

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Sater CC18-74-1HN VERT

Location SEC 18 T4N R63W

State COLORADO

County WELD

Country USA

Rig Number H&P 315

API Number 05-123-37983

AFE # 140577

Region DJ BASIN

Field WATTENBERG

Spud Date 3/30/2014

Drilling Completed 4/1/2014

Surface Coordinates SESE SEC 18 T4N R63W
300' FSL; 375' FEL

LAT/LON: 40.30562/-104.47239

Bottom Hole Coordinates NWNE SEC 18 T4N R63W
75' FNL; 1,650' FEL

Ground Elevation 4,678'

K.B. Elevation 4,702'

Logged Interval 2,000' **To** 5,942'

Total Depth 5,942'

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, NATHAN MURPHY

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
 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
 CHERT
 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 DOWN...
 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

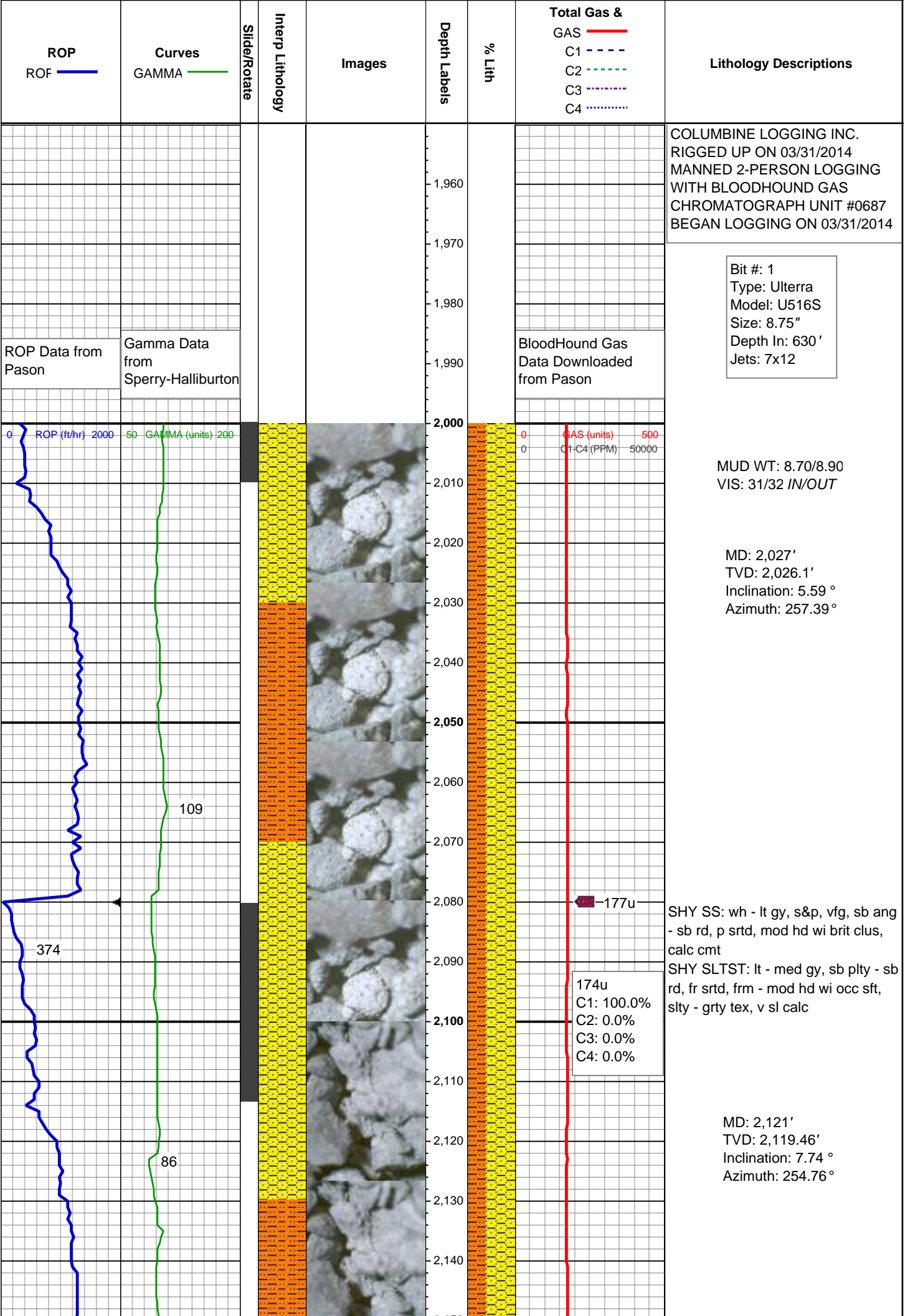
Textures

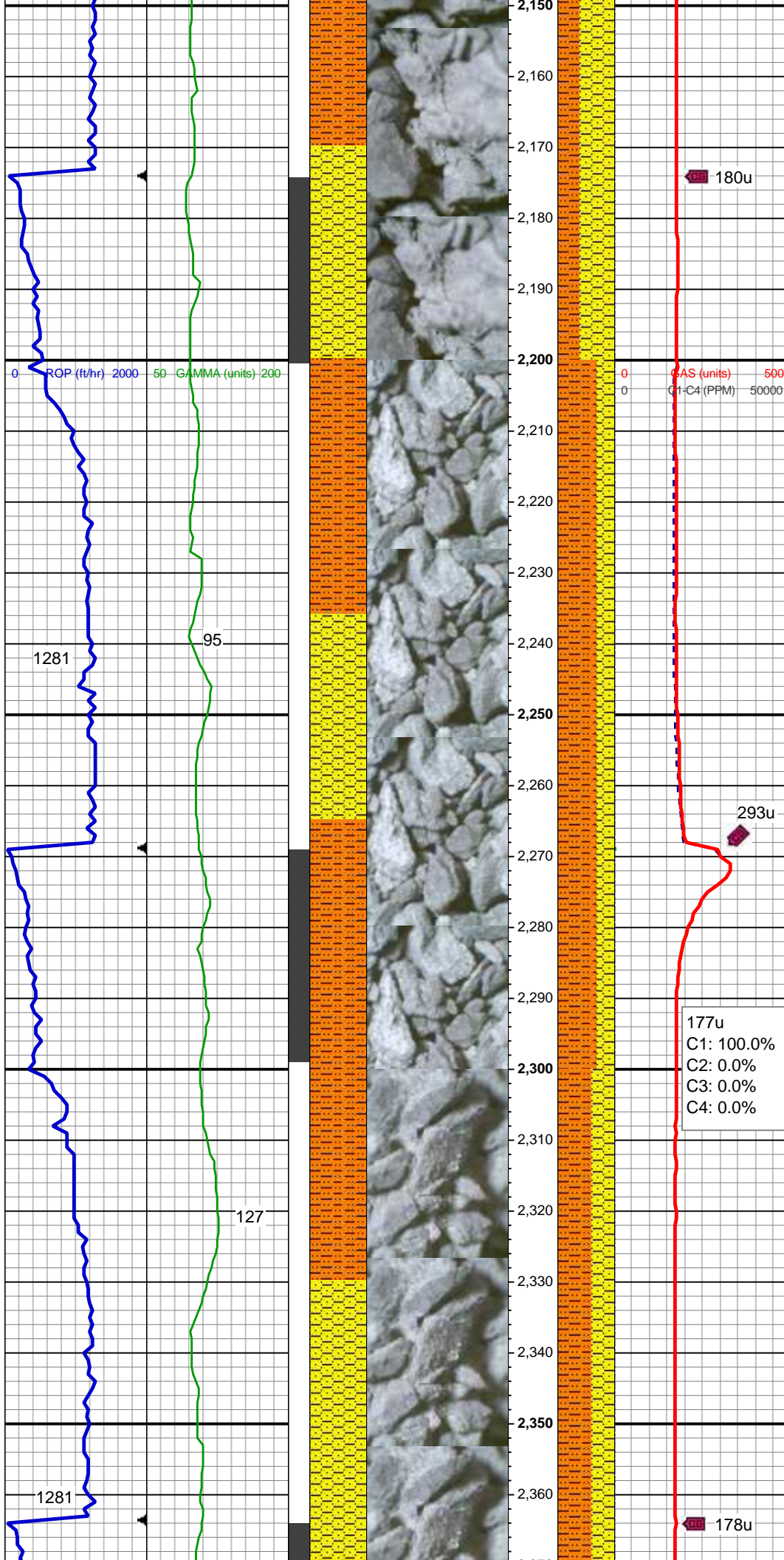
BOUNDSTONE
 CHALKY
 CRYPTOXLN
 EARTHY
 FINELYXLN

GRAINSTONE
 LITHOGRAPHIC
 MICROXLN
 MUDSTONE
 PACKSTONE
 WACKESTONE

Sorting

MODERATE
 POOR
 WELL





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

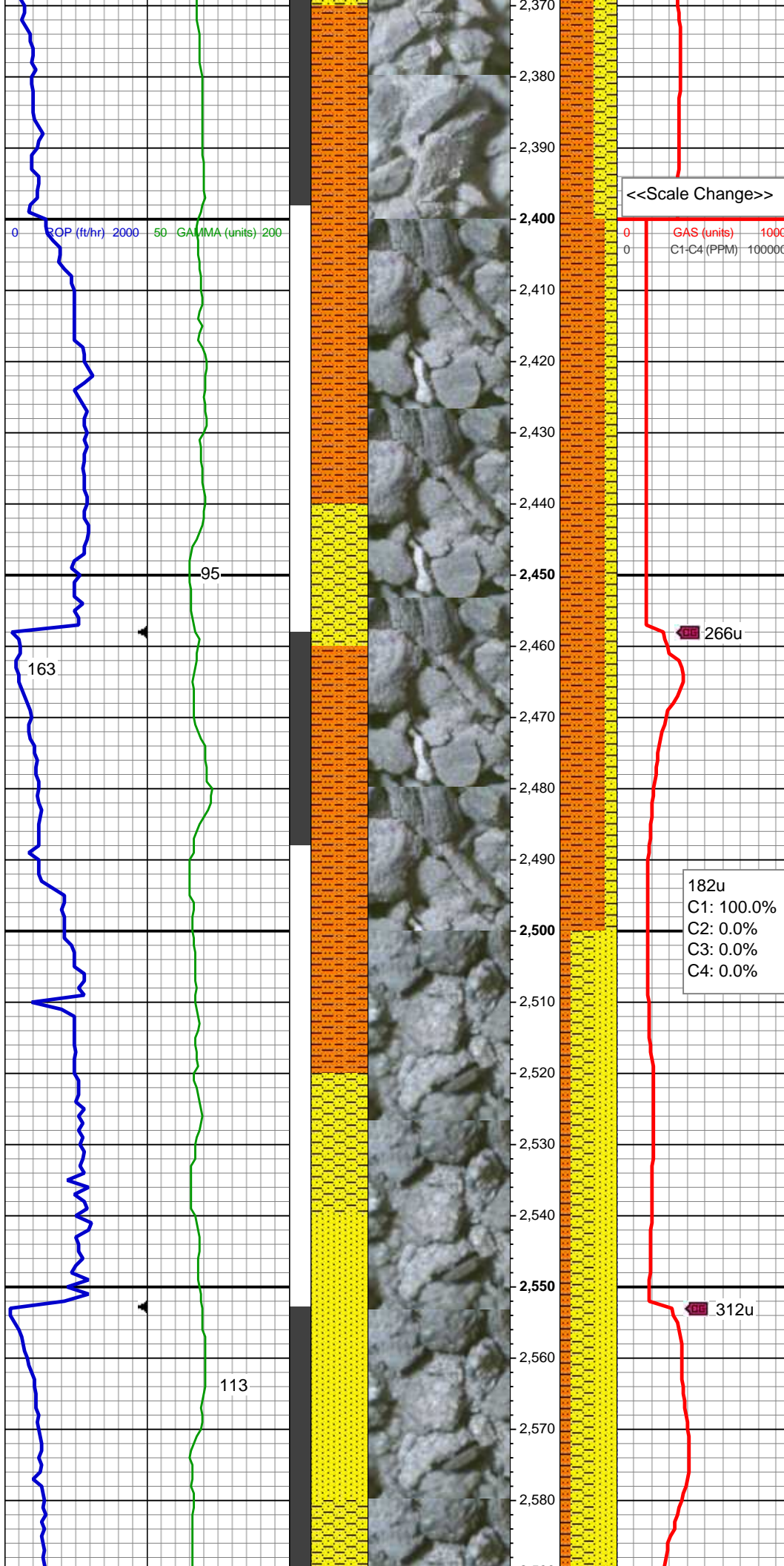
SHY SLTST: lt - med gy, sb plty - sb
rd, fr srtd, frm - mod hd wi occ sft,
slty - grty tex, v sl calc

MD: 2,216'
TVD: 2,213.46'
Inclination: 8.94 °
Azimuth: 251.26 °

SHY SLTST: lt - med gy, sb plty - sb
rd, fr srtd, frm - mod hd wi occ sft,
slty - grty tex, v sl calc

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

MD: 2,311'
TVD: 2,307.28'
Inclination: 9.12 °
Azimuth: 259.85 °



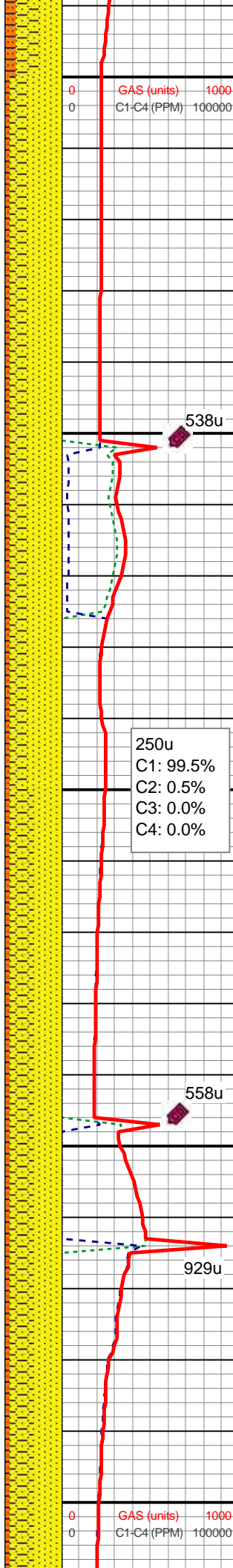
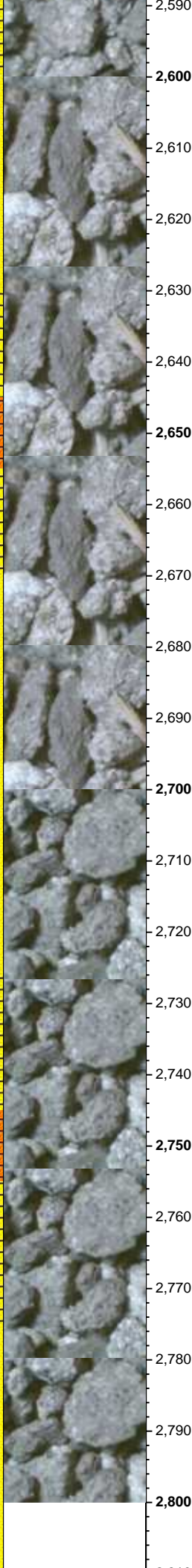
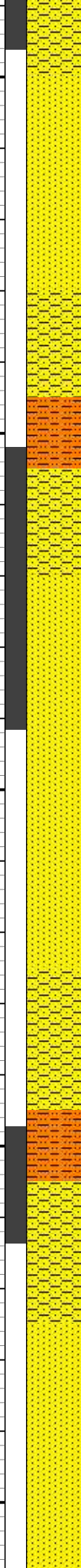
SHY SLTST: lt - med gy, sb plty - sb rd, fr srted, frm - mod hd wi occ sft, slty - grty tex, v sl calc
SHY SS: wh - lt gy, s&p, vfg, sb ang - sb rd, p srted, frm - mod hd wi brit clus, calc cmt

MD: 2,406'
TVD: 2,400.98'
Inclination: 9.88 °
Azimuth: 260.74 °

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

MD: 2,501'
TVD: 2,494.5'
Inclination: 10.38 °
Azimuth: 262.15 °

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



SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
silty - grty tex, v sl calc

MD: 2,596'
TVD: 2,587.72'
Inclination: 11.8 °
Azimuth: 261.1 °

MUD WT: 8.80/8.90
VIS: 31/32 IN/OUT

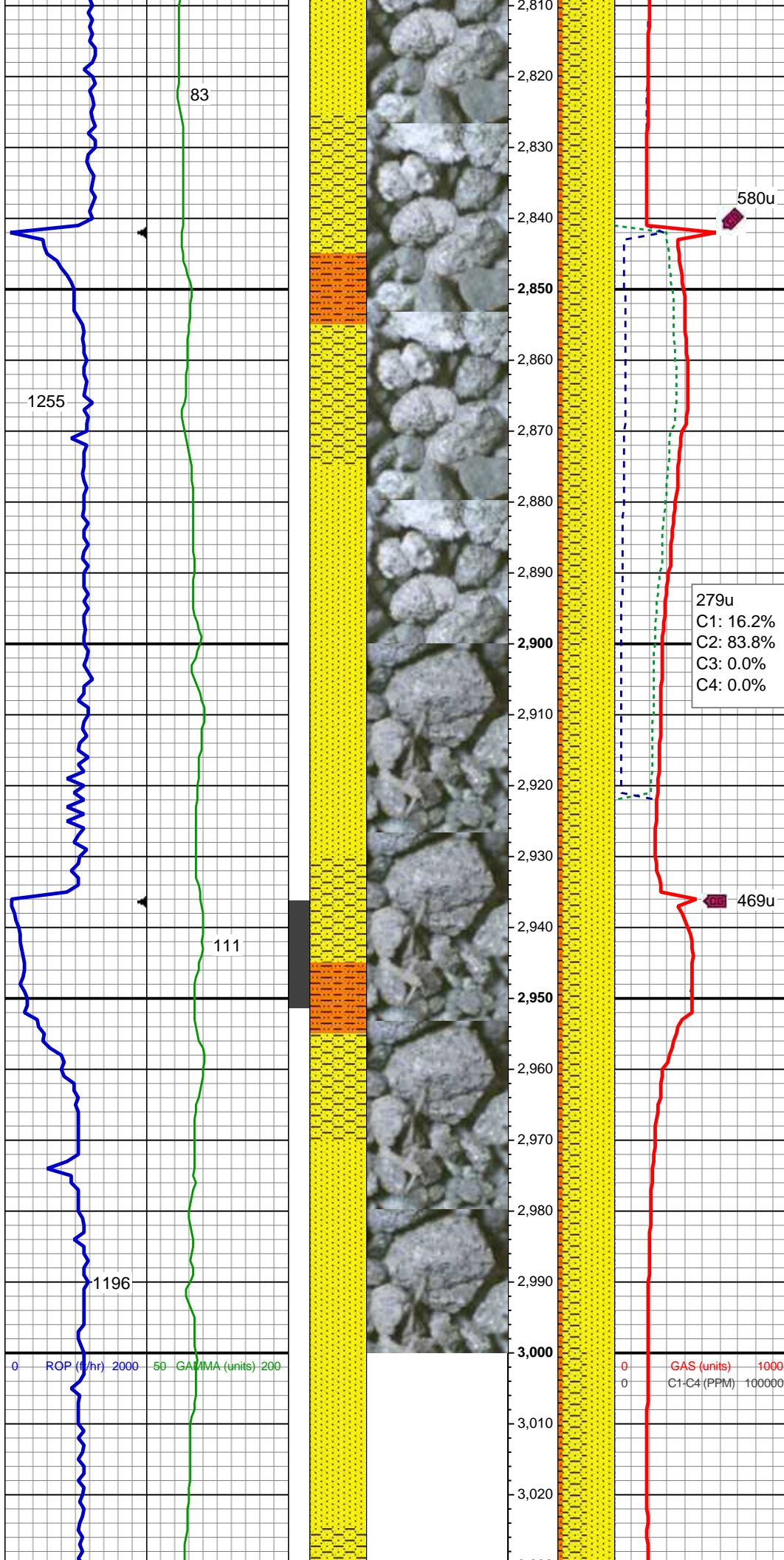
SS: wh, fros - trnsl, speckl wi mica,
f gr, ang - sb ang, p srted, hd brit
clus, v calc cmt
SHY SS: lt gy, s&p, vfg, sb ang - sb
rd, p srted, frm - mod hd wi brit clus,
calc cmt

SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
silty - grty tex, v sl calc

MD: 2,691'
TVD: 2,680.28'
Inclination: 14.19 °
Azimuth: 262.86 °

MD: 2,786'
TVD: 2,772.17'
Inclination: 15.24 °
Azimuth: 262.65 °

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

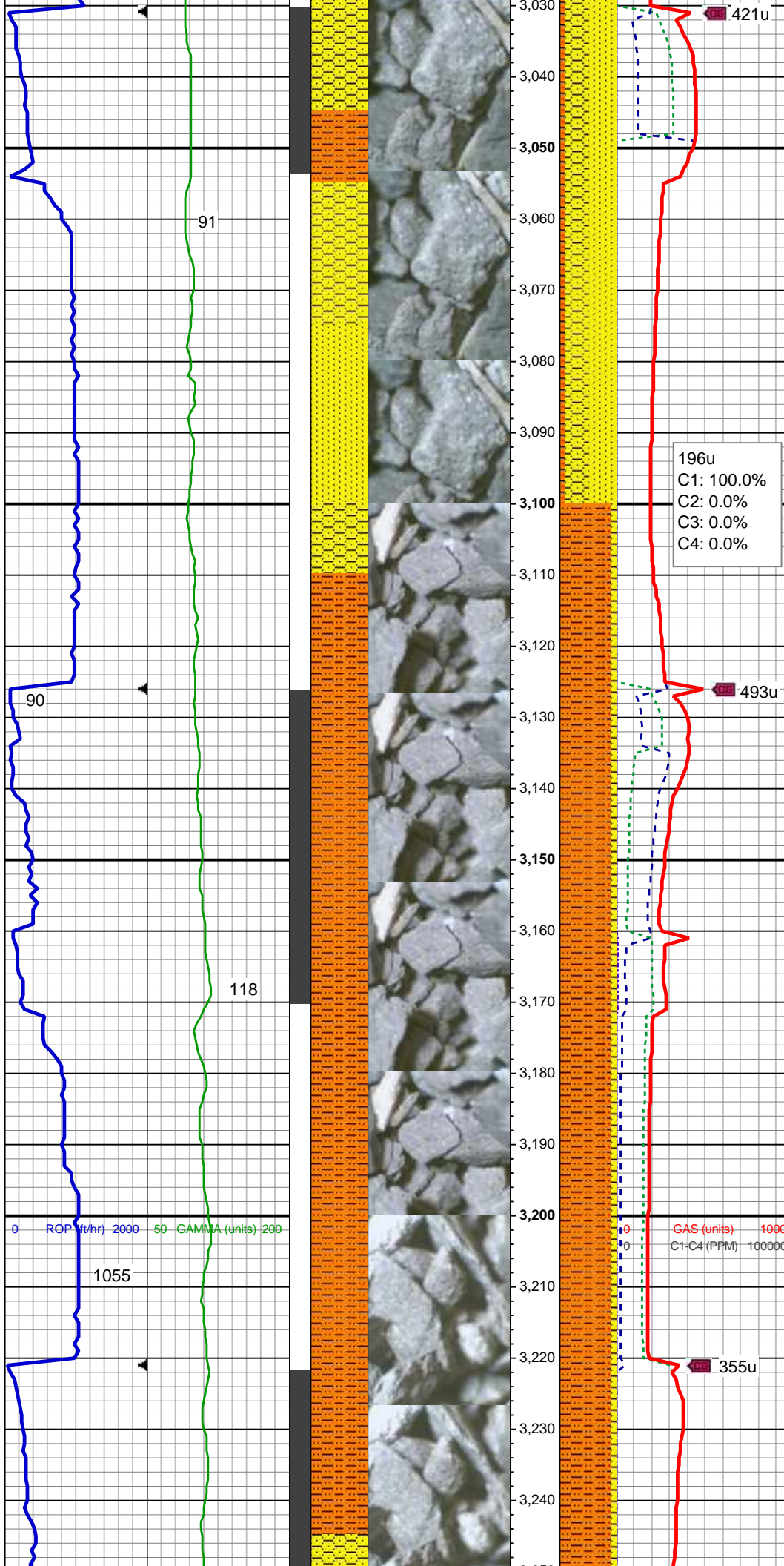


MD: 2,881'
TVD: 2,864.03'
Inclination: 14.26 °
Azimuth: 261.75 °

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

MD: 2,976'
TVD: 2,956.31'
Inclination: 13.27 °
Azimuth: 259.07 °

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



MD: 3,070'
TVD: 3,047.73'
Inclination: 13.6 °
Azimuth: 258.28 °

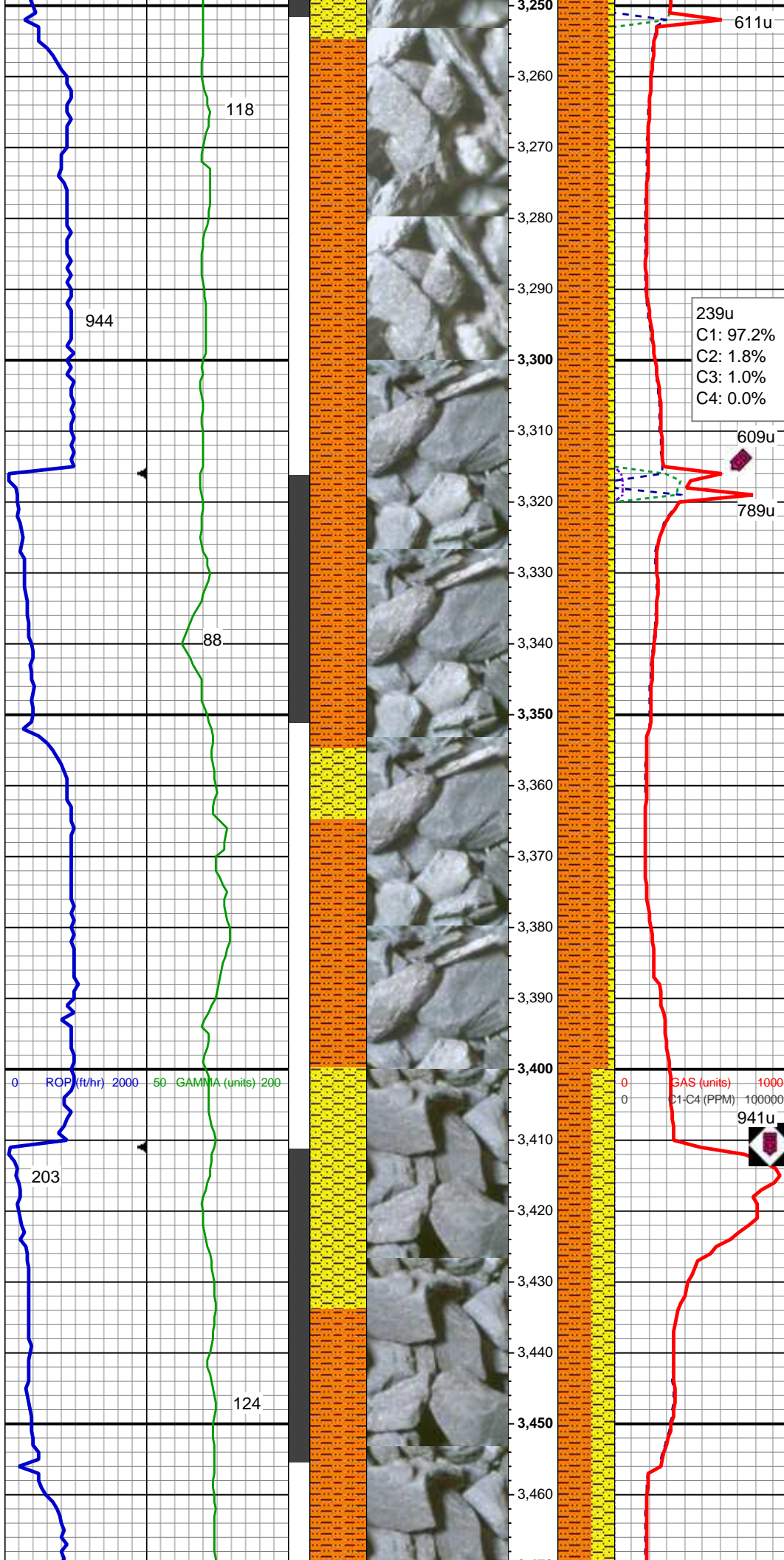
SS: wh, fros - trnsl, speckl wi mica,
f gr, ang - sb ang, p srted, hd brit
clus, v calc cmt
SHY SS: lt gy, s&p, vfg, sb ang - sb
rd, p srted, frm - mod hd wi brit clus,
calc cmt
SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
slty - grty tex, v sl calc

196u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

MD: 3,166'
TVD: 3,141'
Inclination: 13.82 °
Azimuth: 256.87 °

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

03/31/2014
Mud Wt: 8.85
FVis: 31
PVis: 5
YP: 4
GELS: 1/3/5
API Filt: n/s
CAKE: 1/0
pH: 9.1
Cl: 2,300
Ca: 80



MD: 3,261'
TVD: 3,233.43'
Inclination: 12.9 °
Azimuth: 263.65 °

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

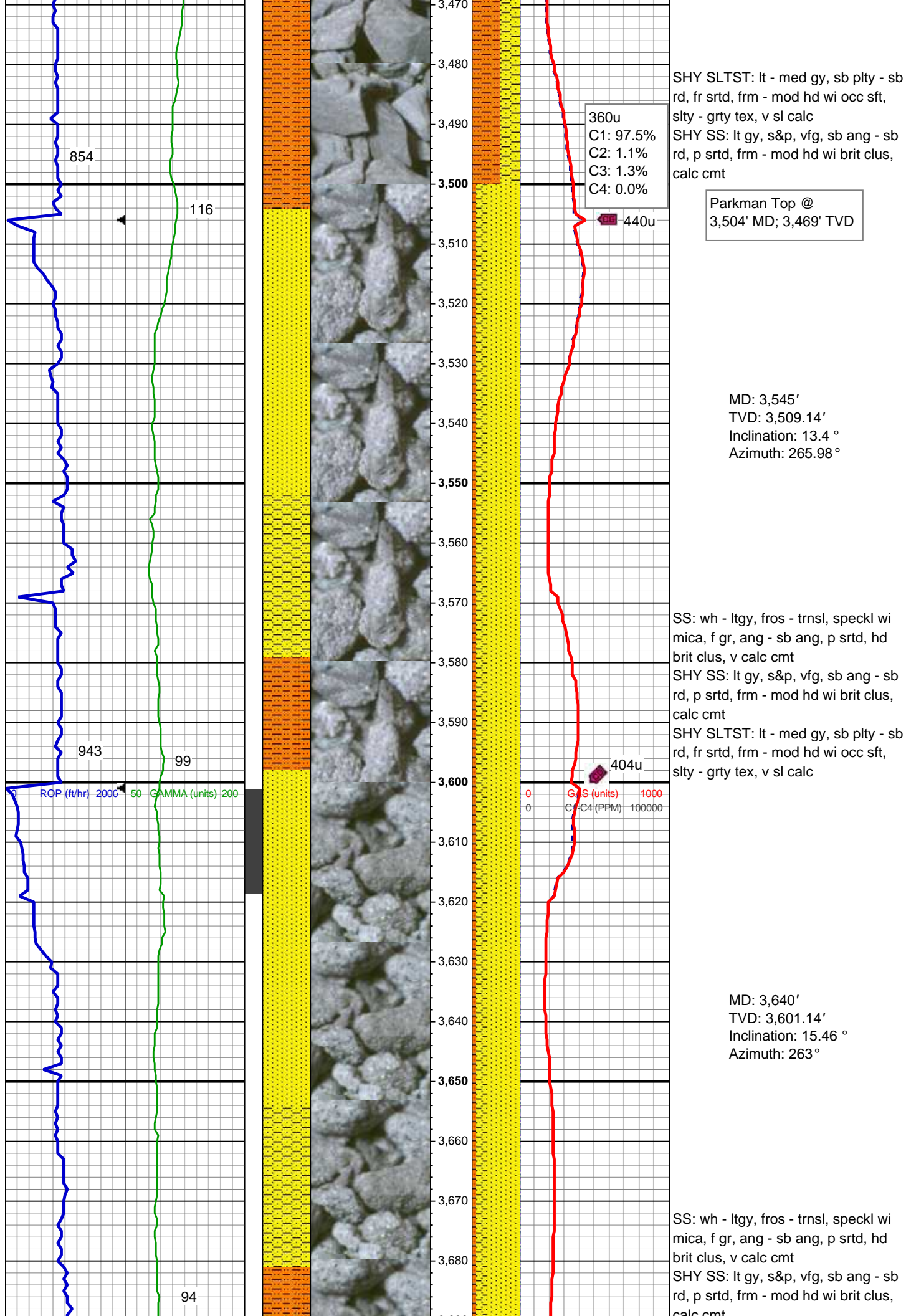
239u
C1: 97.2%
C2: 1.8%
C3: 1.0%
C4: 0.0%

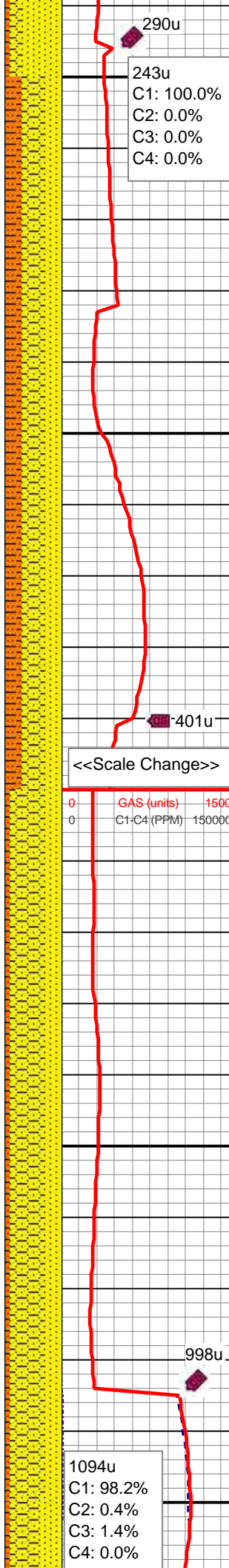
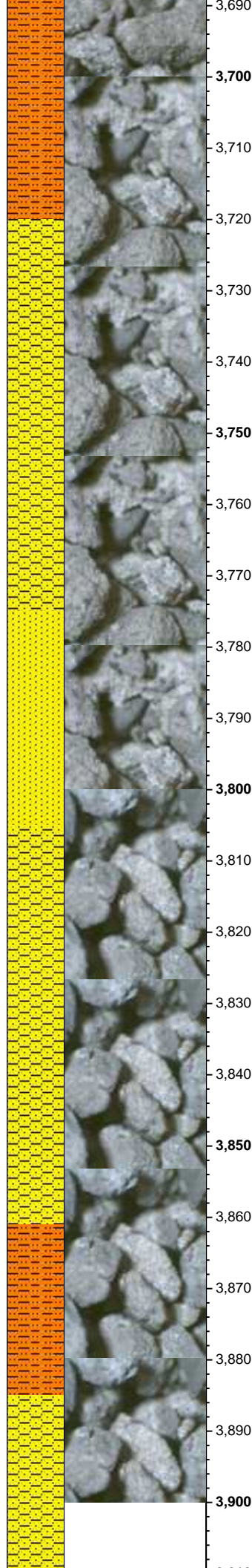
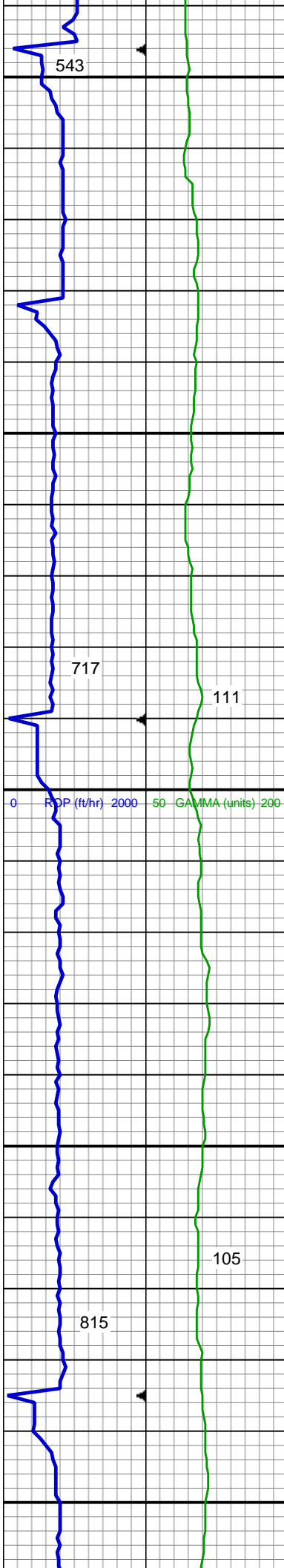
MD: 3,355'
TVD: 3,324.92'
Inclination: 13.64 °
Azimuth: 268.57 °

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

MUD WT: 8.8/8.7
VIS: 33/31 IN/OUT

MD: 3,450'
TVD: 3,417'
Inclination: 14.83 °
Azimuth: 265.43 °





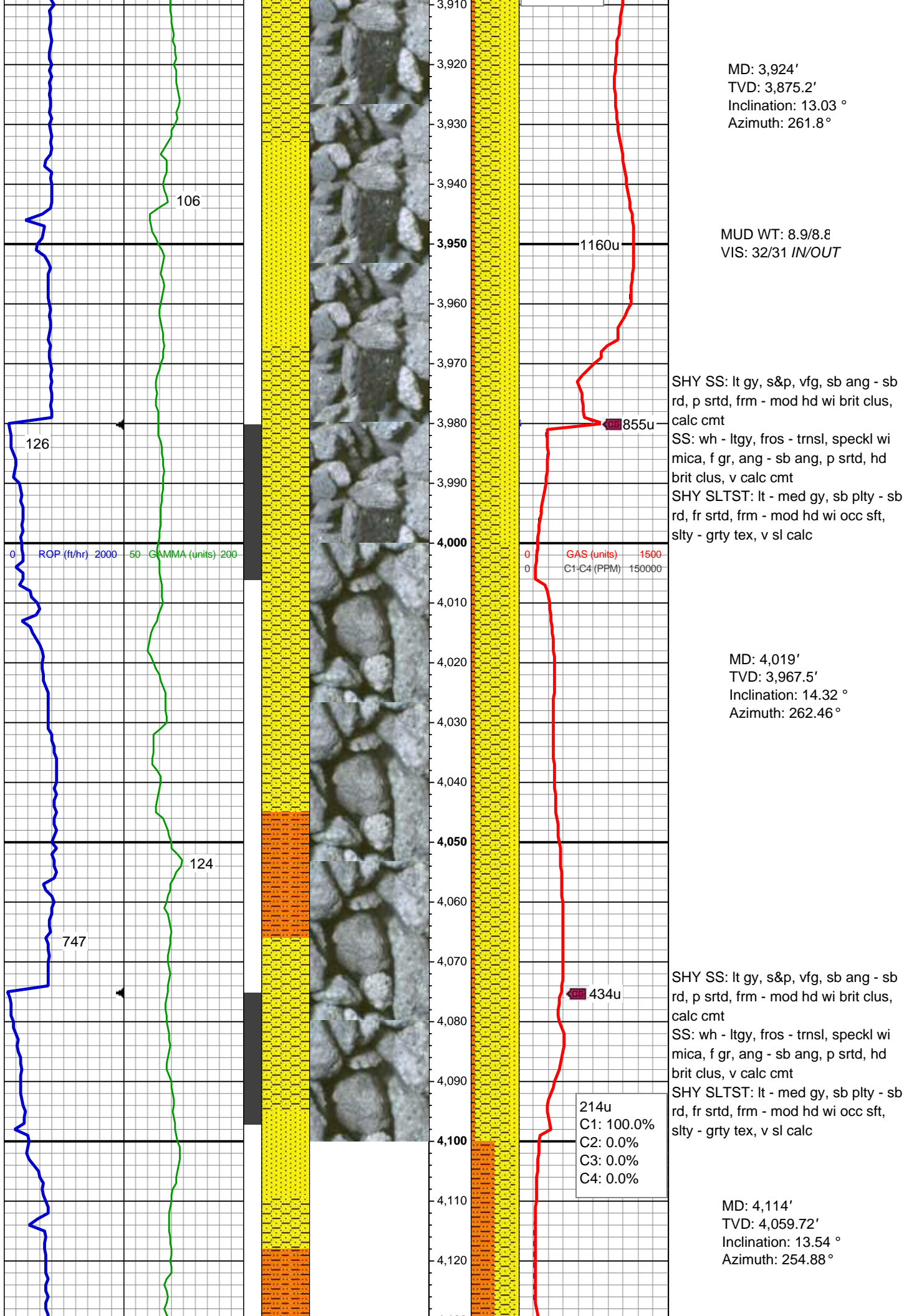
Calc cmt
SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
slty - grty tex, v sl calc

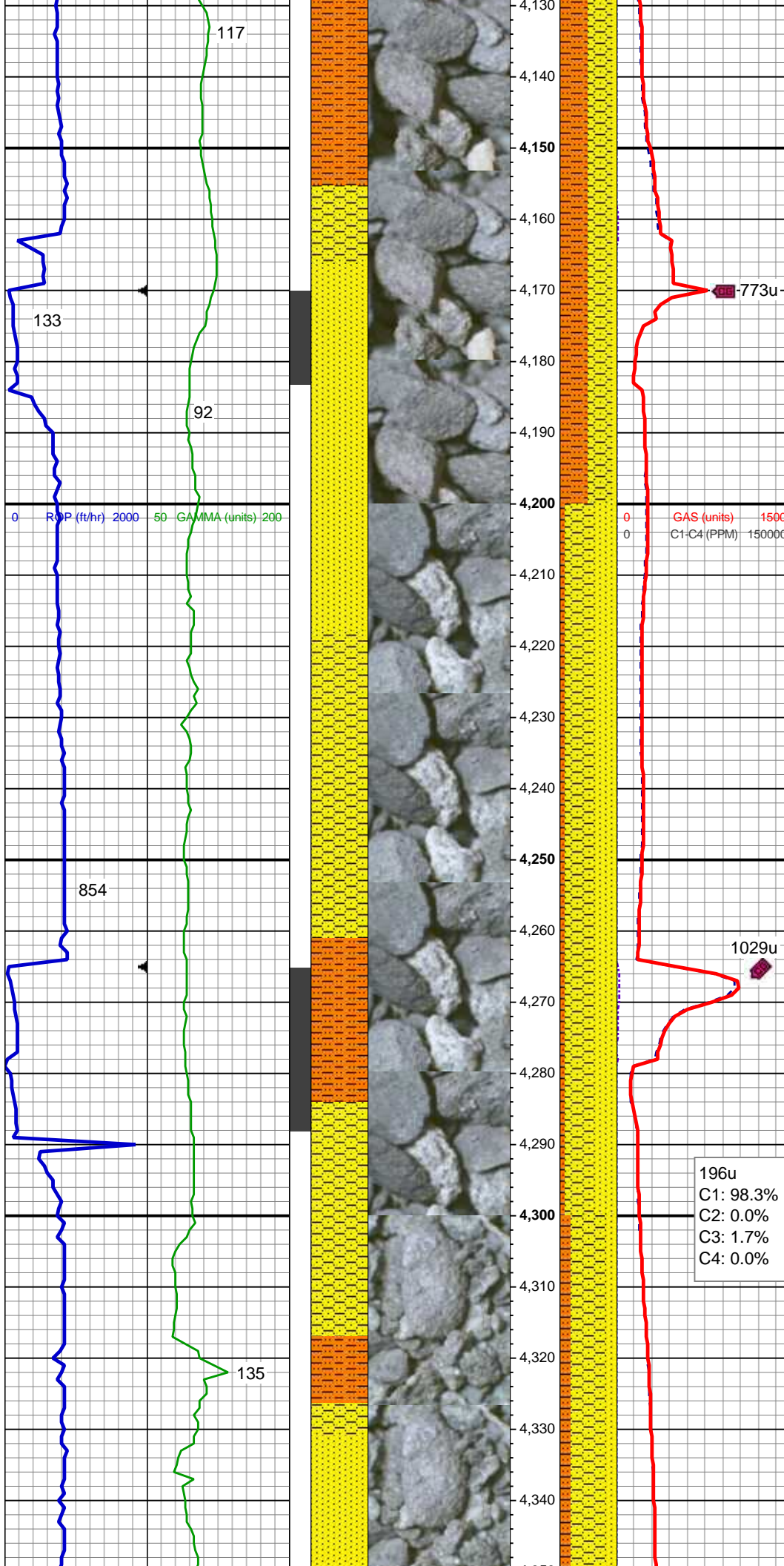
MD: 3,735'
TVD: 3,692.59'
Inclination: 15.96 °
Azimuth: 262.77 °

SHY SS: lt gy, s&p, vfg, sb ang - sb
rd, p srted, frm - mod hd wi brit clus,
calc cmt
SS: wh - ltgy, fros - trnsd, speckl wi
mica, f gr, ang - sb ang, p srted, hd
brit clus, v calc cmt
SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
slty - grty tex, v sl calc

MD: 3,829'
TVD: 3,783.1'
Inclination: 15.34 °
Azimuth: 262.49 °

SHY SS: lt gy, s&p, vfg, sb ang - sb
rd, p srted, frm - mod hd wi brit clus,
calc cmt
SS: wh - ltgy, fros - trnsd, speckl wi
mica, f gr, ang - sb ang, p srted, hd
brit clus, v calc cmt
SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
slty - grty tex, v sl calc





MUD WT: 8.80/8.80
VIS: 32/32 IN/OUT

Sussex Top @
4,166' MD; 4,111' TVD

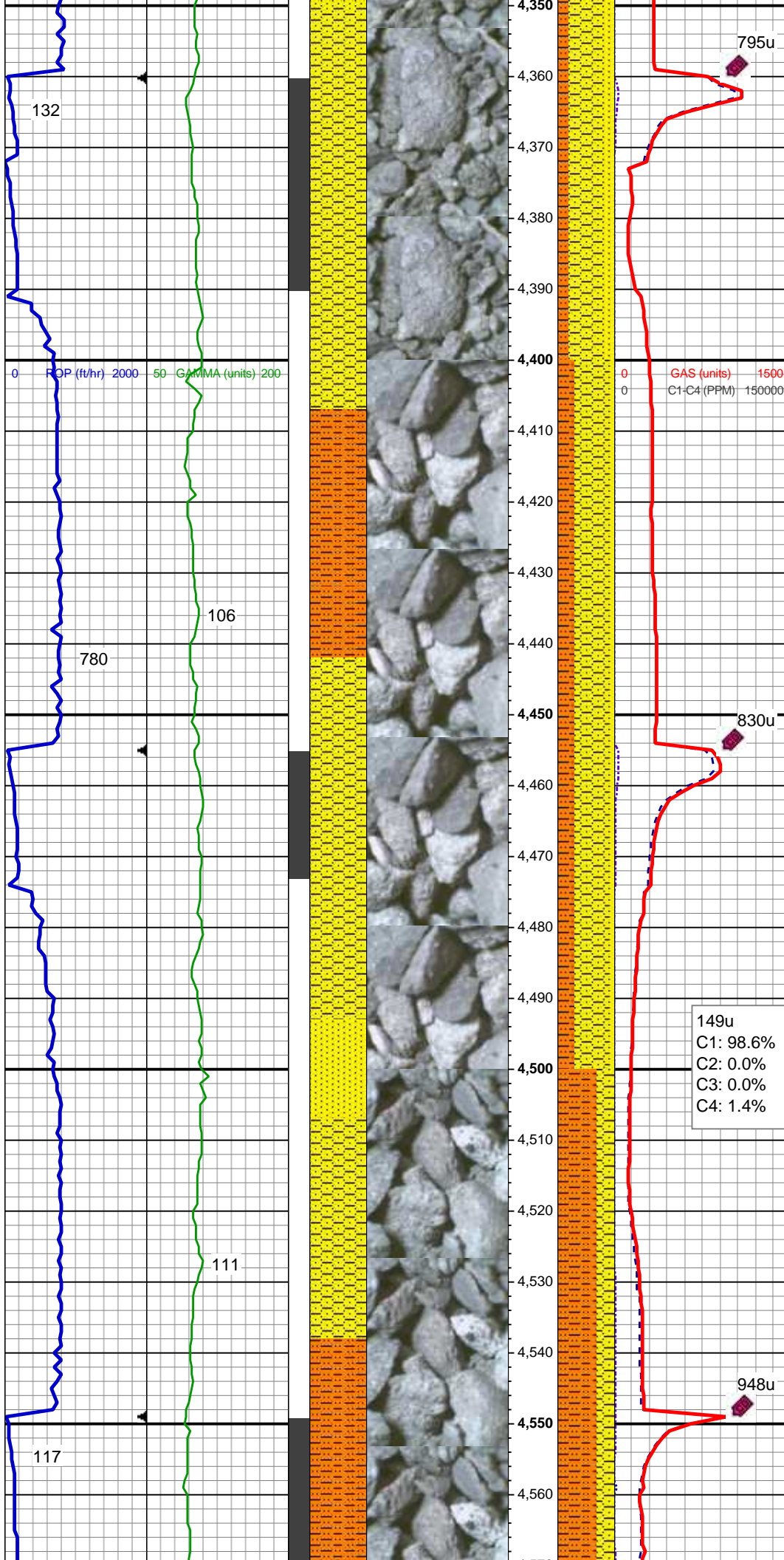
SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
slty - grty tex, v sl calc
SHY SS: lt gy, s&p, vfg, sb ang - sb
rd, p srted, frm - mod hd wi brit clus,
calc cmt
SS: wh - ltgy, fros - trnsd, speckl wi
mica, f gr, ang - sb ang, p srted, hd
brit clus, v calc cmt

MD: 4,208'
TVD: 4,151.2'
Inclination: 13.04 °
Azimuth: 255.75 °

SHY SS: lt gy, s&p, vfg, sb ang - sb
rd, p srted, frm - mod hd wi brit clus,
calc cmt
SS: wh - ltgy, fros - trnsd, speckl wi
mica, f gr, ang - sb ang, p srted, hd
brit clus, v calc cmt
SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
slty - grty tex, v sl calc

MD: 4,303'
TVD: 4,243.8'
Inclination: 12.75 °
Azimuth: 259.21 °

196u
C1: 98.3%
C2: 0.0%
C3: 1.7%
C4: 0.0%



SHY SS: lt gy, s&p, vfg, sb ang - sb
rd, p srted, frm - mod hd wi brit clus,
calc cmt
SS: wh - ltgy, fros - trnsd, speckl wi
mica, f gr, ang - sb ang, p srted, hd
brit clus, v calc cmt
SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
slty - grty tex, v sl calc

MD: 4,398'
TVD: 4,336.26'
Inclination: 13.82 °
Azimuth: 262.81 °

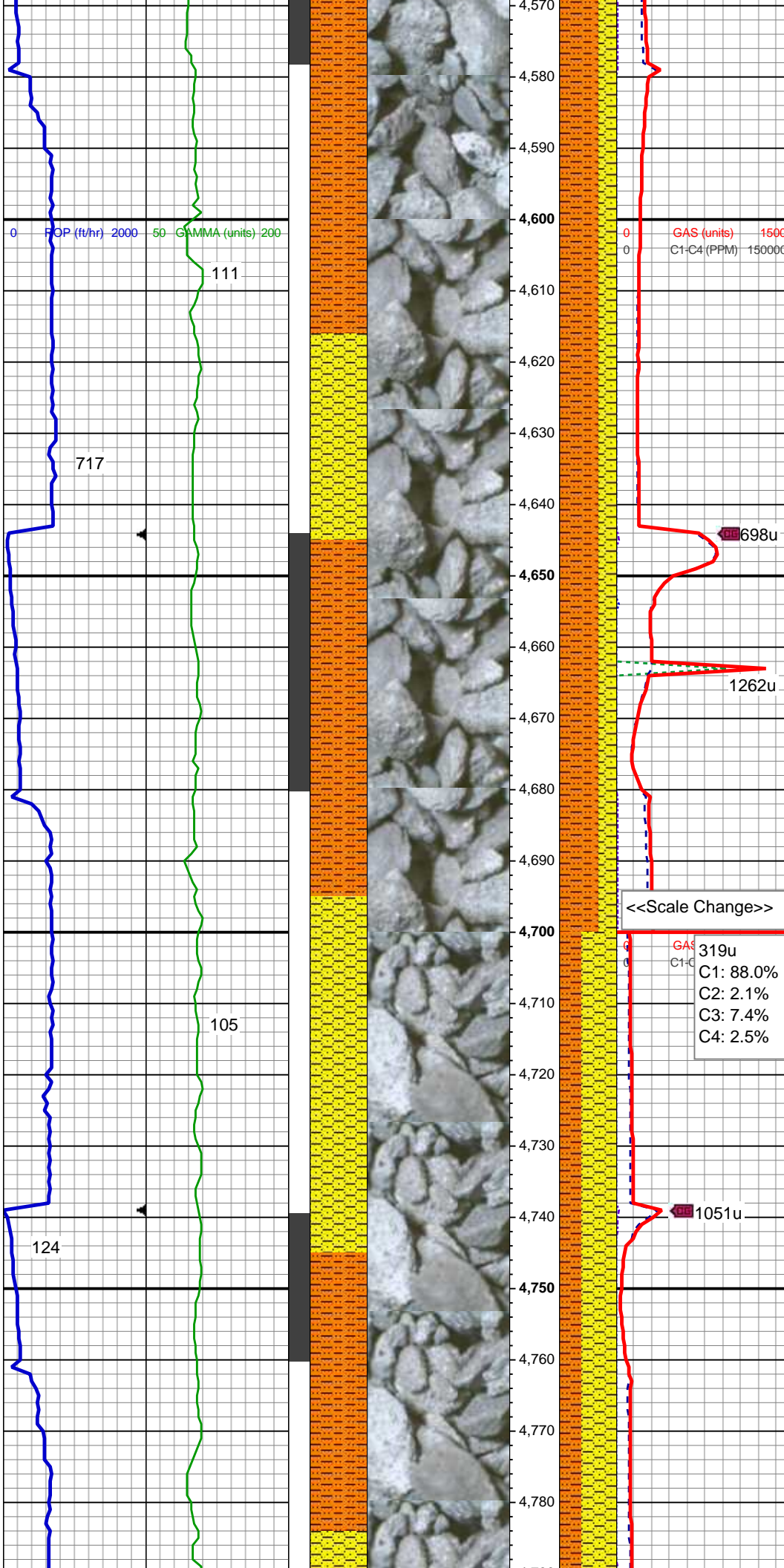
MUD WT: 8.80/8.85
VIS: 30/29 IN/OUT

SHY SS: lt gy, s&p, vfg, sb ang - sb
rd, p srted, frm - mod hd wi brit clus,
calc cmt
SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
slty - grty tex, v sl calc
SS: wh - ltgy, fros - trnsd, speckl wi
mica, f gr, ang - sb ang, p srted, hd
brit clus, v calc cmt

149u
C1: 98.6%
C2: 0.0%
C3: 0.0%
C4: 1.4%

MD: 4,493'
TVD: 4,428.53'
Inclination: 13.75 °
Azimuth: 263.57 °

MD: 4,588'



TVD: 4,520.95'
Inclination: 13.02 °
Azimuth: 263.11 °

SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
silty - grty tex, v sl calc
SHY SS: lt gy, s&p, vfg, sb ang - sb
rd, p srted, frm - mod hd wi brit clus,
calc cmt

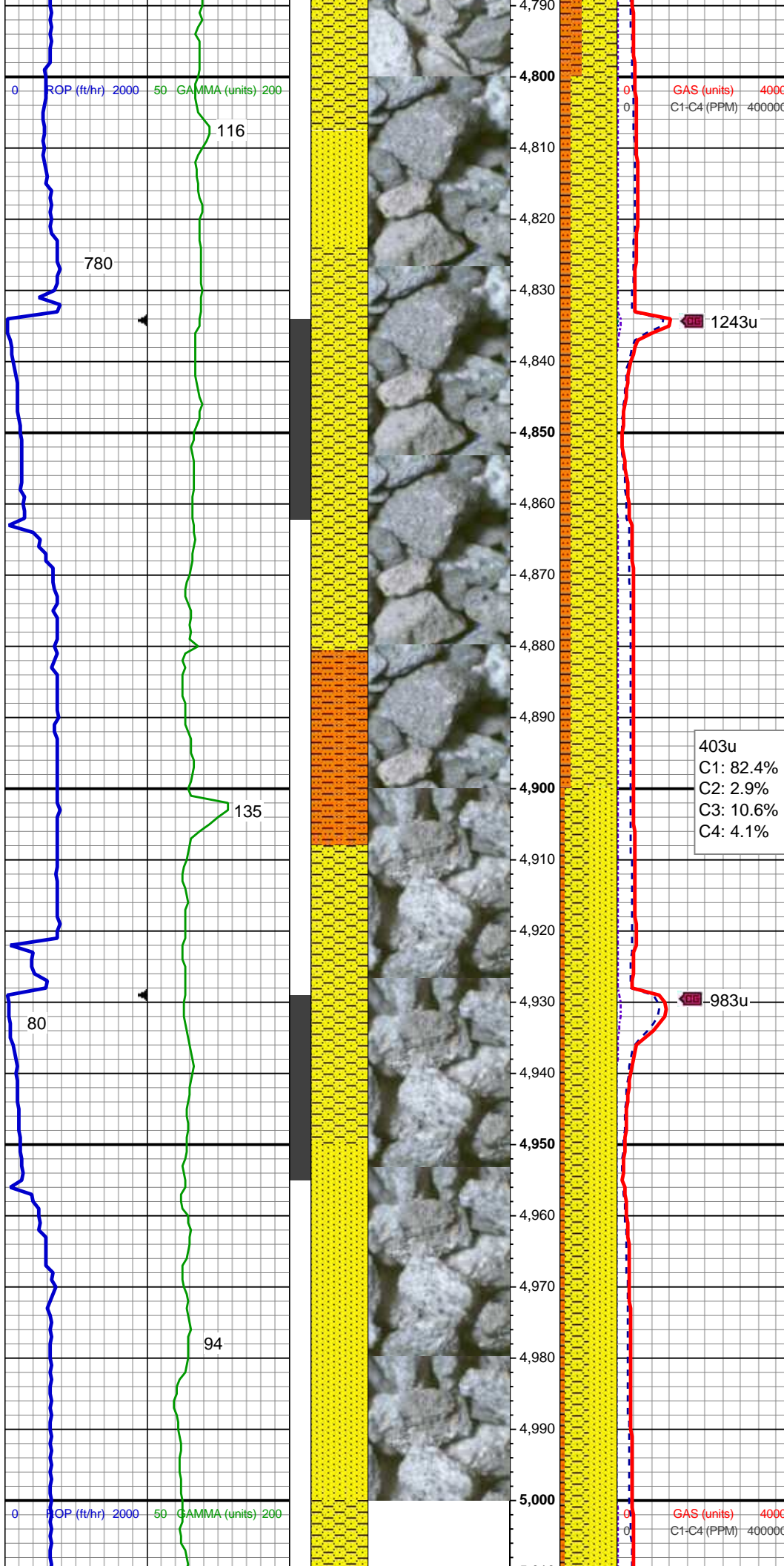
MD: 4,683'
TVD: 4,613.24'
Inclination: 14.37 °
Azimuth: 260.05 °

SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
silty - grty tex, v sl calc
SHY SS: lt gy, s&p, vfg, sb ang - sb
rd, p srted, frm - mod hd wi brit clus,
calc cmt

MUD WT: 8.80/8.85
VIS: 29/30 IN/OUT

MD: 4,778'
TVD: 4,705.35'
Inclination: 13.96 °
Azimuth: 260.48 °

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



SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
silty - grty tex, v sl calc

Shannon Top @
4,807' MD; 4,734' TVD

MD: 4,873'
TVD: 4,797.45'
Inclination: 14.43 °
Azimuth: 259.97 °

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

SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
silty - grty tex, v sl calc

SS: wh - ltgy, fros - trnsf, speckl wi
mica, f gr, ang - sb ang, p srted, hd
brit clus, v calc cmt

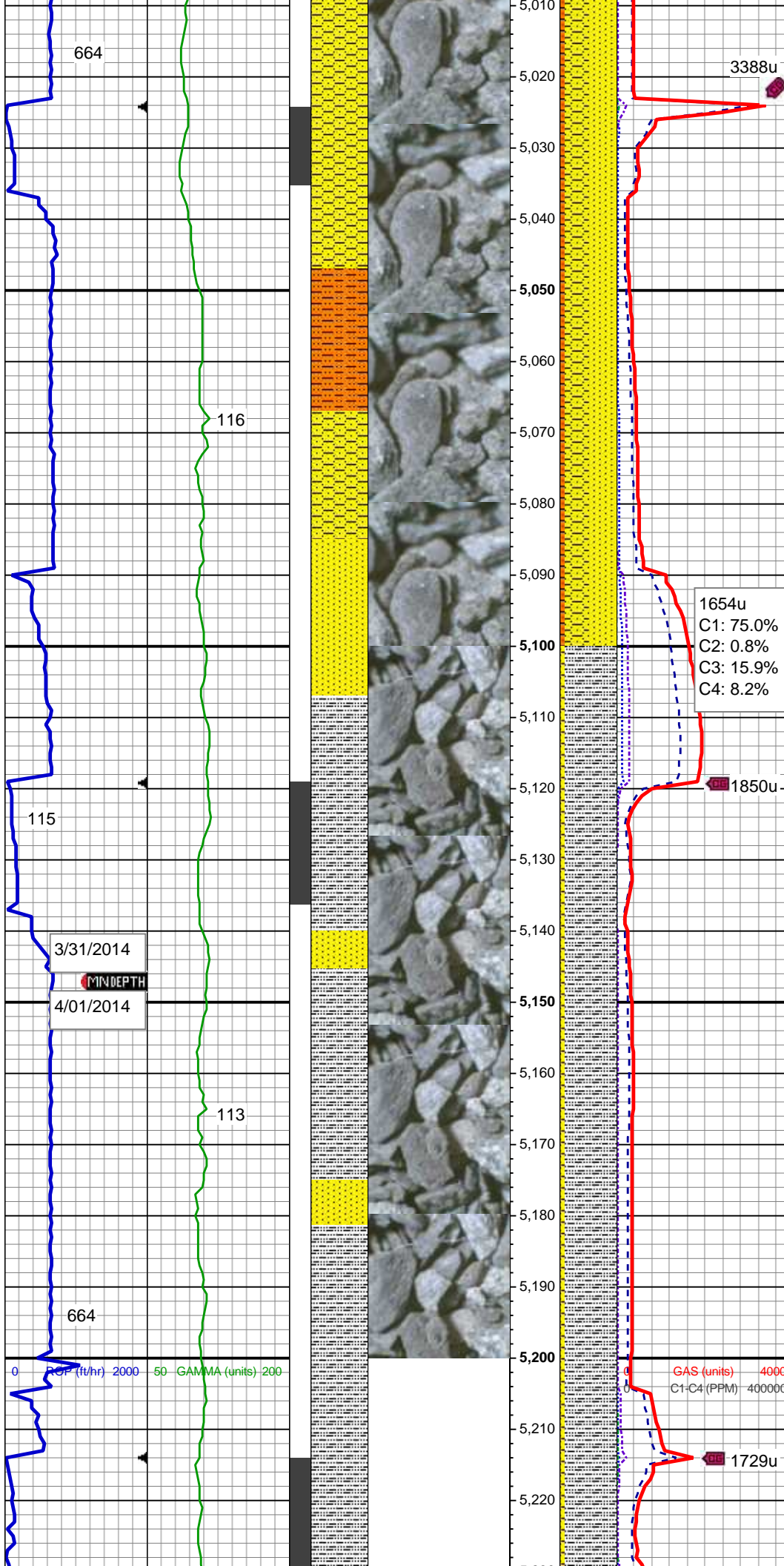
403u
C1: 82.4%
C2: 2.9%
C3: 10.6%
C4: 4.1%

MD: 4,968'
TVD: 4,889.24'
Inclination: 15.46 °
Azimuth: 258.52 °

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

SS: wh - ltgy, fros - trnsf, speckl wi
mica, f gr, ang - sb ang, p srted, hd
brit clus, v calc cmt

SHY SLTST: lt - med gy, sb plty - sb
rd, fr srted, frm - mod hd wi occ sft,
silty - grty tex, v sl calc



MD: 5,063'
TVD: 4,980.9'
Inclination: 14.99 °
Azimuth: 258.14 °

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

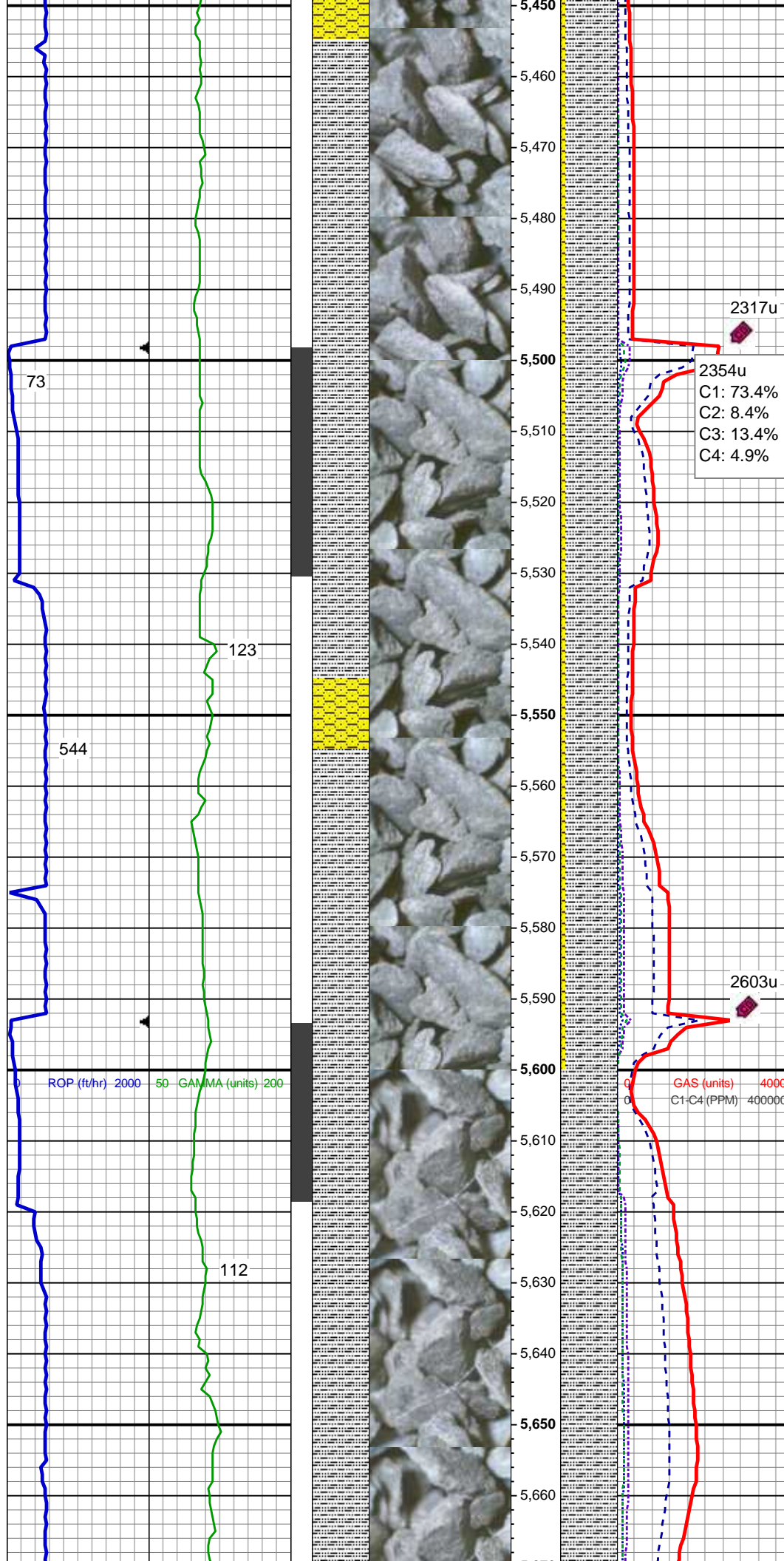
SS: wh - ltgy, fros - trnsd, speckl wi mica, f gr, ang - sb ang, p srted, hd brit clus, v calc cmt

SHY SLTST: lt - med gy, sb plty - sb rd, fr srted, frm - mod hd wi occ sft, slty - grty tex, v sl calc

MD: 5,158'
TVD: 5,072.93'
Inclination: 13.76 °
Azimuth: 258.27 °

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

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



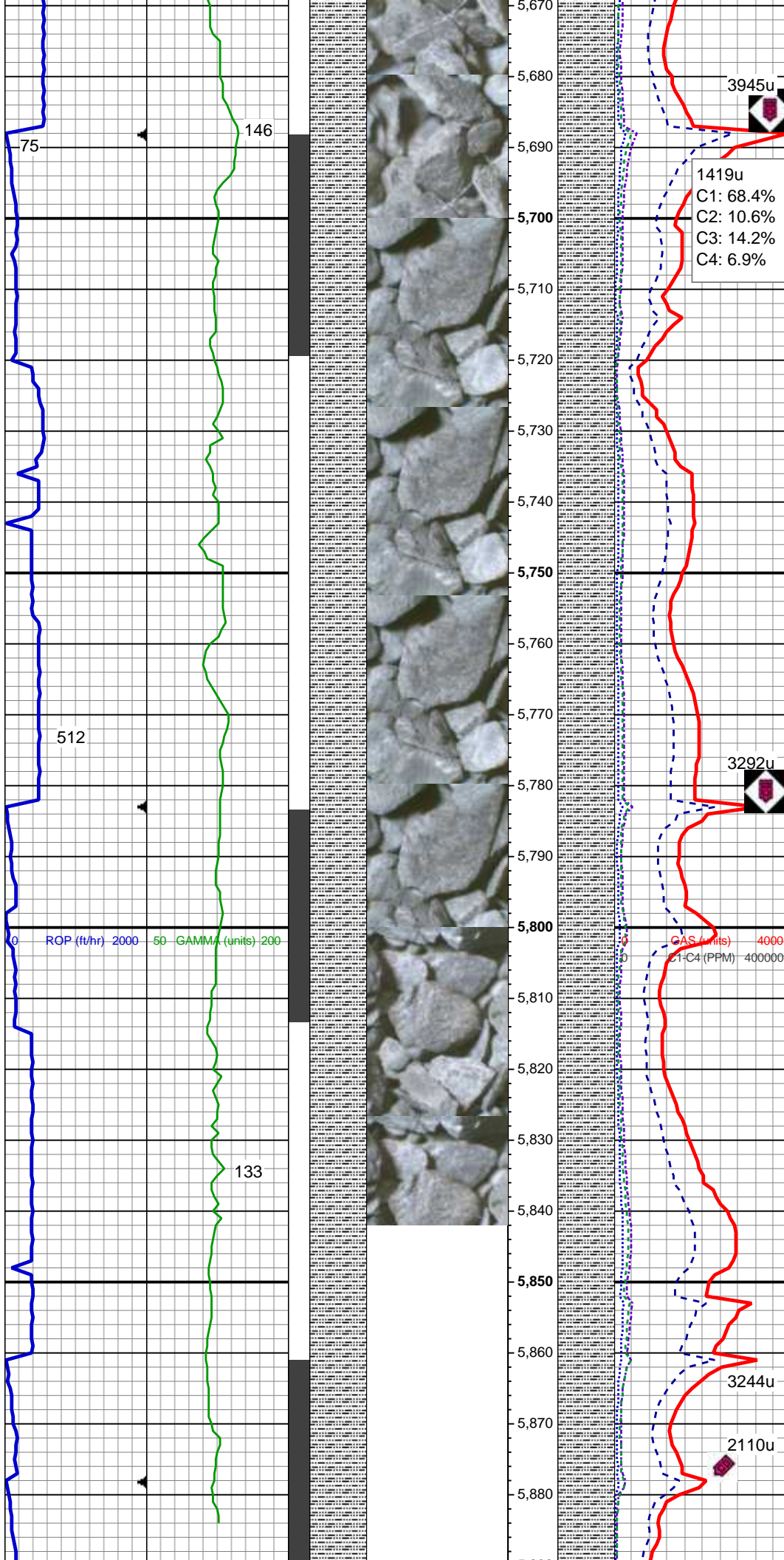
SLTY SH: lt - med gy brn, occ dk gy,
frm - hd, plty - sb plty, occ sb blk,
sly - grty tex, v sl calc
SHY SS: lt gy, fros - trnsl, s&p, vfg,
sb ang - sb rd, p srted, mod hd wi
brit clus, calc cmt

MD: 5,537'
TVD: 5,440.41'
Inclination: 15.48 °
Azimuth: 261.59 °

SLTY SH: lt - med gy brn, occ dk gy,
frm - hd, plty - sb plty, occ sb blk,
sly - grty tex, v sl calc
SHY SS: lt gy, fros - trnsl, s&p, vfg,
sb ang - sb rd, p srted, mod hd wi
brit clus, calc cmt

MD: 5,632'
TVD: 5,532.14'
Inclination: 14.65 °
Azimuth: 259.57 °

04/01/2014
Mud Wt: 9.50
FVis: 34
PVis: 10
YP: 8
GELS: 3/7/11
API Filt: 9.2
CAKE: 1/0
pH: 8.8
Cl: 2,400
Ca: 80



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

MD: 5,727'
TVD: 5,623.94'
Inclination: 15.19 °
Azimuth: 257.99 °

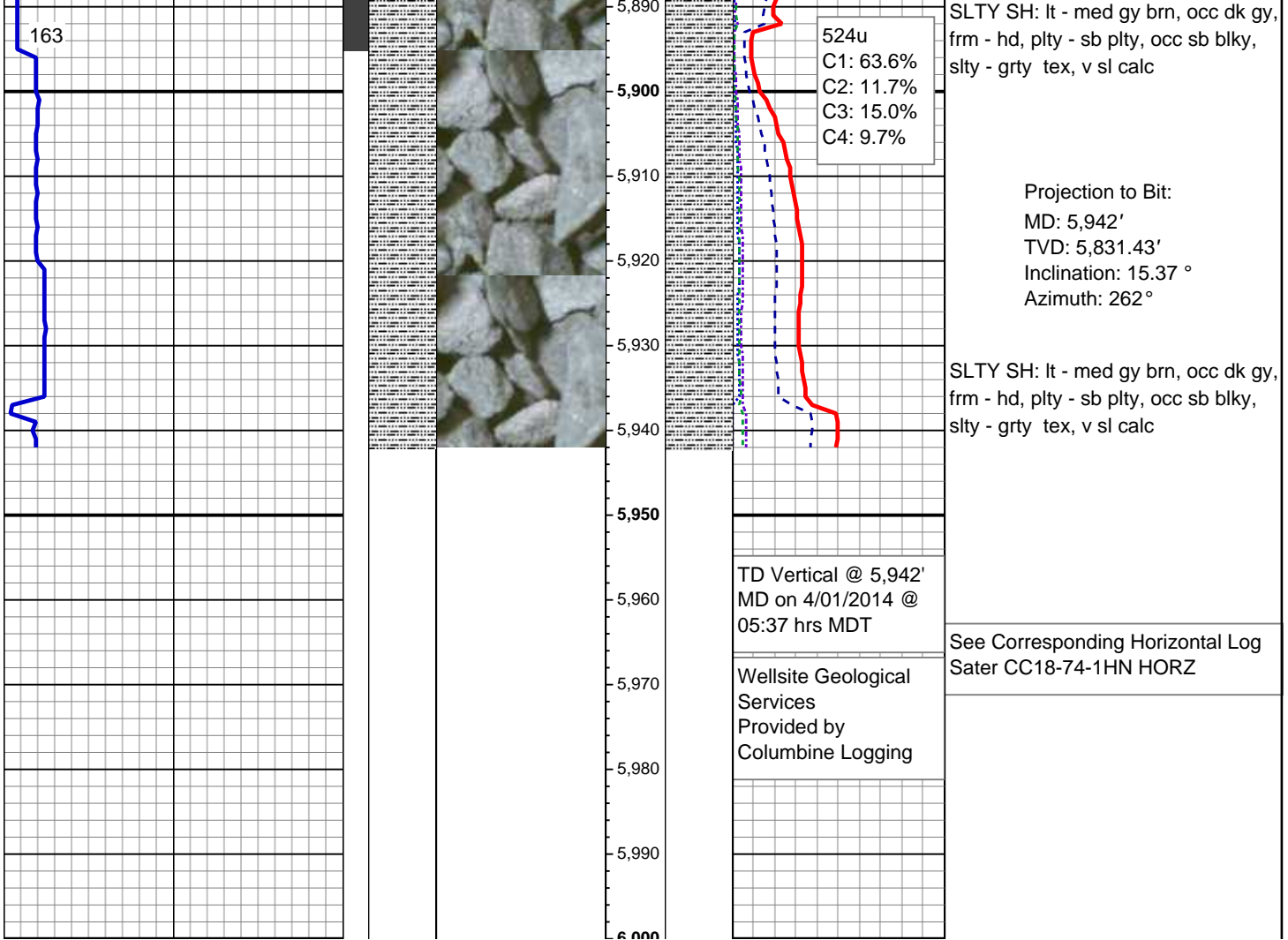
SLTY SH: lt - med gy brn, occ dk gy,
frm - hd, plty - sb plty, occ sb blk,
slty - grty tex, v sl calc

MD: 5,821'
TVD: 5,714.7'
Inclination: 14.98 °
Azimuth: 259.19 °

MUD WT: 9.70/9.60
VIS: 33/33 IN/OUT

Teepee Buttes Top @
5,873' MD; 5,765' TVD

MD: 5,885'
TVD: 5,776.47'
Inclination: 15.37 °
Azimuth: 262 °



See Corresponding Horizontal Log
Sater CC18-74-1HN HORZ