

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Holman B15-66HN VERT

Location SEC 14 T5N R64W

State Colorado

County Weld

Country USA

Rig Number H&P 315

API Number 05-123-37201

AFE # 139201

Region DJ Basin

Field Kersey

Spud Date 8/24/2013

Drilling Completed 8/26/2013

Surface Coordinates SENW SEC 14 T5N R64W
2,163' FNL; 2298' FWL

LAT/LONG: 40.400560/-104.518540

Bottom Hole Coordinates SWNW SEC. 15-5N-64W
1,190' FWL; 2,910' FNL

Ground Elevation 4584'

K.B. Elevation 4608'

Logged Interval 2000' **To** 5976'

Total Depth 5976'

Formation Niobrara B Chalk

Type of Drilling Fluid LSND

Operator

Company Noble Energy Inc

Address 1625 Broadway Suite 2200
Denver, CO 80202

Geologist

Name MARK COLE, JACK WEINERTH

Company COLUMBINE LOGGING, INC

Address 2385 S Lipan St
Denver, CO 80223

Rock Types

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

Accessories

Fossils

ALGAE
 AMPHIPORA
 BELEMNITE
 BIOCLASTIC
 BRACHIOIPOD
 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

EARTHY
 FENESTRAL
 FRACTURE
 INTERCRYSTALLINE
 INTEROOLITIC
 MOLDIC

ORGANIC
 PINPOINT
 VUGGY

Engineering

BIT
 CONNECTION (LEFT)
 CONNECTION (RIGHT)
 CONNECTION GAS
 CONNECTION GAS RIGHT
 CONNECTION GAS DOWN
 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

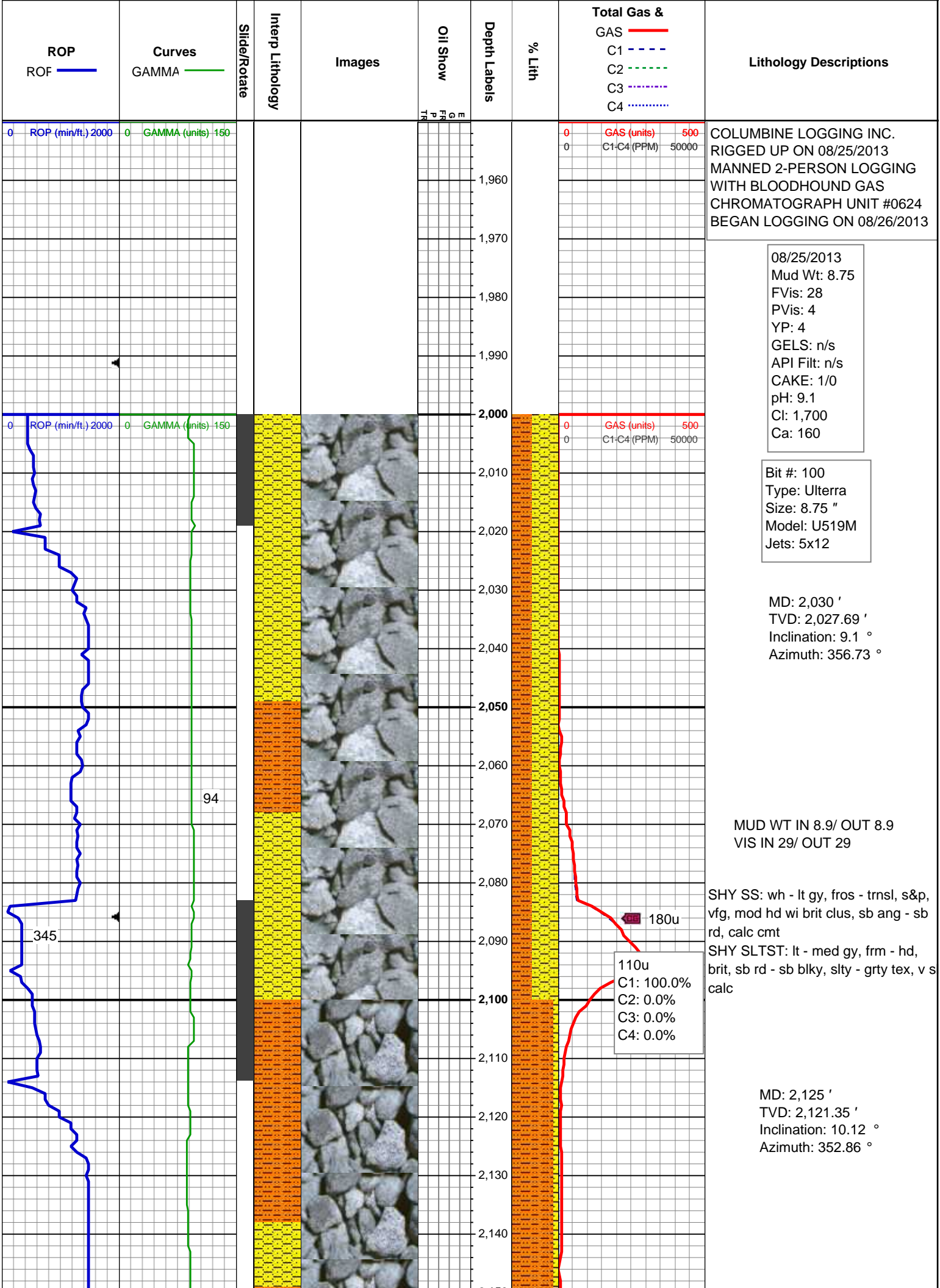
Textures

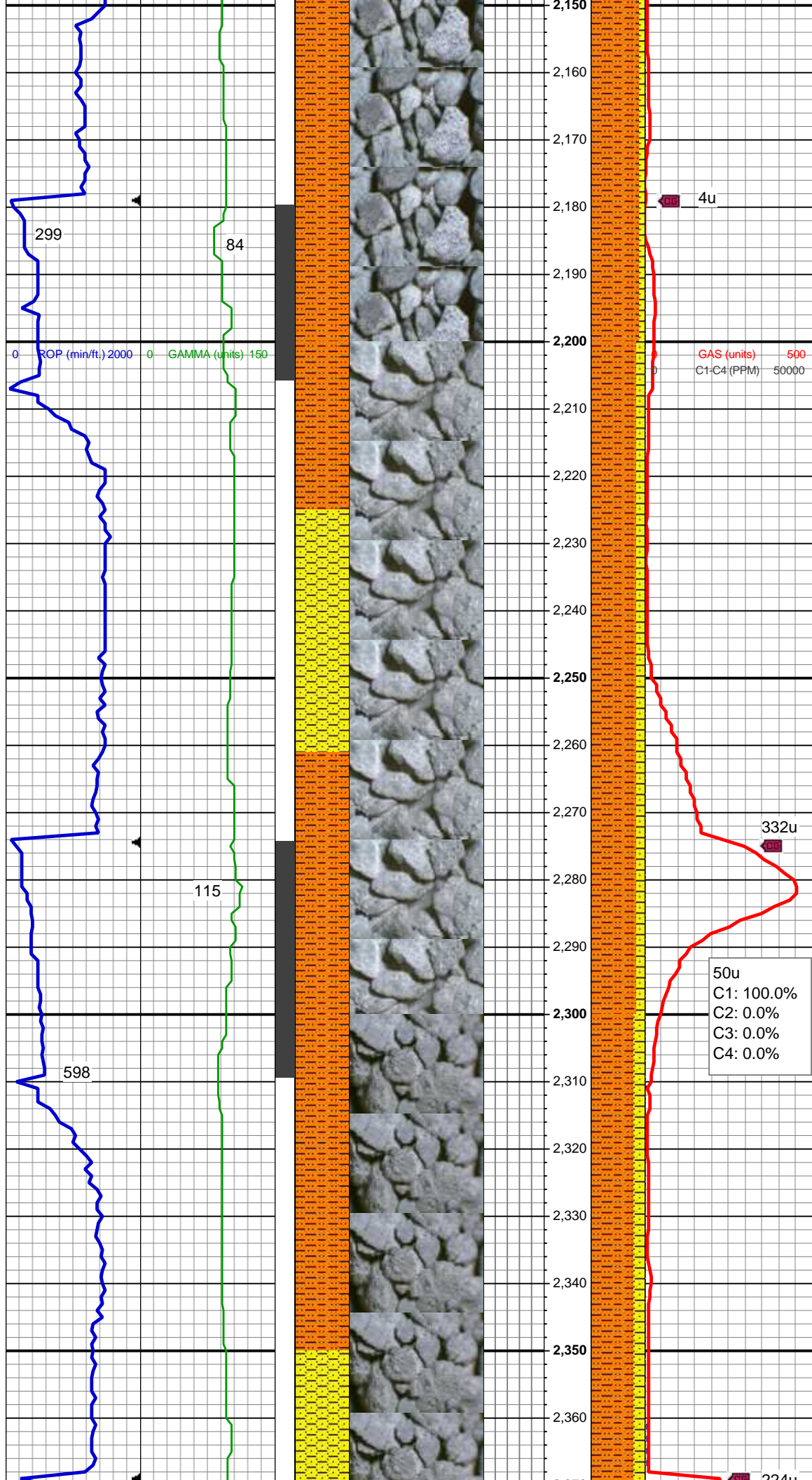
BOUNDSTONE
 CHALKY
 CRYPTOXLN
 EARTHY
 FINELYXLN

GRAINSTONE
 LITHOGRAPHIC
 MICROXLN
 MUDSTONE
 PACKSTONE
 WACKESTONE

Sorting

MODERATE
 POOR
 WELL



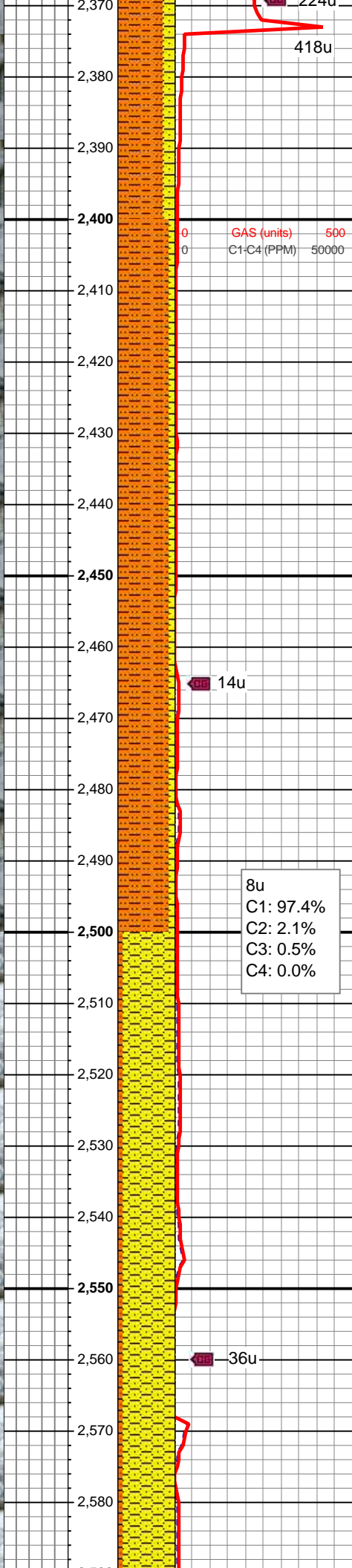
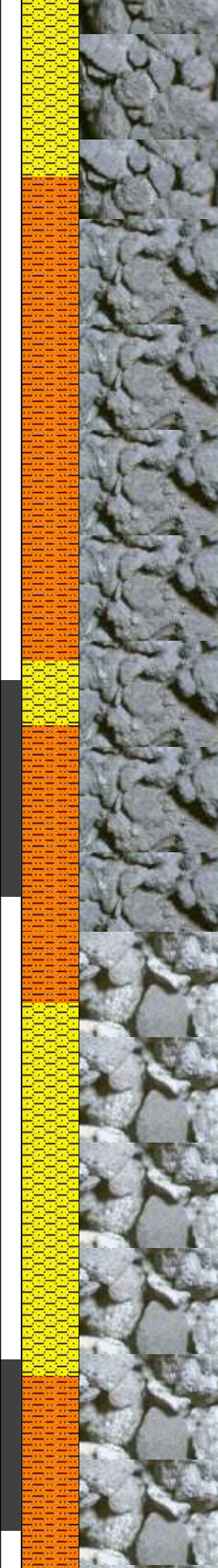
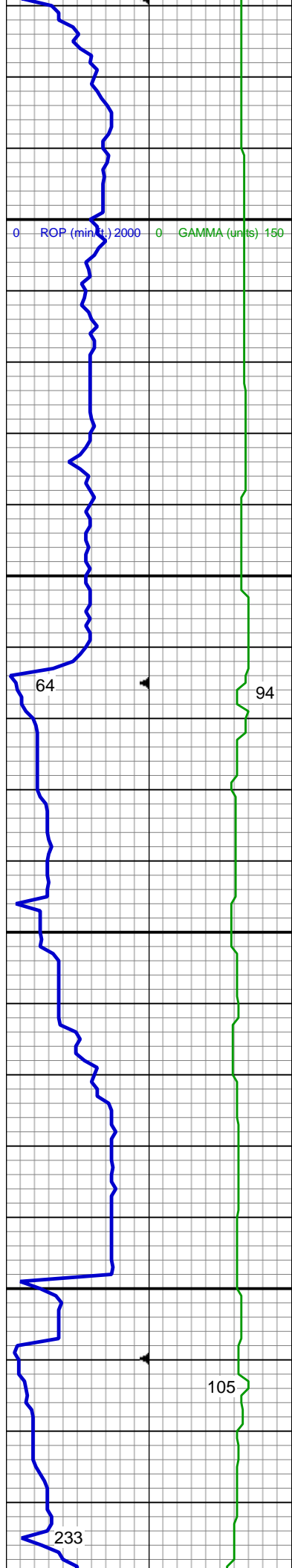


SHY SLTST: lt - med gy, frm - hd, brit, sb rd - sb blk, slty - grty tex, v s calc
SHY SS: wh - lt gy, fros - trns, s&p, vfg, mod hd wi brit clus, sb ang - sb rd, calc cmt

MD: 2,219 '
TVD: 2,213.92 '
Inclination: 9.89 °
Azimuth: 356.08 °

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: 2,314 '
TVD: 2,307.2 '
Inclination: 11.96 °
Azimuth: 1.35 °



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

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

MD: 2,409 '
TVD: 2,400.33 '
Inclination: 10.77 °
Azimuth: 358.29 °

MUD WT IN 8.75/ OUT 9.0
VIS IN 28/ OUT 31

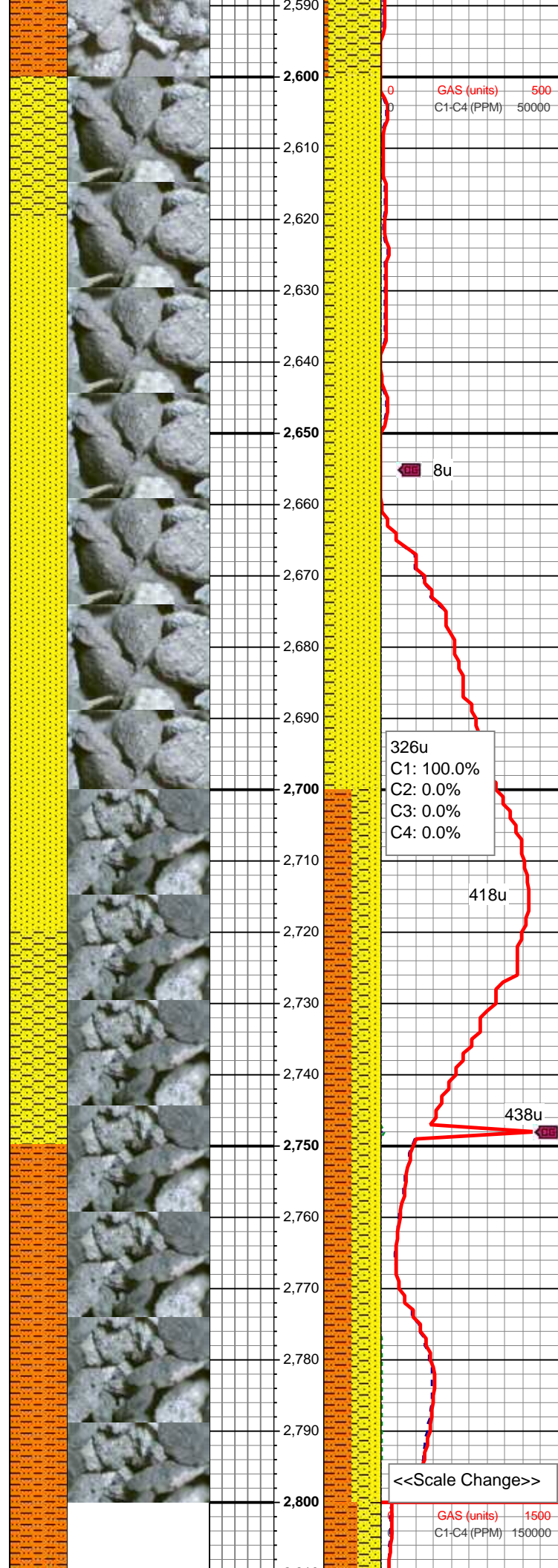
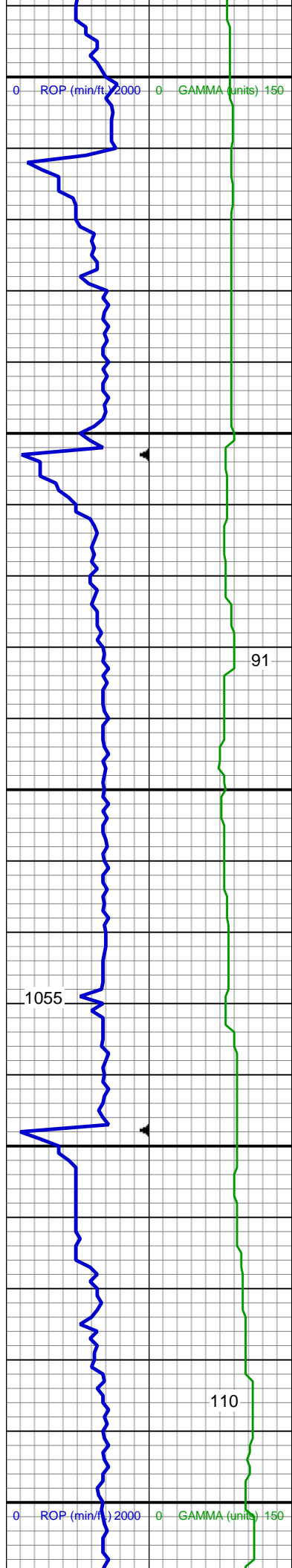
SHY SLTST: lt - med gy, frm - hd, brit, sb rd - sb blkly, slty - grty tex, v s calc

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

MD: 2,504 '
TVD: 2,493.49 '
Inclination: 11.83 °
Azimuth: 2.19 °

08/26/2013
Mud Wt: 8.90
FVis: 29
PVis: 5
YP: 5
GELS: n/s
API Filt: n/s
CAKE: 1/0
pH: 10.8
Cl: 1,600
Ca: 160

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



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

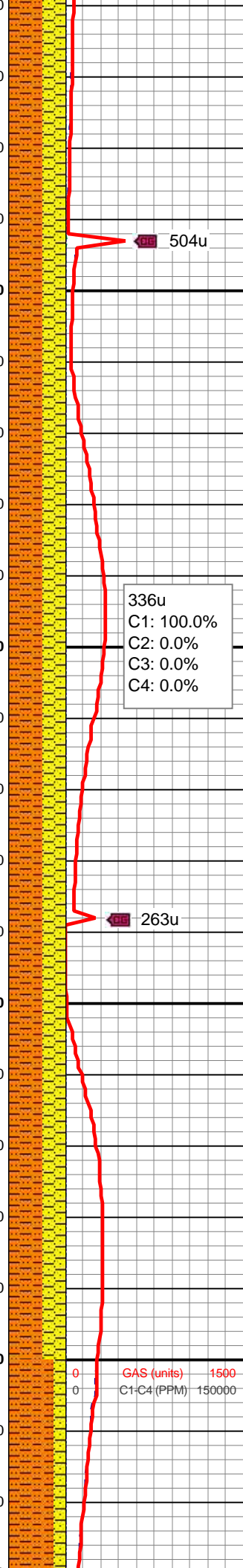
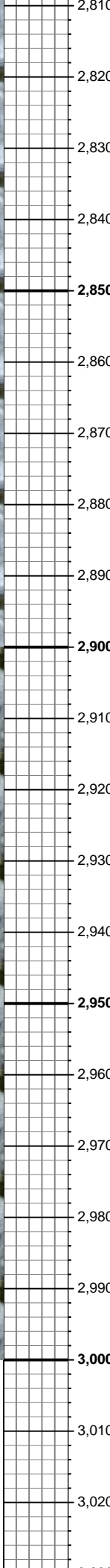
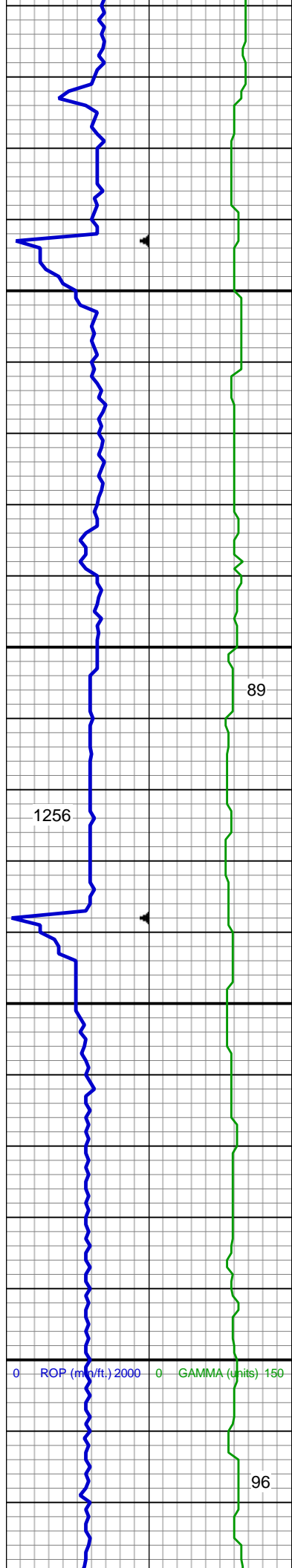
MD: 2,599 '
TVD: 2,586.14 '
Inclination: 13.71 °
Azimuth: 6.57 °

MD: 2,694 '
TVD: 2,678.4 '
Inclination: 13.86 °
Azimuth: 6.07 °

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
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

MD: 2,789 '
TVD: 2,770.95 '



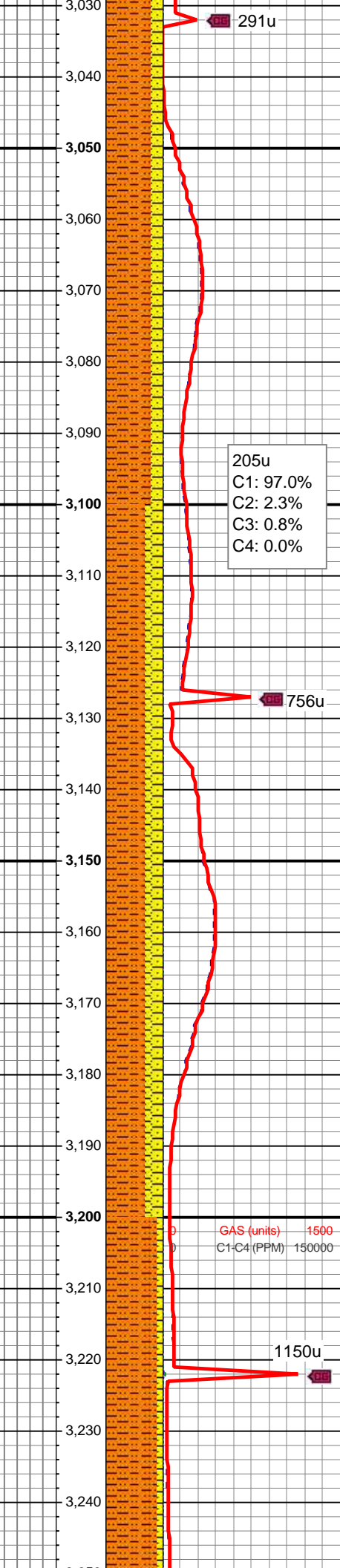
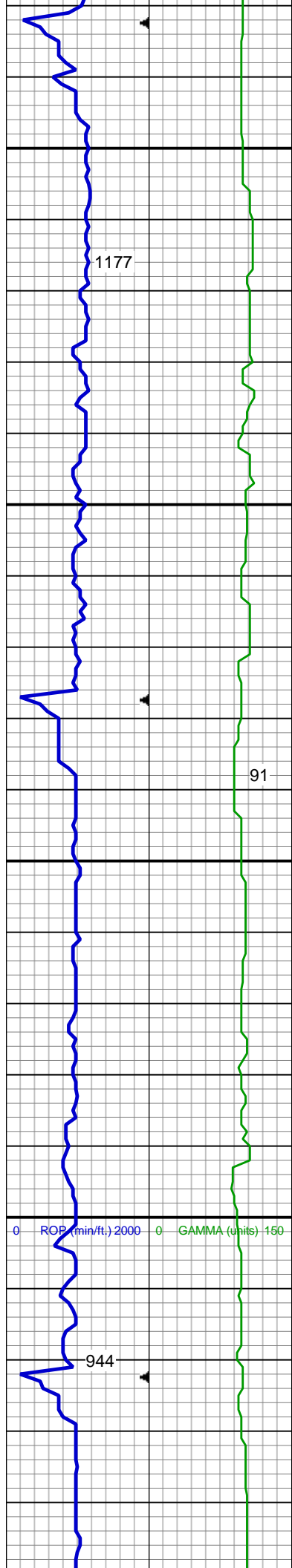
TVD: 2,770.93 '
Inclination: 12.23 °
Azimuth: 3.95 °

MD: 2,884 '
TVD: 2,863.92 '
Inclination: 11.48 °
Azimuth: 1.74 °

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
grdg to tr ss

MD: 2,979 '
TVD: 2,957.31 '
Inclination: 9.65 °
Azimuth: 358.69 °

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

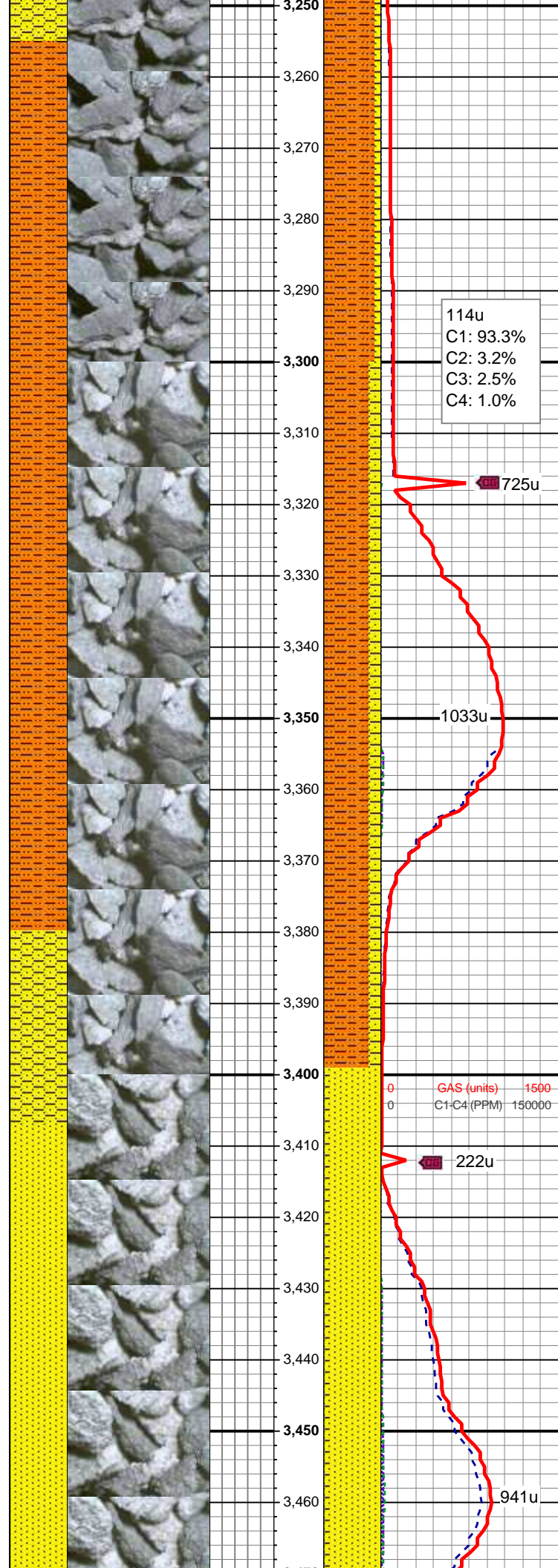
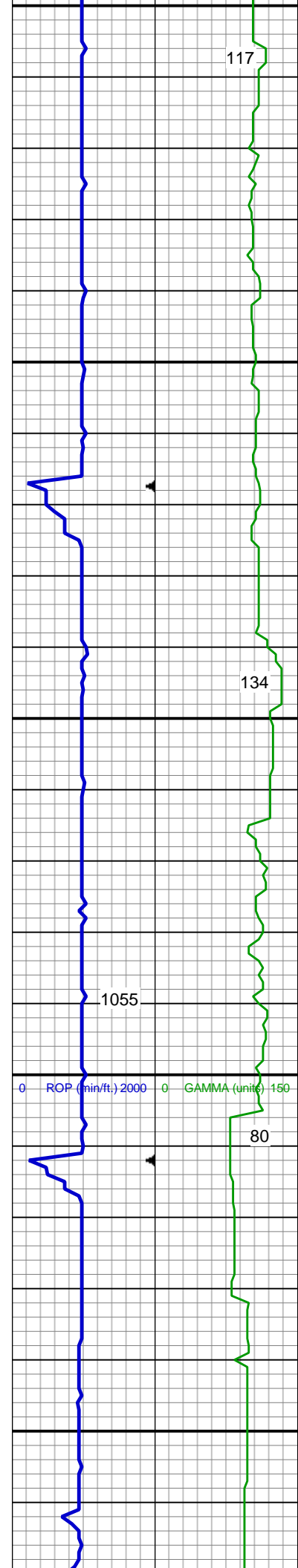


MD: 3,074 '
TVD: 3,051.11 '
Inclination: 8.52 °
Azimuth: 358.31 °

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

MD: 3,169 '
TVD: 3,145.31 '
Inclination: 6.33 °
Azimuth: 0.44 °

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



114u
C1: 93.3%
C2: 3.2%
C3: 2.5%
C4: 1.0%

725u

1033u

GAS (units) 1500
C1-C4 (PPM) 150000

222u

941u

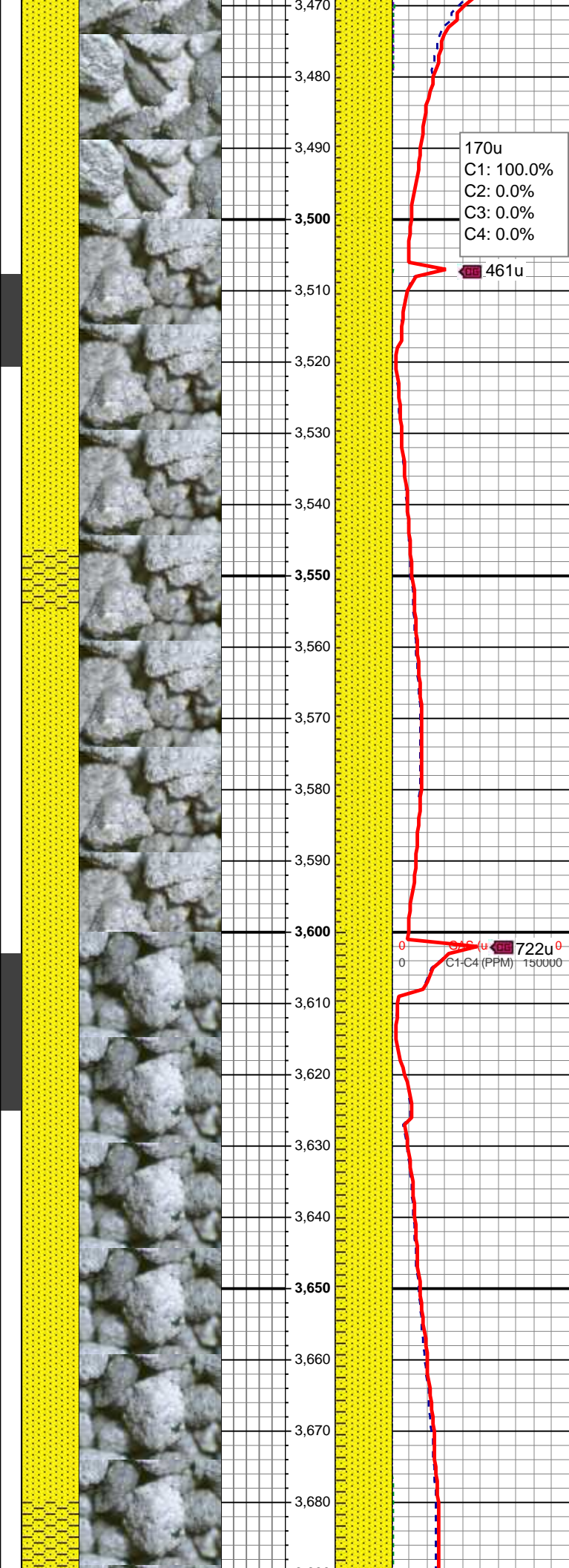
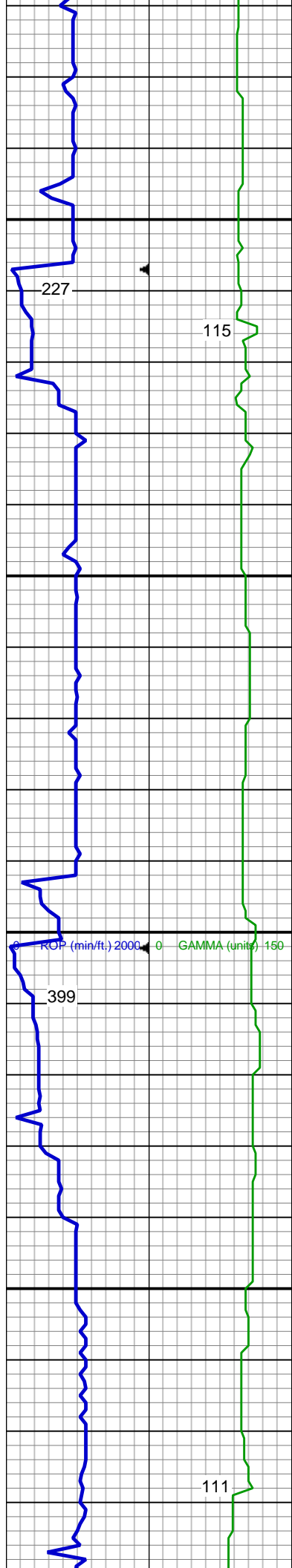
SHY SLTST: lt - med gy, frm - hd, sb
rd - sb blk, slty - grty tex, v sl calc
SHY SS: lt gy, s&p, vfg, mod hd wi
brit clus, sb ang - sb rd, calc cmt

MD: 3,359 '
TVD: 3,334.59 '
Inclination: 3.89 °
Azimuth: 357.31 °

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

Parkman Top @
3,407' MD; 3,382' TVD

MD: 3,454 '
TVD: 3,429.38 '
Inclination: 3.69 °
Azimuth: 357.5 °



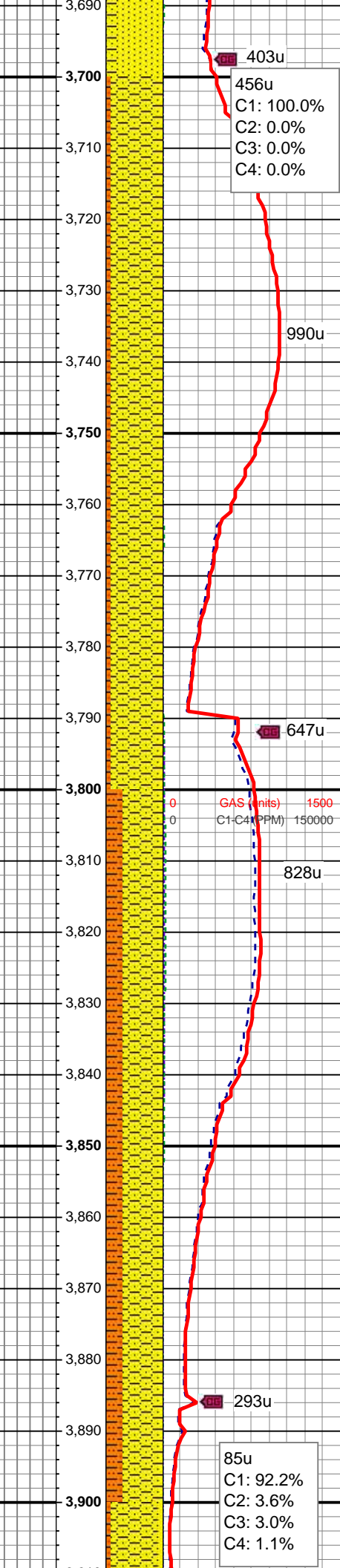
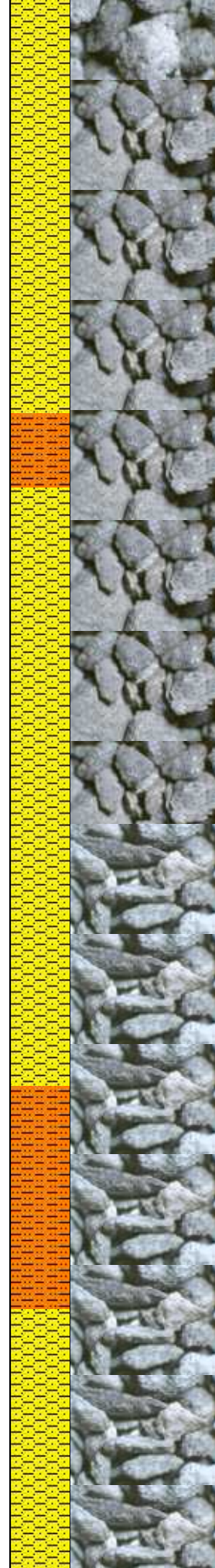
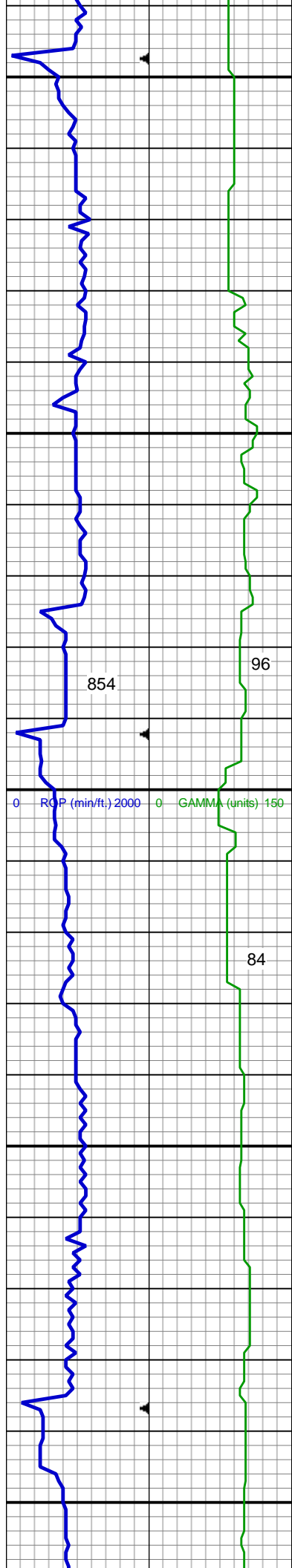
SS: wh - lt gy, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang, v calc cmt
SHY SS: lt gy, s&p, vfg, mod hd wi brit clus, sb ang - sb rd, calc cmt

MD: 3,549 '
TVD: 3,524.24 '
Inclination: 2.51 °
Azimuth: 12.98 °

SS: wh - lt gy, fros - trnsl, 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

MD: 3,644 '
TVD: 3,619.19 '
Inclination: 1.5 °
Azimuth: 346.3 °

SS: wh - lt gy, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang,

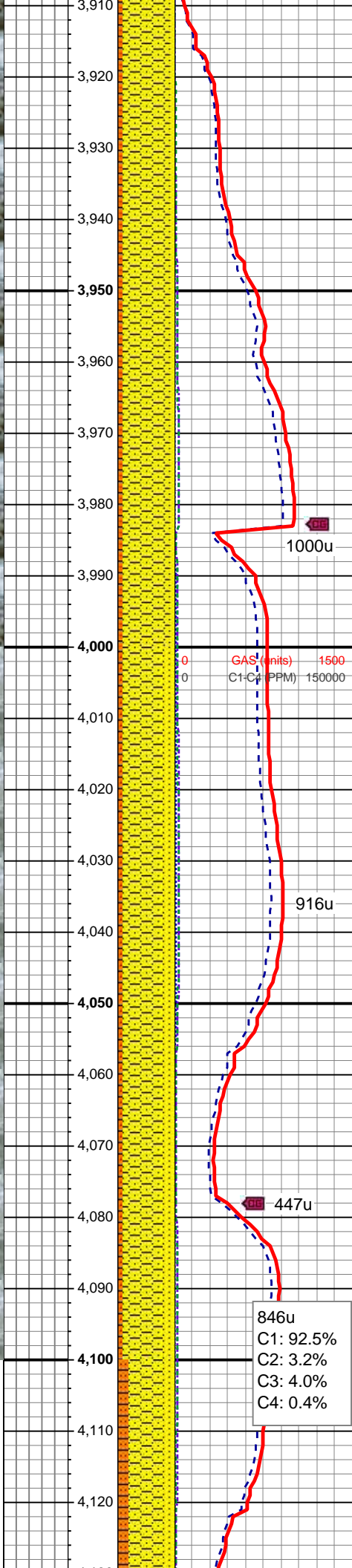
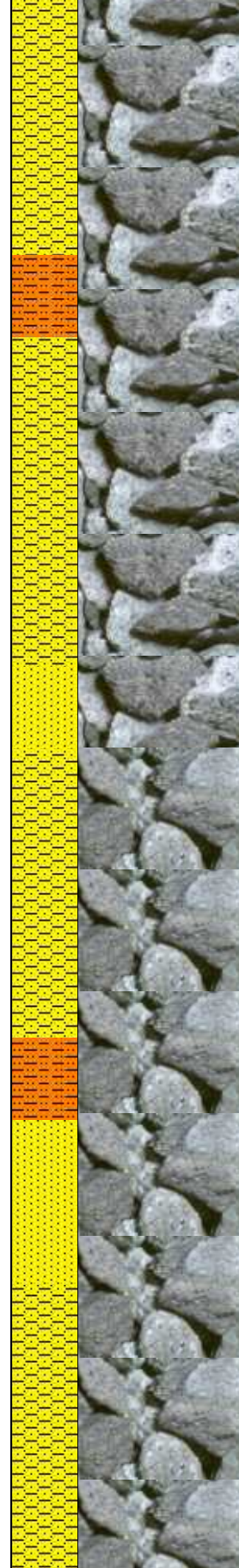
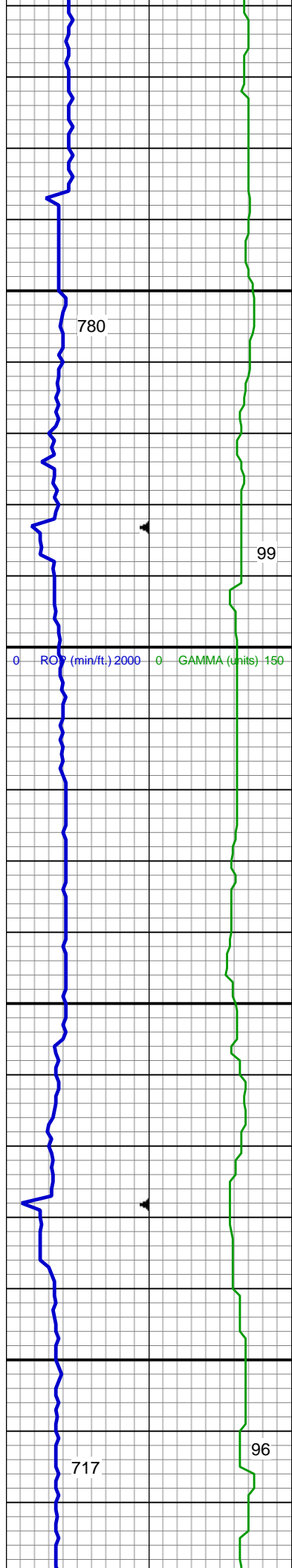


v calc cmt
SHY SS: lt gy, s&p, vfg, mod hd wi
brit clus, sb ang - sb rd, calc cmt

MD: 3,739 '
TVD: 3,714.16 '
Inclination: 0.94 °
Azimuth: 18.99 °

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

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

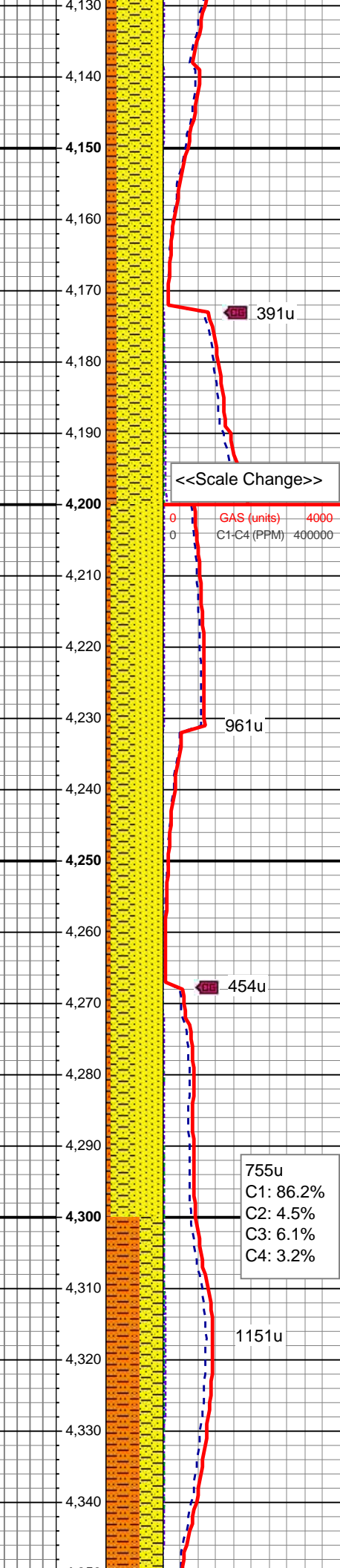
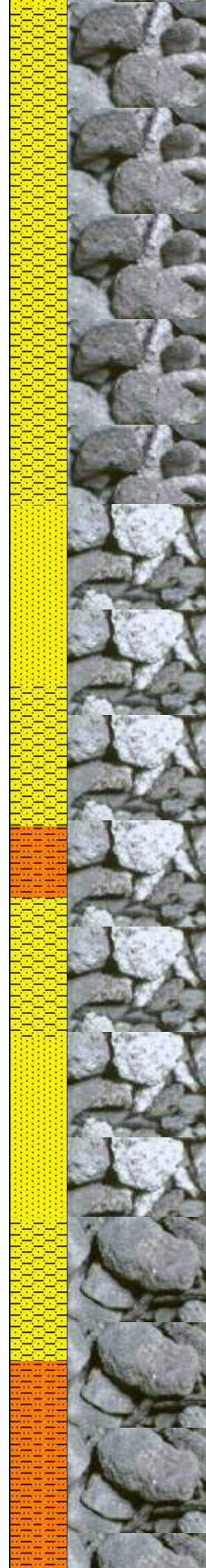
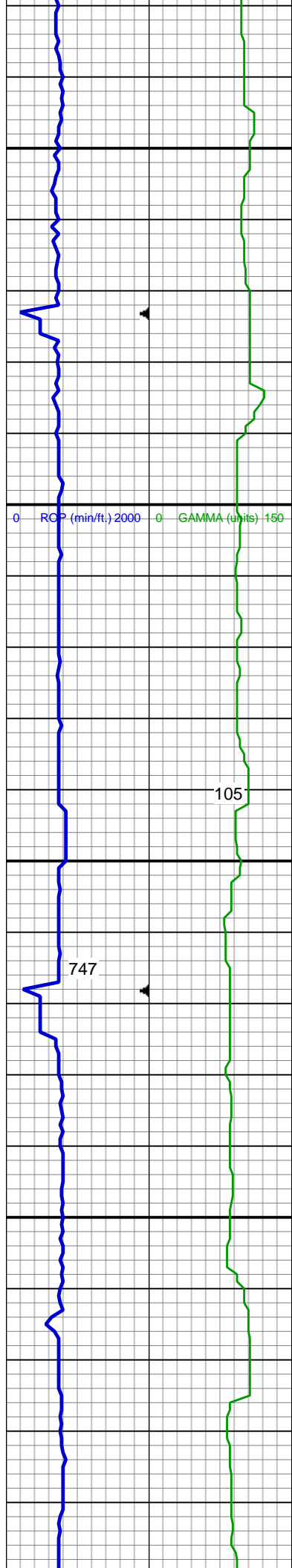


SHY SS: lt gy, s&p, vfg, frm - mod
hd wi brit clus, sb ang - sb rd, calc
cmt
SHY SLTST: lt - med gy, frm - hd, sb
rd - sb blk, slty - grty tex, v sl calc
SS: wh - lt gy, fros - trns, speckl wi
mica, f gr, hd brit clus, ang - sb ang,
v calc cmt

MD: 4,023 '
TVD: 3,998.15 '
Inclination: 0.44 °
Azimuth: 294.18 °

SHY SS: lt gy, s&p, vfg, frm - 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, tr Inoc

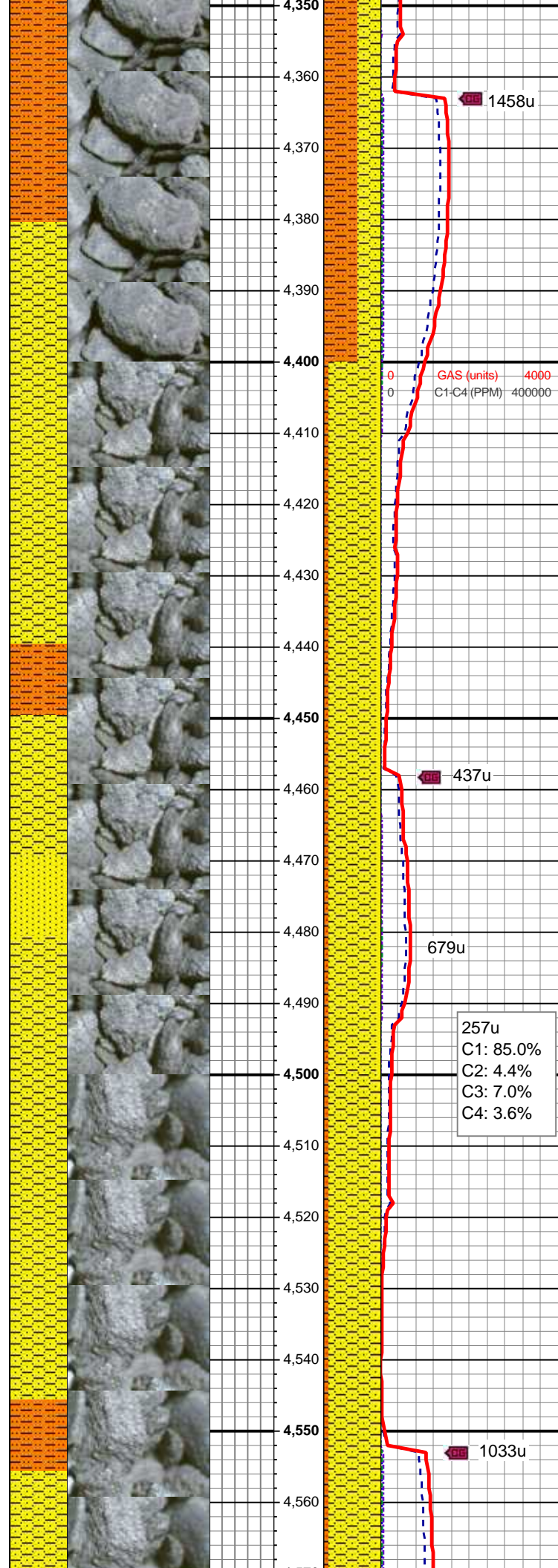
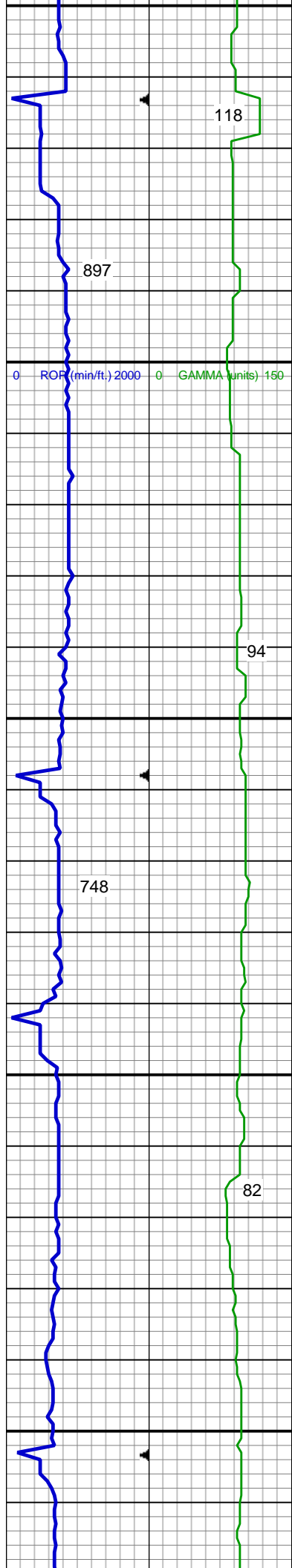
Sussex Top @
4,109' MD; 4,084' TVD



SHY SS: lt gy, s&p, vfg, frm - 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, frm - 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: 4,308 '
TVD: 4,283.1 '
Inclination: 1.54 °
Azimuth: 271.24 °

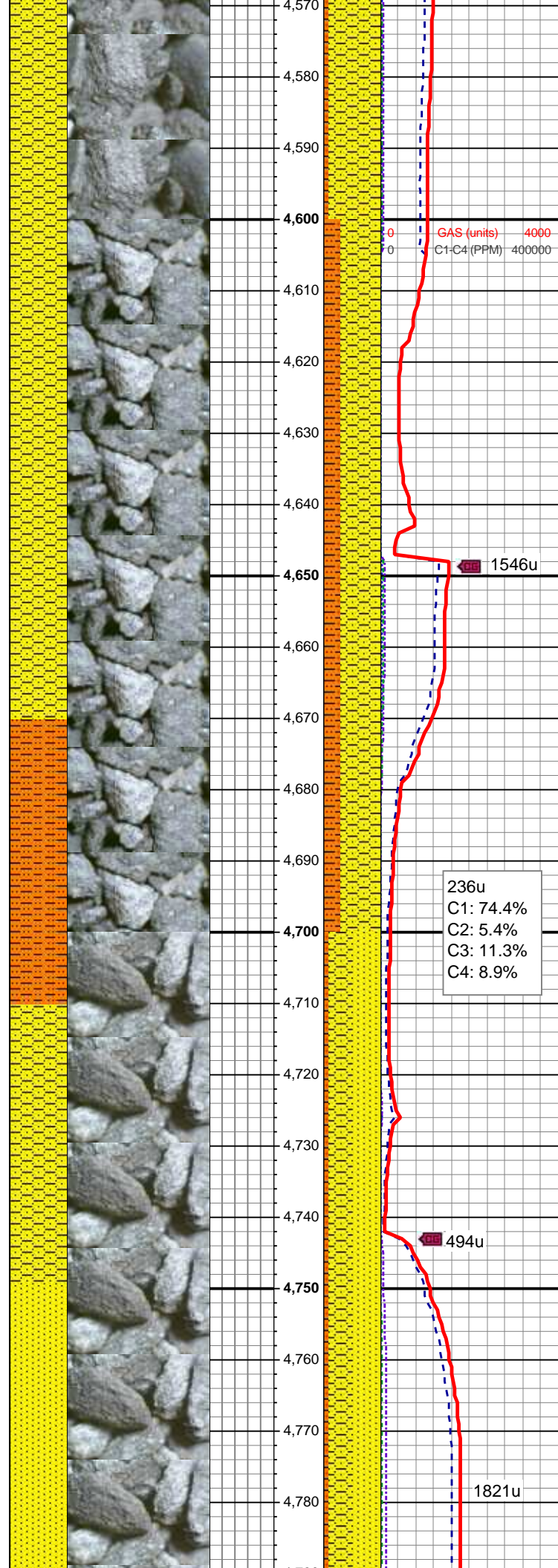
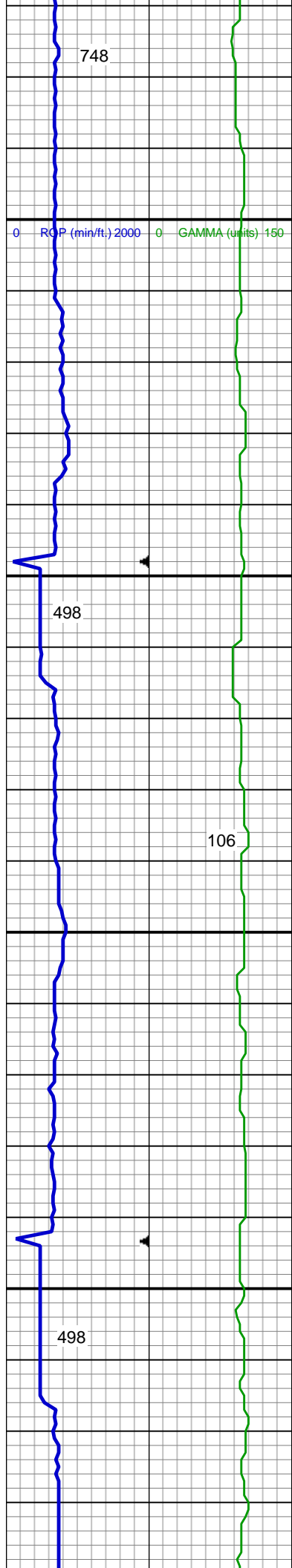


SHY SS: lt gy, s&p, vfg, frm - mod
hd wi brit clus, sb ang - sb rd, calc
cmt
SHY SLTST: lt - med gy, frm - hd, sb
rd - sb blk, slty - grty tex, v sl calc

SHY SS: lt gy, s&p, vfg, frm - 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

MUD WT: 9.05/9.05
VIS: 29/29 IN/OUT

MD: 4.503 /



MD: 4,593
TVD: 4,568.07 '
Inclination: 0.37 °
Azimuth: 147.57 °

SHY SS: lt gy, s&p, vfg, frm - 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

GAS (units) 4000
C1-C4 (PPM) 400000

1546u

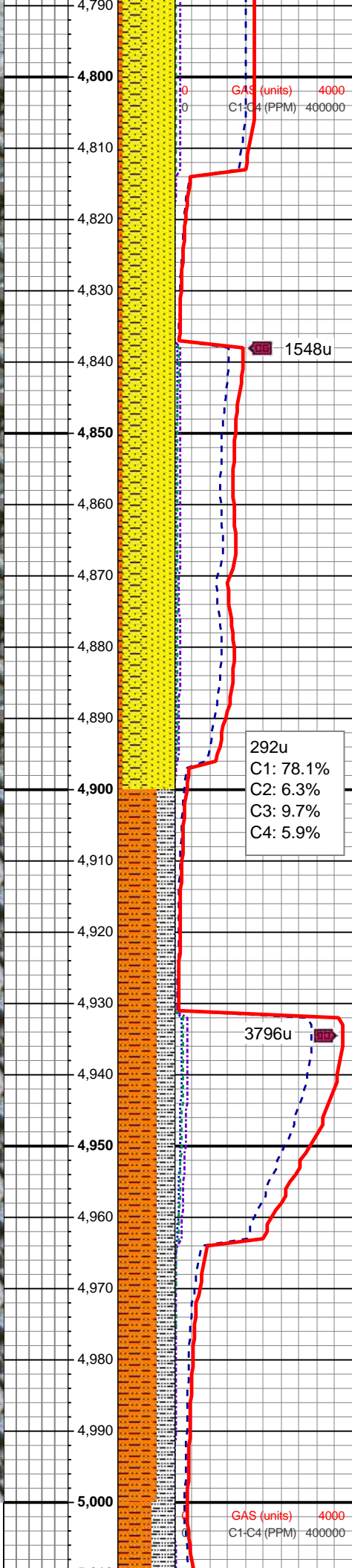
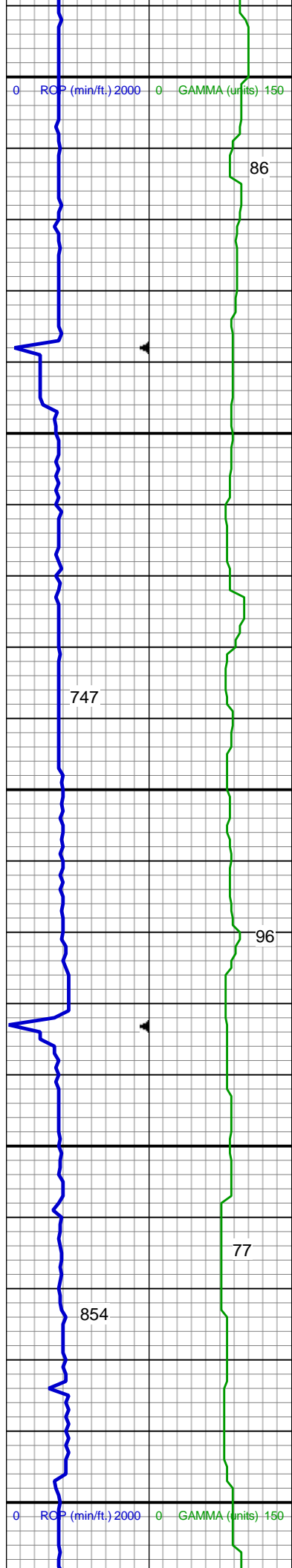
236u
C1: 74.4%
C2: 5.4%
C3: 11.3%
C4: 8.9%

494u

1821u

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

Shannon Top @
4,750' MD; 4,725' TVD

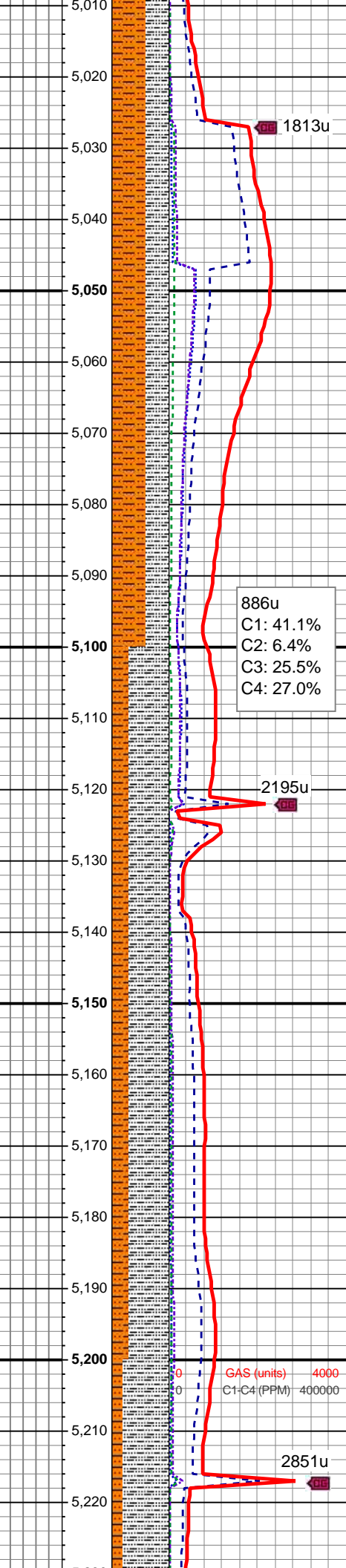
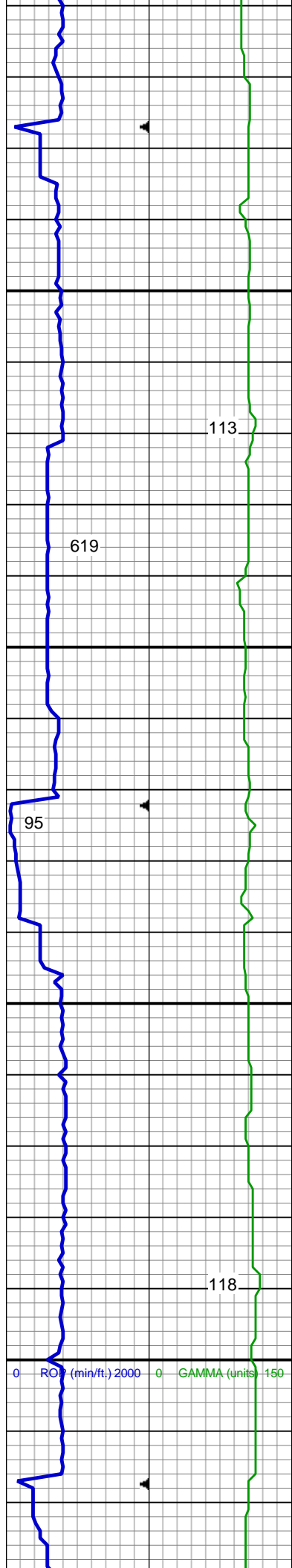


nd w/ brt clus, sb ang - sb rd, calc
cmt
SHY SLTST: lt - med gy, frm - hd, sb
rd - sb blk, slty - grty tex, v sl calc

MD: 4,878 '
TVD: 4,853.05 '
Inclination: 0.97 °
Azimuth: 161.07 °

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, frm - 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

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



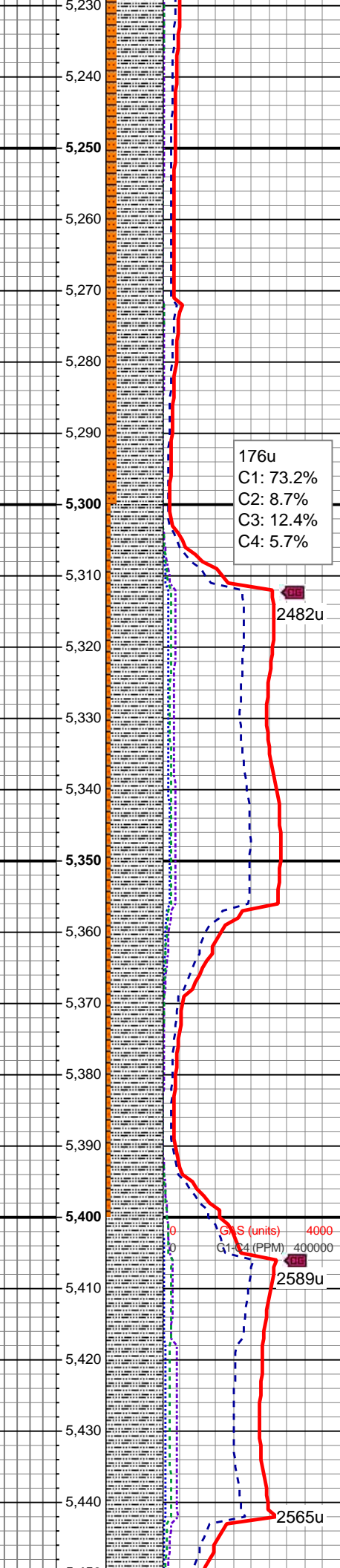
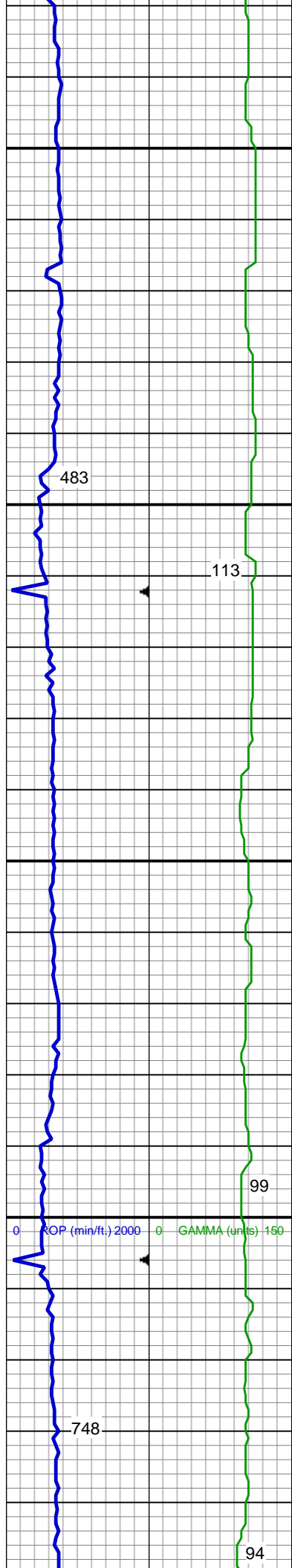
SHY SLTST: lt - med gy, frm - mod
hd, sb rd - sb blk, slty - grty tex, v sl
calc
SLTY SH: lt - med gy, occ dk gy, frm
- hd, sb plty - plty, slty - grty tex, v sl
calc

MUD WT: 9.20/9.20
VIS: 29/29 IN/OUT

MD: 5,163 '
TVD: 5,138.04 '
Inclination: 0.22 °
Azimuth: 14.85 °

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

GAS (units) 4000
C1-C4 (PPM) 400000



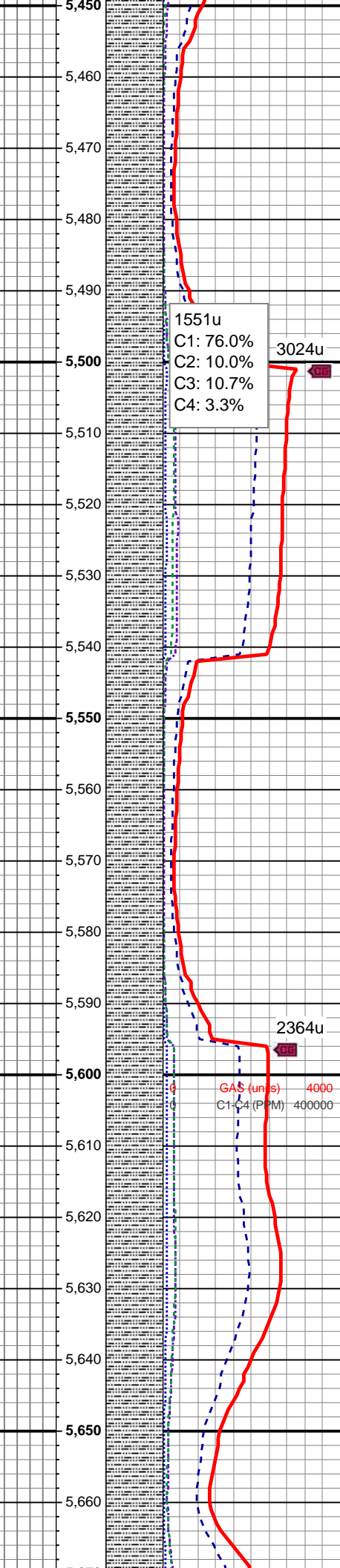
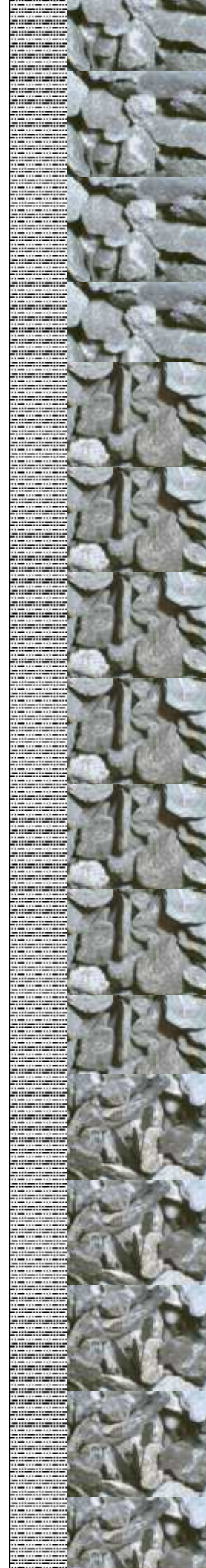
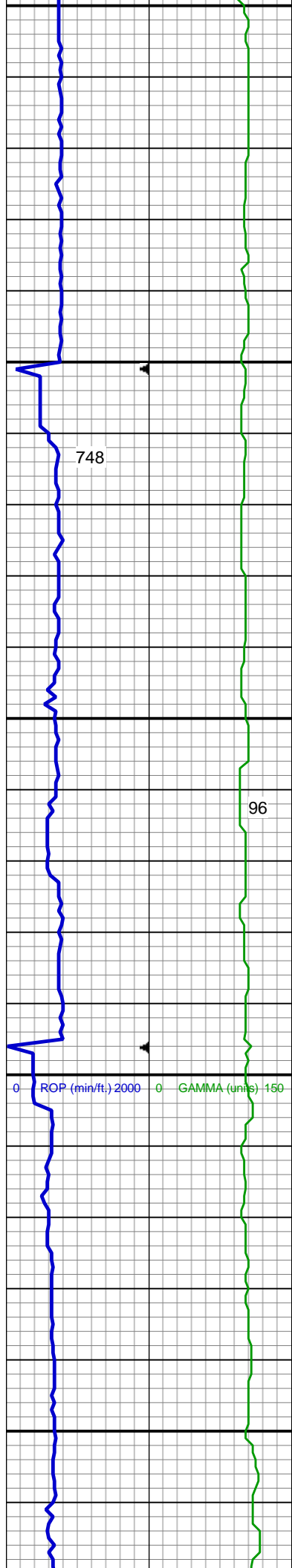
SLTY SH: lt - med gy, occ dk gy, frm - hd, sb plty - plty, slty - grty tex, v sl calc

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

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

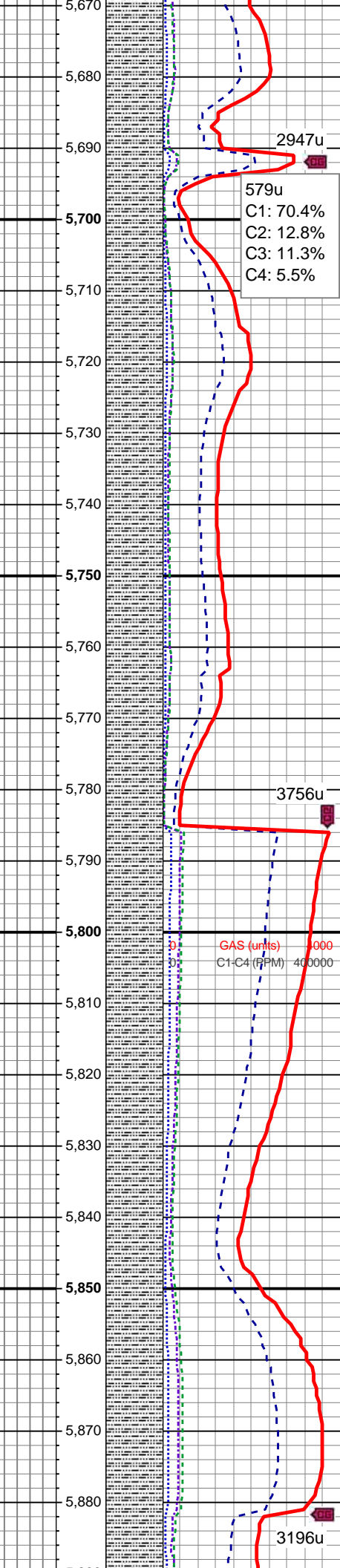
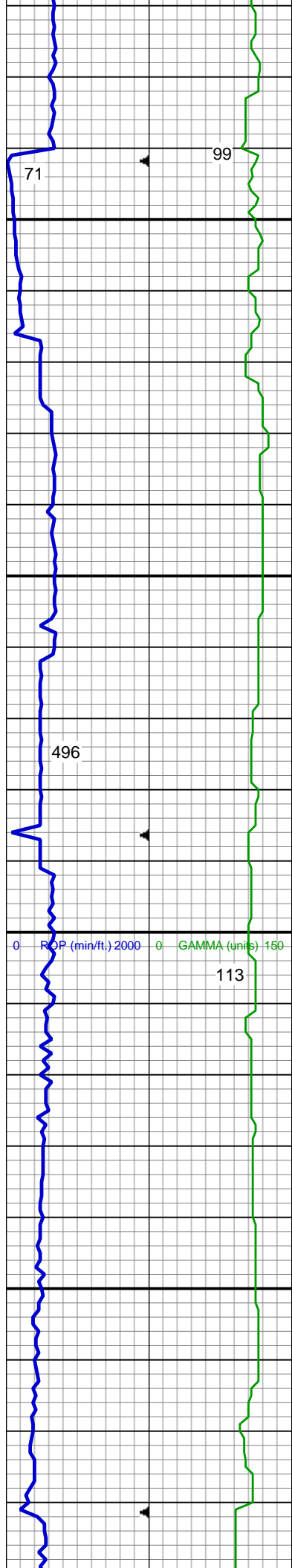
SHY SLTST: lt - med gy, frm - mod hd, sb rd - sb blk, slty - grty tex, v sl calc

MD: 5,447 '
TVD: 5,422.03 '
Inclination: 0.82 °
Azimuth: 141.84 °



SLTY SH: lt - med gy, occ dk gy, frm
- hd, plty - sb plty - 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

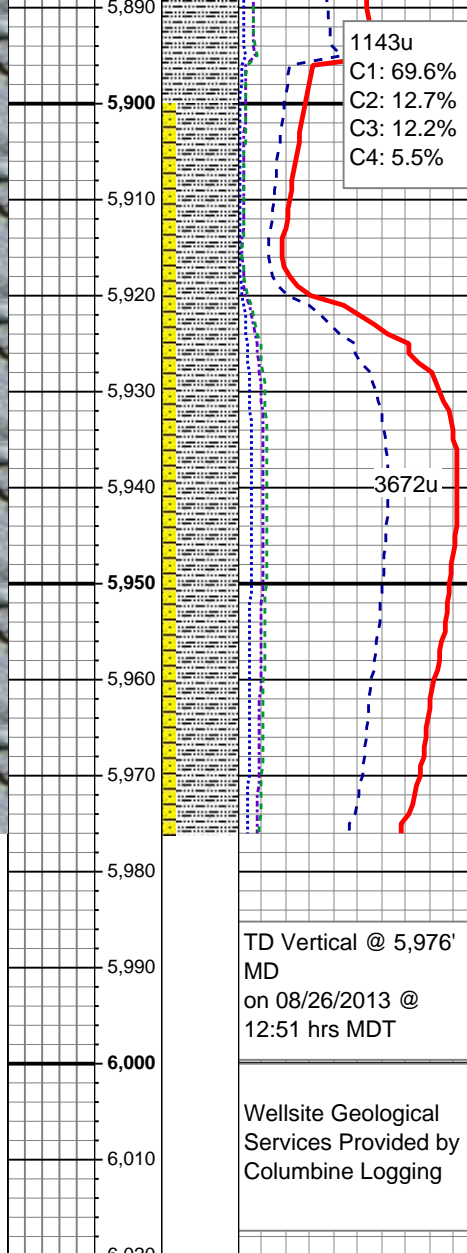
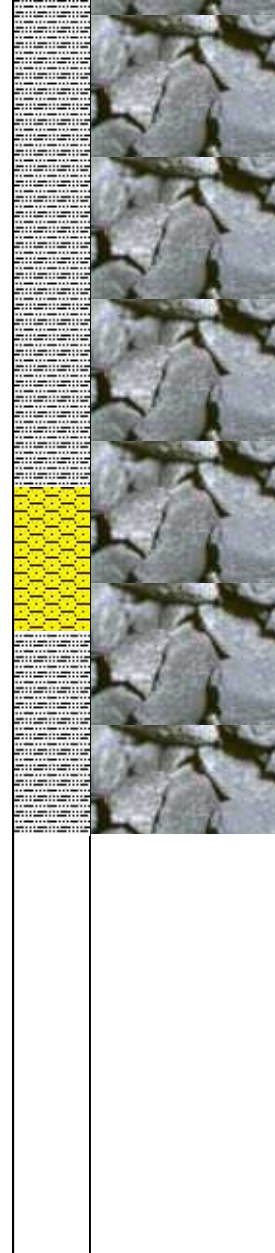
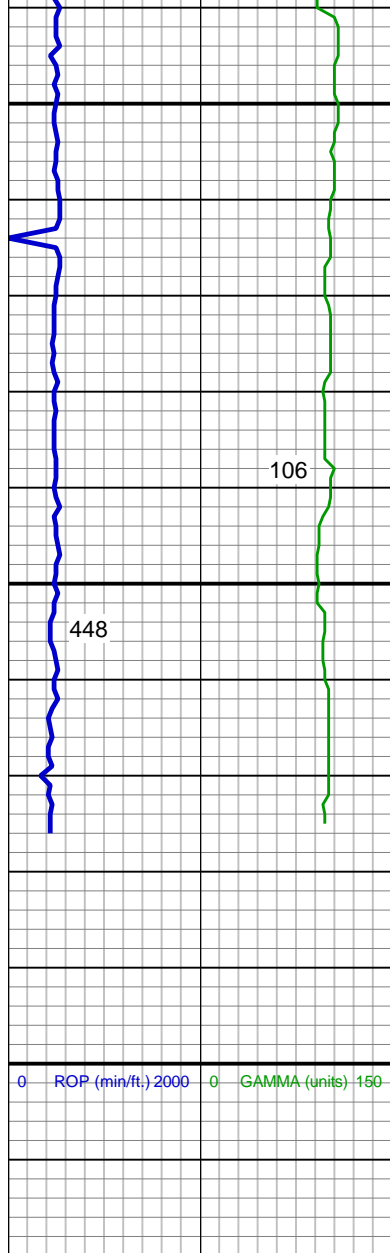


SLTY SH: lt - med gy, occ dk gy, frm - hd, plty - sb plty - sb blkly, slty - grty tex, v sl calc, tr lnoo

MD: 5,732 '
TVD: 5,707.02 '
Inclination: 0.62 °
Azimuth: 327.48 °

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

Teepee Buttes Top @
5,785' MD; 5,760' TVD



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

MD: 5,920 '
TVD: 5,895.01 '
Inclination: 0.93 °
Azimuth: 110.5 °

Projection to Bit:
MD: 5,976 '
TVD: 5,951.01 '
Inclination: 0.93 °
Azimuth: 110.5 °

SLTY SH: lt - med gy, occ dk gy, frm
- hd, plty - sb plty - sb blkly, slty - grty
tex, v sl calc
SHY SS: wh - lt gy, s&p, vfg, frm -
mod hd wi brit clus, sb ang - sb rd,
calc cmt

See Corresponding Horizontal Log
Holman B15-66HN HORZ