

COLUMBINE LOGGING

Scale: 4.72" / 100'
Measured Depth Log

Well Name Bethyl GW30-16

Location SESE 30 T8N R63W 6 PM

State COLORADO

County WELD

Country UNITED STATES

Rig Number PRECISION 829

API Number 05-123-35855

Region DJ BASIN

Field WILDCAT

Spud Date 8/20/2013

Drilling Completed 22:00hrs 8/27/2013

Surface Coordinates 875'FSL; 179'FEL
Lat/Long: 40.62679/-104.46901

Ground Elevation 4938'

K.B. Elevation 4954'

Logged Interval 7400'

To 9150'

Total Depth 9150'

Formation J-SAND, DAKOTA, MORRISON, ENTRADA, LYKINS, BLAIN, LYONS, SATANKA

Type of Drilling Fl... LSND; WATER, WATER BASED MUD, POLY

Operator

Company Noble Energy Inc

Address 1625 Broadway, Suite 2200
Denver, CO 80202

Geologist

Name BRAD WILSON; TERRY ACOMB

Company COLUMBINE LOGGING INC.

Address 2385 S. Lipan StDenver, CO 80223

Other

MUD ENGINEER SERVICES

NEWPARK DRILLING FLUIDS

DIRECTIONAL COMPANY

Rock Types

UNKNOWN ANHYDRITE BENTONITE BRECCIA CEMENT CHALK CHERT CLAY CHOKE SAND CLAYSTONE	COAL CONGLOMERATE DOLOMITE GRANITE GYPSUM IGNEOUS LIMESTONE SIDERITE or LIMONITE MARLSTONE	METAMORPHIC NOSAMPLE SALT SALT-PEPPER SAND SANDSTONE SHALE SHALE-COLORED SHALE GRAY SHALY SANDSTONE	SHALY SILTSTONE SILTSTONE SILTY SHALE TILL TUFF WELDED TUFF
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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
 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

E EARTHY
 F FENESTRAL
 F FRACTURE
 X INTERCRYSTALLINE
 φ INTEROOLITIC

Moldic

O ORGANIC
 P PINPOINT
 V VUGGY

Engineering

BIT
 CONNECTION (LEFT)
 CONNECTION (RIGHT)
 CONNECTION GAS
 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

A ANGULAR
 R ROUNDED
 B SUBANG
 R SUBRND

Textures

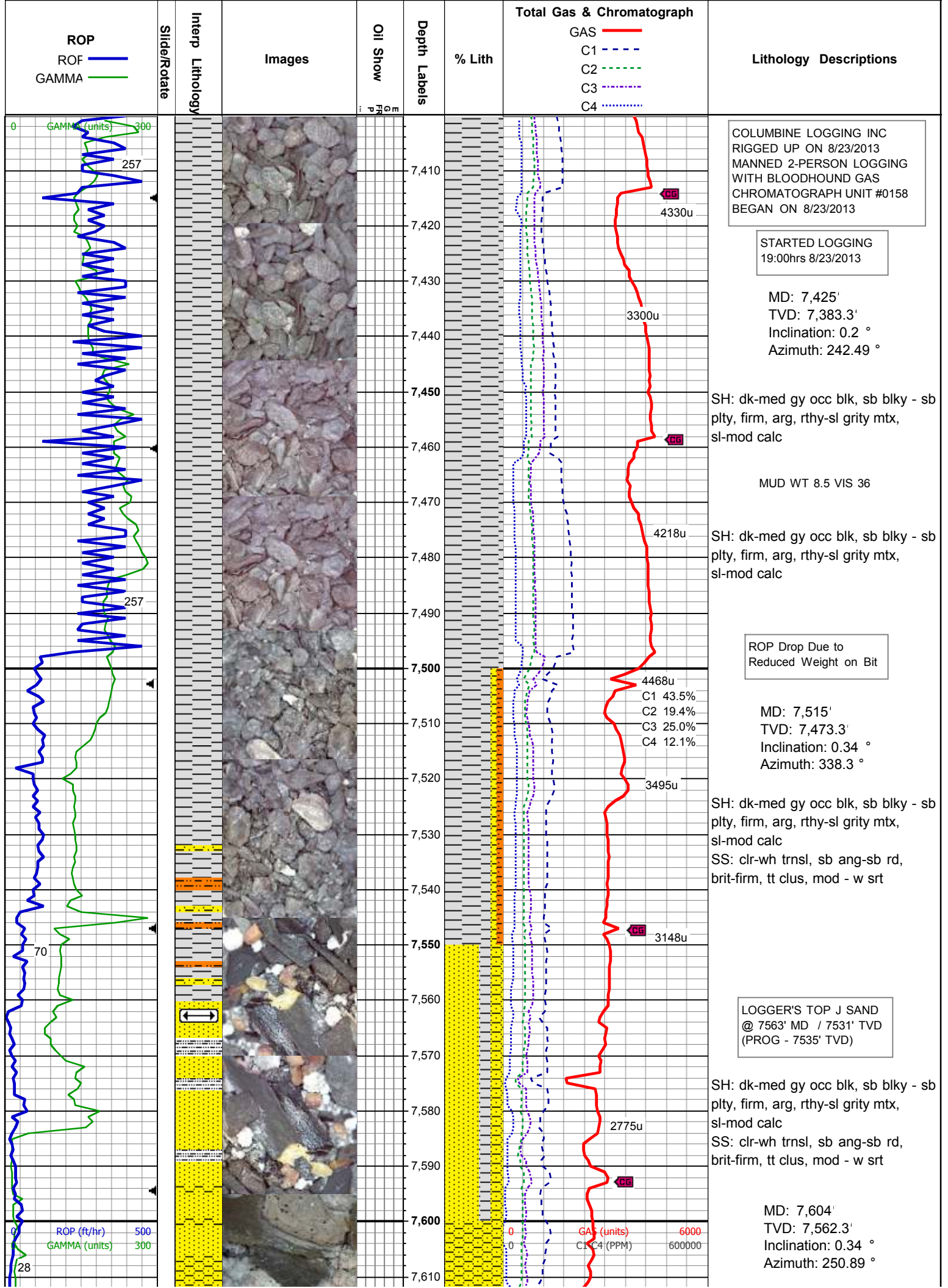
BS BOUNDSTONE
 C CHALKY
 CX CRYPTOXLN

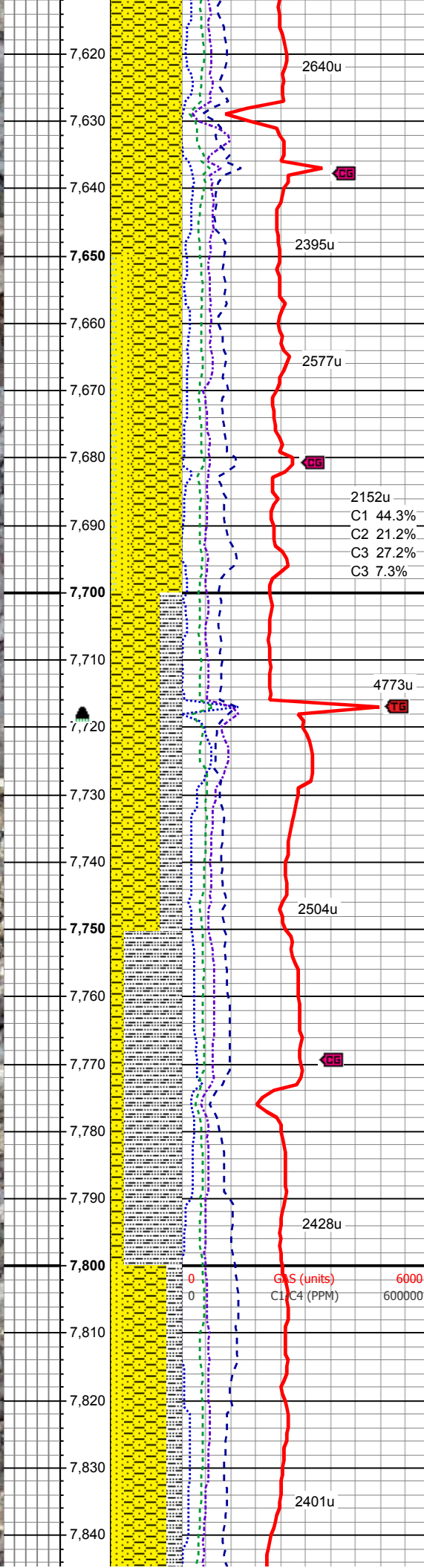
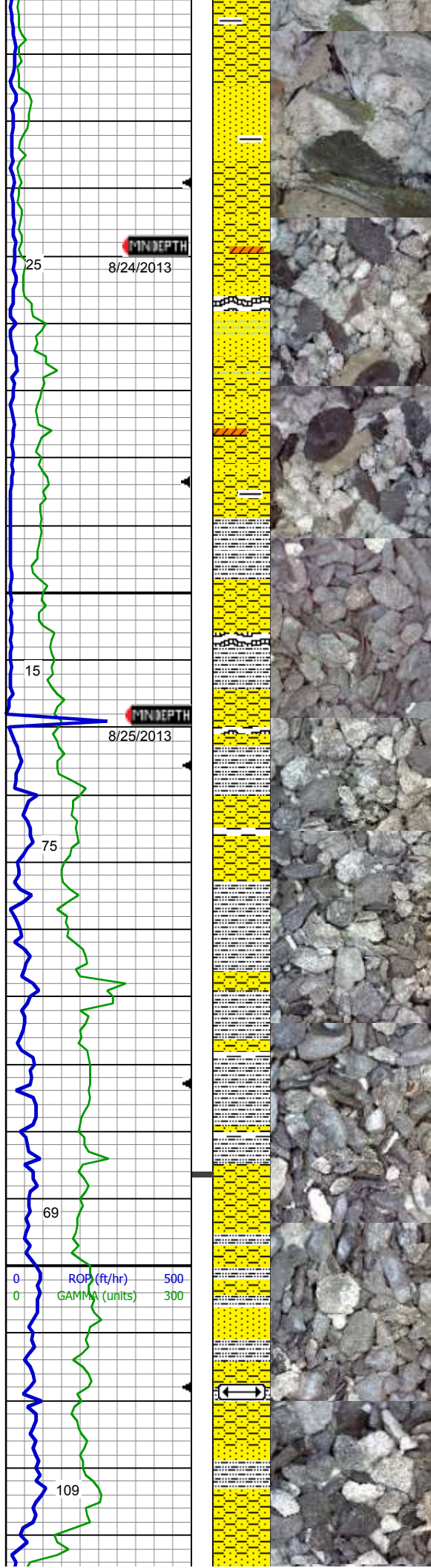
E earthy

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

Sorting

M MODERATE
 P POOR
 W WELL





100% SHY SS:wh- lt gy, occ trnsl, vf
- f gr, sb ang-sb rnd, p-mod srt,
predy frm occ sft, arg mtx, v sl calc

MUD WT 8.5 VIS 36

SHY SS:lt-dk gy, occ trnsl, vf - f gr,
sb ang-sb rnd, p-mod srt, predy frm
occ sft, arg mtx, v sl calc
SS:wh- trnsl, f gr, sb ang-sb rnd,
p-mod srt, frm occ sft, arg mtx, v sl
calc ; occ sh, abnt wh - lt gy cly pos
anhy, some bent

MD: 7,694'
TVD: 7,652.3'
Inclination: 0.09 °
Azimuth: 39.52 °

TOOH @ 7717'
Bit / Motor Change

SHY SS:lt-dk gy, occ trnsl, vf - f gr,
sb ang-sb rnd, p-mod srt, predy frm
occ sft, arg mtx, sl calc, some bent
SLTY SH: med-dk gy, plty -sb plty,
firm - brit, rthy - slty tex occ gritty

SLTY SH: med-dk gy, plty -sb plty,
firm - brit, rthy - slty tex occ gritty
SHY SS:lt-dk gy, occ trnsl, vf - f gr,
sb ang-sb rnd, p-mod srt, predy frm
occ sft, arg mtx, sl calc, some bent

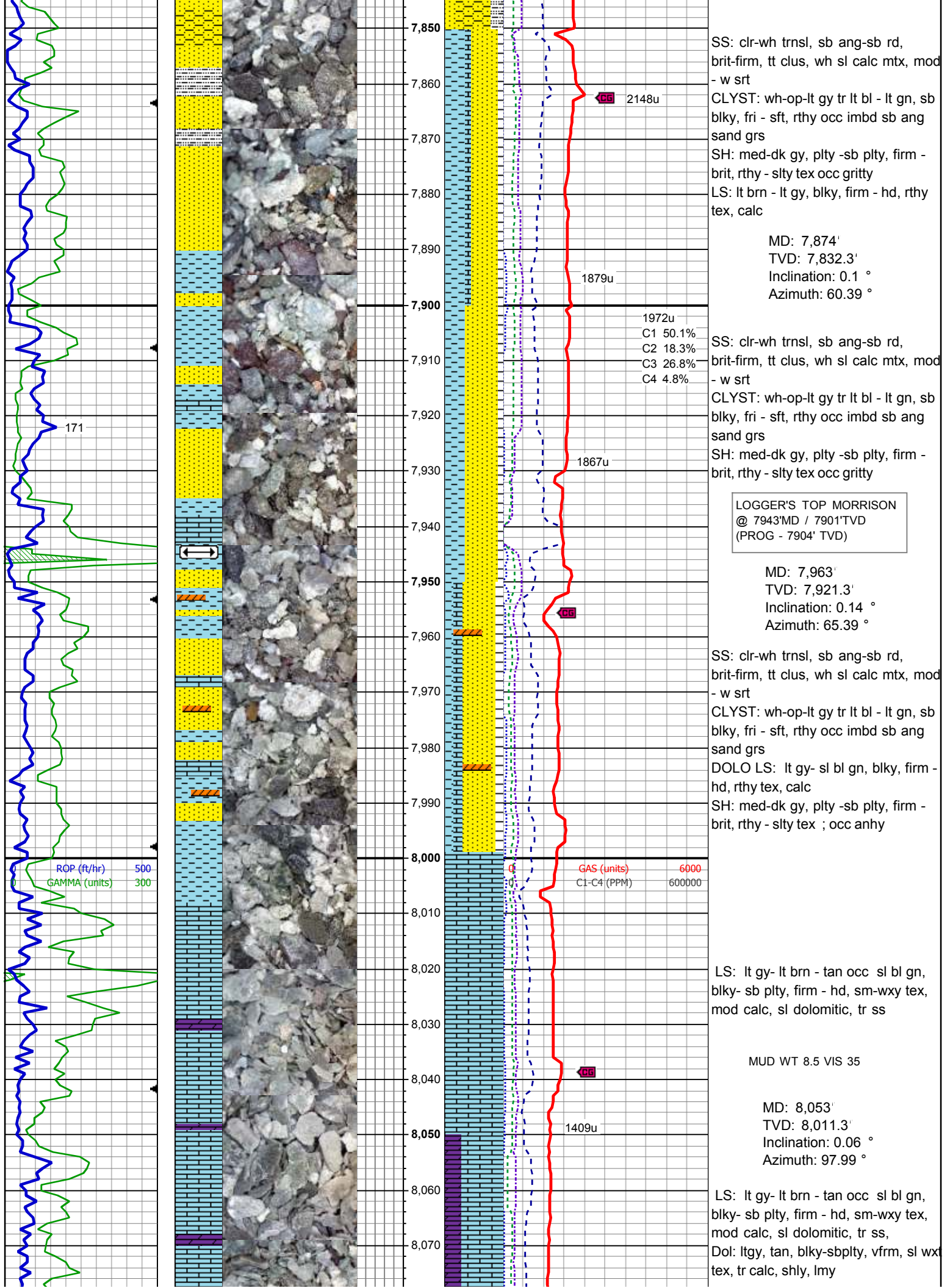
MD: 7,784'
TVD: 7,742.3'
Inclination: 0.15 °
Azimuth: 206.11 °

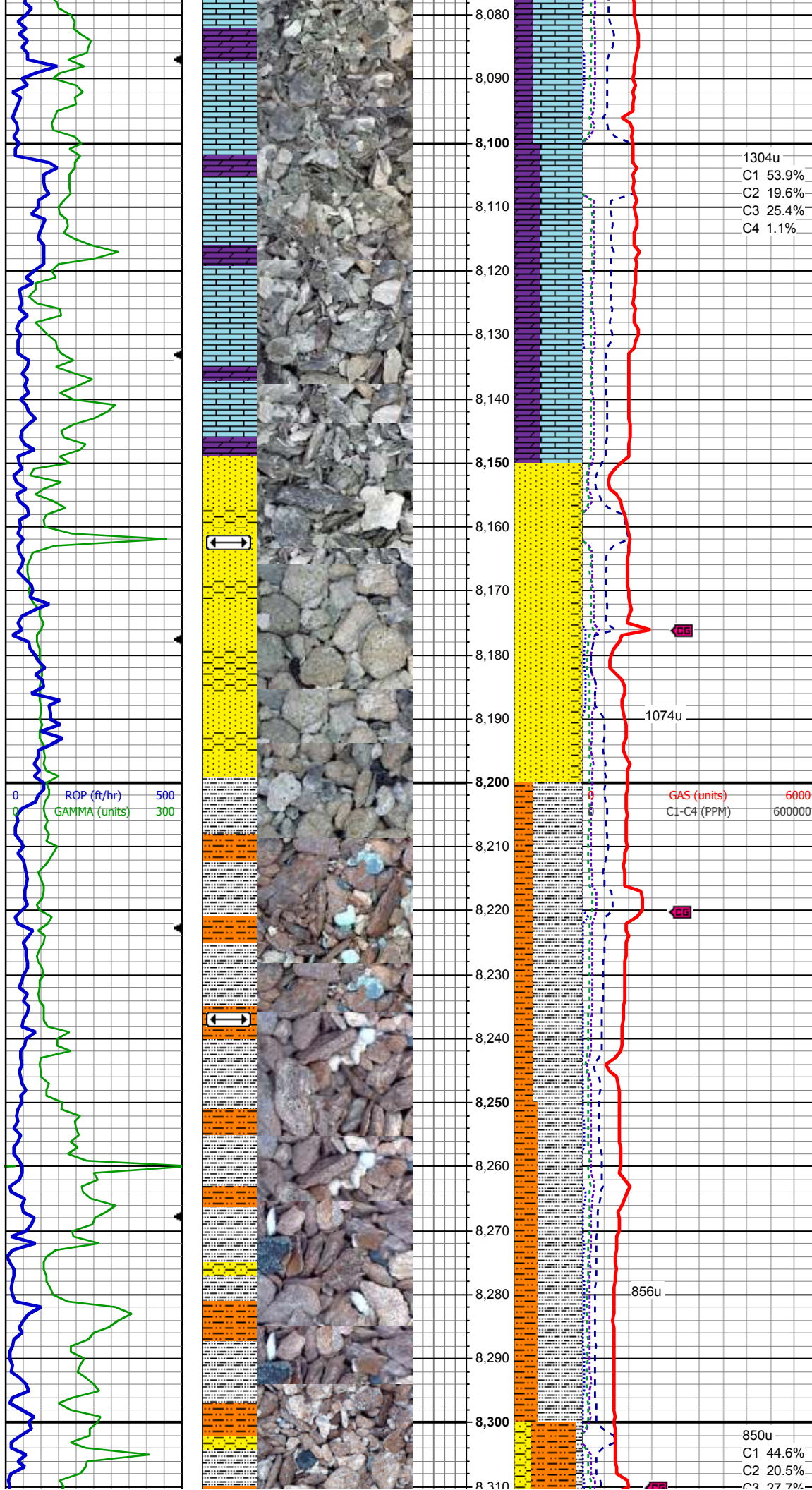
MUD WT 8.5 VIS 36

LOGGER'S TOP DAKOTA
@ 7820' MD / 7778'TVD
(PROG -7794 'TVD)

SS: clr-wh trnsl, sb ang-sb rd,
brit-firm, tt clus, mod - w srt
SLTY SH: med-dk gy, plty -sb plty,
firm - brit, rthy - slty tex occ gritty
SHY SS:lt-dk gy, occ trnsl, vf - f gr,
sb ang-sb rnd, p-mod srt, predy frm
occ sft, arg mtx, sl calc, some bent

MUD WT 8.5 VIS 35





LS: lt gy- lt brn - tan occ sl bl gn,
blky- sb plty, firm - hd, sm-wxy tex,
mod calc, sl dolomitic, tr ss,
Dol: ltgy, tan, blky-sbplty, vfrm, sl wx
tex, tr calc, shly, lmy

MD: 8,143'
TVD: 8,101.3'
Inclination: 0.1 °
Azimuth: 265.13 °

LOGGERS TOP ENTRADA
@ 8163'MD / 8121'TVD
(PROG - 8114' TVD)

SS: vpale orgrd, trnsf, vf-fgr,
sbrnd-sbang, m-wcmt, mod-wsrt, sl
calc
SHLYSS: offwh, trnsf, vpale orgrd,
vfgr, sbrnd-sbang, p-mcmt, ncalc

MUD WT 8.5 VIS 35

START RED BEDS

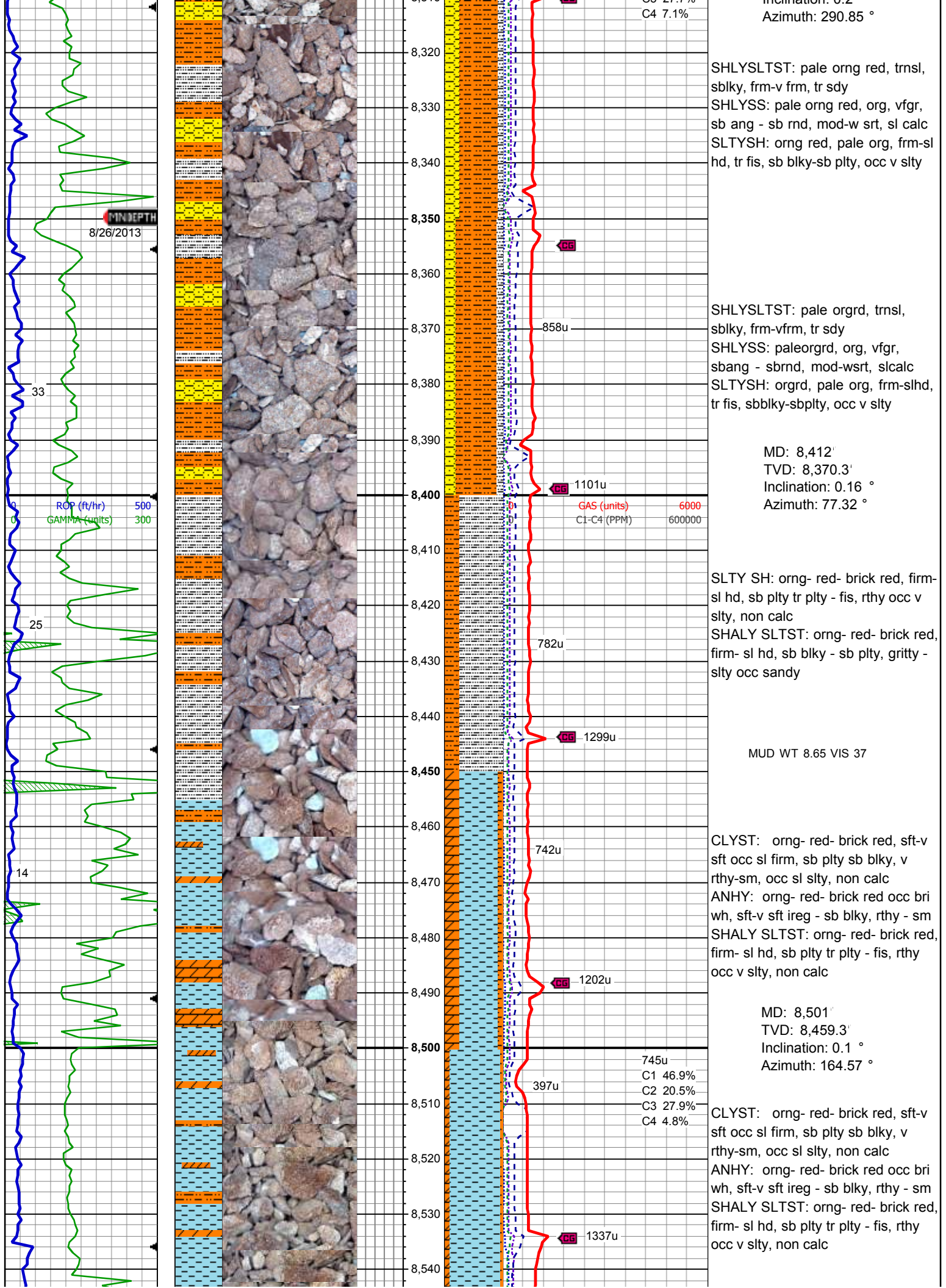
SLTYSH: orgrd, pale org, frm-slhd,
tr fis, sbblky-sbplty, occ v slty
SHLYSLTST: pale orgrd, trnsf,
sblky, frm-vfrm, tr sdy

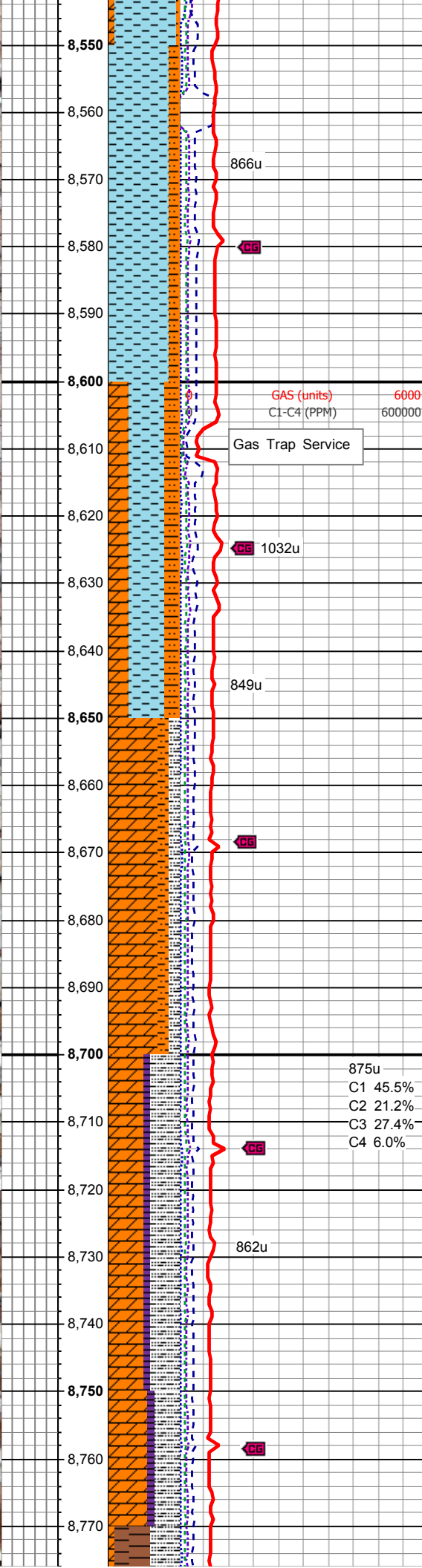
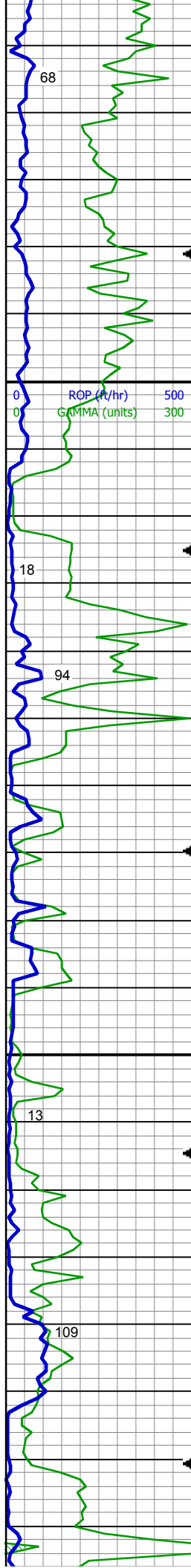
MD: 8,232'
TVD: 8,190.3'
Inclination: 0.13 °
Azimuth: 160.32 °

LOGGERS TOP "TOP LYKINS"
@ 8238'MD / 8196'TVD
(PROG - 8191'TVD)

SLTYSH: orgng red, pale org,
frm-slhd, tr fis, sb blky-sb plty, occ v
slty
SHLYSLTST: pale orgng red, trnsf,
sb blky, frm-v frm, tr sdy

MD: 8,322'
TVD: 8,280.3'
Inclination: 0.2 °





CLYST: orng- red- brick red, sft-v
sft occ sl firm, sb plty sb blkly, v
rthy-sm, occ sl slty, non calc
SHALY SLTST: orng- red- brick red,
firm- sl hd, sb plty tr plty - fis, rthy
occ v slty, non calc ; tr anhy

MD: 8,591'
TVD: 8,549.3'
Inclination: 0.09 °
Azimuth: 161.2 °

LOGGER'S TOP "LOWER LYKINS"
@ 'MD / 'TVD
(PROG - 8548'TVD)

CLYST: orng- red- brick red, sft-v
sft occ sl firm, sb plty sb blkly, v
rthy-sm, occ sl slty, non calc
ANH: orng- red- brick red incr bri
wh, sft-v sft ireg - sb blkly, rthy - sm
SHALY SLTST: orng- red- brick red,
firm- sft, sb plty tr plty - fis, rthy occ v
slty, non calc

MUD WT 8.6 VIS 38

ANH: wh, pale orng, sft-v sft ireg -
sb blkly, rthy - sm
SLTY SH: orng- red- brick red, firm-
sl hd, sb plty tr plty - fis, rthy occ v
slty, non calc

MD: 8,681'
TVD: 516.26'
Inclination: 0.07 °
Azimuth: 55.57 °

MUD WT 8.5 VIS 37

ANH: wh, pale orng, sft-v sft ireg -
sb blkly, rthy - sm
SLTY SH: orng- red- brick red, firm-
sl hd, sb plty tr plty - fis, rthy occ v
slty, non calc

Dol: ltgy, tan, blkly-sbplty, vfrm, sl wx
tex, tr calc, shly, lmy

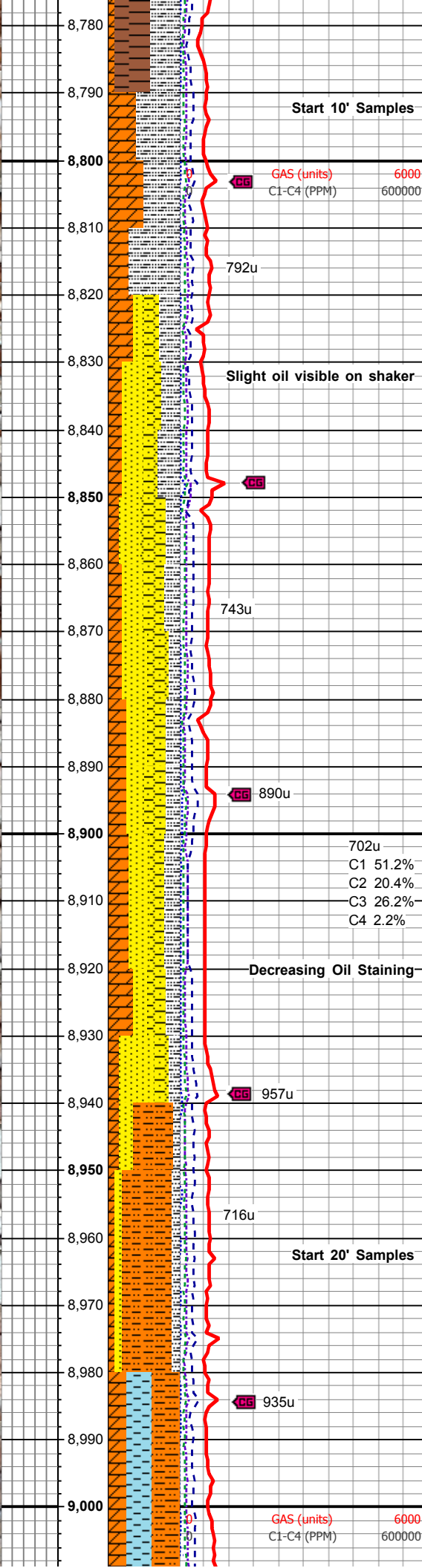
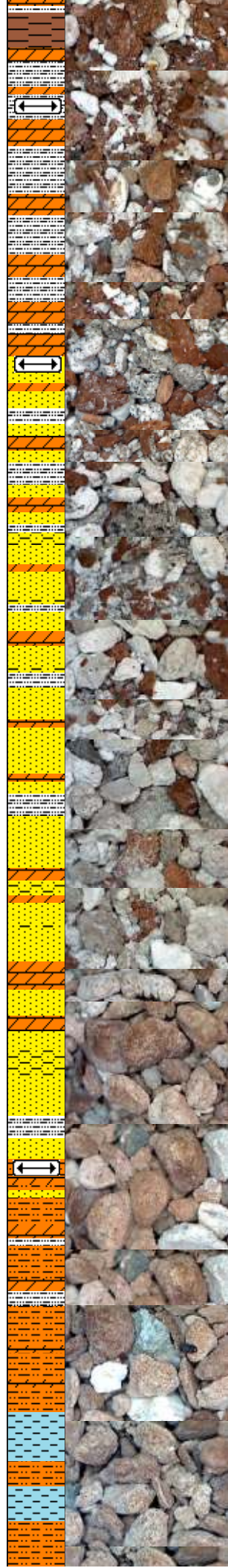
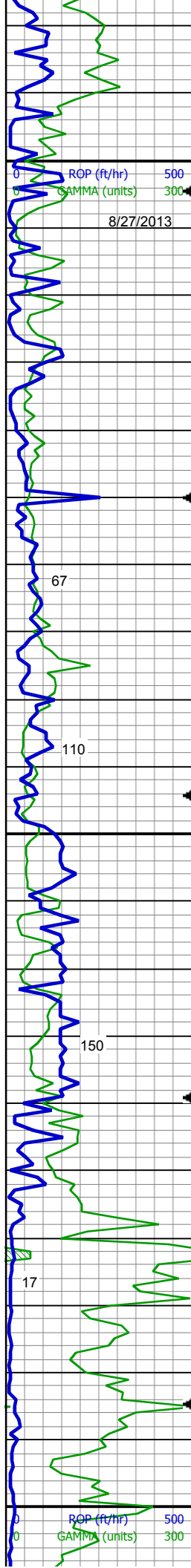
ANH: wh, pale orng, sft-v sft ireg -
sb blkly, rthy - sm
SLTY SH: orng- red- brick red, firm-
sl hd, sb plty tr plty - fis, rthy occ v
slty, non calc

Dol: ltgy, tan, blkly-sbplty, vfrm, sl wx
tex, tr calc, shly, lmy

SH: orng rd, brick rd, sbblkly-sbplty,
slsft-firm, non calc

ANH: wh, pale orng, sft-v sft ireg -
sb blkly, rthy - sm

SLTY SH: orng- red- brick red, firm-
sl hd, sb plty tr plty - fis, rthy occ v



slty, non calc

LOGGER'S TOP BLAINE
@ 8783'MD / 8741'TVD
(PROG - 8738'TVD)

ANHY: wh, pale org, sft-v sft ireg -
sb blk, rthy - sm

SLTY SH: org- red- brick red, firm-
sl hd, sb plty tr plty - fis, rthy occ v
slty, non calc

LOGGER'S TOP LYONS
@ 8830'MD / 8788'TVD
(PROG - 8782'TVD)

SS: wh, trnsl, clr, fri, f-mgr,
sbrnd-rnd, tr-occ uncon, mod-abnt
blk oil stain, tr tan oil stn, vis flor

SHLYSS: wh, offwh, wh cly cmt,
vf-fgr, tr uncon, tr-mod blk oil stain

SS: wh, trnsl, clr, fri, f-mgr,
sbrnd-rnd, tr-occ uncon, mod blk
oil stain, tr tan oil stn, vis flor

SHLYSS: wh, offwh, wh cly cmt,
vf-fgr, tr uncon, mod blk oil stain

SS: wh, trnsl, clr, fri, f-mgr,
sbrnd-rnd, tr-occ uncon, mod blk
oil stain, tr tan oil stn, vis flor

SHLYSS: wh, offwh, wh cly cmt,
vf-fgr, tr uncon, mod blk oil stain

SS: wh, trnsl, clr, fri, f-mgr,
sbrnd-rnd, tr-occ uncon, tr-mod
blk oil stain, tr tan oil stn, vis flor

SHLYSS: wh, offwh, wh cly cmt,
vf-fgr, tr uncon, tr-mod blk oil stain

SS: wh with faint brn stain occ trnsl-
clr, fri-brit, f-mgr, sbrnd-rnd, tr-occ
uncon, rr blk oil stain, tr tan oil
stn, tr vis flor

SHLYSS: wh, offwh, wh cly cmt,
vf-fgr, tr uncon, rr blk oil stain

MD: 8,950'
TVD: 516.15'
Inclination: 0.07 °
Azimuth: 259.51 °

LOGGER'S TOP SATANKA
@ 8949'MD / 8907'TVD
(PROG - 8903'TVD)

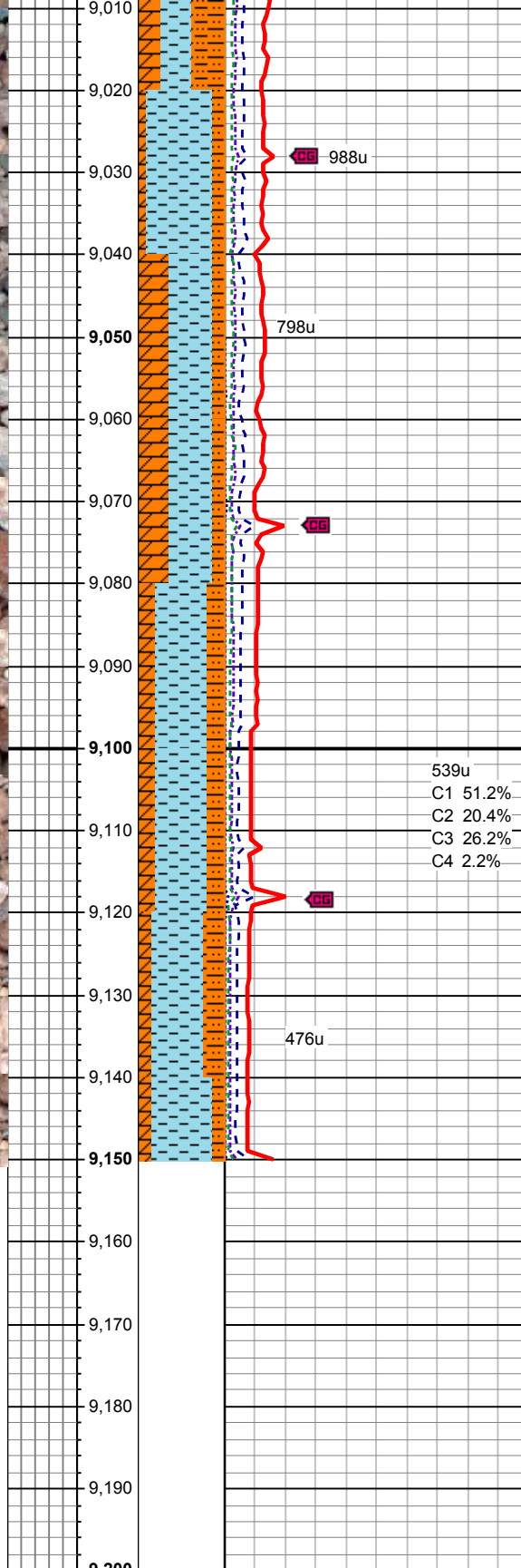
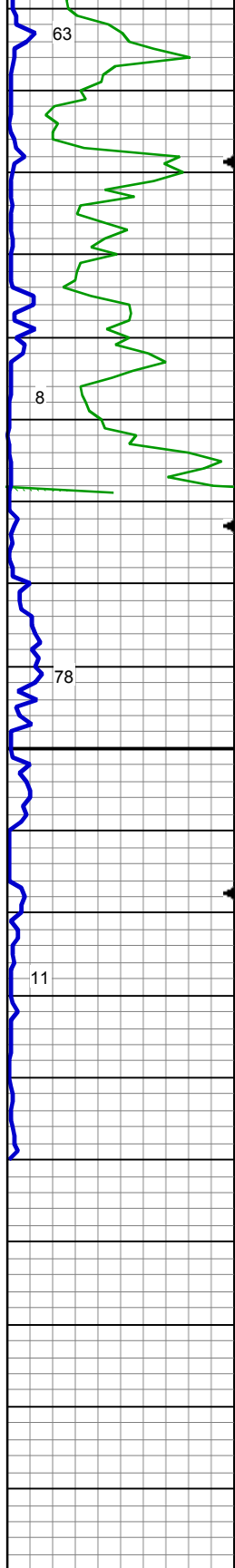
SHALY SLTST: pink grading to pard
- pardbn, sb blk, fri-sft occ firm,
slty-gritty tex, occ imbd qtz, some
bndd dk o stng

ANHY: pink -wh, pale org, sft-v sft
ireg - sb blk, rthy - sm

SS: wh- trnsl- clr with wh mtx,
fri-brit, f-mgr, sbrnd-rnd, tr-occ
uncon, rr blk oil stain, rr tan oil
stn, tr vis flor

SHALY SLTST: org- red- brick red,
firm- sft, sb plty tr plty - fis, rthy occ v
slty, non calc

CLYST: org- red- brick red, sft-v
sft occ sl firm, sb plty sb blk, v
rthv-sm occ sl slty, non calc



ANHY: orng- red- brick red incr bri
wh, sft-v sft ireg - sb blk, rthy - sm

MUD WT 8.7 VIS 38

CLYST: orng- red- brick red, sft-v
sft occ sl firm, sb plty sb blk, v
rthy-sm, occ sl slty, non calc
ANHY: pink with some orng- red-
brick red tr bri wh, sft-v sft ireg - sb
blk, rthy - sm
SHALY SLTST: orng- red- brick red,
firm- sft, sb plty tr plty - fis, rthy occ v
slty, non calc

MD: 9,071'
TVD: 9,029.29'
Inclination: 0.09 °
Azimuth: 176.49 °

CLYST: orng- red- brick red, sft-v
sft occ sl firm, sb plty sb blk, v
rthy-sm, occ sl slty, non calc
ANHY: pink with some orng- red-
brick red tr bri wh, sft-v sft ireg - sb
blk, rthy - sm
SHALY SLTST: orng- red- brick red,
firm- sft, sb plty tr plty - fis, rthy occ v
slty, non calc

539u
C1 51.2%
C2 20.4%
C3 26.2%
C4 2.2%

MUD WT 8.85 VIS 38

CLYST: orng- red- brick red, sft-v
sft occ sl firm, sb plty sb blk, v
rthy-sm, occ sl slty, non calc
ANHY: pink with some orng- red-
brick red tr bri wh, sft-v sft ireg - sb
blk, rthy - sm
SHALY SLTST: orng- red- brick red,
firm- sft, sb plty tr plty - fis, rthy occ v
slty, non calc

TD 9150' MD REACHED 22:00 8/27/13