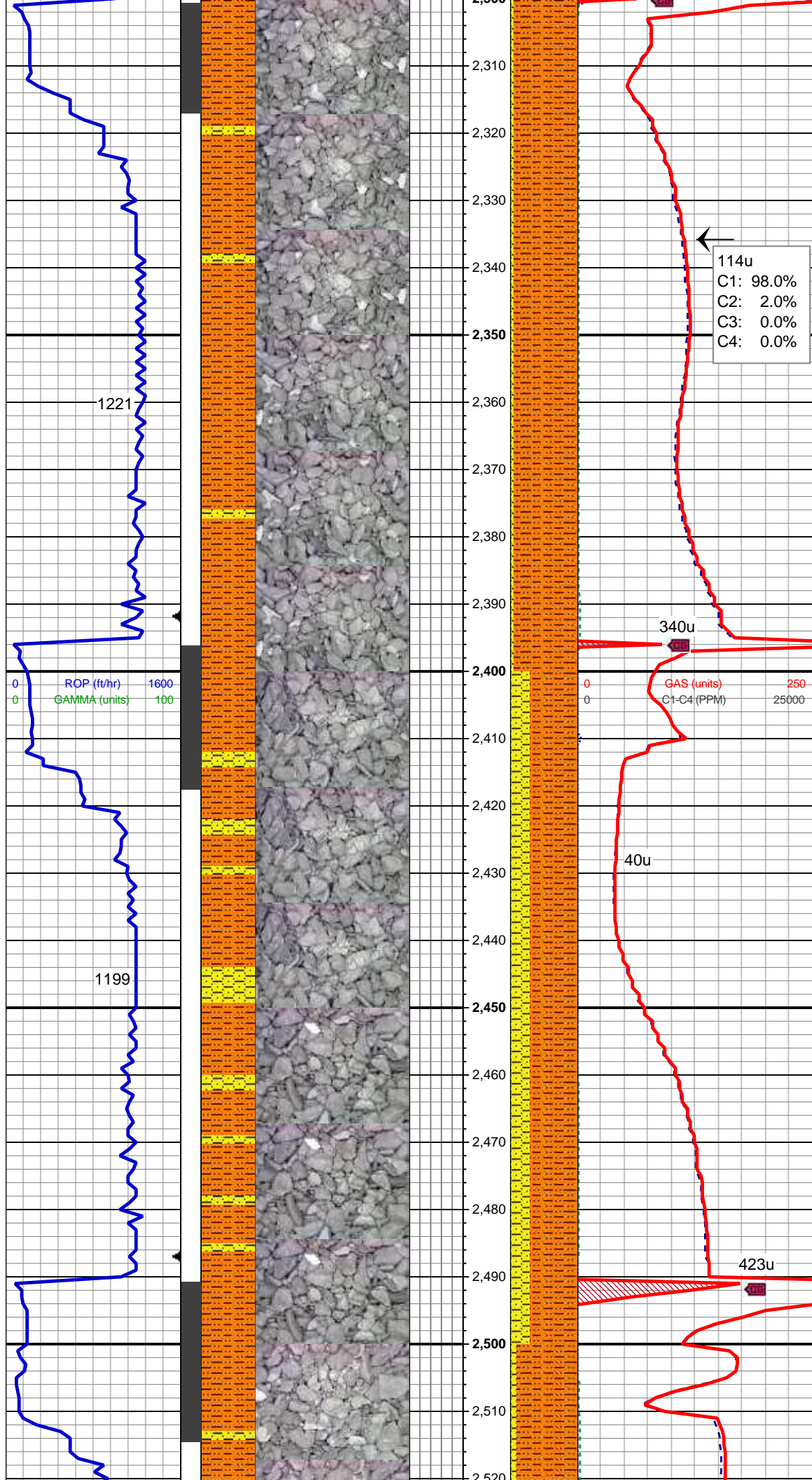


MUD WT 8.6 VIS 28

MD: 2,144 '
TVD: 2,134.84 '
Inclination: 12.13 °
Azimuth: 306.02 °
85% SF VS: 86.94 P100: light gray, soft-friable, sub blocky - blocky, arenaceous - silty texture
15% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement, sme scattered biotite

MD: 2,239 '
TVD: 2,227.85 '
Inclination: 11.37 °
Azimuth: 308.6 °
65% SH VS: 103.34 ONE: light gray, soft-friable, sub blocky - blocky, arenaceous - silty texture
35% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement, sme scattered biotite

MUD WT 8.6 VIS 28



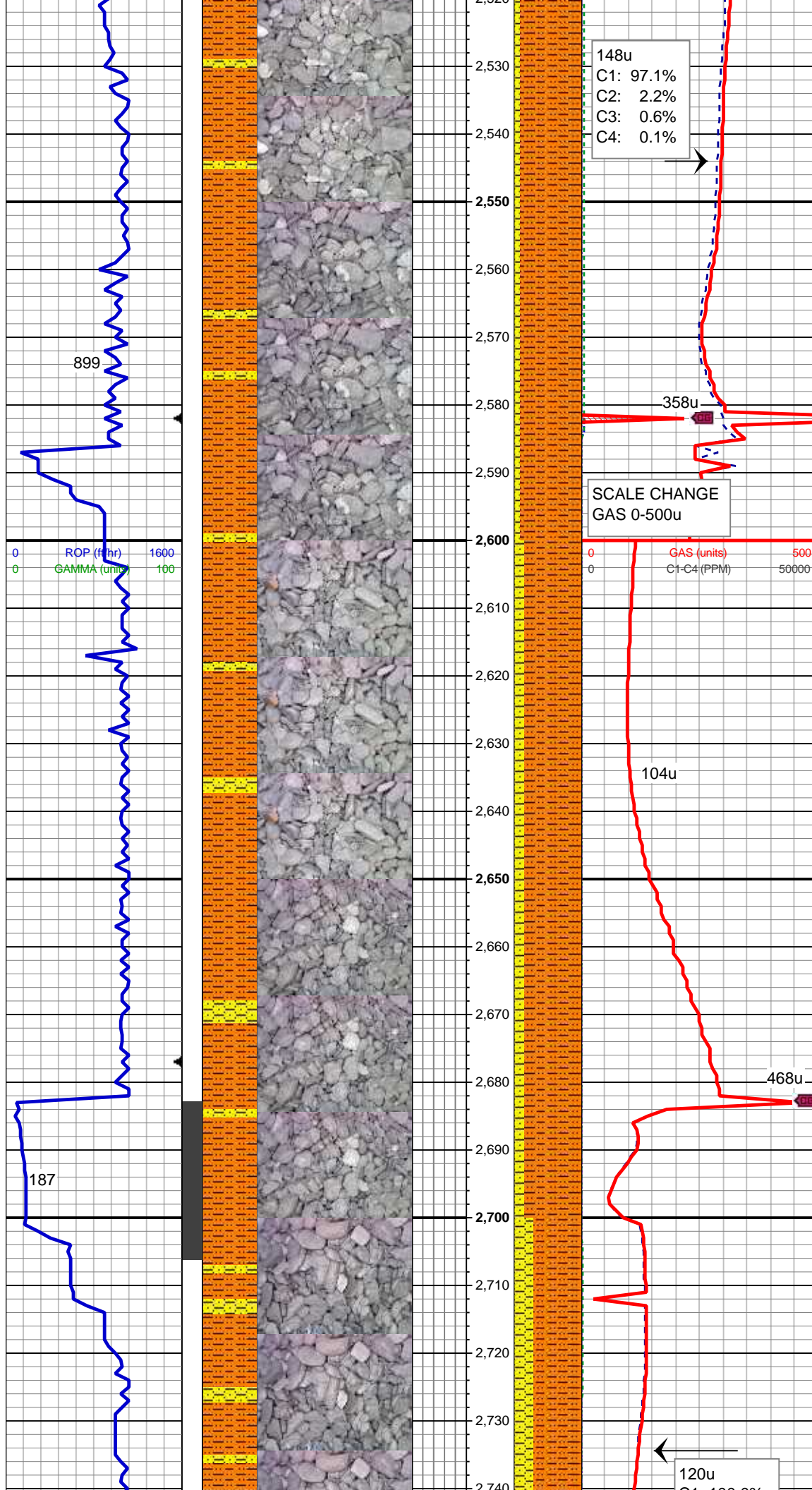
MD: 2,333 '
TVD: 2,319.99 '
Inclination: 11.48 °
Azimuth: 308.33 °

95% SHALY SILTSTONE: light gray, soft-friable, sub blocky - blocky, arenaceous - silty texture
5% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement, sme scattered biotite

MUD WT 8.6 VIS 29

MD: 2,428 '
TVD: 2,412.96 '
Inclination: 12.26 °
Azimuth: 308.67 °

70% SHALY SILTSTONE: light gray, soft-friable, sub blocky - blocky, arenaceous - silty texture
30% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement, sme biotite



MD: 2,523 '
TVD: 315.8 '
Inclination: 12 °
Azimuth: 2,505.84 °
VS: 151.21 '

90% SHALY SILTSTONE: light gray, soft friable, sub blocky - blocky, arenaceous - silty texture
10% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement, sme biotite

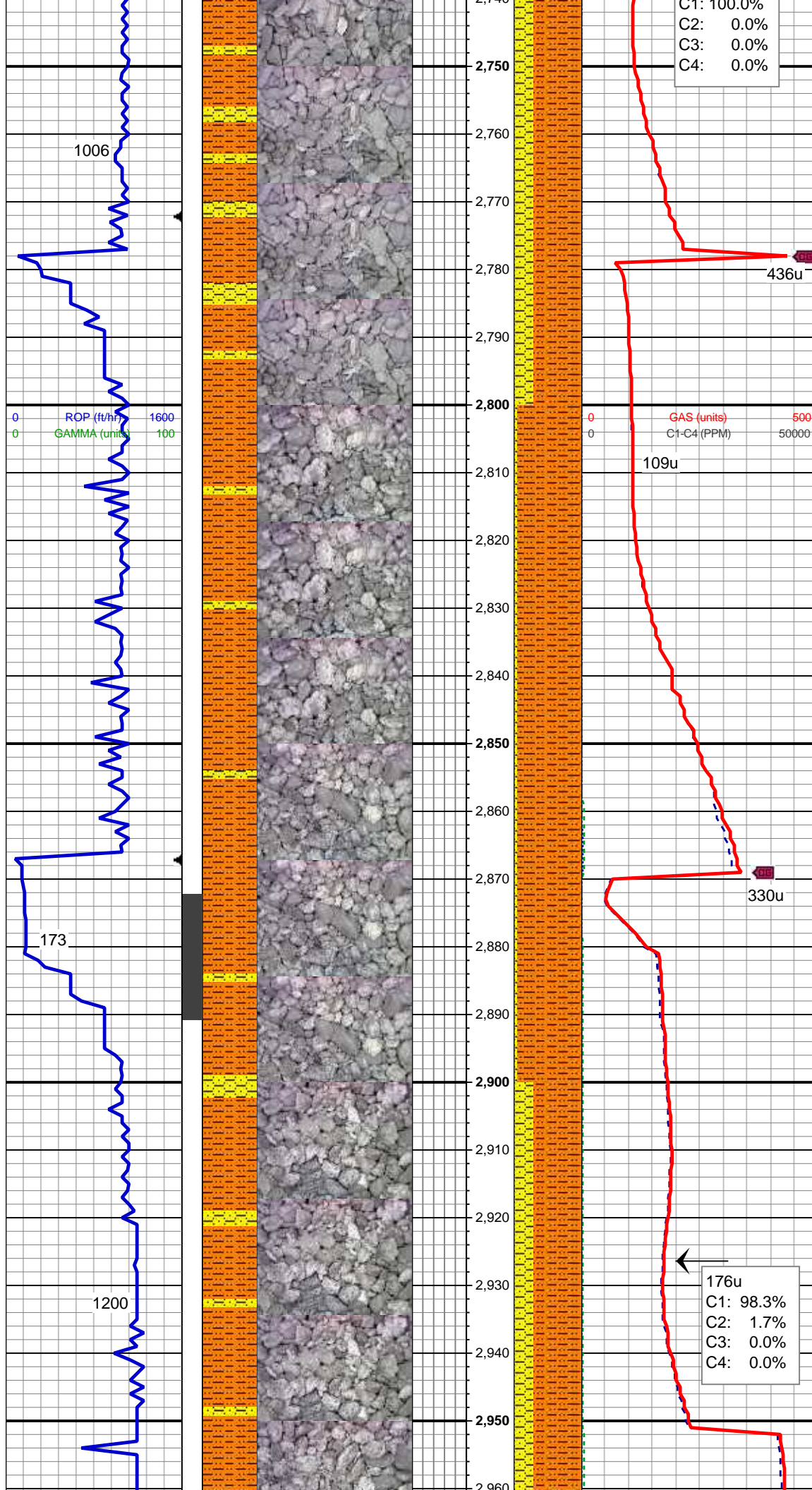
MUD WT 8.6 VIS 29

MD: 2,618 '
TVD: 315.97 '
Inclination: 11.57 °
Azimuth: 2,598.84 °
VS: 165.94 '

85% SHALY SILTSTONE: light gray, soft friable, sub blocky - blocky, arenaceous - silty texture
15% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity

MD: 2,713 '
TVD: 312.71 '
Inclination: 12.39 °
Azimuth: 2,691.77 °
VS: 181.26 '

70% SHALY SILTSTONE: light



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

gray, soft friable, sub blocky -
blocky, arenaceous - silty texture
30% SHALY SANDSTONE: white -
light gray sme salt and pepper,
fine grained, sub rounded- sub
angular, fair sorted, friable,
moderately porosity, argillaceous
cement, sme biotite

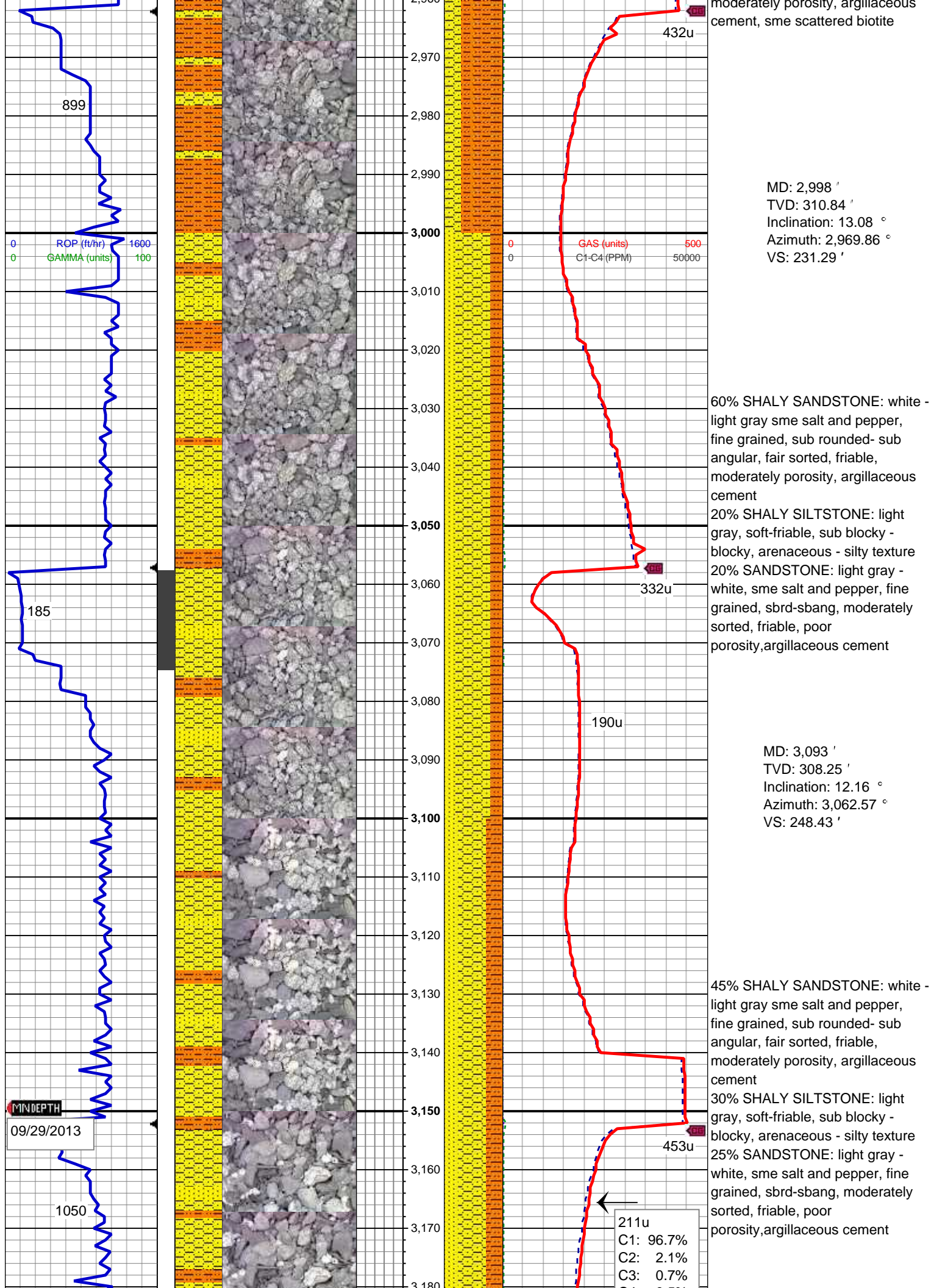
MD: 2,808 '
TVD: 314.17 '
Inclination: 12.23 °
Azimuth: 2,784.59 °
VS: 197.19 '

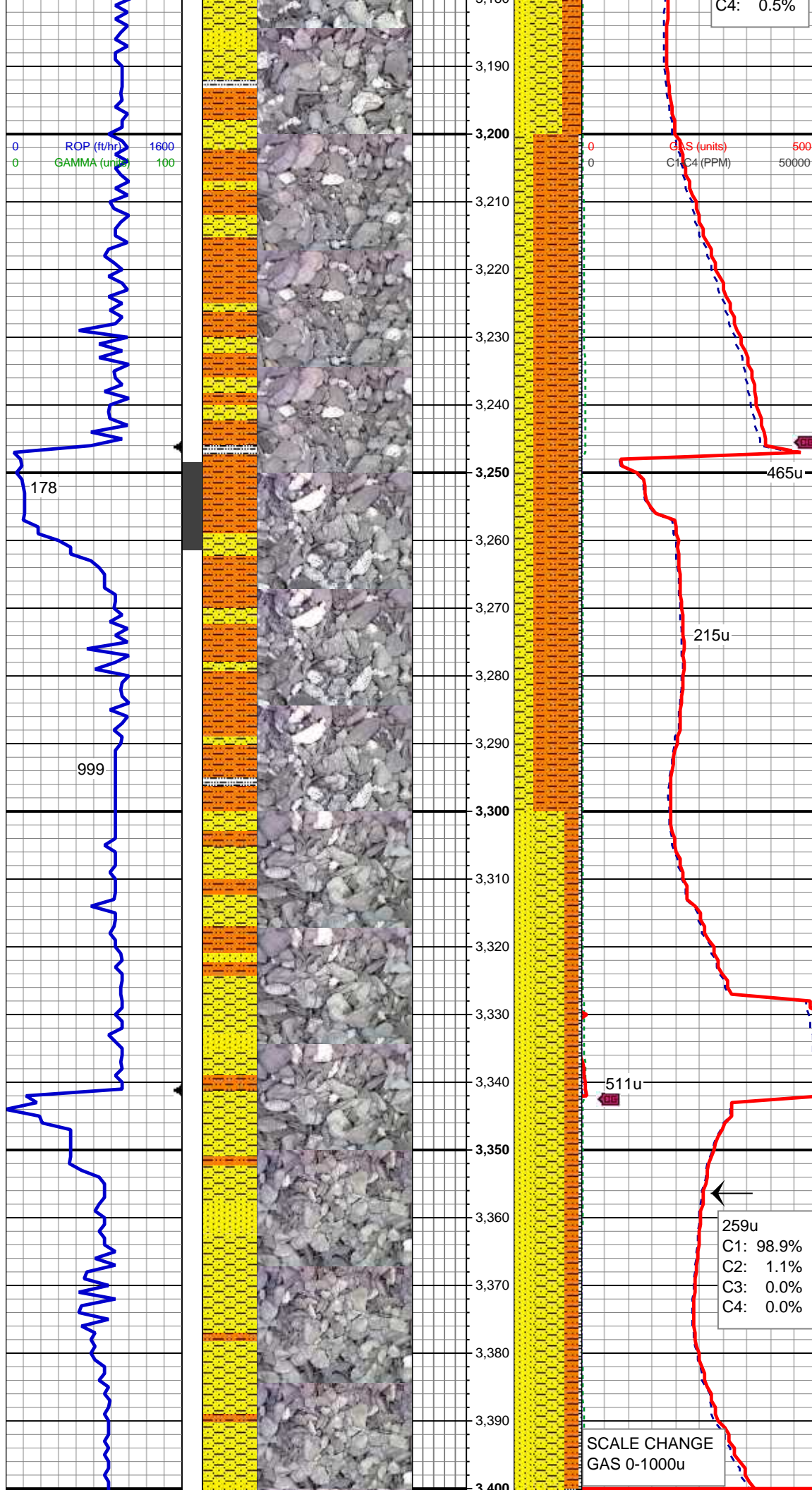
95% SHALY SILTSTONE: light
gray, soft friable, sub blocky -
blocky, arenaceous - silty texture
5% SHALY SANDSTONE: white -
light gray sme salt and pepper,
fine grained, sub rounded- sub
angular, fair sorted, friable,
moderately porosity, argillaceous
cement, sme scattered biotite
MUD WT 8.7 VIS 28

MD: 2,903 '
TVD: 310.02 '
Inclination: 12.96 °
Azimuth: 2,877.3 °
VS: 213.79 '

176u
C1: 98.3%
C2: 1.7%
C3: 0.0%
C4: 0.0%

70% SHALY SILTSTONE: light
gray, soft friable, sub blocky -
blocky, arenaceous - silty texture
30% SHALY SANDSTONE: white -
light gray sme salt and pepper,
fine grained, sub rounded- sub
angular, fair sorted, friable,
moderately porosity, argillaceous
cement, sme scattered biotite





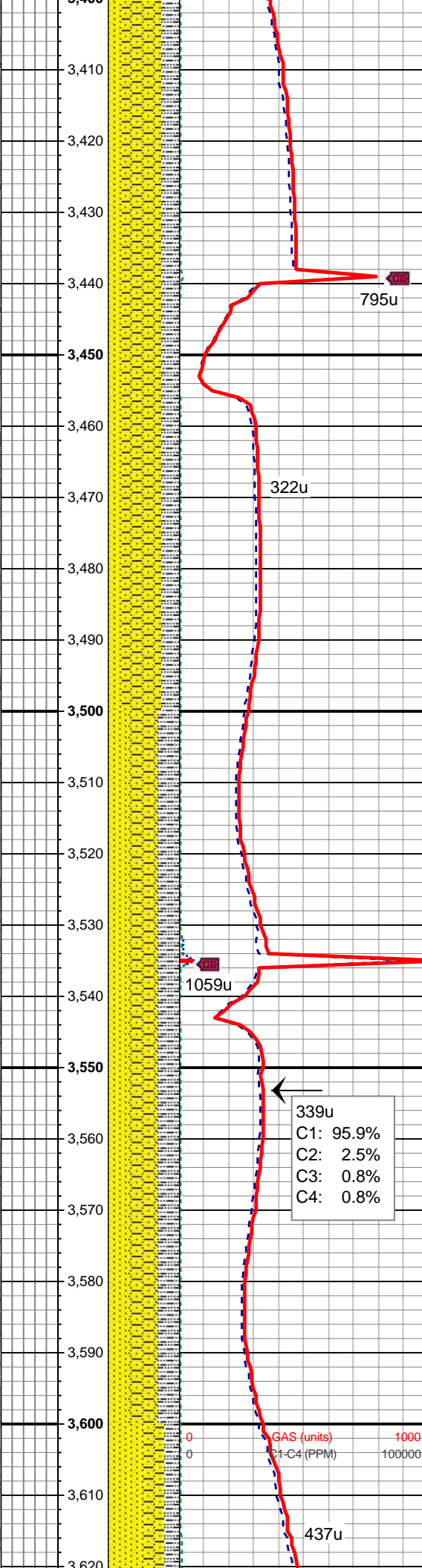
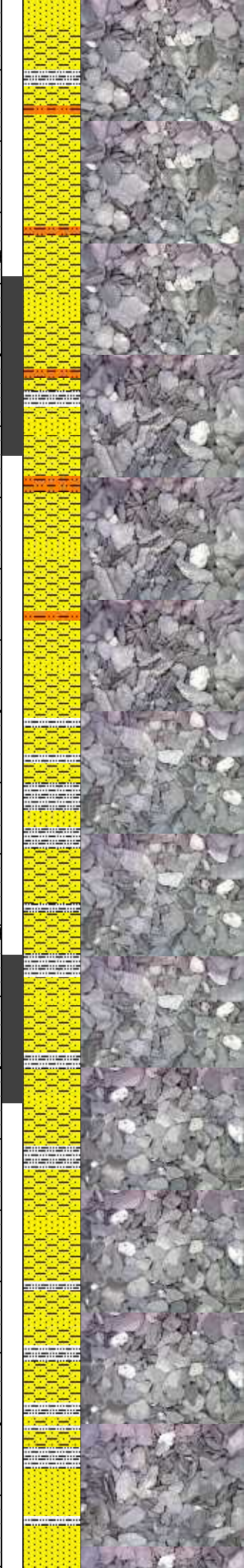
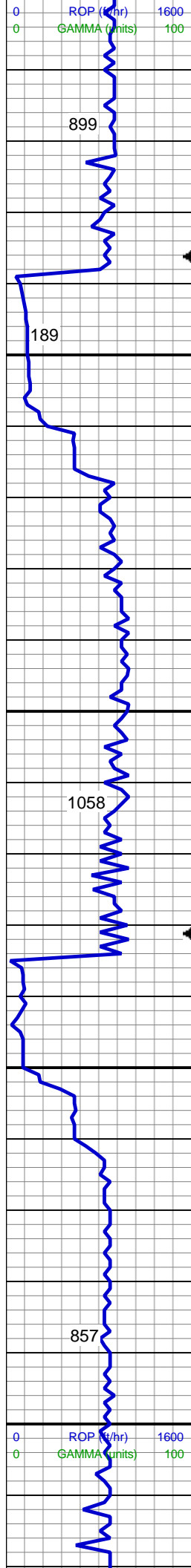
MD: 3,187 '
TVD: 308.73 '
Inclination: 12.21 °
Azimuth: 3,154.45 °
VS: 265.03 '

MUD WT 8.8 VIS 29

65% SHALE:SILTSTONE: light gray, soft friable, sub blocky - blocky, arenaceous - silty texture
30% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement
5% SILTY SHALE: m-dark gray occasional gray brown, firm-slightly soft, earthy-slightly silty

MD: 3,282 '
TVD: 307.18 '
Inclination: 11.4 °
Azimuth: 3,247.44 °
VS: 281.39 '

45% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity
30% SANDSTONE: light gray - white, sme salt and pepper, fine grained, sbdr-sbang, moderately sorted, friable, poor porosity, argillaceous cement
20% SHALE:SILTSTONE: light gray, soft friable, sub blocky - blocky, arenaceous - silty texture
5% SILTY SHALE: m-dark gray occasional
MD: 3,377 '
TVD: 304.15 '
Inclination: 10.7 °
Azimuth: 3,340.68 °
VS: 297.09 '

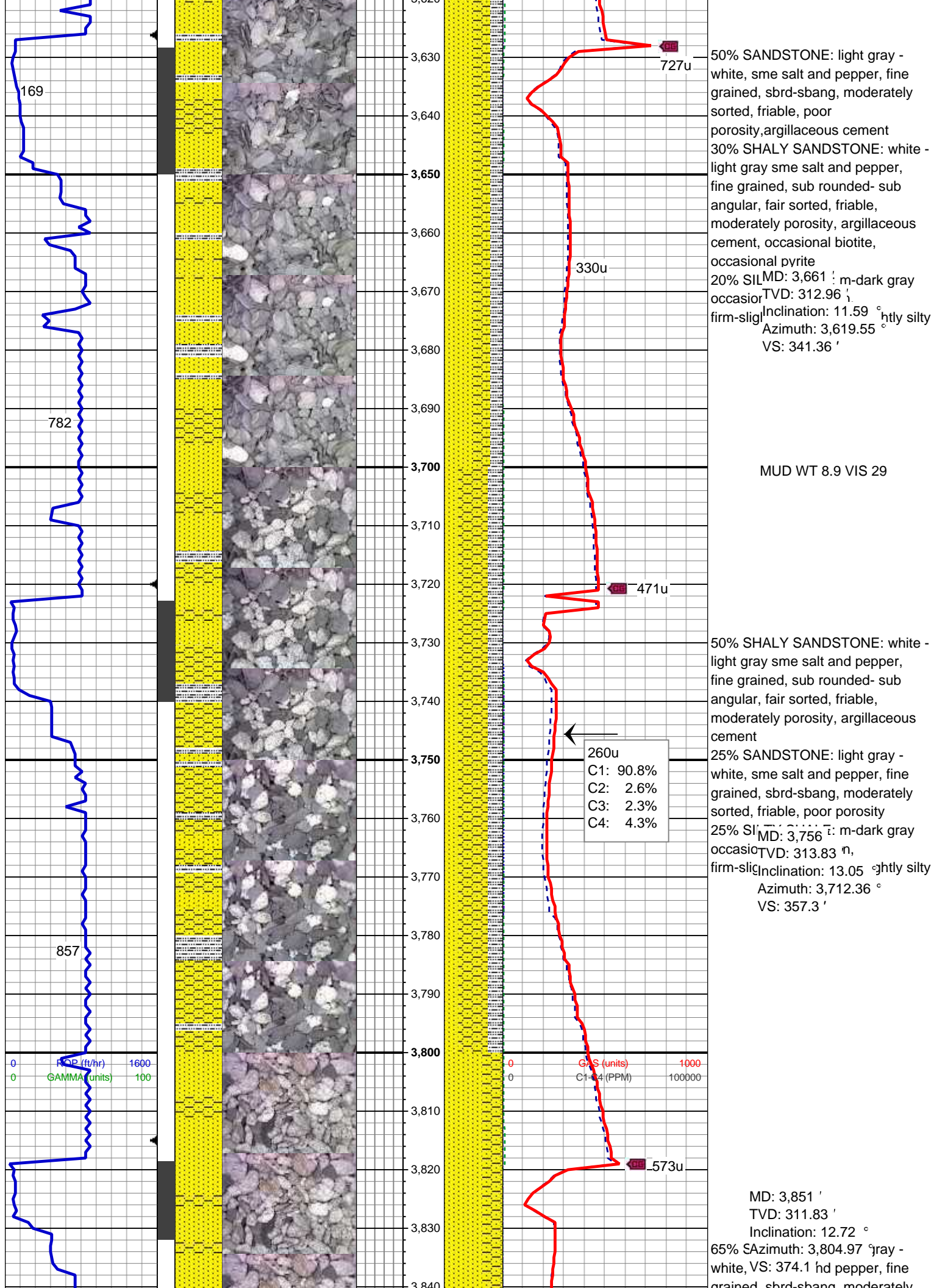


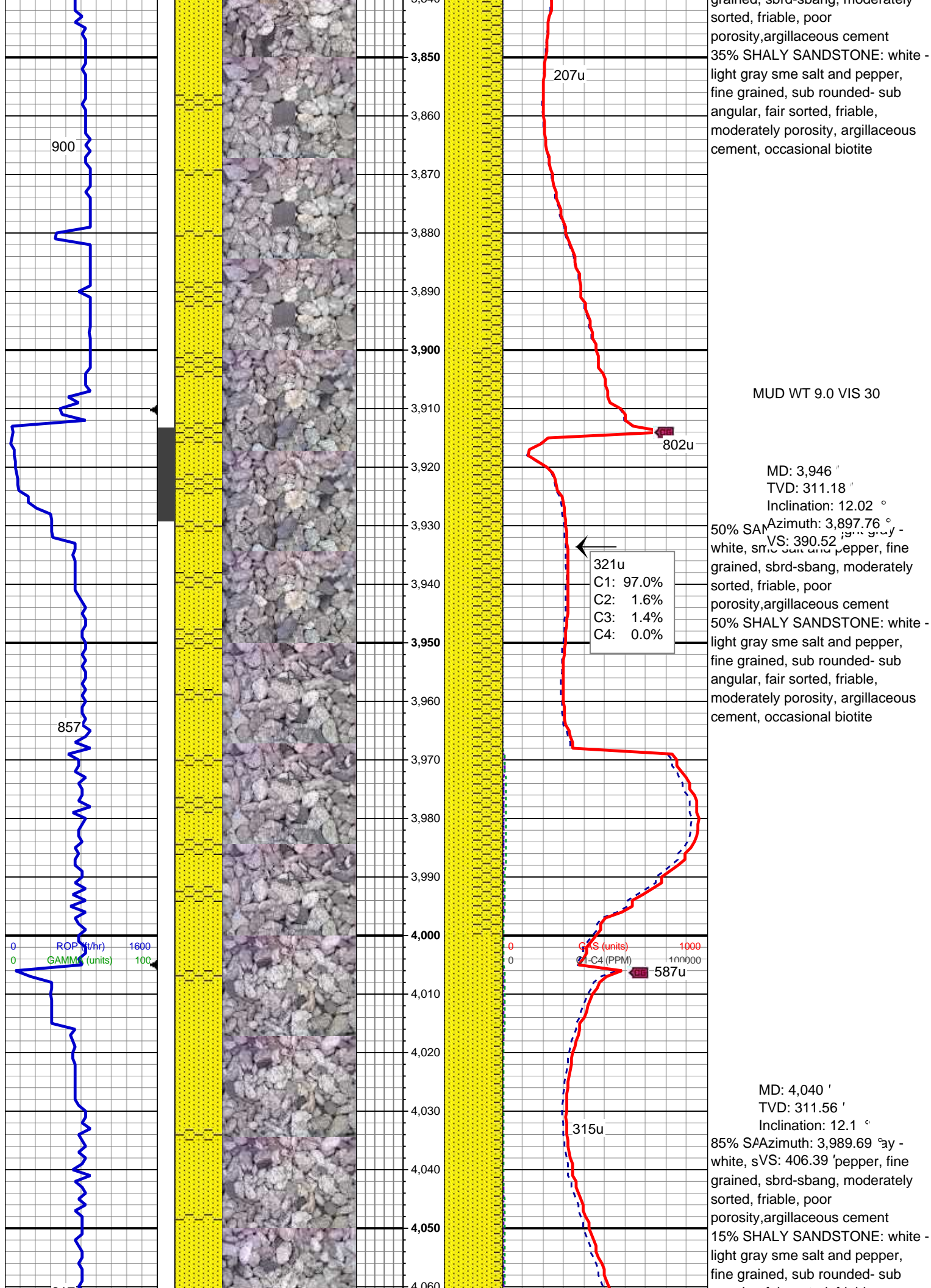
55% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity
20% SANDSTONE: light gray - white, sme salt and pepper, fine grained, sbdr-sbang, moderately sorted, friable, poor porosity, argillaceous cement
25% SILTY SHALE: m-dark gray occasional firm-slight
MD: 3,472
TVD: 308.69'
Inclination: 11.21°
Azimuth: 3,433.95°
VS: 312.53'

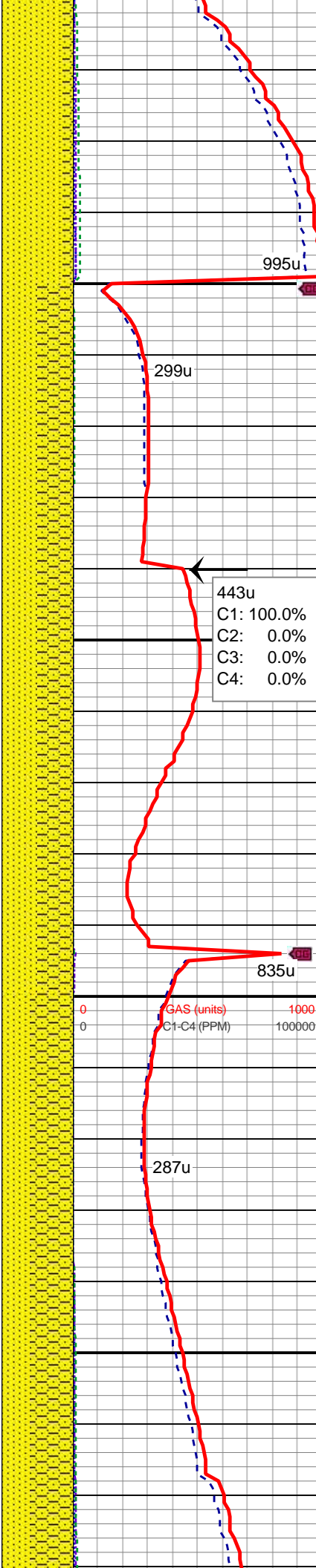
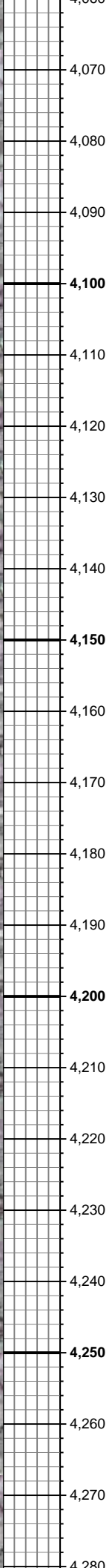
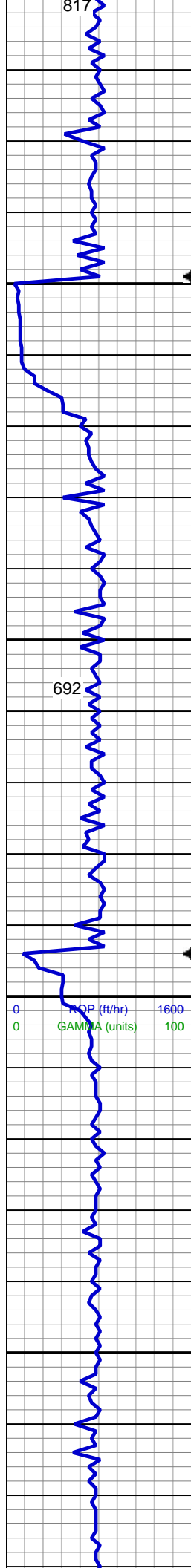
MUD WT 8.9 VIS 29

40% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity
30% SANDSTONE: light gray - white, sme salt and pepper, fine grained, sbdr-sbang, moderately sorted, friable, poor porosity, argillaceous cement
30% SILTY SHALE: m-dark gray occasional firm-slight
MD: 3,567
TVD: 311.85'
Inclination: 10.35°
Azimuth: 3,527.27°
VS: 327.1'

339u
C1: 95.9%
C2: 2.5%
C3: 0.8%
C4: 0.8%



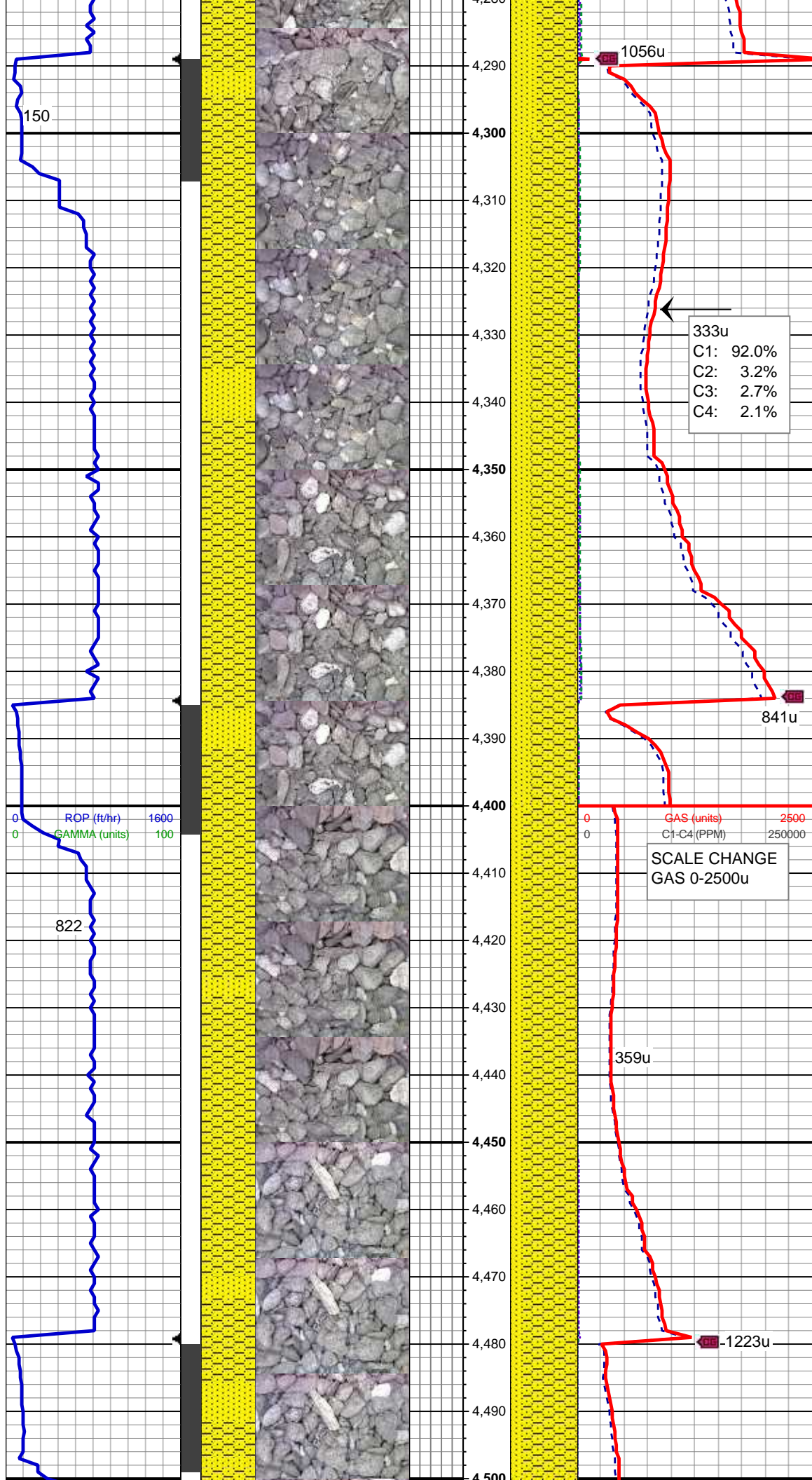




angular, fair sorted, friable,
moderately porosity, argillaceous
cement, occasional biotite

MD: 4,135 '
TVD: 307.1 '
Inclination: 12.02 °
Azimuth: 4,082.59 °
VS: 422.82
50% SANDSTONE: white -
light gray sme salt and pepper,
fine grained, sub rounded- sub
angular, fair sorted, friable,
moderately porosity, argillaceous
cement, occasional biotite
50% SANDSTONE: light gray -
white, sme salt and pepper, fine
grained, sbdr-sbang, moderately
sorted, friable, poor
porosity, argillaceous cement

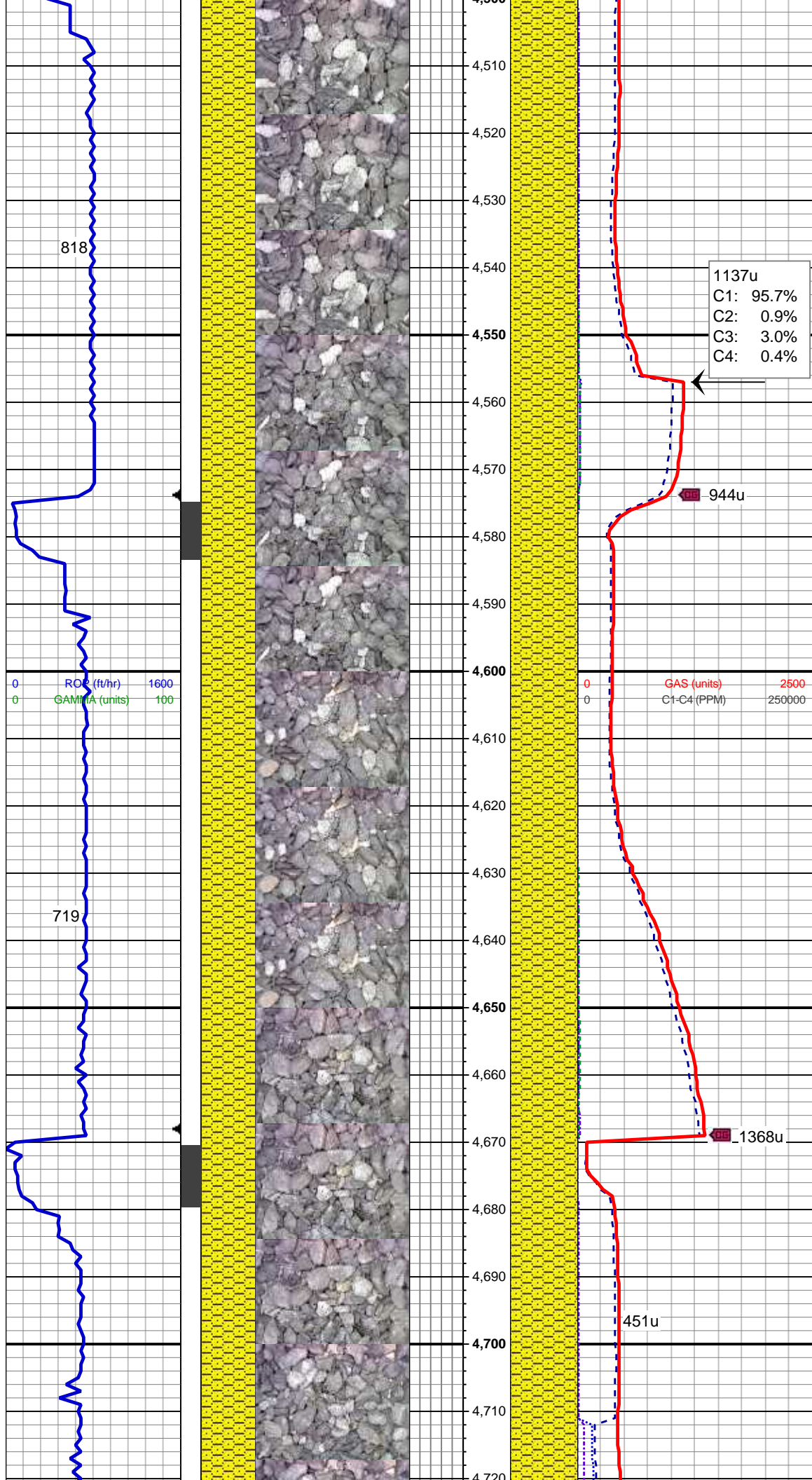
MD: 4,230 '
TVD: 307.44 '
Inclination: 11.38 °
Azimuth: 4,175.62 °
VS: 439.16
60% SANDSTONE: white -
light gray sme salt and pepper,
fine grained, sub rounded- sub
angular, fair sorted, friable,
moderately porosity, argillaceous
cement
40% SANDSTONE: light gray -
white, sme salt and pepper, fine
grained, sbdr-sbang, moderately
sorted, friable, poor
porosity, argillaceous cement
MUD WT 9.0 VIS 30



MD: 4,325 '
TVD: 306.59 '
Inclination: 11.03 °
Azimuth: 4,268.81 °
VS: 454.86 '
70% SHALE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement
30% SANDSTONE: light gray - white, sme salt and pepper, fine grained, sbdr-sbang, moderately sorted, friable, poor porosity, argillaceous cement

MD: 4,420 '
TVD: 307.25 '
Inclination: 11.54 °
Azimuth: 4,361.97 °
VS: 470.7 '
80% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement
20% SANDSTONE: light gray - white, sme salt and pepper, fine grained, sbdr-sbang, moderately sorted, friable, poor porosity, argillaceous cement

MUD WT 9.0 VIS 30



MD: 4,515 '
TVD: 309.6 '
Inclination: 12.69 °
Azimuth: 4,454.86 °
VS: 487.38 '

95% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement
5% SANDSTONE: light gray - white, sme salt and pepper, fine grained, sbdr-sbang, moderately sorted, friable, poor porosity, argillaceous cement

1137u
C1: 95.7%
C2: 0.9%
C3: 3.0%
C4: 0.4%

944u

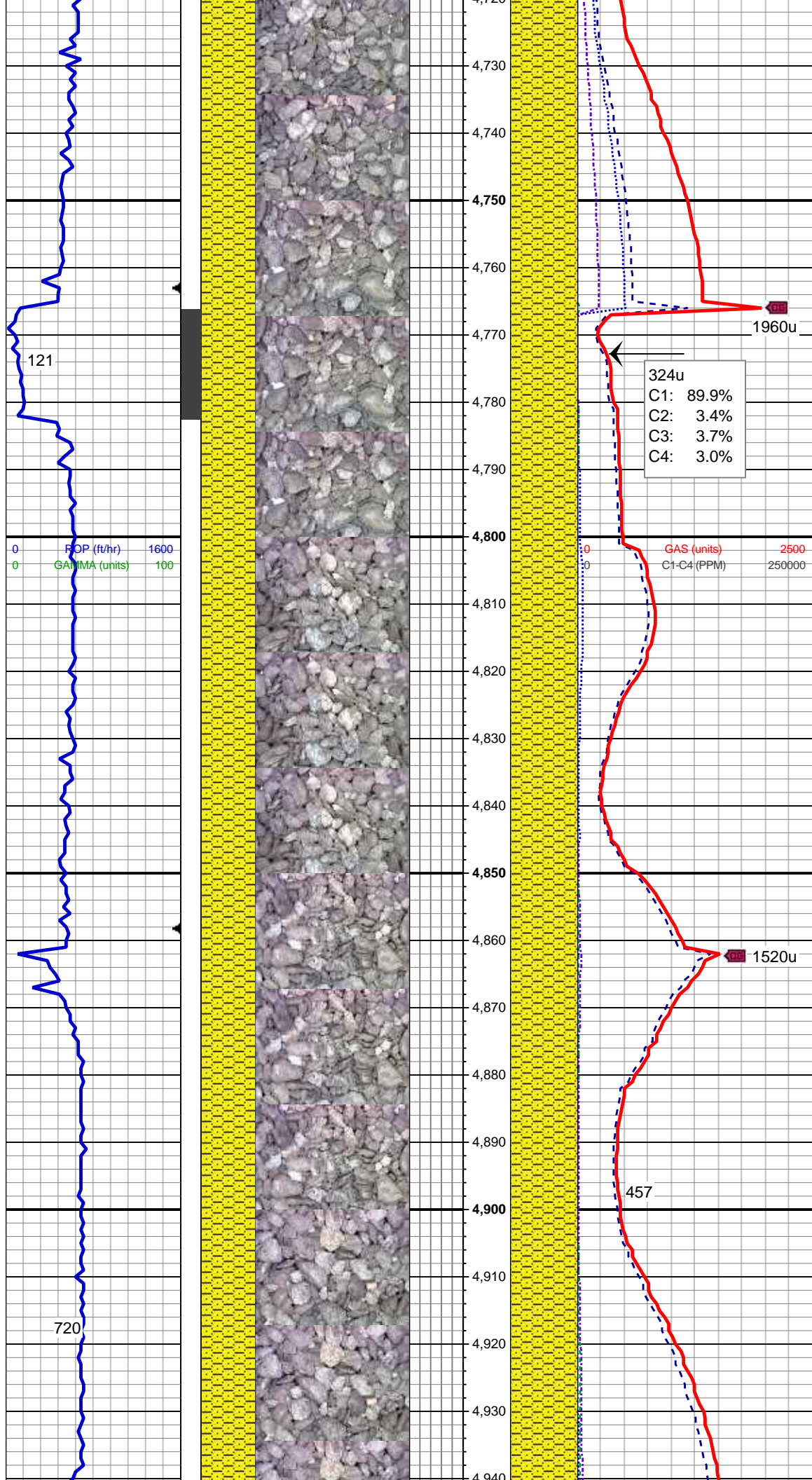
MD: 4,609 '
TVD: 4,546.59 '
Inclination: 12.51 °
Azimuth: 312.27 °
VS: 504.04 '

100% SHALY SANDSTONE: white - light gray sme salt and pepper, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement

1368u

451u

MD: 4,704 '
TVD: 4,639.68 '
Inclination: 10.47 °
Azimuth: 310.01 °
VS: 519.36 '



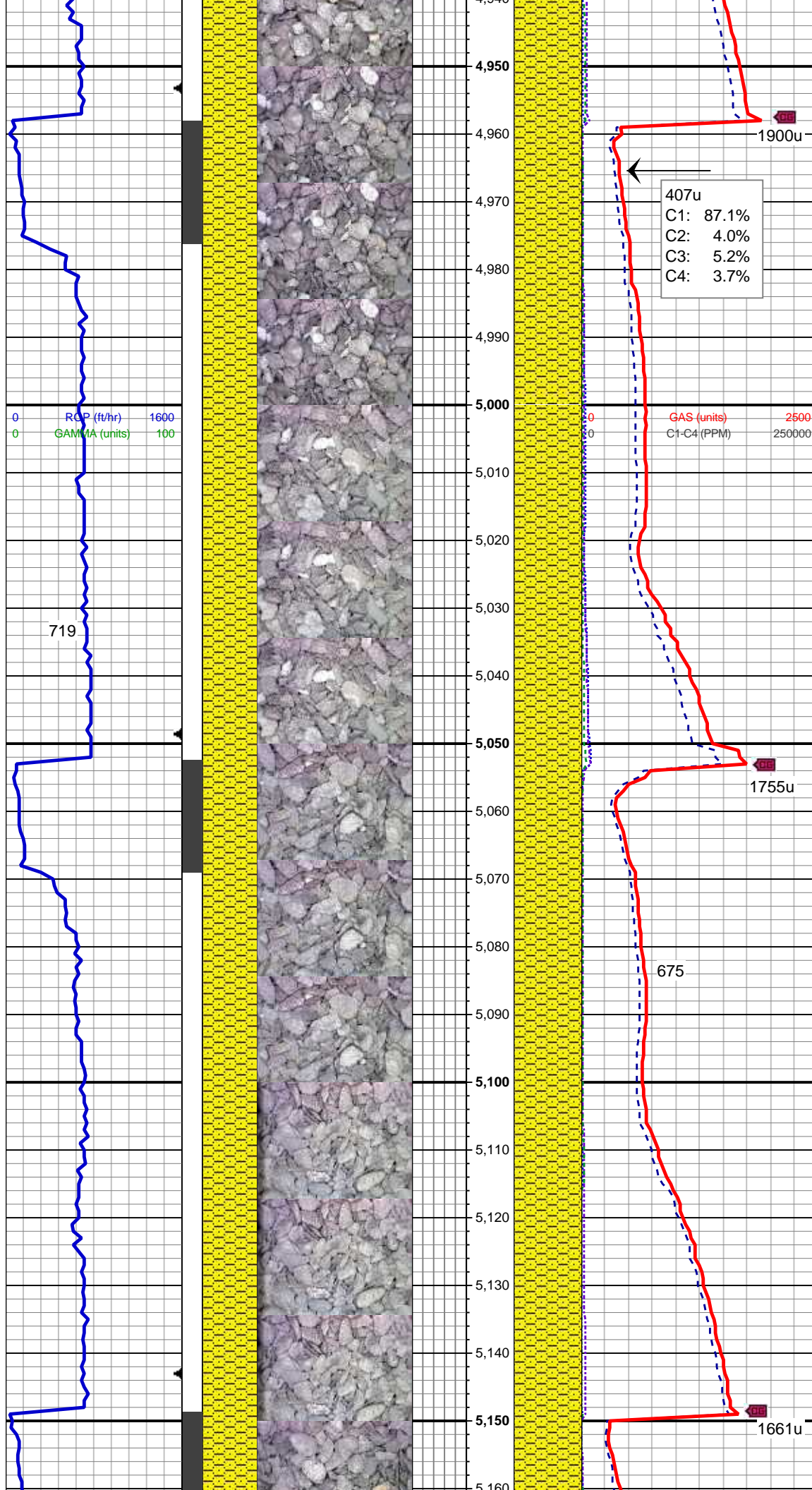
100% SHALY SANDSTONE: white
- light gray sme salt and pepper,
fine grained, sub rounded- sub
angular, fair sorted, friable,
moderately porosity, argillaceous
cement

MUD WT 9.0 VIS 30

MD: 4,799 '
TVD: 4,733.07 '
Inclination: 10.7 °
Azimuth: 306.24 °
VS: 534.02 '

100% SHALY SANDSTONE: white
- light gray sme salt and pepper,
fine grained, sub rounded- sub
angular, fair sorted, friable,
moderately porosity, argillaceous
cement

MD: 4,894 '
TVD: 4,826.65 '
Inclination: 9.12 °
Azimuth: 303.43 °
VS: 548.23 '



100% SHALY SANDSTONE: white
- light gray sme salt and pepper,
fine grained, sub rounded- sub
angular, fair sorted, friable,
moderately porosity, argillaceous
cement, sme biotite

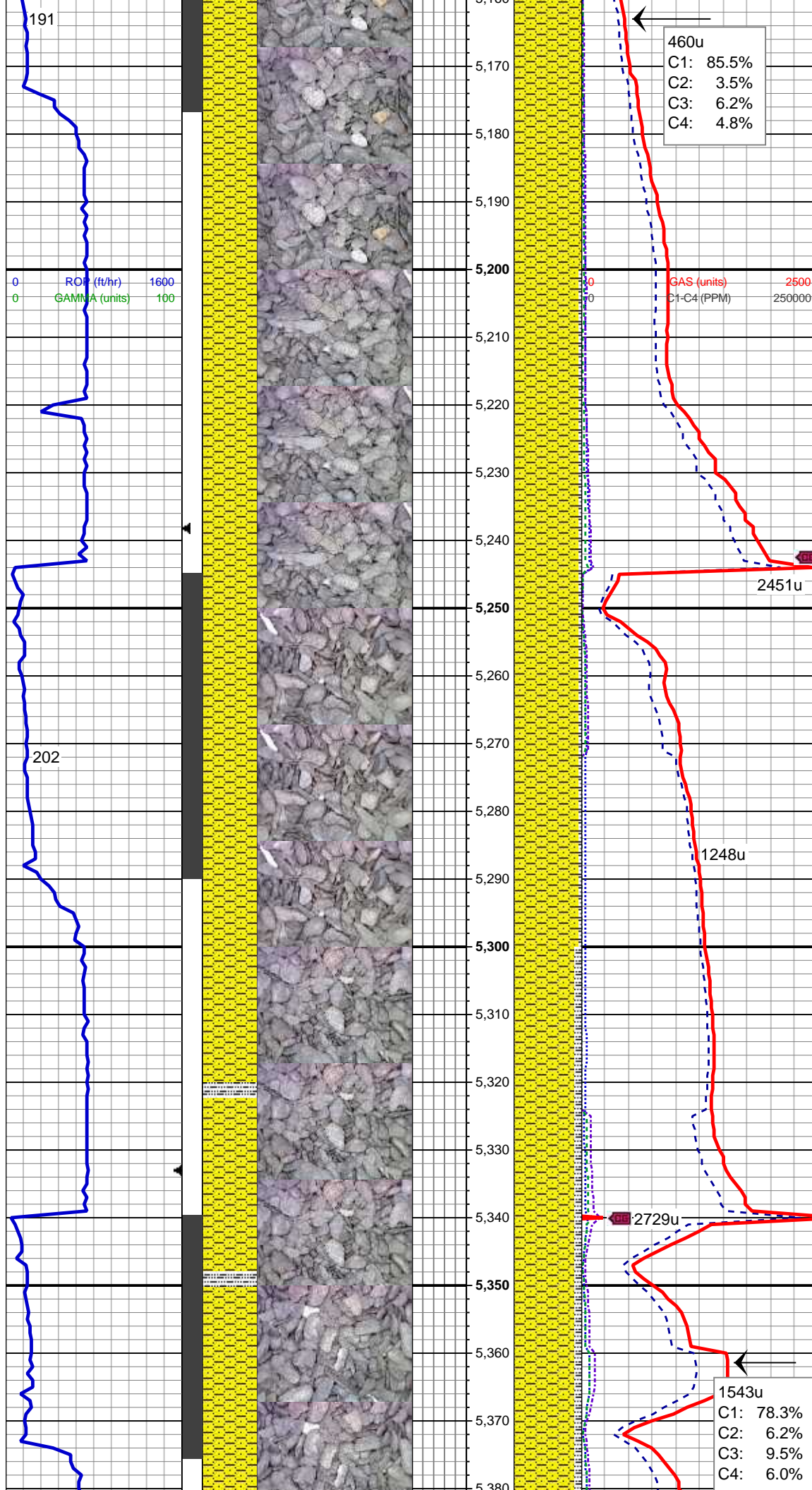
MD: 4,989 '
TVD: 4,920.69 '
Inclination: 7.08 °
Azimuth: 303.85 °
VS: 560.02 '

100% SHALY SANDSTONE: white
- light gray sme salt and pepper,
fine grained, sub rounded- sub
angular, fair sorted, friable,
moderately porosity, argillaceous
cement

MUD WT 9.1 VIS 30

MD: 5,084 '
TVD: 5,015.08 '
Inclination: 5.96 °
Azimuth: 308.31 °
VS: 569.3 '

100% SHALY SANDSTONE: white
- light gray, fine grained, sub
rounded- sub angular, fair sorted,
friable, moderately porosity,
argillaceous cement, sme biotite



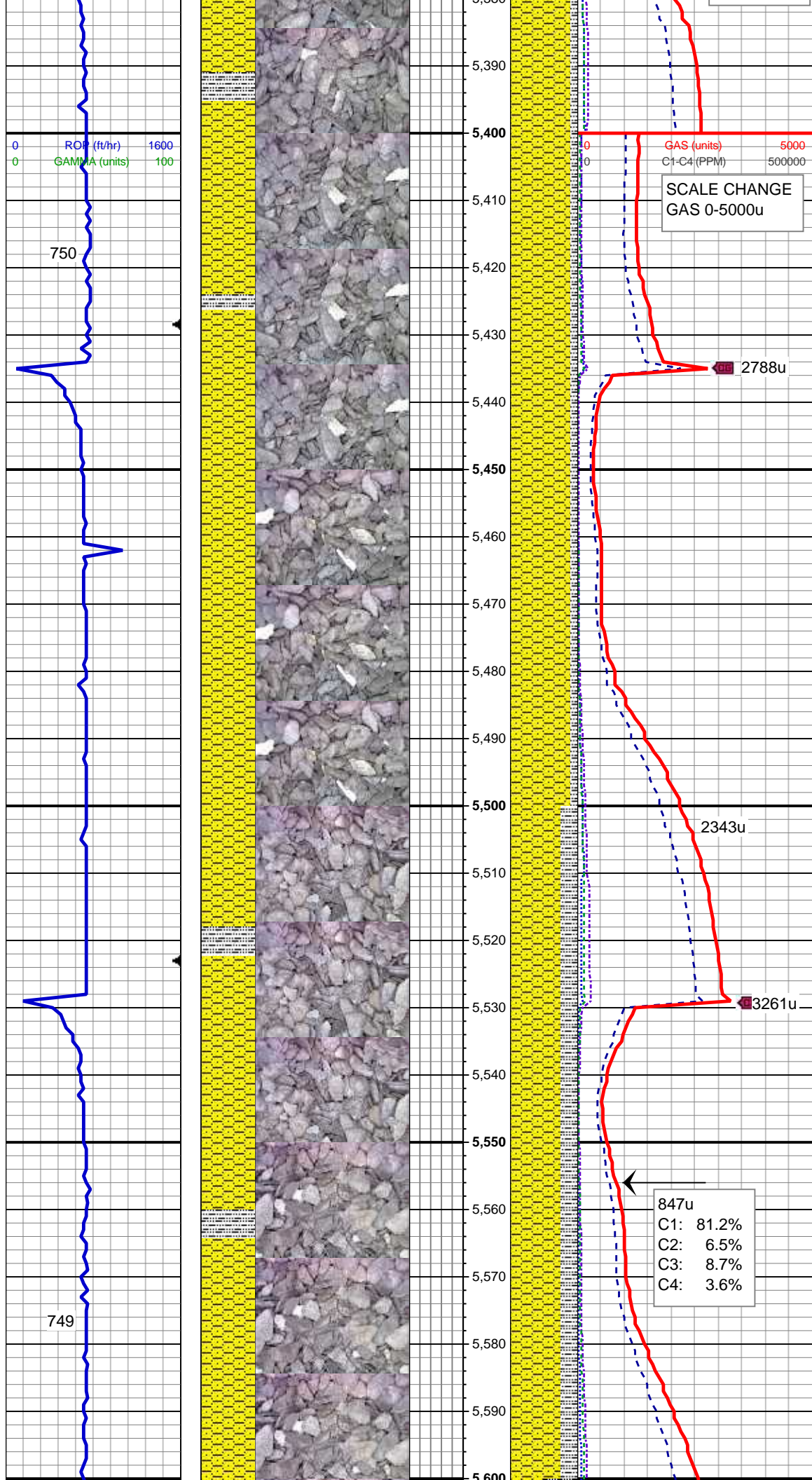
MD: 5,179 '
TVD: 5,109.7 '
Inclination: 4.33 °
Azimuth: 319.92 °
VS: 575.99 '

95% SHALY SANDSTONE: white - light gray, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity, argillaceous cement
5% SILTY SHALE: m-dark gray occasional gray brown, platy - sub platy firm-slightly soft, earthy-slightly silty

MD: 5,274 '
TVD: 5,204.52 '
Inclination: 2.58 °
Azimuth: 302.47 °
VS: 580.45 '

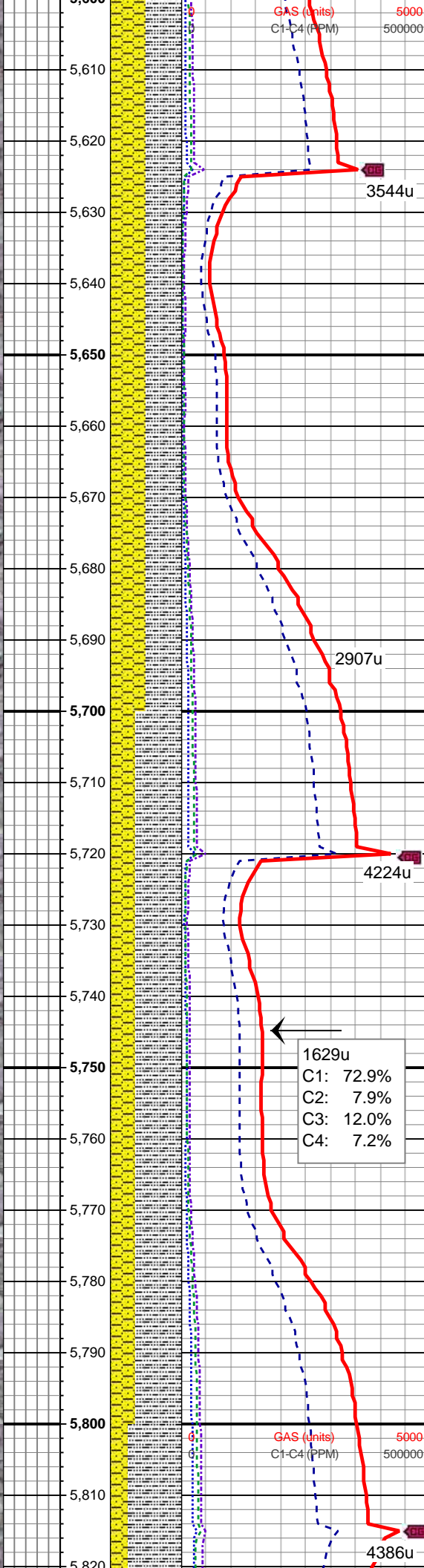
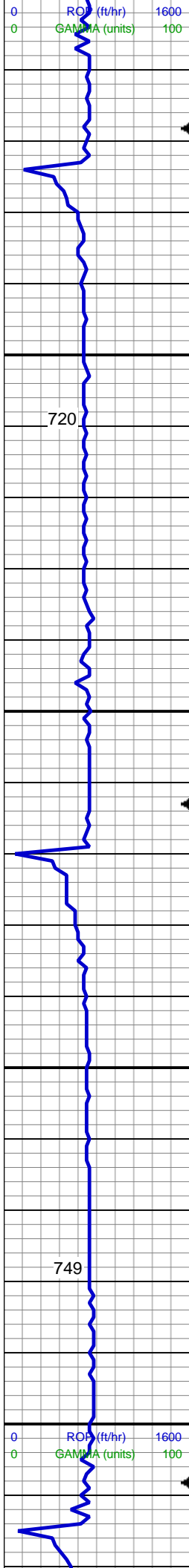
90% SHALY SANDSTONE: white - light gray, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity
10% SILTY SHALE: m-dark gray occasional gray brown, platy - sub platy firm-slightly soft, earthy-slightly silty

MD: 5,369 '
TVD: 5,299.49 '
Inclination: 0.53 °
Azimuth: 199.46 °
VS: 582.46 '



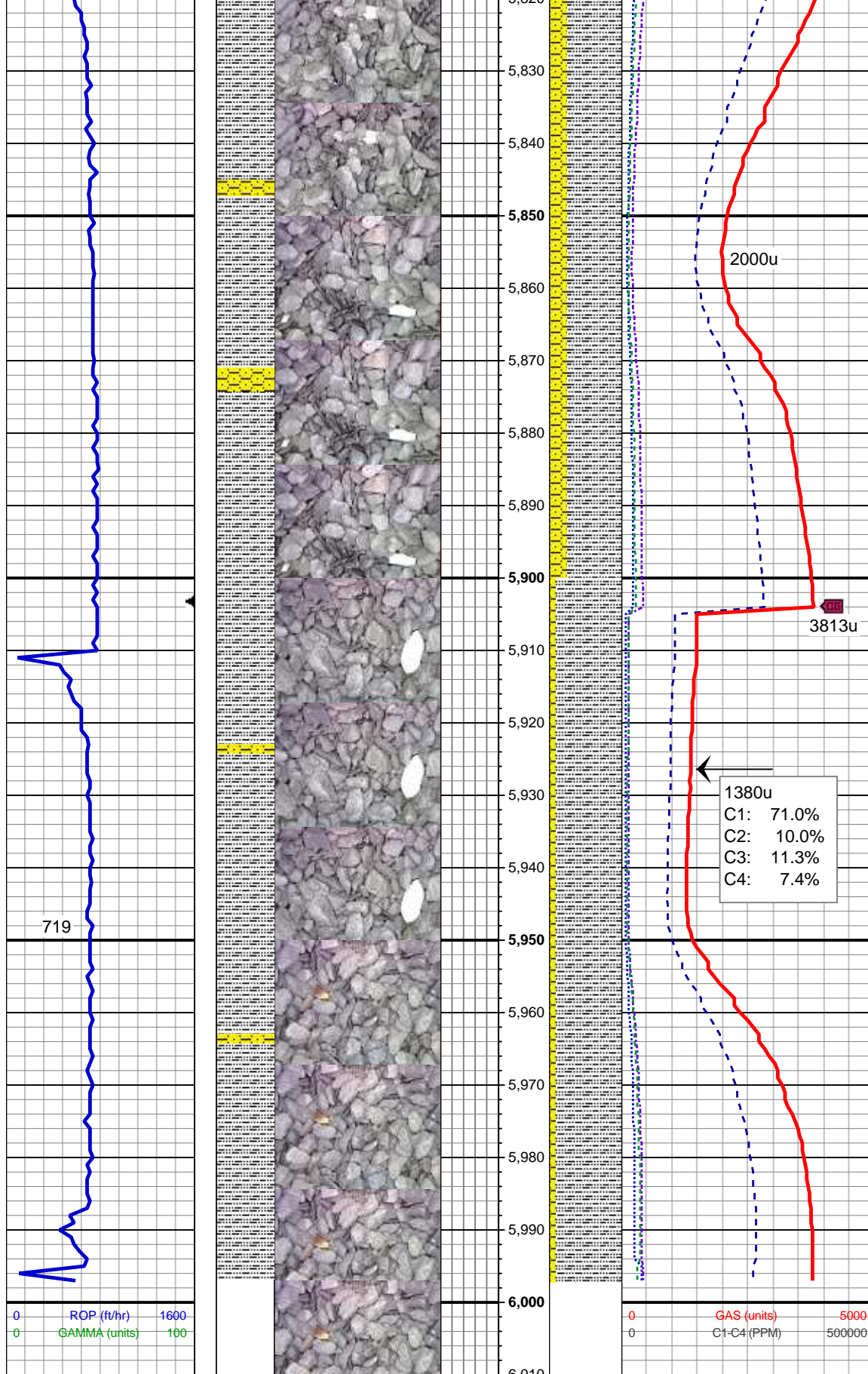
90% SHALY SANDSTONE: white - light gray, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity
10% SILTY SHALE: m-dark gray occasional gray brown, platy - sub platy firm-slightly soft, earthy-slightly silty⁴
TVD: 5,394.49 '
Inclination: 0.48 °
Azimuth: 202.89 °
VS: 582.69 '

75% SHALY SANDSTONE: white - light gray, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity
25% SILTY SHALE: m-dark gray occasional gray brown, platy - sub platy firm-slightly soft, earthy-slightly silty⁹
TVD: 5,489.48 '
Inclination: 0.33 °
Azimuth: 176.7 °
VS: 582.77 '



50% SHALY SANDSTONE: white - light gray, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity
50% SILTY SHALE: m-dark gray occasional gray brown, platy - sub platy firm-slightly soft, earthy-slightly silty
TVD: 5,664.48 '
Inclination: 0.61 °
Azimuth: 86.16 °
VS: 582.22 '

65% SHALY SANDSTONE: white - light gray, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity
35% SILTY SHALE: m-dark gray occasional gray brown, platy - sub platy firm-slightly soft, earthy-slightly silty
MD: 5,749 '
TVD: 5,679.47 '
Inclination: 0.77 °
Azimuth: 96.97 °
VS: 581.08 '



MD: 5,844 '
TVD: 5,774.47 '
Inclination: 0.78 °
Azimuth: 105.11 °
VS: 579.8 '
75% SHALE: white - light gray, fine grained, sub rounded- sub angular, fair sorted, friable, moderately porosity
25% SILTY SHALE: m-dark gray occasional gray brown, platy - sub platy firm-slightly soft, earthy-slightly silty

MUD WT 9.0 VIS 28

MD: 5,939 '
TVD: 5,869.46 '
Inclination: 0.83 °
Azimuth: 103.37 °
VS: 578.48 '

TD Vertical @ 5997' MD 11:22 hrs
09/29/2013

TOOH For Directional
BHA at 5,997'

Thank you for choosing
Columbine Logging Inc.