

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name EWS 4

Location NE, SE, Sec 18, T2N, R63W

State Colorado

County Weld

Country USA

Rig Number Ensign 121

API Number 05-123-44167-00

Field Wattenberg

Geographic Region DJ

Drilling Completed 2/21/2017

Spud Date 2/10/2017

Surface Coordinates NE, SE, Sec 18, T2N, R63W
2157' FSL, 498' FEL
40.137050, -104.472640

Bottom Hole Coordinates NE, SE, Sec 18, T2N, R63W
2157' FSL, 498' FEL
40.137050, -104.472640

Ground Elevation 4877'

K.B. Elevation 4890'

Logged Interval 109' **To** 10190'

Total Depth 10190'

Formation Pierre to Fountain

Type of Drilling Fluid Water Based Mud

Operator

Company Petrotek

Address 5935 S Zang St Ste 200
Littleton, CO 80127

Geologist

Name Arron Payne

Company Petrotek

Address 5935 S Zang St Ste 200
Littleton, CO 80127

Zone Color Coding

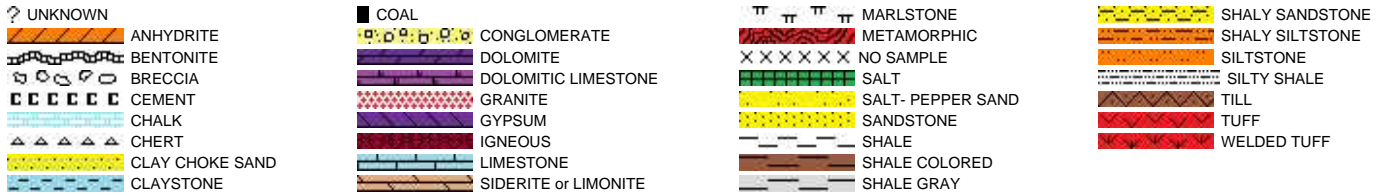
 Oil	 Condensate	 Gas
 Note	 Core	 Pressure
 Error	 Water	 Seal

Other

Loggers on site Dennis C. Vertrees, Andrew Martens, Mark Koury

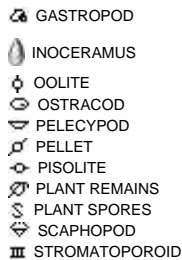
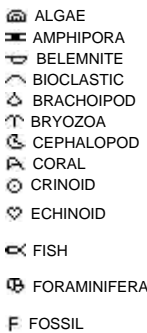
Bloodhound & Computer# 313 & 52A

Rock Types

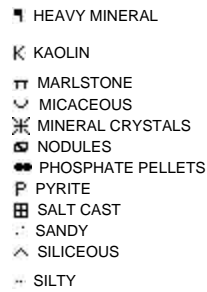
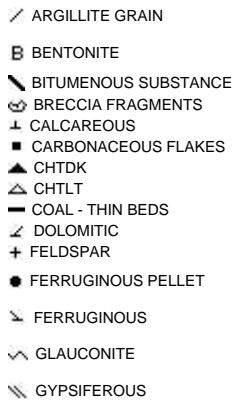
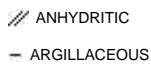


Accessories

Fossils



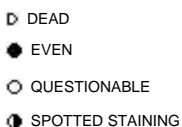
Minerals



Stringer

Other Symbols

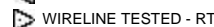
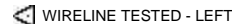
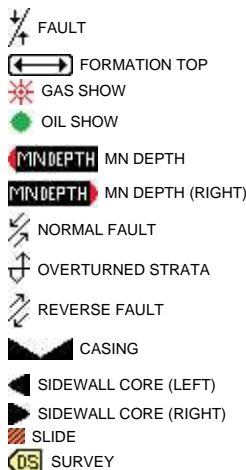
Oil Show



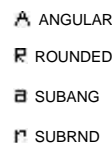
Porosity



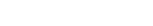
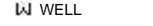
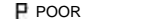
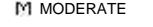
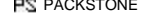
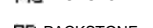
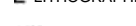
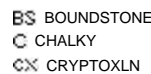
Engineering

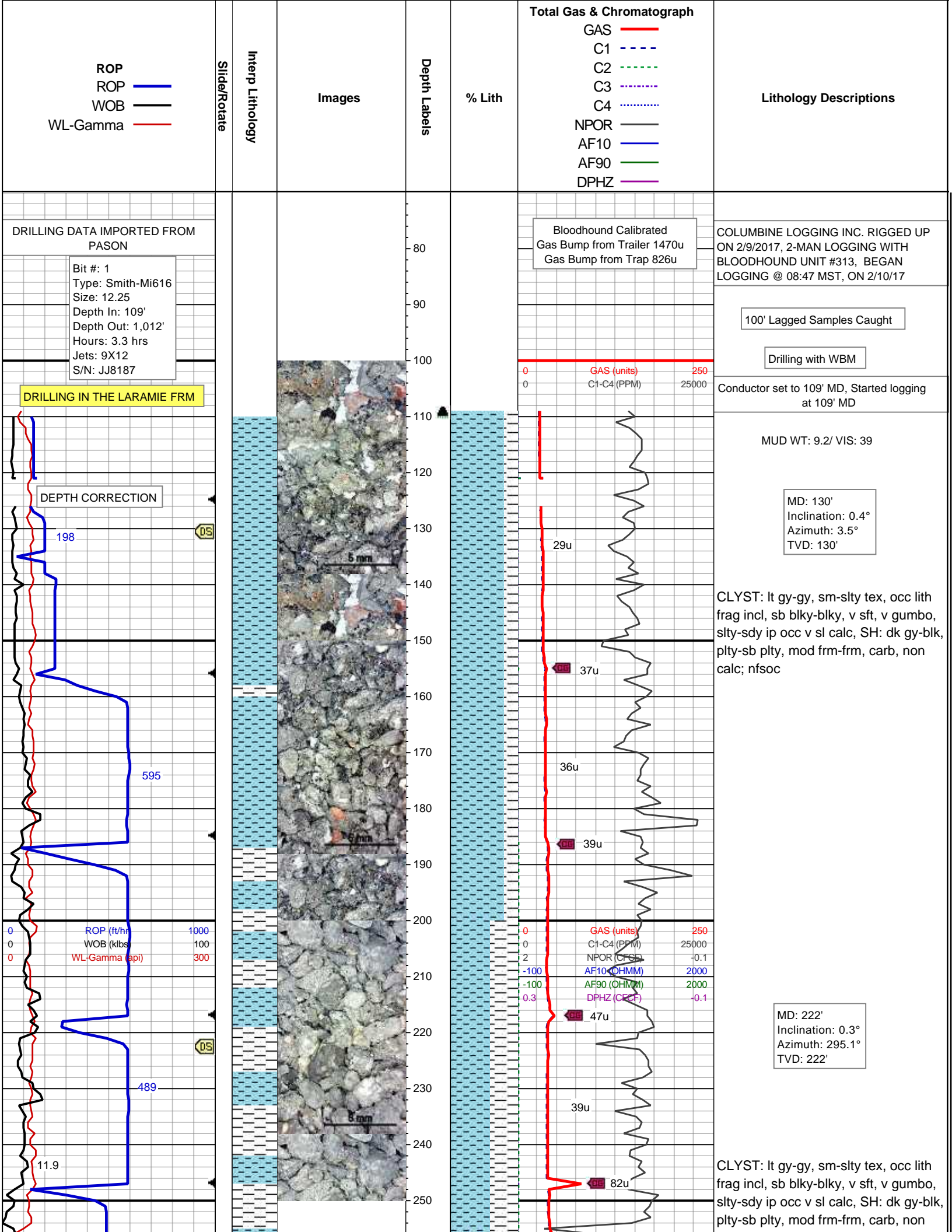


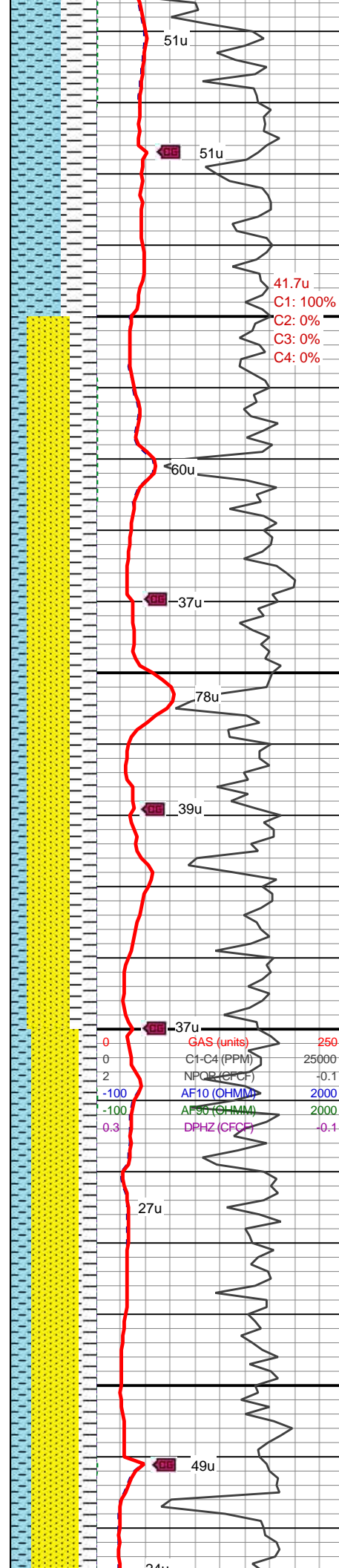
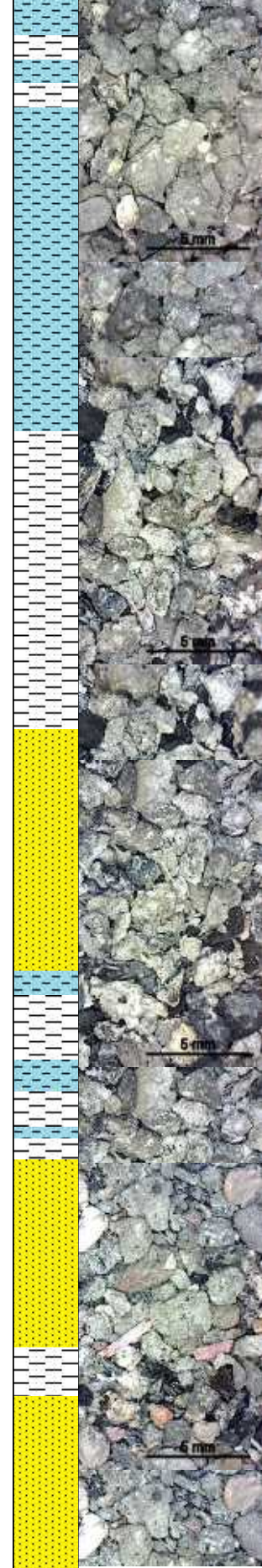
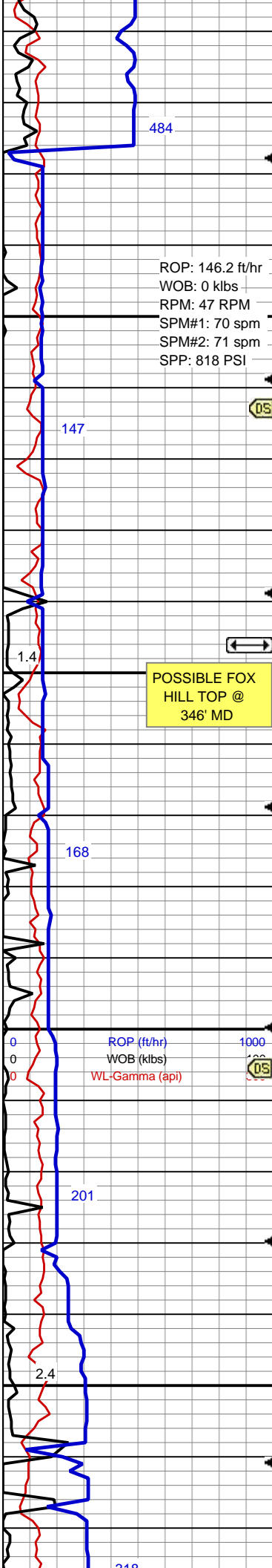
Rounding



Textures







calc; scat mica, nfsoc

TOOH TO CHECK FOR MUD BALLING ON BHA AND BIT AT 308' MD @ 10:42 MST, CLEANED BIT, WAITED ON DE-FOAMING CHEMICAL, TIH, RESUMED DRILLING @ 15:42 MST

MD: 313'
Inclination: 0.4°
Azimuth: 319.5°
TVD: 313'

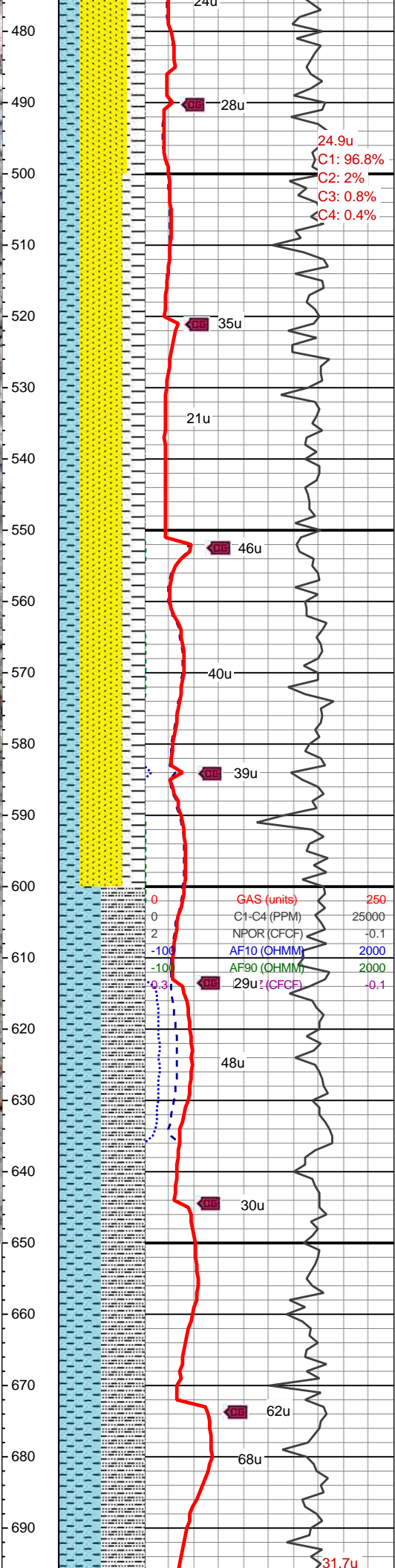
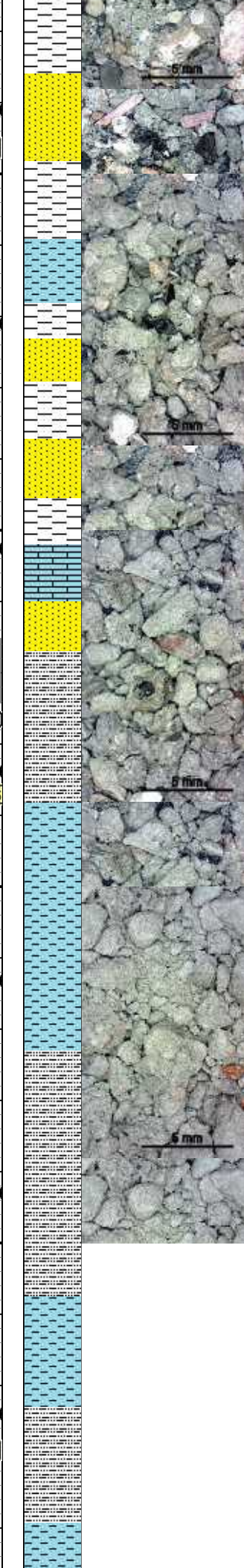
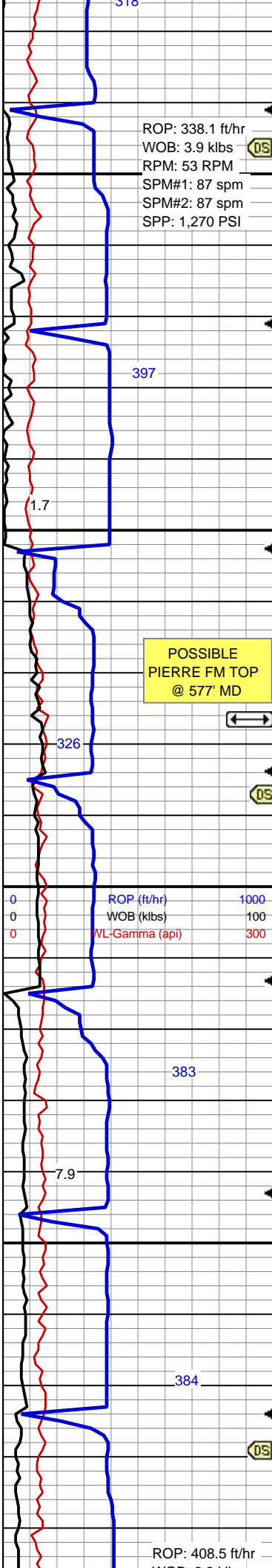
SH: dk gy-blk, gy ip, sb plty-sb blk, mod frm-frm, carb-lig, non calc, SS: wh-lt gy, rr clr-trnsl, vf-f gr, mod sft, sb rnd-sb ang, por srted, slty-cly mtx, p por, slty-shy ip, CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blk-bly, v sft, v gumbo, occ v sl calc; nfsoc

MUD WT: 9.25/ VIS: 37/ pH 8.6

MD: 405'
Inclination: 0.4°
Azimuth: 339.8°
TVD: 404.99'

MUD WT: 9.0/ VIS: 36

SH: dk gy-blk, gy ip, sb plty-sb blk, mod frm-frm, carb-lig, non calc, SS: wh-lt gy, rr clr-trnsl, vf-f gr, mod sft, sb rnd-sb ang, por srted, slty-cly mtx, p por, slty-shy ip, CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blk-bly, v sft, v gumbo, occ v sl calc; nfsoc



MD: 496'
Inclination: 0.4°
Azimuth: 342.9°
TVD: 495.99'

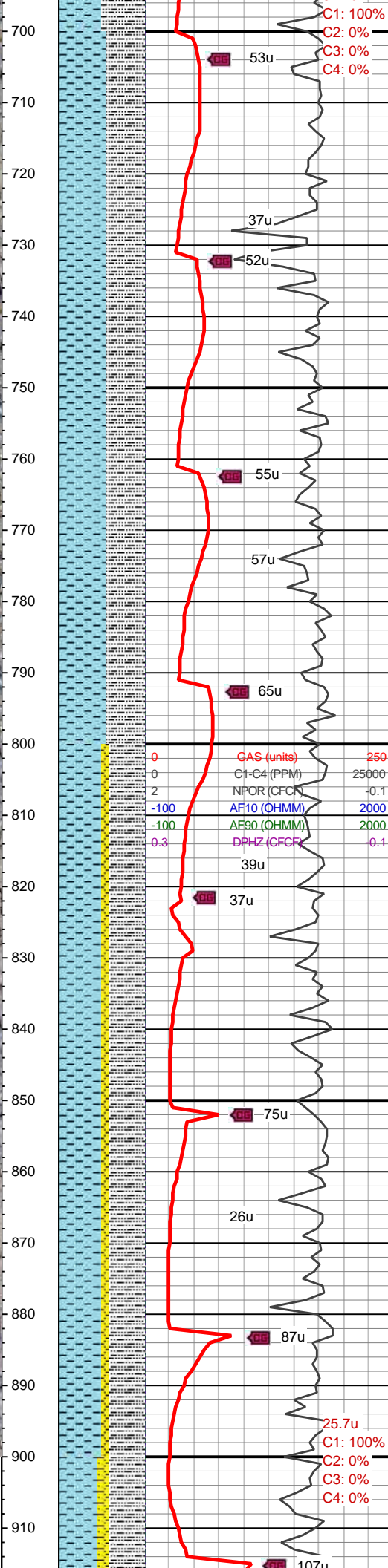
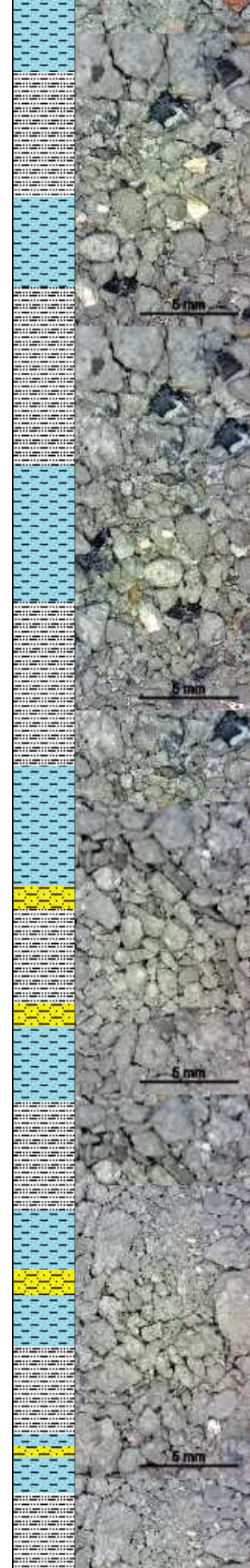
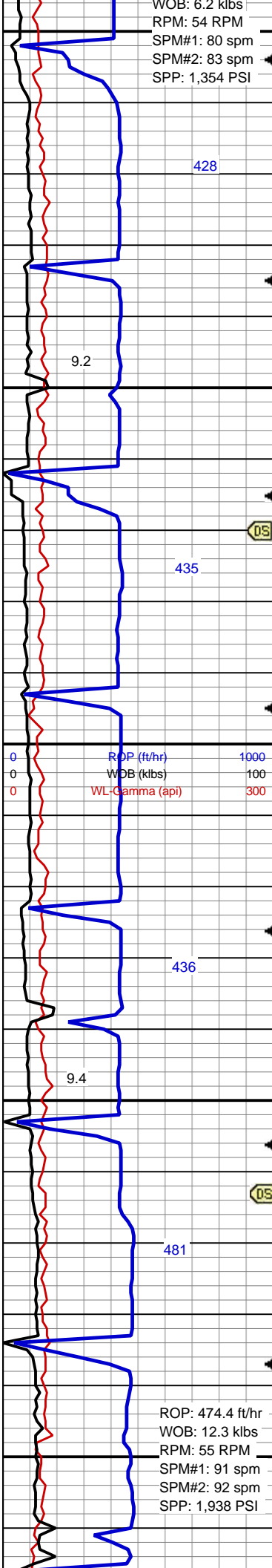
SH: dk gy-blk, gy ip, sb plty-sb blkly, mod frm-frm, carb-lig, non calc, SS: wh-lt gy, rr clr-trnsl, vf-f gr, mod sft, sb rnd-sb ang, por srted, slty-ctly mtx, p por, slty-shy ip, CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blkly-blkly, v sft, v gumbo, occ v sl calc, nfsoc

MD: 587'
Inclination: 0.4°
Azimuth: 343.8°
TVD: 586.99'

MUD WT: 9.3/ VIS: 36/ pH 8.6

CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blkly-blkly, v sft, v gumbo, occ v sl calc, SH: dk gy-blk, plty-sb plty, mod frm-frm, carb, non calc, SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; nfsoc

MD: 679'
Inclination: 0.3°
Azimuth: 320.1°
TVD: 678.99'



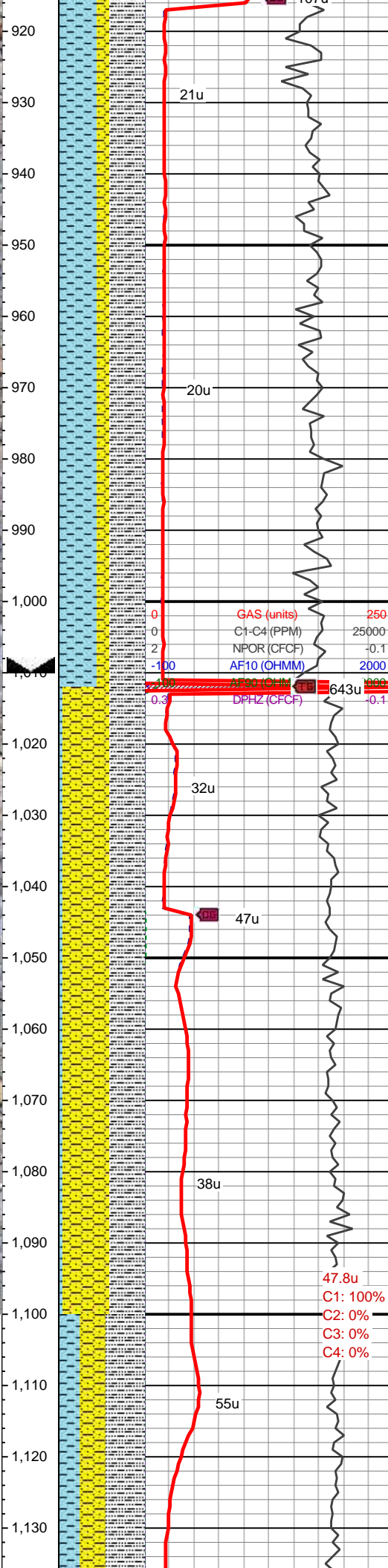
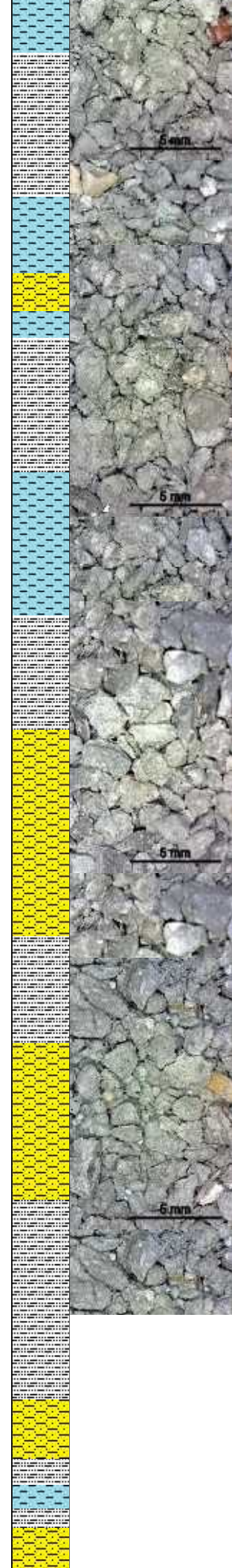
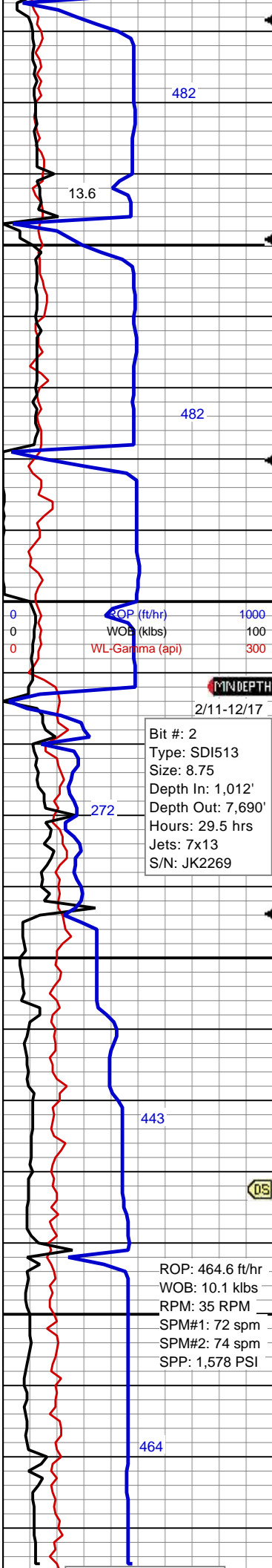
MUD WT: 9.2/ VIS: 36/ pH 8.7

CLYST: lt gy-gy, sm-sltly tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo, occ v sl calc, SH: dk gy-blk, plty-sb plty, mod frm-frm, carb, non calc, SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; nfsoc

MD: 770'
Inclination: 0.4°
Azimuth: 326.4°
TVD: 769.99'

CLYST: lt gy-gy, sm-sltly tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo, occ v sl calc, SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; SHY SS: lt gy, vf-f gr, mod srt, v sft-fri, mod cmt; nfsoc

MD: 863'
Inclination: 0.3°
Azimuth: 267.5°
TVD: 862.98'



CLYST: lt gy-gy, sm-sltly tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo, occ v sl calc, SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; SHY SS: lt gy, vf-f gr, mod srt, v sft-fri, mod cmt; nfsoc

Depth: 1,012
Mud Weight: 9.3
Viscosity: 37
Yield Pt: 5
API Filtrate: 8.4
Solids: 5.5%
pH: 8.7
Chlorides: 3,700 mg/l

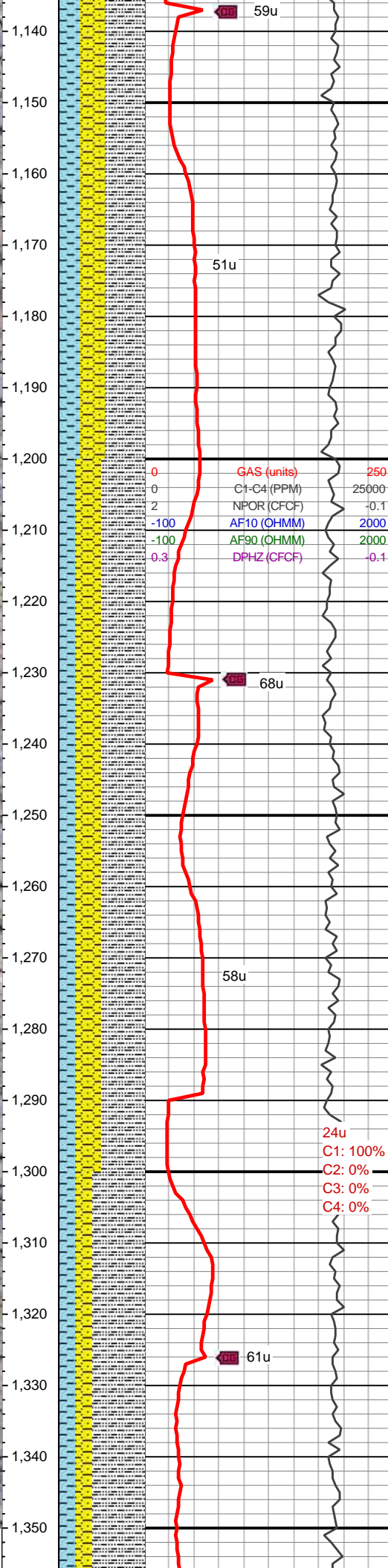
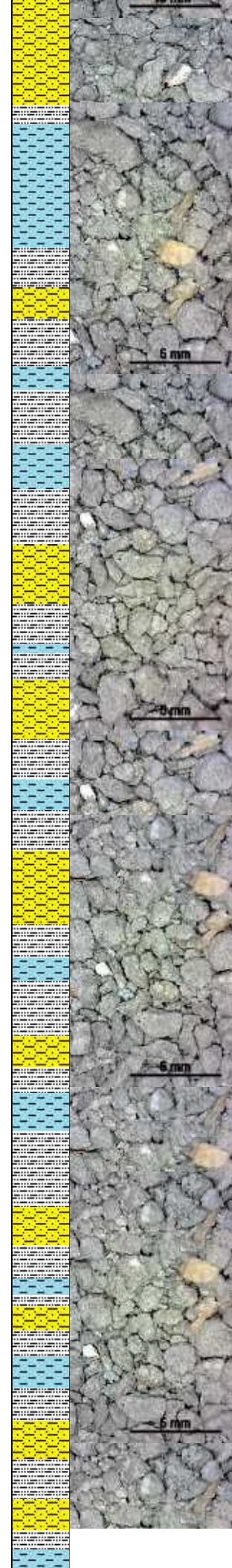
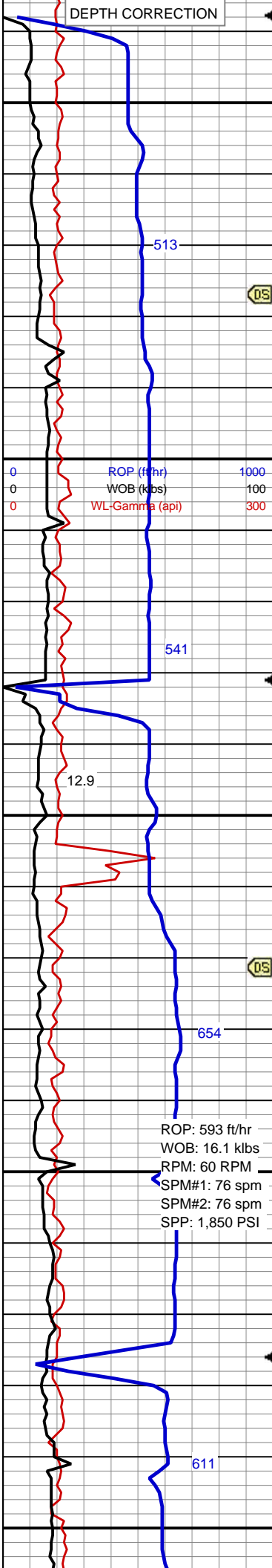
MUD WT: 9.2/ VIS: 36/ pH 8.8

TD SURFACE AT 1012' MD @ 21:00 MST ON 2/11/2017. RAN 1010' OF 9 5/8" CASING, CEMENTED, TESTED BOP, MADE UP 7500' OF 4.5" DRILL PIPE STANDS, RESUMED DRILLING OF INTERMEDIATE @ 16:08 MST ON 2/12/2017.

MUD WT: 9.6/ VIS: 37

SHY SS: lt gy, vf-f gr, mod srt, v sft-fri, mod cmt; SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; CLYST: lt gy-gy, sm-sltly tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo, occ v sl calc; nfsoc

MD: 1,082'
Inclination: 0.7°
Azimuth: 296.2°
TVD: 1,081.98'



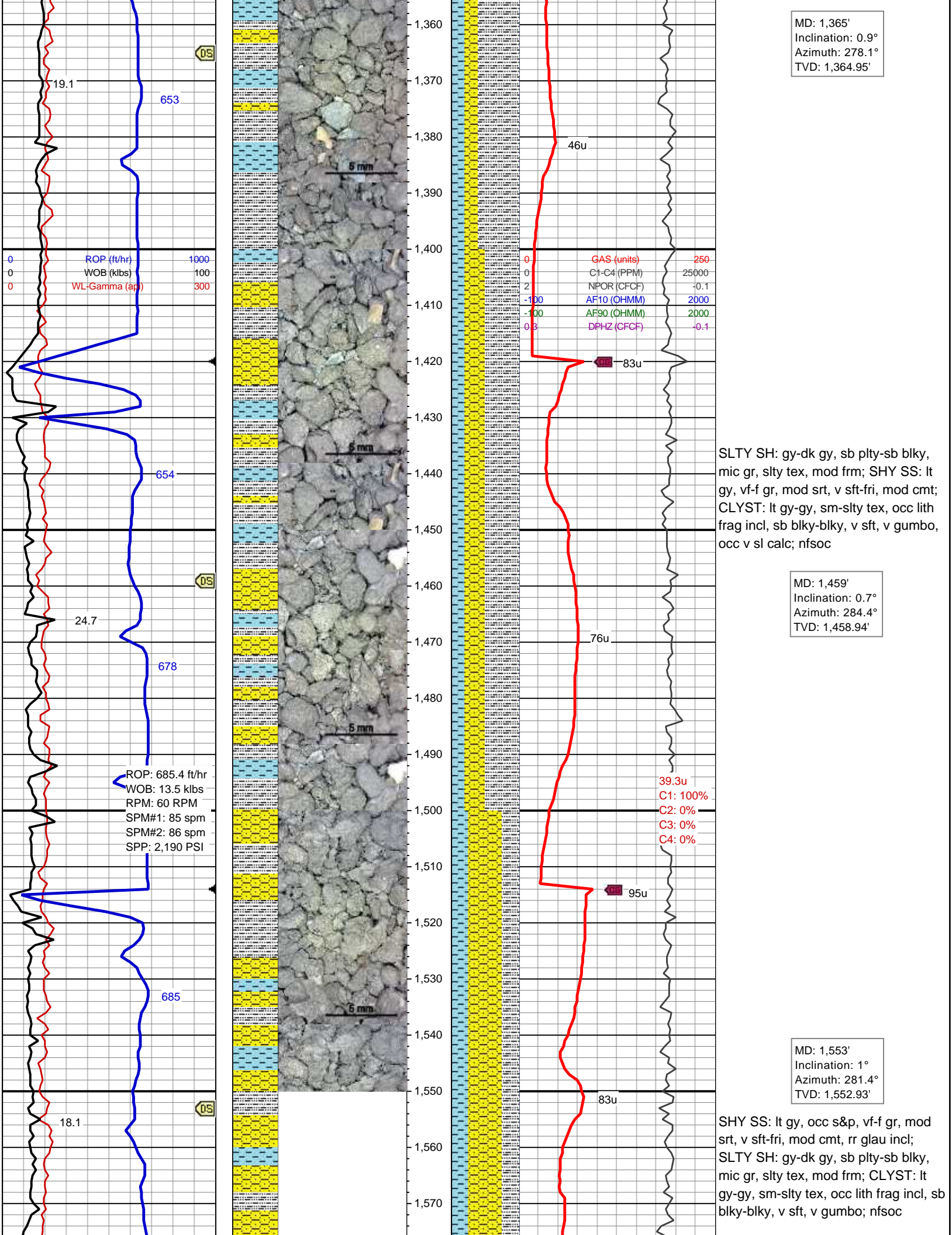
SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; SHY SS: lt gy, vf-f gr, mod srt, v sft-fri, mod cmt; CLYST: lt gy-gy, sm-sltly tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo, occ v sl calc; nfsoc

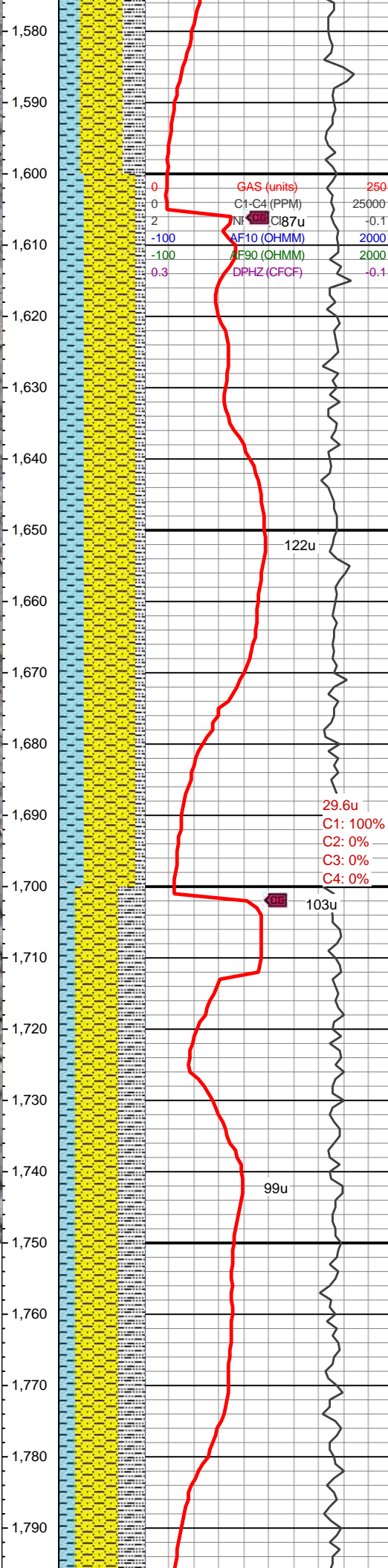
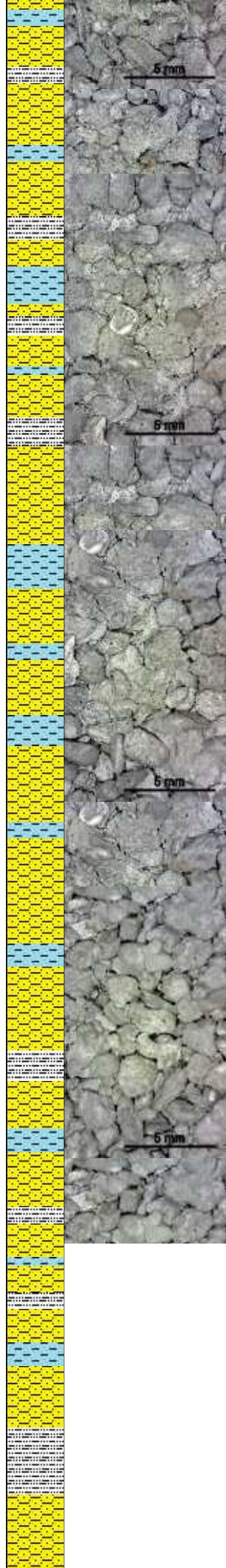
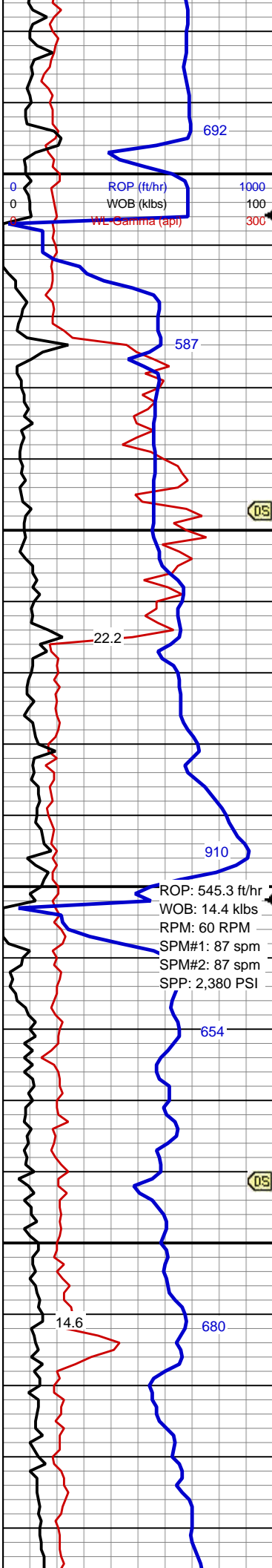
MD: 1,177'
Inclination: 0.9°
Azimuth: 288.1°
TVD: 1,176.97'

SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; SHY SS: lt gy, vf-f gr, mod srt, v sft-fri, mod cmt; CLYST: lt gy-gy, sm-sltly tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo, occ v sl calc; nfsoc

MD: 1,271'
Inclination: 0.8°
Azimuth: 289.3°
TVD: 1,270.96'

SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; SHY SS: lt gy, vf-f gr, mod srt, v sft-fri, mod cmt; CLYST: lt gy-gy, sm-sltly tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo, occ v sl calc; nfsoc





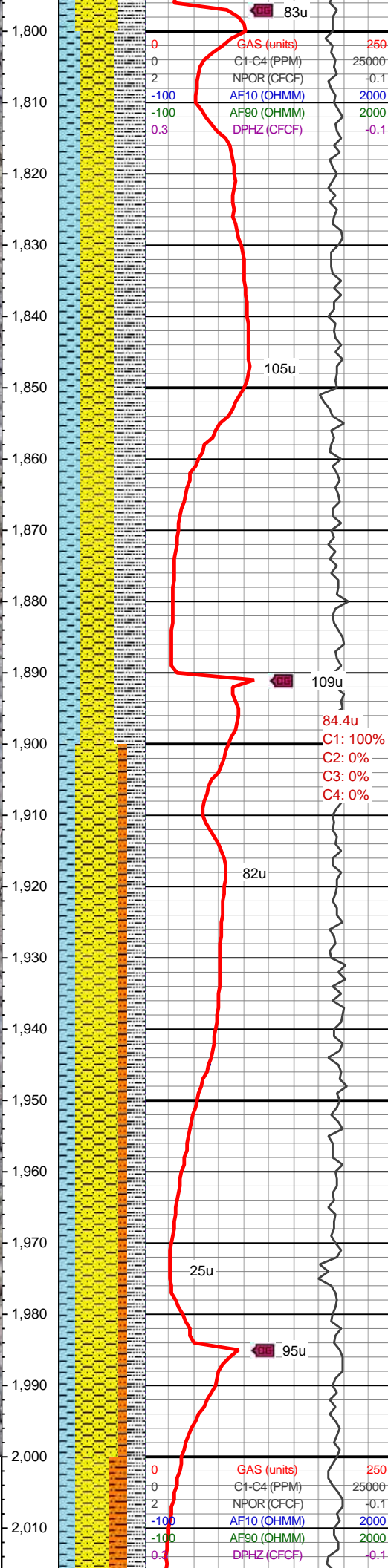
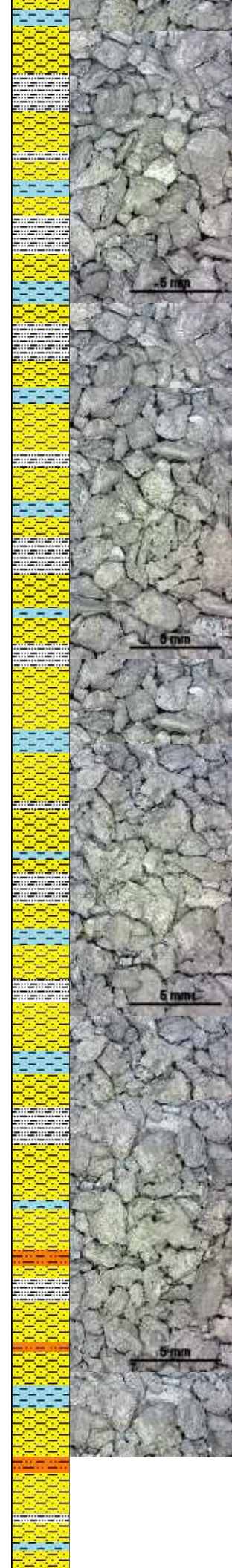
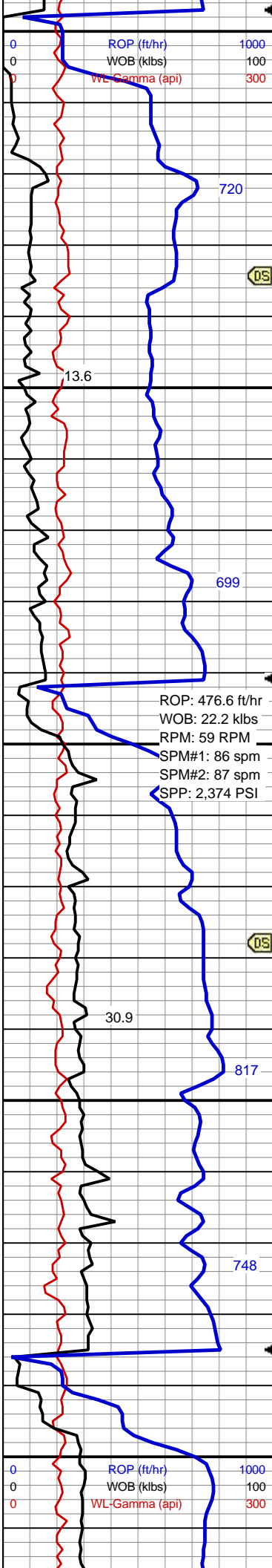
MD: 1,647'
Inclination: 0.9°
Azimuth: 274.4°
TVD: 1,646.91'

SHY SS: lt gy, occ s&p, vf-f gr, mod srt, v sft-fri, mod cmt, rr glau incl; CLYST: lt gy-gy, sm-sltly tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo; SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; nfsoc

MUD WT: 9.25/ VIS: 36 IN
MUD WT: 9.25/ VIS: 36 OUT
Ph: 10.1

MD: 1,741'
Inclination: 0.9°
Azimuth: 276.1°
TVD: 1,740.9'

SHY SS: lt gy, occ s&p, vf-f gr, mod srt, v sft-fri, mod cmt, rr glau incl; SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; CLYST: lt gy-gy, sm-sltly tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo; nfsoc

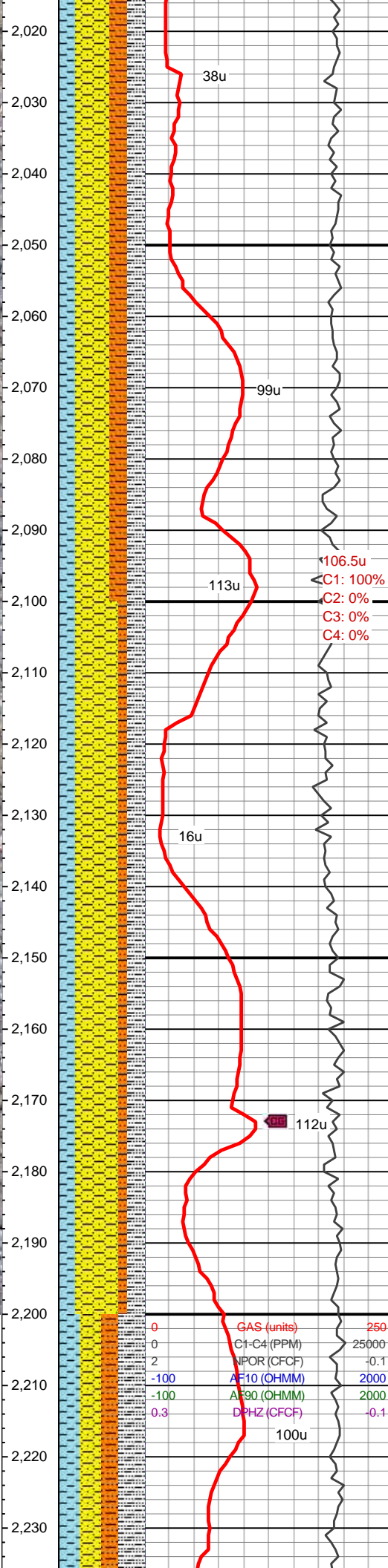
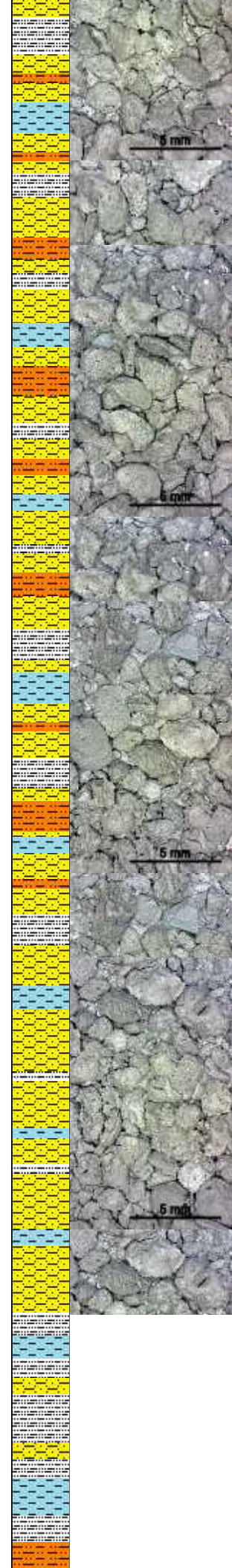
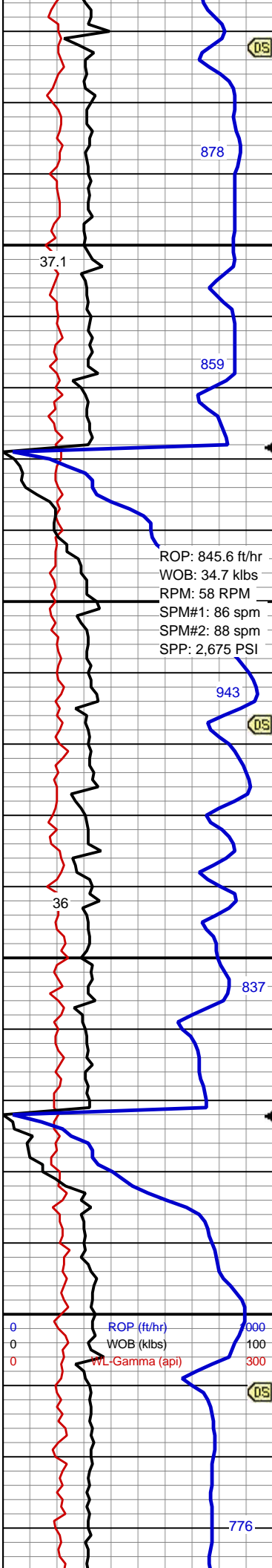


MD: 1,834'
Inclination: 1°
Azimuth: 261.5°
TVD: 1,833.89'

SHY SS: lt gy, occ s&p, vf-f gr, mod srt, v sft-fri, mod cmt; SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo; nfsoc

MD: 1,928'
Inclination: 1°
Azimuth: 260°
TVD: 1,927.88'

SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec, mod cmt; SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm; nfsoc



MD: 2,022'
Inclination: 1°
Azimuth: 260.5°
TVD: 2,021.86'

SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec, mod cmt; SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm; nfsoc

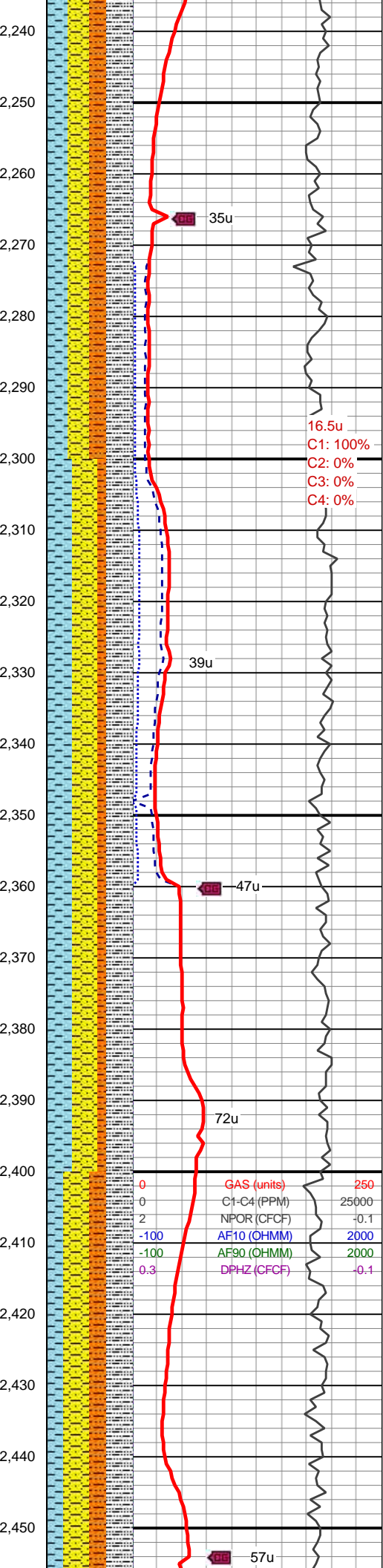
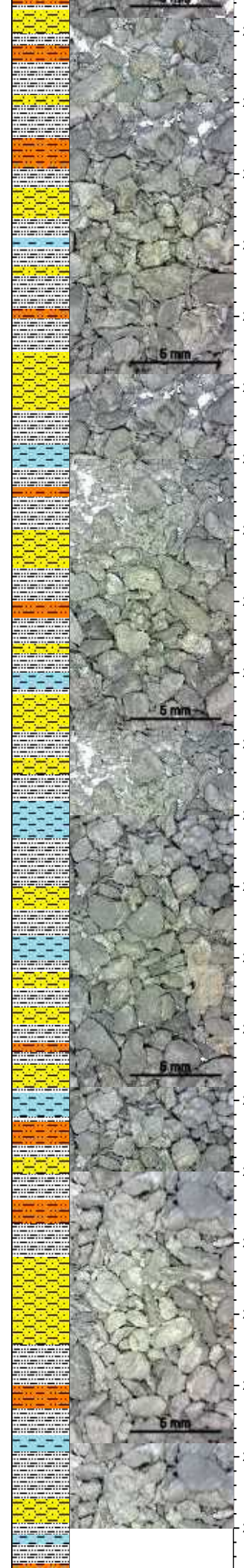
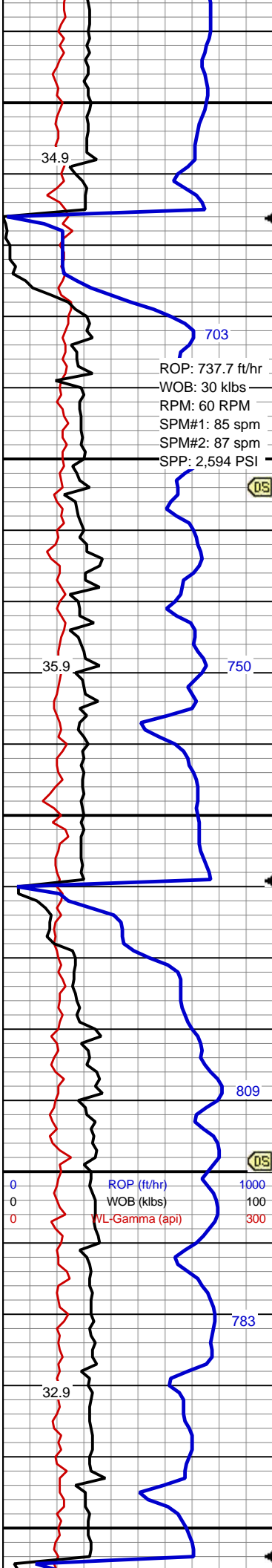
MUD WT: 9.3/ VIS: 38/ pH 10.2

MD: 2,117'
Inclination: 0.8°
Azimuth: 260.5°
TVD: 2,116.85'

SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec, mod cmt; SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm; nfsoc

MD: 2,211'
Inclination: 0.6°
Azimuth: 256.4°
TVD: 2,210.84'

SLTY SH: gy-dk gy, sb plty-sb blkly



SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec, mod cmt; CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm; nfsoc

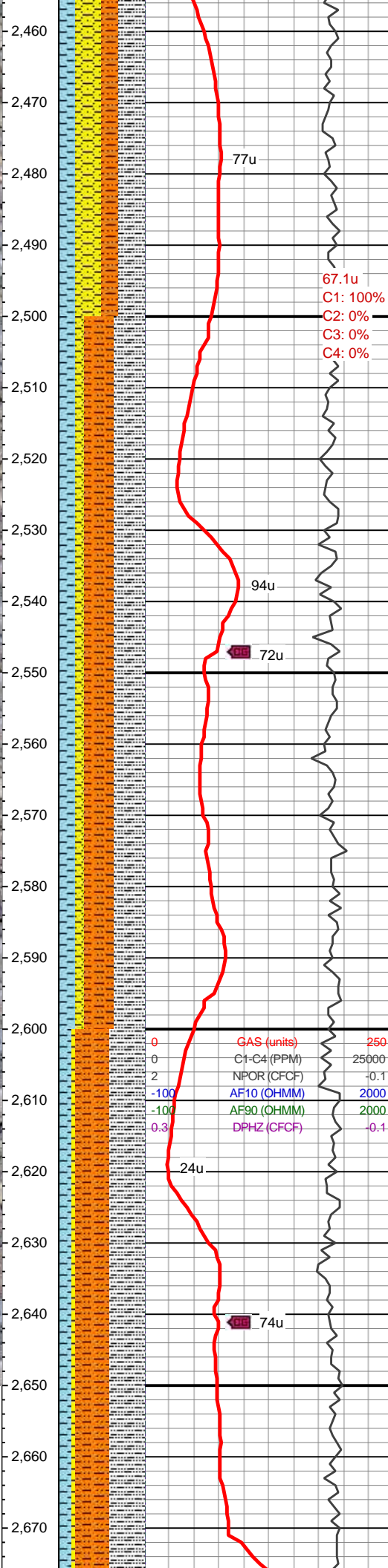
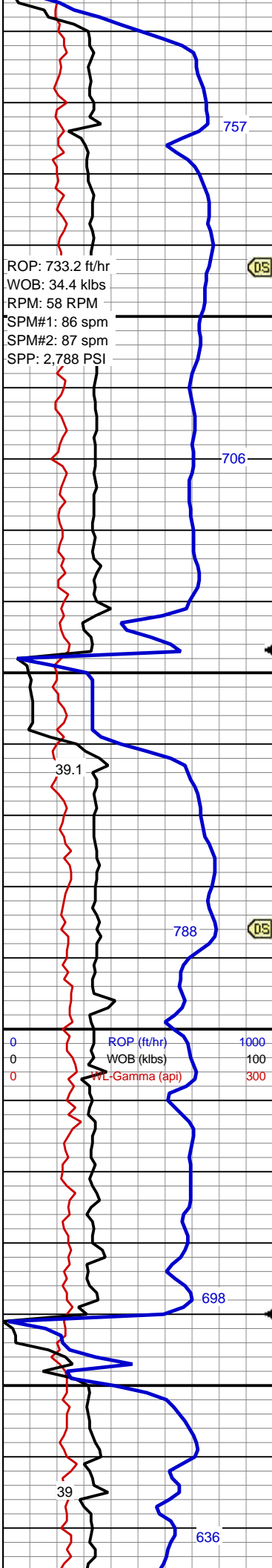
MUD WT: 9.35/ VIS: 40/ pH 10.1

MD: 2,304'
Inclination: 0.7°
Azimuth: 246.6°
TVD: 2,303.84'

SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec, mod cmt; SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm; nfsoc

MD: 2,398'
Inclination: 0.8°
Azimuth: 244.8°
TVD: 2,397.83'

SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec, mod cmt; SLTY SH: gy-dk gy, sb plty-sb blkly, mic gr, slty tex, mod frm; CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty,



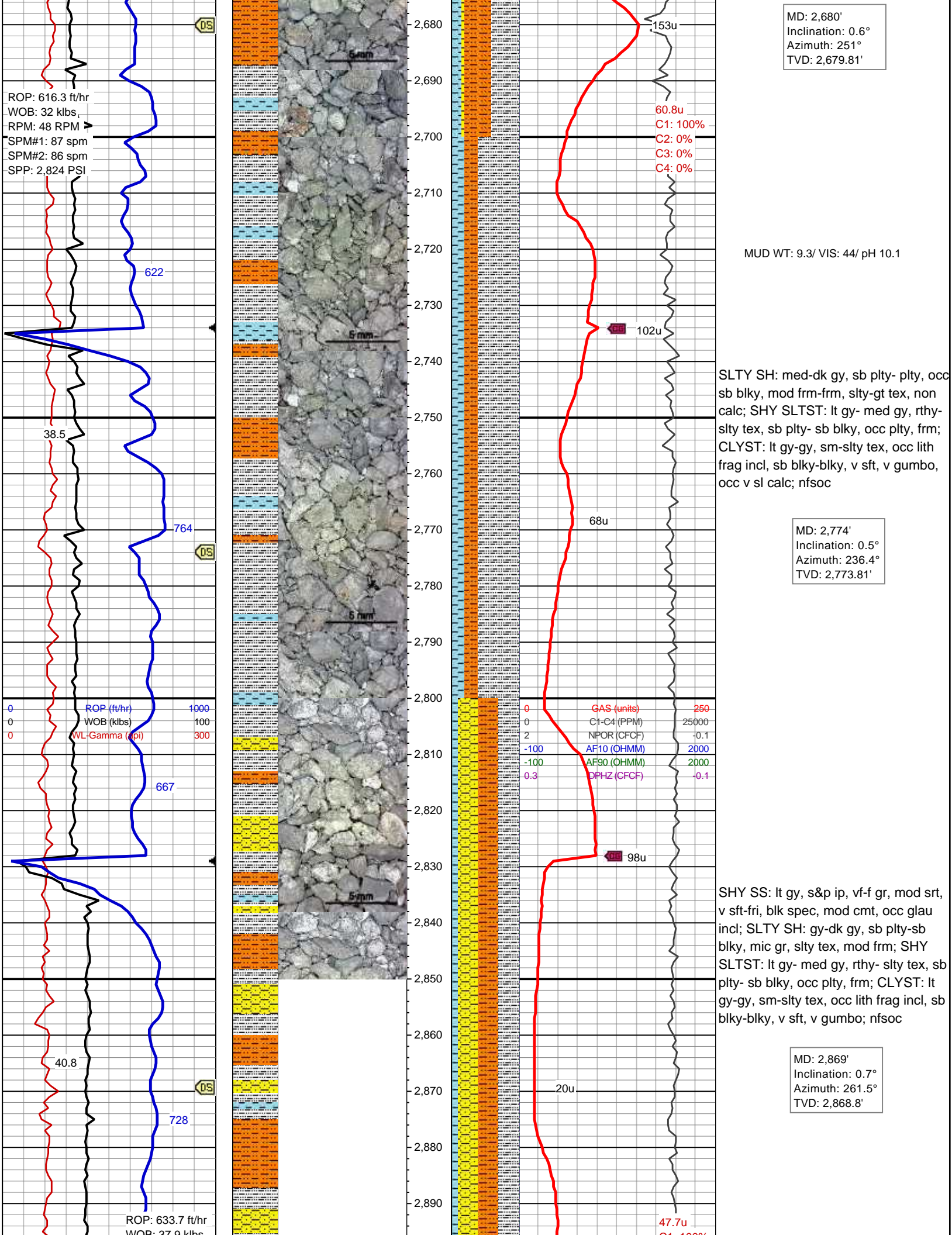
frm; nfsoc

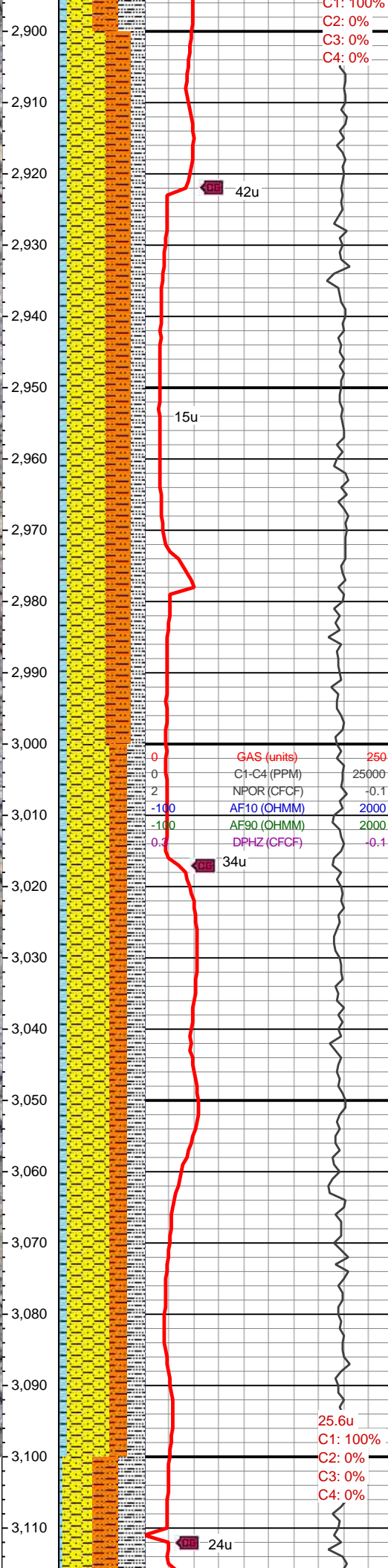
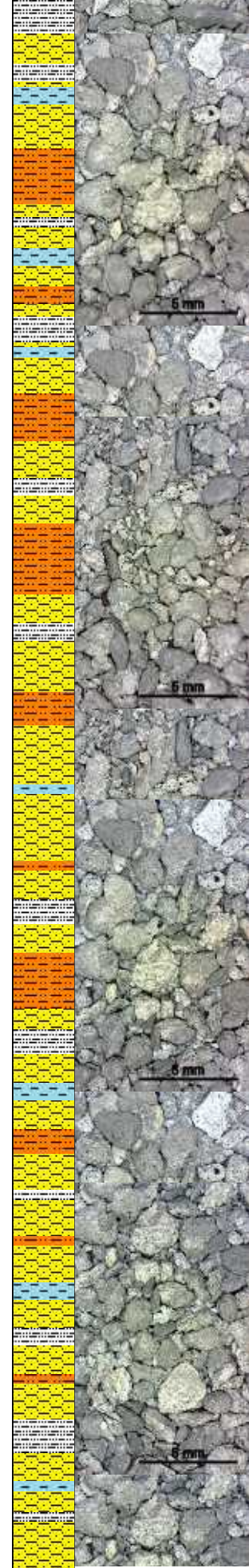
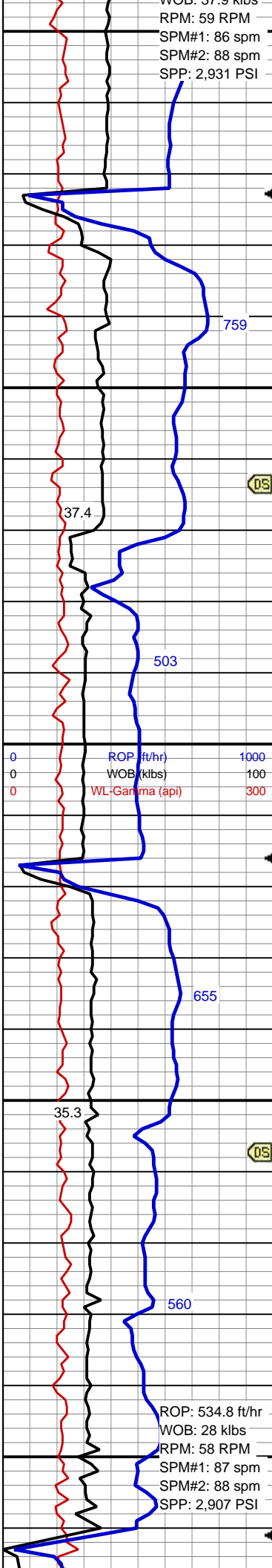
MD: 2,493'
Inclination: 0.6°
Azimuth: 216.9°
TVD: 2,492.82'

SLTY SH: med-dk gy, sb plty- plty, occ sb blkly, mod frm-frm, slty-gt tex, non calc; SHY SLTST: lt gy- med gy, rthy-slty tex, sb plty- sb blkly, occ plty, frm; CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo, occ v sl calc; SHY SS: lt gy, vf-f gr, mod srt, v sft-fri, mod cmt; nfsoc

MD: 2,586'
Inclination: 0.5°
Azimuth: 225.7°
TVD: 2,585.82'

SLTY SH: med-dk gy, sb plty- plty, occ sb blkly, mod frm-frm, slty-gt tex, non calc; SHY SLTST: lt gy- med gy, rthy-slty tex, sb plty- sb blkly, occ plty, frm; CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blkly-blky, v sft, v gumbo, occ v sl calc; SHY SS: lt gy, vf-f gr, mod srt, v sft-fri, mod cmt; nfsoc



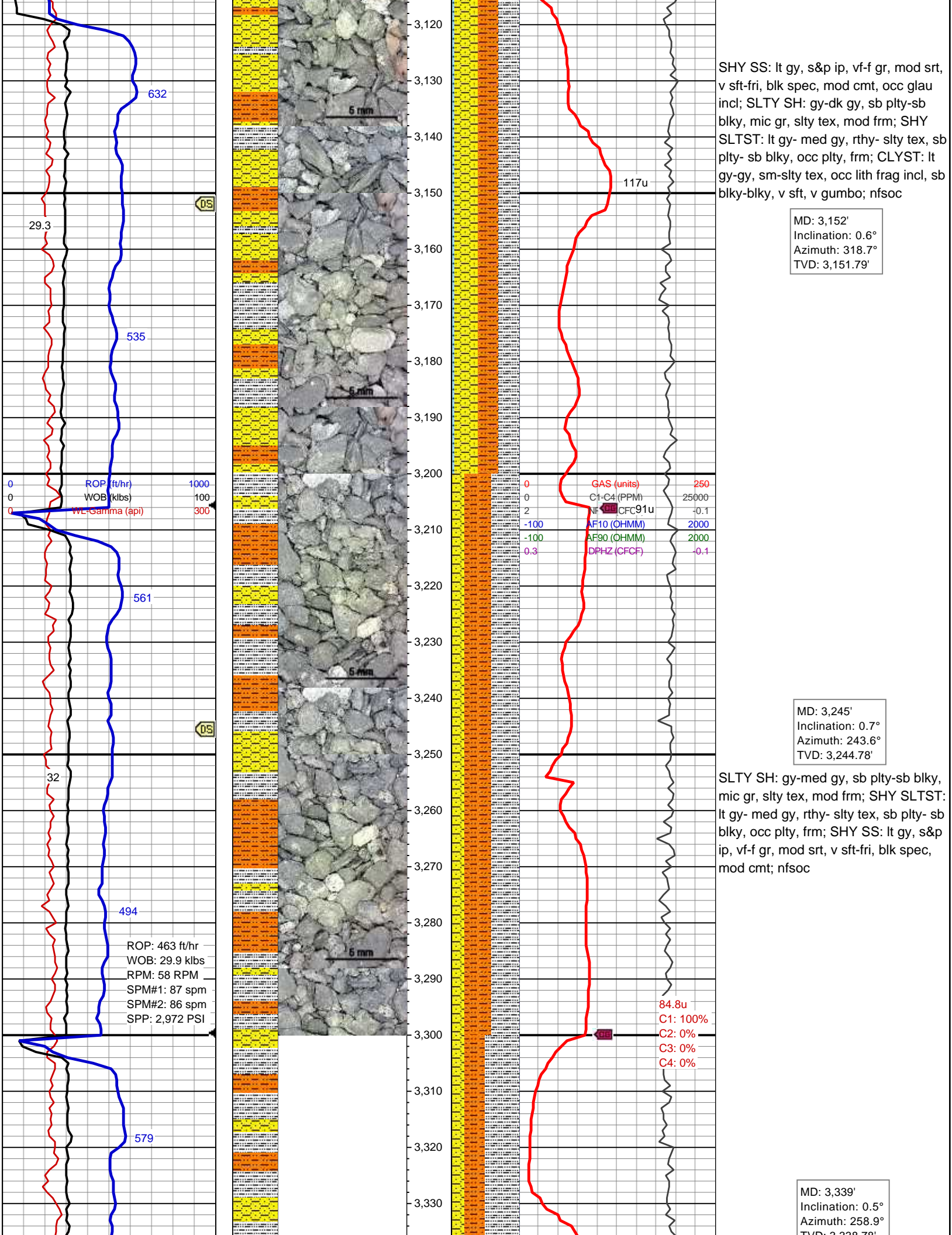


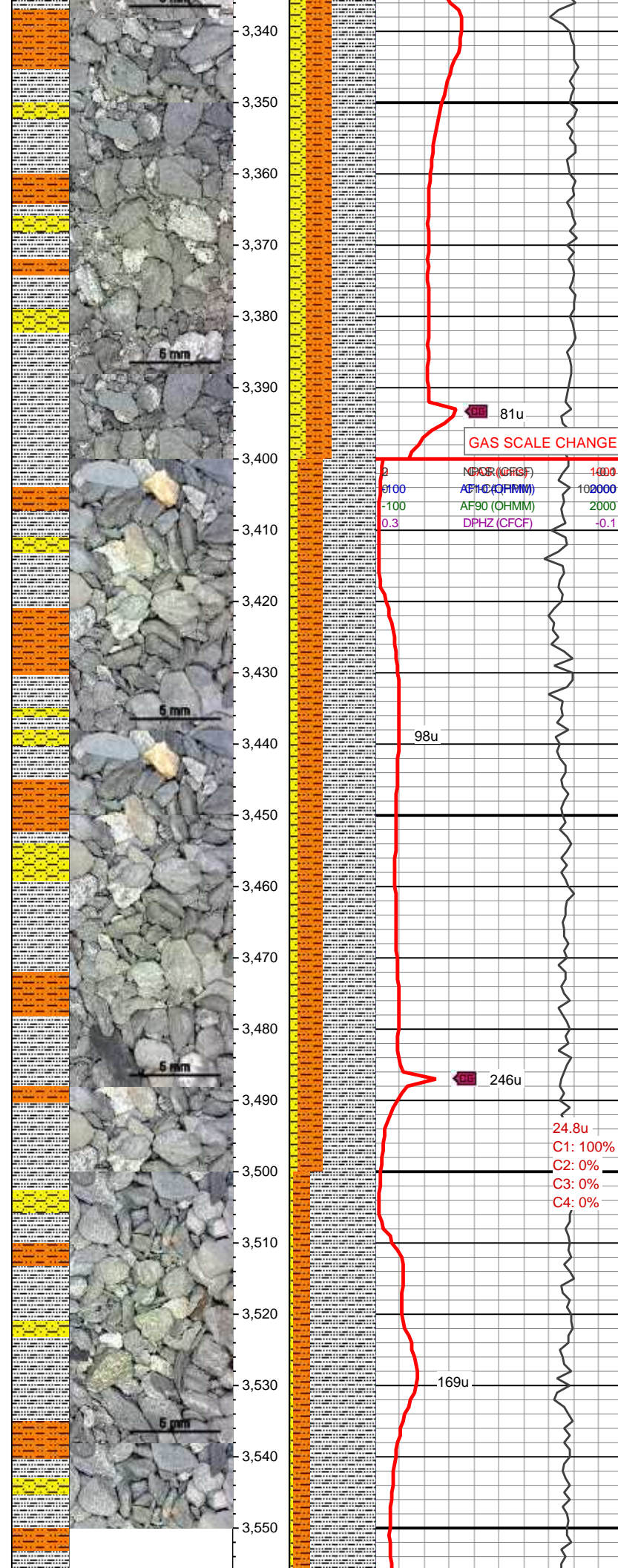
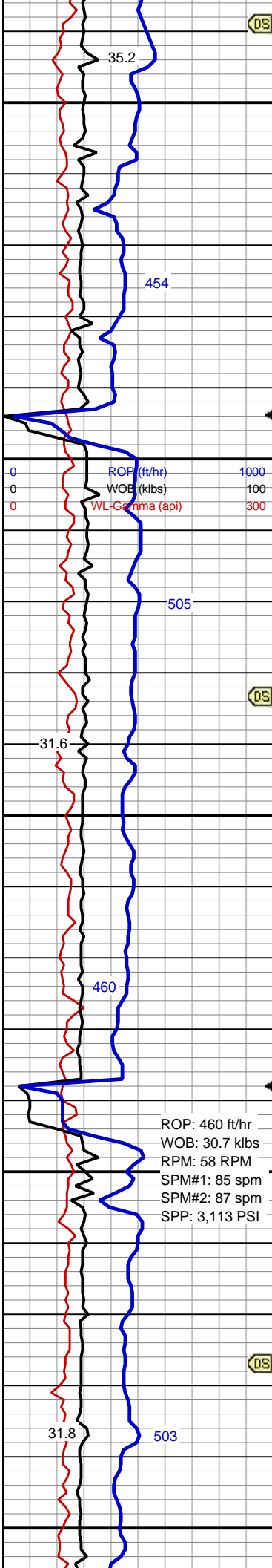
SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec, mod cmt, occ glau incl; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blk, occ plty, frm; SLTY SH: gy-dk gy, sb plty-sb blk, mic gr, slty tex, mod frm; CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blk-bkly, v sft, v gumbo; nfsoc

MD: 2,963'
Inclination: 0.6°
Azimuth: 245.3°
TVD: 2,962.8'

SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec, mod cmt, occ glau incl; SLTY SH: gy-dk gy, sb plty-sb blk, mic gr, slty tex, mod frm; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blk, occ plty, frm; CLYST: lt gy-gy, sm-slty tex, occ lith frag incl, sb blk-bkly, v sft, v gumbo; nfsoc

MD: 3,057'
Inclination: 0.6°
Azimuth: 299.9°
TVD: 3,056.79'





TVD: 3,338.76'

SLTY SH: gy-med gy, sb plty-sb blkly, mic gr, slty tex, mod frm; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm; SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec, mod cmt; nfsoc

81u

GAS SCALE CHANGE

NPOR (CHCF)	1000
AF10 (CHRM)	10000
AF90 (OHMM)	2000
DPHZ (CFCF)	-0.1

MD: 3,433'
Inclination: 1.2°
Azimuth: 222.5°
TVD: 3,432.77'

SLTY SH: gy-med gy, sb plty-sb blkly, mic gr, slty tex, mod frm; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm; SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec, mod cmt; nfsoc

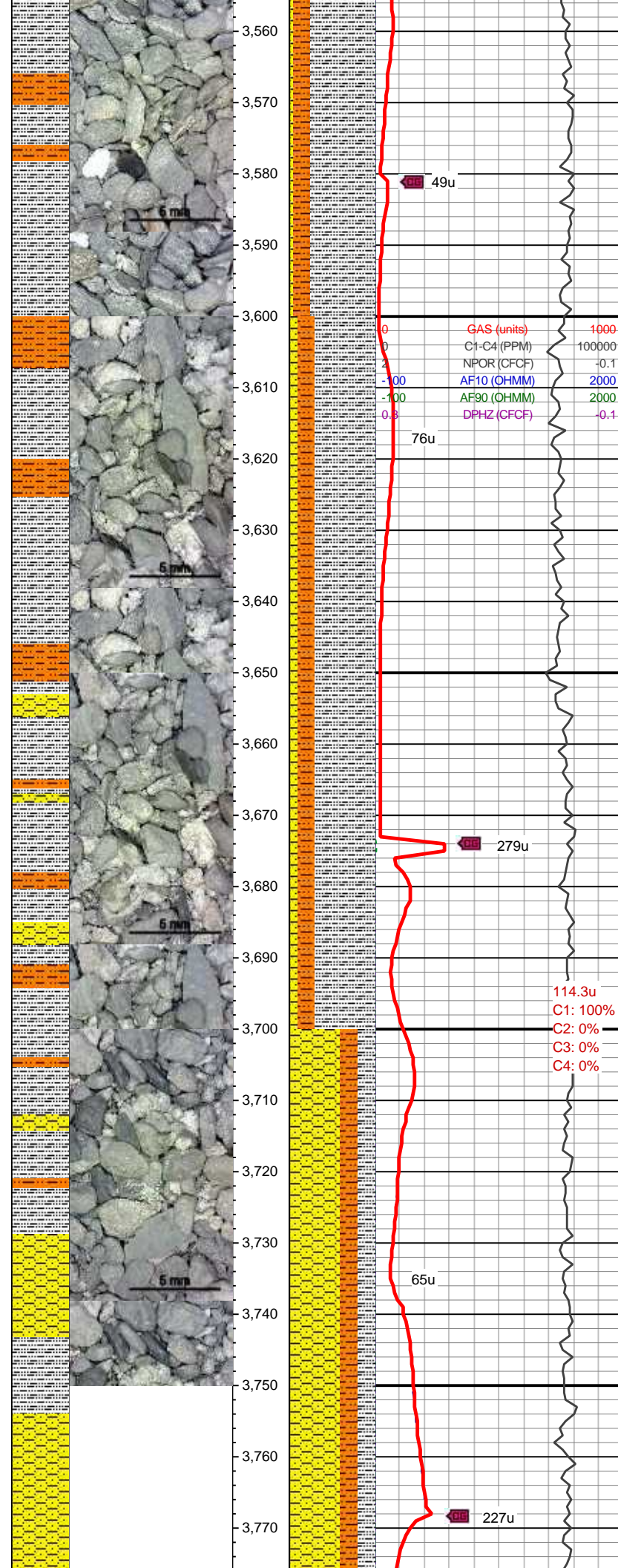
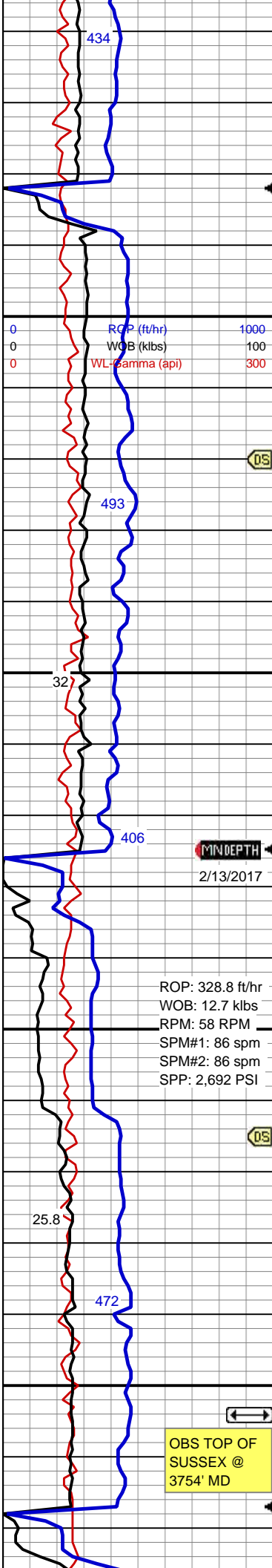
98u

246u

24.8u
C1: 100%
C2: 0%
C3: 0%
C4: 0%

MD: 3,527'
Inclination: 1.1°
Azimuth: 216.9°
TVD: 3,526.75'

SLTY SH: gy-med gy, sb plty-sb blkly, mic gr, slty tex, mod frm; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm; SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec,



mod cmt; ntsoc

MUD WT: 9.3/ VIS: 53/ pH 10.1

MD: 3,620'
Inclination: 1.3°
Azimuth: 225.1°
TVD: 3,619.73'

SLTY SH: gy-med gy, sb plty-sb blkly, mic gr, slty tex, mod frm; SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm; SHY SS: lt gy, s&p ip, vf-f gr, mod srt, v sft-fri, blk spec, mod cmt; nfsoc

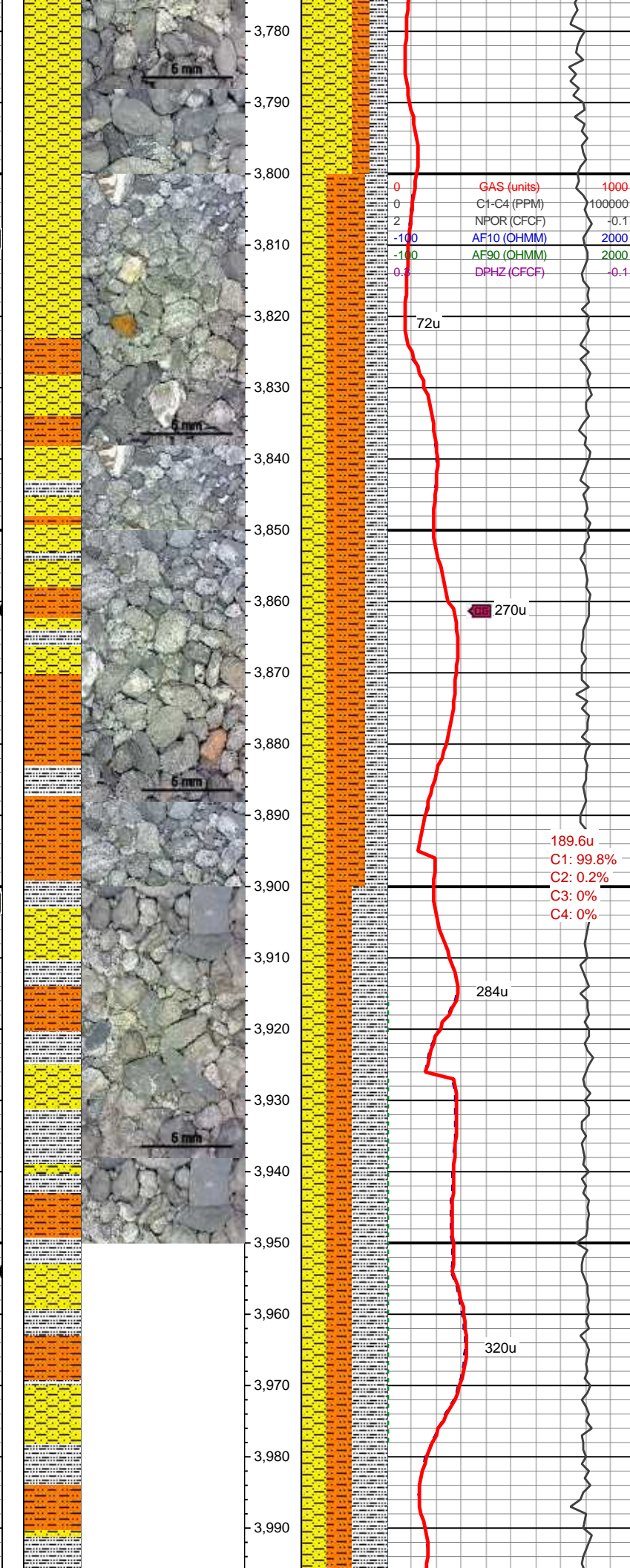
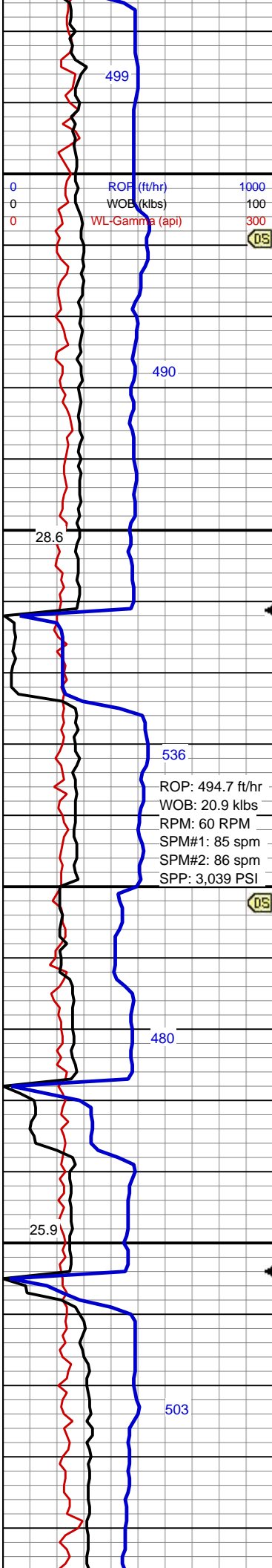
BOTH PUMPS DOWN @ 0:00 MST on 2/13/2017, Resumed drilling @ 02:00MST on 2/13/2017

Depth: 3,675
Mud Weight: 9.95
Viscosity: 59
Yield Pt: 17
API Filtrate: 8.6
Solids: 9%
pH: 10
Chlorides: 3,700 mg/l

MD: 3,715'
Inclination: 1.4°
Azimuth: 223.6°
TVD: 3,714.7'

SHY SS: lt gy-lt brn, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmt, cly mtx, p-mod p por, sl calc; SLTY SH: gy-med gy, occ lt brn, sb plty-sb blkly, mic gr, slty tex grd to shy sltst, mod sft-mod frm, v sl calc; SHY SLTST: lt gy-med gy, rthy slty tex sb plty-sb blkly, mod frm-frn, rr fnt yel min flor, nsoc

MUD WT: 9.35/ VIS: 65



MD: 3,809'
Inclination: 1.6°
Azimuth: 217.9°
TVD: 3,808.67'

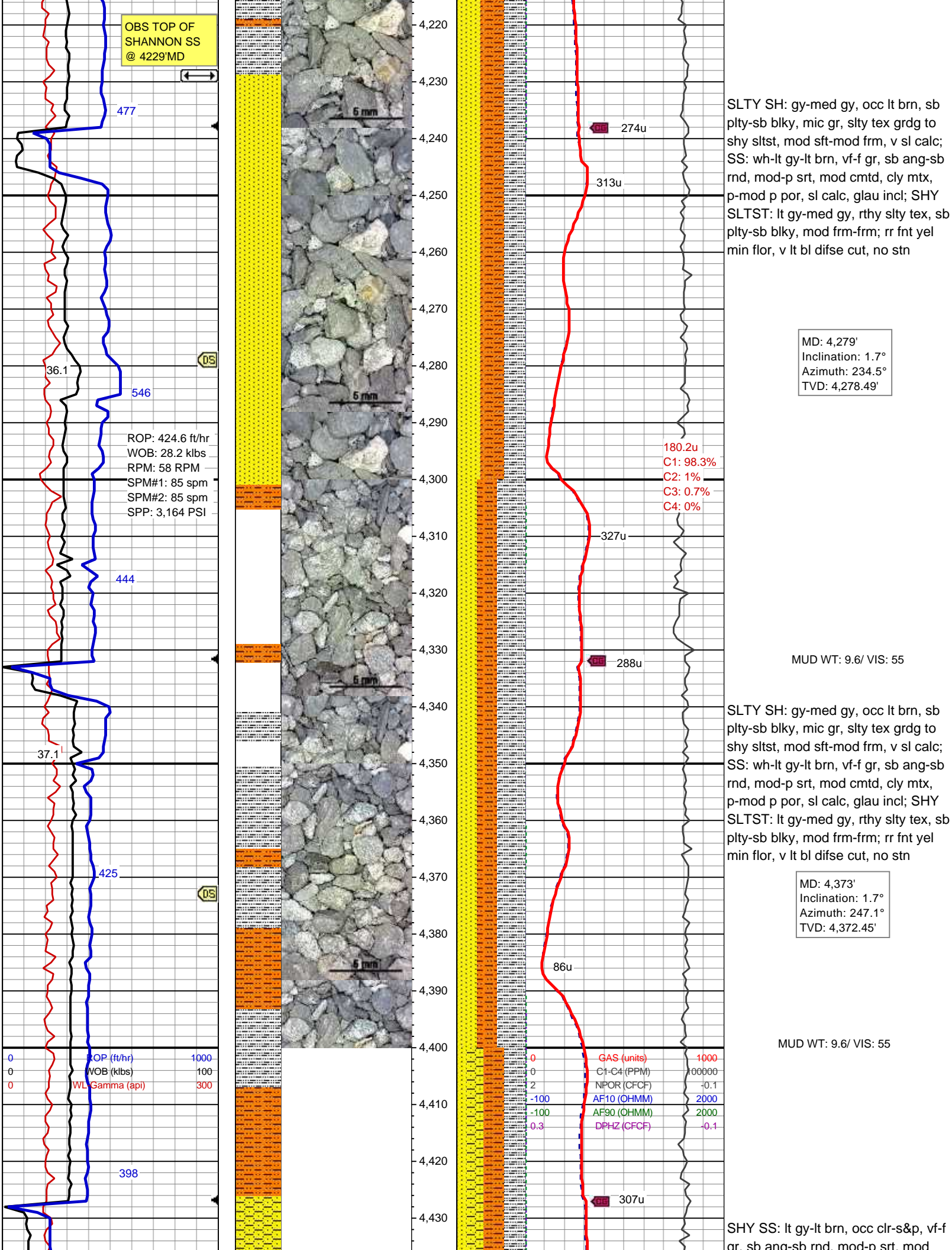
SHY SLTST: lt gy-med gy, rthy slty tex
sb plty-sb blkly, mod frm-frm; SHY SS:
lt gy-lt brn, occ clr-s&p, vf-f gr, sb
ang-sb rnd, mod-p srt, mod cmted, cly
mtx, p-mod p por, sl calc; SLTY SH:
gy-med gy, occ lt brn, sb plty-sb blkly,
mic gr, slty tex grd to shy sltst, mod
sft-mod frm, v sl calc; rr fnt yel min
flor, nsoc

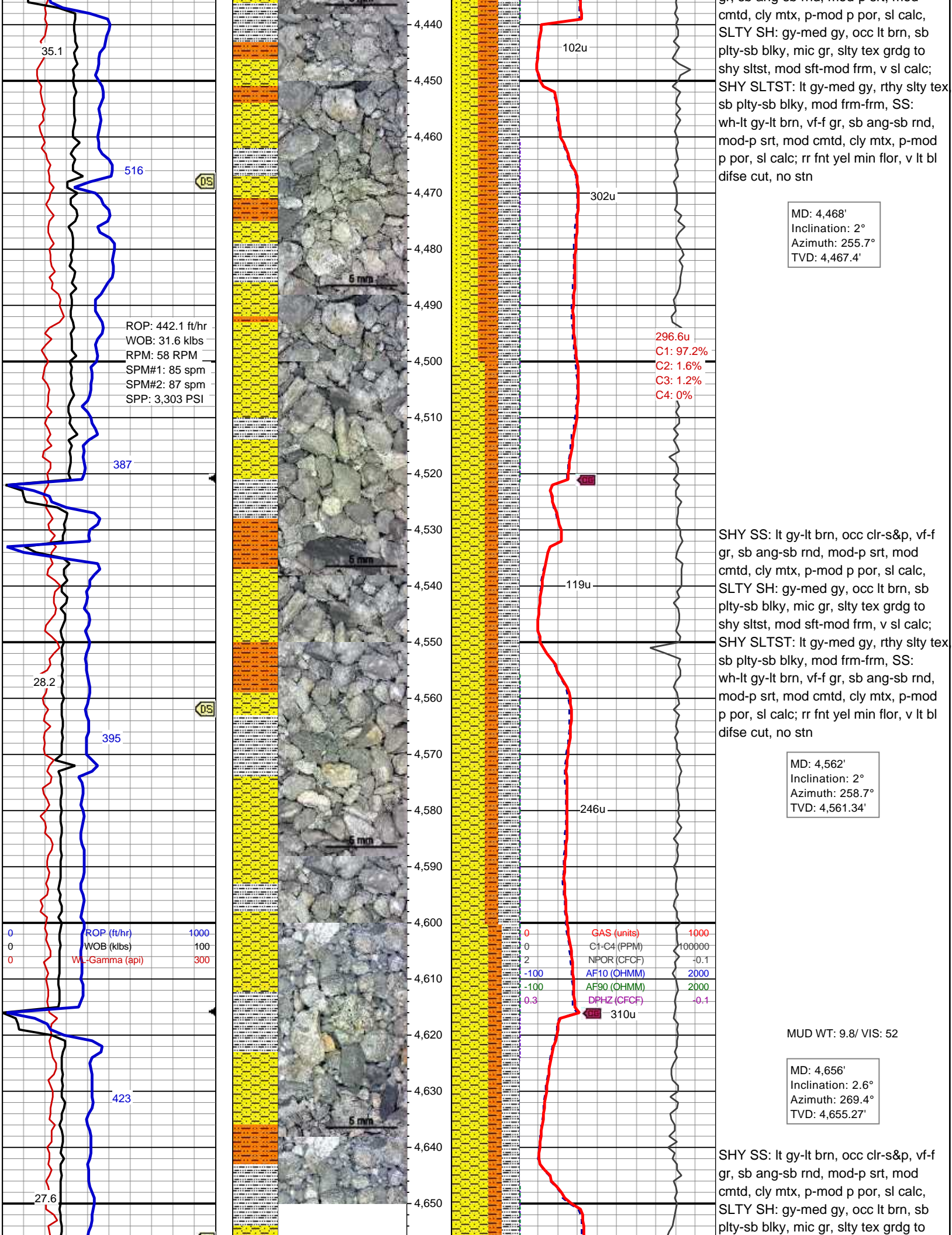
MD: 3,903'
Inclination: 1.7°
Azimuth: 225°
TVD: 3,902.63'

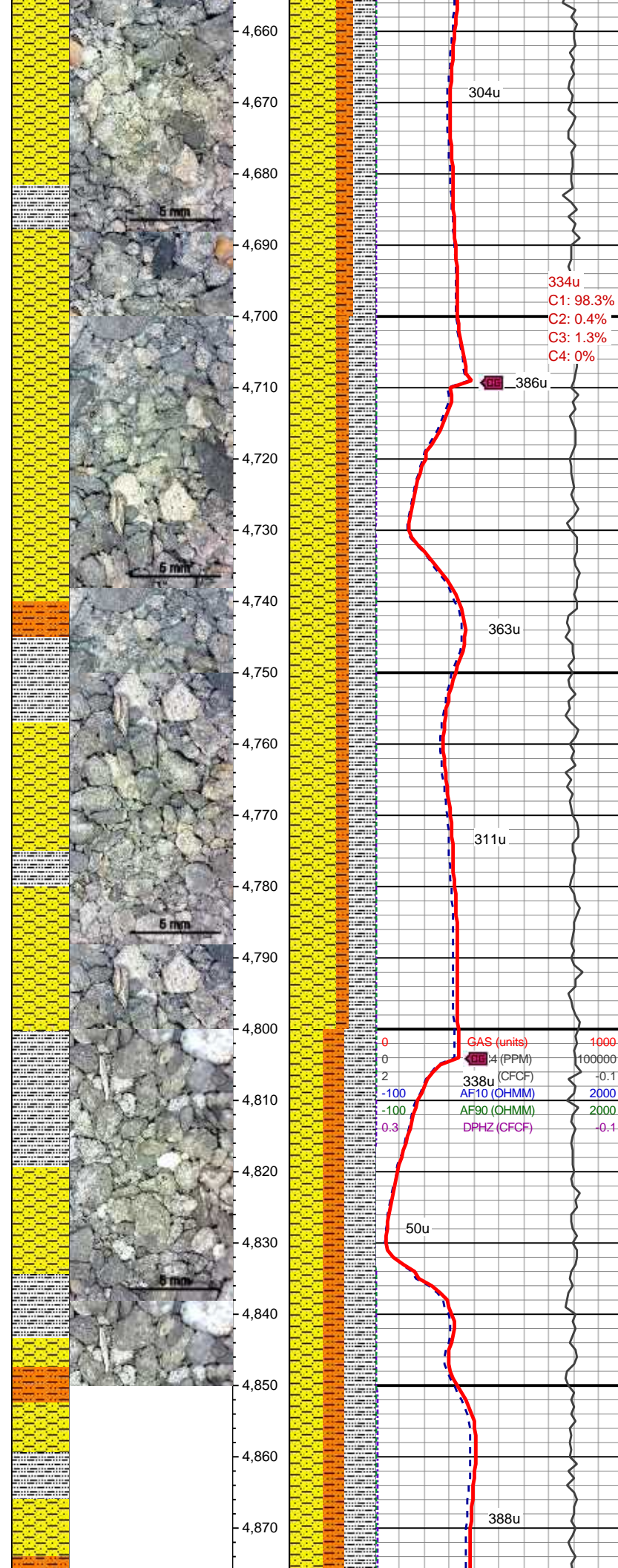
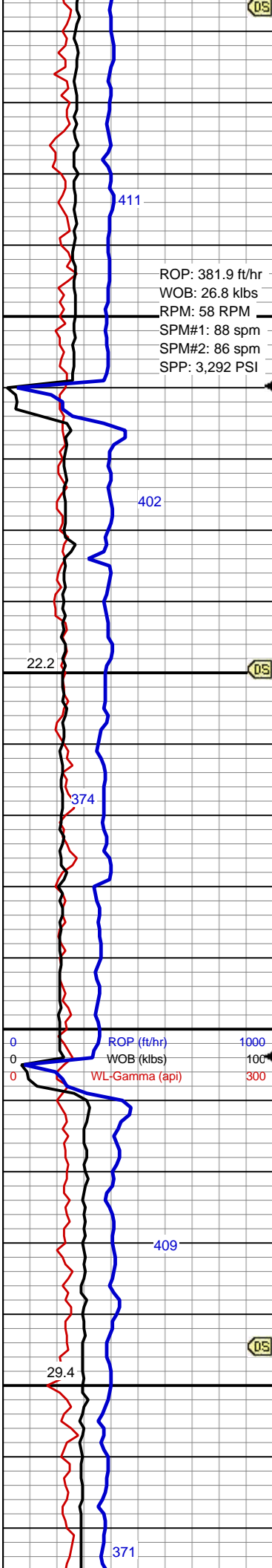
SLTY SH: gy-med gy, occ lt brn, sb
plty-sb blkly, mic gr, slty tex grd to
shy sltst, mod sft-mod frm, v sl calc;
SHY SS: lt gy-lt brn, occ clr-s&p, vf-f
gr, sb ang-sb rnd, mod-p srt, mod
cmted, cly mtx, p-mod p por, sl calc;
SHY SLTST: lt gy-med gy, rthy slty tex
sb plty-sb blkly, mod frm-frm; rr fnt yel
min flor, nsoc

MD: 3,997'

	Inclination: 1.4° Azimuth: 233° TVD: 3,996.6'	
SLTY SH: gy-med gy, occ lt brn, sb plty-sb blkly, mic gr, slty tex grdg to shy sltst, mod sft-mod frm, v sl calc; SHY SS: lt gy-lt brn, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmted, cly mtx, p-mod p por, sl calc; SHY SLTST: lt gy-med gy, rthy slty tex sb plty-sb blkly, mod frm-frm; rr fnt yel min flor, nsoc		
	MUD WT: 9.7/ VIS: 55	
	MD: 4,091' Inclination: 1.6° Azimuth: 220.4° TVD: 4,090.57'	
SLTY SH: gy-med gy, occ lt brn, sb plty-sb blkly, mic gr, slty tex grdg to shy sltst, mod sft-mod frm, v sl calc; SHY SS: lt gy-lt brn, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmted, cly mtx, p-mod p por, sl calc; SHY SLTST: lt gy-med gy, rthy slty tex sb plty-sb blkly, mod frm-frm; rr fnt yel min flor, nsoc		
	MD: 4,185' Inclination: 1.6° Azimuth: 221.5° TVD: 4,184.53'	







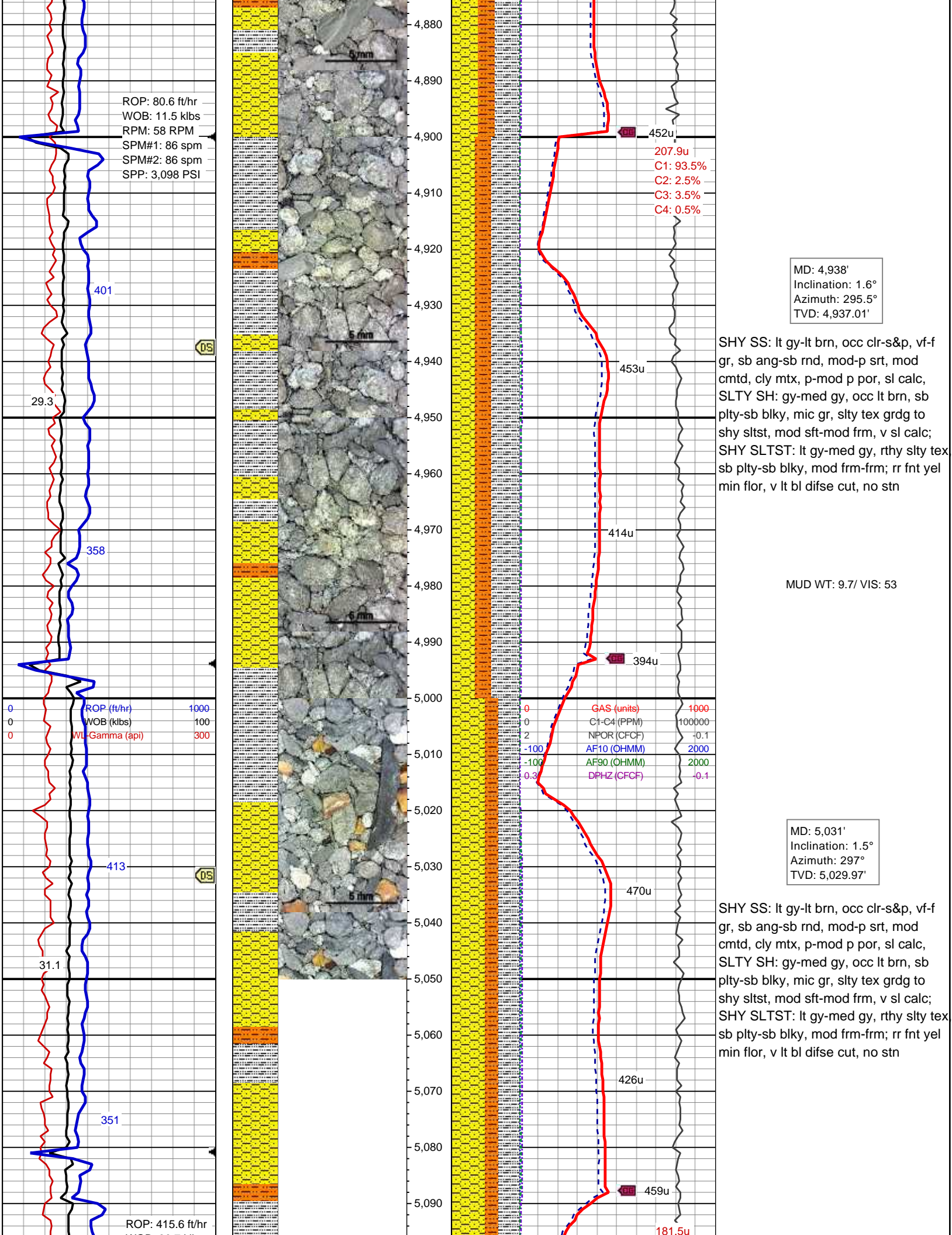
shy sltst, mod sft-mod frm, v sl calc;
SHY SLTST: lt gy-med gy, rthy slty tex
sb plty-sb blkly, mod frm-frm; rr fnt yel
min flor, v lt bl difse cut, no stn

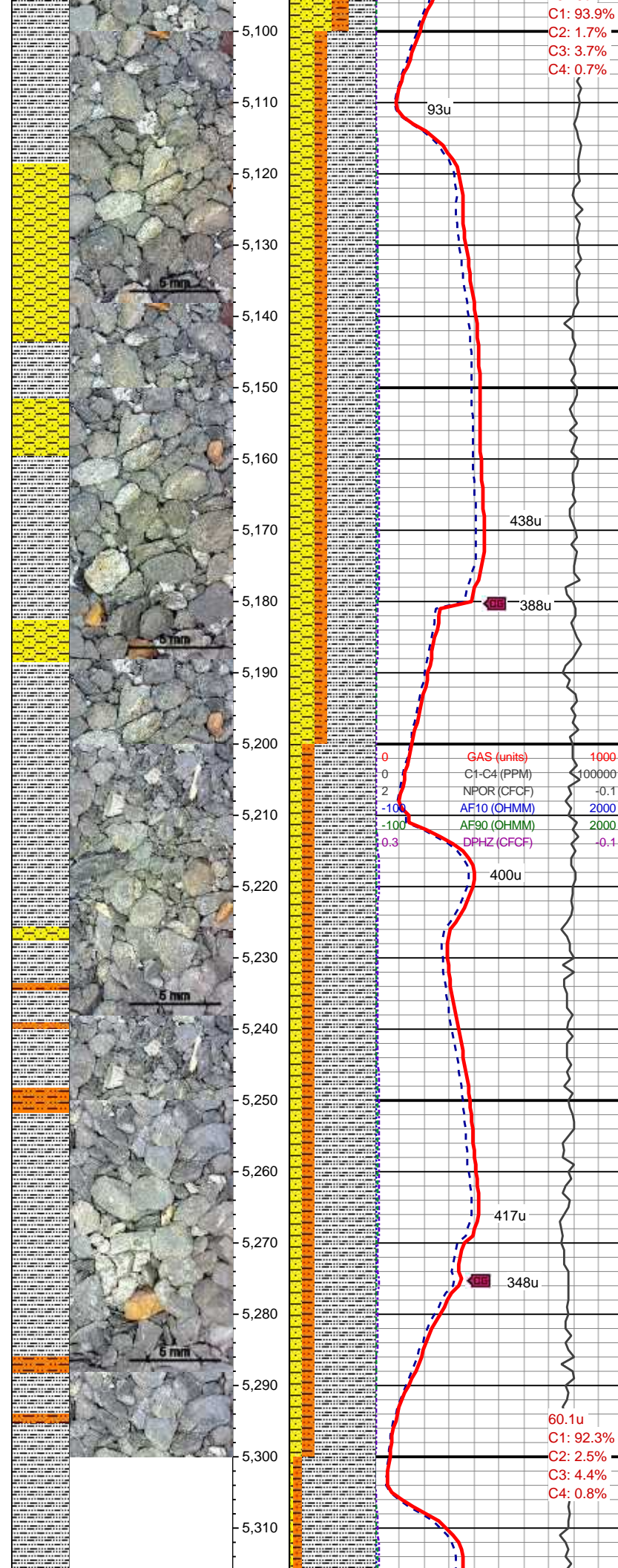
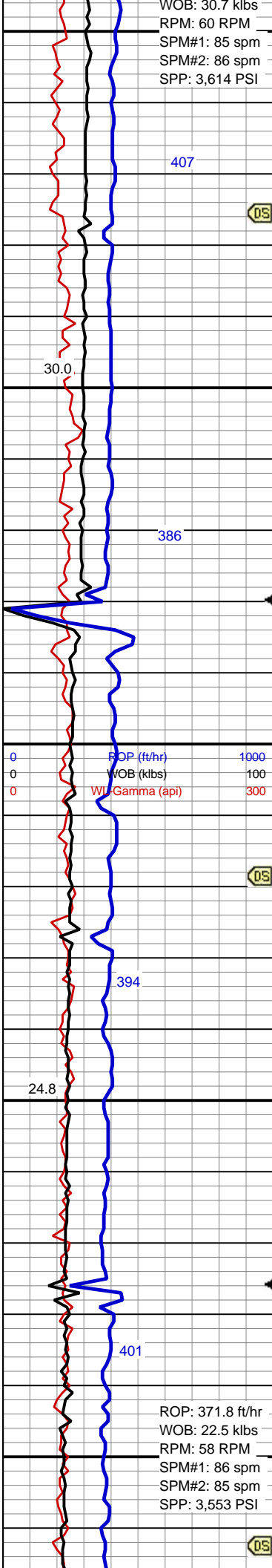
MD: 4,750'
Inclination: 2.8°
Azimuth: 278.8°
TVD: 4,749.16'

SHY SS: lt gy-lt brn, occ clr-s&p, vf-f
gr, sb ang-sb rnd, mod-p srt, mod
cmt, cly mtx, p-mod p por, sl calc,
SLTY SH: gy-med gy, occ lt brn, sb
plty-sb blkly, mic gr, slty tex grd to
shy sltst, mod sft-mod frm, v sl calc;
SHY SLTST: lt gy-med gy, rthy slty tex
sb plty-sb blkly, mod frm-frm; rr fnt yel
min flor, v lt bl difse cut, no stn

MD: 4,844'
Inclination: 2.4°
Azimuth: 289.5°
TVD: 4,843.07'

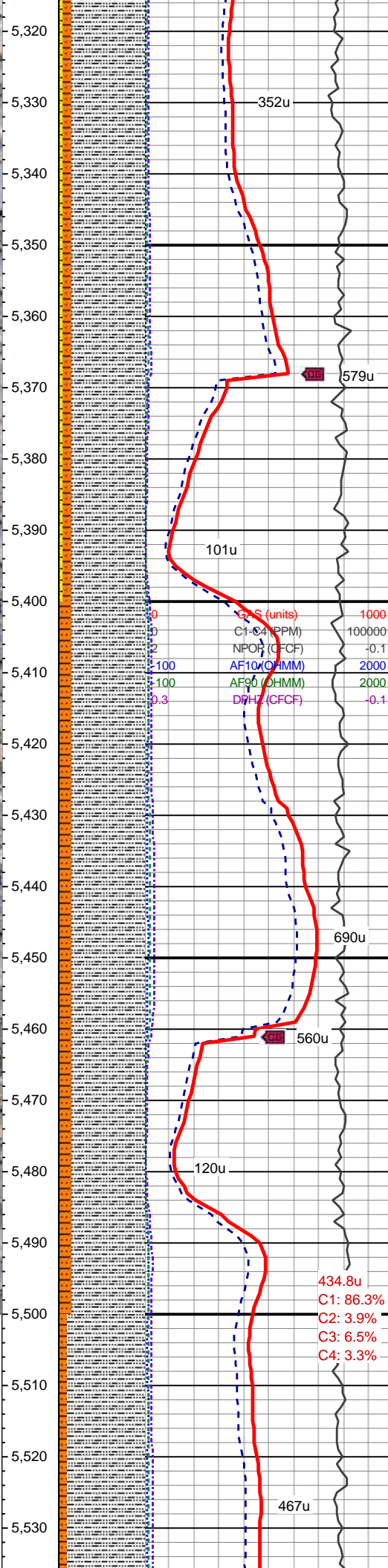
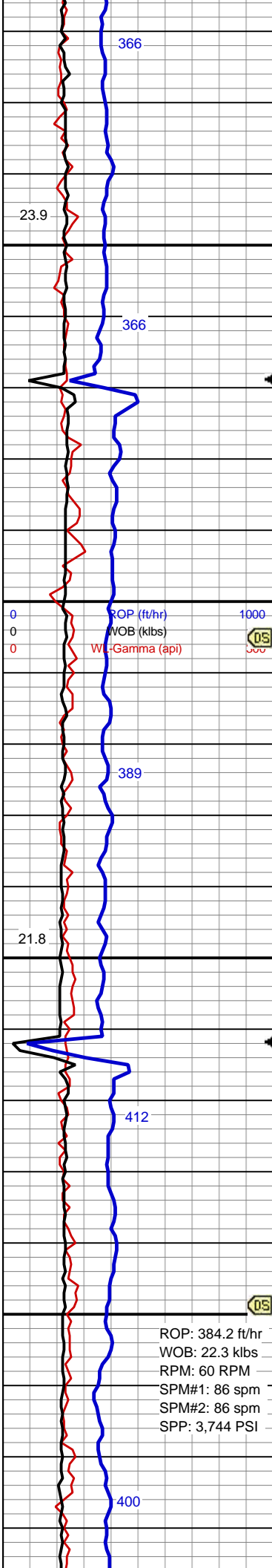
SHY SS: lt gy-lt brn, occ clr-s&p, vf-f
gr, sb ang-sb rnd, mod-p srt, mod
cmt, cly mtx, p-mod p por, sl calc,
SLTY SH: gy-med gy, occ lt brn, sb
plty-sb blkly, mic gr, slty tex grd to
shy sltst, mod sft-mod frm, v sl calc;
SHY SLTST: lt gy-med gy, rthy slty tex
sb plty-sb blkly, mod frm-frm; rr fnt yel
min flor, v lt bl difse cut, no stn





SLTY SH: gy-med gy, sb plty-sb blkly, occ plty, mic gr, slty tex grdg to shy sltst, mod sft-mod frm, v sl calc; SHY SLTST: lt gy-med gy, slty-gt tex, sb plty-sb blkly, mod frm-frm, occ grdg to shy ss; SHY SS: lt gy, tr clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmted, cly mtx, p-mod p por, v sl calc; rr fnt yel min flor, v lt bl difse cut, no stn

SLTY SH: gy-med gy, sb plty-sb blkly, occ plty, mic gr, slty tex grdg to shy sltst, mod sft-mod frm, v sl calc; SHY SLTST: lt gy-med gy, slty-gt tex, sb plty-sb blkly, mod frm-frm, occ grdg to shy ss; SHY SS: lt gy, tr clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmted, cly mtx, p-mod p por, v sl calc; rr fnt yel min flor, v lt bl difse cut, no stn



SLTY SH: gy-med gy, sb plty-sb blkly, occ plty, mic gr, slty tex grd to shy sltst, mod sft-mod frm, v sl calc; SHY SLTST: lt gy-med gy, slty-gt tex, sb plty-sb blkly, mod frm-frm, occ grd to shy ss; SHY SS: lt gy, tr clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmted, cly mtx, p-mod p por, v sl calc; rr fnt yel min flor, v lt bl difse cut, no stn

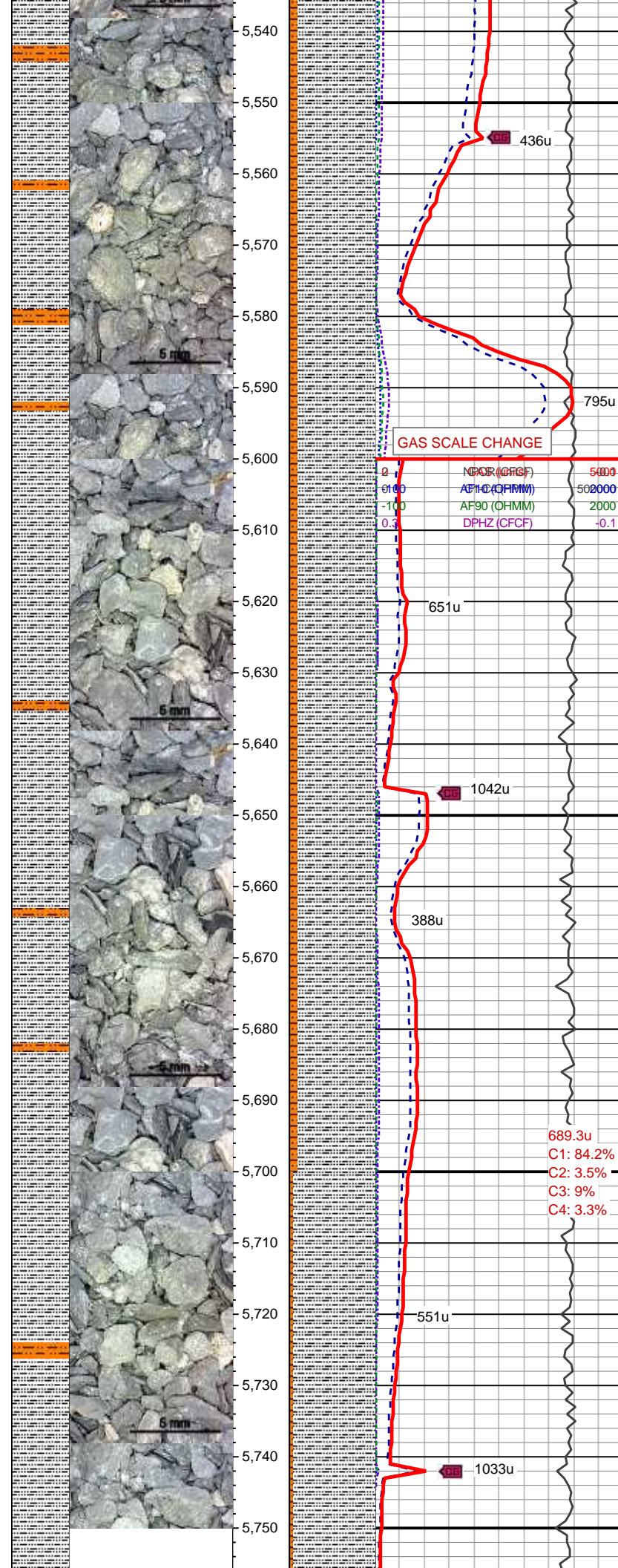
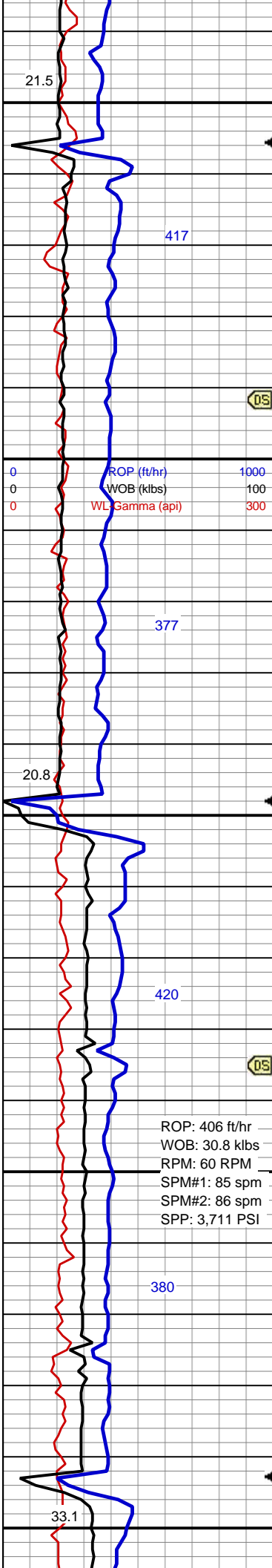
MD: 5,405'
Inclination: 1°
Azimuth: 347.5°
TVD: 5,403.91'

SLTY SH: gy-med gy, sb plty-occ plty, mic gr, slty tex grd to shy sltst, mod sft-mod frm, v sl calc; SHY SLTST: lt gy-med gy, slty-gt tex, sb plty-sb blkly, mod frm-frm; rr fnt yel min flor, v lt bl difse cut, no stn

MUD WT: 9.8/ VIS: 75

MD: 5,498'
Inclination: 0.7°
Azimuth: 353.1°
TVD: 5,496.9'

ROP: 384.2 ft/hr
WOB: 22.3 klbs
RPM: 60 RPM
SPM#1: 86 spm
SPM#2: 86 spm
SPP: 3,744 PSI



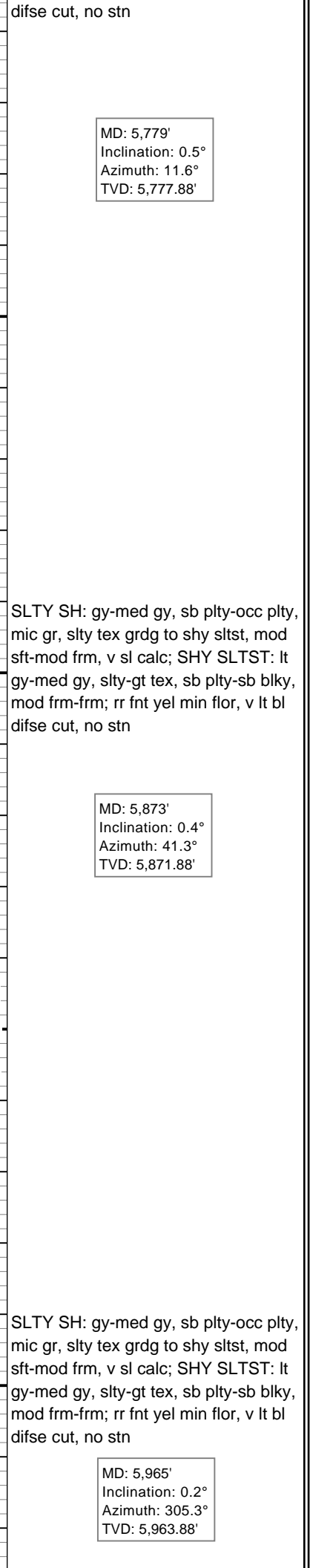
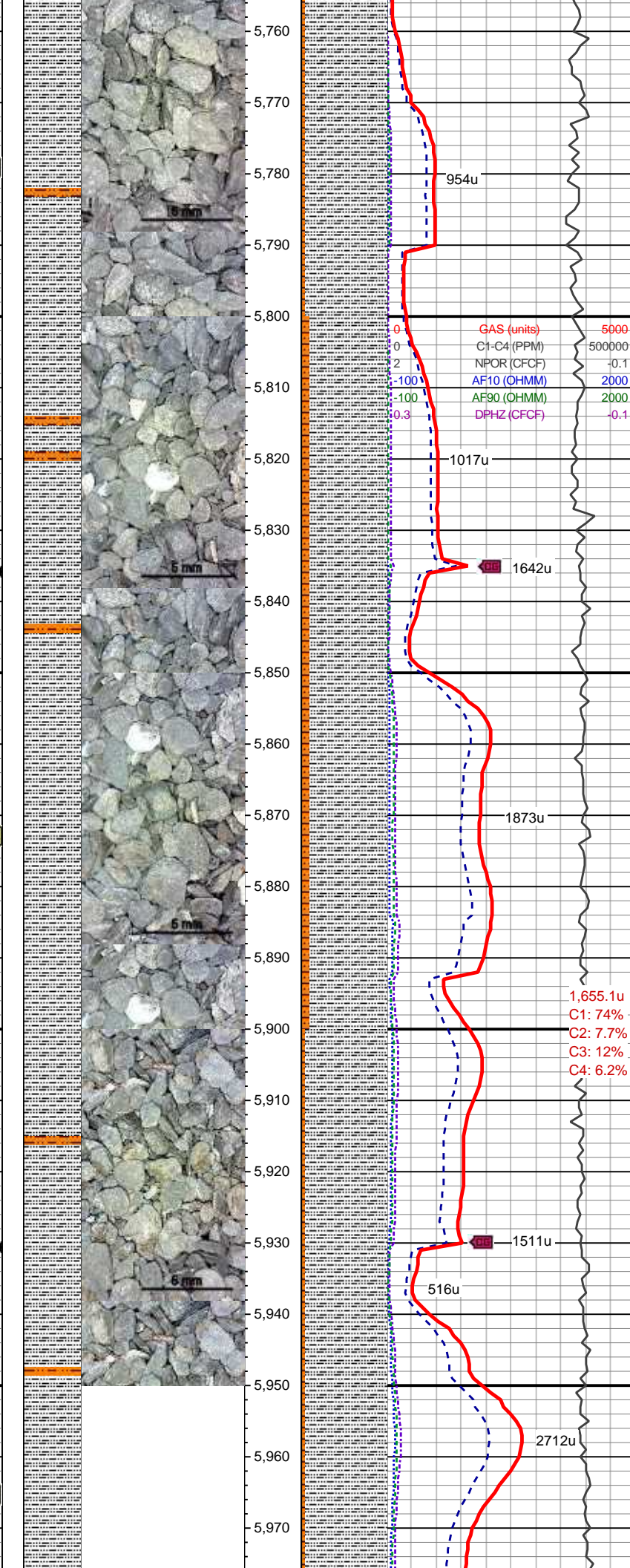
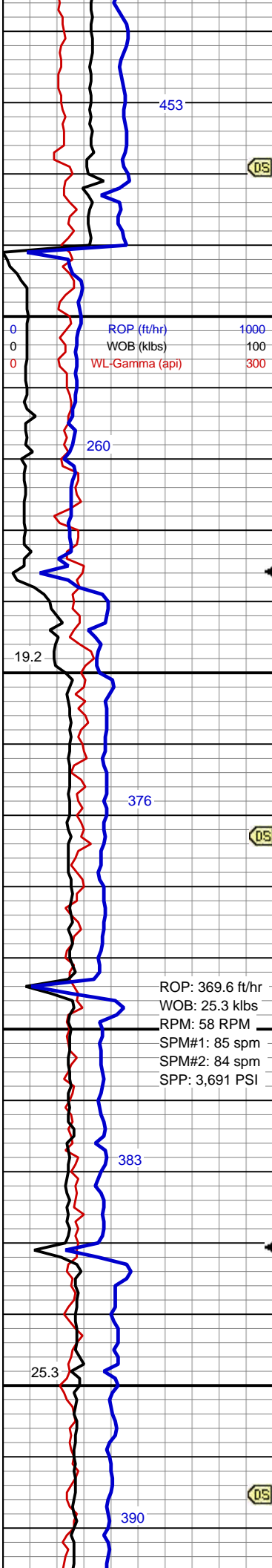
SLTY SH: gy-med gy, sb plty-occ plty, mic gr, slty tex grd to shy sltst, mod sft-mod frm, v sl calc; SHY SLTST: lt gy-med gy, slty-gt tex, sb plty-sb blk, mod frm-frm; rr fnt yel min flor, v lt bl difse cut, no stn

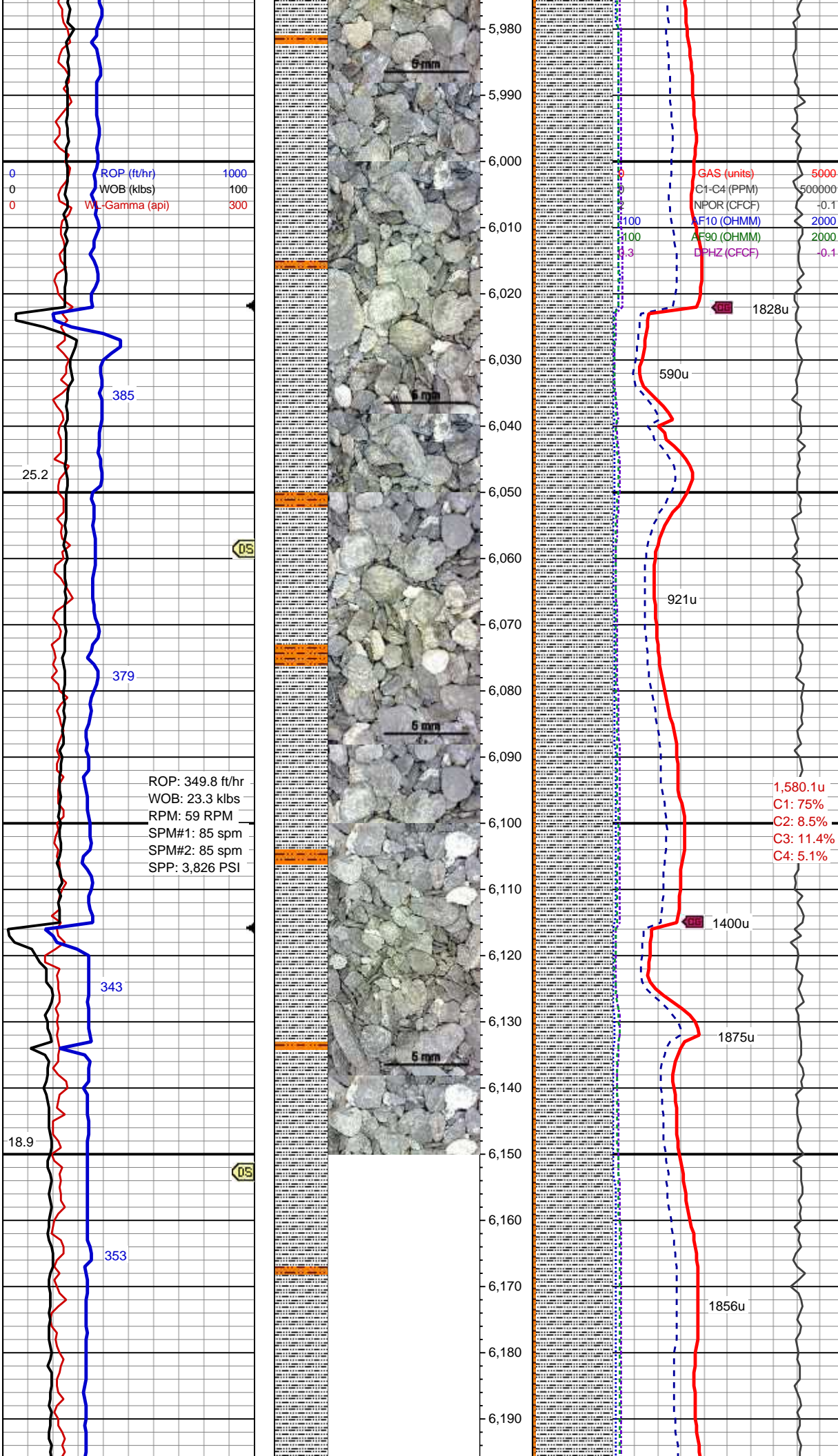
MD: 5,592'
Inclination: 0.7°
Azimuth: 349.8°
TVD: 5,590.89'

SLTY SH: gy-med gy, sb plty-occ plty, mic gr, slty tex grd to shy sltst, mod sft-mod frm, v sl calc; SHY SLTST: lt gy-med gy, slty-gt tex, sb plty-sb blk, mod frm-frm; rr fnt yel min flor, v lt bl difse cut, no stn

MD: 5,685'
Inclination: 0.5°
Azimuth: 7.5°
TVD: 5,683.88'

SLTY SH: gy-med gy, sb plty-occ plty, mic gr, slty tex grd to shy sltst, mod sft-mod frm, v sl calc; SHY SLTST: lt gy-med gy, slty-gt tex, sb plty-sb blk, mod frm-frm; rr fnt yel min flor, v lt bl



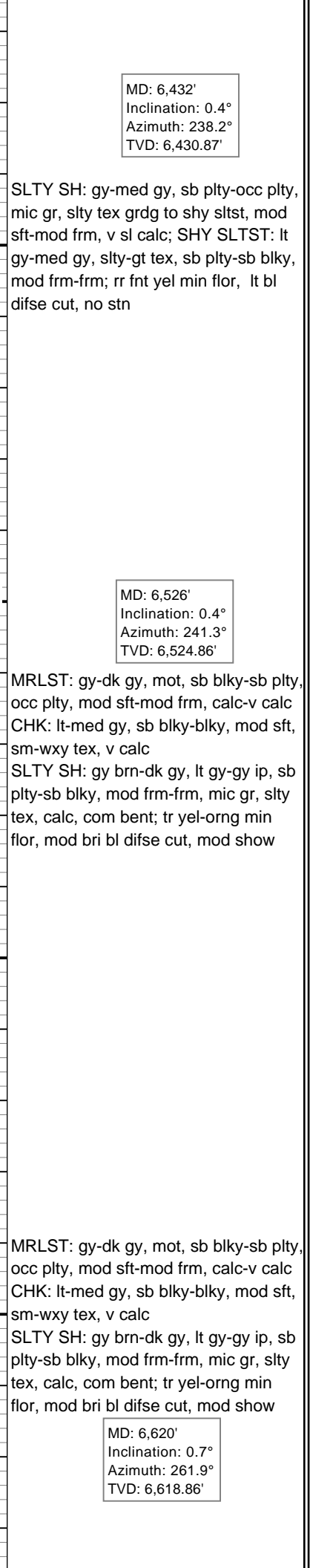
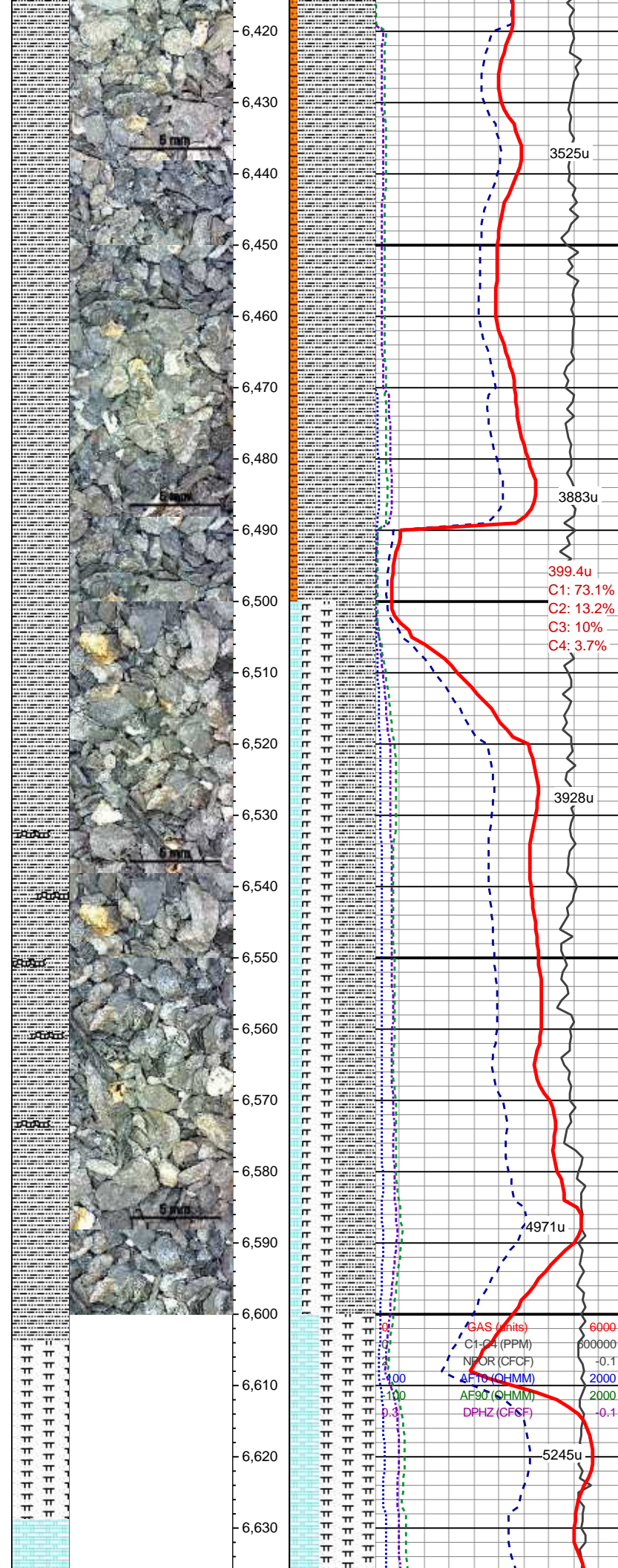
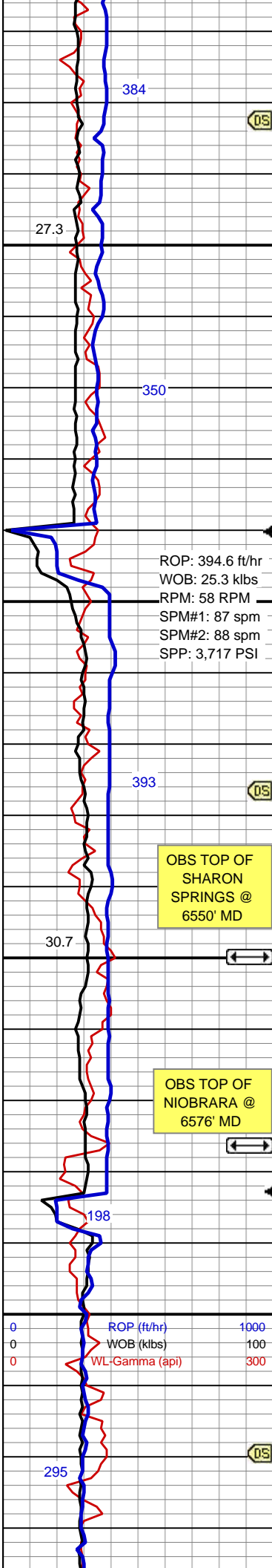


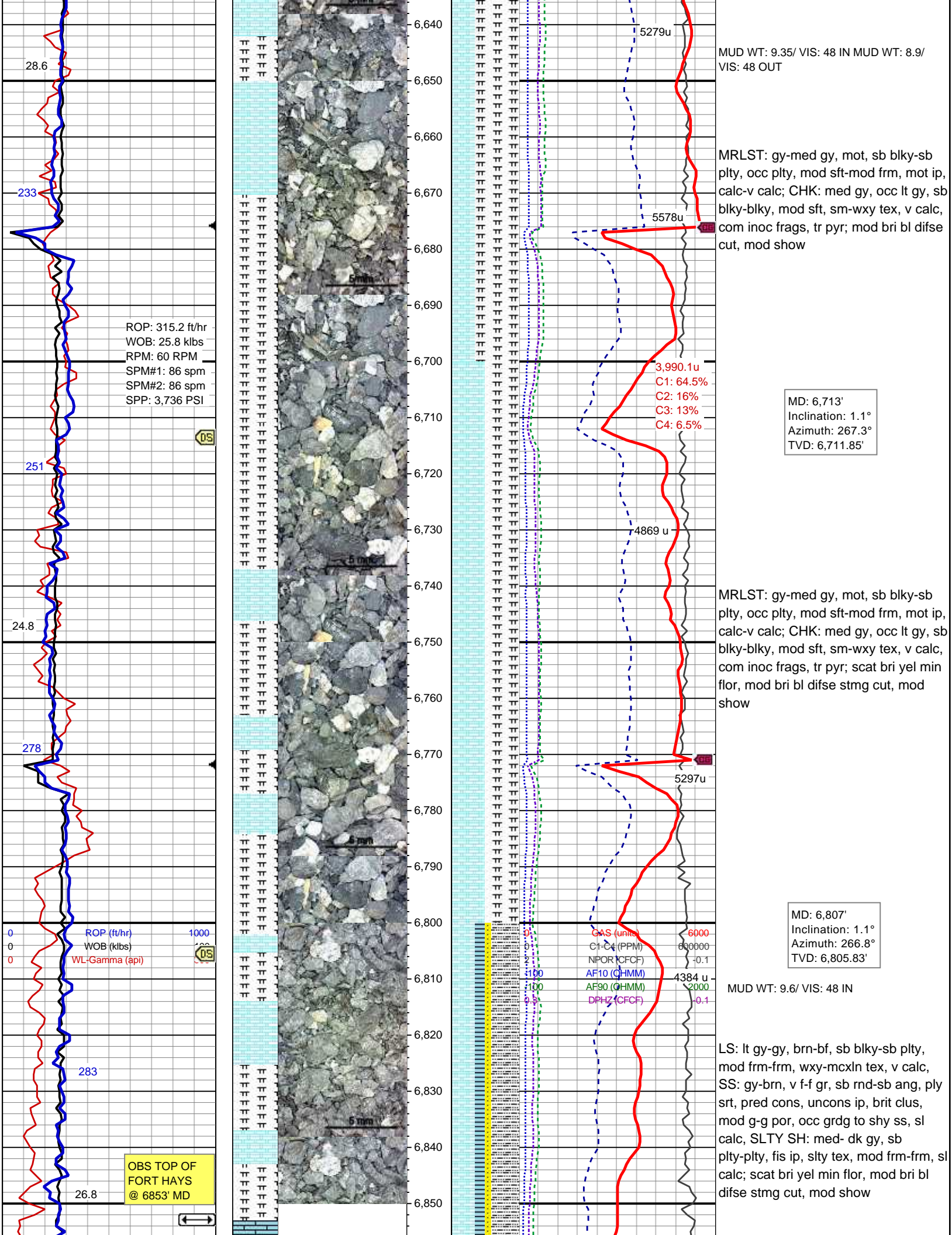
SLTY SH: gy-med gy, sb plty-occ plty, mic gr, slty tex grdg to shy sltst, mod sft-mod frm, v sl calc; SHY SLTST: lt gy-med gy, slty-gt tex, sb plty-sb blkly, mod frm-frm; rr fnt yel min flor, lt bl difse cut, no stn

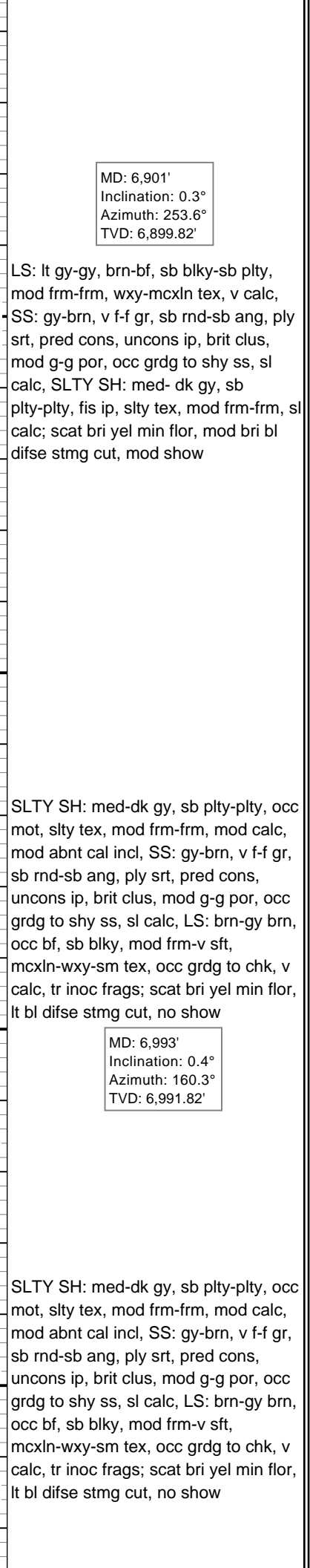
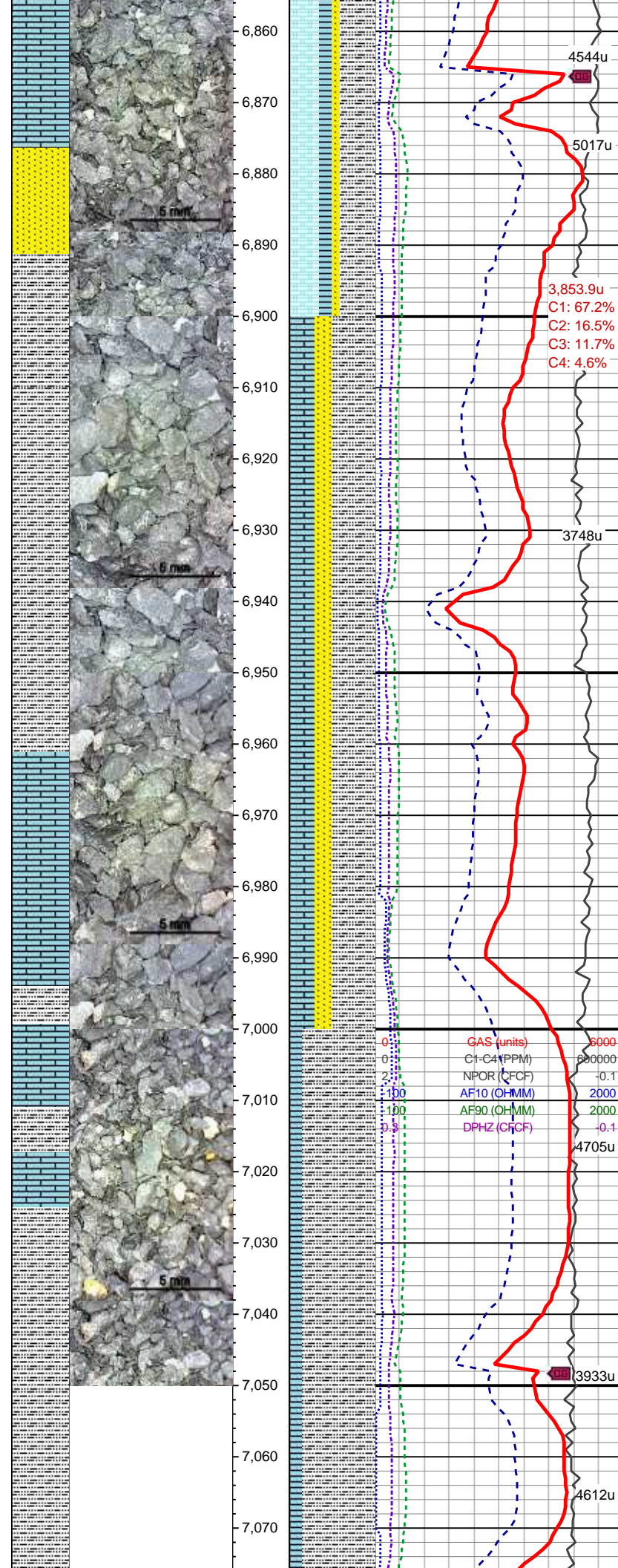
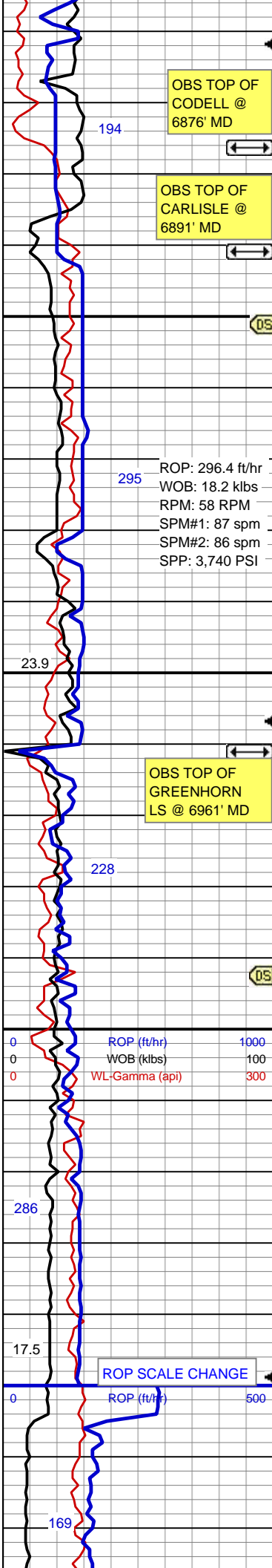
MD: 6,059'
Inclination: 0.1°
Azimuth: 120.2°
TVD: 6,057.88'

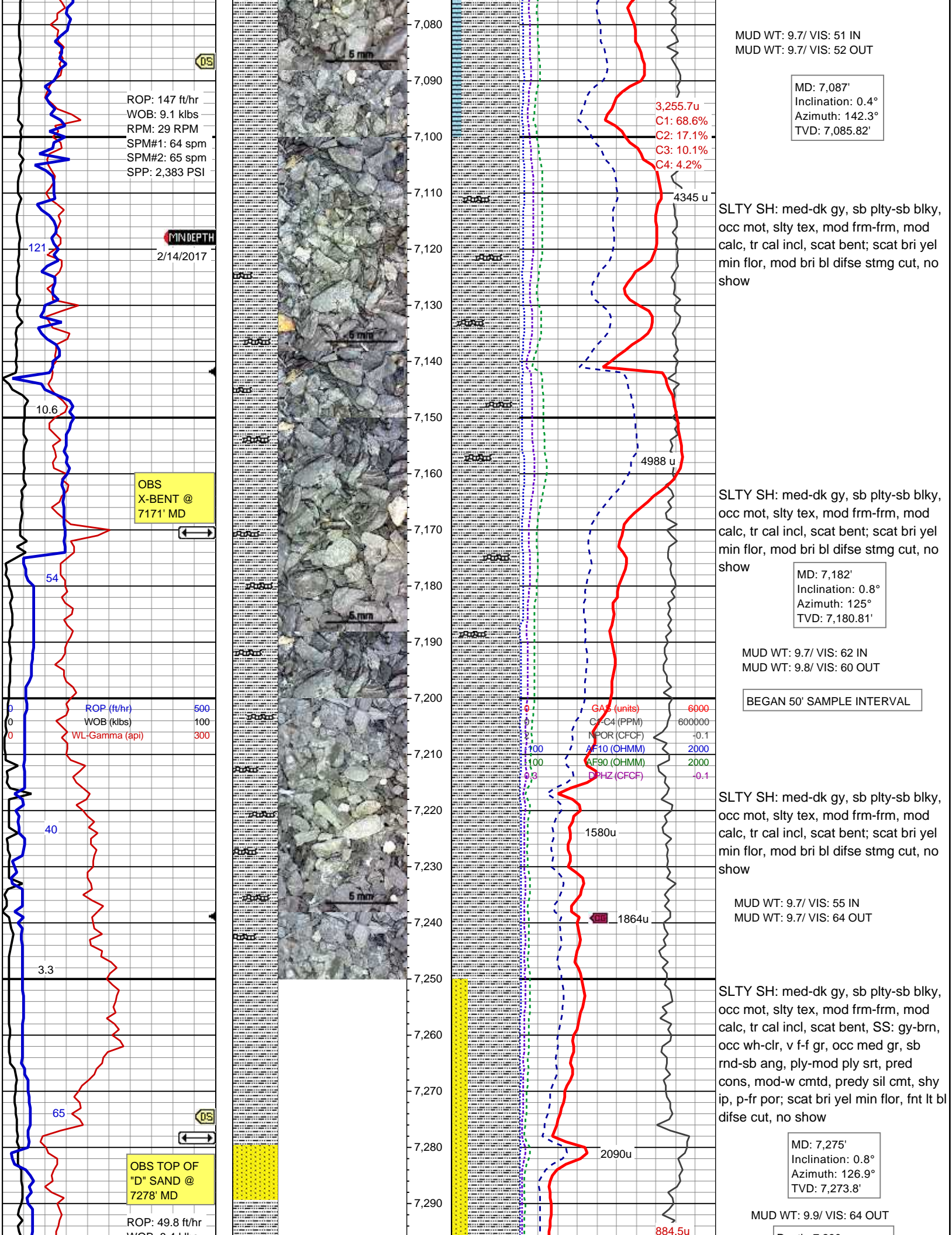
SLTY SH: gy-med gy, sb plty-occ plty, mic gr, slty tex grdg to shy sltst, mod sft-mod frm, v sl calc; SHY SLTST: lt gy-med gy, slty-gt tex, sb plty-sb blkly, mod frm-frm; rr fnt yel min flor, lt bl difse cut, no stn

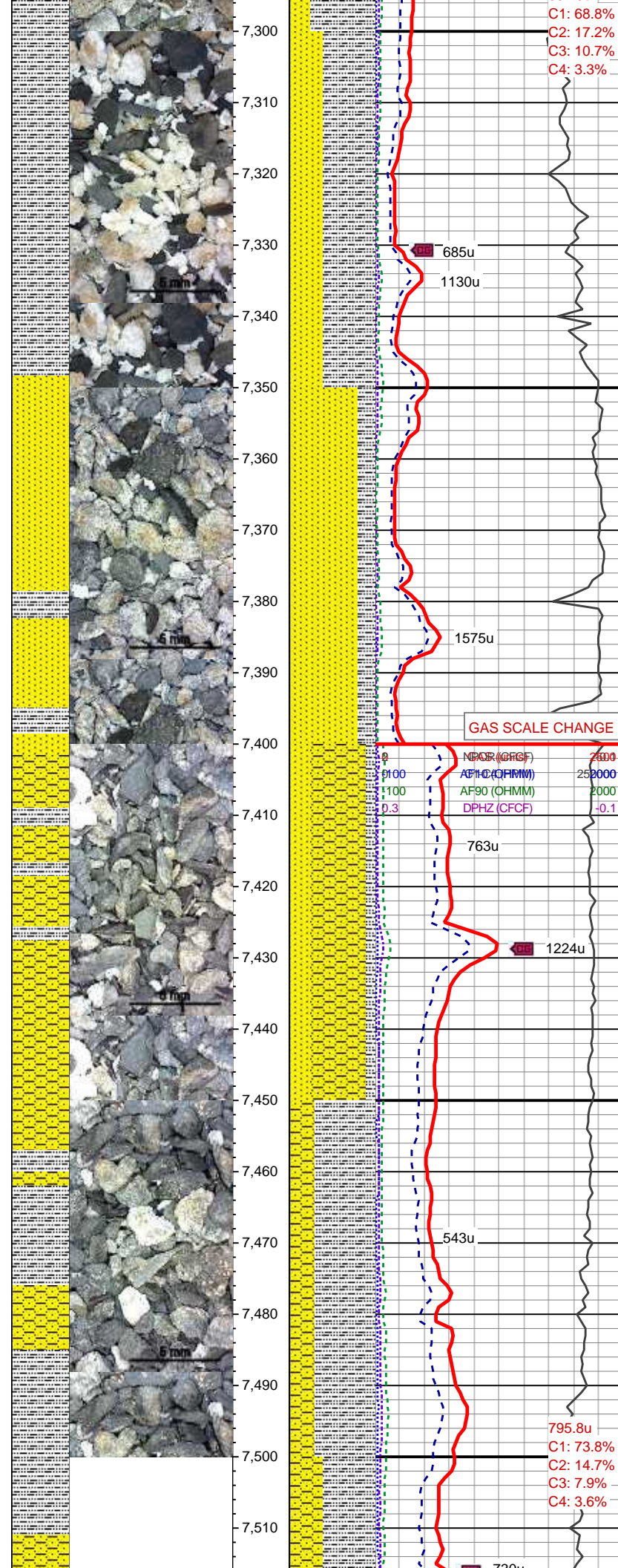
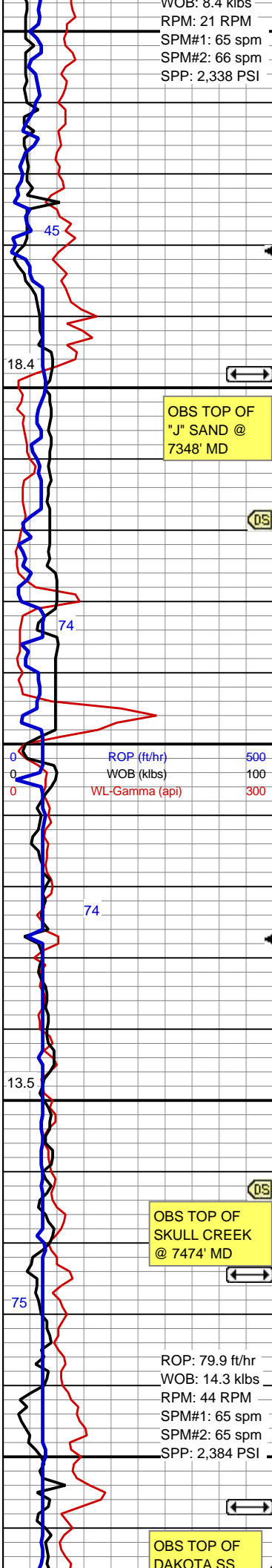
MD: 6,153'
Inclination: 0.5°
Azimuth: 193.2°
TVD: 6,151.88'











Depth: 7,290
Mud Weight: 9.9
Viscosity: 64
Yield Pt: 27
API Filtrate: 5.6
Solids: 10%
pH: 9.1
Chlorides: 2,900 mg/l

SLTY SH: med-dk gy, sb plty-sb blkly, occ mot, slty tex, mod frm-frm, mod calc, tr cal incl, scat bent, SS: gy-brn, occ wh-clr, v f-f gr, occ med gr, sb rnd-sb ang, ply-mod ply srt, pred cons, mod-w cmt, predy sil cmt, shy ip, p-fr por; scat bri yel min flor, fnt lt bl difse cut, no show

MD: 7,369'
Inclination: 0.7°
Azimuth: 115.5°
TVD: 7,367.8'

SS: wh-cl, brn-dk brn ip, f-med gr, occ v f gr, sb rnd-sb ang, ply-mod srt, pred cons, mod-w cmt, predy sil cmt, shy ip, p-fr por, SLTY SH: med-dk gy, sb plty-sb blkly, occ mot, slty tex, mod frm-frm, mod calc, tr cal incl, scat bent; scat bri yel min flor, fnt lt bl difse cut, tr dd o in sample

MUD WT: 9.8/ VIS: 46 IN
MUD WT: 9.8/ VIS: 48 OUT

GAS SCALE CHANGE

NPOR (CFCF) 2400
API-C (CFRM) 25000
AF90 (OHMM) 2000
DPHZ (CFCF) 0.1

SHY SS: lt gy-gy, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmt, cly mtx, p-mod p por, sl calc, SS: lt gy-wh, vf-f gr, occ med gr, sb rnd-sb ang, ply srt, pred cons, mod cmt, sil-arg cmt, shy ip, p por, v sl calc, SLTY SH: med-dk gy, sb plty-sb blkly, occ mot, slty tex, mod frm-frm, mod calc, slty-sdy ip, tr bent, sl calc; tr bri yel min flor, lt bl difse cut, no show

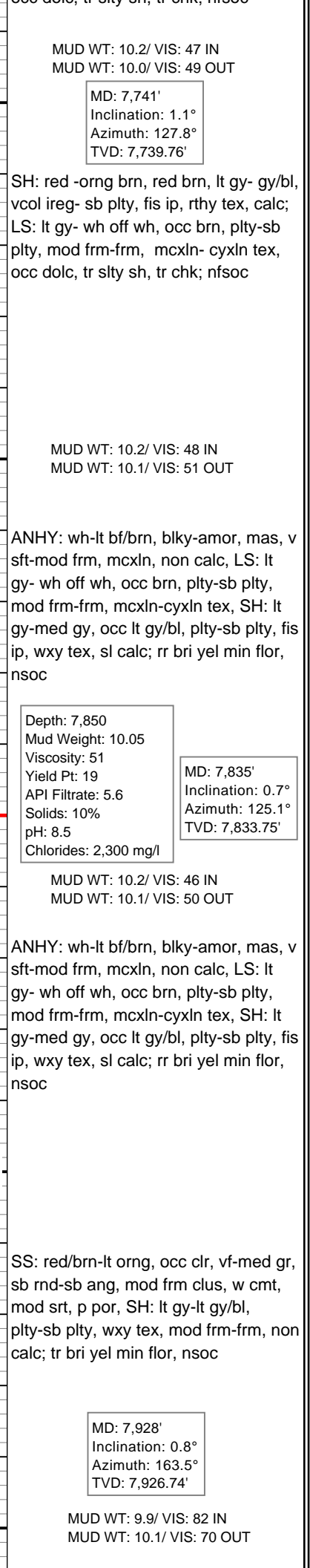
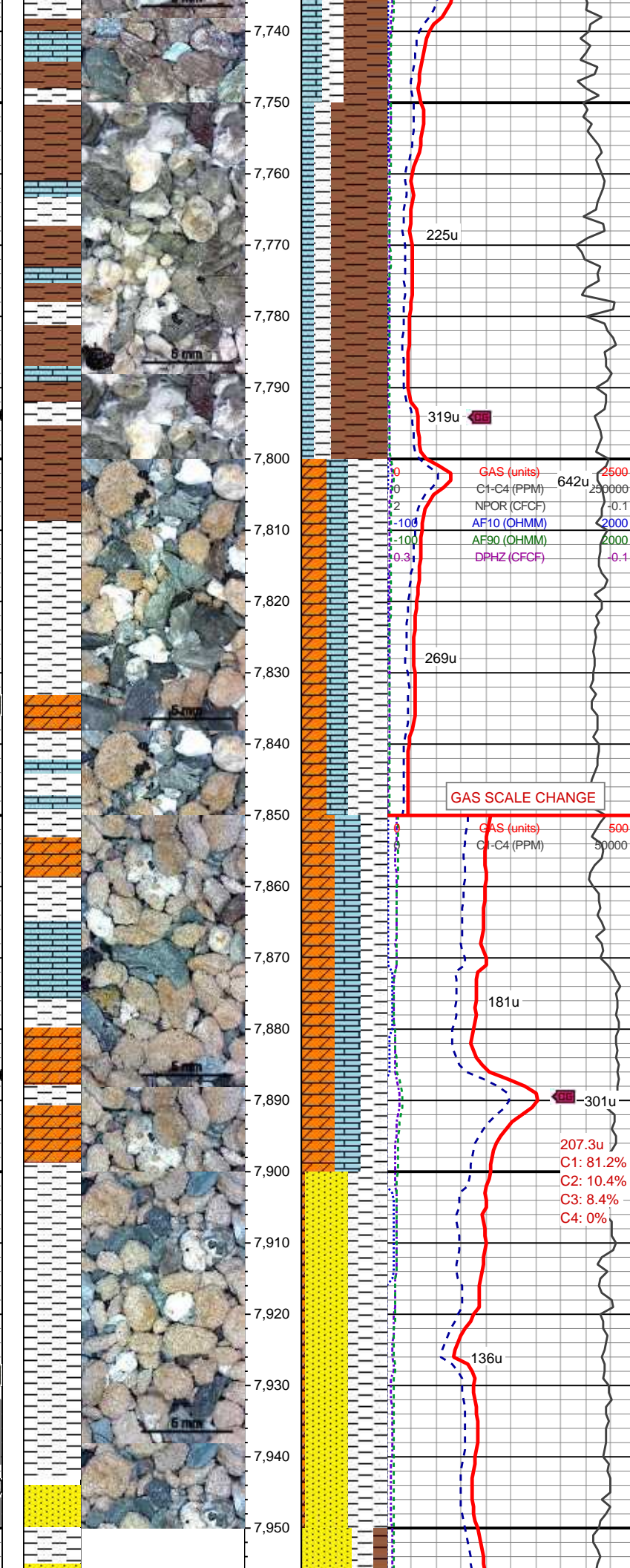
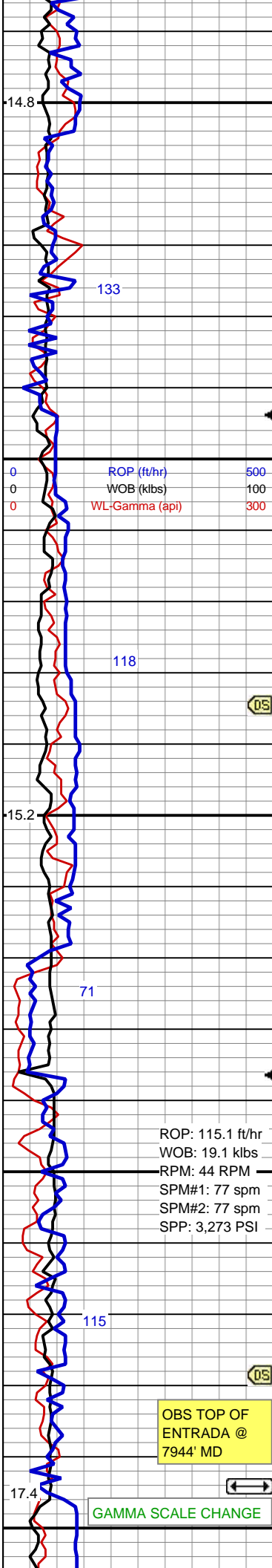
MUD WT: 9.8/ VIS: 46 IN
MUD WT: 9.8/ VIS: 49 OUT

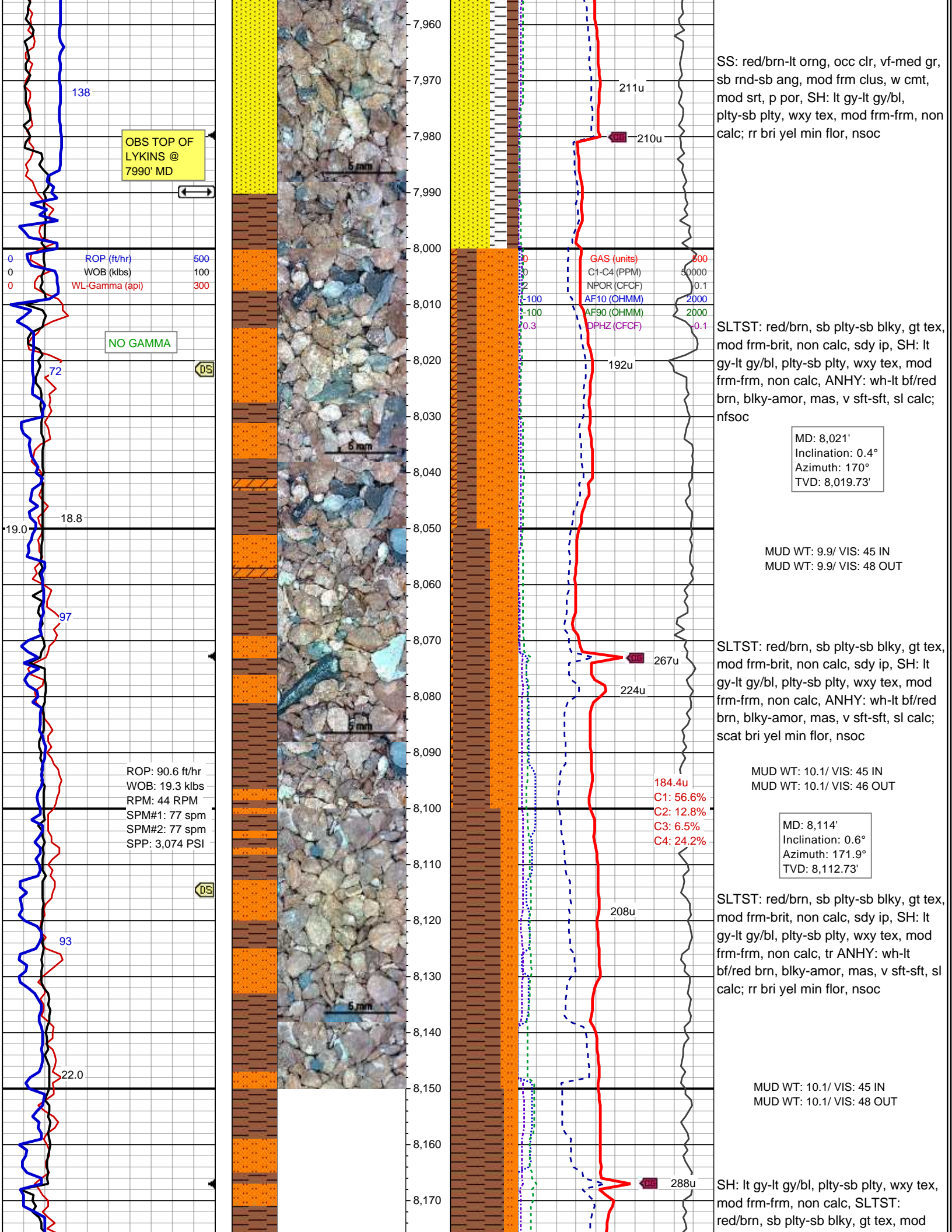
MD: 7,462'
Inclination: 0.7°
Azimuth: 133.4°
TVD: 7,460.79'

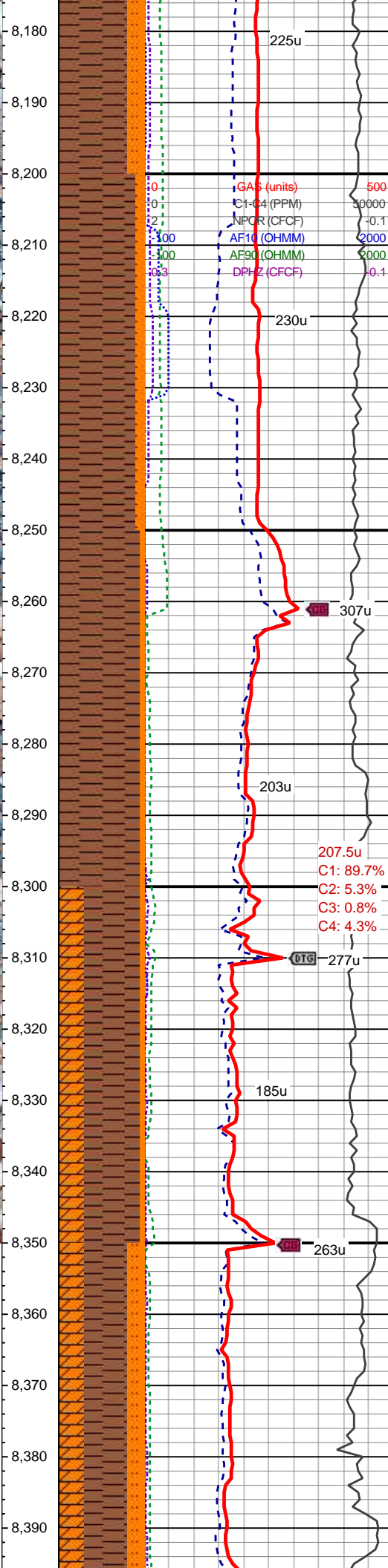
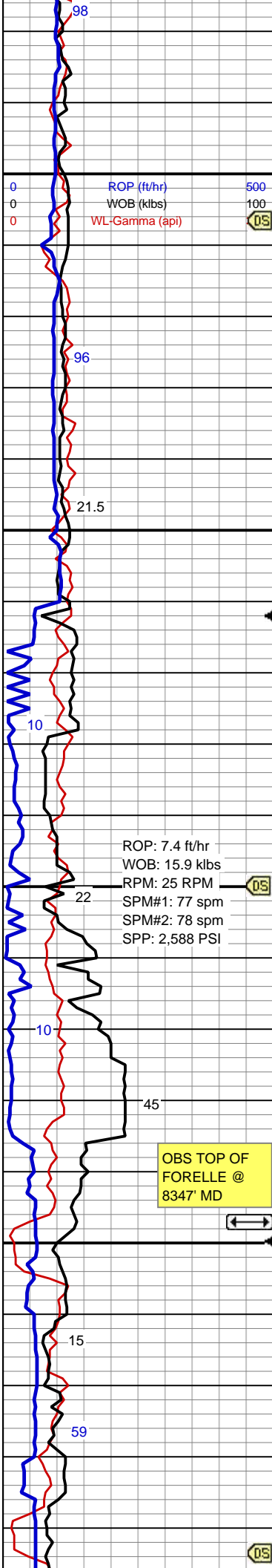
SLTY SH: med-dk gy, sb plty-sb blkly, occ mot, slty tex, mod frm-frm, mod calc, tr cal incl, scat bent, SS: wh-cl, lt brn ip, f-med gr, occ vf gr, sb rnd-sb ang, ang ip, mod ply srt, pred cons, mod-w cmt, predy sil cmt, p-fr por; scat bri yel min flor, lt bl difse cut, no show

MUD WT: 9.8/ VIS: 45 IN
MUD WT: 9.8/ VIS: 47 OUT

SLTY SH: med-dk gy, sb plty-sb blkly,







frm-frm, non calc; rr bri yel min flor, nsoc

MUD WT: 10.2/ VIS: 45 IN
MUD WT: 10.2/ VIS: 46 OUT

MD: 8,206'
Inclination: 0.8°
Azimuth: 128.6°
TVD: 8,204.72'

SH: lt gy-lt gy/bl, plty-sb plty, wxy tex, mod sft-frm, non calc, SLTST: red/brn, sb plty-sb blk, gt tex, mod frm-frm, non calc; rr bri yel min flor, nsoc

MUD WT: 9.9/ VIS: 43 IN
MUD WT: 9.9/ VIS: 45 OUT

SH: lt gy-lt gy/bl, plty-sb plty, wxy tex, mod sft-frm, non calc, SLTST: red/brn, sb plty-sb blk, gt tex, mod frm-frm, non calc; rr bri yel min flor, nsoc

Note: 50% of Sample is up hole slough (dk gy-blk Shales)

MD: 8,300'
Inclination: 0.7°
Azimuth: 101.8°
TVD: 8,298.71'

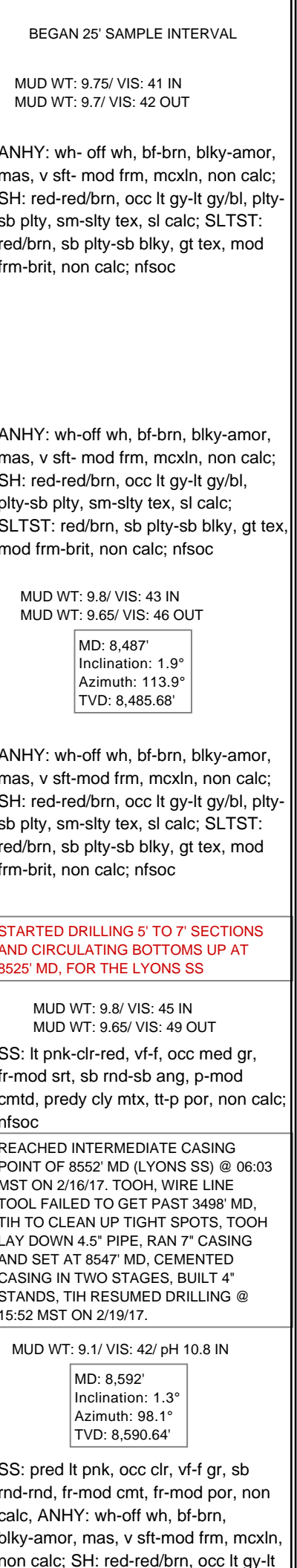
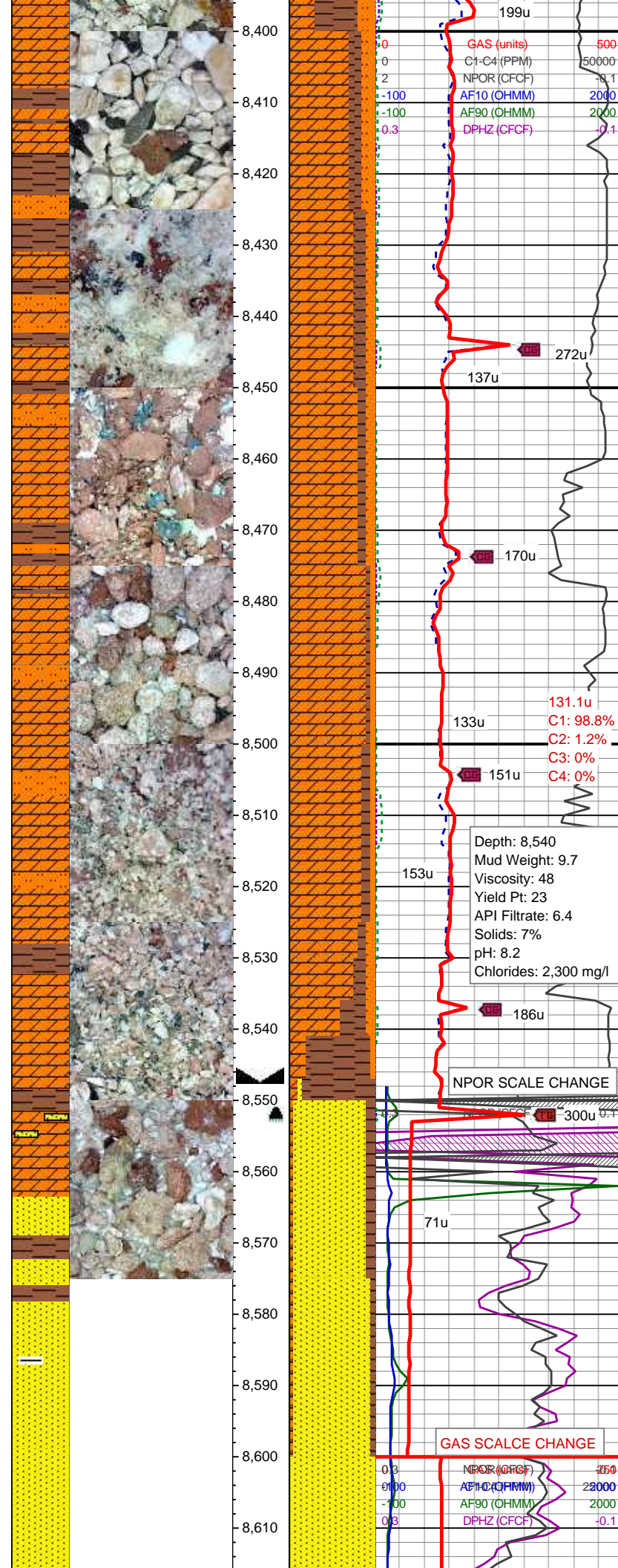
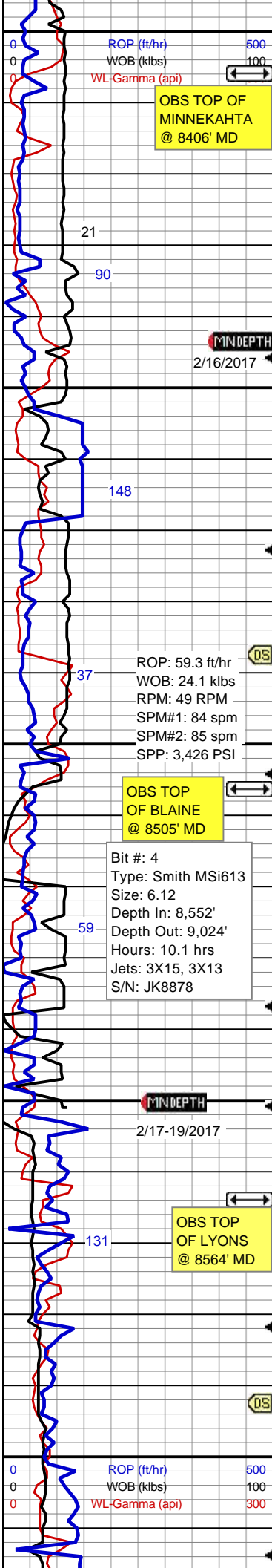
MUD WT: 9.8/ VIS: 44 IN
MUD WT: 9.8/ VIS: 47 OUT

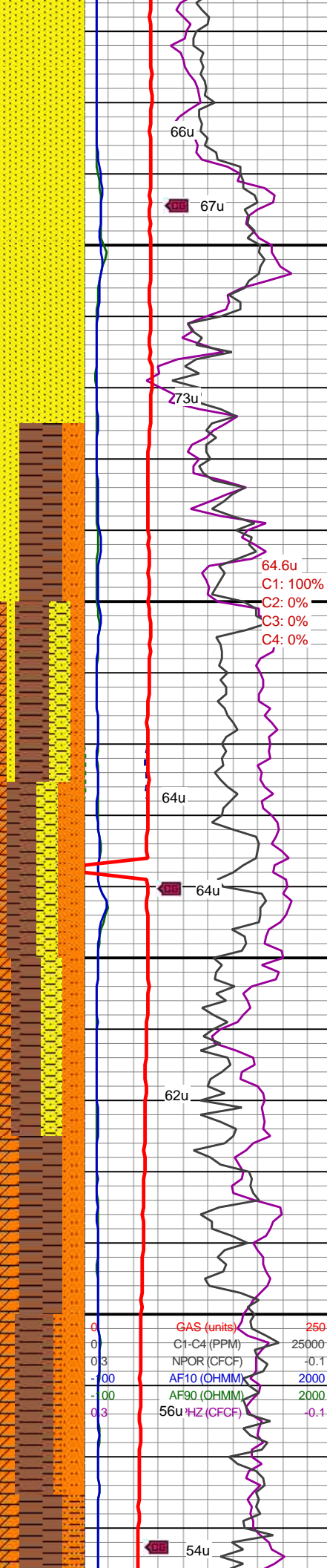
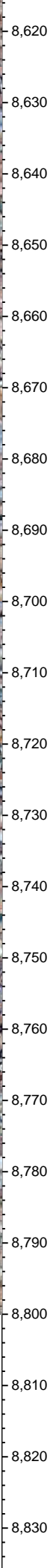
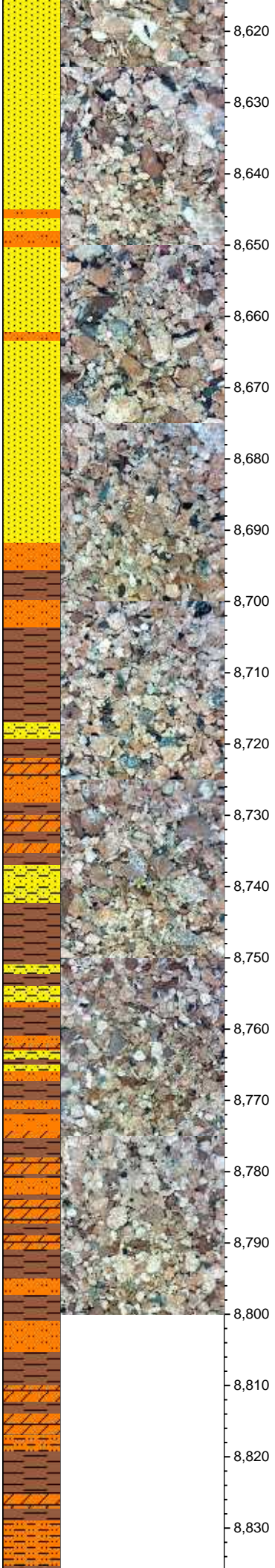
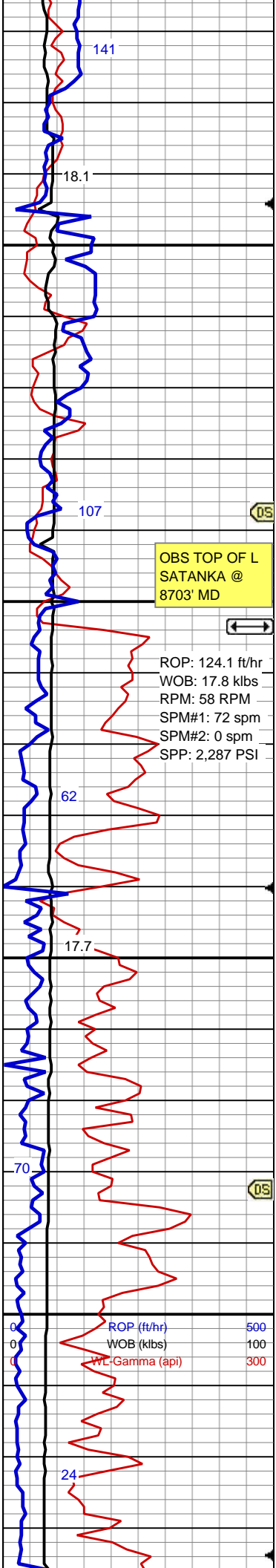
SH: red-red/brn, occ lt gy- lt gy/bl, plty-sb plty, slty tex, sl calc; ANHY: wh- lt orng/brn, blk-amor, mas, v sft- mod frm, mcxln, non calc; SLTST: red/brn, sb plty-sb blk, gt tex, mod frm-brit, non calc; nfsoc

MUD WT: 9.7/ VIS: 40 IN
MUD WT: 9.7/ VIS: 41 OUT

SLTST: red/brn, sb plty-sb blk, gt tex, mod frm-brit, non calc; SH: red-red/brn, occ lt gy- lt gy/bl, plty-sb plty, sm-slty tex, sl calc; ANHY: wh- lt orng/brn, blk-amor, mas, v sft- mod frm, mcxln, non calc; nfsoc

MD: 8,393'
Inclination: 0.8°
Azimuth: 116.9°
TVD: 8,391.71'





gy/bl, pty- sb pty, sm-sly tex, sl calc; nfsoc

MUD WT: 9.0/ VIS: 38 IN
MUD WT: 9.0/ VIS: 38 OUT

SS: pred lt pnk/orng-wh, occ clr/trnsl, vf-f gr, w srt, sb rnd-rnd, pred cons, mod por, non calc; SLTST: red/orng, sb pty-sb blkly ip, sly tex, occ grd to sly sh, non-sl calc; SH: red/orng-brn/orng, sb pty-pty, mod frm, sm-rthy tex, non calc; nfsoc

MD: 8,687'
Inclination: 1.7°
Azimuth: 83.3°
TVD: 8,685.61'

MUD WT: 9.05/ VIS: 39 IN
MUD WT: 9.1/ VIS: 45 OUT

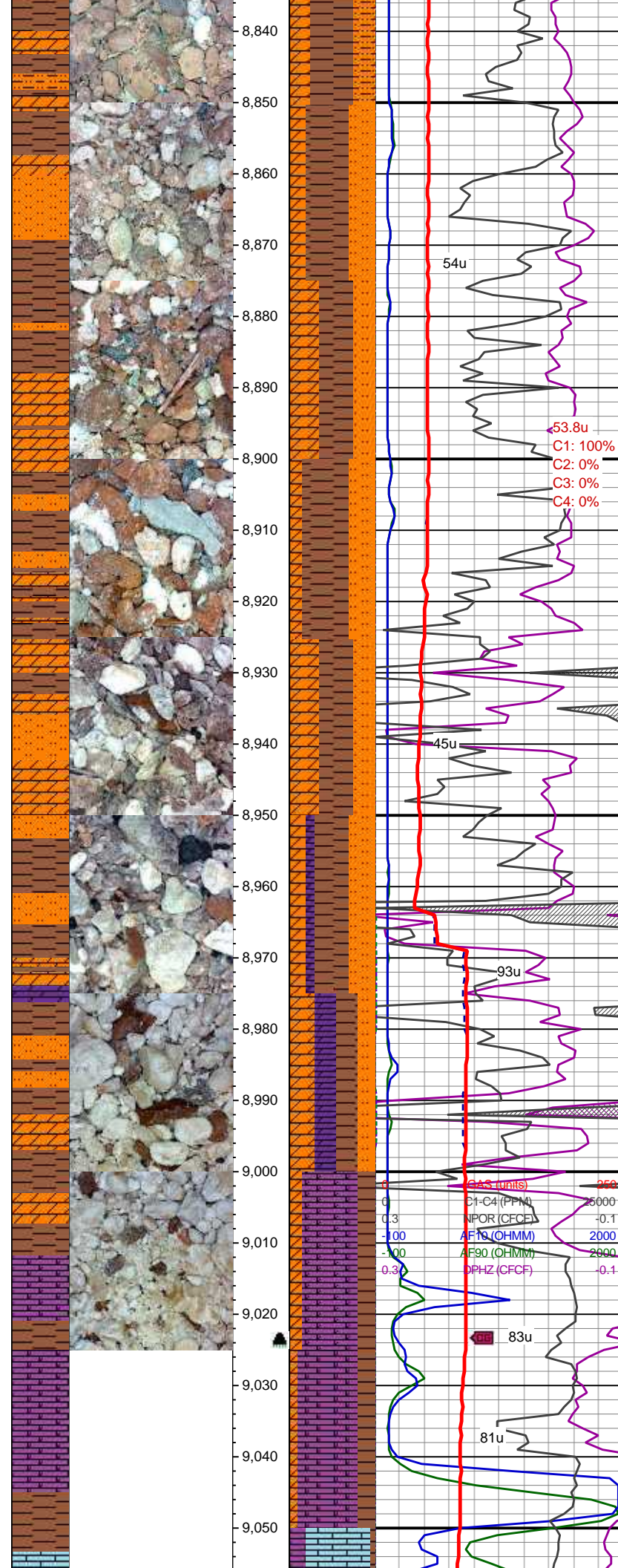
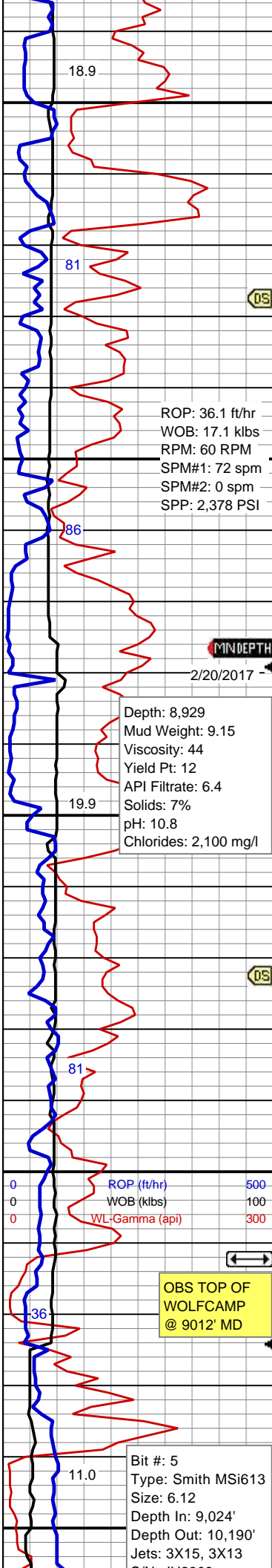
SLTST: red/orng, sb pty-sb blkly ip, sly tex, occ grd to sly sh, non-sl calc; SH: red/orng-brn/orng, sb pty-pty, mod frm, sm-rthy tex, non calc; SHY SS: pnk/lt red, vf gr, sb rnd-sb ang, lam, mod srt, tt, non calc, occ grd to ss, ANHY: wh-off wh, bf-brn, blkly-amor, mas, v sft-mod frm, mcxln, non calc; nfsoc

MUD WT: 9.1/ VIS: 43IN
MUD WT: 9.1/ VIS: 41 OUT

SLTST: red/orng, sb pty-sb blkly ip, sly tex, occ grd to sly sh, non-sl calc; SH: red/orng-brn/orng, sb pty-pty, mod frm, sm-rthy tex, non calc; SHY SS: pnk/lt red, vf gr, sb rnd-sb ang, lam, mod srt, tt, non calc, occ grd to ss, ANHY: wh-off wh, bf-brn, blkly-amor, mas, v sft-mod frm, mcxln, non calc; nfsoc

MD: 8,782'
Inclination: 1.6°
Azimuth: 80.3°
TVD: 8,780.57'

SH: red/orng-brn/orng, sb pty-pty, mod frm, rthy tex, non calc; SHY SLTST: red/orng, sb pty-sb blkly ip, sly tex, occ grd to sly sh, non-sl calc; ANHY: wh-lt orng/brn, amor, v sft, sm-rthy tex, non calc; nfsoc



MUD WT: 9.1/ VIS: 44 IN
MUD WT: 9.15/ VIS: 41 OUT

SH: red/orng-brn/orng, sb plty-plty, mod frm, rthy tex, non calc; SLTST: red/orng, sb plty-sb blkly ip, slty tex, occ grd to slty sh, non-sl calc; ANHY: wh-lt orng/brn, amor, v sft, sm-rthy tex, non calc; nfsoc

MD: 8,877'
Inclination: 1.4°
Azimuth: 78.5°
TVD: 8,875.54'

MUD WT: 9.15/ VIS: 45 IN
MUD WT: 9.1/ VIS: 49 OUT

SH: red/orng-brn/orng, sb plty-plty, mod frm, rthy tex, non calc; SLTST: red/orng, sb plty-sb blkly ip, slty tex, occ grd to slty sh, non-sl calc; ANHY: wh-lt orng/brn, amor, v sft, sm-rthy tex, non calc; nfsoc

MUD WT: 9.15/ VIS: 41 IN
MUD WT: 9.15/ VIS: 43 OUT

DOL: wh-off wh, sb blkly, mcxln-cyxln, mod frm-frm, sm-wxy tex, occ mot, sl- v calc; SH: red/orng-brn/orng, sb plty-plty, mod frm, rthy tex, non calc; SLTST: red/orng, sb plty-sb blkly ip, slty tex, occ grd to slty sh, non-sl calc; ANHY: wh-lt orng/brn, amor, v sft, sm-rthy tex, non calc; lt yel min flor, nsoc

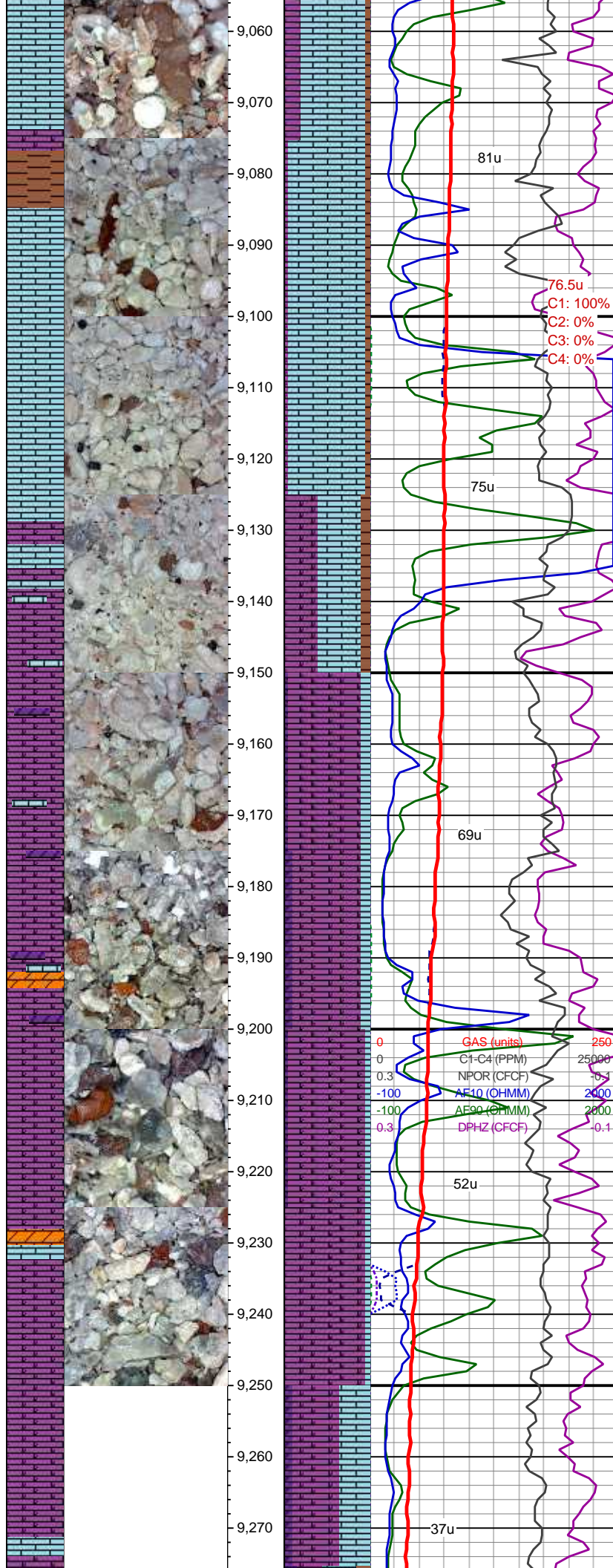
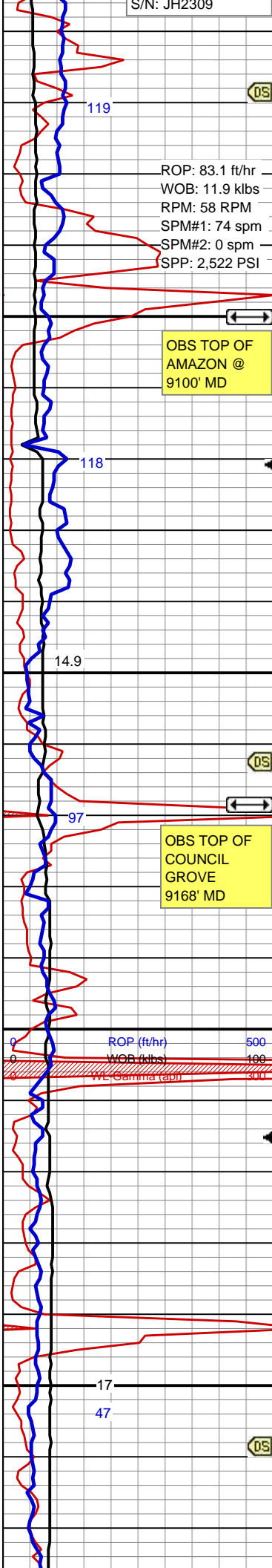
MD: 8,972'
Inclination: 1.4°
Azimuth: 79.1°
TVD: 8,970.51'

MUD WT: 9.15/ VIS: 46 IN
MUD WT: 9.15/ VIS: 47 OUT

TOOH AT 9024' MD FOR MUD MOTOR @ 03:19 MST ON 2/20/17. TIH, RESUMED DRILLING @ 01:56 MST ON 2/20/17

MUD WT: 9.0/ VIS: 44 IN
MUD WT: 9.0/ VIS: 46 OUT

DOLC LS: wh-off wh, sb blkly, mcxln-cyxln, mod frm-frm, sm-wxy tex, occ mot, sl- v calc; SH: red/orng-brn/orng, sb plty-plty, mod frm, rthy tex, non calc; SLTST: red/orng, sb plty-sb blkly ip, slty tex, occ grd to slty sh, non-sl calc; ANHY: wh-lt orng/brn, amor, v sft, sm-rthy tex, non calc; lt yel min flor, nsoc



MD: 9,068'
Inclination: 1.5°
Azimuth: 85.8°
TVD: 9,066.48'

LS: wh-off wh, lt pnk, mcxln, sm tex, sft-mod sft, v calc, DOLC LS: wh-off wh, sb blk, mcxln-cyxln, mod frm-frm, sm-wxy tex, occ mot, sl- v calc, SH: red/orng-brn/orng, sb pty-pty, mod frm, rthy tex, non calc; nfsoc

76.5u
C1: 100%
C2: 0%
C3: 0%
C4: 0%

LS: wh-off wh, lt pnk, mcxln, sm tex, sft-mod sft, v calc, DOLC LS: wh-off wh, sb blk, mcxln-cyxln, mod frm-frm, sm-wxy tex, occ mot, sl- v calc, SH: red/orng-brn/orng, sb pty-pty, mod frm, rthy tex, non calc; nfsoc

MUD WT: 9.0/ VIS: 43 IN
MUD WT: 9.0/ VIS: 43 OUT

MD: 9,163'
Inclination: 1.3°
Azimuth: 83.3°
TVD: 9,161.45'

DOLC LS: wh-off wh, lt pnk, mcxln-cyxln, sm tex, sft-mod sft, dns chky, calc, LS: wh-off wh, sb blk, mcxln-cyxln, mod frm-frm, sm-wxy tex, occ mot, calc - v calc, nfsoc

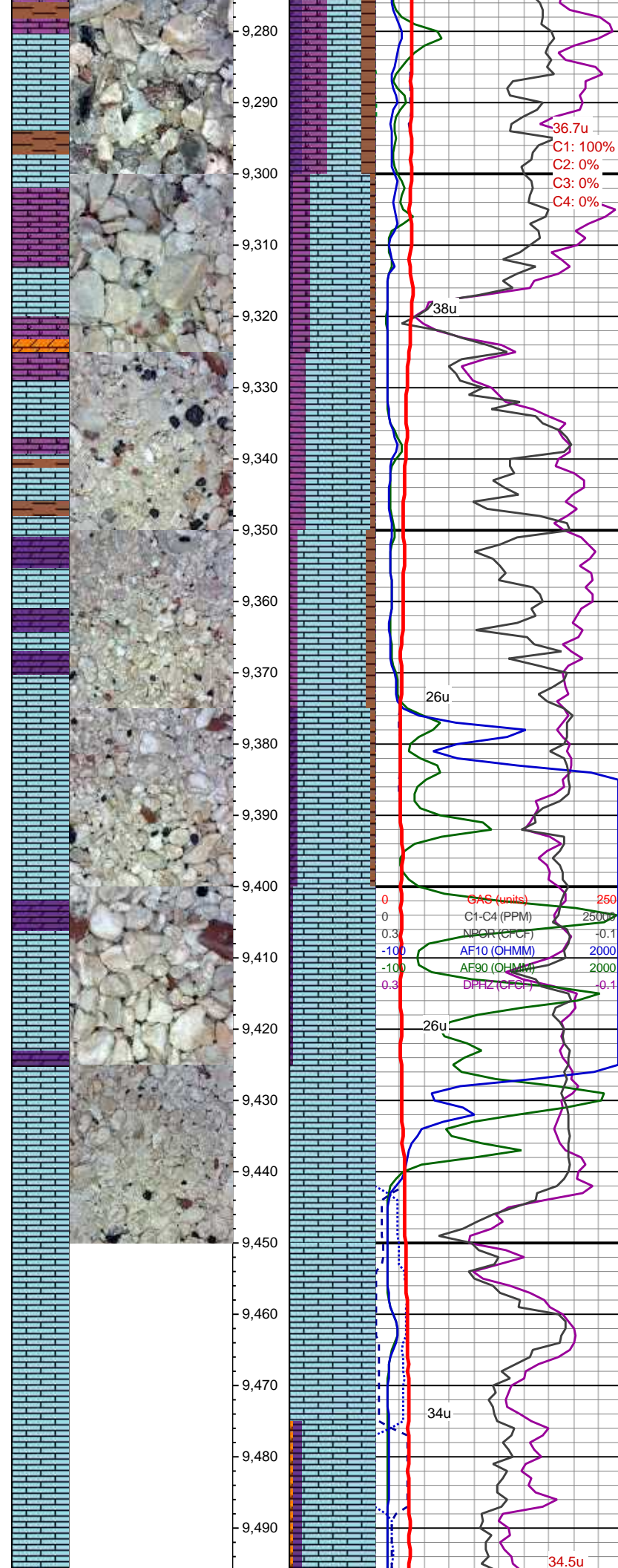
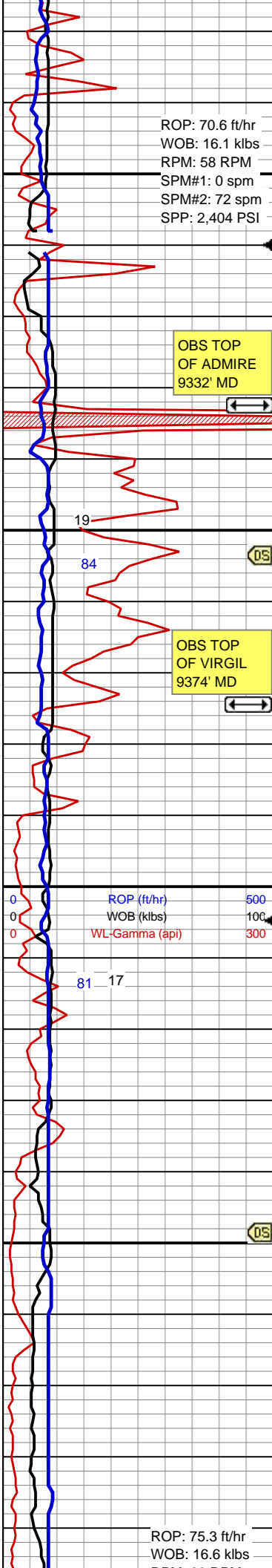
0 GAS (units) 250
0 C1-C4 (PPM) 25000
0.3 NPOR (CFCF) -0.3
-100 AF10 (OHMM) 2000
-100 AF90 (OHMM) 2000
0.3 DPHZ (CFCF) -0.1

DOLC LS: wh-off wh, lt pnk, mcxln-cyxln, sm tex, sft-mod sft, dns chky, calc, LS: wh-off wh, sb blk, mcxln-cyxln, mod frm-frm, sm-wxy tex, occ mot, calc - v calc, nfsoc

MUD WT: 9.0/ VIS: 45 IN
MUD WT: 9.0/ VIS: 43 OUT

MD: 9,258'
Inclination: 1.2°
Azimuth: 96.5°
TVD: 9,256.43'

LS: wh-lt gy-grm, mcxln, sm-wxy tex, mod sft-mod frm, sb pty-sb blk, v calc; DOLC LS: wh-off wh-lt pnk, sb blk, mcxln-cyxln, mod frm-frm, sm-wxy tex, occ mot, sl-v calc; SH:



red/orng, sb plty-plty, mod frm, rthy
tex, non calc; nfsoc

MUD WT: 8.7/ VIS: 49 IN
MUD WT: 9.15/ VIS: 43 OUT

36.7u
C1: 100%
C2: 0%
C3: 0%
C4: 0%

LS: wh-lt gy-crm, mcxln, sm-wxy tex,
mod sft-mod frm, sb plty-sb blk, v
calc; DOLC LS: wh-off wh-lt pnk, sb
blk, mcxln-cyxln, mod frm-frm,
sm-wxy tex, occ mot, sl-v calc; SH:
red/orng, sb plty-plty, mod frm, rthy
tex, non calc; nfsoc

MUD WT: 8.95/ VIS: 43 IN
MUD WT: 9.1/ VIS: 43 OUT

MD: 9,353'
Inclination: 1.1°
Azimuth: 86.1°
TVD: 9,351.41'

LS: wh-lt gy-crm, mcxln, sm-wxy tex,
mod sft-mod frm, sb plty-sb blk, v
calc; DOLC LS: wh-off wh-lt pnk, sb
blk, mcxln-cyxln, mod frm-frm,
sm-wxy tex, occ mot, sl-v calc; SH:
red/orng, sb plty-plty, mod frm, rthy
tex, non calc; nfsoc

MUD WT: 9.05/ VIS: 45 IN
MUD WT: 9.15/ VIS: 42 OUT

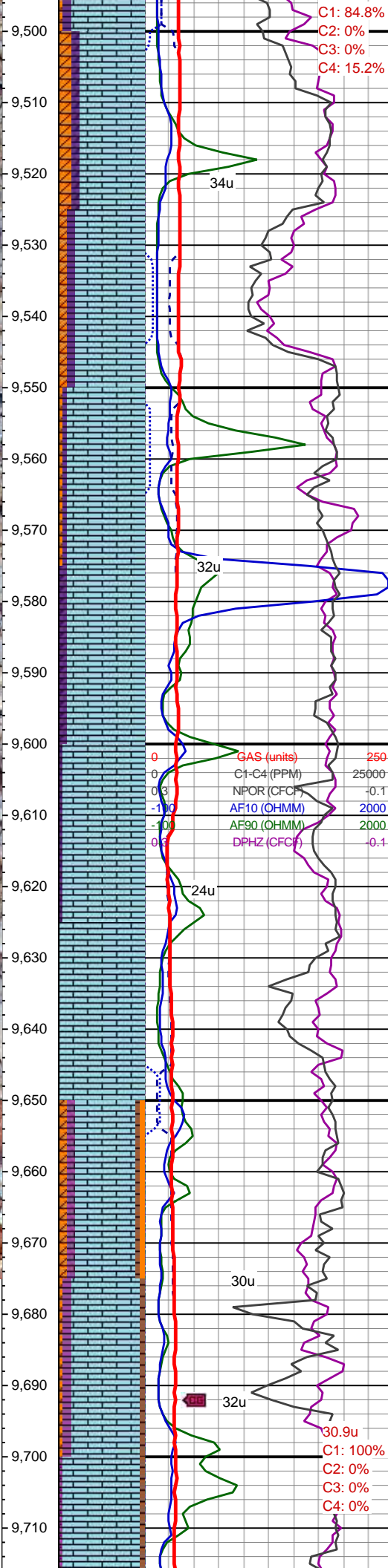
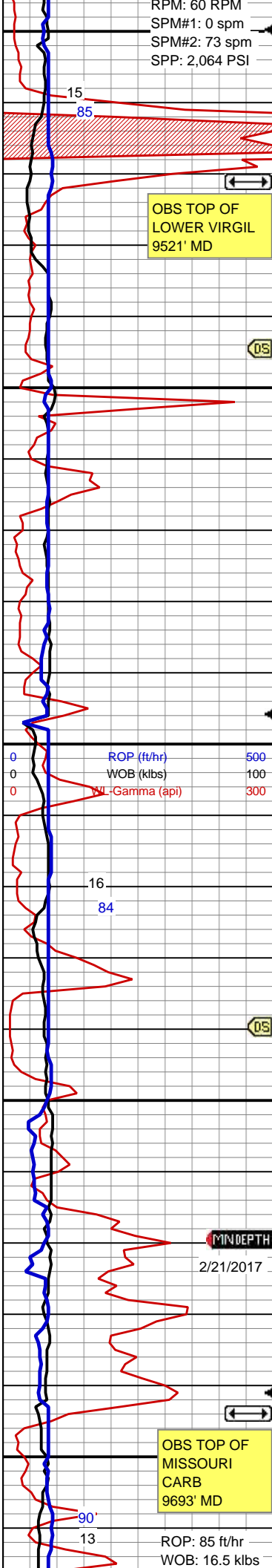
LS: wh-lt gy-crm, mcxln, sm-wxy tex,
mod sft-mod frm, sb plty-sb blk, v
calc; DOLC LS: wh-off wh-lt pnk, sb
blk, mcxln-cyxln, mod frm-frm,
sm-wxy tex, occ mot, sl-v calc; nfsoc

MD: 9,448'
Inclination: 1.1°
Azimuth: 76.8°
TVD: 9,446.39'

LS: wh-lt gy-crm, mcxln-cyxln, sm-wxy
tex, mod sft-mod frm, sb plty-sb blk,
v calc; dns, arg ip, anhyc, nfsoc

MUD WT: 9.0/ VIS: 46 IN
MUD WT: 9.15/ VIS: 42 OUT

34.5u



LS: wh-lt gy-crm, mcxln, sm-wxy tex, mod sft-mod frm, sb plty-sb blkly, v calc; DOLC LS: wh-off wh-lt pnk, sb blkly, mcxln-cyxln, mod frm-frm, sm-wxy tex, occ mot, sl-v calc; anhyc ip, dns, arg, nfsoc

MD: 9,544'
Inclination: 1°
Azimuth: 66.1°
TVD: 9,542.37'

LS: wh-lt gy-crm, mcxln, sm-wxy tex, mod sft-mod frm, sb plty-sb blkly, v calc; DOLC LS: wh-off wh-lt pnk, sb blkly, mcxln-cyxln, mod frm-frm, sm-wxy tex, occ mot, sl-v calc; anhyc ip, dns, arg, nfsoc

MUD WT: 9.0/ VIS: 44 IN
MUD WT: 9.15/ VIS: 42 OUT

LS: wh-lt gy-crm, mcxln, sm-wxy tex, mod sft-mod frm, sb plty-sb blkly, v calc; DOLC LS: wh-off wh-lt pnk, sb blkly, mcxln-cyxln, mod frm-frm, sm-wxy tex, occ mot, sl-v calc; anhyc ip, dns, arg, nfsoc

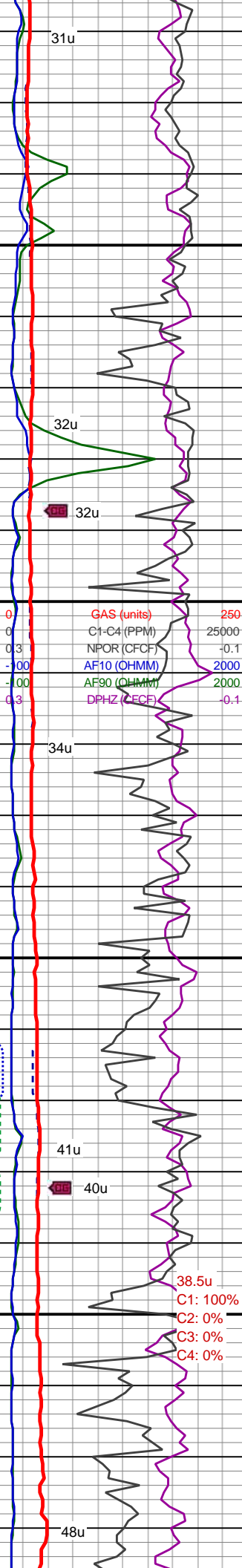
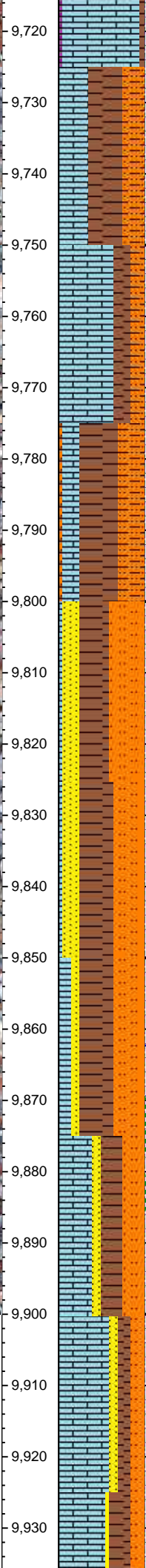
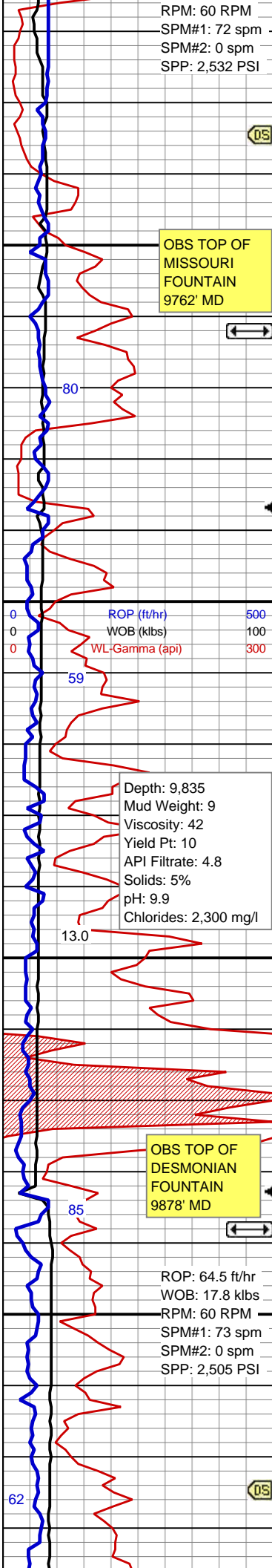
MUD WT: 9.0/ VIS: 42 IN
MUD WT: 9.2/ VIS: 42 OUT

MD: 9,639'
Inclination: 1.1°
Azimuth: 63.6°
TVD: 9,637.36'

LS: wh-lt gy-crm, mcxln, sm-wxy tex, mod sft-mod frm, sb plty-sb blkly, v calc; DOLC LS: wh-off wh-lt pnk, sb blkly, mcxln-cyxln, mod frm-frm, sm-wxy tex, occ mot, sl-v calc; anhyc ip, dns, arg, occ red brn slty SH, nfsoc

MUD WT: 8.9/ VIS: 44 IN
MUD WT: 9.2/ VIS: 43 OUT

LS: wh-lt gy-crm, mcxln, sm-wxy tex, mod sft-mod frm, sb plty-sb blkly, v calc; DOLC LS: wh-off wh-lt pnk, sb blkly, mcxln-cyxln, mod frm-frm,



sm-wxy tex, occ mot, sl-v calc; anhy
ip, dns, arg, occ red brn slty SH,
nfsoc

MUD WT: 9.0/ VIS: 41 IN
MUD WT: 9.15/ VIS: 43 OUT

MD: 9,734'
Inclination: 0.6°
Azimuth: 53.9°
TVD: 9,732.35'

SLTST: red/orng, sb plty-sb blk
ip, slty tex, occ grd to slty sh, sl
calc; LS: wh-lt gy-crm lt pnk, mcxln,
sm-wxy tex, sft-mod sft, sb plty-sb
blk, v calc; SH: red/orng, sb plty-plty,
mod frm, rthy tex, non calc; nfsoc

MUD WT: 9.0/ VIS: 41 IN
MUD WT: 9.15/ VIS: 40 OUT

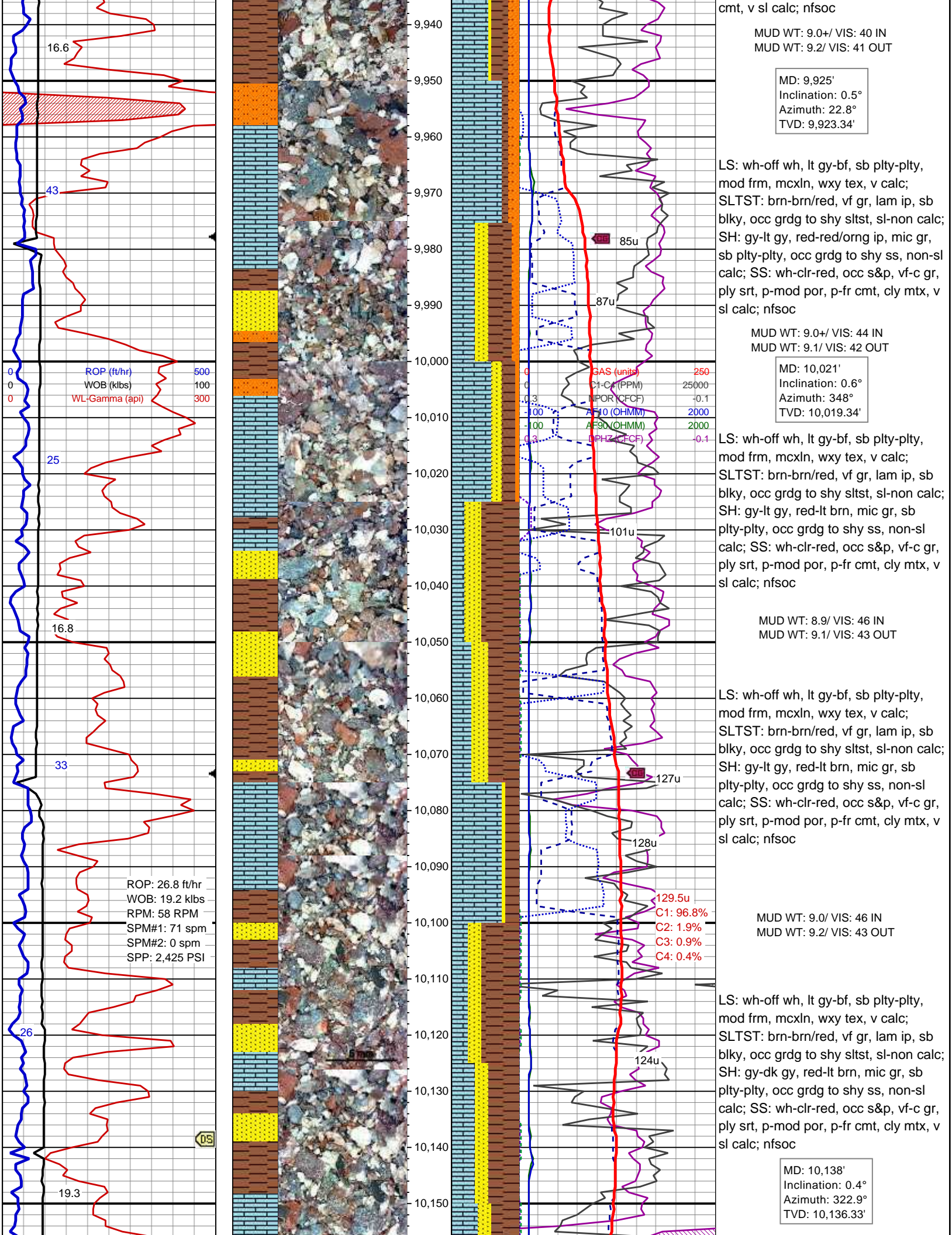
MD: 9,830'
Inclination: 0.5°
Azimuth: 23.5°
TVD: 9,828.34'

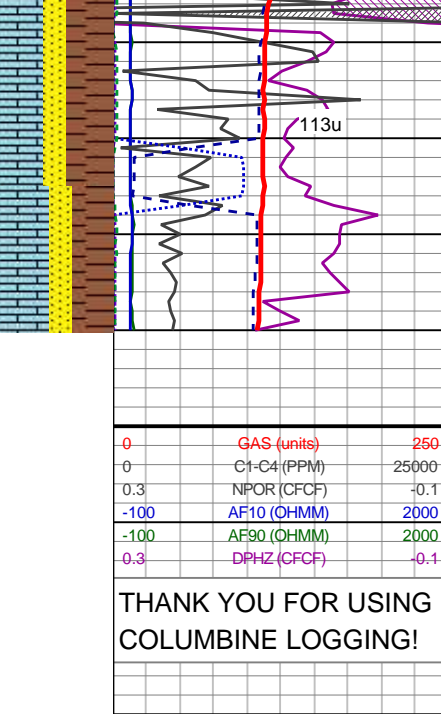
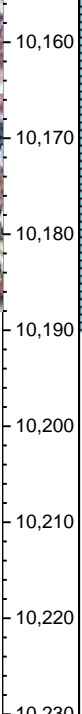
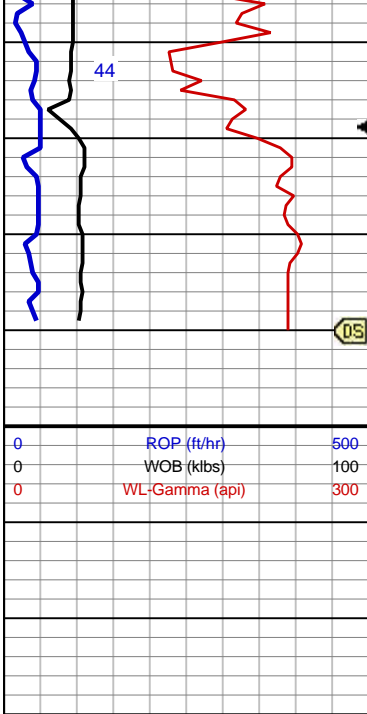
SLTST: red/orng, gy-med gy, sb
plty-sb blk ip, blk ip slty tex, occ
grd to slty sh, sl calc; SS: wh-lt gy,
occ clr, vf -med gr, ply srt, sb rnd-rnd,
tr cgl, slty mtx, p por; LS: wh-lt gy-crm
lt pnk, mcxln, sm-wxy tex, sft-mod sft,
sb plty-sb blk, v calc; SH: red/orng,
sb plty-plty, mod frm, rthy tex, non
calc; nfsoc

SLTST: red/orng, gy-med gy, sb
plty-sb blk ip, blk ip slty tex, occ
grd to slty sh, sl calc; SS: wh-lt
gy-red, occ clr, vf -med gr, ply srt, sb
rnd-rnd, tr cgl, slty mtx, p por; LS:
wh-lt gy-crm lt pnk, mcxln, sm-wxy tex,
sft-mod sft, sb plty-sb blk, v calc; SH:
red/orng, sb plty-plty, mod frm, rthy
tex, non calc; nfsoc

MUD WT: 9.0/ VIS: 42 IN
MUD WT: 9.2/ VIS: 42 OUT

LS: wh-off wh, lt gy-bf, sb plty-plty,
mod frm, mcxln, wxy tex, v calc;
SLTST: brn-brn/red, vf gr, lam ip, sb
blk, occ grd to shy sltst, sl-non calc;
SH: gy-lt gy, red-red/orng ip, mic gr,
sb plty-plty, occ grd to shy ss, non-sl
calc; SS: wh-clr-red, occ s&p, vf gr,
mod srt, mod por, gr sup mtx, p-fr





MUD WT: 9.0/ VIS: 52 IN
MUD WT: 9.2/ VIS: 46 OUT

LS: wh-off wh, lt gy-bf, sb plty-plty, mod frm, mcxln, wxy tex, v calc;
SLTST: brn-brn/red, vf gr, lam ip, sb blk, occ grd to shy sltst, sl-non calc;
SH: gy-dk gy, red-lt brn, mic gr, sb plty-plty, occ grd to shy ss, non-sl calc;
SS: wh-clr-red, occ s&p, vf-c gr, ply srt, p-mod por, p-fr cmt, cly mtx, v sl calc; nfsoc

MD: 10,190'
Inclination: 0.4°
Azimuth: 322.9°
TVD: 10,188.33'

REACHED TD OF 10190' MD @ 14:10
MST ON 2/21/2017.