COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name	Crow Creek AA01-776 HORZ		
Location	SEC 1 T6N R63W		
State	COLORADO	**County**	WELD
Country	USA	**Rig Number**	H&P 315
API Number	05-123-40157	**AFE #**	200438
Region	DJ BASIN	**Field**	WATTENBERG
Spud Date	1/9/2015	**Drilling Completed**	1/15/2015
Surface Coordinates	NWNW SEC 1 T6N R63W 290' FNL; 575' FWL LAT/LON: 40.52203/-104.39221		
Bottom Hole Coordinates	SEC 12 T6N R63W 30' FNL; 950' FWL		
Ground Elevation	4,798'	**K.B. Elevation**	4,822'
Logged Interval	6,090' **To** 11,647'	**Total Depth**	11,647'
Formation	NIOBRARA C CHALK		
Type of Drilling Fluid	LSND		

Operator

Company Noble Energy Inc

Address 1625 BROADWAY SUITE 2200
DENVER, CO 80202

Geologist

Name MARK COLE; ZACH UBER

Company COLUMBINE LOGGING, INC

Address 602 S LIPAN ST
DENVER, CO 80223

Zone Color Coding

Oil	Condensate	
Note	Core	
Error	Water	

Rock Types

CHALK	CEMENT	IGNEOUS
MARLSTONE	CHERT	SIDERITE
SILTY SHALE	CLAY CHOKE SAND	METAMO
SHALY SANDSTONE	CLAYSTONE	NO SAMP
LIMESTONE	COAL	SALT
UNKNOWN	CONGLOMERATE	SANDSTO
ANHYDRITE	DOLOMITE	SALT-PER
BENTONITE	GRANITE	SHALE
BRECCIA	GYPSUM	SHALE C

Gas
Pressure
Seal

S
E or LIMONITE
RPHIC
LE

ONE
PPER SAND

OLORED

SHALE GRAY
SHALY SILTSTONE
SILTSTONE
TILL
TUFF
WELDED TUFF

Accessories

Fossils

ALGAE
AMPHIPORA
BELEMNITE
BIOCLASTIC
BRACHIOPOD
BRYOZOA
CEPHALOPOD
CORAL
CRINOID
ECHINOID
FISH
FORAMINIFERA
FOSSIL
GASTROPOD
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
INOCERAMUS
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
ORGANIC
PINPOINT
VUGGY

Porosity

EARTHY
FENESTRAL
FRACTURE
INTERCRYSTALLINE
INTEROOLITIC
MOLDIC

Engineering

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

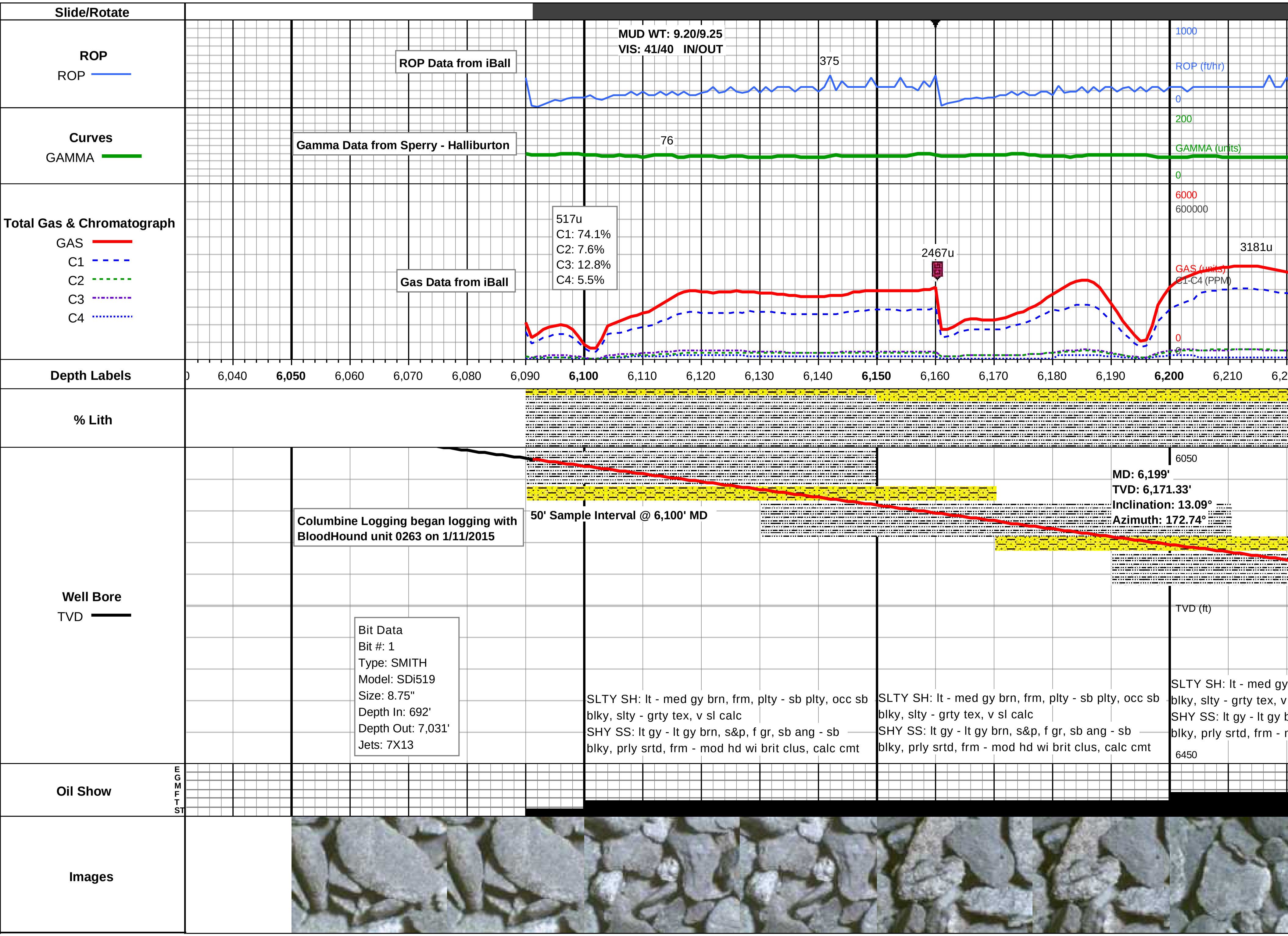
ANGULAR
ROUNDED
SUBANG
SUBRND

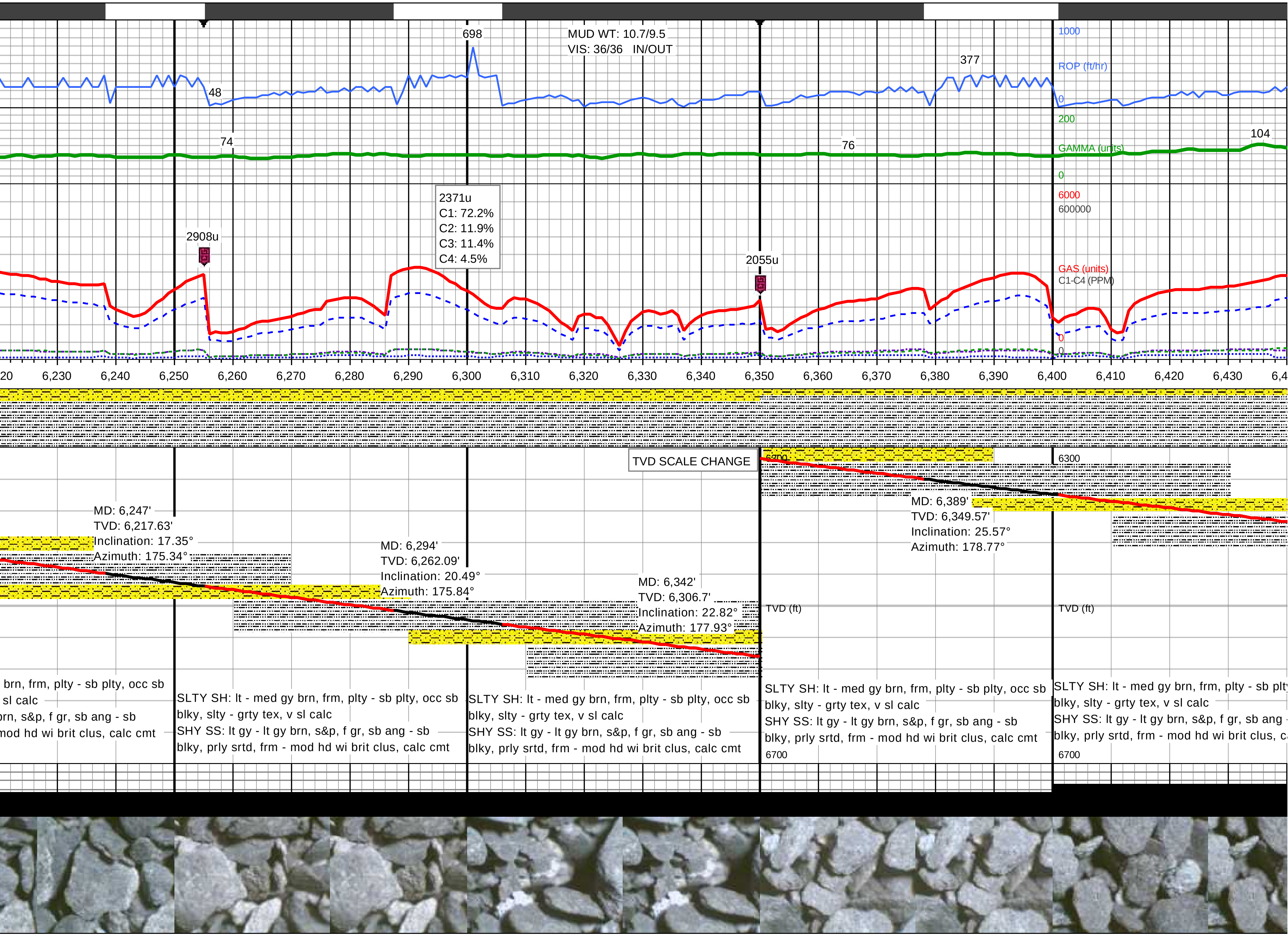
Textures

BOUNDSTONE
CHALKY
CRYPTOXLN
EARTHY
FINELYXLN
GRAINSTONE
LITHOGRAPHIC
MICROXLN
MUDSTONE
PACKSTONE
WACKESTONE

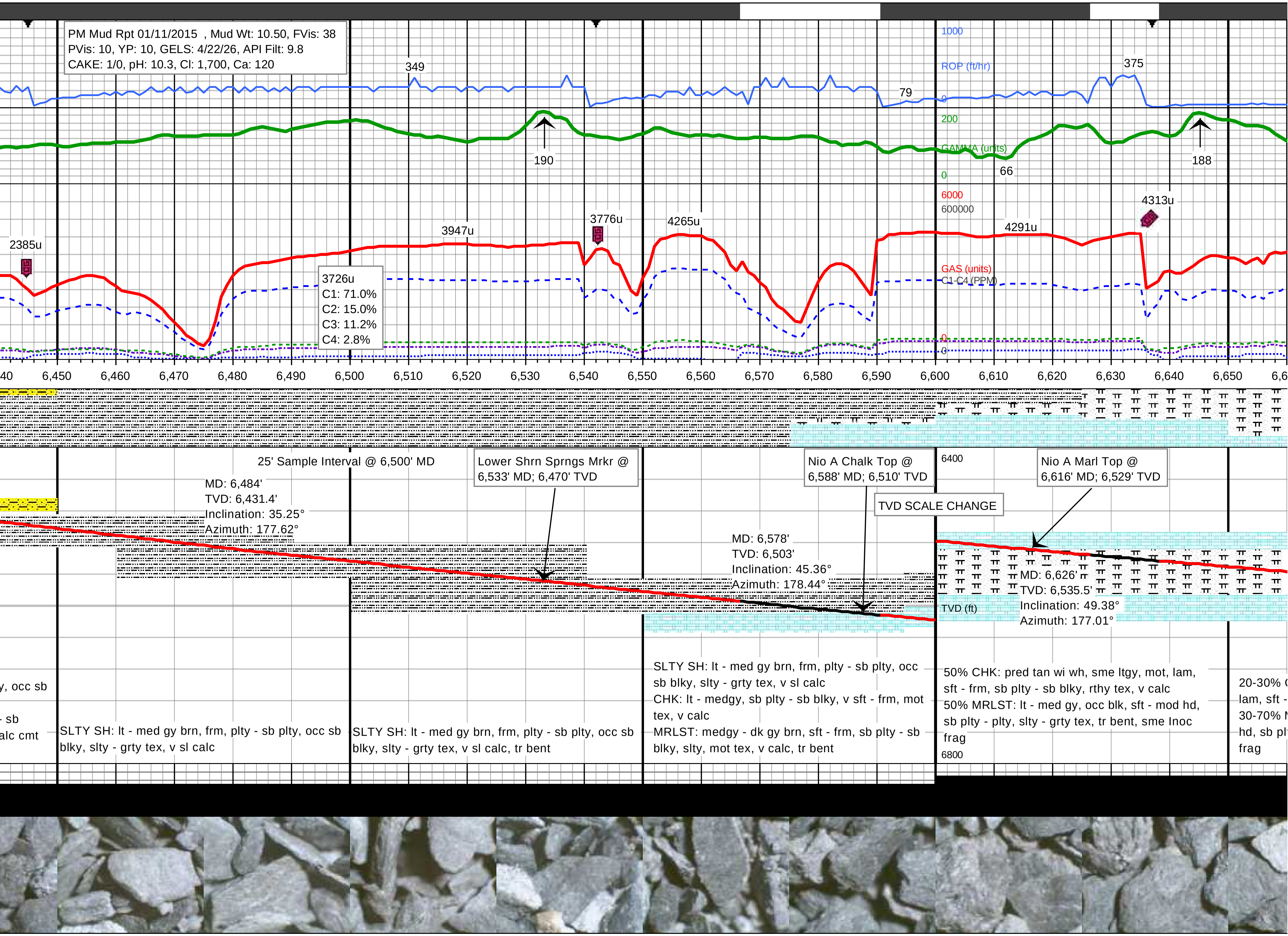
Sorting

MODERATE
POOR
WELL

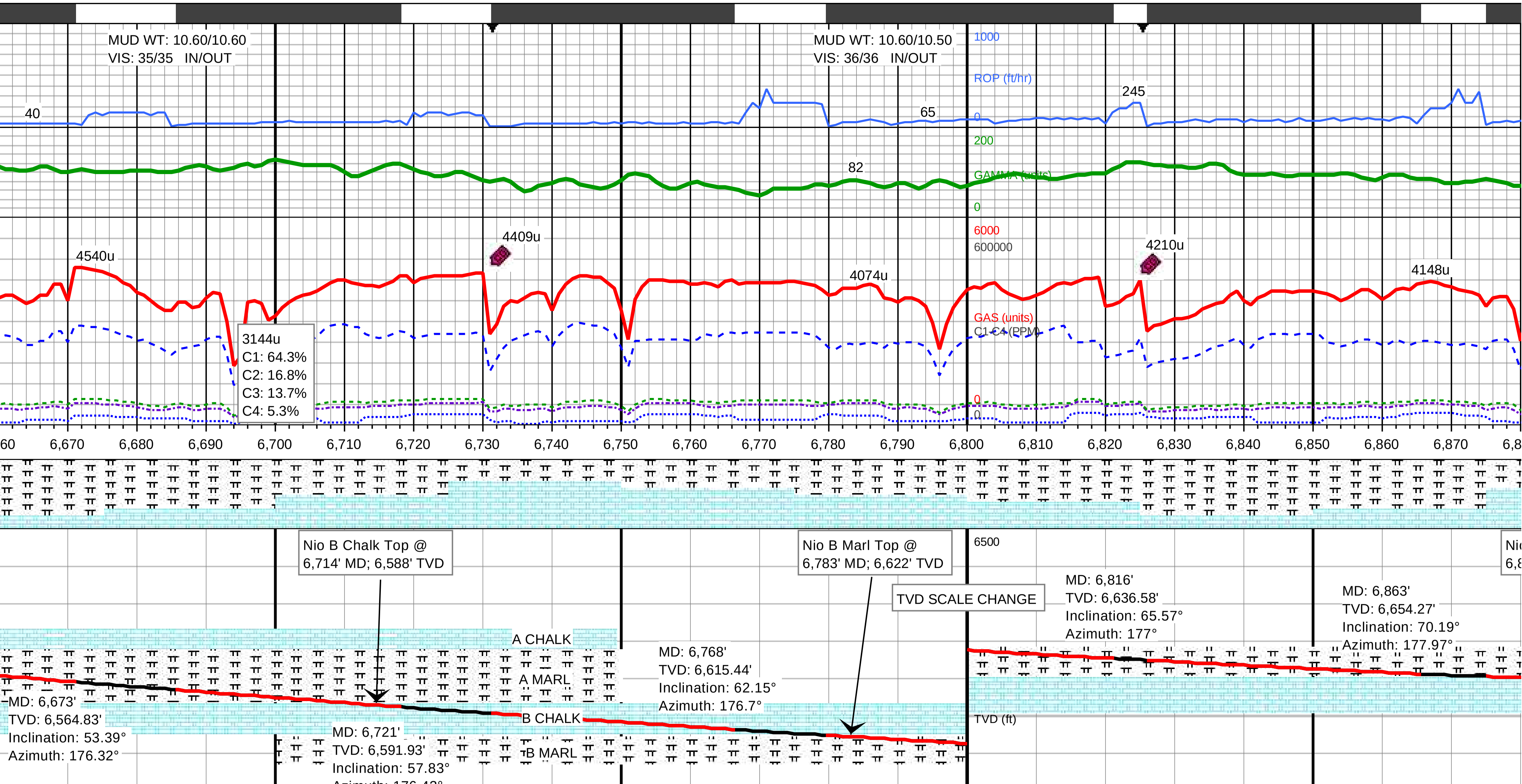

Slide/Rotate
ROP
ROP
Curves
GAMMA
Total Gas & Chromatograph
GAS
C1
C2
C3
C4
Depth Labels
% Lith
Well Bore
TVD
Oil Show
E G M F T ST
Images
ROP Data from iBall
MUD WT: 9.20/9.25
VIS: 41/40 IN/OUT
375
1000
ROP (ft/hr)
0
Gamma Data from Sperry - Halliburton
76
200
GAMMA (units)
0
Gas Data from iBall
517u
C1: 74.1%
C2: 7.6%
C3: 12.8%
C4: 5.5%
2467u
3181u
6000
600000
GAS (units)
C1-C4 (PPM)
0
0
6,040
6,050
6,060
6,070
6,080
6,090
6,100
6,110
6,120
6,130
6,140
6,150
6,160
6,170
6,180
6,190
6,200
6,210
Columbine Logging began logging with BloodHound unit 0263 on 1/11/2015
50' Sample Interval @ 6,100' MD
6050
MD: 6,199'
TVD: 6,171.33'
Inclination: 13.09°
Azimuth: 172.74°
TVD (ft)
6450
Bit Data
Bit #: 1
Type: SMITH
Model: SDi519
Size: 8.75"
Depth In: 692'
Depth Out: 7,031'
Jets: 7X13
SLTY SH: lt - med gy brn, frm, plty - sb plty, occ sb blky, slty - grty tex, v sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang - sb blky, prly srtd, frm - mod hd wi brit clus, calc cmt
SLTY SH: lt - med gy brn, frm, plty - sb plty, occ sb blky, slty - grty tex, v sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang - sb blky, prly srtd, frm - mod hd wi brit clus, calc cmt
SLTY SH: lt - med gy
blky, slty - grty tex, v
SHY SS: lt gy - lt gy b
blky, prly srtd, frm - r



1000
ROP (ft/hr)
0
200
GAMMA (units)
0
6000
600000
GAS (units)
C1-C4 (PPM)
0
0
48
698
377
74
76
104
MUD WT: 10.7/9.5
VIS: 36/36 IN/OUT
2908u
2371u
C1: 72.2%
C2: 11.9%
C3: 11.4%
C4: 4.5%
2055u
20
6,230
6,240
6,250
6,260
6,270
6,280
6,290
6,300
6,310
6,320
6,330
6,340
6,350
6,360
6,370
6,380
6,390
6,400
6,410
6,420
6,430
6,4
TVD SCALE CHANGE
MD: 6,247'
TVD: 6,217.63'
Inclination: 17.35°
Azimuth: 175.34°
MD: 6,294'
TVD: 6,262.09'
Inclination: 20.49°
Azimuth: 175.84°
MD: 6,342'
TVD: 6,306.7'
Inclination: 22.82°
Azimuth: 177.93°
MD: 6,389'
TVD: 6,349.57'
Inclination: 25.57°
Azimuth: 178.77°
6300
6300
TVD (ft)
TVD (ft)
6700
6700
brn, frm, plty - sb plty, occ sb
sl calc
brn, s&p, f gr, sb ang - sb
mod hd wi brit clus, calc cmt
SLTY SH: lt - med gy brn, frm, plty - sb plty, occ sb
blky, slty - grty tex, v sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang - sb
blky, prly srtd, frm - mod hd wi brit clus, calc cmt
SLTY SH: lt - med gy brn, frm, plty - sb plty, occ sb
blky, slty - grty tex, v sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang - sb
blky, prly srtd, frm - mod hd wi brit clus, calc cmt
SLTY SH: lt - med gy brn, frm, plty - sb plty, occ sb
blky, slty - grty tex, v sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang - sb
blky, prly srtd, frm - mod hd wi brit clus, calc cmt
SLTY SH: lt - med gy brn, frm, plty - sb plty
blky, slty - grty tex, v sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
blky, prly srtd, frm - mod hd wi brit clus, c



PM Mud Rpt 01/11/2015 , Mud Wt: 10.50, FVis: 38
PVis: 10, YP: 10, GELS: 4/22/26, API Filt: 9.8
CAKE: 1/0, pH: 10.3, Cl: 1,700, Ca: 120
349
375
79
1000
ROP (ft/hr)
0
200
GAMMA (units)
0
190
66
188
6000
600000
GAS (units)
C1-C4 (PPM)
0
2385u
3947u
3776u
4265u
4291u
4313u
3726u
C1: 71.0%
C2: 15.0%
C3: 11.2%
C4: 2.8%
40
6,450
6,460
6,470
6,480
6,490
6,500
6,510
6,520
6,530
6,540
6,550
6,560
6,570
6,580
6,590
6,600
6,610
6,620
6,630
6,640
6,650
25' Sample Interval @ 6,500' MD
MD: 6,484'
TVD: 6,431.4'
Inclination: 35.25°
Azimuth: 177.62°
Lower Shrn Sprngs Mrkr @
6,533' MD; 6,470' TVD
MD: 6,578'
TVD: 6,503'
Inclination: 45.36°
Azimuth: 178.44°
Nio A Chalk Top @
6,588' MD; 6,510' TVD
TVD SCALE CHANGE
6400
TVD (ft)
6800
Nio A Marl Top @
6,616' MD; 6,529' TVD
MD: 6,626'
TVD: 6,535.5'
Inclination: 49.38°
Azimuth: 177.01°
y, occ sb
- sb
alc cmt
SLTY SH: lt - med gy brn, frm, plty - sb plty, occ sb blky, slty - grty tex, v sl calc
SLTY SH: lt - med gy brn, frm, plty - sb plty, occ sb blky, slty - grty tex, v sl calc, tr bent
SLTY SH: lt - med gy brn, frm, plty - sb plty, occ sb blky, slty - grty tex, v sl calc
CHK: lt - medgy, sb plty - sb blky, v sft - frm, mot tex, v calc
MRLST: medgy - dk gy brn, sft - frm, sb plty - sb blky, slty, mot tex, v calc, tr bent
50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - frm, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk, sft - mod hd, sb plty - plty, slty - grty tex, tr bent, sme Inoc frag
20-30% C
lam, sft -
30-70% M
hd, sb pl
frag



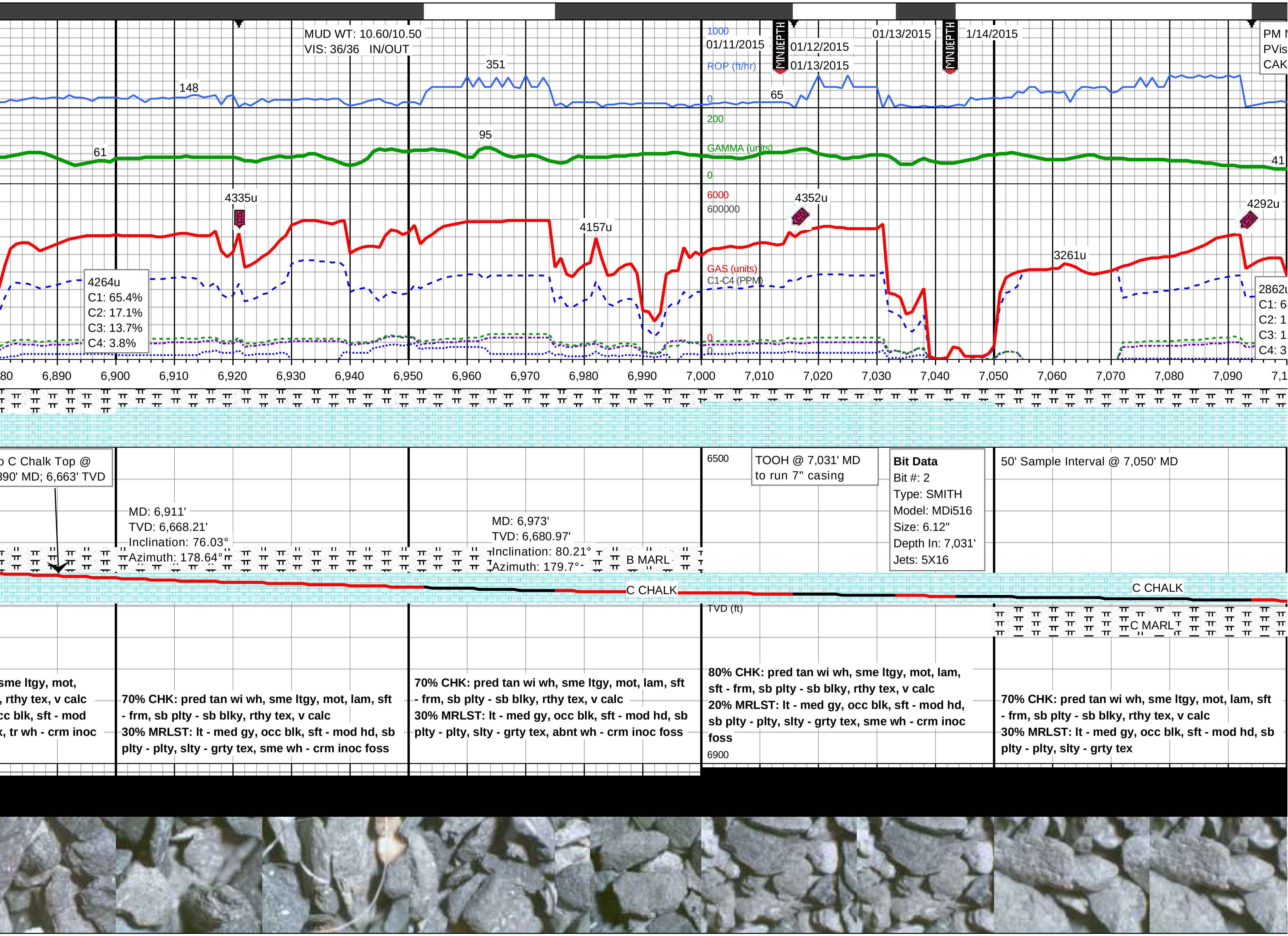
CHK: pred tan wi wh, sme ltgy, mot, frm, sb plty - sb blky, rthy tex, v calc
MRLST: lt - med gy, occ blk, sft - mod
ty - plty, slty - grty tex, tr bent, tr Inoc

50-70% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - frm, sb plty - sb blky, rthy tex, v calc
50-30% MRLST: lt - med gy, occ blk, sft - mod hd, sb plty - plty, slty - grty tex, calc

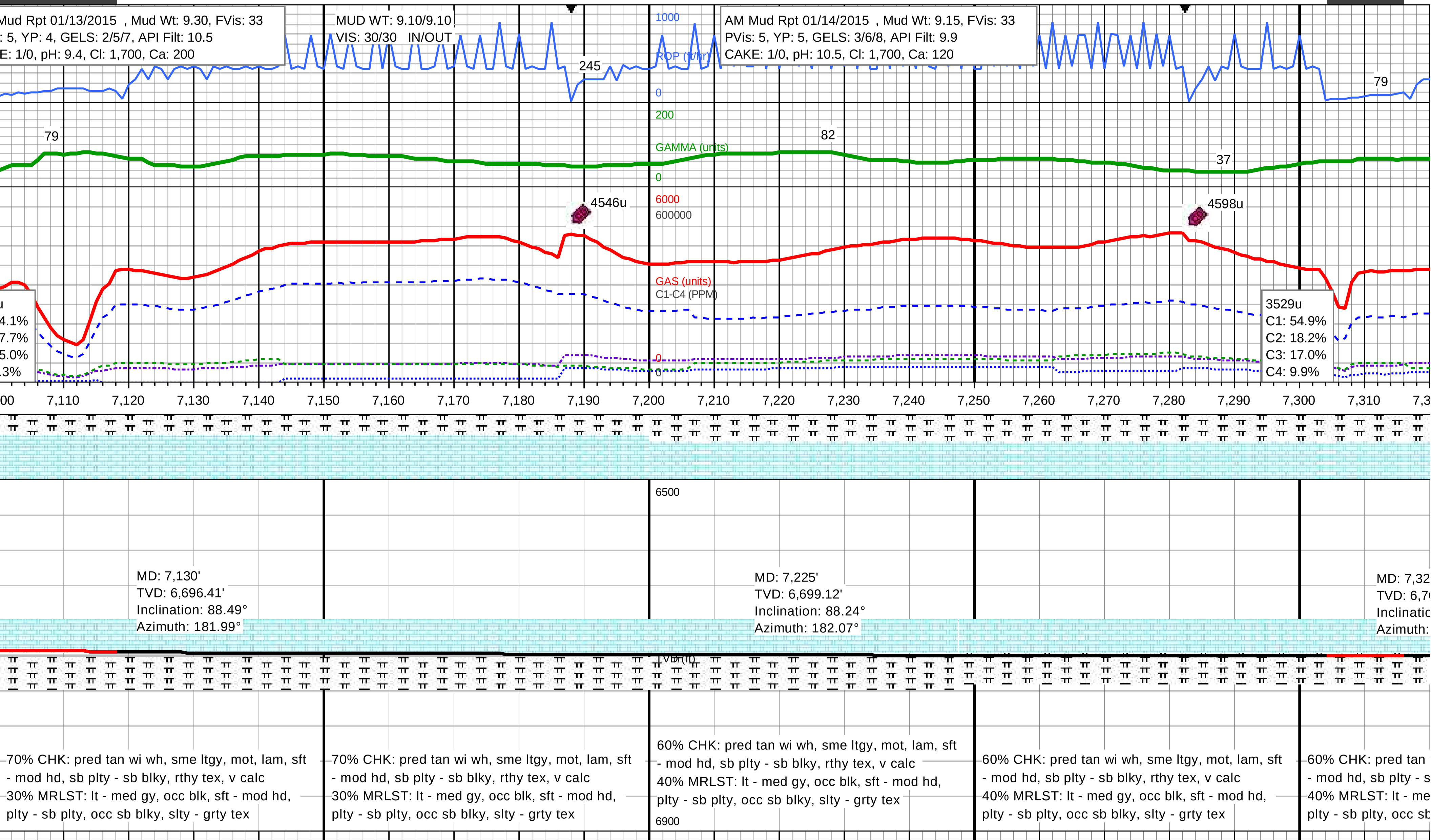
60-50% CHK: lt - medgy, sb plty - sb blky, v sft - frm, mot tex, v calc
40-50% MRLST: lt - med gy, occ blk, sft - mod hd, sb plty - plty, slty - grty tex, calc

40-20% CHK: lt - medgy, sb plty - sb blky, v sft - frm, mot tex, v calc
60-80% MRLST: lt - med gy, occ blk, sft - mod hd, sb plty - plty, slty - grty tex, calc

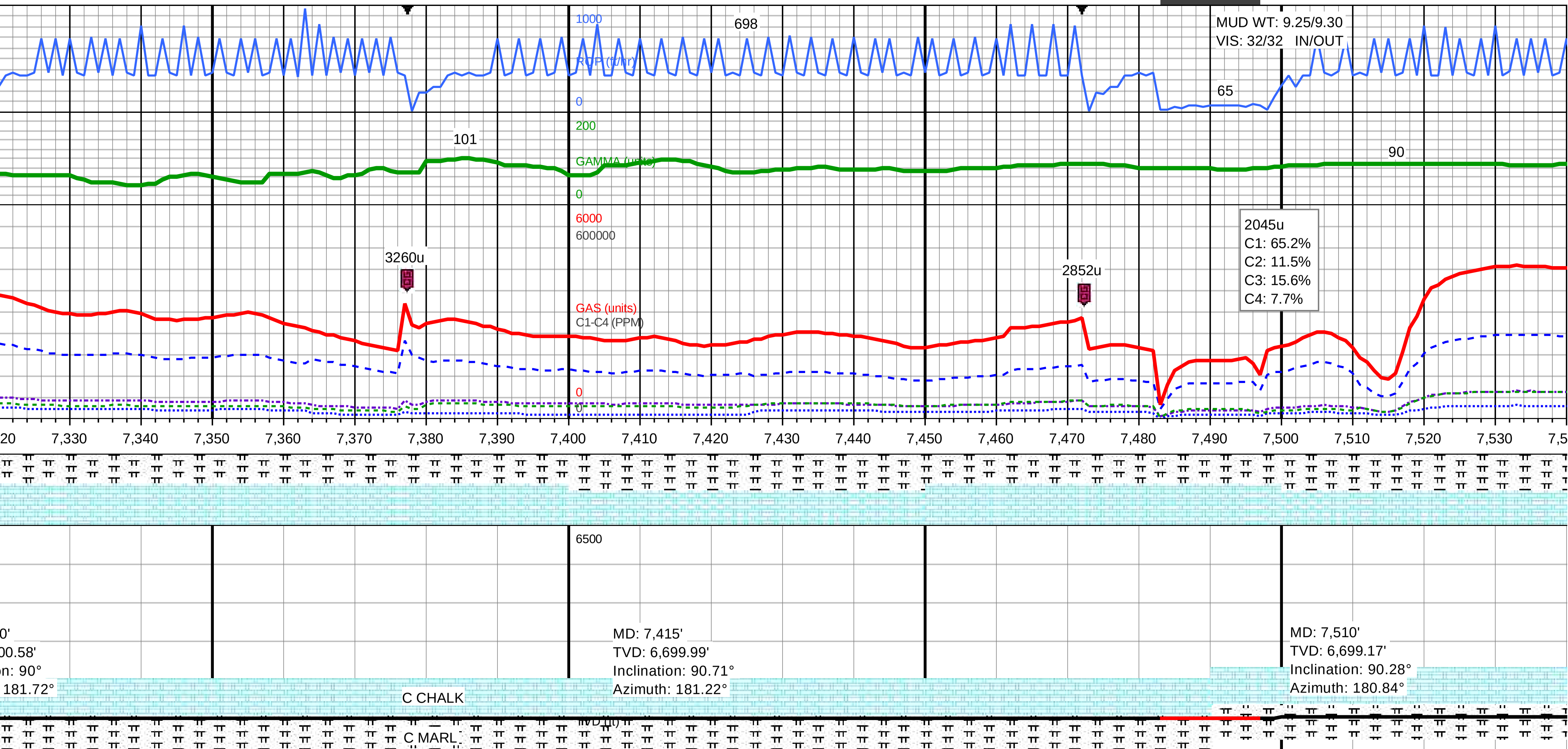
30-60% CHK: pred tan wi wh, lam, sft - frm, sb plty - sb blky
70-40% MRLST: lt - med gy, o
hd, sb plty - plty, slty - grty tex
foss



MUD WT: 10.60/10.50
VIS: 36/36 IN/OUT
01/11/2015
01/12/2015
01/13/2015
01/13/2015
1/14/2015
MNDEPTH
MNDEPTH
PM
PVis
CAK
1000
ROP (ft/hr)
0
148
351
65
200
GAMMA (units)
0
61
95
41
6000
600000
GAS (units)
C1-C4 (PPM)
0
0
4335u
4157u
4352u
3261u
4292u
4264u
C1: 65.4%
C2: 17.1%
C3: 13.7%
C4: 3.8%
2862u
C1: 6
C2: 1
C3: 1
C4: 3
6,880
6,890
6,900
6,910
6,920
6,930
6,940
6,950
6,960
6,970
6,980
6,990
7,000
7,010
7,020
7,030
7,040
7,050
7,060
7,070
7,080
7,090
7,1
C Chalk Top @
890' MD; 6,663' TVD
MD: 6,911'
TVD: 6,668.21'
Inclination: 76.03°
Azimuth: 178.64°
MD: 6,973'
TVD: 6,680.97'
Inclination: 80.21°
Azimuth: 179.7°
B MARL
C CHALK
6500
TVD (ft)
6900
TOOH @ 7,031' MD
to run 7" casing
Bit Data
Bit #: 2
Type: SMITH
Model: MDi516
Size: 6.12"
Depth In: 7,031'
Jets: 5X16
50' Sample Interval @ 7,050' MD
C CHALK
C MARL
sme ltgy, mot,
, rthy tex, v calc
cc blk, sft - mod
, tr wh - crm inoc
70% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - frm, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, occ blk, sft - mod hd, sb plty - plty, slty - grty tex, sme wh - crm inoc foss
70% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - frm, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, occ blk, sft - mod hd, sb plty - plty, slty - grty tex, abnt wh - crm inoc foss
80% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - frm, sb plty - sb blky, rthy tex, v calc
20% MRLST: lt - med gy, occ blk, sft - mod hd, sb plty - plty, slty - grty tex, sme wh - crm inoc foss
70% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - frm, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, occ blk, sft - mod hd, sb plty - plty, slty - grty tex



Mud Rpt 01/13/2015 , Mud Wt: 9.30, FVis: 33
: 5, YP: 4, GELS: 2/5/7, API Filt: 10.5
E: 1/0, pH: 9.4, Cl: 1,700, Ca: 200
MUD WT: 9.10/9.10
VIS: 30/30 IN/OUT
AM Mud Rpt 01/14/2015 , Mud Wt: 9.15, FVis: 33
PVis: 5, YP: 5, GELS: 3/6/8, API Filt: 9.9
CAKE: 1/0, pH: 10.5, Cl: 1,700, Ca: 120
1000
ROP (ft/hr)
0
200
GAMMA (units)
0
6000
600000
GAS (units)
C1-C4 (PPM)
0
0
79
245
82
37
79
4546u
4598u
u
4.1%
7.7%
5.0%
.3%
3529u
C1: 54.9%
C2: 18.2%
C3: 17.0%
C4: 9.9%
00
7,110
7,120
7,130
7,140
7,150
7,160
7,170
7,180
7,190
7,200
7,210
7,220
7,230
7,240
7,250
7,260
7,270
7,280
7,290
7,300
7,310
7,3
6500
MD: 7,130'
TVD: 6,696.41'
Inclination: 88.49°
Azimuth: 181.99°
MD: 7,225'
TVD: 6,699.12'
Inclination: 88.24°
Azimuth: 182.07°
MD: 7,32
TVD: 6,7
Inclinatio
Azimuth:
TVD (ft)
70% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc 30% MRLST: lt - med gy, occ blk, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex
70% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc 30% MRLST: lt - med gy, occ blk, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex
60% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc 40% MRLST: lt - med gy, occ blk, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex
6900
60% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc 40% MRLST: lt - med gy, occ blk, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex
60% CHK: pred tan - mod hd, sb plty - s 40% MRLST: lt - me plty - sb plty, occ sb



wi wh, sme ltgy, mot, lam, sft
b blky, rthy tex, v calc
d gy, occ blk, sft - mod hd,
blky, slty - grty tex

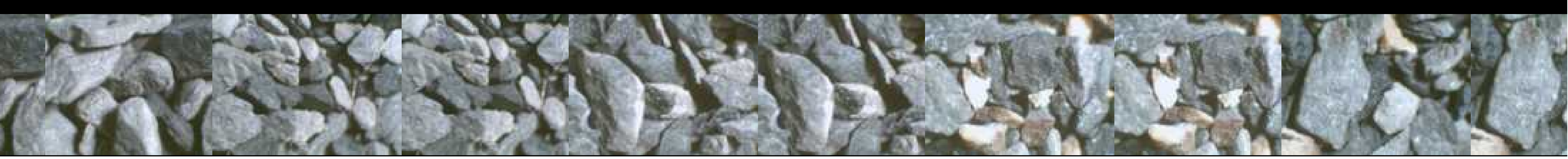
60% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
40% MRLST: lt - med gy, occ blk, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

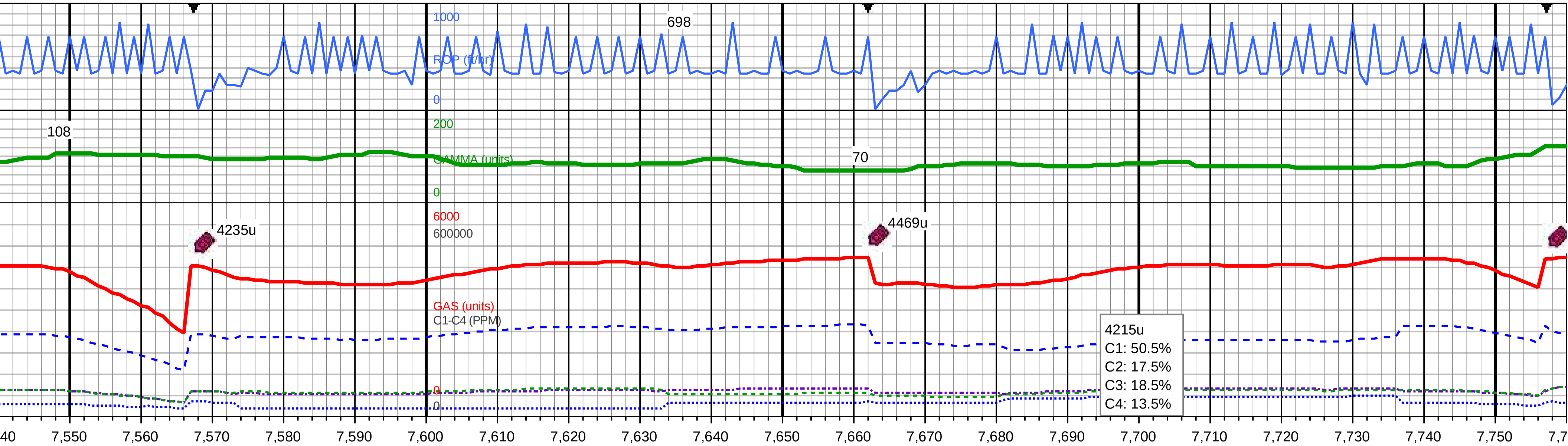
50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

6900

60% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
40% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

50% CHK: pred tan wi wh, sme ltgy, mot,
- mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl w
sft - mod hd, plty - sb plty, occ sb blky, sl
tex





6500

MD: 7,605'
TVD: 6,699.25'
Inclination: 89.63°
Azimuth: 180.09°

MD: 7,700'
TVD: 6,699.2'
Inclination: 90.43°
Azimuth: 179.75°

TVD (ft)

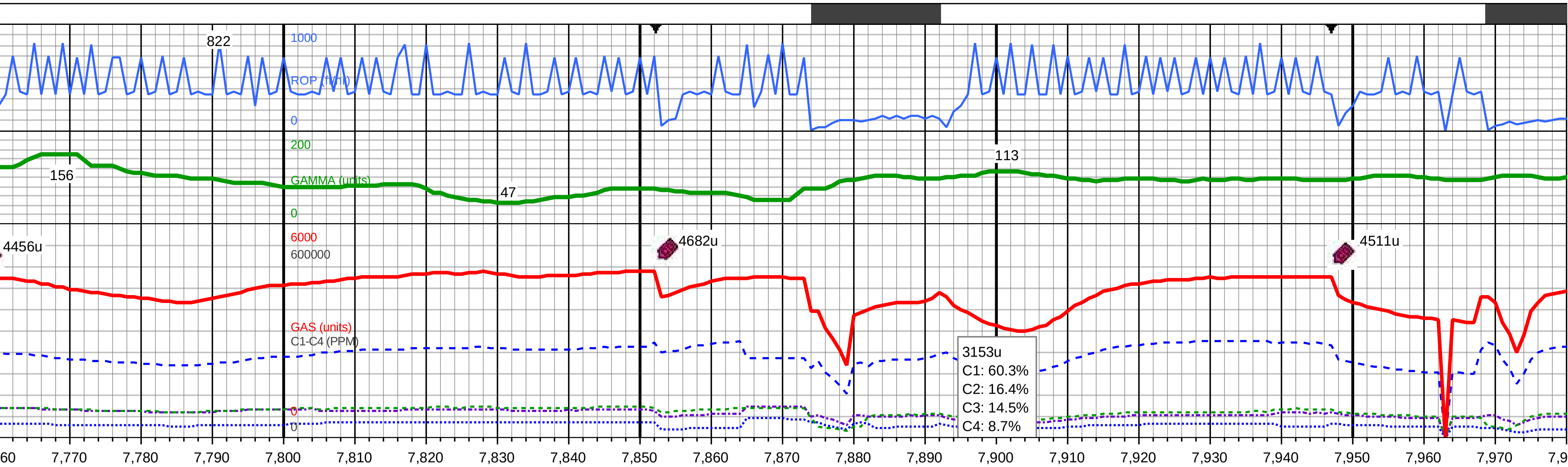
50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

6900

50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr Inoc



6500

MD: 7,795'
TVD: 6,698.02'
Inclination: 90.99°
Azimuth: 179.55°

MD: 7,890'
TVD: 6,696.37'
Inclination: 91.02°
Azimuth: 179.92°

MD:
TVD
Incli
Azin

TVD (ft)

: pred tan wi wh, sme ltgy, mot, lam, sft
sb plty - sb blky, rthy tex, v calc
ST: lt - med gy, occ blk speckl wi wh,
hd, plty - sb plty, occ sb blky, slty - grty
c

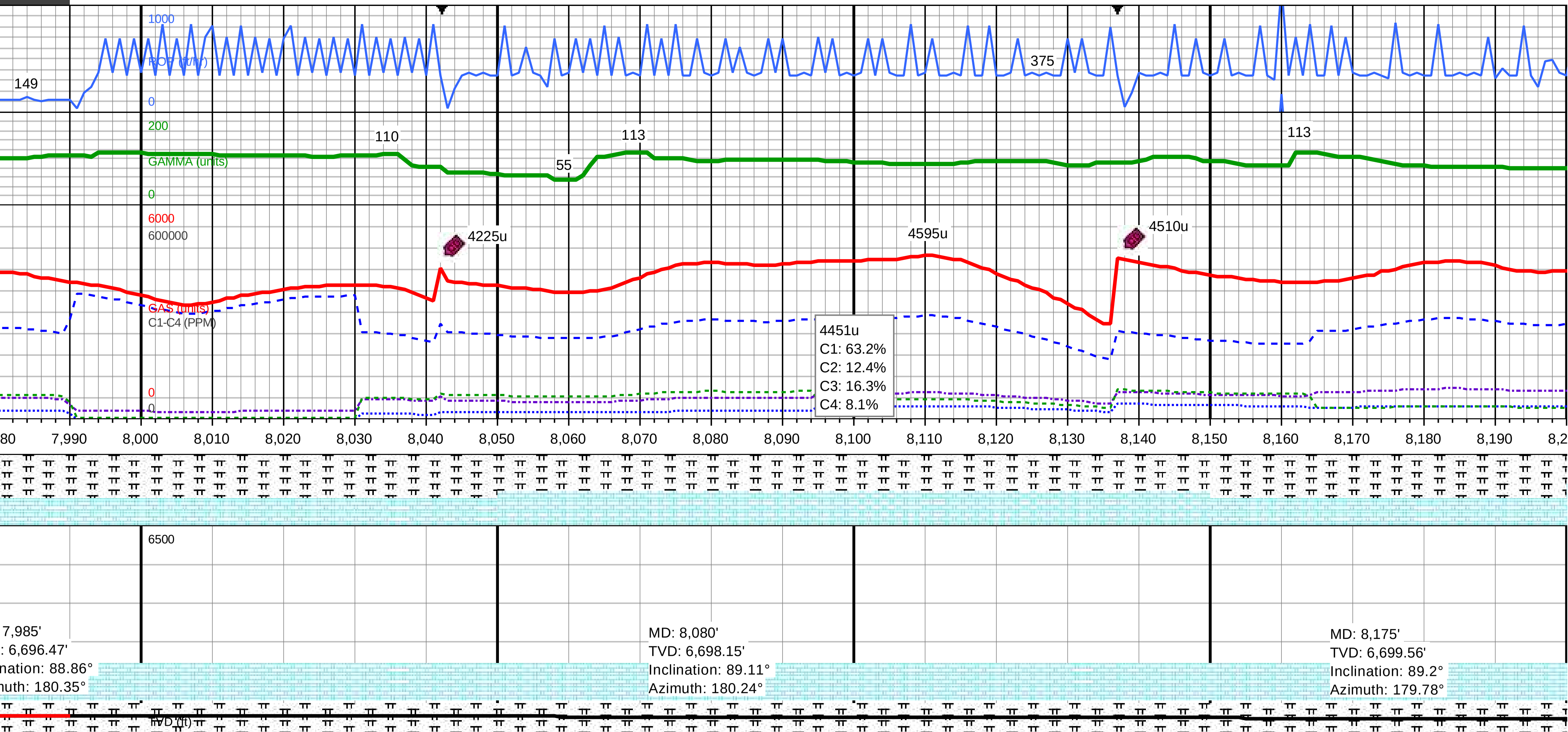
50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr Inoc

6900

40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr Inoc

40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr Inoc

40% CHK: pred tan wi wh, sme
- mod hd, sb plty - sb blky, rthy
60% MRLST: lt - med gy, occ b
sft - mod hd, plty - sb plty, occ
tex, tr Inoc



ltgy, mot, lam, sft
tex, v calc
lk speckl wi wh,
sb blky, slty - grty

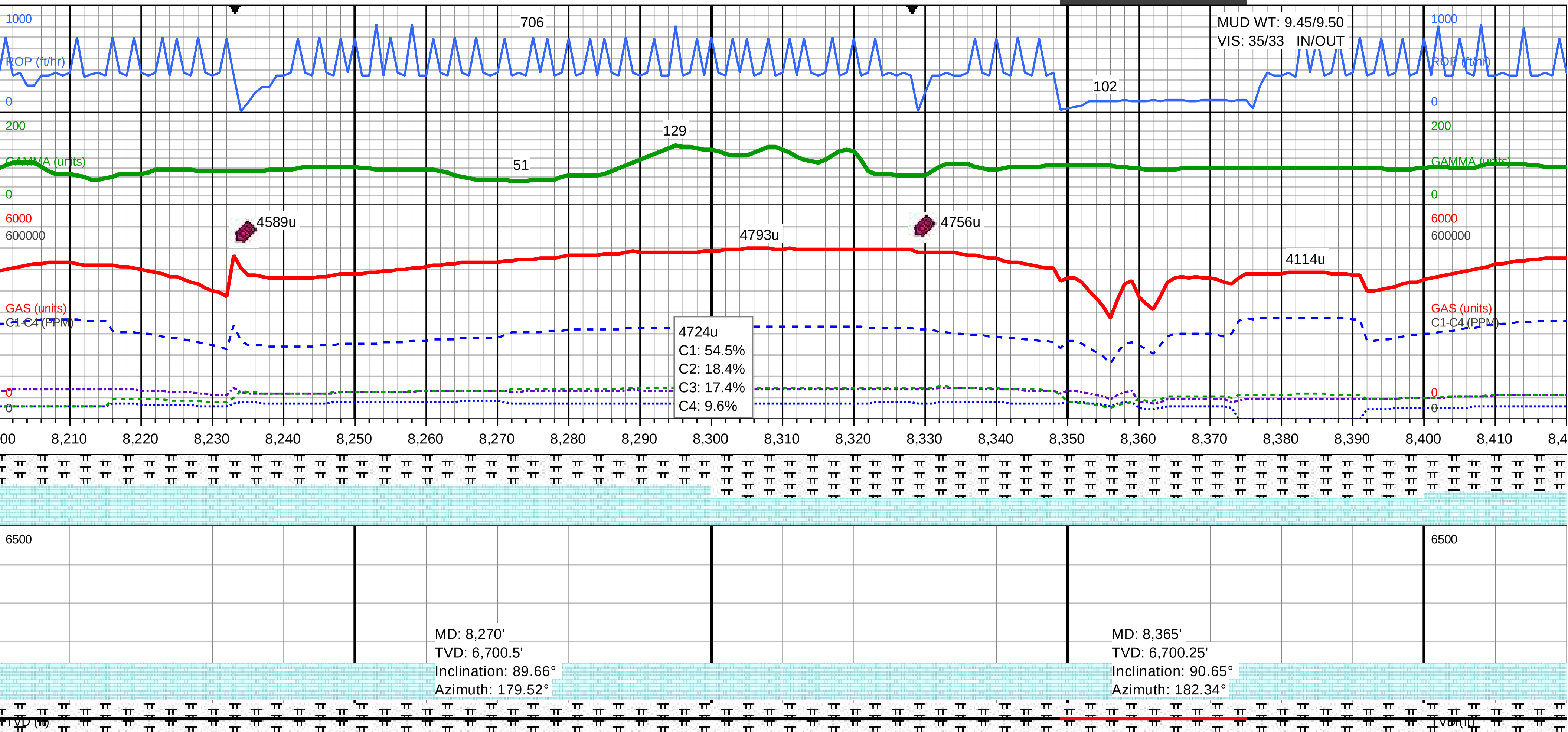
40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr Inoc

6900

50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr Inoc

50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr Inoc

40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr Inoc



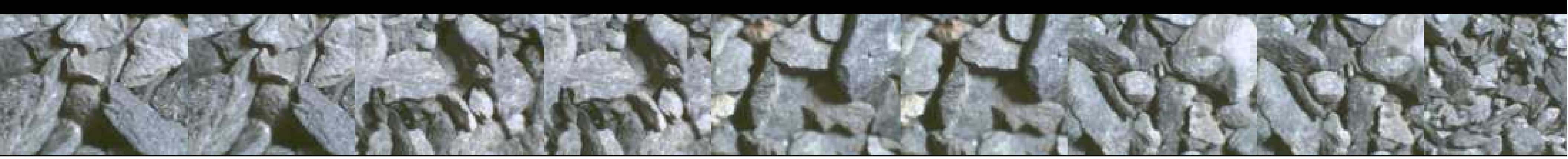
60% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
40% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme lnoc

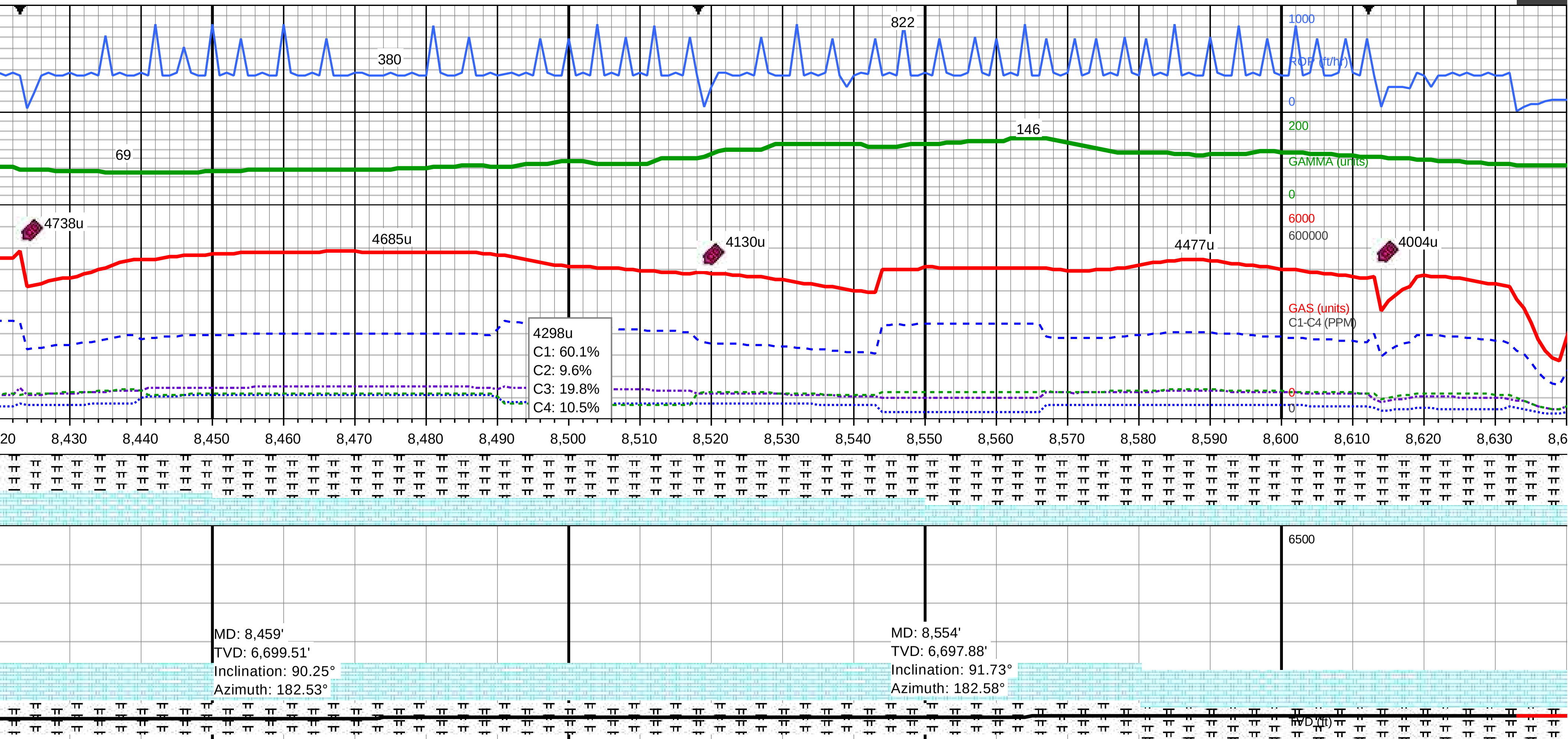
60% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
40% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme lnoc

40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme lnoc

40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme lnoc

50% CHK: pred tan w
- mod hd, sb plty - sb
50% MRLST: lt - me
sft - mod hd, plty - s
tex, sme lnoc





wi wh, sme ltgy, mot, lam, sft
b blky, rthy tex, v calc
d gy, occ blk speckl wi wh,
b plty, occ sb blky, slty - grty

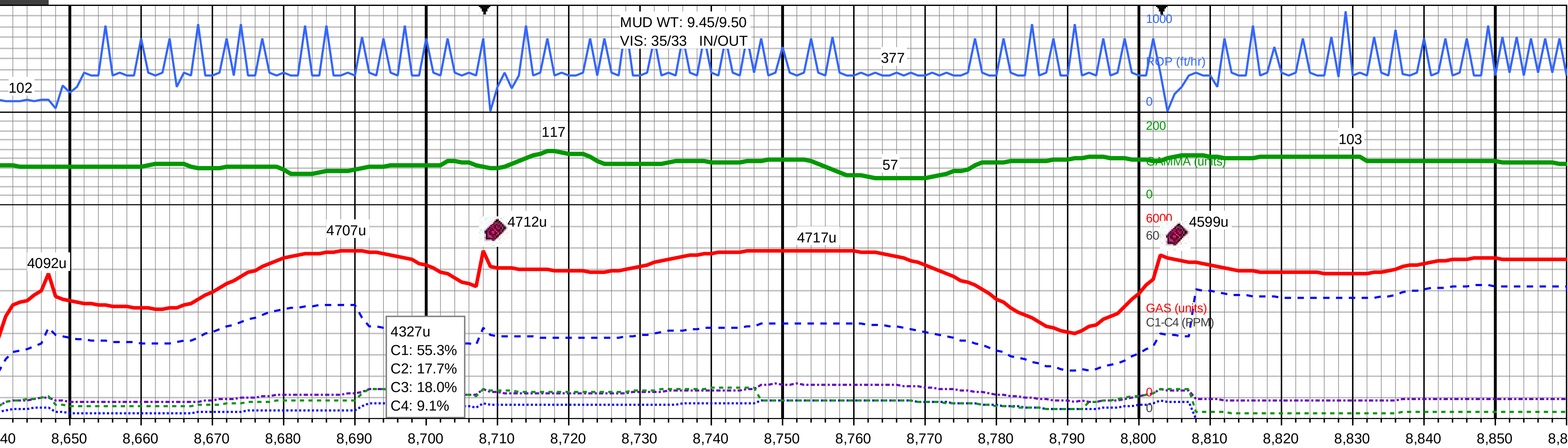
40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

30% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
70% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme Inoc

30% CHK: pred tan wi wh, sme ltgy, mot,
- mod hd, sb plty - sb blky, rthy tex, v calc
70% MRLST: lt - med gy, occ blk speckl w
sft - mod hd, plty - sb plty, occ sb blky, sl
tex, sme Inoc

6900



6500

MD: 8,649'
TVD: 6,696.98'
Inclination: 89.35°
Azimuth: 181.99°

MD: 8,744'
TVD: 6,697.88'
Inclination: 89.57°
Azimuth: 181.96°

MD: 8,839'
TVD: 6,698.64'
Inclination: 89.51°
Azimuth: 180.63°

TVD (ft)

lam, sft
c
vi wh,
ty - grty

30% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
70% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme lnoc

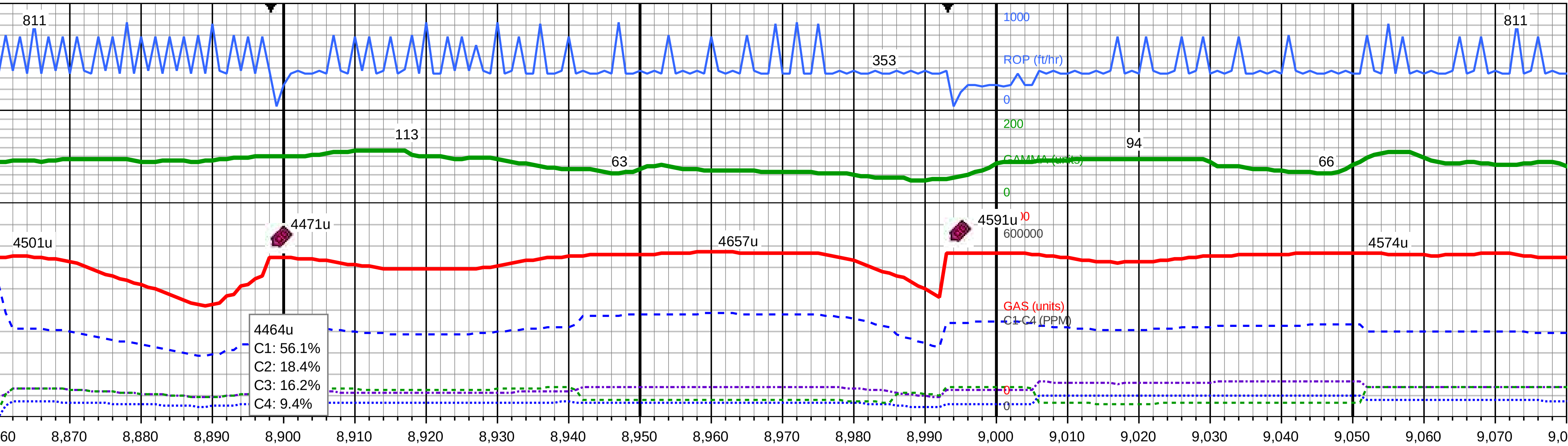
30% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
70% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme lnoc

40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme lnoc

40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme lnoc

6900

50% CHK
- mod hd,
50% MRL
sft - mod
tex, sme l



6500

MD: 8,934'
TVD: 6,698.95'
Inclination: 90.12°
Azimuth: 180.99°

MD: 9,029'
TVD: 6,697.85'
Inclination: 91.2°
Azimuth: 180.79°

TVD (ft)

: pred tan wi wh, sme ltgy, mot, lam, sft
sb plty - sb blky, rthy tex, v calc
ST: lt - med gy, occ blk speckl wi wh,
hd, plty - sb plty, occ sb blky, slty - grty
lnoc

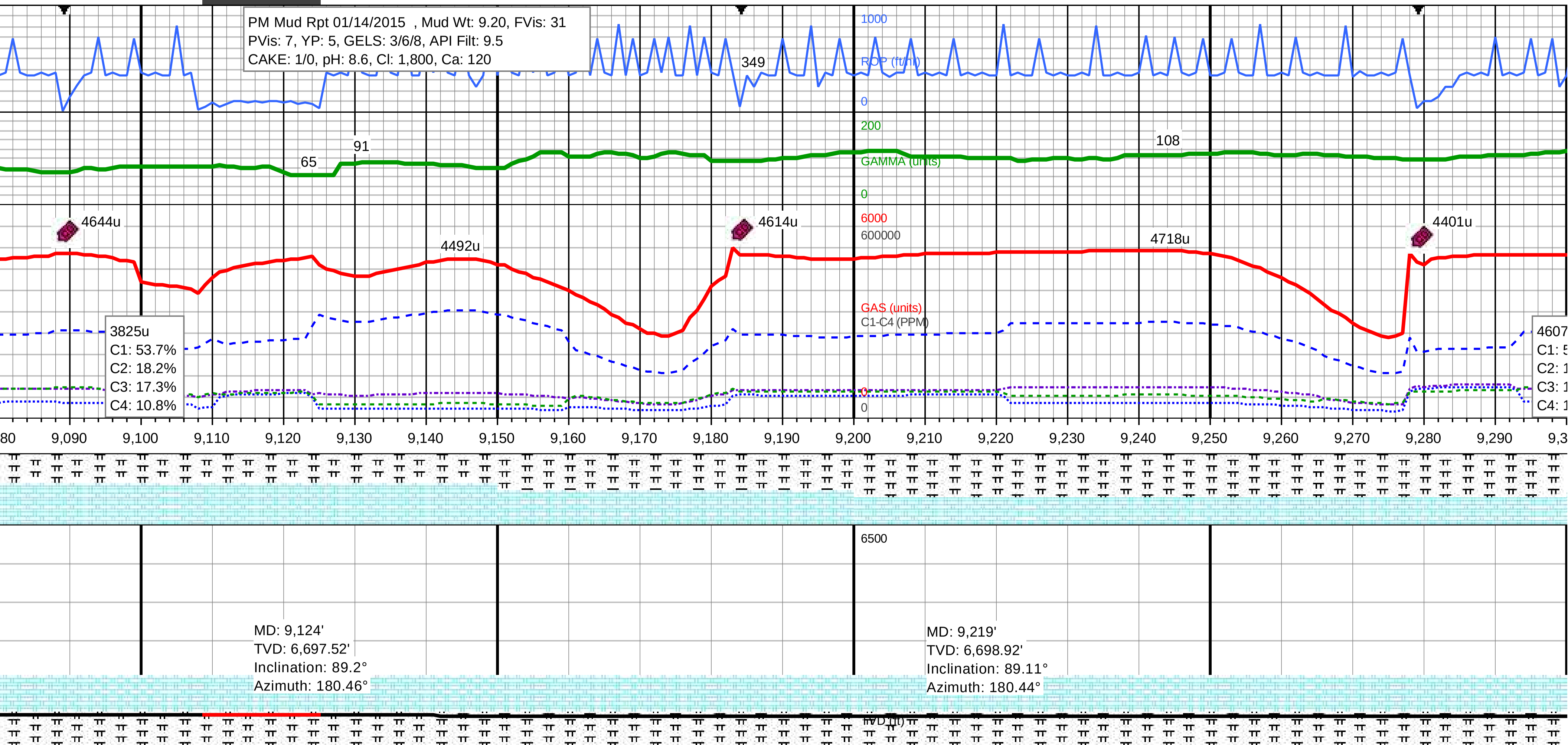
50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme lnoc

50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme lnoc

50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

6900

60% CHK: pred tan wi wh, sme
- mod hd, sb plty - sb blky, rthy
40% MRLST: lt - med gy, occ b
sft - mod hd, plty - sb plty, occ
tex, sme lnoc



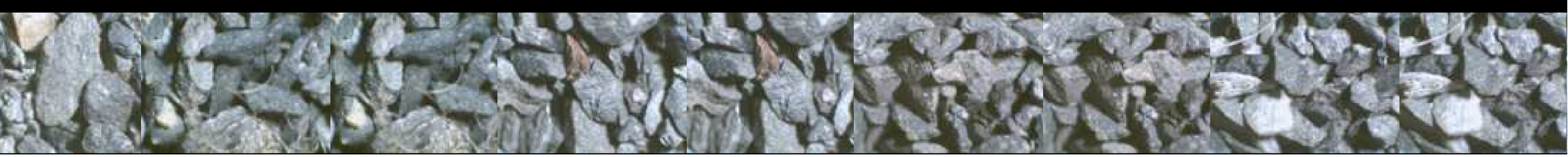
ltgy, mot, lam, sft
tex, v calc
lk speckl wi wh,
sb blky, slty - grty

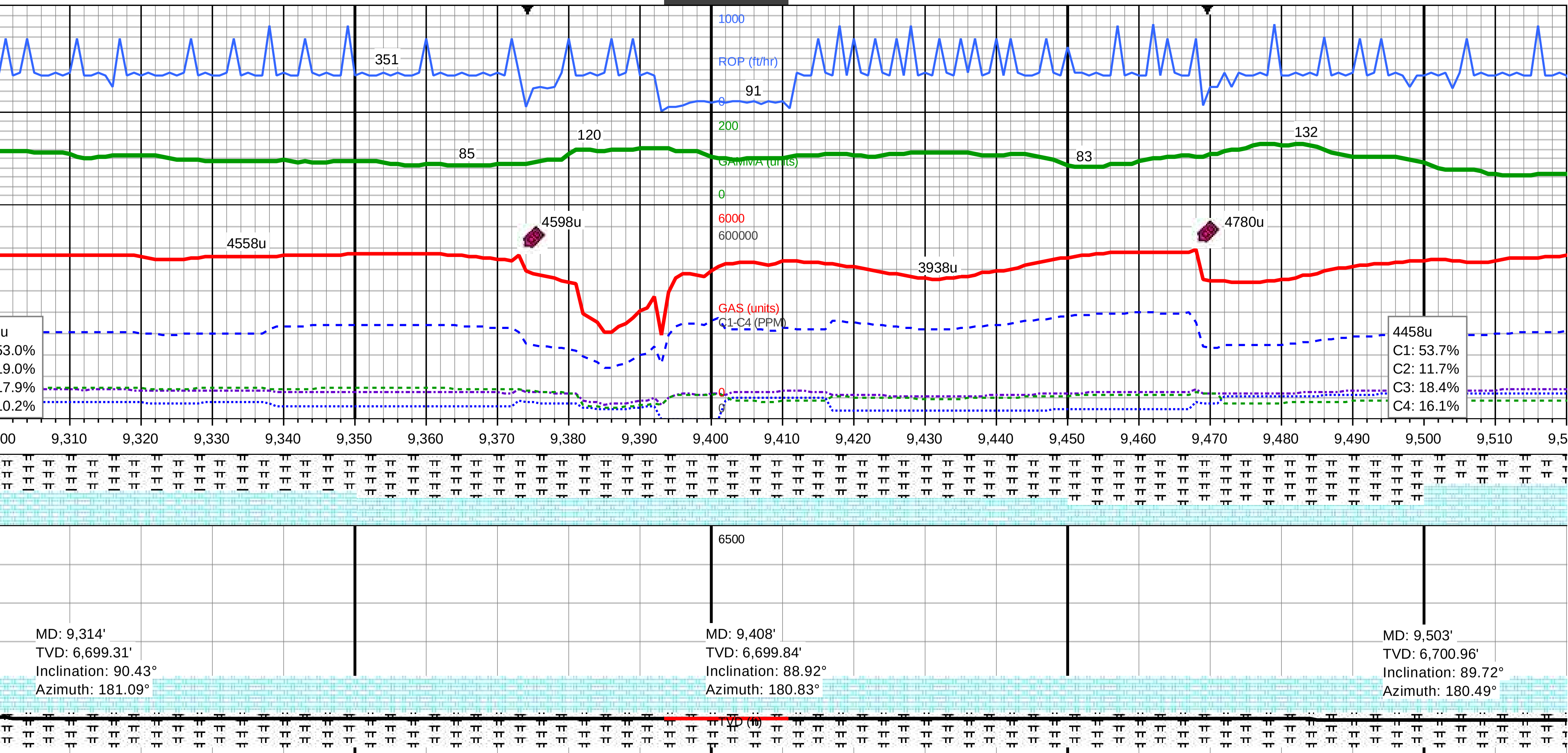
60% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
40% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme Inoc

50% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, sme Inoc

40% CHK: pred v lt gy, occ medgy, sb plty - sb blky, v sft - frm, mot tex, v calc
60% MRLST: med - dk gy, sft - frm, sb plty - sb blky, slty, mot tex, v calc, sme bent, tr wh - crm inoc fos frags

40% CHK: pred v lt gy, occ medgy, sb plty - sb blky, v sft - frm, mot tex, v calc
60% MRLST: med - dk gy, sft - frm, sb plty - sb blky, slty, mot tex, v calc, sme bent, tr wh - crm inoc fos frags





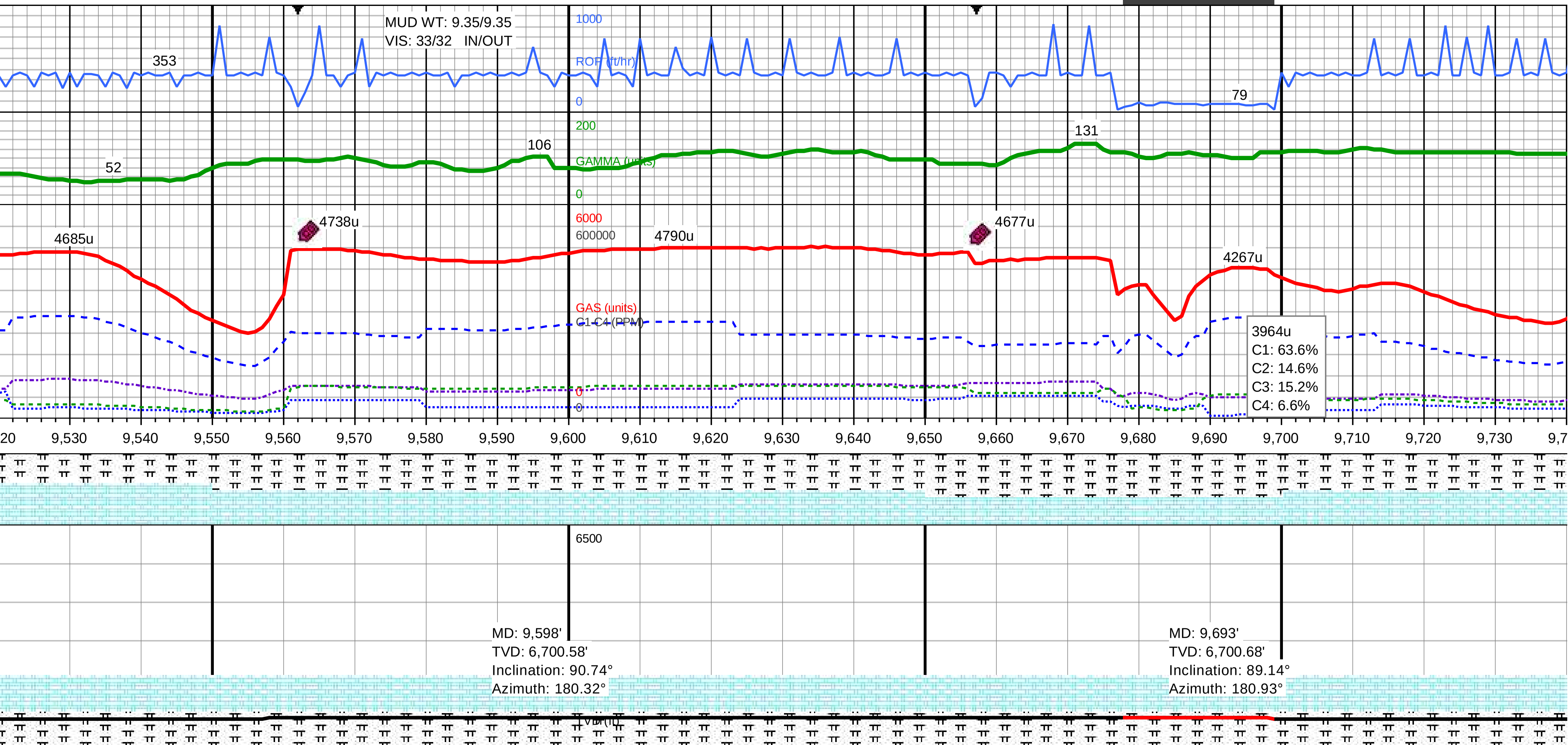
50% CHK: pred v lt gy, occ medgy, sb plty - sb blky, v sft - frm, mot tex, v calc
50% MRLST: med - dk gy, sft - frm, sb plty - sb blky, slty, mot tex, v calc, sme bent, tr wh - crm inoc fos frags

40% CHK: pred v lt gy, occ medgy, sb plty - sb blky, v sft - frm, mot tex, v calc
60% MRLST: med - dk gy, sft - frm, sb plty - sb blky, slty, mot tex, v calc, tr wh - crm inoc fos frags

40% CHK: pred v lt gy, occ medgy, sb plty - sb blky, v sft - frm, mot tex, v calc
60% MRLST: med - dk gy, sft - frm, sb plty - sb blky, slty, mot tex, v calc, sme bent

30% CHK: pred v lt gy, occ medgy, sb plty - sb blky, v sft - frm, mot tex, v calc
70% MRLST: med - dk gy, sft - frm, sb plty - sb blky, slty, mot tex, v calc

60% CHK: lt - med
frm, sb plty - sb bl
40% MRLST: lt - m
hd, sb plty - plty, s
inoc fos frags



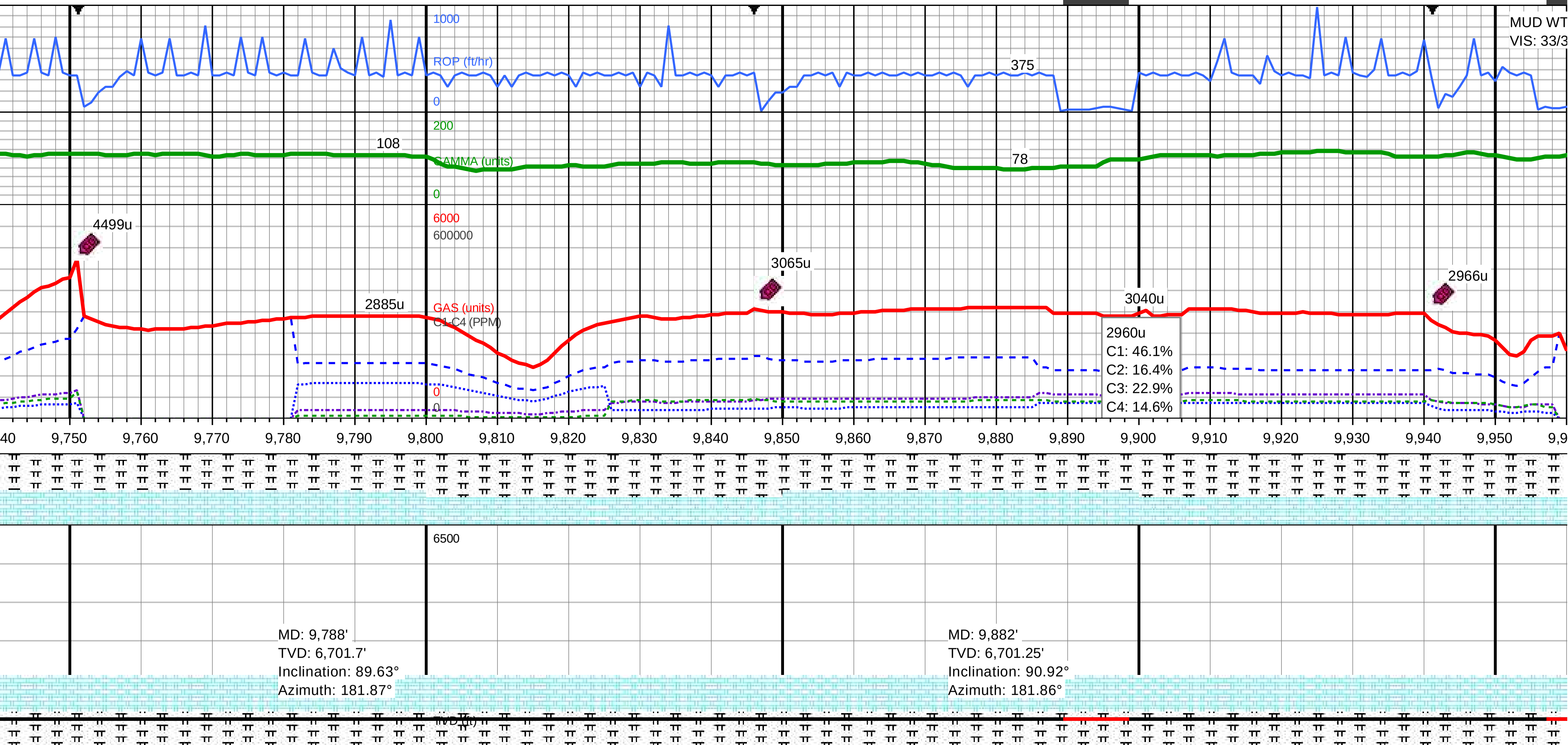
gy - gy brn, mot, lam, sft - ky, rthy tex, v calc ned gy, sme blk, sft - mod lty - grty tex, tr bent, tr wh

50% CHK: lt - med gy - gy brn, mot, lam, sft - frm, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, sme blk, sft - mod hd, sb plty - plty, slty - grty tex, tr bent, sme wh inoc fos frags

50% CHK: lt - med gy - gy brn, mot, lam, sft - frm, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, sme blk, sft - mod hd, sb plty - plty, slty - grty tex, sme bent, sme wh - crm inoc fos frags

40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

50% CHK: lt - med gy - gy brn, mot, lam, frm, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, sme blk, sft - sb plty - plty, slty - grty tex, sme wh - cr fos frags



, sft -
mod hd,
rm inoc

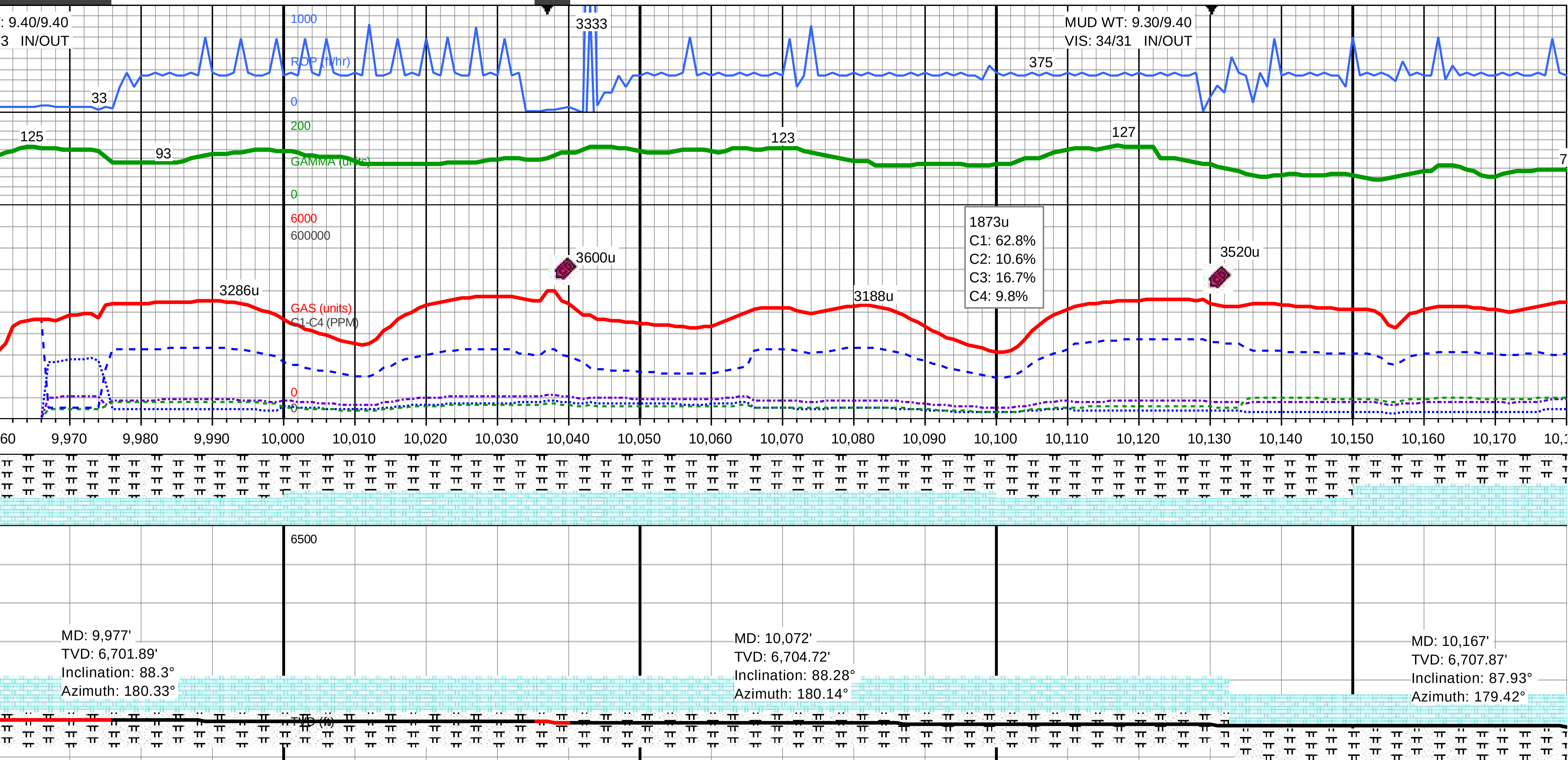
50% CHK: lt - med gy - gy brn, mot, lam, sft - frm, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, sme blk, sft - mod hd, sb plty - plty, slty - grty tex, sme wh - crm inoc fos frags

40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

50% CHK: lt - med gy - gy brn, mot, lam, sft - frm, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, sme blk, sft - mod hd, sb plty - plty, slty - grty tex

40% CHK: pred tan wi wh, sme ltgy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

40% CHK
lam, sft -
calc
60% MRL
wh, sft -
slty - grty



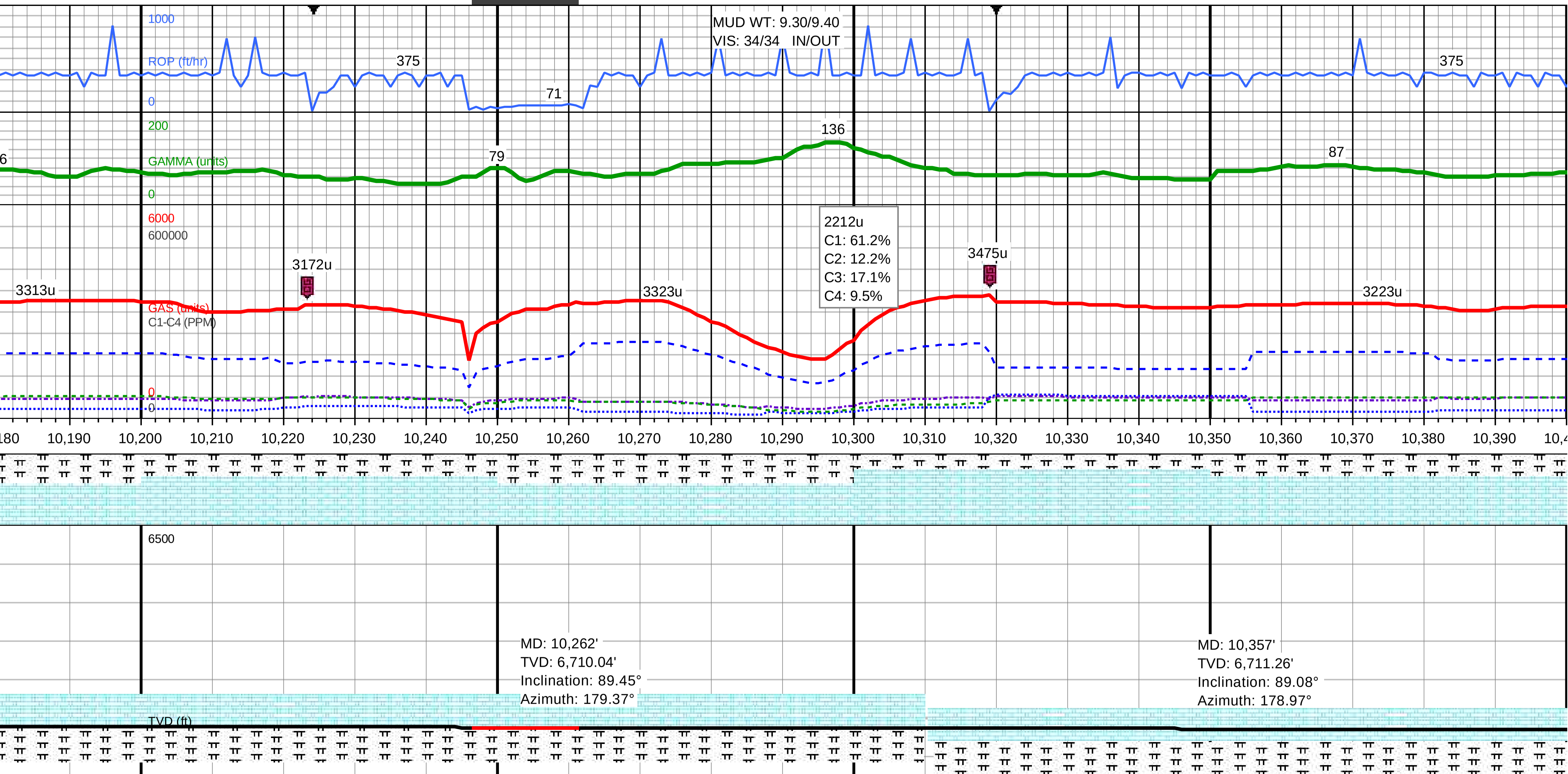
K: pred tan wi wh, sme ltgy, mot, mod hd, sb plty - sb blky, rthy tex, v
LST: lt - med gy, occ blk speckl wi mod hd, plty - sb plty, occ sb blky, tex

50% CHK: pred tan - lt gy, sme med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

50% CHK: pred tan - lt gy, sme med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

40% CHK: lt gy - med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

60% CHK: lt gy - med gy, mo hd, sb plty - sb blky, rthy tex
40% MRLST: lt - med gy, occ wh, sft - mod hd, plty - sb plt slty - grty tex



MD: 10,262'
TVD: 6,710.04'
Inclination: 89.45°
Azimuth: 179.37°

MD: 10,357'
TVD: 6,711.26'
Inclination: 89.08°
Azimuth: 178.97°

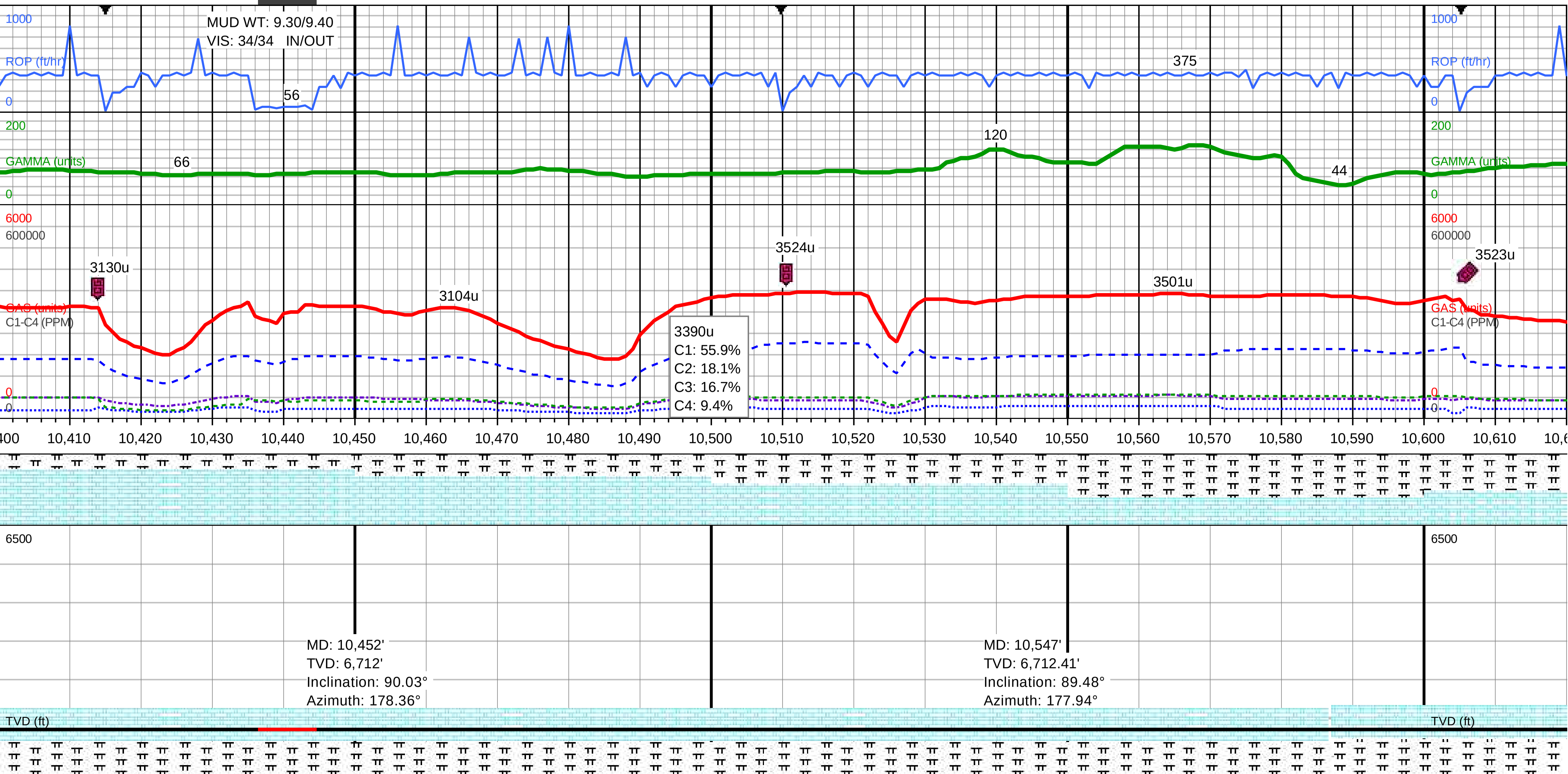
t, lam, sft - mod
, v calc
: blk speckl wi
y, occ sb blky,

70% CHK: lt gy - med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr bent

60% CHK: lt gy - med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
40% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, v sl tr wh inoc foss frags

80% CHK: lt gy - med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
20% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, abnt wh inoc foss frags

70% CHK: lt gy - med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr scat bent



6900

80% CHK: lt gy - med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
20% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr scat bent

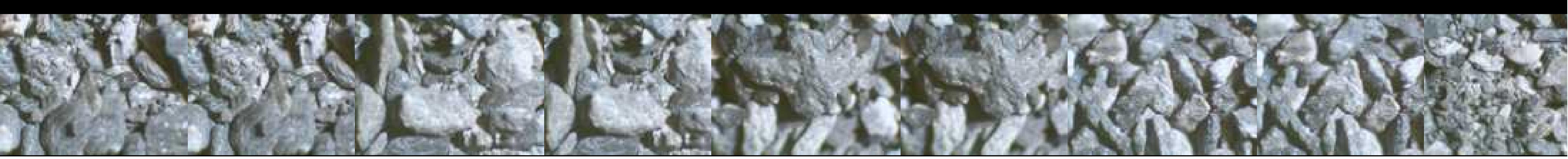
70% CHK: lt gy - med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

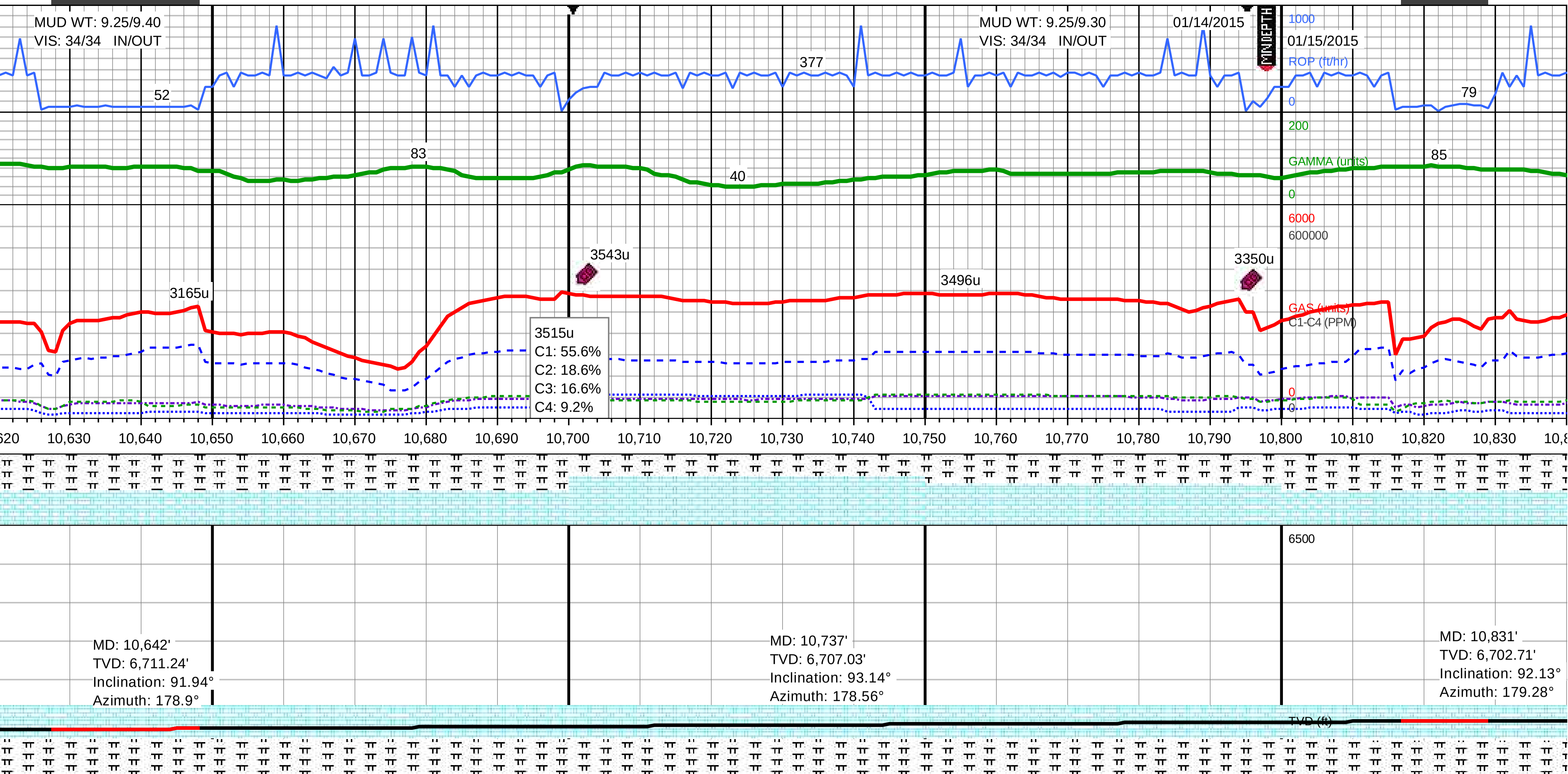
60% CHK: lt gy - med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
40% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr wh inoc foss frags

40% CHK: lt gy - med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
60% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr wh inoc foss frags

6900

50% CHK: lt gy
hd, sb plty - sb
50% MRLST: lt
wh, sft - mod ho
slty - grty tex, tr





- med gy, mot, lam, sft - mod
blky, rthy tex, v calc
- med gy, occ blk speckl wi
d, plty - sb plty, occ sb blky,
wh inoc foss frags

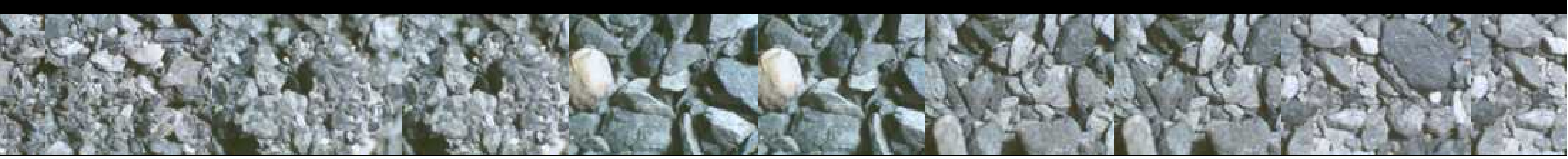
50% CHK: lt gy - med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

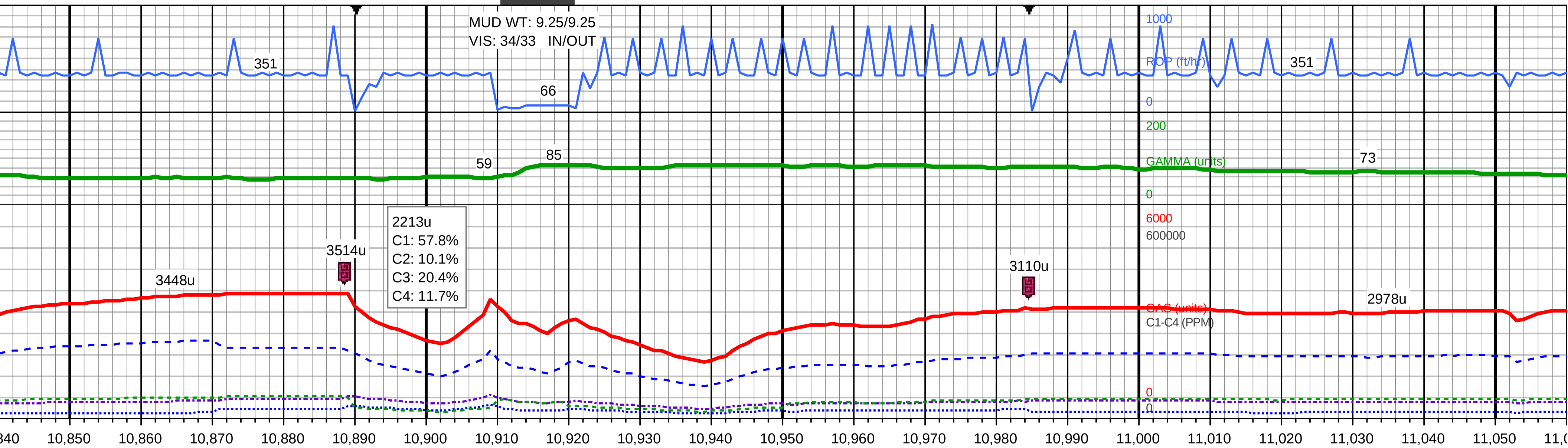
70% CHK: lt gy - med gy, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

60% CHK: lt gy - med gy, sme tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
40% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

50% CHK: lt gy - med gy, sme tan, m
sft - mod hd, sb plty - sb blky, rthy t
calc
50% MRLST: lt - med gy, occ blk sp
wh, sft - mod hd, plty - sb plty, occ s
slty - grty tex, v sl tr cal

6900





6500

MD: 10,926'
TVD: 6,700.43'
Inclination: 90.62°
Azimuth: 178.39°

MD: 11,021'
TVD: 6,698.77'
Inclination: 91.39°
Azimuth: 177.43°

TVD (ft)

6900

...mot, lam, ...tex, v ...speckl wi ...sb blky,

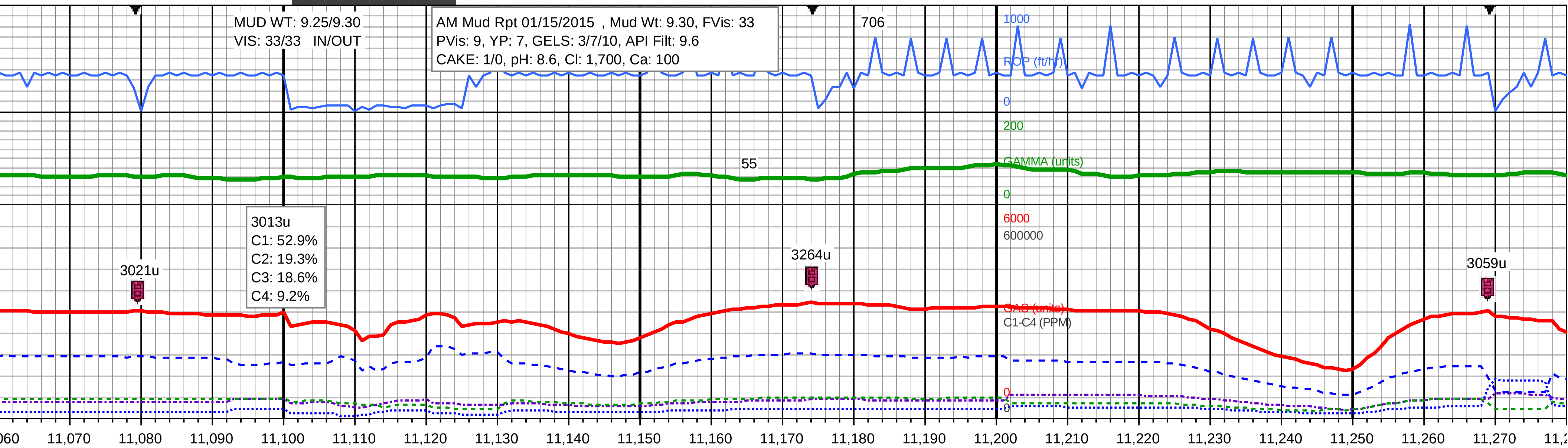
60% CHK: lt gy - med gy, sme tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
40% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

50% CHK: lt gy - med gy, sme tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
50% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

60% CHK: lt gy - med gy, sme tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
40% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr cal, tr wh inoc foss frags

60% CHK: lt gy - med gy, sme tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
40% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex, tr cal, tr wh inoc foss frags

70% CH... sft - mo... calc
30% MR... wh, sft -... slty - gr...



6500

MD: 11,116'
TVD: 6,698.44'
Inclination: 89.01°
Azimuth: 177.71°

MD: 11,211'
TVD: 6,700.59'
Inclination: 88.4°
Azimuth: 177.11°

TVD (ft)

K: lt gy - med gy, sme tan, mot, lam,
d hd, sb plty - sb blky, rthy tex, v
RLST: lt - med gy, occ blk speckl wi
mod hd, plty - sb plty, occ sb blky,
y tex, tr cal, tr wh inoc foss frags

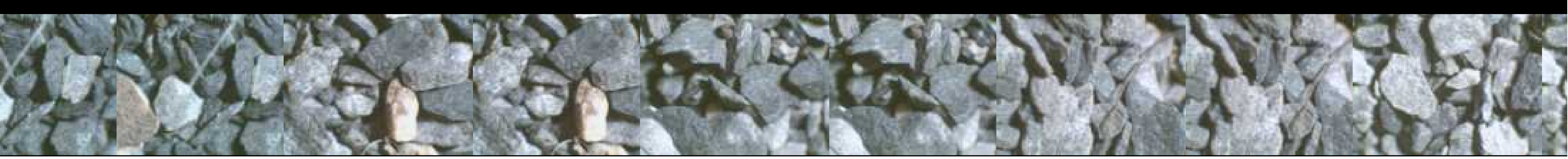
70% CHK: lt gy - med gy, sme tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

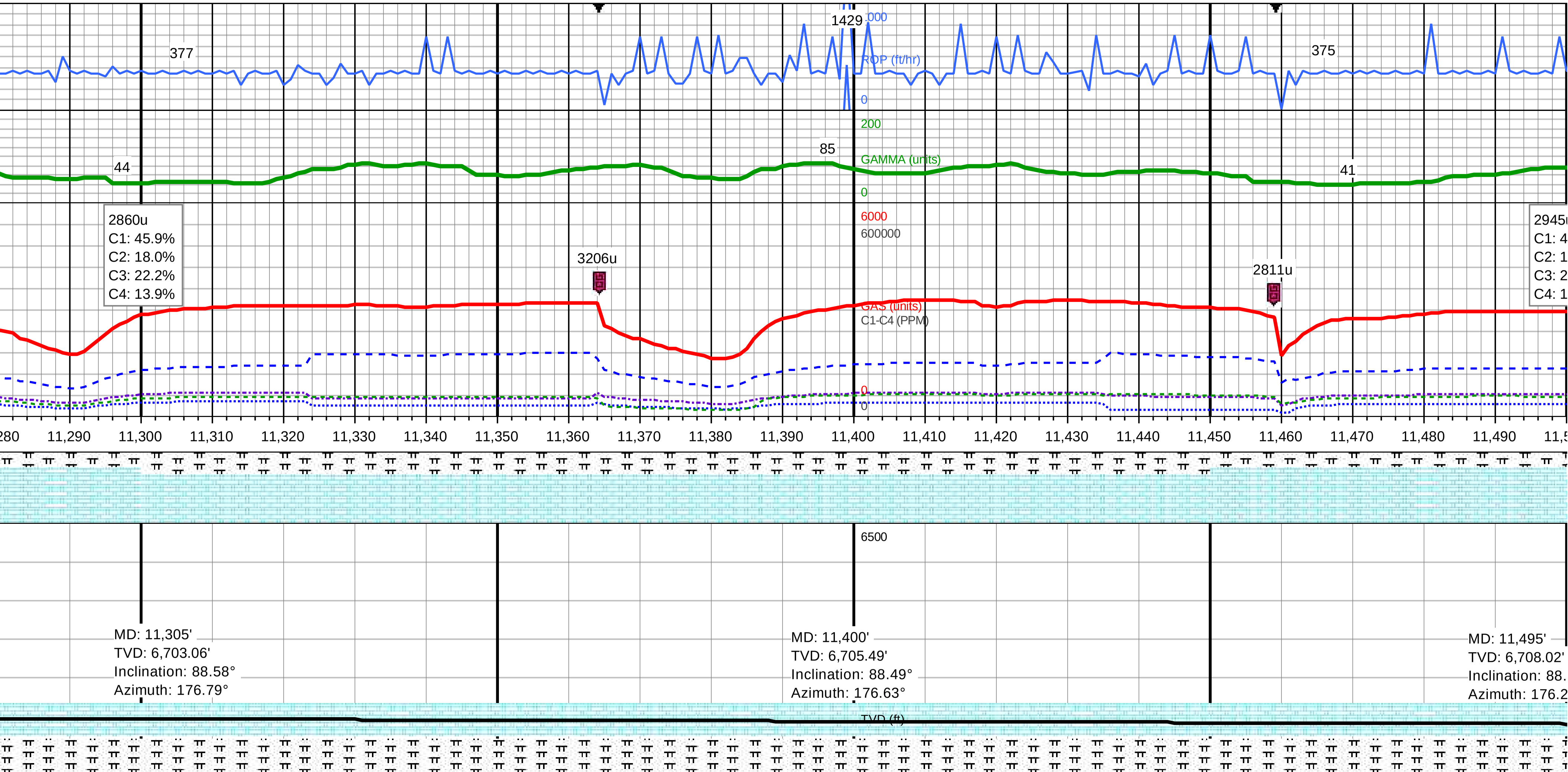
70% CHK: lt gy - med gy, sme tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, occ blk speckl wi wh, sft - mod hd, plty - sb plty, occ sb blky, slty - grty tex

80% CHK: lt gy - tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
20% MRLST: lt - med gy, rr blk speckl wi wh, frm - hd, plty - sb plty, occ sb blky, slty - grty tex

6900

80% CHK: lt gy - tan, mot, lam
plty - sb blky, rthy tex, v calc
20% MRLST: lt - med gy, rr blk
- hd, plty - sb plty, occ sb blky





sft - mod hd, sb
speckl wi wh, frm
slty - grty tex

70% CHK: lt gy - tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, rr blk speckl wi wh, frm - hd, plty - sb plty, occ sb blky, slty - grty tex

70% CHK: lt gy - tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, rr blk speckl wi wh, frm - hd, plty - sb plty, occ sb blky, slty - grty tex

70% CHK: lt gy - tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
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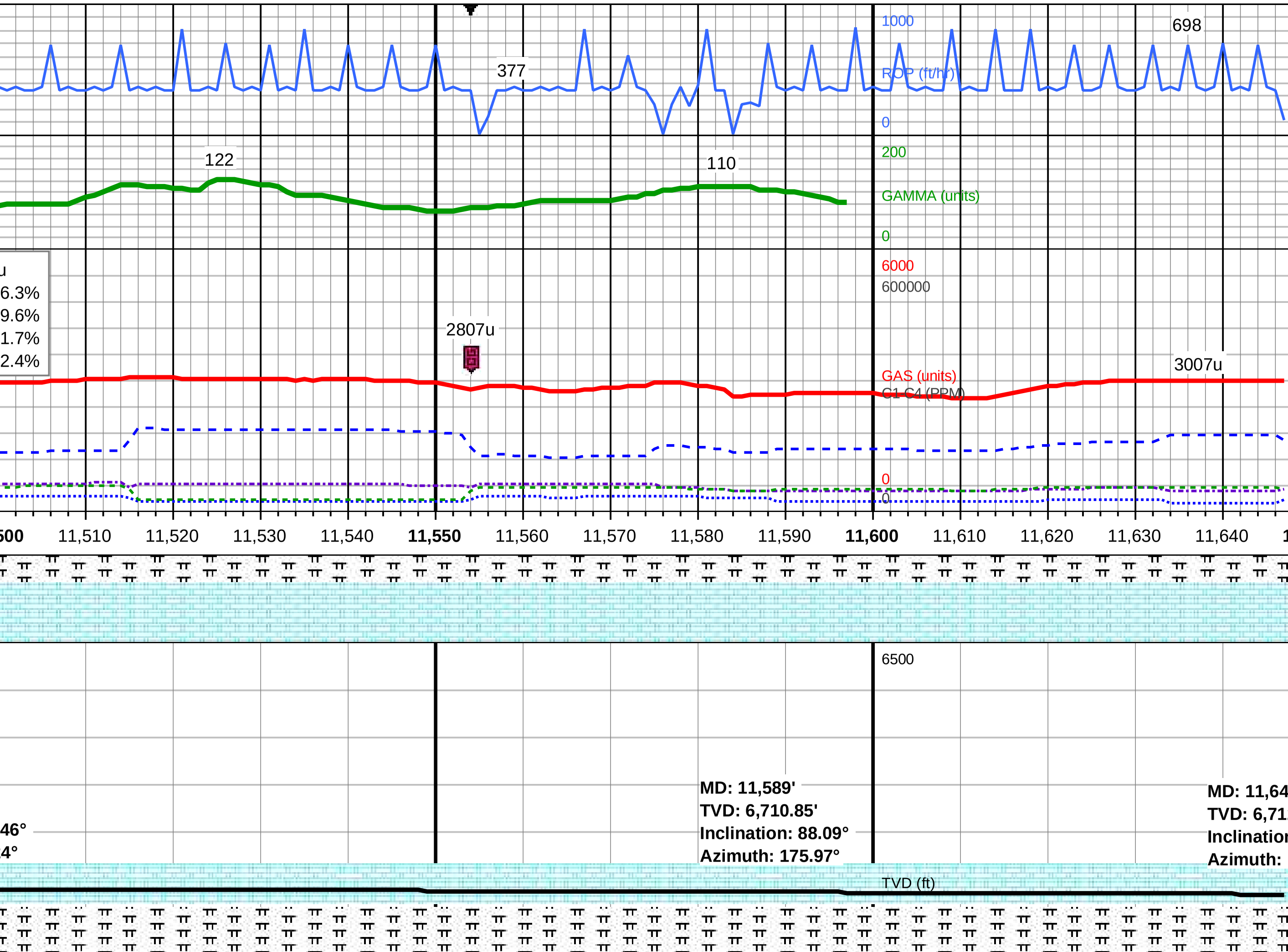
6900

80% CHK: lt gy - tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
20% MRLST: lt - med gy, rr blk speckl wi wh, frm - hd, plty - sb plty, occ sb blky, slty - grty tex



TD @ 11,647' MD @ 05:01 hrs MST on 1/15/2015

See Corresponding Vertical Log Crow Creek AA01-776 VERT

70% CHK: lt gy - tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, rr blk speckl wi wh, frm - hd, plty - sb plty, occ sb blky, slty - grty tex

70% CHK: lt gy - tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, rr blk speckl wi wh, frm - hd, plty - sb plty, occ sb blky, slty - grty tex

70% CHK: lt gy - tan, mot, lam, sft - mod hd, sb plty - sb blky, rthy tex, v calc
30% MRLST: lt - med gy, rr blk speckl wi wh, frm - hd, plty - sb plty, occ sb blky, slty - grty tex

6900

Wellsite Geological Services Provided By Columbine Logging