Scale: 5" / 100'
Measured Depth Log

Well Name	Seltzer LD 21-031HC Mudlog		
Location	SEC 4, T1S, R67W		
State	COLORADO	**County**	ADAMS
Country	UNITED STATES	**Rig Number**	PRECISION 460
API Number	050011019900	**AFE #**	18DC0135
Geographic Region	DJ BASIN	**Field**	WATTENBERG
Ground Elevation	5139.5'	**K.B. Elevation**	5159.5'
Logged Interval	4500' MD **To** 23960'MD	**Total Depth**	23960'MD
Formation	CODELL		
Type of Drilling Fluid	OIL BASED MUD		

Operator

Company Great Western Operating Company, LLC

Address 1001 17th Street, Suite 2000
Denver, CO 80202

Geologist

Name Joey Luce, Zac Olds, Mark Sowinski

Company Terra Guidance

Address 67 W. Floyd Ave. Ste 105
Englewood, CO 80110
(970) 260-5408

Other

MUDLOG START DATE 11/18/2018

MUDLOG END DATE 11/29/2018

Color Coding

Oil	Condensate	Gas
Note	Core	Pressure
Error	Water	Seal

Rock Types

Sandstone	SILTSTONE	SALT	SHALE COLORED
LIMESTONE	SANDSTONE	SIDERITE or LIMONITE	CONGLOMERATE
Chalk	BENTONITE	DOLOMITE	BRECCIA
Marl	CALCARIOUS SHALE	CHERT	TILL
SHALE	CEMENT	COAL	TUFF
Silty Shale	UNKNOWN	MARLSTONE	IGNEOUS
Shaly Siltstone	ANHYDRITE	CLAYSTONE	METAMORPHIC
Silty Sandston	GYPSUM	SHALE GRAY	

Fossils

GASTROPOD
OOLITE
ALGAE
AMPHIPORA
BELEMNITE
BIOCLASTIC
BRACHIOPOD
BRYOZOA
CEPHALOPOD
CORAL
CRINOID
ECHINOID
FISH
FORAMINIFERA
FOSSIL
OSTRACOD
PELECYPOD
PELLET
PISOLITE
PLANT REMAINS
PLANT SPORES
SCAPHOPOD
STROMATOPOROID

Minerals

ANHYDRITIC
ARGILLACEOUS
ARGILLITE GRAIN

BEN
BITU
BRE
CAL
CAR
CHT
CHT
COA
DOL
FELI
FER
FER
GLA
GYI
HEA

Oil Show

DEAD
EVEN
QUESTIONABLE
SPOTTED STAINING
ORGANIC
PINPOINT
VUGGY

Porosity

EARTHY
FENESTRAL
FRACTURE
INTERCRYSTALLINE
INTEROOLITIC
MOLDIC

Engineering

BIT
CASING
CONNECTION (LEFT)
CONNECTION (RIGHT)
CONNECTION GAS
CORE - LOST
CORE - RECOVERED
DST INTERVAL
FAULT

Accessories

ITONITE
UMENOUS SUBSTANCE
ECCIA FRAGMENTS
CAREOUS
RBONACEOUS FLAKES
TDK
TLT
AL - THIN BEDS
LOMITIC
DSPAR
RUGINOUS PELLET
RRUGINOUS
AUCONITE
PSIFEROUS
VY MINERAL

KAOLIN
MARLSTONE
MINERAL CRYSTALS
NODULES
PHOSPHATE PELLETS
PYRITE
SALT CAST
SANDY
SILICEOUS
SILTY
TUFFACEOUS

COAL STRINGER
DOLOMITE STRINGER
GYPSUM STRINGER
LIMESTONE STRINGER
MARLSTONE (CALC) STRG
MARLSTONE (DOL) STRG
SANDSTONE STRINGER
SHALE STRINGER
SILTSTONE STRINGER
CALC SHALE
CHALK

Stringer

ANHYDRITE STRINGER
BENTONITE STRINGER

Other Symbols

FORMATION TOP
GAS SHOW
MNDEPTH MN DEPTH
NORMAL FAULT
OIL SHOW
OVERTURNED STRATA
REVERSE FAULT
SIDEWALL CORE (LEFT)
SIDEWALL CORE (RIGHT)
SLIDE
DS SURVEY
TG TRIP GAS
WIRELINE TESTED - LEFT
WIRELINE TESTED - RT

Rounding

A ANGULAR
R ROUNDED
a 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

CALCARIUOS SHALE

CALCARIOUS SHALE

ROP
ROP
Gamma

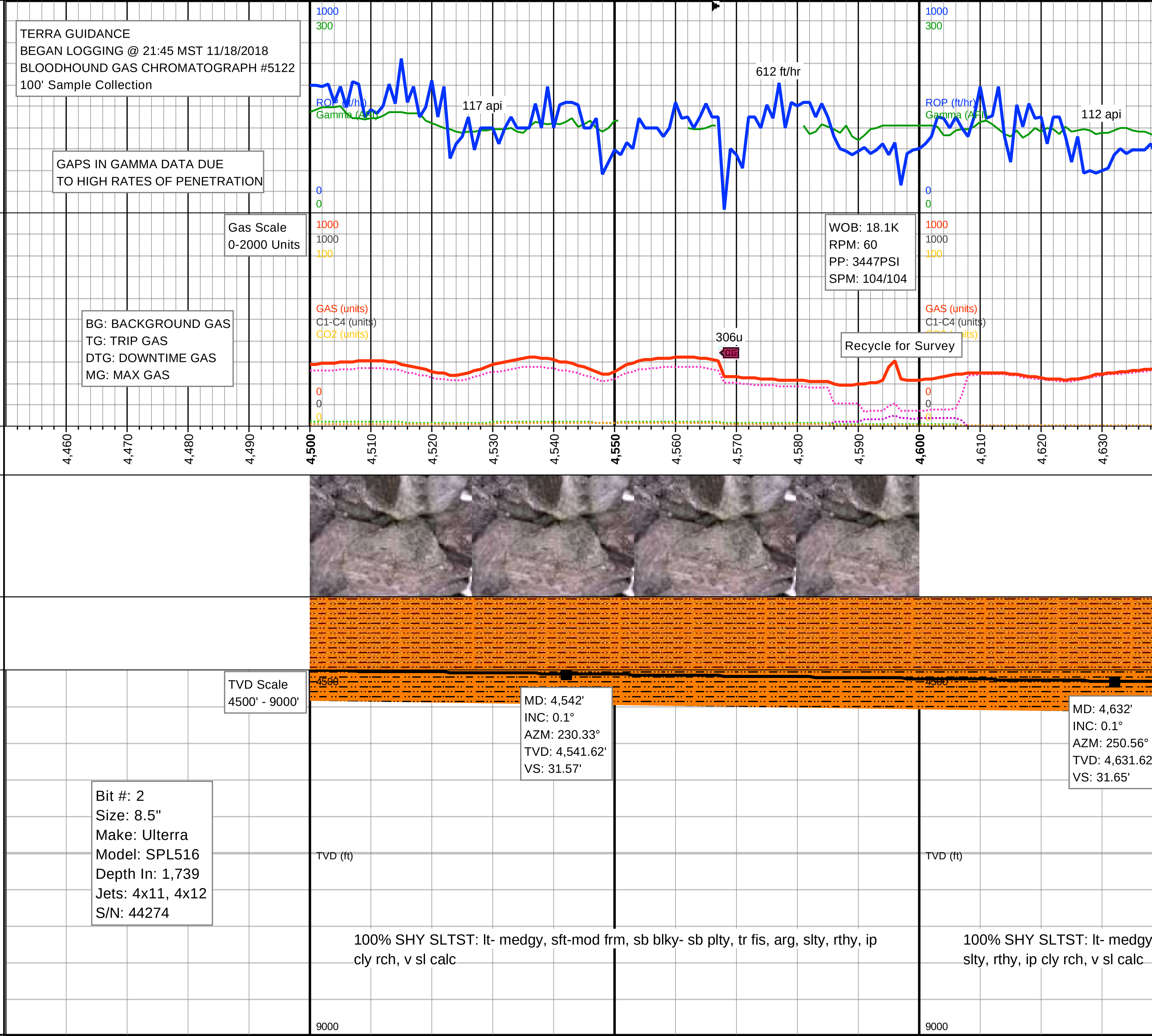
Total Gas & Chromatograph
GAS
C1
C2
C3
C4
CO2

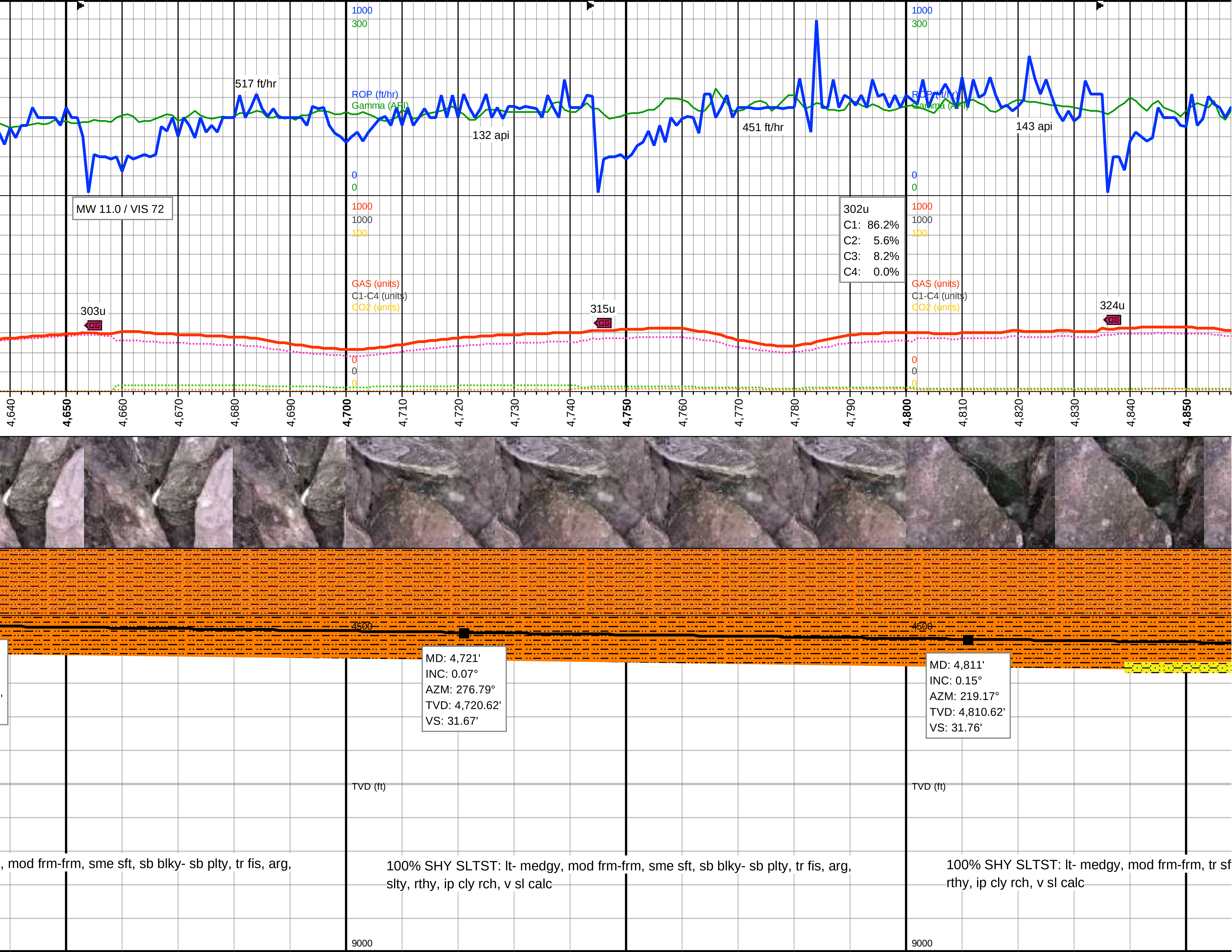
Depth

Images

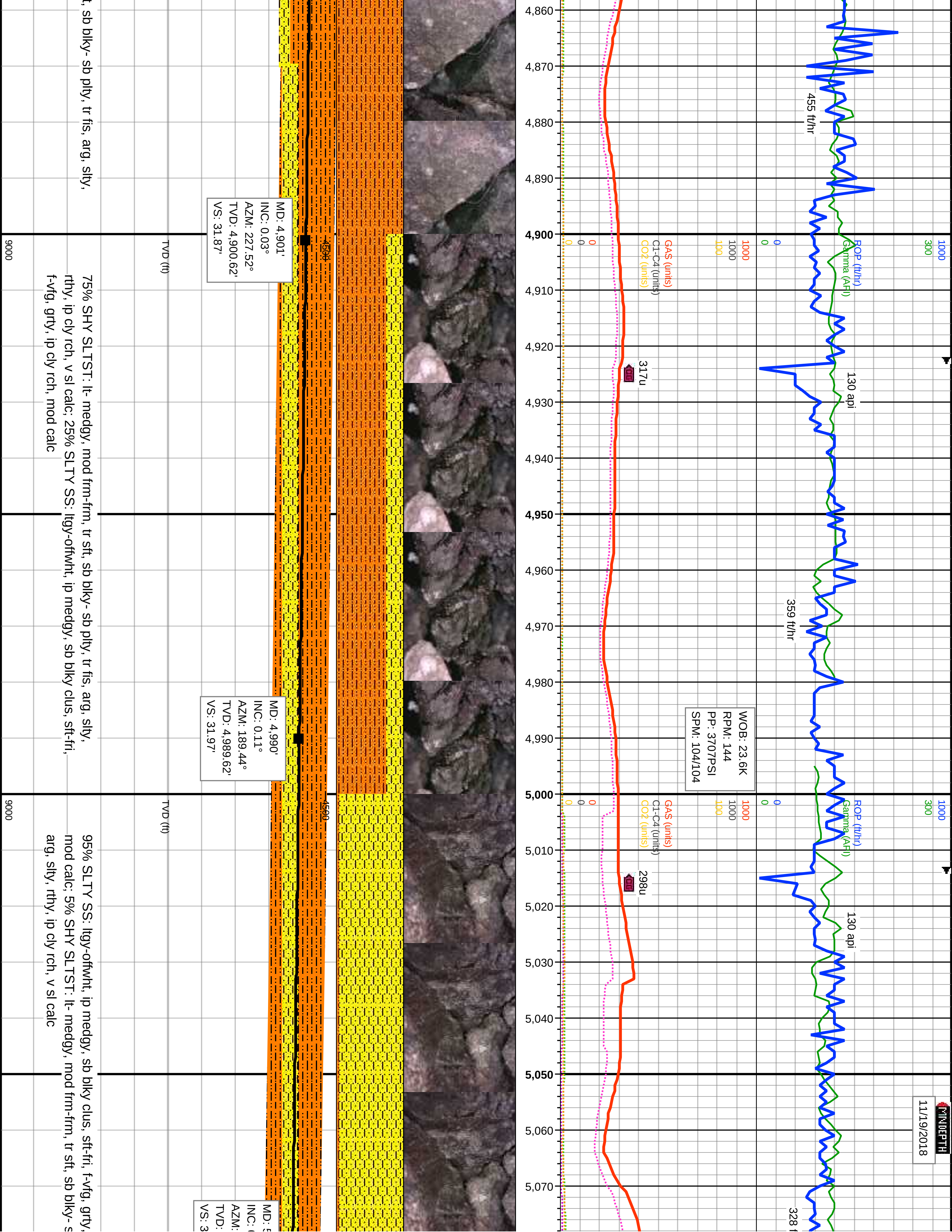
% Lithology

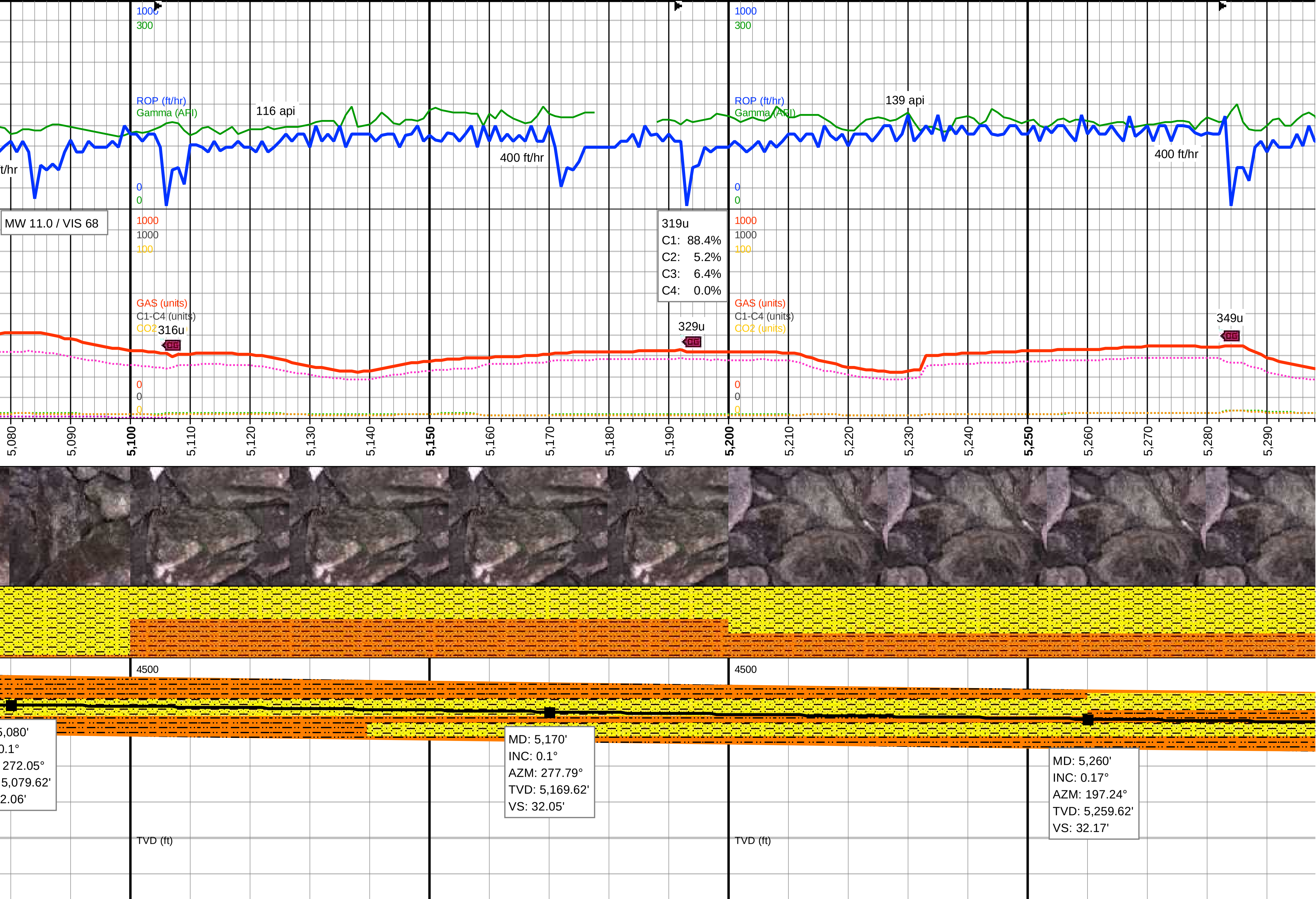
Well Bore
TVD





1000
300
ROP (ft/hr)
Gamma (API)
0
0
517 ft/hr
132 api
451 ft/hr
143 api
MW 11.0 / VIS 72
1000
1000
100
GAS (units)
C1-C4 (units)
CO2 (units)
0
0
0
303u
315u
324u
302u
C1: 86.2%
C2: 5.6%
C3: 8.2%
C4: 0.0%
4,640
4,650
4,660
4,670
4,680
4,690
4,700
4,710
4,720
4,730
4,740
4,750
4,760
4,770
4,780
4,790
4,800
4,810
4,820
4,830
4,840
4,850
4500
MD: 4,721'
INC: 0.07°
AZM: 276.79°
TVD: 4,720.62'
VS: 31.67'
MD: 4,811'
INC: 0.15°
AZM: 219.17°
TVD: 4,810.62'
VS: 31.76'
TVD (ft)
9000
, mod frm-frm, sme sft, sb blky- sb plty, tr fis, arg,
100% SHY SLTST: lt- medgy, mod frm-frm, sme sft, sb blky- sb plty, tr fis, arg, slty, rthy, ip cly rch, v sl calc
100% SHY SLTST: lt- medgy, mod frm-frm, tr sf rthy, ip cly rch, v sl calc

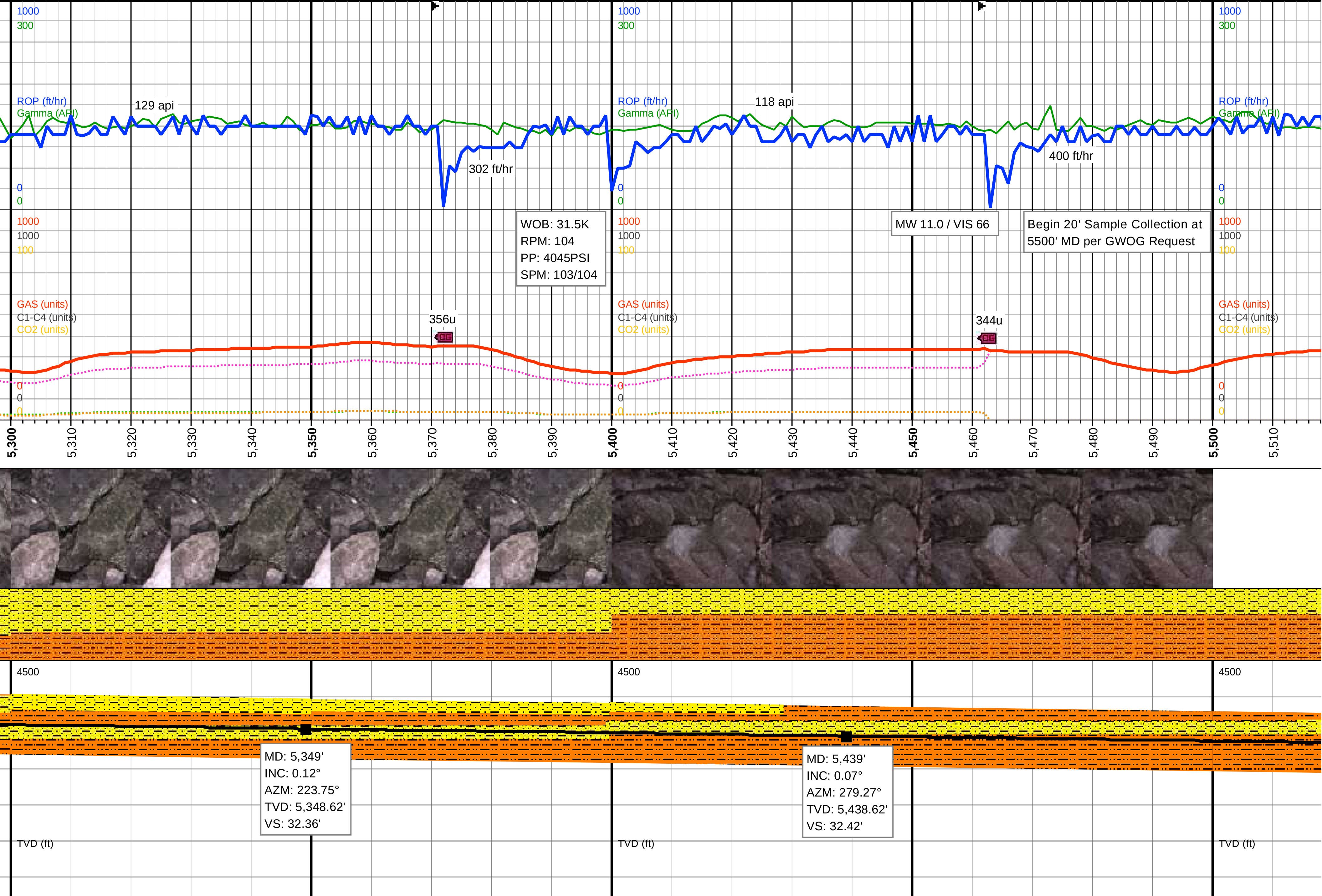

...t, sb blky- sb plty, tr fis, arg, slty,
75% SHY SLTST: lt- medgy, mod frm-frm, tr sft, sb blky- sb plty, tr fis, arg, slty,
rthy, ip cly rch, v sl calc; 25% SLTY SS: ltgy-offwht, ip medgy, sb blky clus, sft-fri,
f-vfg, grty, ip cly rch, mod calc
95% SLTY SS: ltgy-offwht, ip medgy, sb blky clus, sft-fri, f-vfg, grty,
mod calc; 5% SHY SLTST: lt- medgy, mod frm-frm, tr sft, sb blky- s
arg, slty, rthy, ip cly rch, v sl calc
9000
TVD (ft)
4500
MD: 4,901'
INC: 0.03°
AZM: 227.52°
TVD: 4,900.62'
VS: 31.87'
MD: 4,990'
INC: 0.11°
AZM: 189.44°
TVD: 4,989.62'
VS: 31.97'
4,860
4,870
4,880
4,890
4,900
4,910
4,920
4,930
4,940
4,950
4,960
4,970
4,980
4,990
5,000
5,010
5,020
5,030
5,040
5,050
5,060
5,070
GAS (units) 0 1000
C1-C4 (units) 0 1000
CO2 (units) 0 100
ROP (ft/hr) 0 300 1000
Gamma (API) 0
317u
298u
455 ft/hr
359 ft/hr
130 api
WOB: 23.6K
RPM: 144
PP: 3707PSI
SPM: 104/104
11/19/2018



ip cly rch,
sb plty, tr fis,

55% SHY SLTST: lt- medgy, mod frm-hrd, sb blky- sb plty, tr fis, arg, slty, rthy, ip cly rch, v sl calc; 45% SLTY SS: ltgy-offwht, ip medgy, sb blky clus, sft-fri, f-vfg, grty, ip cly rch, mod calc;

65% SLTY SS: ltgy-offwht, ip medgy, sb blky clus, sft-fri, f-vfg, grty, ip cly rch, mod calc; 35% SHY SLTST: lt- medgy, mod frm-frm, tr sft, sb blky- sb plty, tr fis, arg, slty, rthy, ip cly rch, v sl calc

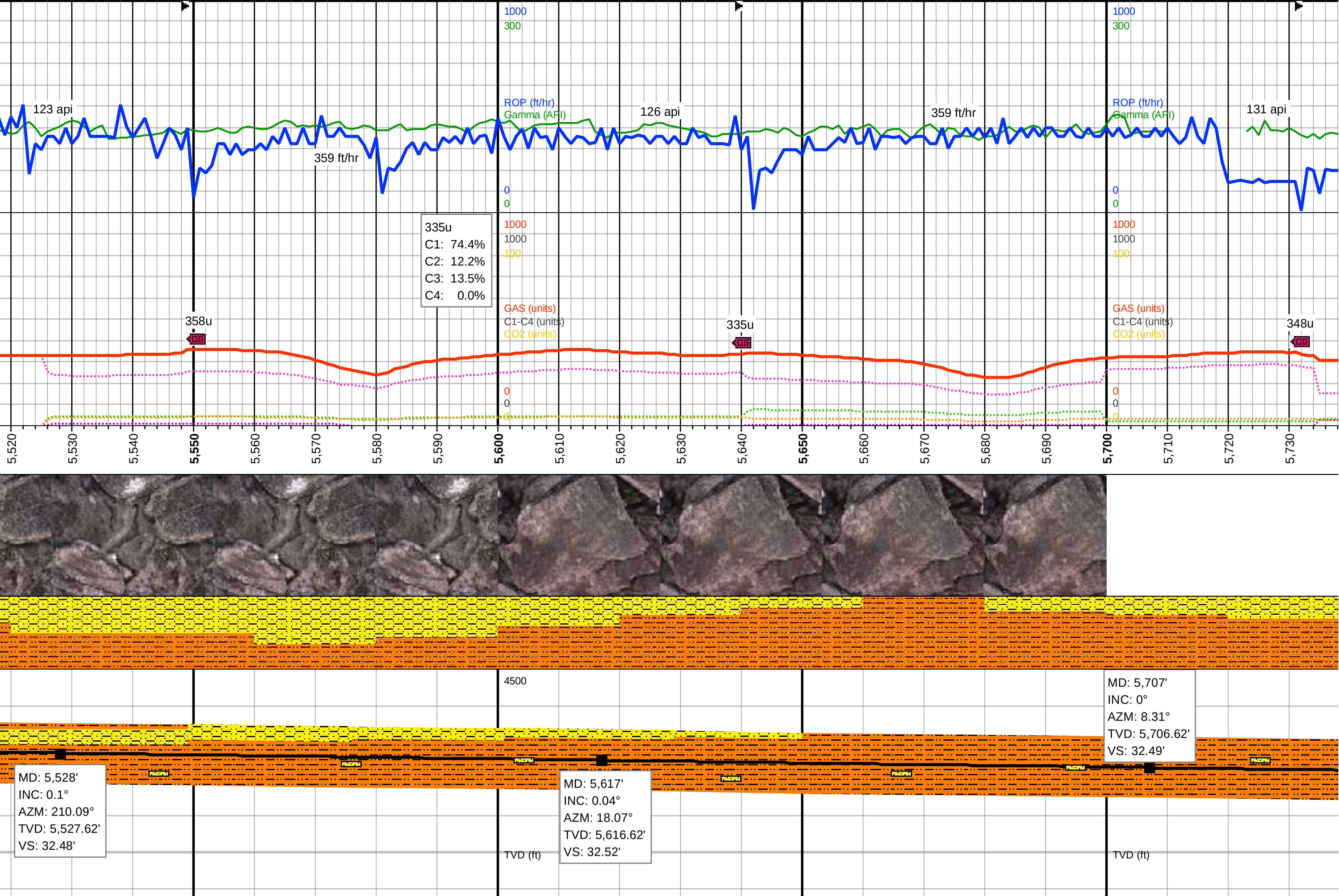


60% SLTY SS: ltgy-offwht, ip medgy, sb blky clus, sft-fri, f-vfg, grty, ip cly rch, mod calc; 40% SHY SLTST: lt- medgy, mod frm-frm, tr sft, sb blky- sb plty, tr fis, arg, slty, rthy, ip cly rch, v sl calc

65% SHY/AREN SLTST: lt-medgy, mod frm-hrd, sb blky-sb plty, ip ang, tr fis, arg, slty, rthy, ip cly rch, v sl calc; 35% SLTY SS: lt-medgy, sme wh-s&p, sb blky clus, sft-fri, occ frm, f-vfg, grty, ip cly rch, sl calc

65-50% SHY/AR
brn, mod frm-hc
fis, arg, slty, rthy
35-50% SLTY S
sb blky clus, sft-
rch, sl calc

9000



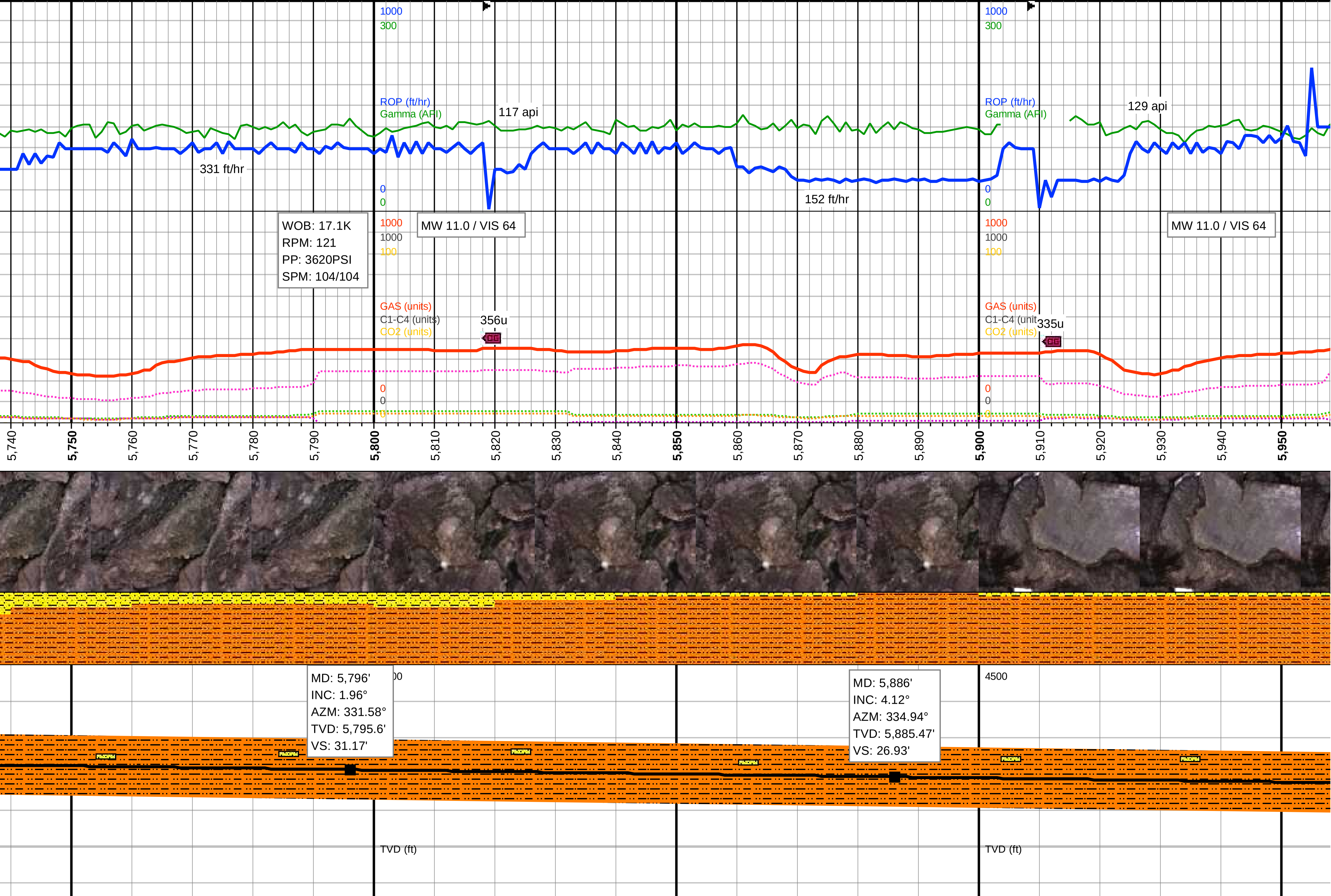
...REN SLTST: lt-medgy, sme ...l, sb blky-sb plty, ip ang, tr ...y, ip cly rch, v sl calc; ...SS: lt-medgy, sme wh-s&p, ...-fri, occ frm, vfg, grty, ip cly

50-65-55% SLTY SS: lt-medgy, sme wh-s&p, sb blky clus, sft-fri, occ frm, vfg, grty, ip cly rch, sl calc; 50-35-45% SHY/AREN SLTST: lt-medgy, sme brn, mod frm-hd, sb blky-sb plty, ip ang, tr fis, arg, slty, rthy, ip cly rch, v sl calc

60-75% SHY SLTST: lt-medgy, sme brn, mod frm-hd, sb blky-sb plty, ip ang, tr fis, arg, slty-ip aren, rthy, ip cly rch, v sl calc; 40-25% SLTY SS: lt-medgy, sme wh-s&p, sb blky clus, sft-fri, occ frm, vfg, grty, ip cly rch, sl calc

85-100-80% SHY SLTST: lt-medgy, sme brn, mod frm-hd, sb blky-sb plty, ip ang, tr fis, arg, slty-ip aren, rthy, ip cly rch, v sl calc; 15-0-20% SLTY SS: lt-medgy, sme wh-s&p, sb blky clus, sft-fri, occ frm, vfg, grty, ip cly rch, sl calc

75-70% SHY SLTST: lt-medgy, sm... drkgy-brn, mod frm-rr fri, sb blky-sb... ang, tr fis, arg, slty-ip aren, rthy, sl... mtx, tr calc; 25-30% SLTY SS: lt-m... sme wh-s&p, sb blky clus, sft-fri, oc... vfg, grty, ip cly rch, sl calc

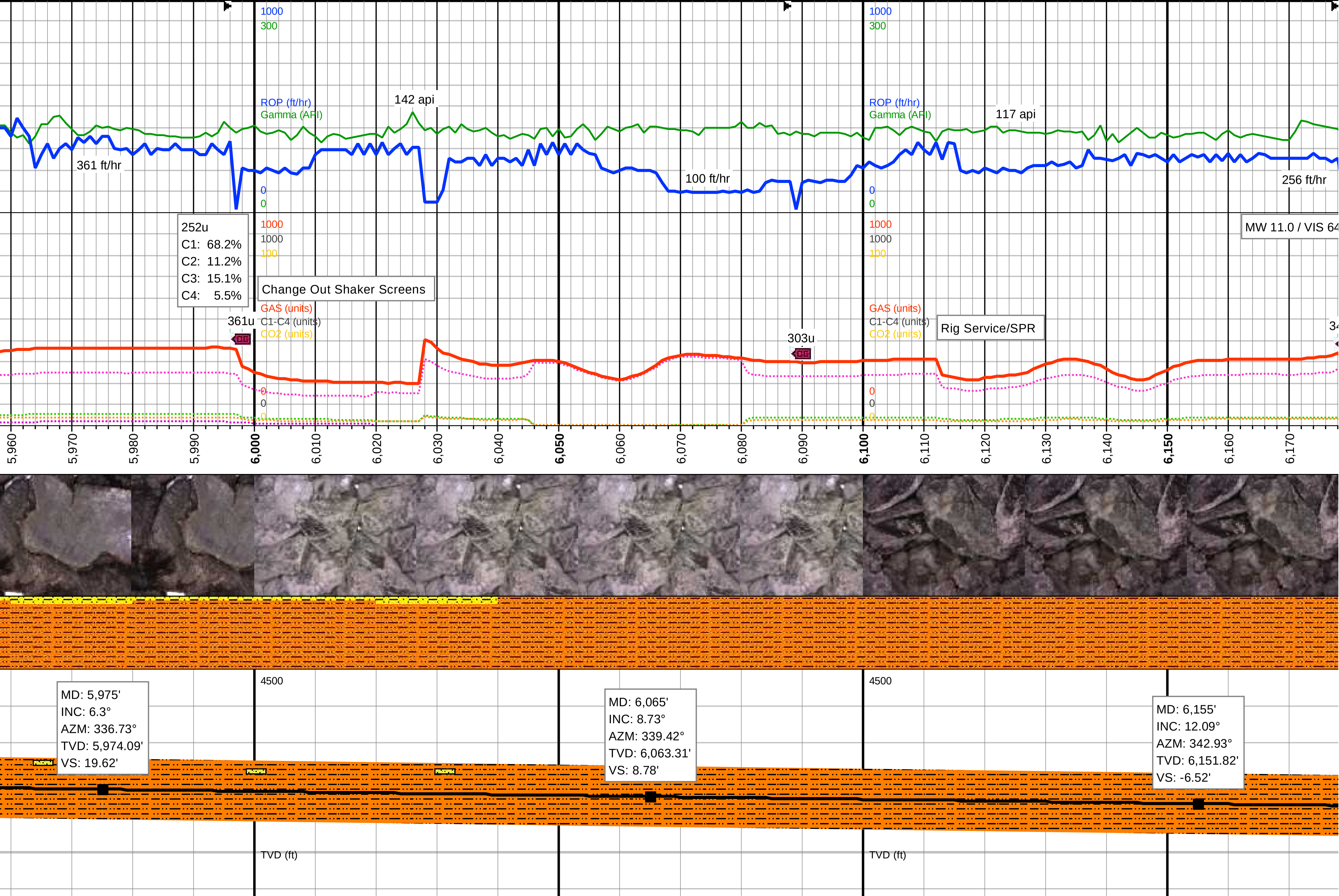


80-85-85% SHY SLTST: lt-medgy, sme drkgy-brn, mod frm-rr fri, sb blky-sb plty, ip ang, tr fis, arg, slty-ip aren, rthy, sl cly/lmy mtx, tr calc; 20-15-15% SLTY SS: lt-medgy, sme wh-s&p, sb blky clus, sft-fri, occ frm, vfg, ip grty, ip cly rch, sl calc

80-90% SHY SLTST: lt-medgy, sme drkgy-brn, mod frm-rr fri, sb blky-sb plty, ip ang, tr fis, arg, slty-ip aren, rthy, sl cly/lmy mtx, tr calc; 20-10% SLTY SS: lt-medgy, sme wh-s&p, sb blky clus, sft-fri, occ frm, vfg, ip grty, ip cly rch, sl calc

95-95-100% SHY SLTST: lt-medgy, sme drkgy-brn, vfg, mod sft-fri, occ frm, sb blky-sb plty, ip ang, tr fis, arg, slty-ip aren, rthy, sl cly-lmy rch mtx, non-tr calc; 5-5-0% SLTY SS: lt-medgy, sme wh-s&p, sb blky clus, sft-fri, occ frm, vfg, ip grty, sl-non calc

95-95% SHY SLTST: med-drkgy, sme ltgy, ip brn, vfg, mod sft-fri, occ frm, sb blky-sb plty, ip ang, tr fis, arg, slty-ip aren, rthy-ip grty, sl cly-lmy rch mtx, sl calc; 5-5% SLTY SS: lt-medgy, rr wh, sb blky clus, sft-fri, occ frm, vfg, ip grty, sl-non calc



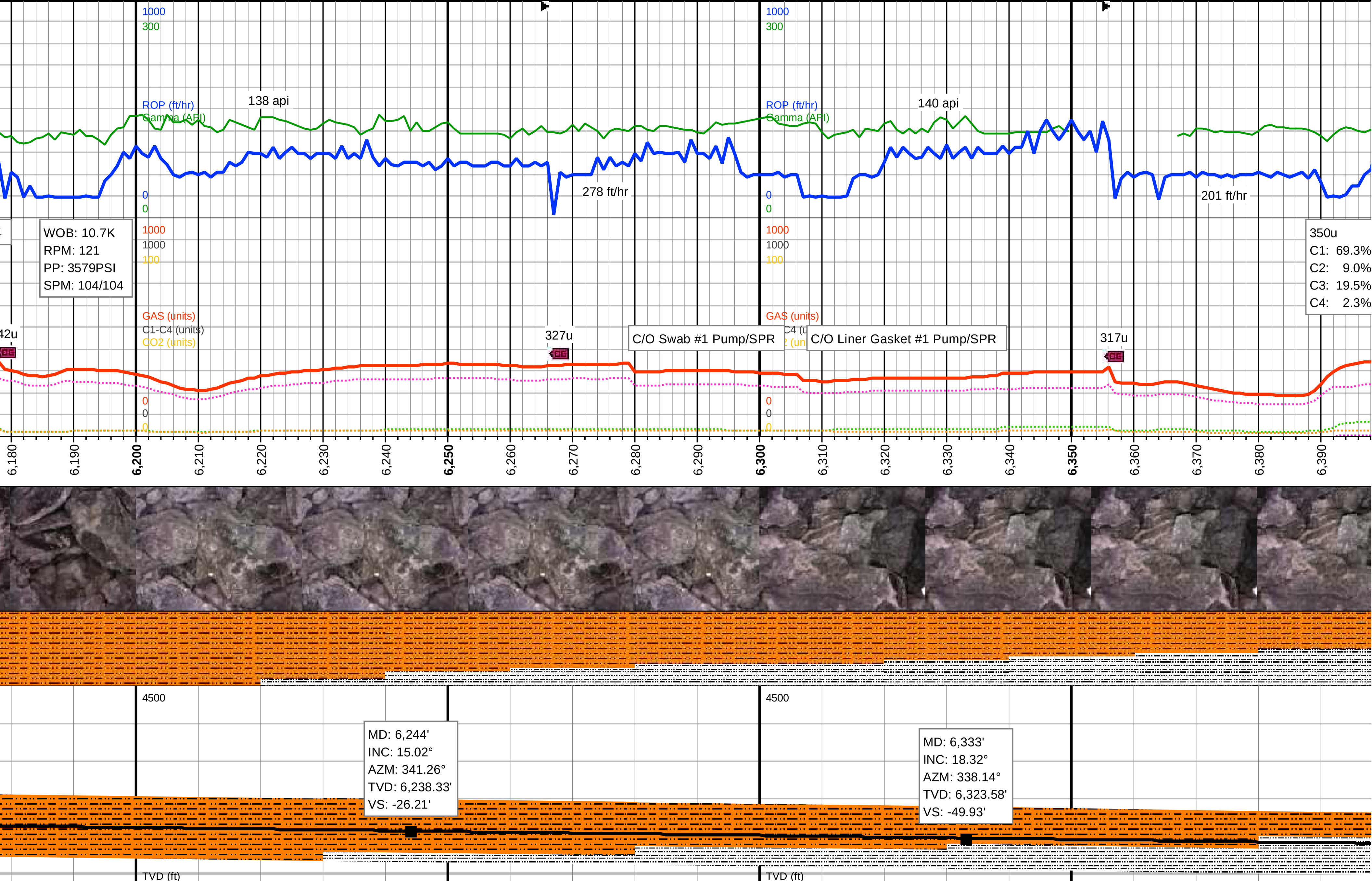
95% SHY SLTST: med-drkgy, sme shbn, ip brn, vfg, mod sft-fri, occ frm, -sb plty, ip ang, tr fis, arg, slty-ip aren, grty, sl cly-lmy rch mtx, sl calc; % SLTY SS: lt-medgy, rr wh, sb blky ft-fri, occ frm, vfg, ip grty, sl-non calc

95-90% SHY SLTST: med-drkgy, sme ltgy, ip brn, vfg, mod sft-fri, occ frm, sb blky-sb plty, ip ang, tr fis, arg, slty-ip aren, rthy-ip grty, sl cly-lmy rch mtx, sl calc; 5-10% SLTY SS: lt-medgy, rr wh, sb blky clus, sft-fri, occ frm, vfg, ip grty, sl-non calc

100% SHY SLTST: med-drkgy, sme ltgy, ip brn, vfg, mod sft-fri, occ frm, sb blky-sb plty, ip ang, tr fis, arg, slty-ip aren, rthy-ip grty, sl cly-lmy rch mtx, sl calc

100% SHY SLTST: med-drkgy, brn, rr ltgy, vfg, mod sft-frm, occ fri, sb blky-sb plty, ip ang, tr fis, arg, slty, rr aren, rthy-sme grty, sl cly rch, v sl calc

100% SHY SLTST: med-[cut off] ltgy, vfg, mod sft-frm, occ [cut off] ip ang, tr fis, arg, slty, rr a[cut off] sl cly/lmy calc mtx, tr LS [cut off]



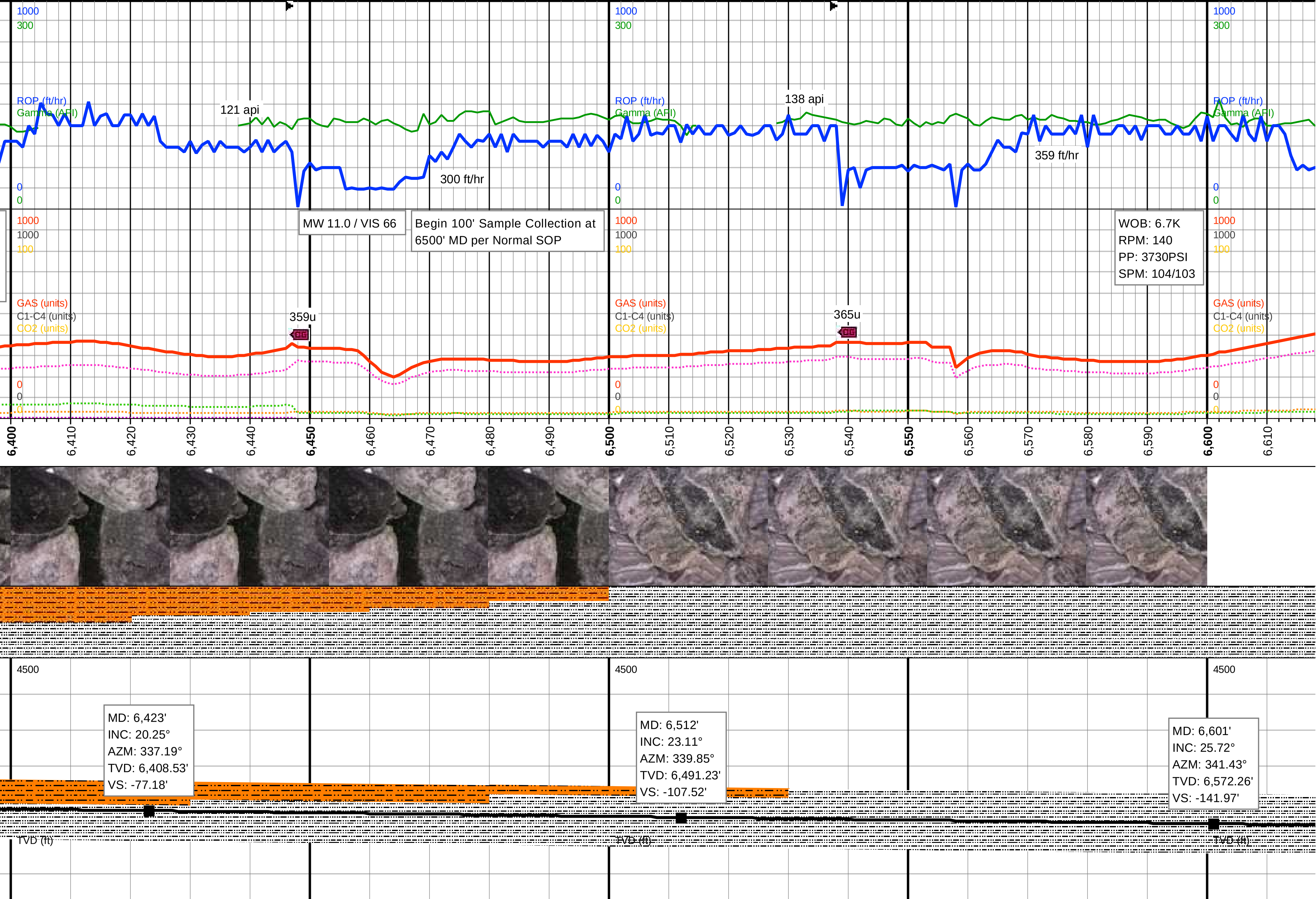
drkgy, brn-rr crm, rr fri, sb blky-sb plty, aren, rthy-sme grty, chnks

100-90% SHY SLTST: med-drkgy, tr ltgy, brn-rr crm, vfg, mod sft-frm, occ fri, sb blky-sb plty, ip ang, tr fis, arg, slty, rr aren, rthy-sme grty, sl cly/lmy calc mtx; 0-10% SLTY SH: med-drkgy, brn ip, mod sft-frm, sb blky-ang, tr fis, slty, arg, v sl calc

80-75-70% SHY SLTST: med-drkgy, tr ltgy, brn-rr crm, vfg, mod sft-frm, occ fri, sb blky-sb plty, ip ang, tr fis, arg, slty, rr aren, rthy-sme grty, sl cly/lmy calc mtx; 20-25-30% SLTY SH: med-drkgy, brn ip, mod sft-frm, sb blky-ang, tr fis, slty, arg, v sl calc

70-65% SHY SLTST: med-drkgy, tr ltgy, brn, vfg, mod sft-frm, occ fri, sb blky-sb plty, ip ang, tr fis, arg, slty, rthy, tr lmy/cly mtx, sl-tr calc; 30-35% SLTY SH: med-drkgy, brn, mod frm, occ sft, sb blky-ang, tr fis, slty, arg, v sl calc

60-55-50% SHY SLTST: med-drkgy, tr ltgy, brn, vfg, mod sft-frm, occ fri, sb blky-sb plty, ip ang, tr fis, arg, slty, rthy, tr lmy/cly mtx, sl-calc; 40-45-50% SLTY SH: med-drkgy, brn, mod frm, occ sft, sb blky-ang, tr fis, slty, arg, v sl calc



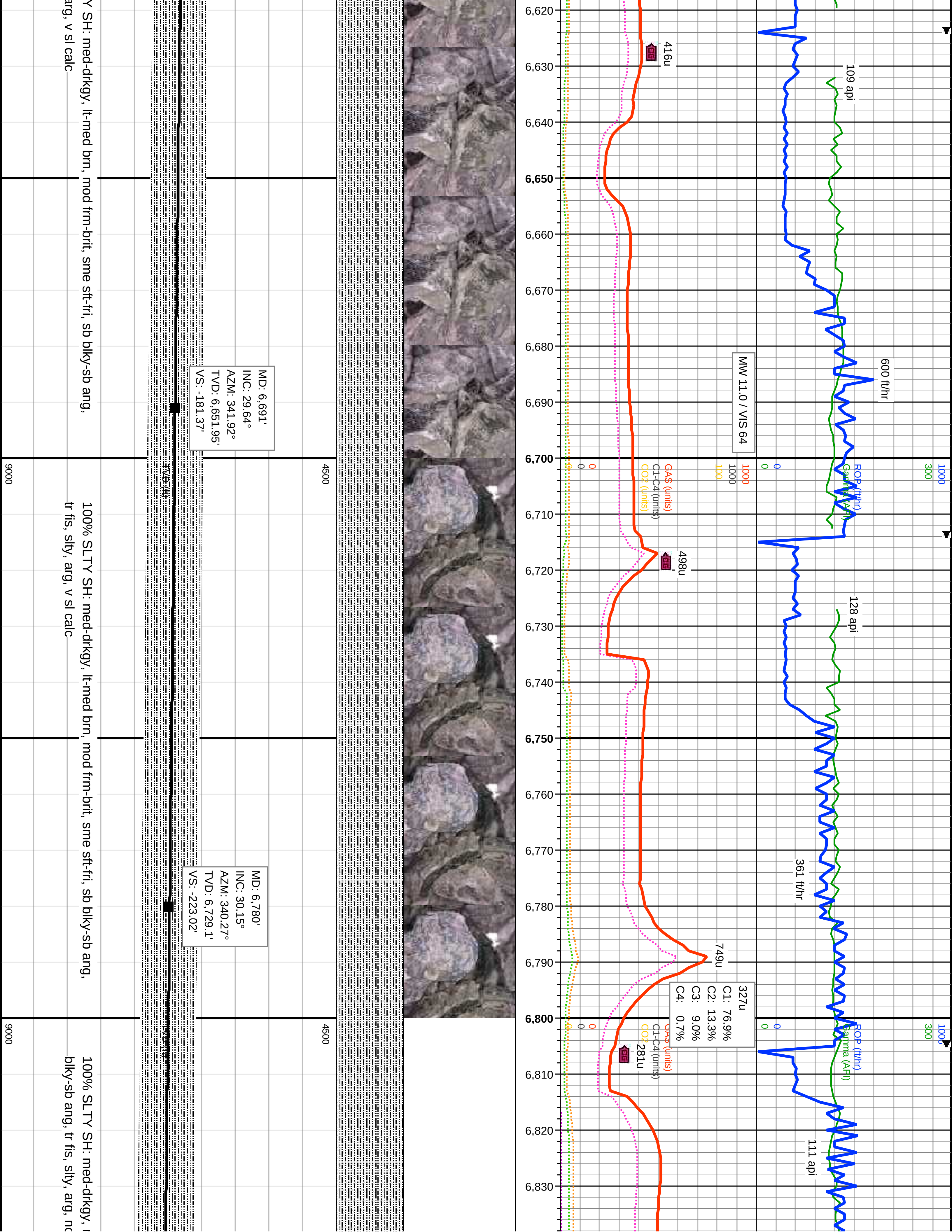
tr

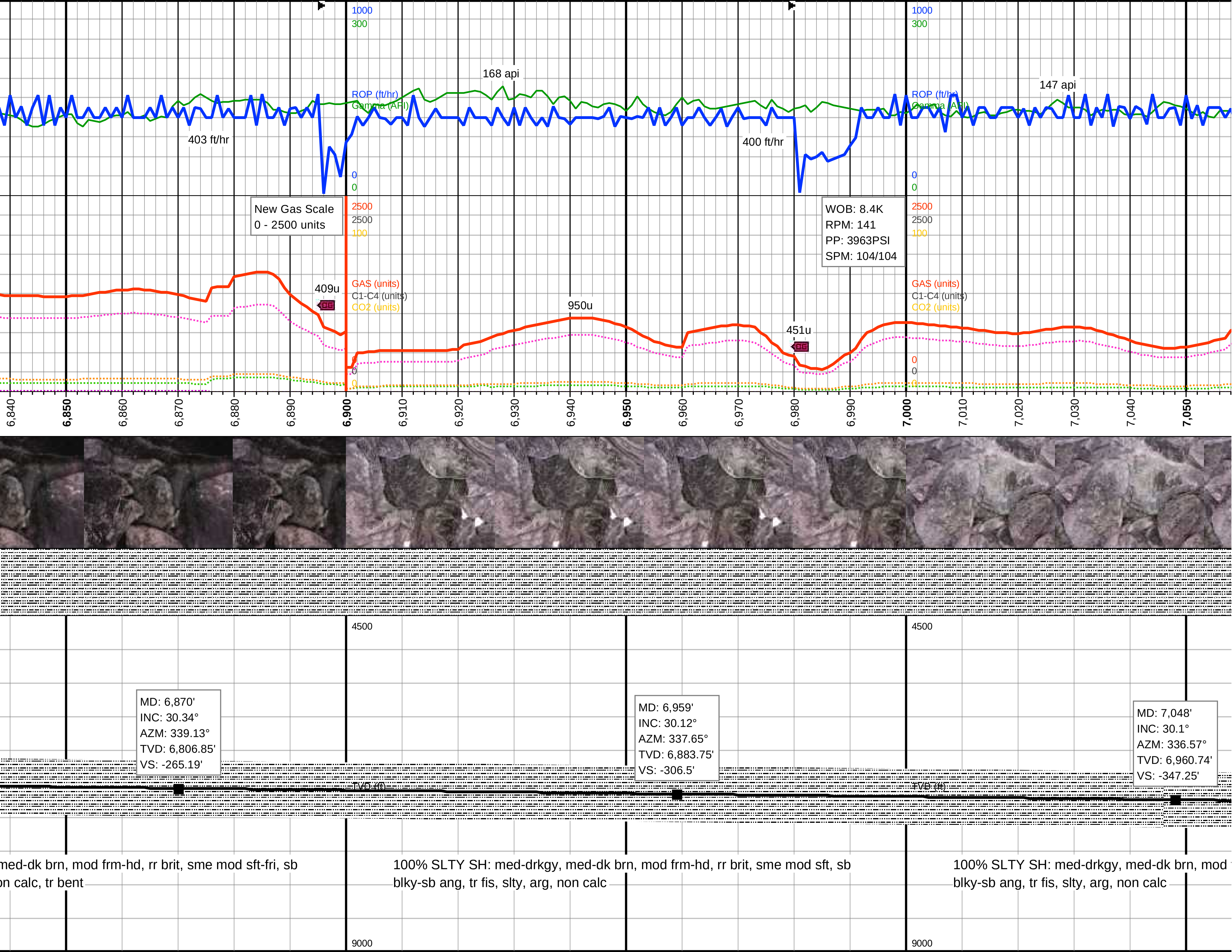
50-60% SLTY SH: med-drkgy, brn, mod frm, occ sft, sb blky-ang, tr fis, slty, arg, v sl calc; 50-40% SHY SLTST: med-drkgy, tr ltgy, brn, vfg, mod sft-frm, occ fri, sb blky-sb plty, ip ang, tr fis, arg, slty, rthy, tr lmy/cly mtx, sl calc

65-70-80% SLTY SH: med-drkgy, lt-med brn, mod sft-fri, occ frm, sb blky-ang, tr fis, slty, arg, sl calc; 35-30-20% SHY SLTST: lt-medgy, sft-ip frm, sb blky-sb plty, tr fis, arg, slty, rthy, ip cly rch, v sl calc

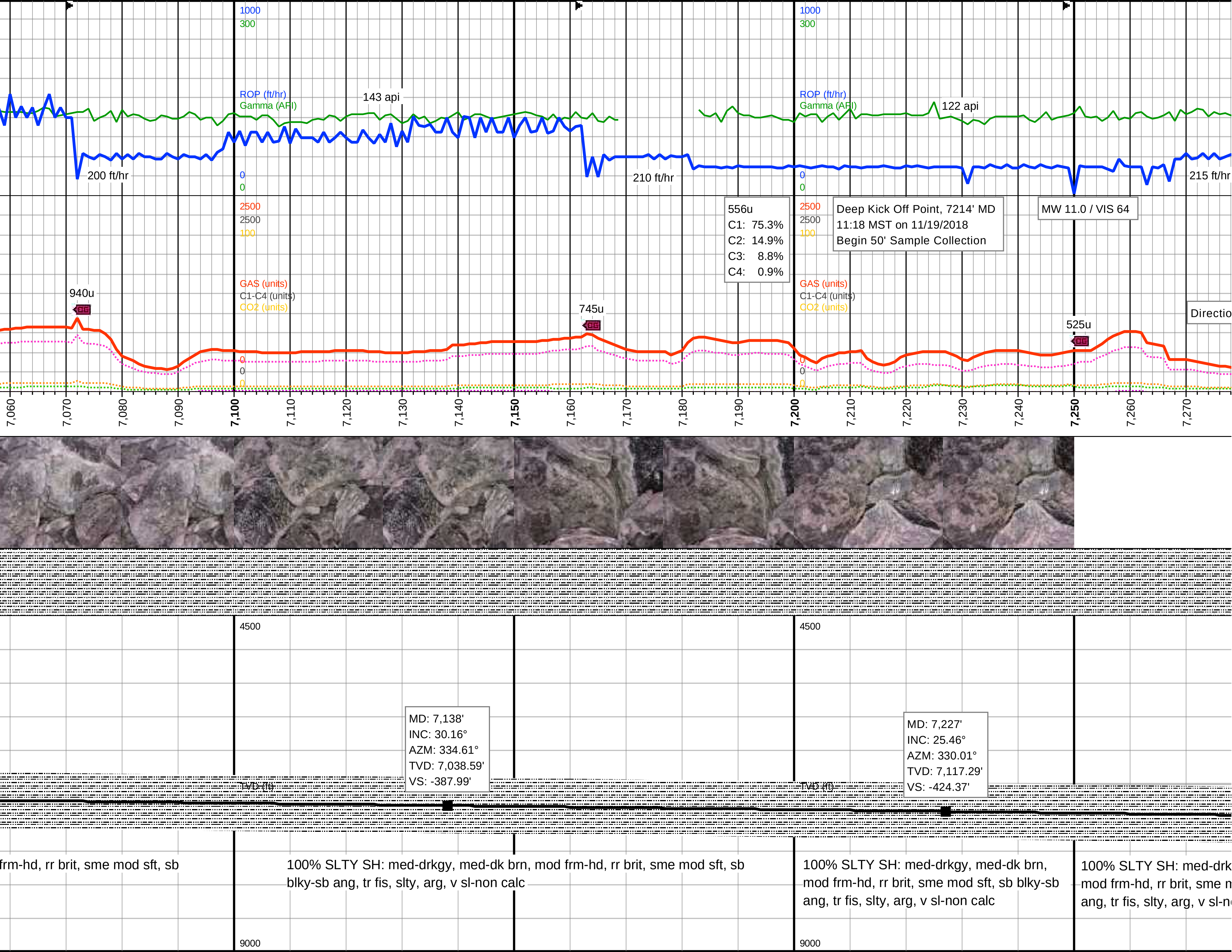
100% SLTY SH: med-drkgy, lt-med brn, mod frm-brit, sme sft-fri, sb blky-sb ang, tr fis, slty, arg, sl calc

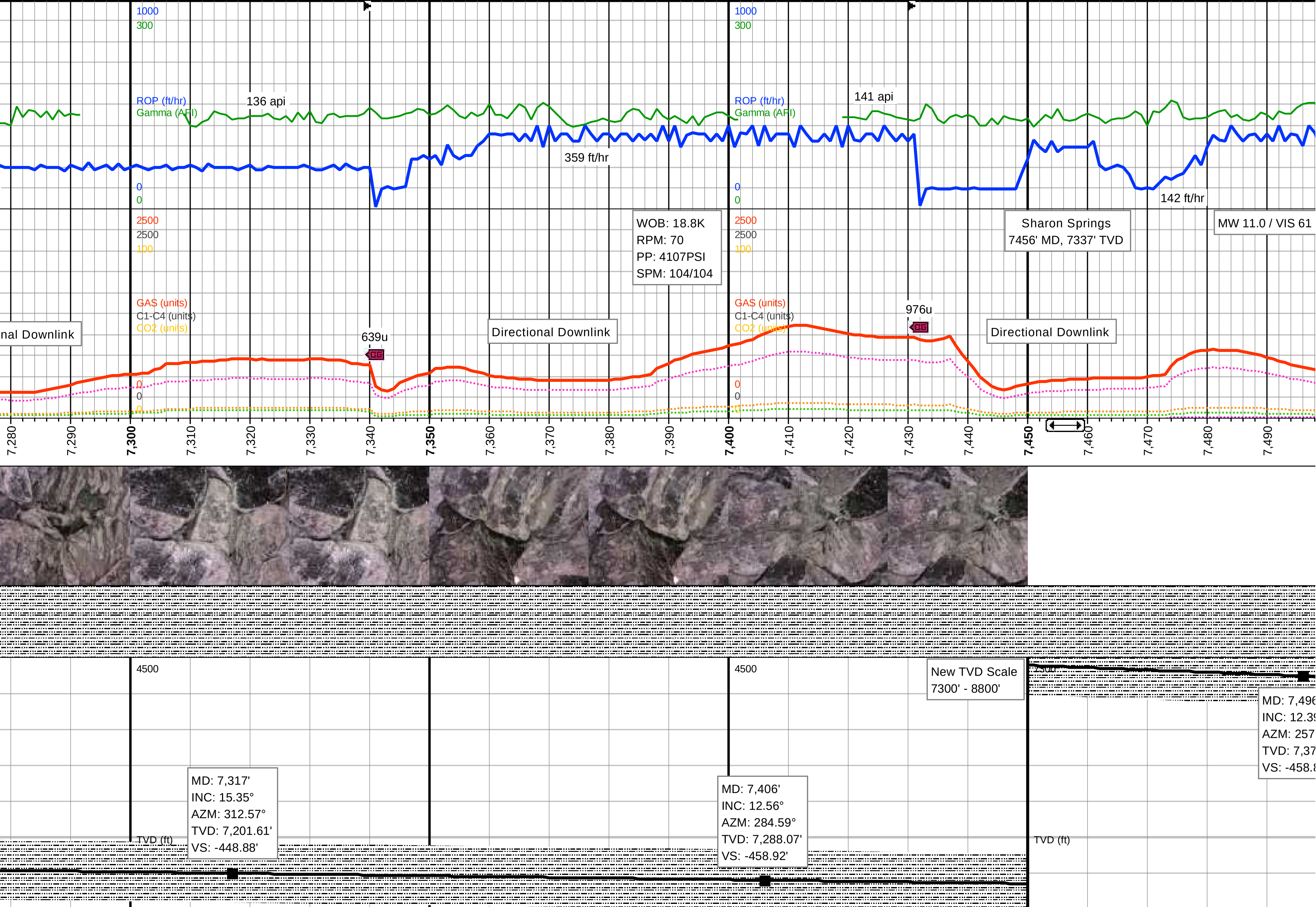
100% SLT
tr fis, slty, a


Y SH: med-drkgy, lt-med brn, mod frm-brit, sme sft-fri, sb blky-sb ang,
arg, v sl calc
100% SLTY SH: med-drkgy, lt-med brn, mod frm-brit, sme sft-fri, sb blky-sb ang,
tr fis, slty, arg, v sl calc
100% SLTY SH: med-drkgy,
blky-sb ang, tr fis, slty, arg, nc
MD: 6,691'
INC: 29.64°
AZM: 341.92°
TVD: 6,651.95'
VS: -181.37'
MD: 6,780'
INC: 30.15°
AZM: 340.27°
TVD: 6,729.1'
VS: -223.02'
9000
4500
TVD (ft)
6,620
6,630
6,640
6,650
6,660
6,670
6,680
6,690
6,700
6,710
6,720
6,730
6,740
6,750
6,760
6,770
6,780
6,790
6,800
6,810
6,820
6,830
416u
498u
749u
281u
327u
C1: 76.9%
C2: 13.3%
C3: 9.0%
C4: 0.7%
109 api
128 api
111 api
600 ft/hr
361 ft/hr
MW 11.0 / VIS 64
GAS (units)
C1-C4 (units)
CO2 (units)
ROP (ft/hr)
Gamma (API)
0
1000
100
300



1000
300
ROP (ft/hr)
Gamma (API)
0
0
403 ft/hr
168 api
400 ft/hr
147 api
New Gas Scale
0 - 2500 units
WOB: 8.4K
RPM: 141
PP: 3963PSI
SPM: 104/104
2500
2500
100
GAS (units)
C1-C4 (units)
CO2 (units)
409u
950u
451u
6,840
6,850
6,860
6,870
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
4500
9000
TVD (ft)
MD: 6,870'
INC: 30.34°
AZM: 339.13°
TVD: 6,806.85'
VS: -265.19'
MD: 6,959'
INC: 30.12°
AZM: 337.65°
TVD: 6,883.75'
VS: -306.5'
MD: 7,048'
INC: 30.1°
AZM: 336.57°
TVD: 6,960.74'
VS: -347.25'
med-dk brn, mod frm-hd, rr brit, sme mod sft-fri, sb
on calc, tr bent
100% SLTY SH: med-drkgy, med-dk brn, mod frm-hd, rr brit, sme mod sft, sb
blky-sb ang, tr fis, slty, arg, non calc
100% SLTY SH: med-drkgy, med-dk brn, mod
blky-sb ang, tr fis, slty, arg, non calc


ROP (ft/hr)
Gamma (API)
1000
300
0
0
143 api
122 api
200 ft/hr
210 ft/hr
215 ft/hr
GAS (units)
C1-C4 (units)
CO2 (units)
2500
2500
100
940u
745u
525u
556u
C1: 75.3%
C2: 14.9%
C3: 8.8%
C4: 0.9%
Deep Kick Off Point, 7214' MD
11:18 MST on 11/19/2018
Begin 50' Sample Collection
MW 11.0 / VIS 64
Directio
7,060
7,070
7,080
7,090
7,100
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
4500
9000
TVD (ft)
MD: 7,138'
INC: 30.16°
AZM: 334.61°
TVD: 7,038.59'
VS: -387.99'
MD: 7,227'
INC: 25.46°
AZM: 330.01°
TVD: 7,117.29'
VS: -424.37'
frm-hd, rr brit, sme mod sft, sb
100% SLTY SH: med-drkgy, med-dk brn, mod frm-hd, rr brit, sme mod sft, sb blky-sb ang, tr fis, slty, arg, v sl-non calc
100% SLTY SH: med-drkgy, med-dk brn, mod frm-hd, rr brit, sme mod sft, sb blky-sb ang, tr fis, slty, arg, v sl-non calc
100% SLTY SH: med-drk
mod frm-hd, rr brit, sme m
ang, tr fis, slty, arg, v sl-n



gy, med-dk brn, mod sft, sb blky-sb on calc

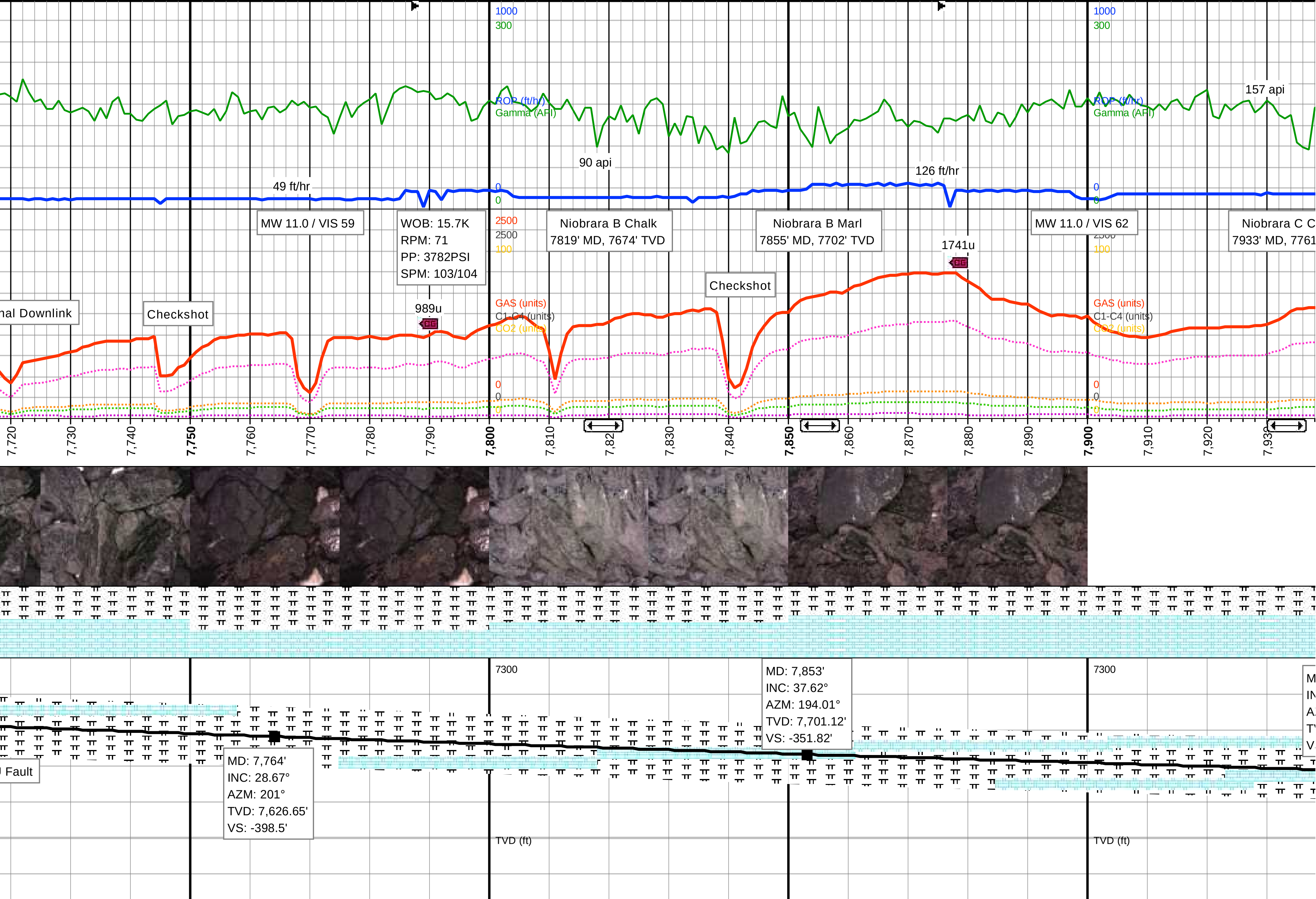
100% SLTY SH: med-drkgy, med-dk brn, sft-mod frm, fri, sb blky-sb ang, tr fis, slty, arg, v sl-non calc

100% SLTY SH: med-drkgy, med-dk brn, mod frm-hd, ip fri, sb blky-sb ang, tr fis, slty, arg, v sl-non calc

100% SLTY SH: med-drkgy, med-dk brn, mod frm, ip fri, sb blky-ang, rr fis, slty, arg, v sl calc

100% SLTY SH: med-drkgy, med-dk brn, mod sft, ip fri, sb blky-ang, tr fis, slty, arg, v sl calc

1000
300
ROP (ft/hr)
Gamma (API)
0
0
162 api
96 ft/hr
130 api
252u
50 ft/hr
183 api
84 api
2500
2500
100
GAS (units)
C1-C4 (units)
CO2 (units)
Gas Buster Online: 7525' MD
1310u
796u
C1: 66.9%
C2: 20.4%
C3: 11.7%
C4: 1.1%
MW 11.0 / VIS 59
999u
Checkshot
Directional Downlink
Niobrara
7654' MD, 7527' TVD
Niobrara A Chalk
7666' MD, 7538' TVD
Niobrara A Marl
7700' MD, 7569' TVD
1187u
7,500
7,510
7,520
7,530
7,540
7,550
7,560
7,570
7,580
7,590
7,600
7,610
7,620
7,630
7,640
7,650
7,660
7,670
7,680
7,690
7,700
7,710
7300
MD: 7,585'
INC: 17.55°
AZM: 245.23°
TVD: 7,461.99'
VS: -450.7'
7586' MD: 46' U/D Fault
MD: 7,675'
INC: 23.2°
AZM: 223.64°
TVD: 7,546.45'
VS: -431.64'
TVD (ft)
8800
100% SLTY SH: med-drkgy, med-dk brn, mod sft, ip fri, sb blky-ang, tr fis, slty, arg, v sl-non calc
100% SLTY SH: med-drkgy, med-dk brn, mod sft, ip fri, sme frm, sb blky-ang, tr fis, slty, arg, non calc
95% SLTY SH: med-drkgy, med-dk brn, mod sft, ip fri, sme frm, sb blky-ang, tr fis, slty, arg, non calc, rr bent; 5% MRLST: drkgy-dk brn, ip blk, mod frm-hd, sb blky-sb ang, rthy, slty, ip arg, calc
60% CHK: lt- med gy, mod sft, sb blky, sb wxy txt, v calc; 35% MRLST: med- dk gy, mod sft- frm, sb blky- ang, rthy, slty, arg, calc, tr bent; 5% SLTY SH: med- dk gy, brn ip, mod sft- frm ip, sb blky- ang, slty, arg, v sl calc
55% CHK: lt- med gy, mod sft, sb blky, sb wxy txt, v calc
mod sft- frm, sb
calc, tr bent



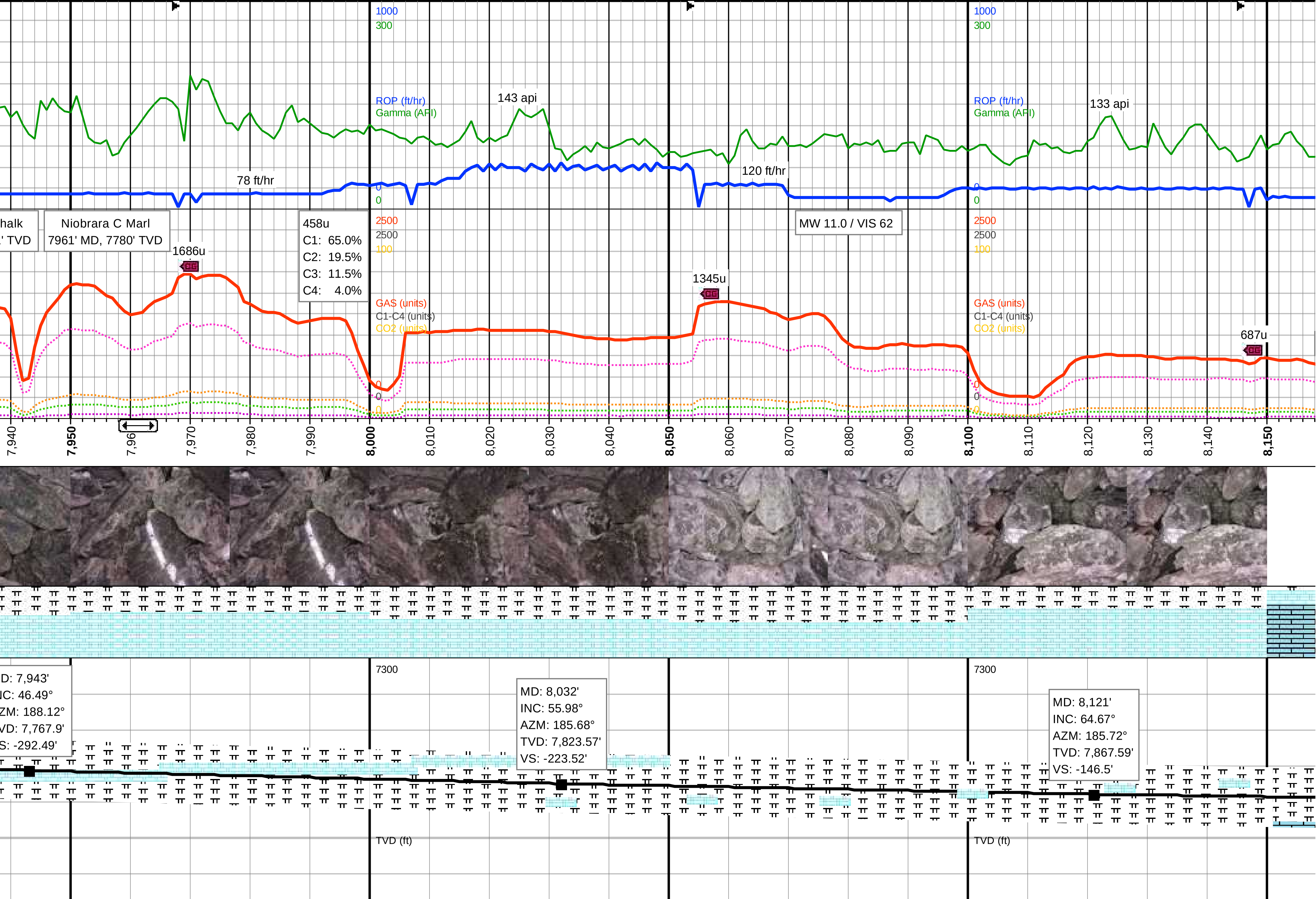
ed gy, mod sft, sb blky, sb ... 45% MRLST: med- dk gy, ... blky- ang, rthy, slty, arg,

60% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc; 40% CHK: gyshbn, lt-med gy, mod sft, sb blky, sb wxy txt, v calc

50% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc; 50% CHK: gyshbn, lt-med gy, ip crm, mod sft, sb blky, sb wxy txt, v calc

60% CHK: gyshbn, lt-med gy, ip crm, mod sft, sb blky, sb wxy txt, v calc; 40% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc

60% CHK: gyshbn, lt-med gy, ip cr... sft, sb blky, sb wxy txt, v calc; 40%... med-dk gy, mod sft- frm, sb blky-ar... slty, arg, calc



m, mod MRLST: ng, rthy,

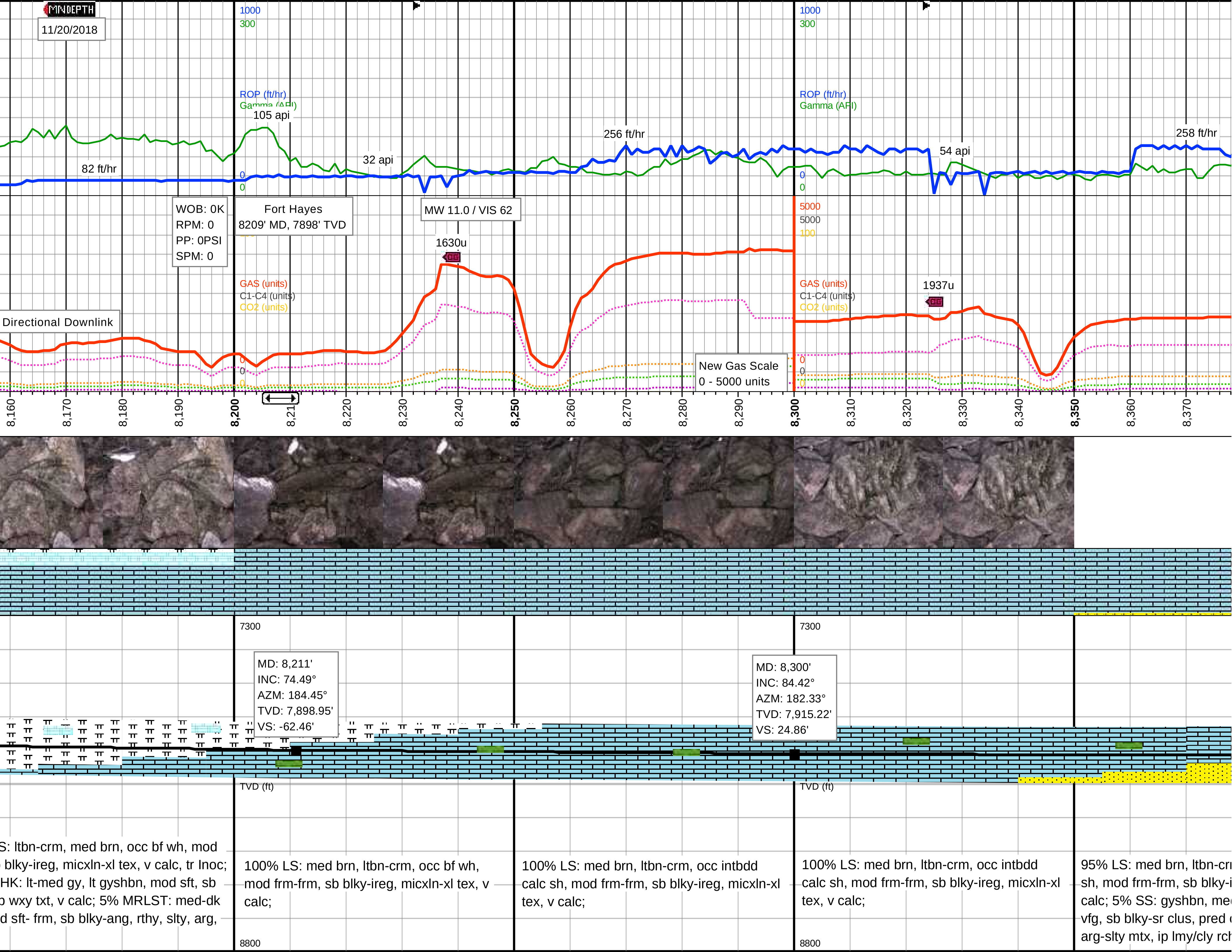
65% CHK: gyshbn, lt-med gy, ip crm, mod sft, sb blky, sb wxy txt, v calc, tr nod pyr; 35% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc

55% CHK: gyshbn, lt-med gy, ip crm, mod sft, sb blky, sb wxy txt, v calc; 45% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc

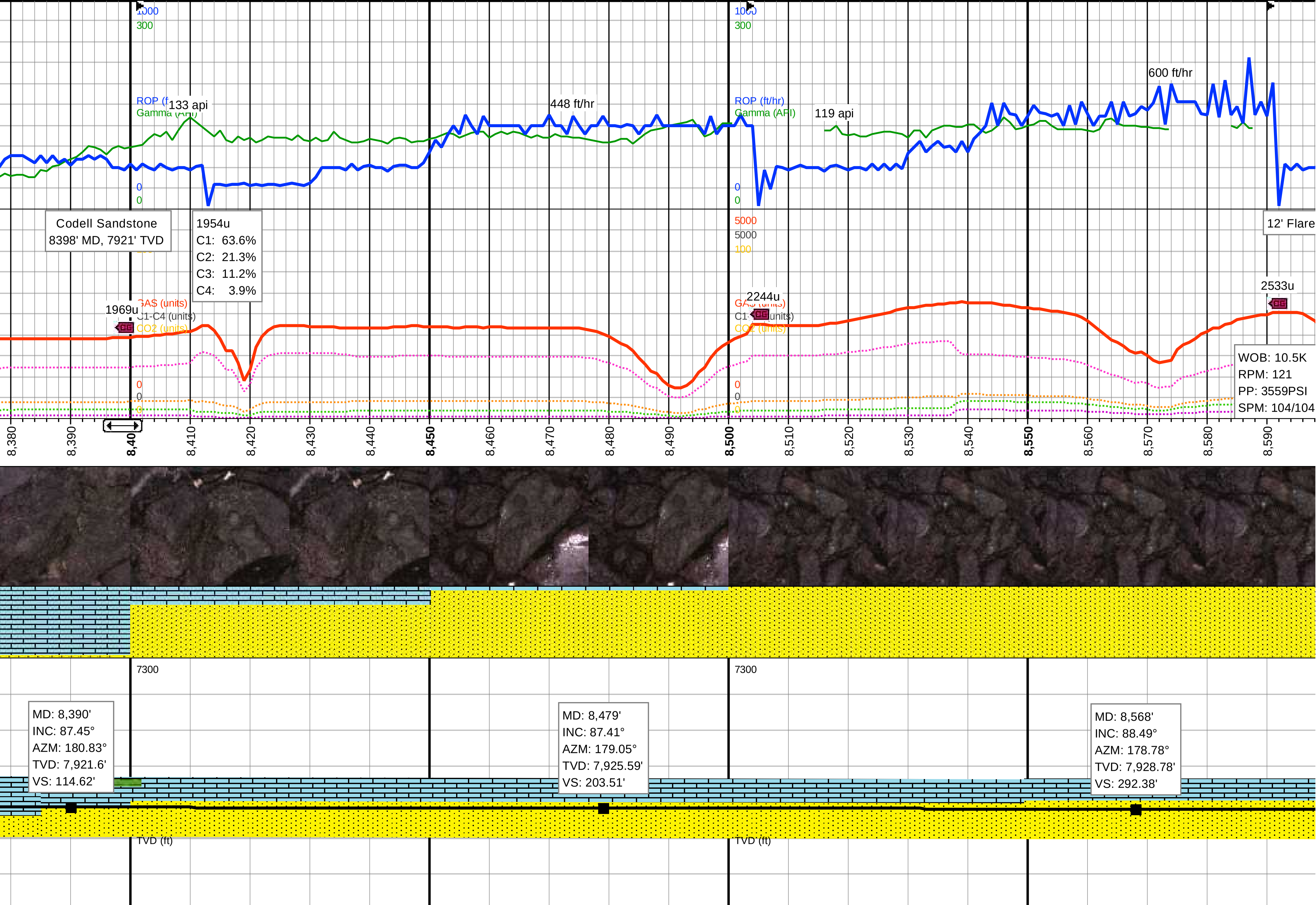
50% CHK: gyshbn, lt-med gy, mod sft, sb blky, sb wxy txt, v calc; 50% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc

70% CHK: lt-med gy, lt gyshbn, mod sft, sb blky, sb wxy txt, v calc; 30% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc

75% L frm, sb 20% C blky, sl gy, mo calc



MINDEPTH
11/20/2018
ROP (ft/hr)
Gamma (API)
1000
300
0
105 api
82 ft/hr
32 api
256 ft/hr
54 api
258 ft/hr
WOB: 0K
RPM: 0
PP: 0PSI
SPM: 0
Fort Hayes
8209' MD, 7898' TVD
MW 11.0 / VIS 62
1630u
1937u
GAS (units)
C1-C4 (units)
CO2 (units)
5000
100
Directional Downlink
New Gas Scale
0 - 5000 units
8,160
8,170
8,180
8,190
8,200
8,210
8,220
8,230
8,240
8,250
8,260
8,270
8,280
8,290
8,300
8,310
8,320
8,330
8,340
8,350
8,360
8,370
7300
TVD (ft)
8800
MD: 8,211'
INC: 74.49°
AZM: 184.45°
TVD: 7,898.95'
VS: -62.46'
MD: 8,300'
INC: 84.42°
AZM: 182.33°
TVD: 7,915.22'
VS: 24.86'
S: ltbn-crm, med brn, occ bf wh, mod
blky-ireg, micxln-xl tex, v calc, tr Inoc;
HK: lt-med gy, lt gyshbn, mod sft, sb
wxy txt, v calc; 5% MRLST: med-dk
d sft- frm, sb blky-ang, rthy, slty, arg,
100% LS: med brn, ltbn-crm, occ bf wh, mod frm-frm, sb blky-ireg, micxln-xl tex, v calc;
100% LS: med brn, ltbn-crm, occ intbdd calc sh, mod frm-frm, sb blky-ireg, micxln-xl tex, v calc;
100% LS: med brn, ltbn-crm, occ intbdd calc sh, mod frm-frm, sb blky-ireg, micxln-xl tex, v calc;
95% LS: med brn, ltbn-cr
sh, mod frm-frm, sb blky-
calc; 5% SS: gyshbn, me
vfg, sb blky-sr clus, pred
arg-slty mtx, ip lmy/cly rc



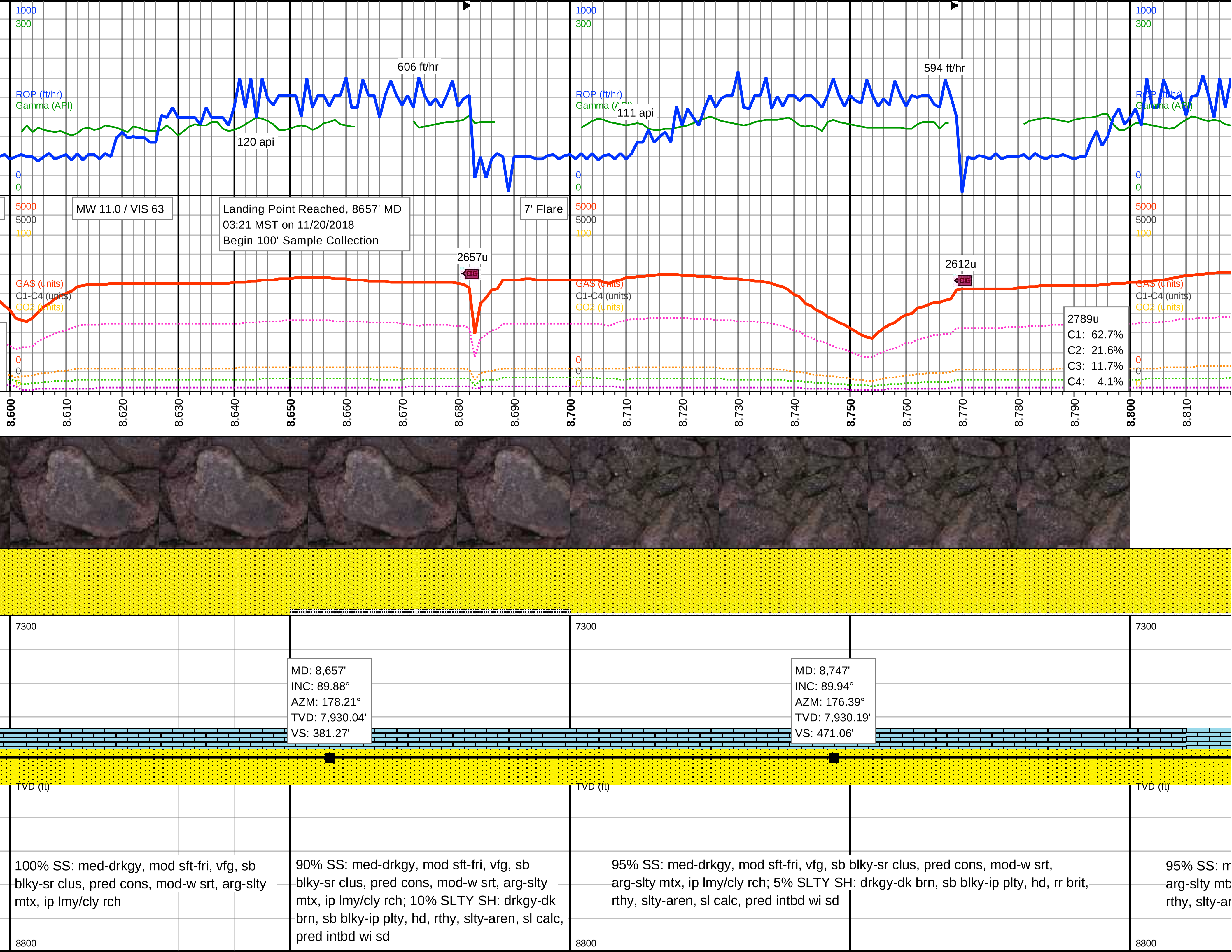
m, occ intbdd calc
reg, micxln-xl tex, v
d-drkgy, mod sft-fri,
cons, mod-w srt,
n;

75% SS: gyshbn, med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, arg-slty mtx, ip lmy/cly rch; 25% LS: med brn, ltbn-crm, occ intbdd calc sh, mod frm-frm, sb blky-ireg, micxln-xl tex, v calc;

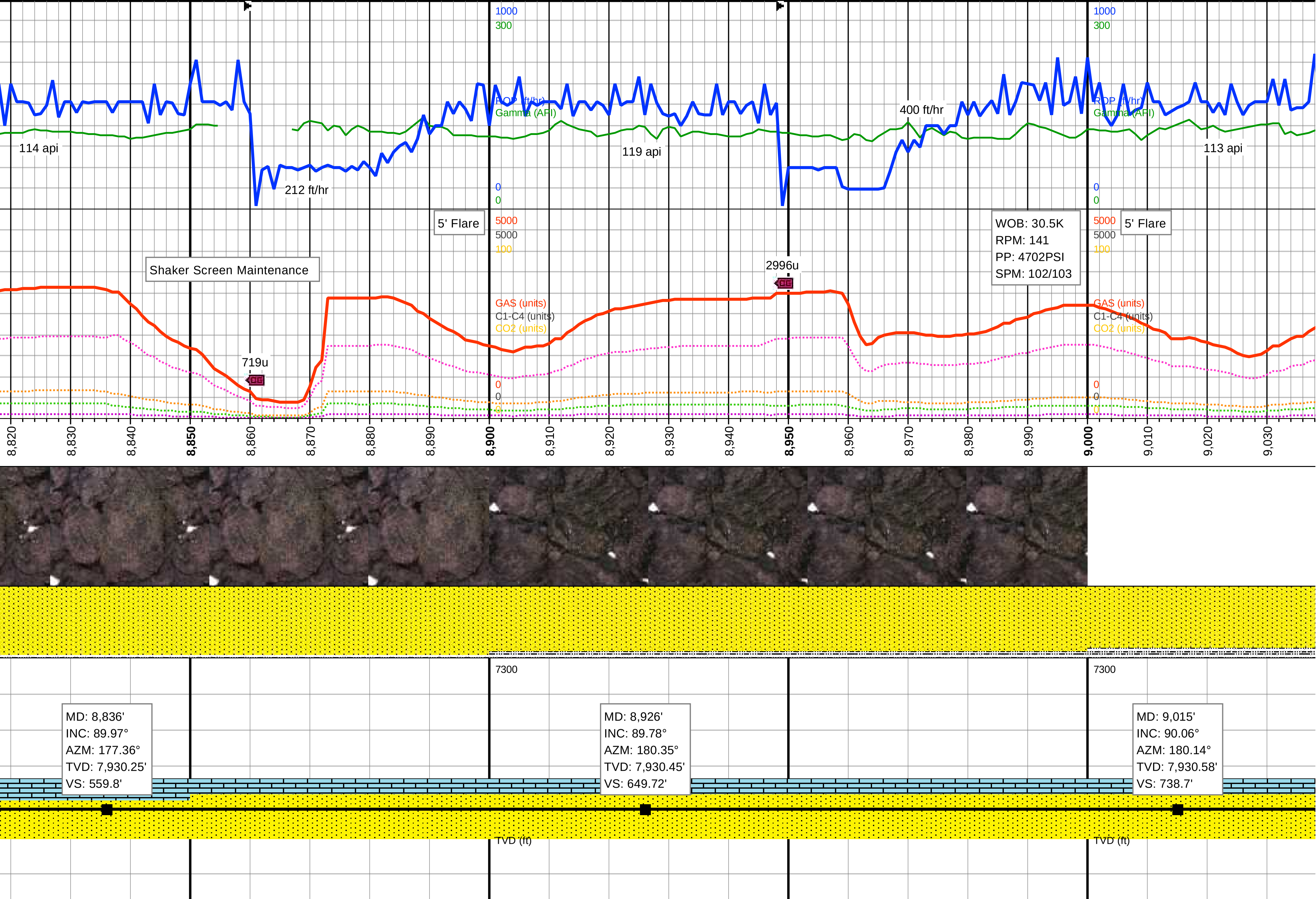
95% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, arg-slty mtx, ip lmy/cly rch; 5% LS: med brn, ltbn-crm, occ intbdd calc sh, mod frm-frm, sb blky-ireg, micxln-xl tex, v calc;

100% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, arg-slty mtx, ip lmy/cly rch

100% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, arg-slty mtx, ip lmy/cly rch, tr calc sh



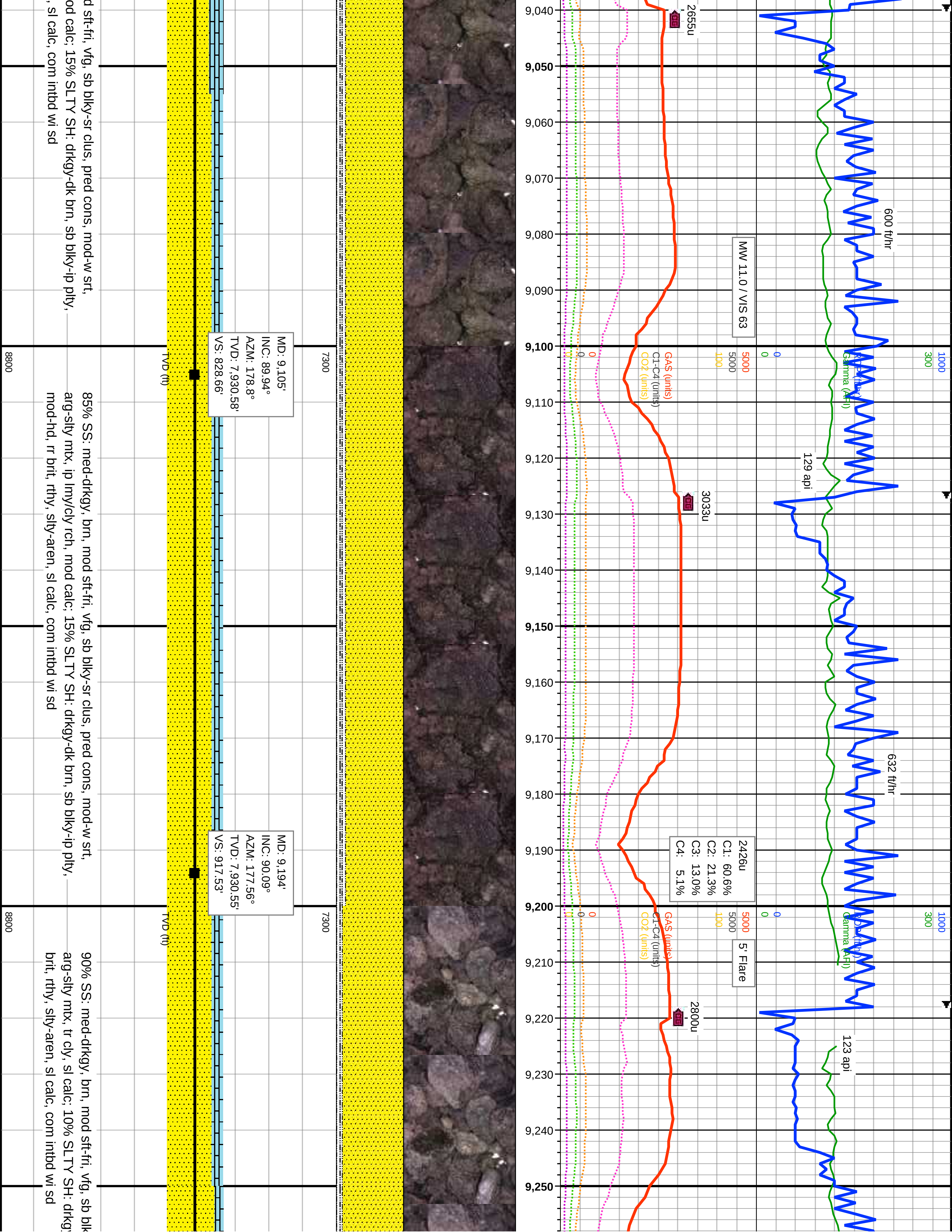
ROP (ft/hr) 0 1000
Gamma (API) 0 300
606 ft/hr
594 ft/hr
120 api
111 api
MW 11.0 / VIS 63
Landing Point Reached, 8657' MD
03:21 MST on 11/20/2018
Begin 100' Sample Collection
7' Flare
GAS (units) 0 5000
C1-C4 (units) 0 5000
CO2 (units) 0 100
2657u
2612u
2789u
C1: 62.7%
C2: 21.6%
C3: 11.7%
C4: 4.1%
8,600
8,610
8,620
8,630
8,640
8,650
8,660
8,670
8,680
8,690
8,700
8,710
8,720
8,730
8,740
8,750
8,760
8,770
8,780
8,790
8,800
8,810
7300
MD: 8,657'
INC: 89.88°
AZM: 178.21°
TVD: 7,930.04'
VS: 381.27'
MD: 8,747'
INC: 89.94°
AZM: 176.39°
TVD: 7,930.19'
VS: 471.06'
TVD (ft)
8800
100% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, arg-slty mtx, ip lmy/cly rch
90% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, arg-slty mtx, ip lmy/cly rch; 10% SLTY SH: drkgy-dk brn, sb blky-ip plty, hd, rthy, slty-aren, sl calc, pred intbd wi sd
95% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, arg-slty mtx, ip lmy/cly rch; 5% SLTY SH: drkgy-dk brn, sb blky-ip plty, hd, rr brit, rthy, slty-aren, sl calc, pred intbd wi sd
95% SS: m
arg-slty mt
rthy, slty-ar



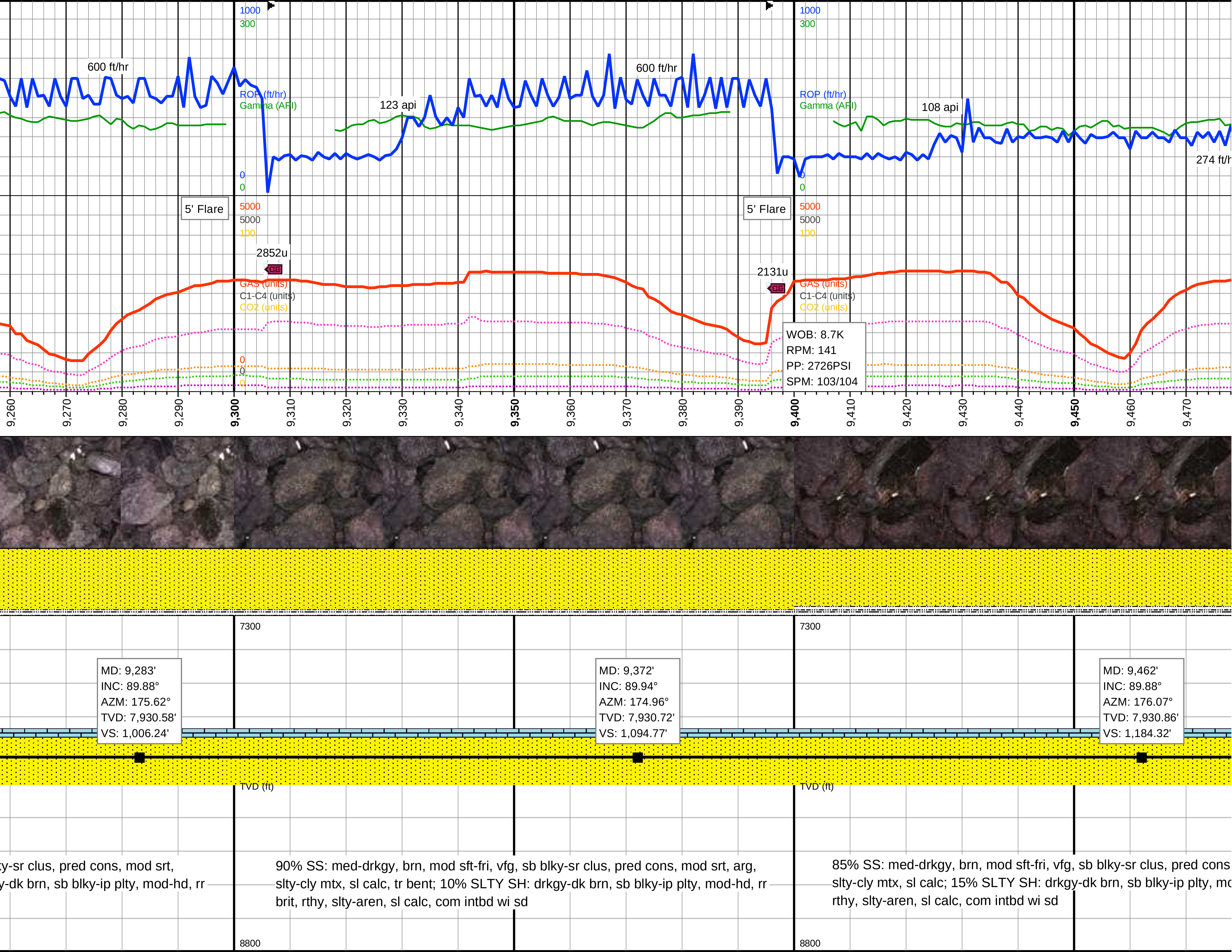
ed-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, x, ip lmy/cly rch; 5% SLTY SH: drkgy-dk brn, sb blky-ip plty, hd, rr brit, en, sl calc, pred intbd wi sd

90% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, arg-slty mtx, ip lmy/cly rch; 10% SLTY SH: drkgy-dk brn, sb blky-ip plty, hd, rr brit, rthy, slty-aren, sl calc, pred intbd wi sd

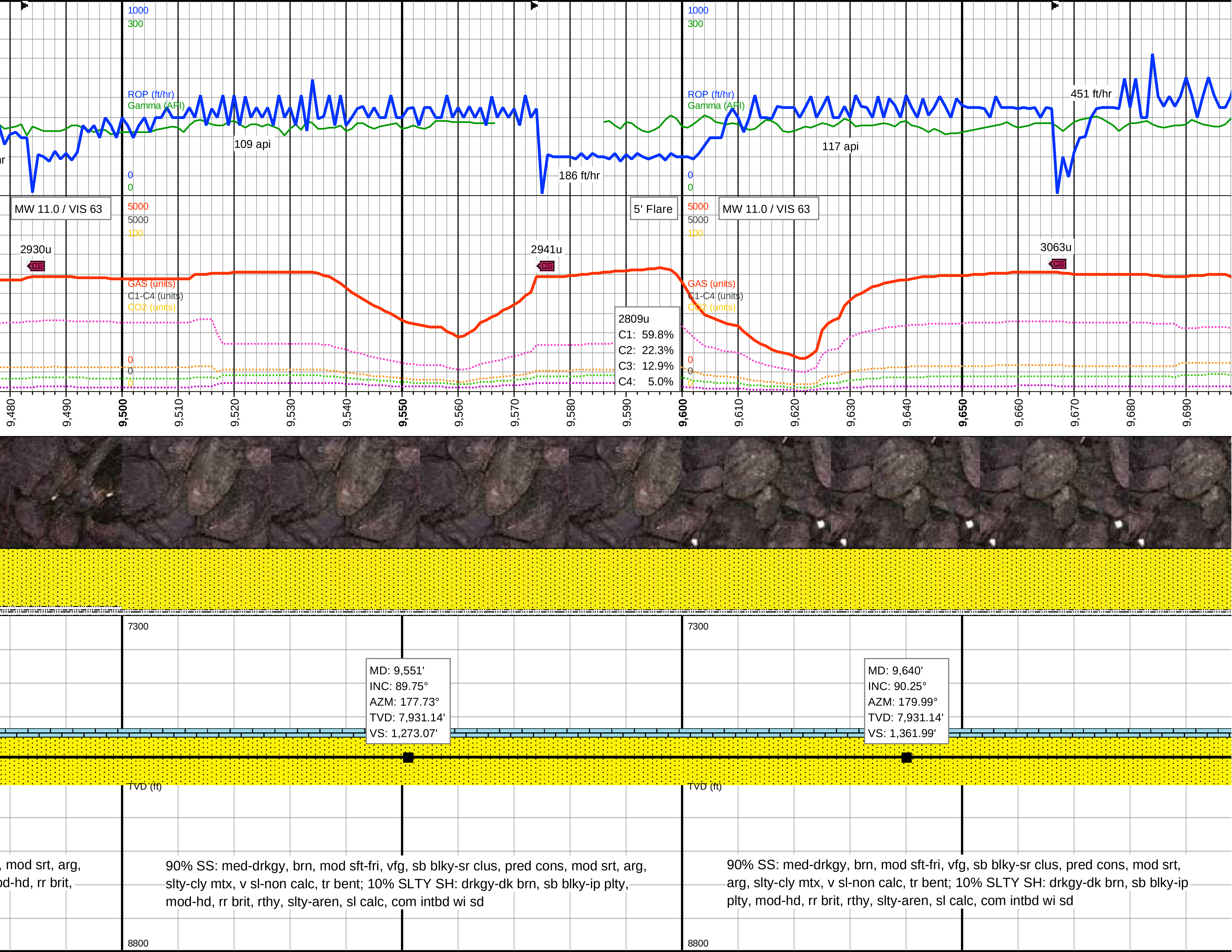
85% SS: med-drkgy, brn, mo arg-slty mtx, ip lmy/cly rch, m mod-hd, rr brit, rthy, slty-aren



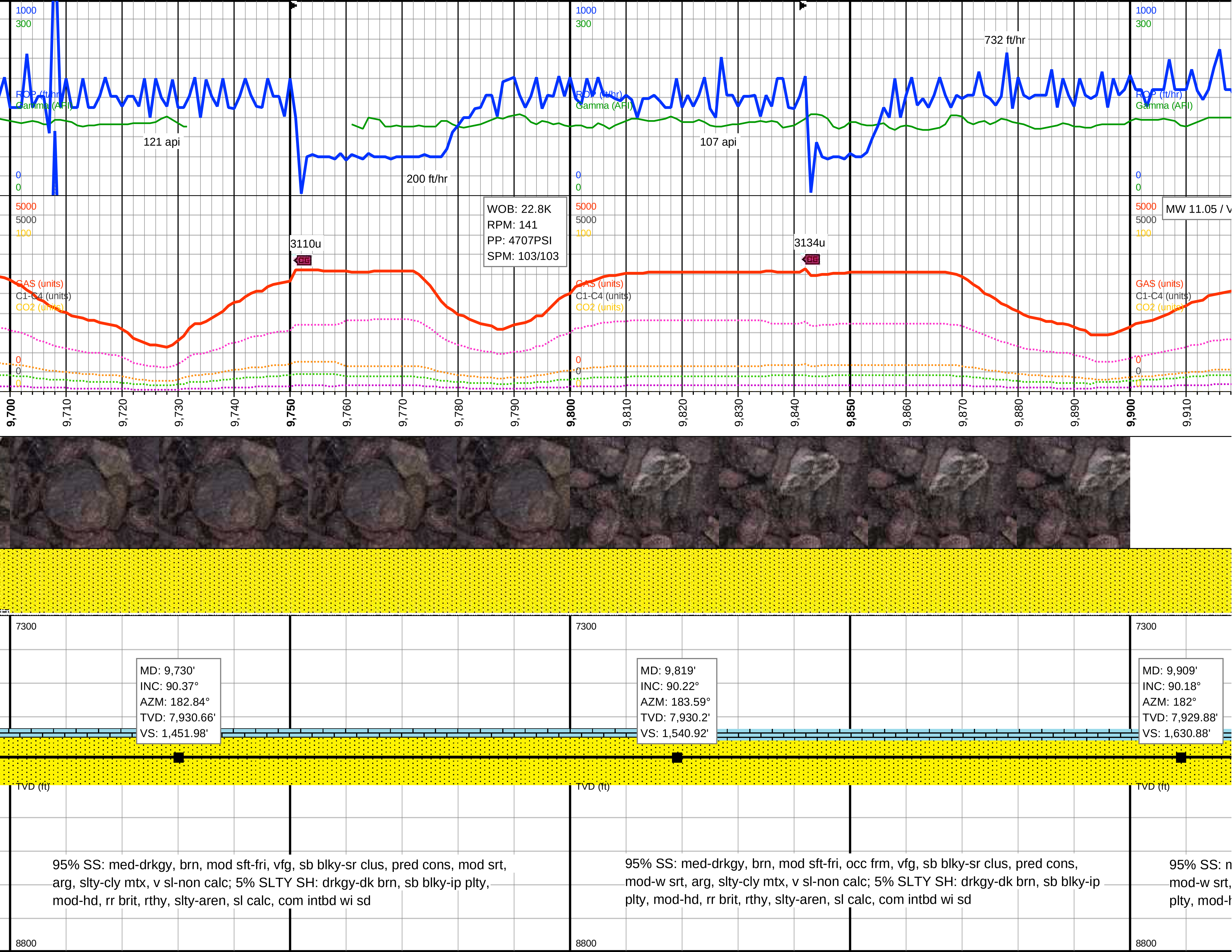
...d sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt,
...od calc; 15% SLTY SH: drkgy-dk brn, sb blky-ip plty,
..., sl calc, com intbd wi sd
MD: 9,105' INC: 89.94° AZM: 178.8° TVD: 7,930.58' VS: 828.66'
85% SS: med-drkgy, brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, arg-slty mtx, ip lmy/cly rch, mod calc; 15% SLTY SH: drkgy-dk brn, sb blky-ip plty, mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd
MD: 9,194' INC: 90.09° AZM: 177.56° TVD: 7,930.55' VS: 917.53'
90% SS: med-drkgy, brn, mod sft-fri, vfg, sb blk... arg-slty mtx, tr cly, sl calc; 10% SLTY SH: drkg... brit, rthy, slty-aren, sl calc, com intbd wi sd
TVD (ft)
8800
7300
9,040
9,050
9,060
9,070
9,080
9,090
9,100
9,110
9,120
9,130
9,140
9,150
9,160
9,170
9,180
9,190
9,200
9,210
9,220
9,230
9,240
9,250
GAS (units) 0 5000
C1-C4 (units) 0 5000
CO2 (units) 0 100
ROP (ft/hr) 0 1000
Gamma (API) 0 300
2655u
MW 11.0 / VIS 63
600 ft/hr
129 api
3033u
632 ft/hr
2426u
C1: 60.6%
C2: 21.3%
C3: 13.0%
C4: 5.1%
5' Flare
2800u
123 api



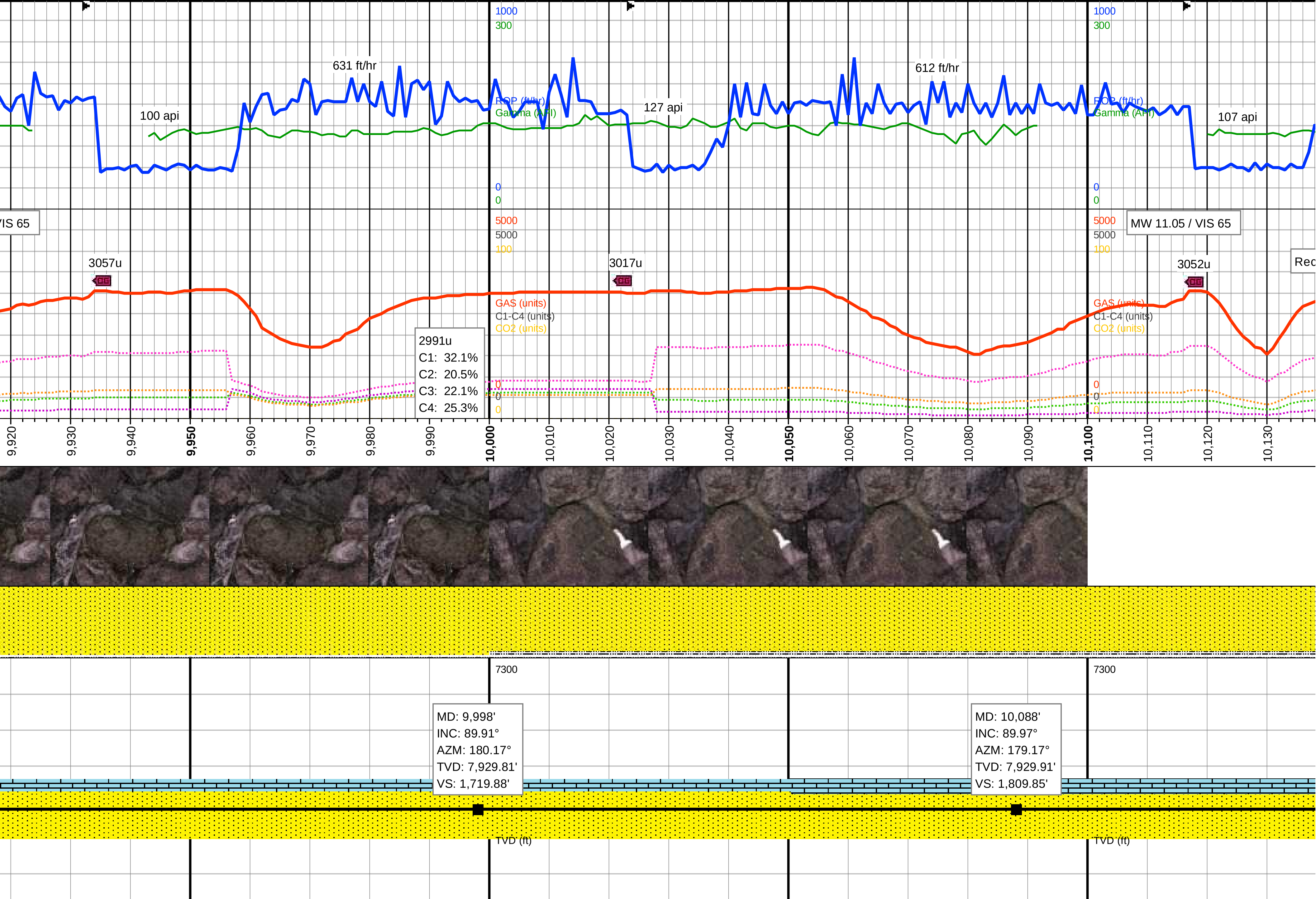
600 ft/hr
5' Flare
1000
300
ROP (ft/hr)
Gamma (API)
0
0
5000
5000
100
2852u
GAS (units)
C1-C4 (units)
CO2 (units)
0
0
0
123 api
600 ft/hr
5' Flare
2131u
108 api
274 ft/hr
WOB: 8.7K
RPM: 141
PP: 2726PSI
SPM: 103/104
9,260
9,270
9,280
9,290
9,300
9,310
9,320
9,330
9,340
9,350
9,360
9,370
9,380
9,390
9,400
9,410
9,420
9,430
9,440
9,450
9,460
9,470
7300
TVD (ft)
8800
MD: 9,283'
INC: 89.88°
AZM: 175.62°
TVD: 7,930.58'
VS: 1,006.24'
MD: 9,372'
INC: 89.94°
AZM: 174.96°
TVD: 7,930.72'
VS: 1,094.77'
MD: 9,462'
INC: 89.88°
AZM: 176.07°
TVD: 7,930.86'
VS: 1,184.32'
ky-sr clus, pred cons, mod srt,
y-dk brn, sb blky-ip plty, mod-hd, rr
90% SS: med-drkgy, brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, arg, slty-cly mtx, sl calc, tr bent; 10% SLTY SH: drkgy-dk brn, sb blky-ip plty, mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd
85% SS: med-drkgy, brn, mod sft-fri, vfg, sb blky-sr clus, pred cons
slty-cly mtx, sl calc; 15% SLTY SH: drkgy-dk brn, sb blky-ip plty, mo
rthy, slty-aren, sl calc, com intbd wi sd



ROP (ft/hr)
Gamma (API)
1000
300
0
0
109 api
186 ft/hr
117 api
451 ft/hr
MW 11.0 / VIS 63
5' Flare
MW 11.0 / VIS 63
5000
5000
100
GAS (units)
C1-C4 (units)
CO2 (units)
0
0
0
2930u
2941u
3063u
2809u
C1: 59.8%
C2: 22.3%
C3: 12.9%
C4: 5.0%
9,480
9,490
9,500
9,510
9,520
9,530
9,540
9,550
9,560
9,570
9,580
9,590
9,600
9,610
9,620
9,630
9,640
9,650
9,660
9,670
9,680
9,690
7300
TVD (ft)
8800
MD: 9,551'
INC: 89.75°
AZM: 177.73°
TVD: 7,931.14'
VS: 1,273.07'
MD: 9,640'
INC: 90.25°
AZM: 179.99°
TVD: 7,931.14'
VS: 1,361.99'
, mod srt, arg,
od-hd, rr brit,
90% SS: med-drkgy, brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, arg, slty-cly mtx, v sl-non calc, tr bent; 10% SLTY SH: drkgy-dk brn, sb blky-ip plty, mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd
90% SS: med-drkgy, brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, arg, slty-cly mtx, v sl-non calc, tr bent; 10% SLTY SH: drkgy-dk brn, sb blky-ip plty, mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd



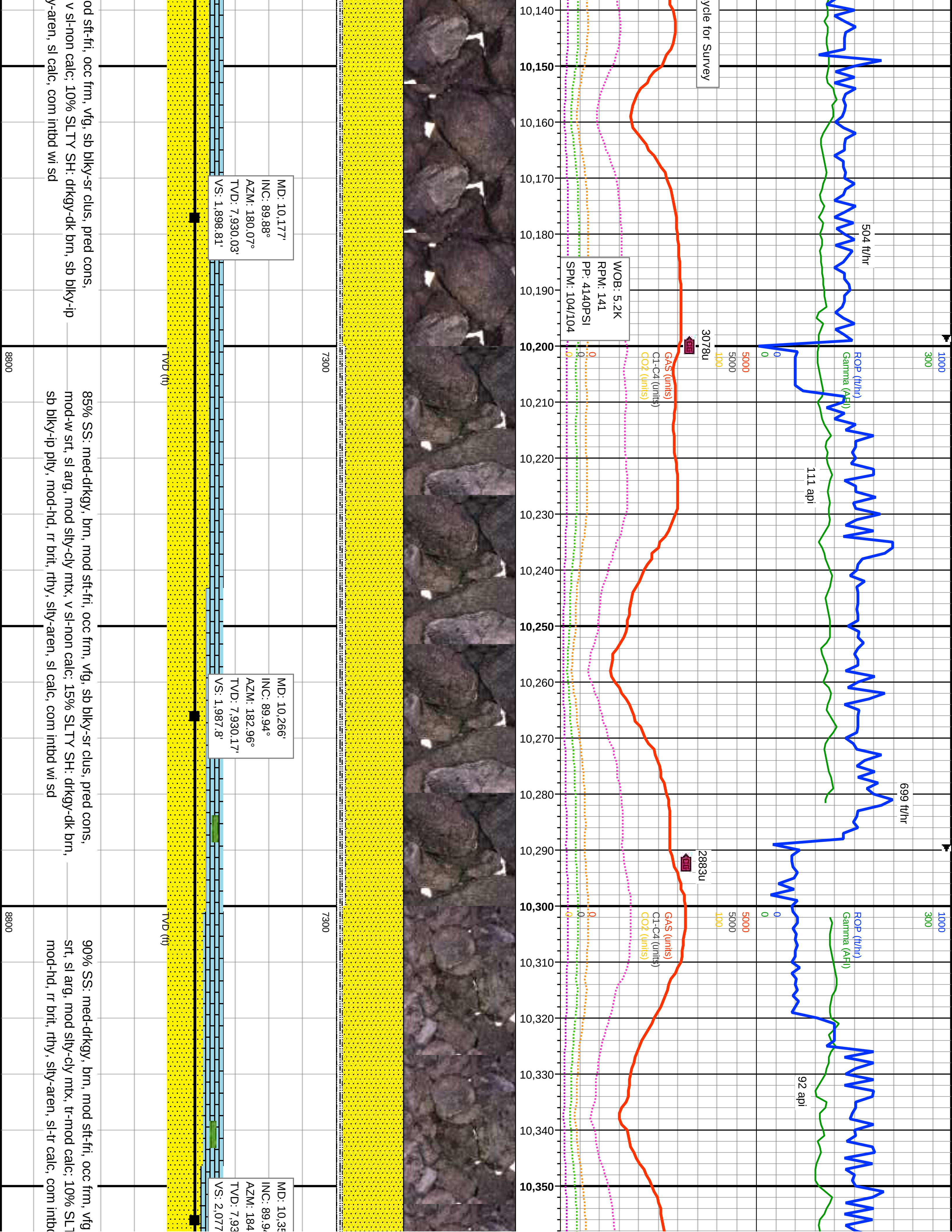
1000
300
ROP (ft/hr)
Gamma (API)
0
0
121 api
200 ft/hr
107 api
732 ft/hr
5000
5000
100
GAS (units)
C1-C4 (units)
CO2 (units)
0
0
0
3110u
3134u
WOB: 22.8K
RPM: 141
PP: 4707PSI
SPM: 103/103
MW 11.05 / V
9,700
9,710
9,720
9,730
9,740
9,750
9,760
9,770
9,780
9,790
9,800
9,810
9,820
9,830
9,840
9,850
9,860
9,870
9,880
9,890
9,900
9,910
7300
TVD (ft)
8800
MD: 9,730'
INC: 90.37°
AZM: 182.84°
TVD: 7,930.66'
VS: 1,451.98'
MD: 9,819'
INC: 90.22°
AZM: 183.59°
TVD: 7,930.2'
VS: 1,540.92'
MD: 9,909'
INC: 90.18°
AZM: 182°
TVD: 7,929.88'
VS: 1,630.88'
95% SS: med-drkgy, brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, arg, slty-cly mtx, v sl-non calc; 5% SLTY SH: drkgy-dk brn, sb blky-ip plty, mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd
95% SS: med-drkgy, brn, mod sft-fri, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, arg, slty-cly mtx, v sl-non calc; 5% SLTY SH: drkgy-dk brn, sb blky-ip plty, mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd
95% SS: m
mod-w srt,
plty, mod-h

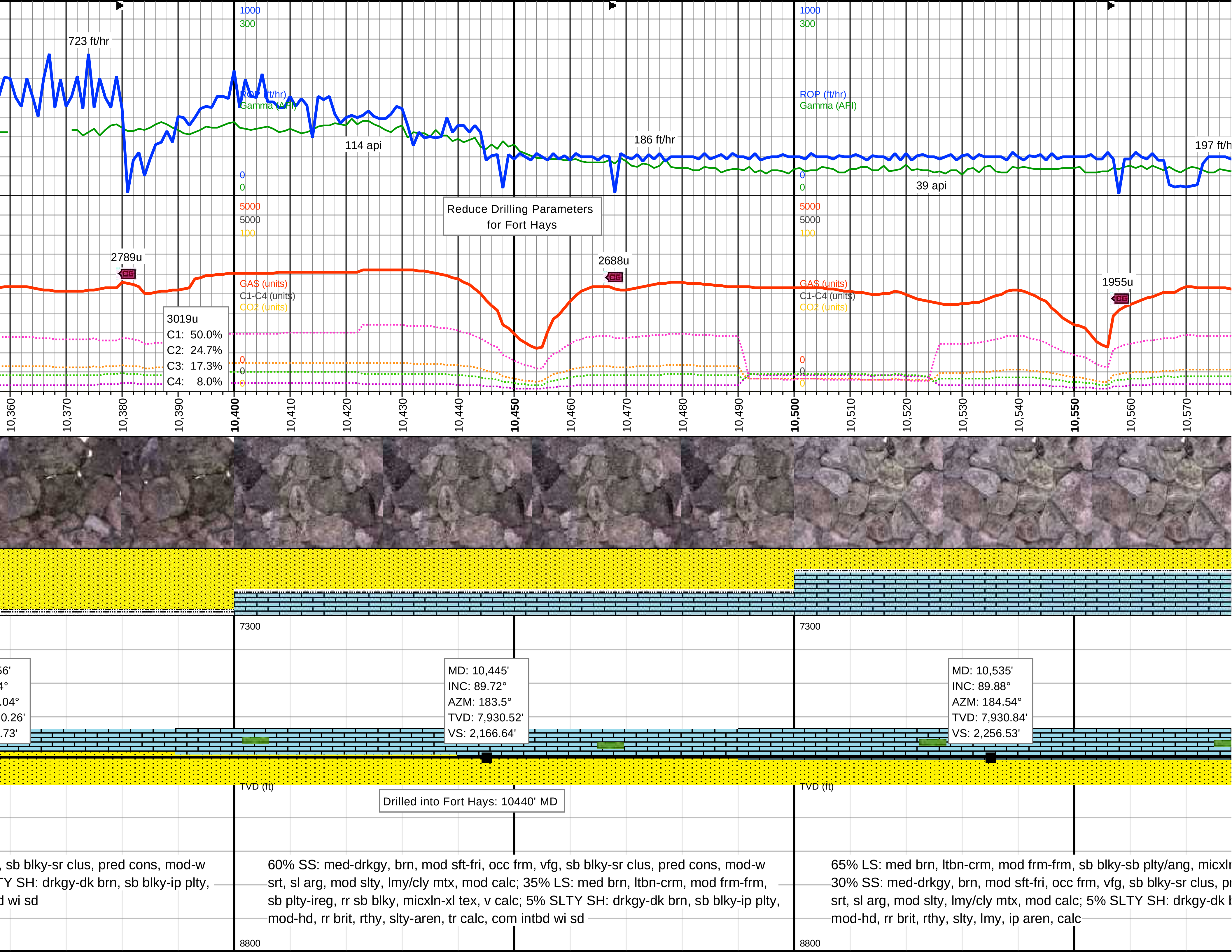


ned-drkgy, brn, mod sft-fri, occ frm, vfg, sb blky-sr clus, pred cons, arg, slty-cly mtx, v sl-non calc; 5% SLTY SH: drkgy-dk brn, sb blky-ip nd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd

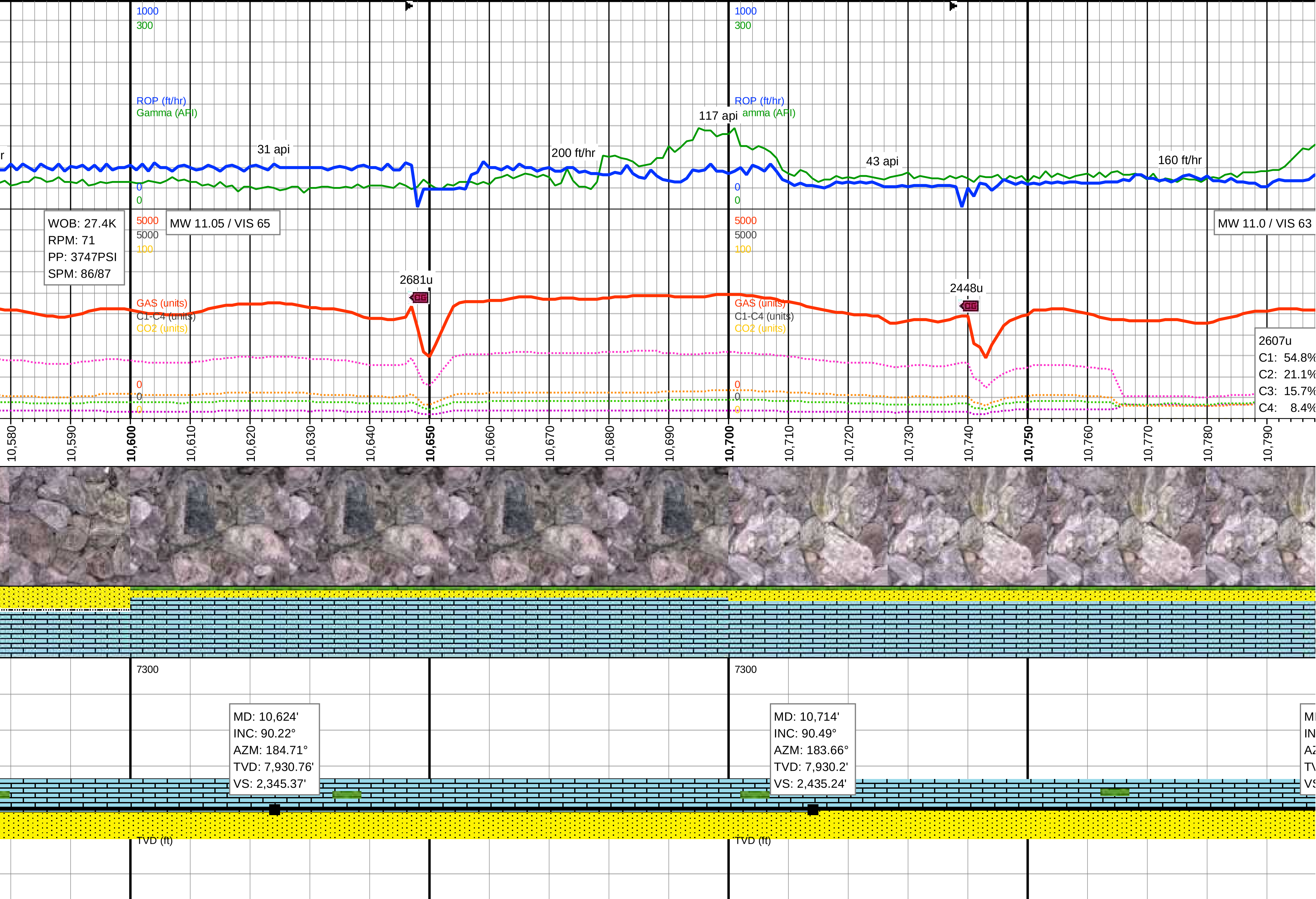
90% SS: med-drkgy, brn, mod sft-fri, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, arg, slty-cly mtx, v sl-non calc; 10% SLTY SH: drkgy-dk brn, sb blky-ip plty, mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd

90% SS: med-drkgy, brn, m mod-w srt, arg, slty-cly mtx, plty, mod-hd, rr brit, rthy, slt


od sft-fri, occ frm, vfg, sb blky-sr clus, pred cons,
v sl-non calc; 10% SLTY SH: drkgy-dk brn, sb blky-ip
y-aren, sl calc, com intbd wi sd
MD: 10,177'
INC: 89.88°
AZM: 180.07°
TVD: 7,930.03'
VS: 1,898.81'
ycle for Survey
WOB: 5.2K
RPM: 141
PP: 4140PSI
SPM: 104/104
504 ft/hr
3078u
10,140
10,150
10,160
10,170
10,180
10,190
10,200
10,210
10,220
10,230
10,240
10,250
10,260
10,270
10,280
10,290
10,300
10,310
10,320
10,330
10,340
10,350
8800
TVD (ft)
7300
GAS (units)
C1-C4 (units)
CO2 (units)
ROP (ft/hr)
Gamma (API)
0
5000
100
1000
300
111 api
85% SS: med-drkgy, brn, mod sft-fri, occ frm, vfg, sb blky-sr clus, pred cons,
mod-w srt, sl arg, mod slty-cly mtx, v sl-non calc; 15% SLTY SH: drkgy-dk brn,
sb blky-ip plty, mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd
MD: 10,266'
INC: 89.94°
AZM: 182.96°
TVD: 7,930.17'
VS: 1,987.8'
699 ft/hr
2883u
90% SS: med-drkgy, brn, mod sft-fri, occ frm, vfg
srt, sl arg, mod slty-cly mtx, tr-mod calc; 10% SLT
mod-hd, rr brit, rthy, slty-aren, sl-tr calc, com intb
92 api
MD: 10,35
INC: 89.9
AZM: 184
TVD: 7,93
VS: 2,077



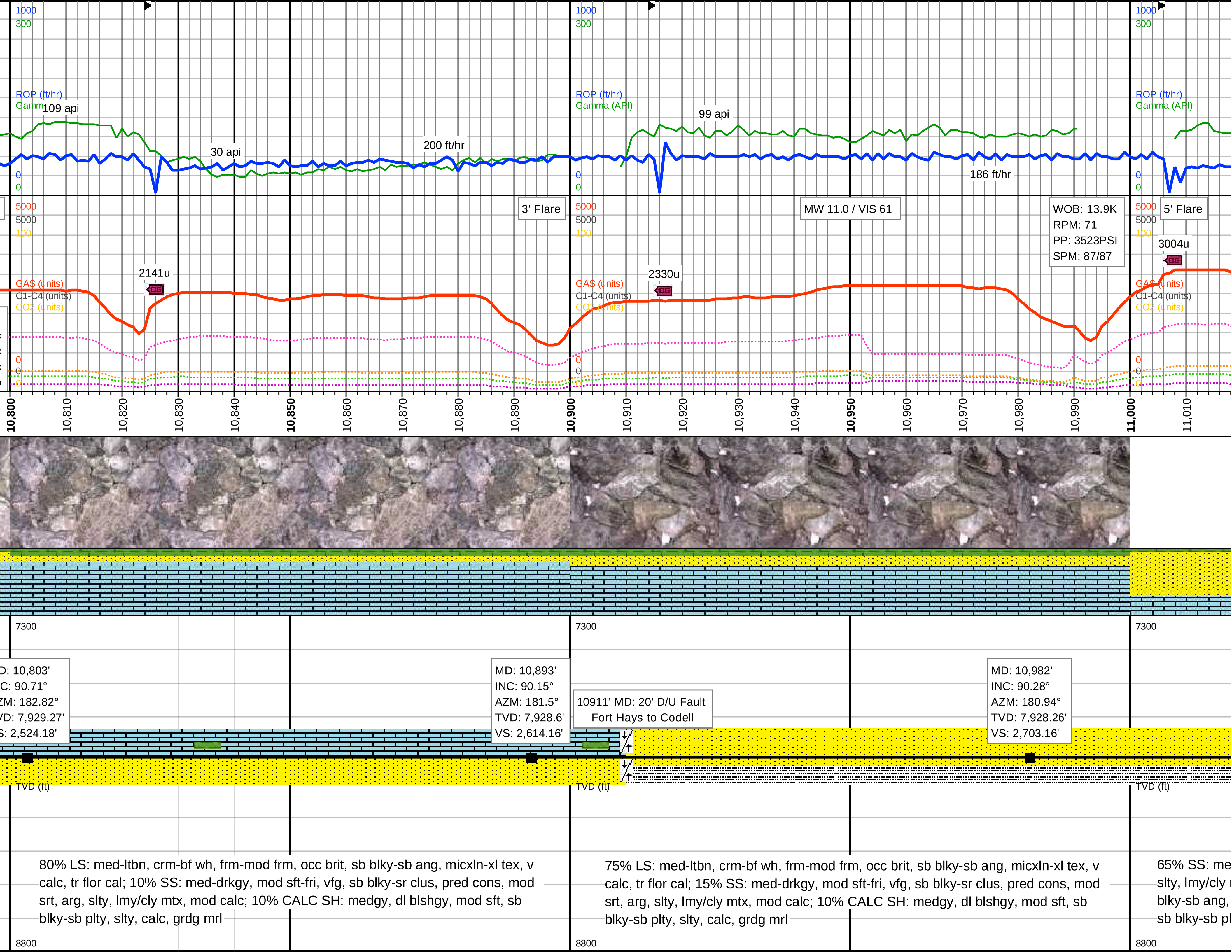
723 ft/hr
114 api
186 ft/hr
197 ft/hr
39 api
1000
300
ROP (ft/hr)
Gamma (API)
0
0
5000
5000
100
GAS (units)
C1-C4 (units)
CO2 (units)
0
0
0
2789u
3019u
C1: 50.0%
C2: 24.7%
C3: 17.3%
C4: 8.0%
Reduce Drilling Parameters for Fort Hays
2688u
1955u
10,360
10,370
10,380
10,390
10,400
10,410
10,420
10,430
10,440
10,450
10,460
10,470
10,480
10,490
10,500
10,510
10,520
10,530
10,540
10,550
10,560
10,570
7300
8800
TVD (ft)
MD: 10,445'
INC: 89.72°
AZM: 183.5°
TVD: 7,930.52'
VS: 2,166.64'
MD: 10,535'
INC: 89.88°
AZM: 184.54°
TVD: 7,930.84'
VS: 2,256.53'
Drilled into Fort Hays: 10440' MD
, sb blky-sr clus, pred cons, mod-w
TY SH: drkgy-dk brn, sb blky-ip plty,
d wi sd
60% SS: med-drkgy, brn, mod sft-fri, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg, mod slty, lmy/cly mtx, mod calc; 35% LS: med brn, ltbn-crm, mod frm-frm, sb plty-ireg, rr sb blky, micxln-xl tex, v calc; 5% SLTY SH: drkgy-dk brn, sb blky-ip plty, mod-hd, rr brit, rthy, slty-aren, tr calc, com intbd wi sd
65% LS: med brn, ltbn-crm, mod frm-frm, sb blky-sb plty/ang, micxl
30% SS: med-drkgy, brn, mod sft-fri, occ frm, vfg, sb blky-sr clus, p
srt, sl arg, mod slty, lmy/cly mtx, mod calc; 5% SLTY SH: drkgy-dk
mod-hd, rr brit, rthy, slty, lmy, ip aren, calc

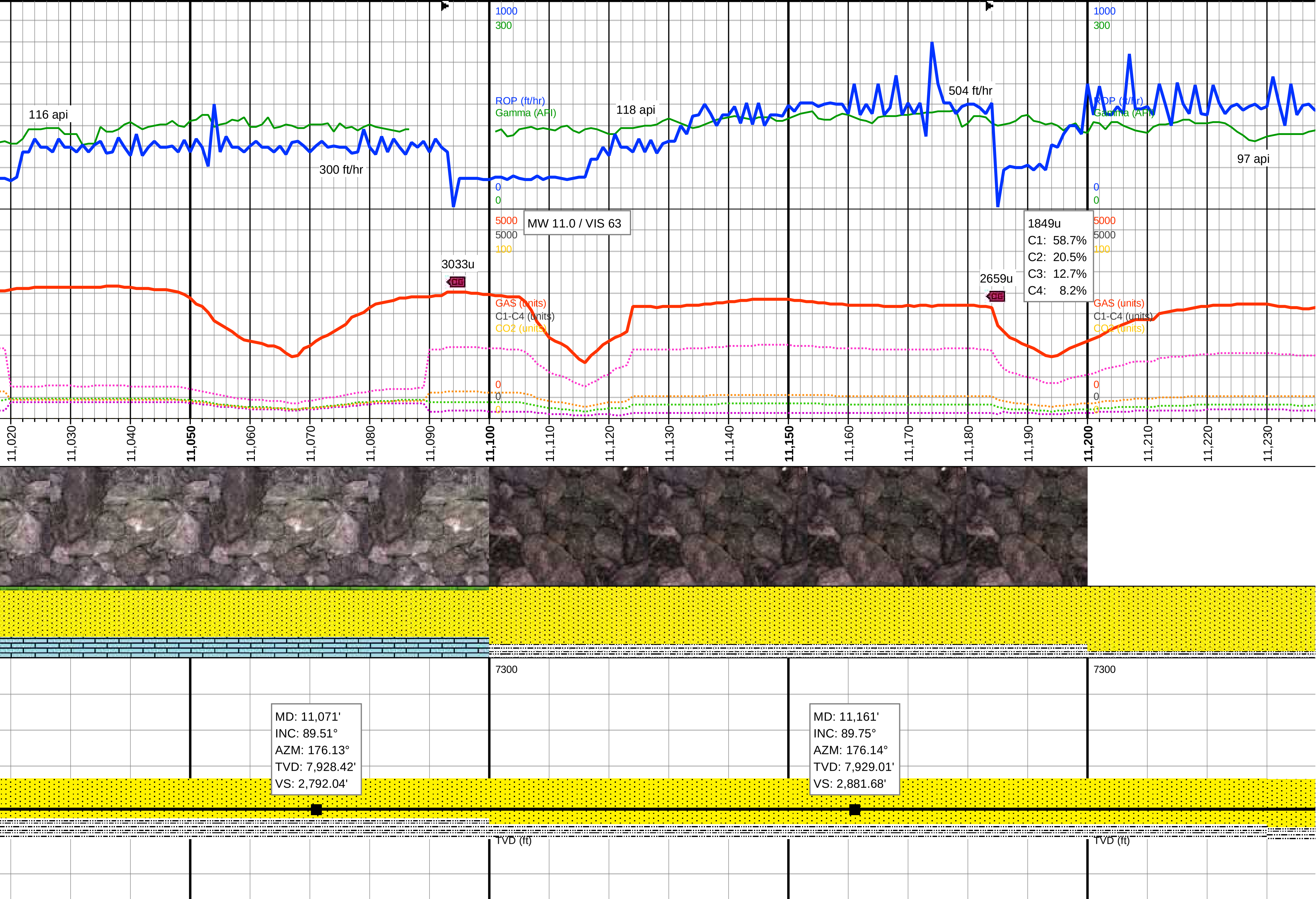


...n-xl tex, v calc; ...red cons, mod-w ...rn, sb blky-ip plty,

85% LS: med-ltbn, crm-bf wh, frm-mod frm, occ brit, sb blky-sb ang, micxln-xl tex, v calc; 10% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, arg, slty, lmy/cly mtx, mod calc; 5% CALC SH: medgy, dl blshgy, mod sft, sb blky-sb plty, slty, calc, grdg mrl

80% LS: med-ltbn, crm-bf wh, frm-mod frm, occ brit, sb blky-sb ang, micxln-xl tex, v calc, tr flor cal; 15% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, arg, slty, lmy/cly mtx, mod calc; 5% CALC SH: medgy, dl blshgy, mod sft, sb blky-sb plty, slty, calc, grdg mrl

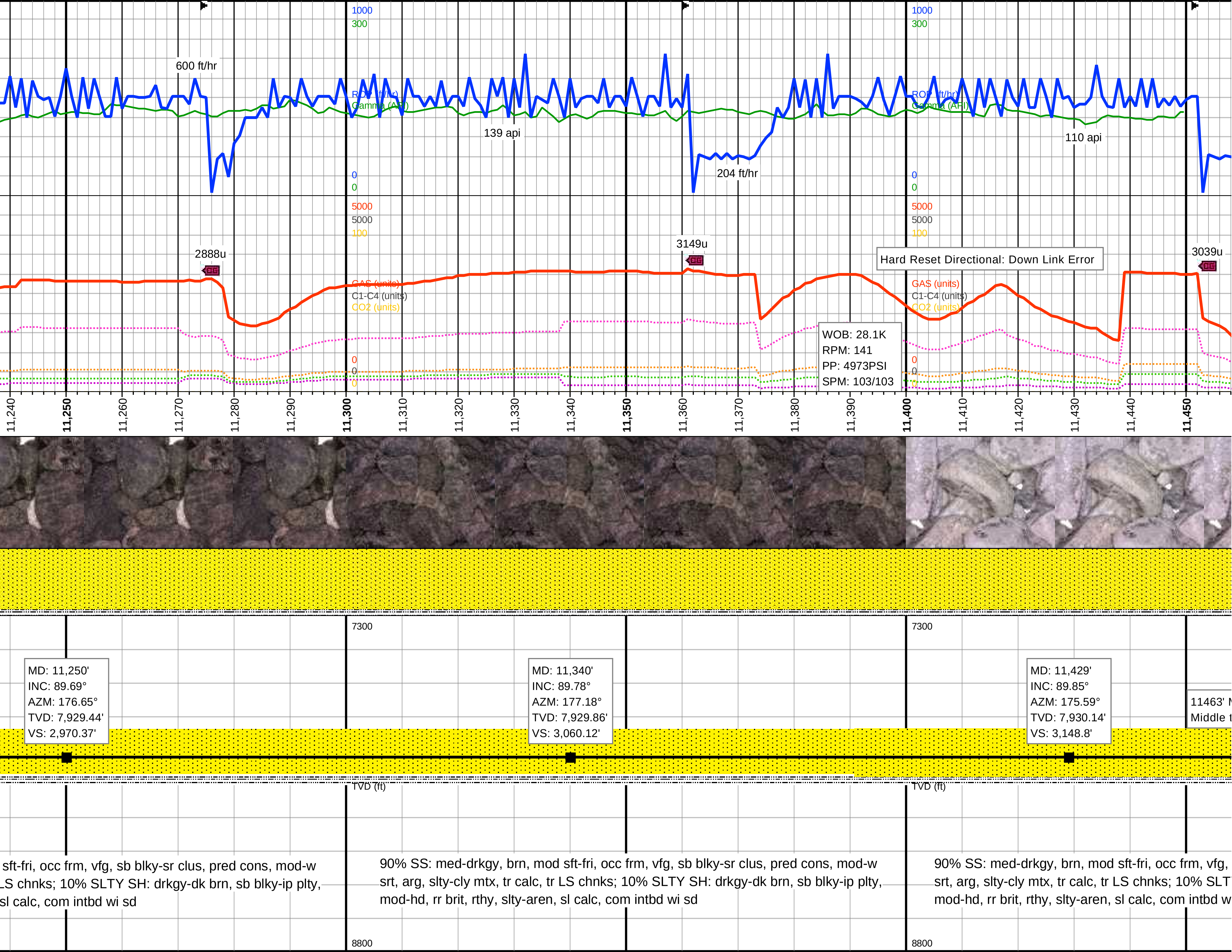

ROP (ft/hr)
Gamma (API)
1000
300
109 api
30 api
200 ft/hr
99 api
186 ft/hr
3' Flare
MW 11.0 / VIS 61
WOB: 13.9K
RPM: 71
PP: 3523PSI
SPM: 87/87
5' Flare
GAS (units)
C1-C4 (units)
CO2 (units)
5000
100
2141u
2330u
3004u
10,800
10,810
10,820
10,830
10,840
10,850
10,860
10,870
10,880
10,890
10,900
10,910
10,920
10,930
10,940
10,950
10,960
10,970
10,980
10,990
11,000
11,010
7300
D: 10,803'
C: 90.71°
ZM: 182.82°
VD: 7,929.27'
S: 2,524.18'
MD: 10,893'
INC: 90.15°
AZM: 181.5°
TVD: 7,928.6'
VS: 2,614.16'
10911' MD: 20' D/U Fault
Fort Hays to Codell
MD: 10,982'
INC: 90.28°
AZM: 180.94°
TVD: 7,928.26'
VS: 2,703.16'
TVD (ft)
80% LS: med-ltbn, crm-bf wh, frm-mod frm, occ brit, sb blky-sb ang, micxln-xl tex, v calc, tr flor cal; 10% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, arg, slty, lmy/cly mtx, mod calc; 10% CALC SH: medgy, dl blshgy, mod sft, sb blky-sb plty, slty, calc, grdg mrl
75% LS: med-ltbn, crm-bf wh, frm-mod frm, occ brit, sb blky-sb ang, micxln-xl tex, v calc, tr flor cal; 15% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, arg, slty, lmy/cly mtx, mod calc; 10% CALC SH: medgy, dl blshgy, mod sft, sb blky-sb plty, slty, calc, grdg mrl
65% SS: me
slty, lmy/cly
blky-sb ang,
sb blky-sb pl
8800



d-drkgy, brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, arg, mtx, mod calc; 30% LS: med-ltbn, crm-bf wh, frm-mod frm, occ brit, sb micxln-xl tex, v calc, tr flor cal; 5% CALC SH: medgy, dl blshgy, mod sft, ty, slty, calc, grdg mrl

80% SS: med-drkgy, brn, mod sft-fri, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, arg, slty-cly mtx, sl calc; 20% SLTY SH: drkgy-dk brn, sb blky-ip plty, mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd

90% SS: med-drkgy, brn, mod srt, arg, slty-cly mtx, tr calc, tr mod-hd, rr brit, rthy, slty-aren,

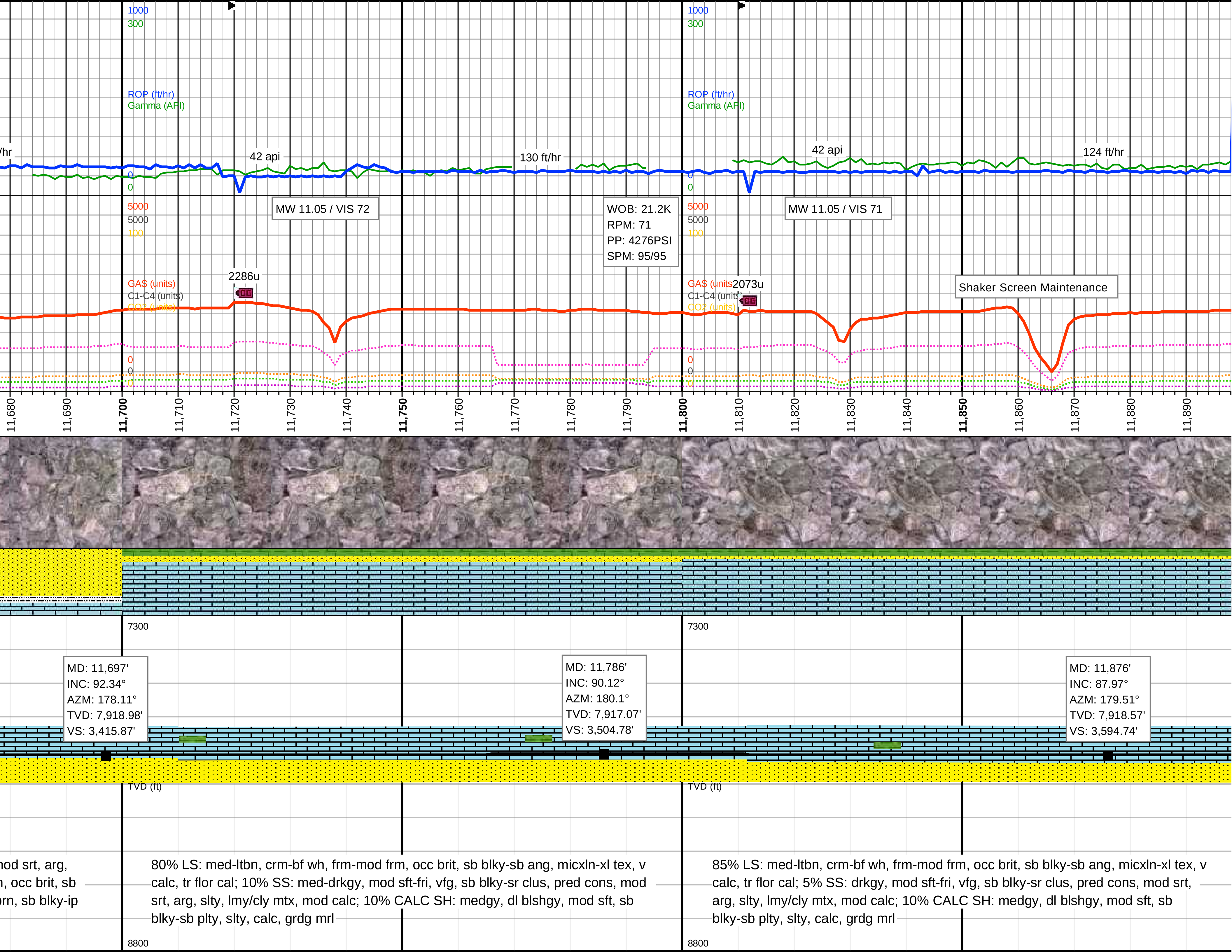


1000
300
ROP (ft/hr)
Gamma (API)
0
0
600 ft/hr
139 api
204 ft/hr
110 api
5000
5000
100
GAS (units)
C1-C4 (units)
CO2 (units)
2888u
3149u
3039u
Hard Reset Directional: Down Link Error
WOB: 28.1K
RPM: 141
PP: 4973PSI
SPM: 103/103
11,240
11,250
11,260
11,270
11,280
11,290
11,300
11,310
11,320
11,330
11,340
11,350
11,360
11,370
11,380
11,390
11,400
11,410
11,420
11,430
11,440
11,450
7300
TVD (ft)
8800
MD: 11,250'
INC: 89.69°
AZM: 176.65°
TVD: 7,929.44'
VS: 2,970.37'
MD: 11,340'
INC: 89.78°
AZM: 177.18°
TVD: 7,929.86'
VS: 3,060.12'
MD: 11,429'
INC: 89.85°
AZM: 175.59°
TVD: 7,930.14'
VS: 3,148.8'
11463' M
Middle t
sft-fri, occ frm, vfg, sb blky-sr clus, pred cons, mod-w
LS chnks; 10% SLTY SH: drkgy-dk brn, sb blky-ip plty,
sl calc, com intbd wi sd
90% SS: med-drkgy, brn, mod sft-fri, occ frm, vfg, sb blky-sr clus, pred cons, mod-w
srt, arg, slty-cly mtx, tr calc, tr LS chnks; 10% SLTY SH: drkgy-dk brn, sb blky-ip plty,
mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd
90% SS: med-drkgy, brn, mod sft-fri, occ frm, vfg,
srt, arg, slty-cly mtx, tr calc, tr LS chnks; 10% SLT
mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd w

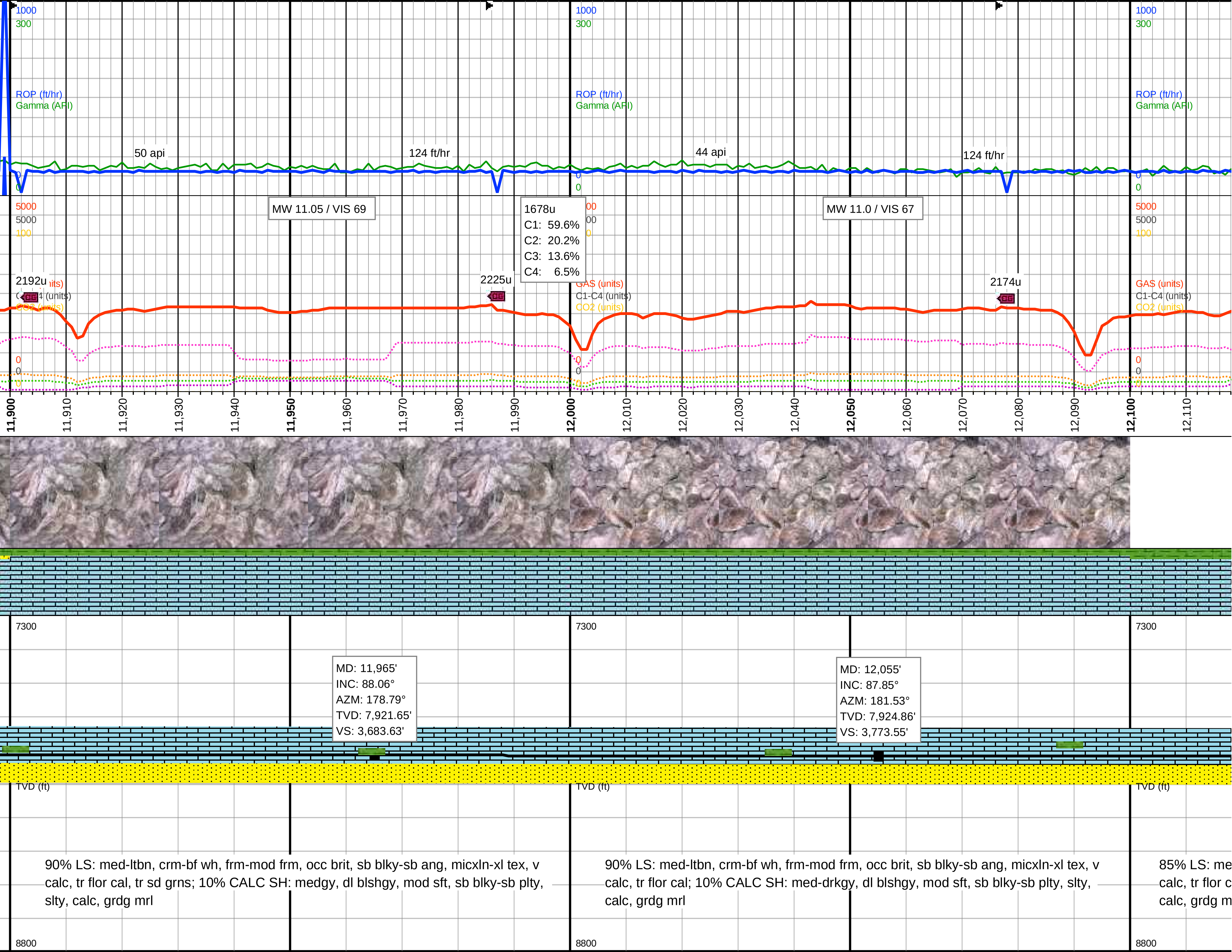
sb blky-sr clus, pred cons, mod-w
Y SH: drkgy-dk brn, sb blky-ip plty,
i sd

85% SS: med-drkgy, brn, mod sft-fri, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, arg, slty-cly mtx, sl-tr calc; 15% SLTY SH: drkgy-dk brn, sb blky-ip plty, mod-hd, rr brit, rthy, slty-aren, sl calc, com intbd wi sd

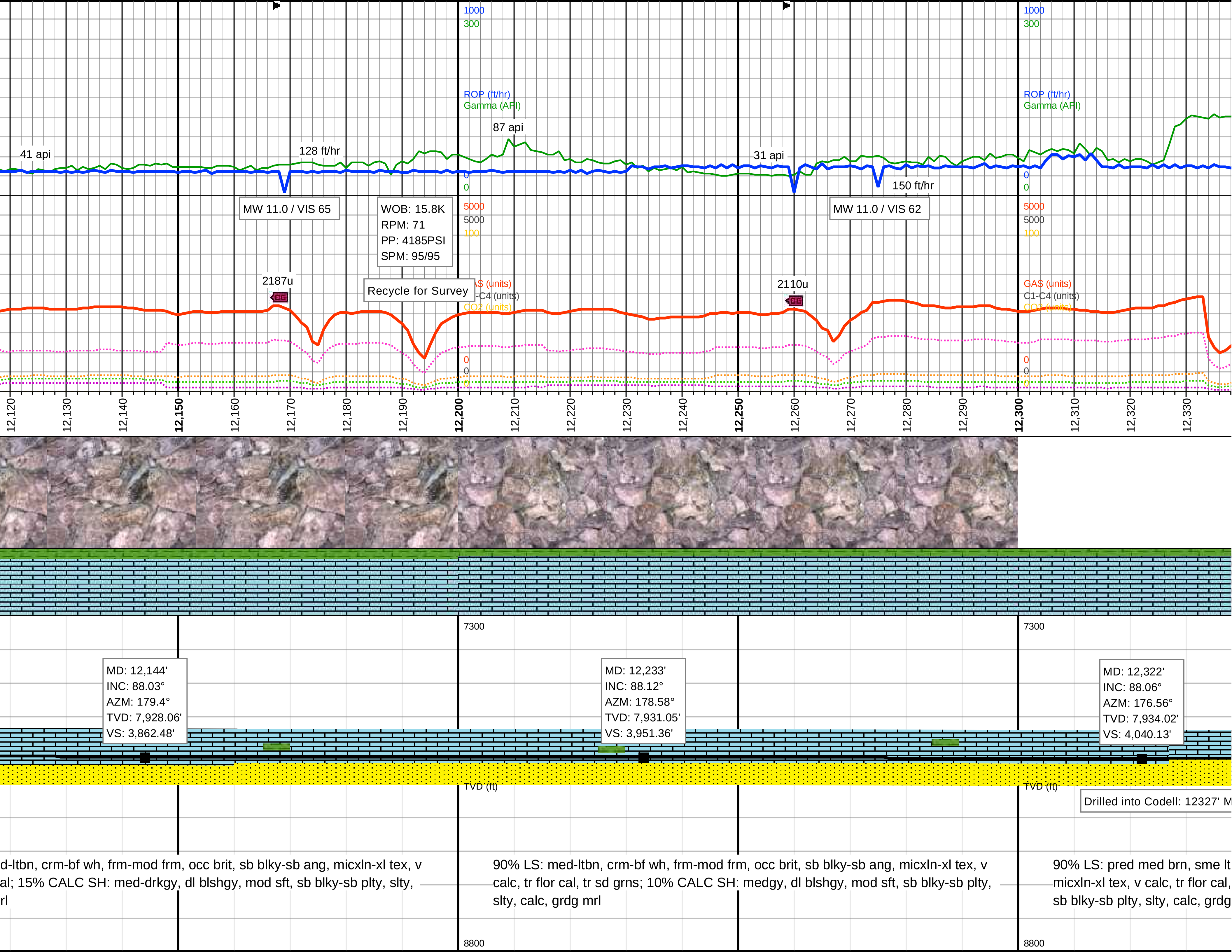
70% SS: med-drkgy, brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, m
slty, lmy/cly mtx, mod calc; 20% LS: med-ltbn, crm-bf wh, frm-mod frm
blky-sb ang, micxln-xl tex, v calc, tr flor cal; 20% SLTY SH: drkgy-dk b
plty, mod-hd, rr brit, rthy, slty-aren, tr calc, com intbd wi sd



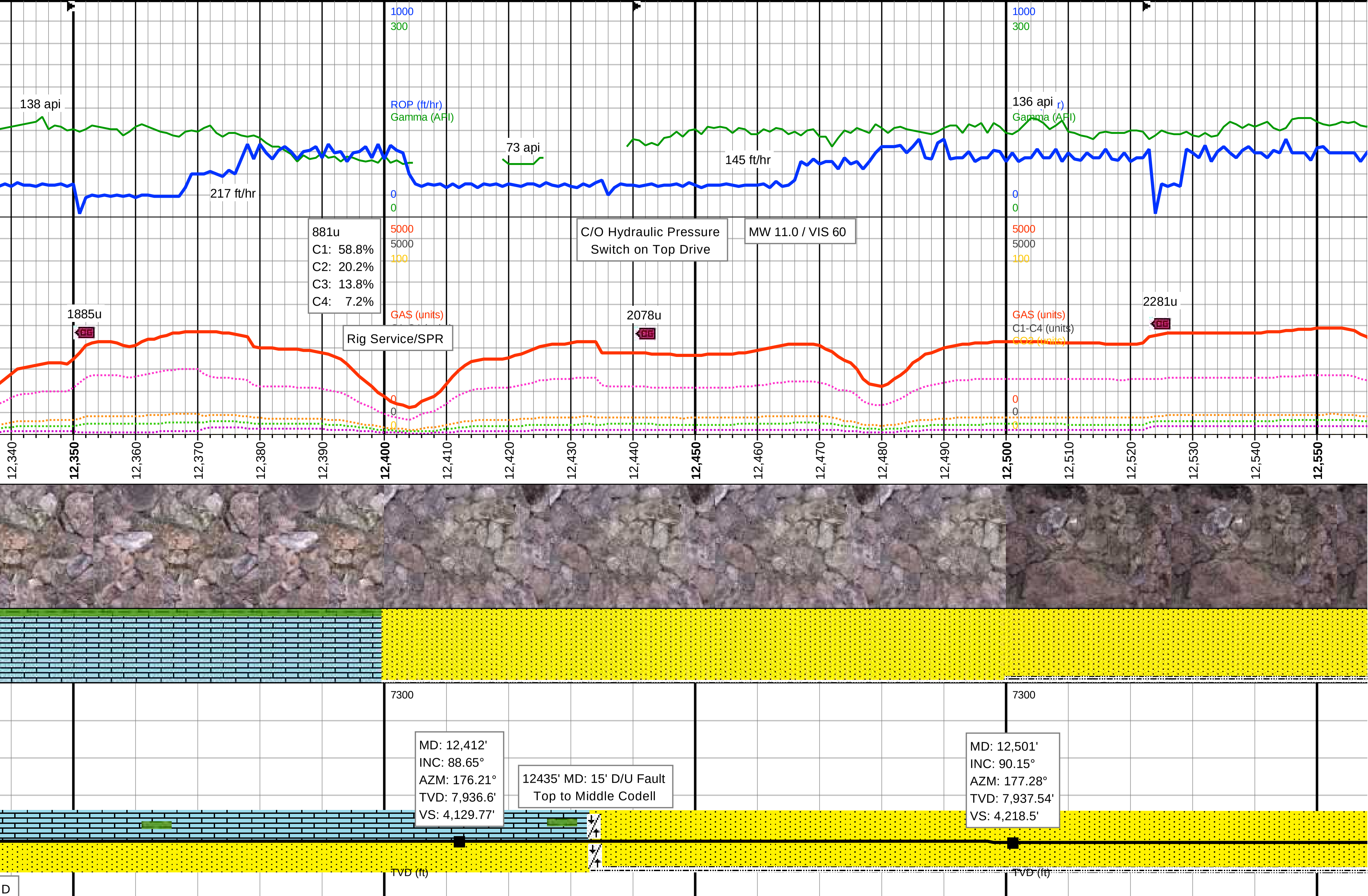
1000
300
ROP (ft/hr)
Gamma (API)
0
0
42 api
130 ft/hr
42 api
124 ft/hr
5000
5000
100
MW 11.05 / VIS 72
WOB: 21.2K
RPM: 71
PP: 4276PSI
SPM: 95/95
MW 11.05 / VIS 71
GAS (units)
C1-C4 (units)
CO2 (units)
2286u
2073u
Shaker Screen Maintenance
0
0
0
11,680
11,690
11,700
11,710
11,720
11,730
11,740
11,750
11,760
11,770
11,780
11,790
11,800
11,810
11,820
11,830
11,840
11,850
11,860
11,870
11,880
11,890
7300
MD: 11,697'
INC: 92.34°
AZM: 178.11°
TVD: 7,918.98'
VS: 3,415.87'
MD: 11,786'
INC: 90.12°
AZM: 180.1°
TVD: 7,917.07'
VS: 3,504.78'
MD: 11,876'
INC: 87.97°
AZM: 179.51°
TVD: 7,918.57'
VS: 3,594.74'
TVD (ft)
8800
nod srt, arg, n, occ brit, sb rn, sb blky-ip
80% LS: med-ltbn, crm-bf wh, frm-mod frm, occ brit, sb blky-sb ang, micxln-xl tex, v calc, tr flor cal; 10% SS: med-drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, arg, slty, lmy/cly mtx, mod calc; 10% CALC SH: medgy, dl blshgy, mod sft, sb blky-sb plty, slty, calc, grdg mrl
85% LS: med-ltbn, crm-bf wh, frm-mod frm, occ brit, sb blky-sb ang, micxln-xl tex, v calc, tr flor cal; 5% SS: drkgy, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, arg, slty, lmy/cly mtx, mod calc; 10% CALC SH: medgy, dl blshgy, mod sft, sb blky-sb plty, slty, calc, grdg mrl



ROP (ft/hr)
Gamma (API)
1000
300
0
GAS (units)
C1-C4 (units)
CO2 (units)
5000
5000
100
0
0
0
2192u
50 api
MW 11.05 / VIS 69
124 ft/hr
2225u
1678u
C1: 59.6%
C2: 20.2%
C3: 13.6%
C4: 6.5%
44 api
MW 11.0 / VIS 67
124 ft/hr
2174u
11,900
11,910
11,920
11,930
11,940
11,950
11,960
11,970
11,980
11,990
12,000
12,010
12,020
12,030
12,040
12,050
12,060
12,070
12,080
12,090
12,100
12,110
7300
MD: 11,965'
INC: 88.06°
AZM: 178.79°
TVD: 7,921.65'
VS: 3,683.63'
MD: 12,055'
INC: 87.85°
AZM: 181.53°
TVD: 7,924.86'
VS: 3,773.55'
TVD (ft)
90% LS: med-ltbn, crm-bf wh, frm-mod frm, occ brit, sb blky-sb ang, micxln-xl tex, v calc, tr flor cal, tr sd grns; 10% CALC SH: medgy, dl blshgy, mod sft, sb blky-sb plty, slty, calc, grdg mrl
90% LS: med-ltbn, crm-bf wh, frm-mod frm, occ brit, sb blky-sb ang, micxln-xl tex, v calc, tr flor cal; 10% CALC SH: med-drkgy, dl blshgy, mod sft, sb blky-sb plty, slty, calc, grdg mrl
85% LS: me
calc, tr flor c
calc, grdg m
8800



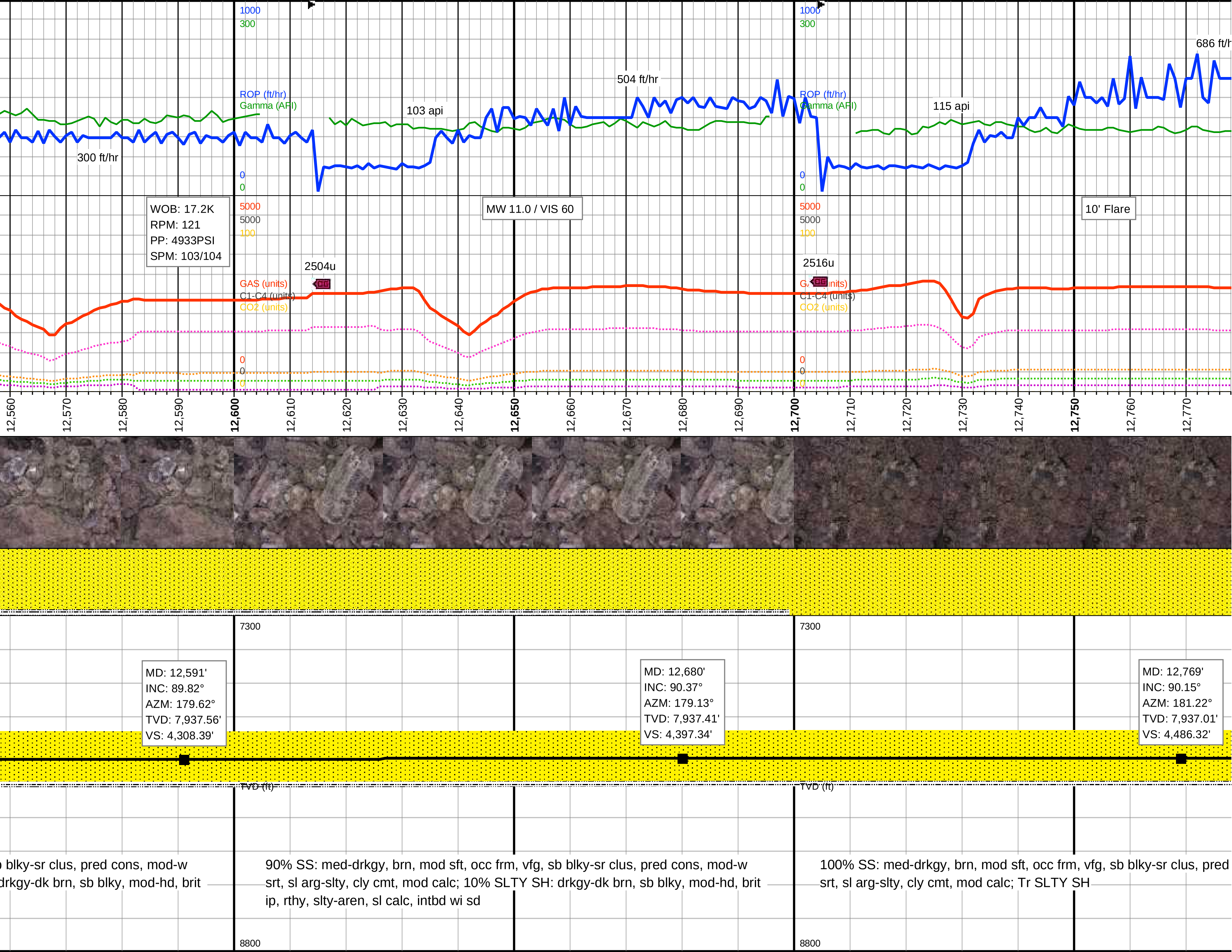
41 api
128 ft/hr
87 api
31 api
150 ft/hr
1000
300
ROP (ft/hr)
Gamma (API)
0
0
5000
5000
100
GAS (units)
C1-C4 (units)
CO2 (units)
0
0
0
MW 11.0 / VIS 65
WOB: 15.8K
RPM: 71
PP: 4185PSI
SPM: 95/95
2187u
Recycle for Survey
2110u
MW 11.0 / VIS 62
12,120
12,130
12,140
12,150
12,160
12,170
12,180
12,190
12,200
12,210
12,220
12,230
12,240
12,250
12,260
12,270
12,280
12,290
12,300
12,310
12,320
12,330
7300
MD: 12,144'
INC: 88.03°
AZM: 179.4°
TVD: 7,928.06'
VS: 3,862.48'
MD: 12,233'
INC: 88.12°
AZM: 178.58°
TVD: 7,931.05'
VS: 3,951.36'
MD: 12,322'
INC: 88.06°
AZM: 176.56°
TVD: 7,934.02'
VS: 4,040.13'
TVD (ft)
Drilled into Codell: 12327' M
d-ltbn, crm-bf wh, frm-mod frm, occ brit, sb blky-sb ang, micxln-xl tex, v
al; 15% CALC SH: med-drkgy, dl blshgy, mod sft, sb blky-sb plty, slty,
rl
90% LS: med-ltbn, crm-bf wh, frm-mod frm, occ brit, sb blky-sb ang, micxln-xl tex, v
calc, tr flor cal, tr sd grns; 10% CALC SH: medgy, dl blshgy, mod sft, sb blky-sb plty,
slty, calc, grdg mrl
90% LS: pred med brn, sme lt
micxln-xl tex, v calc, tr flor cal,
sb blky-sb plty, slty, calc, grdg
8800



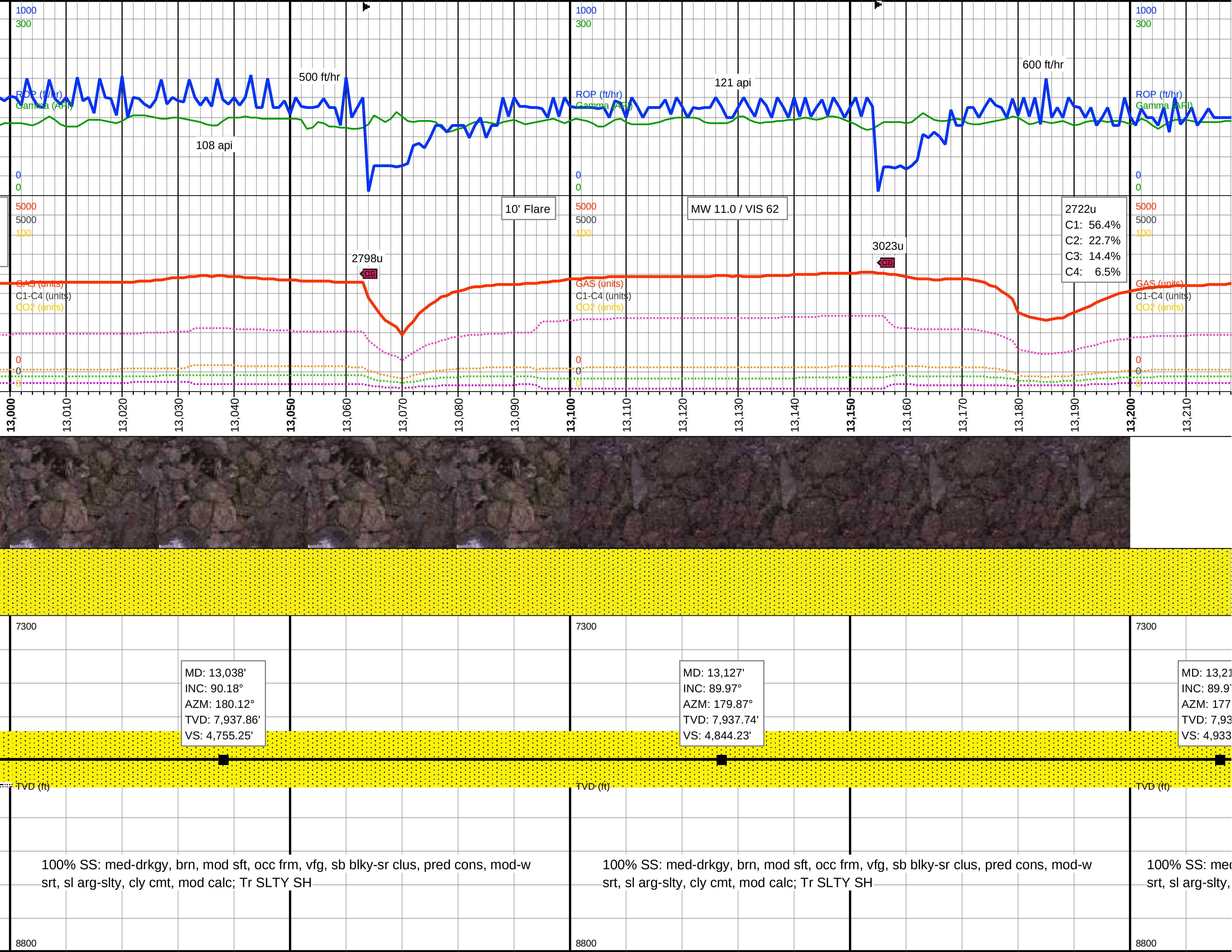
bn-crm, frm-mod frm, occ brit, sb blky-sb ang, tr sd grns; 10% CALC SH: medgy, dl blshgy, mod sft, mrl

95% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; 5% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd

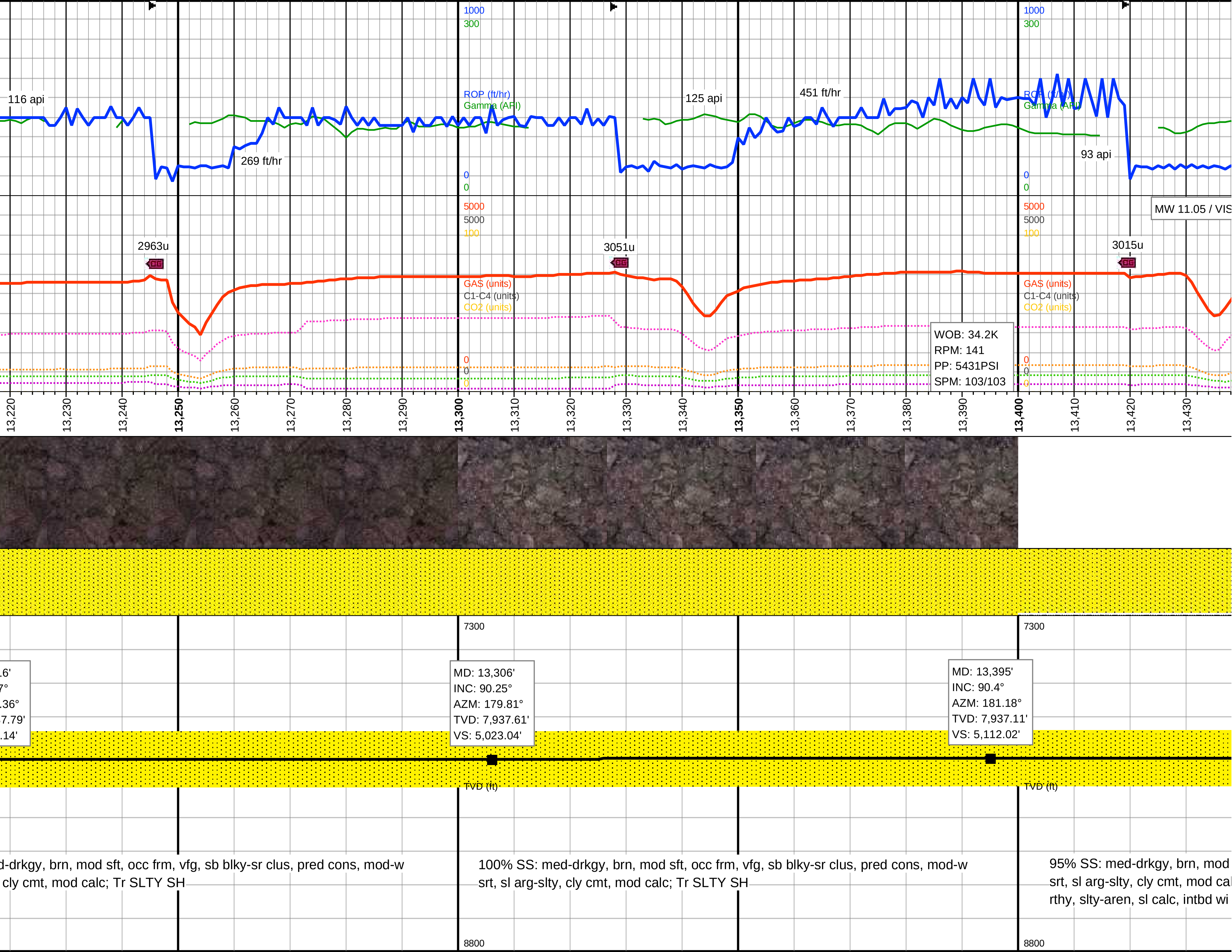
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb srt, sl arg-slty, cly cmt, mod calc; 10% SLTY SH: d ip, rthy, slty-aren, sl calc, intbd wi sd


ROP (ft/hr)
Gamma (API)
1000
300
0
300 ft/hr
103 api
504 ft/hr
115 api
686 ft/hr
WOB: 17.2K
RPM: 121
PP: 4933PSI
SPM: 103/104
MW 11.0 / VIS 60
10' Flare
5000
100
GAS (units)
C1-C4 (units)
CO2 (units)
2504u
2516u
12,560
12,570
12,580
12,590
12,600
12,610
12,620
12,630
12,640
12,650
12,660
12,670
12,680
12,690
12,700
12,710
12,720
12,730
12,740
12,750
12,760
12,770
7300
8800
TVD (ft)
MD: 12,591'
INC: 89.82°
AZM: 179.62°
TVD: 7,937.56'
VS: 4,308.39'
MD: 12,680'
INC: 90.37°
AZM: 179.13°
TVD: 7,937.41'
VS: 4,397.34'
MD: 12,769'
INC: 90.15°
AZM: 181.22°
TVD: 7,937.01'
VS: 4,486.32'
b blky-sr clus, pred cons, mod-w
drkgy-dk brn, sb blky, mod-hd, brit
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w
srt, sl arg-slty, cly cmt, mod calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit
ip, rthy, slty-aren, sl calc, intbd wi sd
100% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred
srt, sl arg-slty, cly cmt, mod calc; Tr SLTY SH

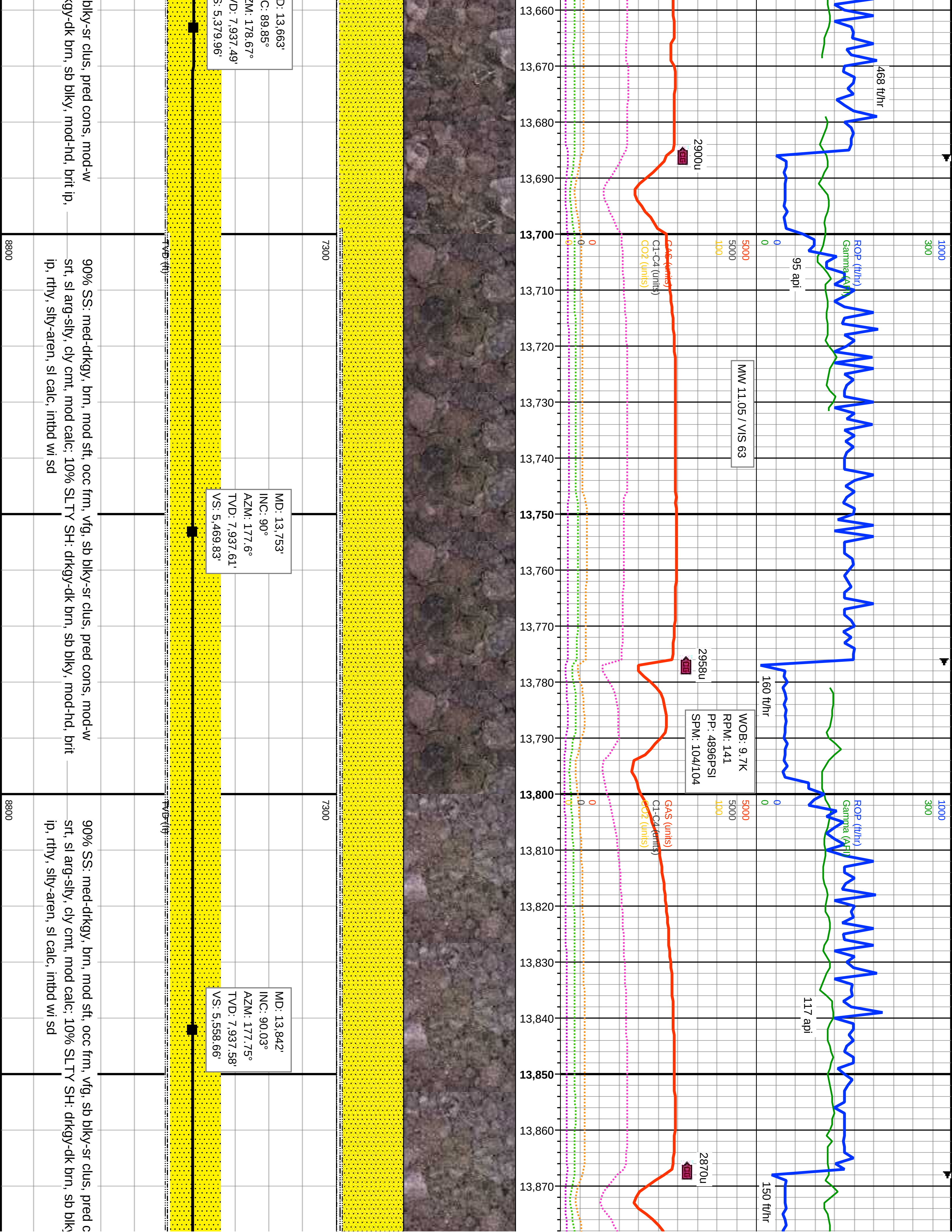
ROP (ft/hr)
Gamma (API)
1000
300
0
0
94 api
156 ft/hr
119 api
300 ft/hr
GAS (units)
C1-C4 (units)
CO2 (units)
5000
5000
100
2657u
2622u
C1: 62.9%
C2: 20.9%
C3: 11.8%
C4: 4.4%
2897u
2795u
MW 11.0 / VIS 62
WOB: 31.9K
RPM: 141
PP: 5345PSI
SPM: 103/104
12,780
12,790
12,800
12,810
12,820
12,830
12,840
12,850
12,860
12,870
12,880
12,890
12,900
12,910
12,920
12,930
12,940
12,950
12,960
12,970
12,980
12,990
7300
TVD (ft)
8800
MD: 12,859'
INC: 89.38°
AZM: 179.84°
TVD: 7,937.38'
VS: 4,576.31'
MD: 12,948'
INC: 89.91°
AZM: 179.61°
TVD: 7,937.93'
VS: 4,665.28'
cons, mod-w
100% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; Tr SLTY SH
100% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; Tr SLTY SH



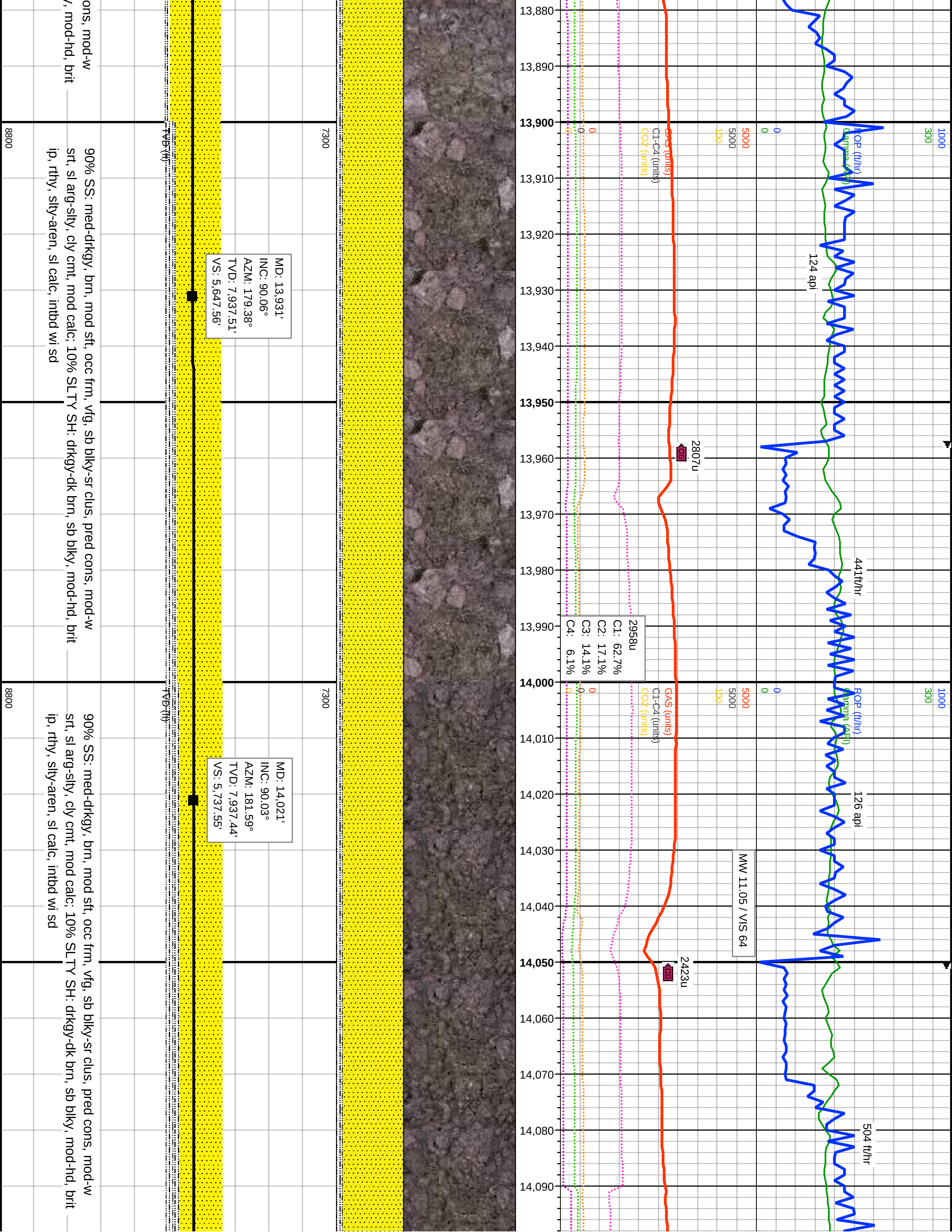
ROP (ft/hr) 0 1000
Gamma (API) 0 300
GAS (units) 0 5000
C1-C4 (units) 0 5000
CO2 (units) 0 100
108 api
500 ft/hr
121 api
600 ft/hr
2798u
3023u
10' Flare
MW 11.0 / VIS 62
2722u
C1: 56.4%
C2: 22.7%
C3: 14.4%
C4: 6.5%
13,000
13,010
13,020
13,030
13,040
13,050
13,060
13,070
13,080
13,090
13,100
13,110
13,120
13,130
13,140
13,150
13,160
13,170
13,180
13,190
13,200
13,210
7300
TVD (ft)
8800
MD: 13,038'
INC: 90.18°
AZM: 180.12°
TVD: 7,937.86'
VS: 4,755.25'
MD: 13,127'
INC: 89.97°
AZM: 179.87°
TVD: 7,937.74'
VS: 4,844.23'
MD: 13,21
INC: 89.9
AZM: 177
TVD: 7,93
VS: 4,933
100% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; Tr SLTY SH
100% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; Tr SLTY SH
100% SS: med
srt, sl arg-slty,


116 api
269 ft/hr
ROP (ft/hr)
Gamma (API)
1000
300
0
0
125 api
451 ft/hr
93 api
MW 11.05 / VIS
2963u
3051u
3015u
5000
5000
100
GAS (units)
C1-C4 (units)
CO2 (units)
0
0
0
WOB: 34.2K
RPM: 141
PP: 5431PSI
SPM: 103/103
13,220
13,230
13,240
13,250
13,260
13,270
13,280
13,290
13,300
13,310
13,320
13,330
13,340
13,350
13,360
13,370
13,380
13,390
13,400
13,410
13,420
13,430
7300
8800
TVD (ft)
.6'
7°
.36°
7.79'
.14'
MD: 13,306'
INC: 90.25°
AZM: 179.81°
TVD: 7,937.61'
VS: 5,023.04'
MD: 13,395'
INC: 90.4°
AZM: 181.18°
TVD: 7,937.11'
VS: 5,112.02'
d-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w
cly cmt, mod calc; Tr SLTY SH
100% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; Tr SLTY SH
95% SS: med-drkgy, brn, mod srt, sl arg-slty, cly cmt, mod cal rthy, slty-aren, sl calc, intbd wi

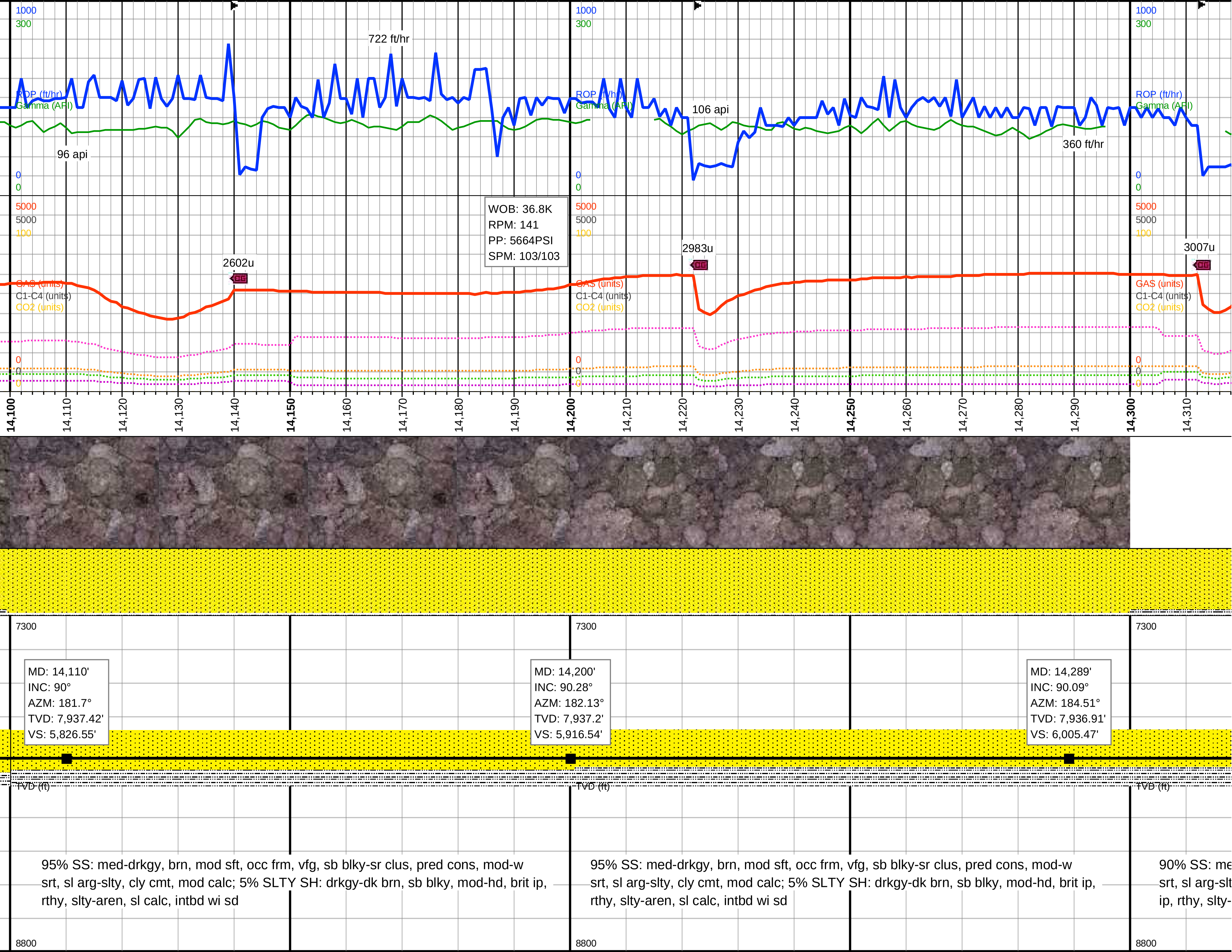
600 ft/hr
360 ft/hr
114 api
117 api
ROP (ft/hr)
Gamma (API)
1000
300
0
0
63
5000
5000
100
GAS (units)
C1-C4 (units)
CO2 (units)
0
0
0
2722u
2993u
2997u
C1: 57.2%
C2: 22.2%
C3: 14.1%
C4: 6.6%
13,440
13,450
13,460
13,470
13,480
13,490
13,500
13,510
13,520
13,530
13,540
13,550
13,560
13,570
13,580
13,590
13,600
13,610
13,620
13,630
13,640
13,650
7300
TVD (ft)
8800
MD: 13,485'
INC: 89.78°
AZM: 181.41°
TVD: 7,936.97'
VS: 5,202.02'
MD: 13,574'
INC: 89.85°
AZM: 179.72°
TVD: 7,937.26'
VS: 5,291.01'
sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w
lc; 5% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip,
sd
95% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w
srt, sl arg-slty, cly cmt, mod calc; 5% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip,
rthy, slty-aren, sl calc, intbd wi sd
95% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb
srt, sl arg-slty, cly cmt, mod calc; 5% SLTY SH: drk
rthy, slty-aren, sl calc, intbd wi sd



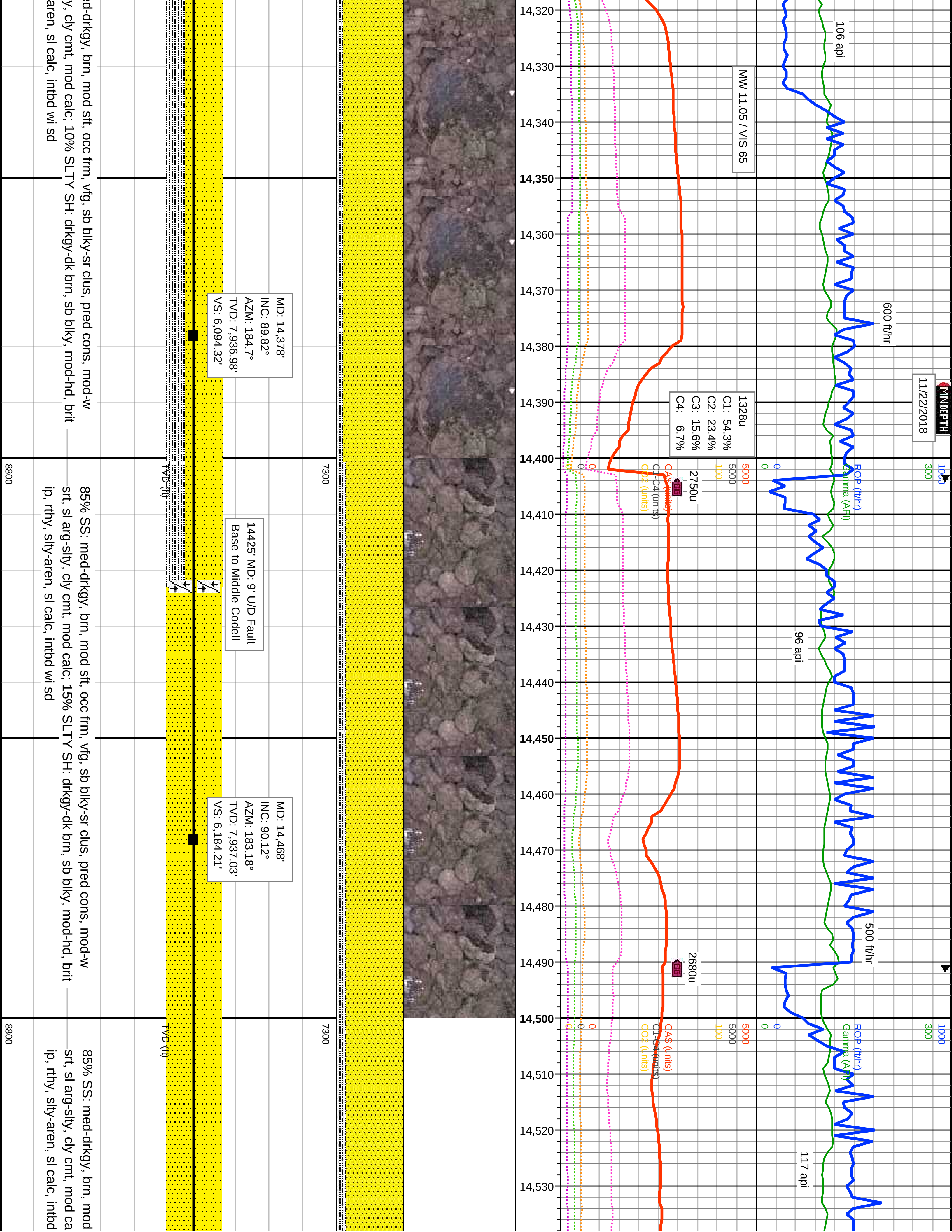
MD: 13,663'
INC: 89.85°
AZM: 178.67°
TVD: 7,937.49'
VS: 5,379.96'
blky-sr clus, pred cons, mod-w
dkgy-dk brn, sb blky, mod-hd, brit ip,
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
MD: 13,753'
INC: 90°
AZM: 177.6°
TVD: 7,937.61'
VS: 5,469.83'
MD: 13,842'
INC: 90.03°
AZM: 177.75°
TVD: 7,937.58'
VS: 5,558.66'
8800
7300
TVD (ft)
13,660
13,670
13,680
13,690
13,700
13,710
13,720
13,730
13,740
13,750
13,760
13,770
13,780
13,790
13,800
13,810
13,820
13,830
13,840
13,850
13,860
13,870
GAS (units)
C1-C4 (units)
CO2 (units)
0
5000
100
ROP (ft/hr)
Gamma (API)
300
1000
2900u
2958u
2870u
468 ft/hr
95 api
160 ft/hr
117 api
150 ft/hr
MW 11.05 / VIS 63
WOB: 9.7K
RPM: 141
PP: 4896PSI
SPM: 104/104



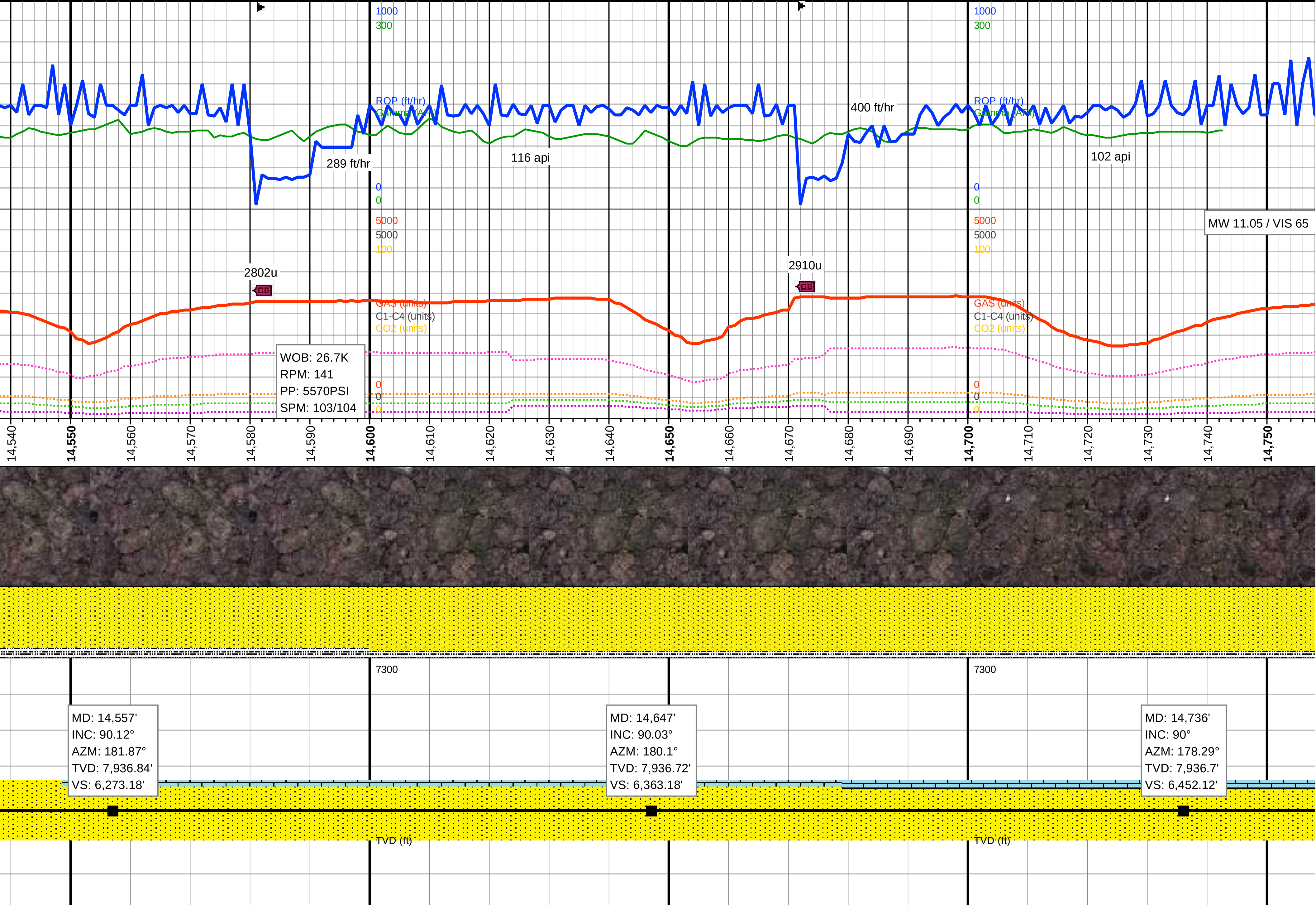
ons, mod-w
/, mod-hd, brit
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
8800
7300
TVD (ft)
MD: 13,931'
INC: 90.06°
AZM: 179.38°
TVD: 7,937.51'
VS: 5,647.56'
13,880
13,890
13,900
13,910
13,920
13,930
13,940
13,950
13,960
13,970
13,980
13,990
14,000
14,010
14,020
14,030
14,040
14,050
14,060
14,070
14,080
14,090
GAS (units) 0 5000
C1-C4 (units) 0 5000
CO2 (units) 0 100
ROP (ft/hr) 0 1000
Gamma (API) 0 300
124 api
2807u
441ft/hr
2958u
C1: 62.7%
C2: 17.1%
C3: 14.1%
C4: 6.1%
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
MD: 14,021'
INC: 90.03°
AZM: 181.59°
TVD: 7,937.44'
VS: 5,737.55'
126 api
MW 11.05 / VIS 64
2423u
504 ft/hr



ROP (ft/hr) 0 1000
Gamma (API) 0 300
96 api
722 ft/hr
106 api
360 ft/hr
GAS (units) 0 5000
C1-C4 (units) 0 5000
CO2 (units) 0 100
2602u
2983u
3007u
WOB: 36.8K
RPM: 141
PP: 5664PSI
SPM: 103/103
14,100
14,110
14,120
14,130
14,140
14,150
14,160
14,170
14,180
14,190
14,200
14,210
14,220
14,230
14,240
14,250
14,260
14,270
14,280
14,290
14,300
14,310
7300
TVD (ft)
8800
MD: 14,110'
INC: 90°
AZM: 181.7°
TVD: 7,937.42'
VS: 5,826.55'
MD: 14,200'
INC: 90.28°
AZM: 182.13°
TVD: 7,937.2'
VS: 5,916.54'
MD: 14,289'
INC: 90.09°
AZM: 184.51°
TVD: 7,936.91'
VS: 6,005.47'
95% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; 5% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
95% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; 5% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
90% SS: me
srt, sl arg-slt
ip, rthy, slty-



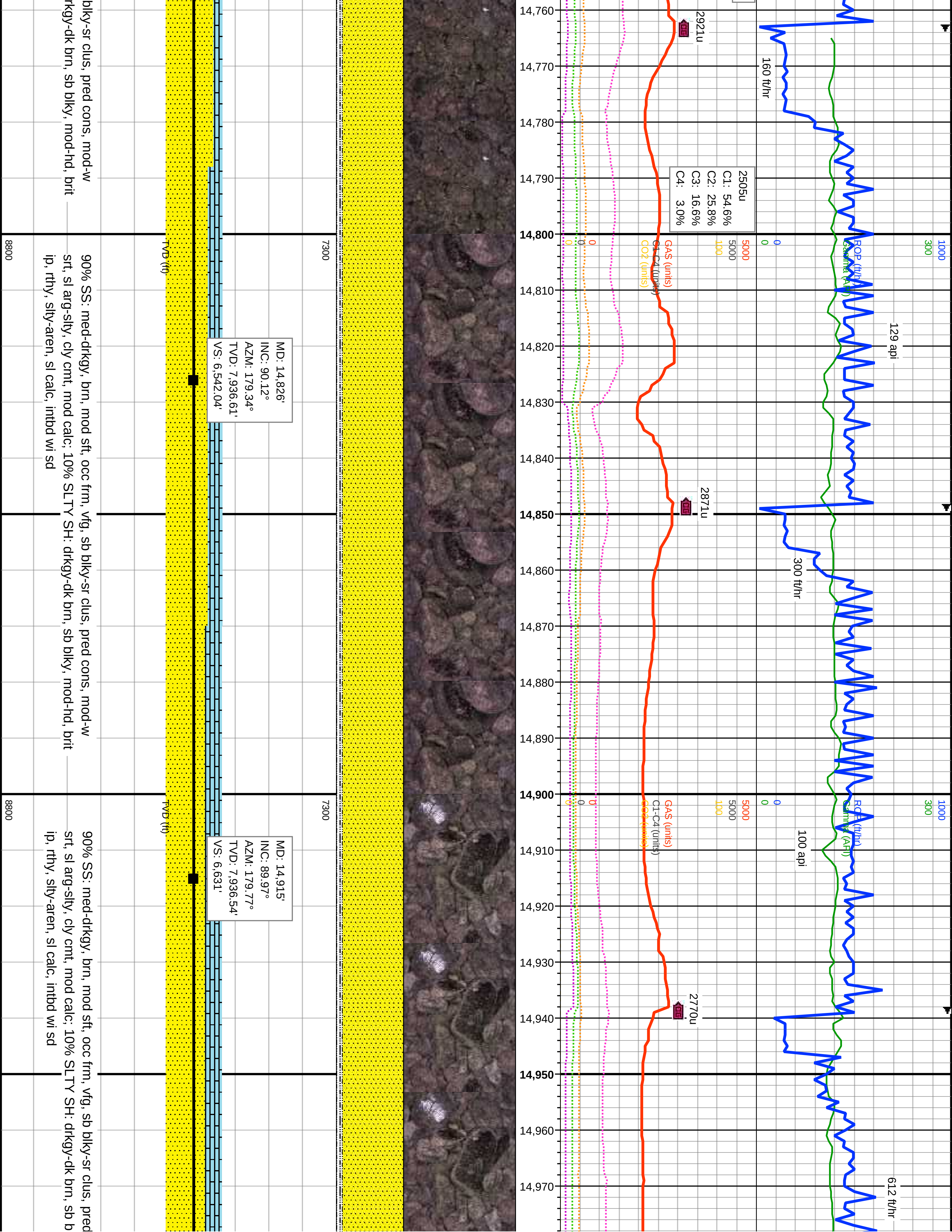
...d-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w ...y, cly cmt, mod calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ...aren, sl calc, intbd wi sd
MD: 14,378'
INC: 89.82°
AZM: 184.7°
TVD: 7,936.98'
VS: 6,094.32'
MW 11.05 / VIS 65
106 api
600 ft/hr
1328u
C1: 54.3%
C2: 23.4%
C3: 15.6%
C4: 6.7%
11/22/2018
MINDEPTH
14,320
14,330
14,340
14,350
14,360
14,370
14,380
14,390
14,400
8800
7300
TVD (ft)
0
0
0
5000
100
5000
0
0
1000
300
GAS (units)
C1-C4 (units)
CO2 (units)
ROP (ft/hr)
Gamma (API)
2750u
85% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; 15% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
14425' MD: 9' U/D Fault
Base to Middle Codell
96 api
MD: 14,468'
INC: 90.12°
AZM: 183.18°
TVD: 7,937.03'
VS: 6,184.21'
500 ft/hr
2680u
14,410
14,420
14,430
14,440
14,450
14,460
14,470
14,480
14,490
14,500
8800
7300
TVD (ft)
0
0
0
5000
100
5000
0
0
1000
300
GAS (units)
C1-C4 (units)
CO2 (units)
ROP (ft/hr)
Gamma (API)
85% SS: med-drkgy, brn, mod ...srt, sl arg-slty, cly cmt, mod ca... ip, rthy, slty-aren, sl calc, intbd...
117 api
14,510
14,520
14,530



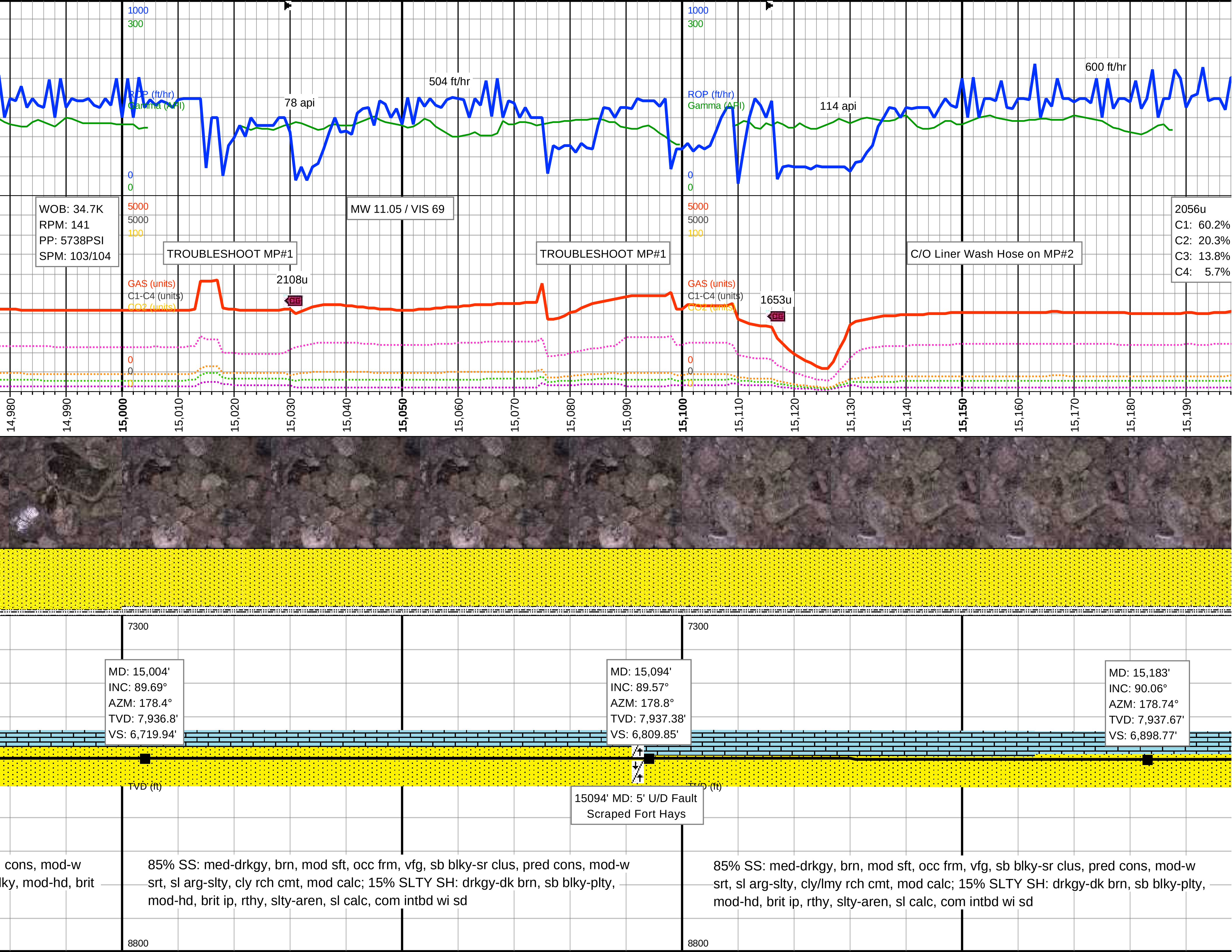
sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w
lc; 15% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit
wi sd

90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd

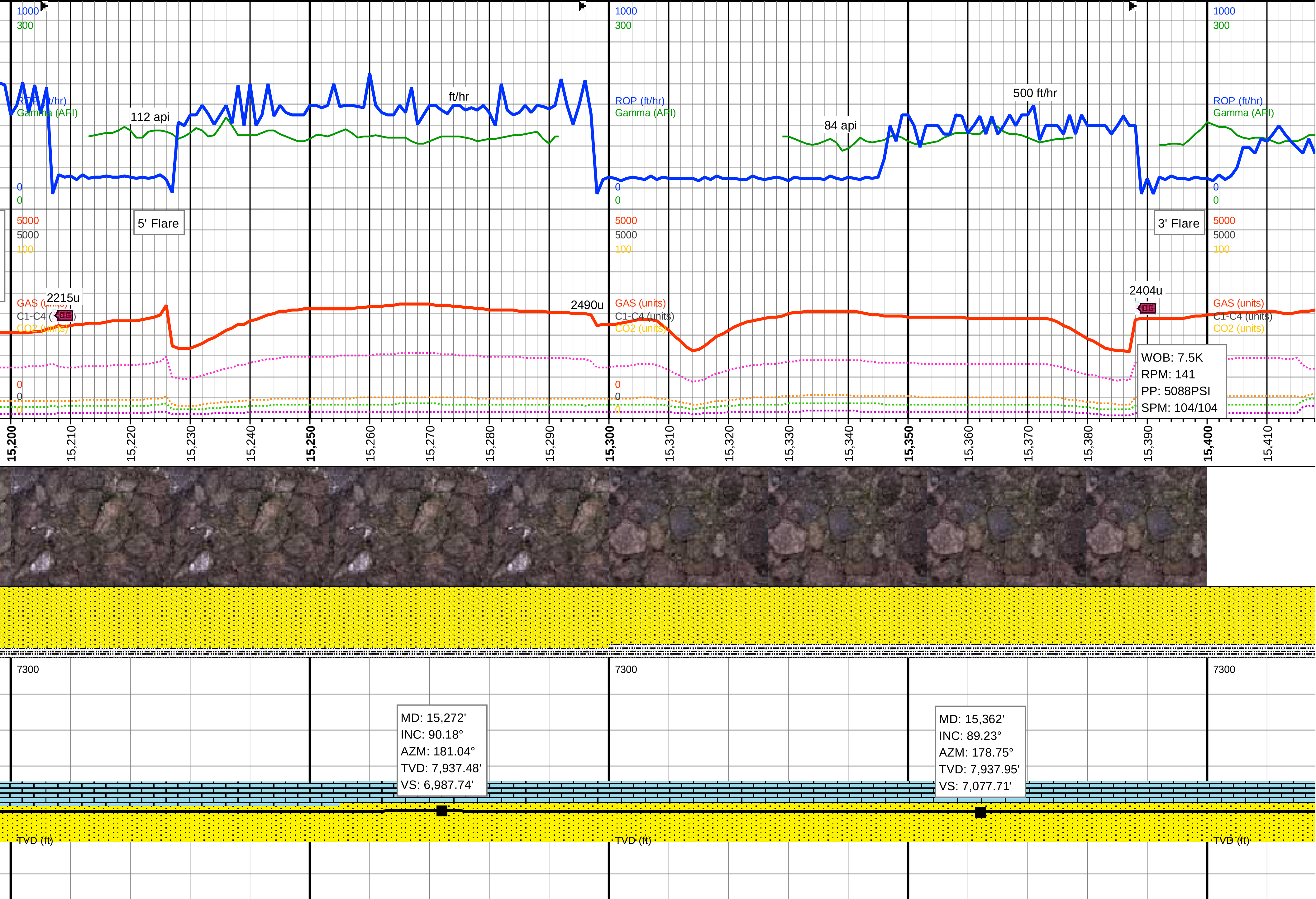
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb
srt, sl arg-slty, cly cmt, mod calc; 10% SLTY SH: d
ip, rthy, slty-aren, sl calc, intbd wi sd



blky-sr clus, pred cons, mod-w
rkgy-dk brn, sb blky, mod-hd, brit
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, mod calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred
srt, sl arg-slty, cly cmt, mod calc; 10% SLTY SH: drkgy-dk brn, sb b
ip, rthy, slty-aren, sl calc, intbd wi sd
8800
TVD (ft)
7300
MD: 14,826'
INC: 90.12°
AZM: 179.34°
TVD: 7,936.61'
VS: 6,542.04'
MD: 14,915'
INC: 89.97°
AZM: 179.77°
TVD: 7,936.54'
VS: 6,631'
14,760
14,770
14,780
14,790
14,800
14,810
14,820
14,830
14,840
14,850
14,860
14,870
14,880
14,890
14,900
14,910
14,920
14,930
14,940
14,950
14,960
14,970
2921u
2505u
C1: 54.6%
C2: 25.8%
C3: 16.6%
C4: 3.0%
2871u
2770u
GAS (units)
C1-C4 (units)
CO2 (units)
0
5000
100
ROP (ft/hr)
Gamma (API)
1000
300
160 ft/hr
129 api
300 ft/hr
100 api
612 ft/hr



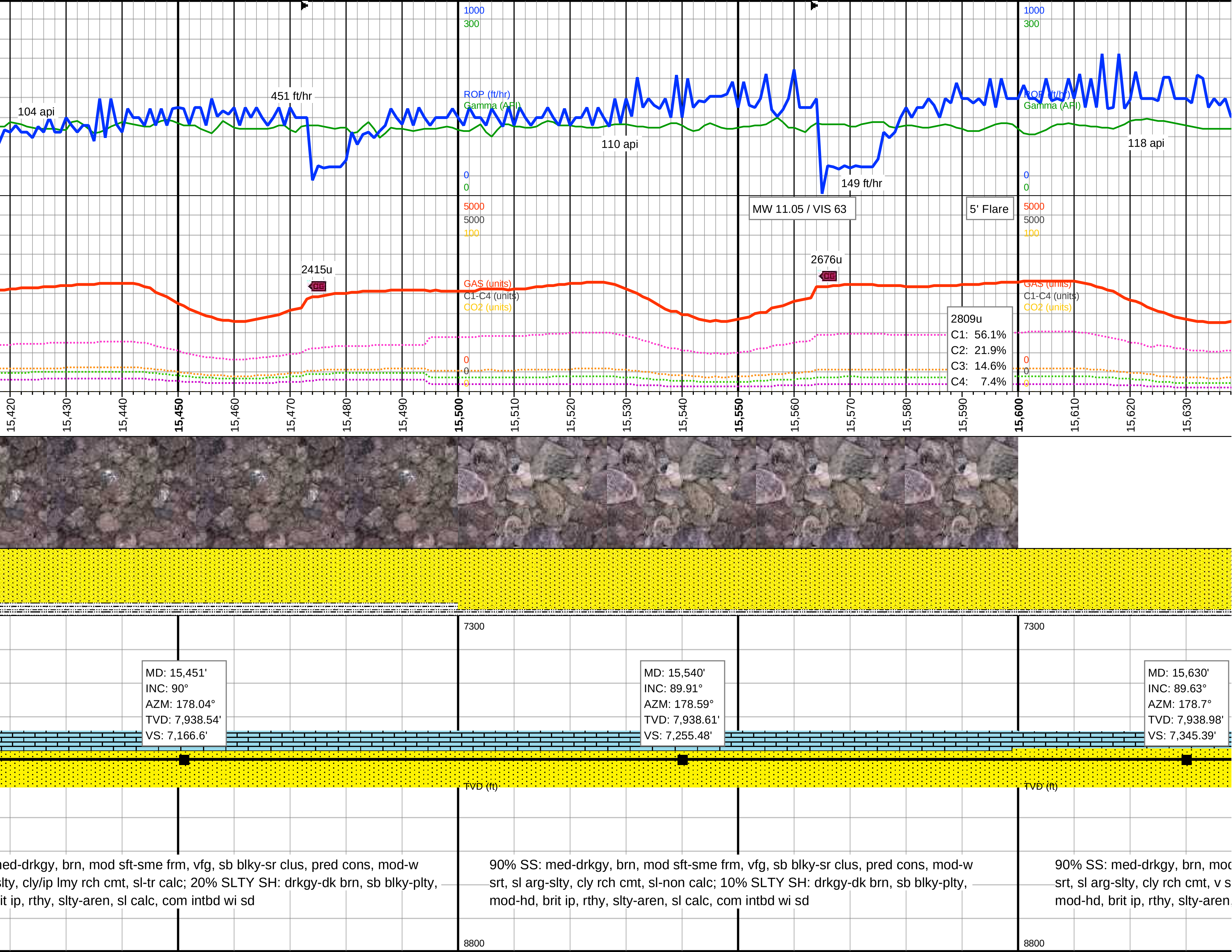
1000
300
ROP (ft/hr)
Gamma (API)
0
0
78 api
504 ft/hr
114 api
600 ft/hr
WOB: 34.7K
RPM: 141
PP: 5738PSI
SPM: 103/104
MW 11.05 / VIS 69
TROUBLESHOOT MP#1
TROUBLESHOOT MP#1
C/O Liner Wash Hose on MP#2
2056u
C1: 60.2%
C2: 20.3%
C3: 13.8%
C4: 5.7%
5000
5000
100
GAS (units)
C1-C4 (units)
CO2 (units)
2108u
1653u
0
0
0
14,980
14,990
15,000
15,010
15,020
15,030
15,040
15,050
15,060
15,070
15,080
15,090
15,100
15,110
15,120
15,130
15,140
15,150
15,160
15,170
15,180
15,190
7300
8800
TVD (ft)
MD: 15,004'
INC: 89.69°
AZM: 178.4°
TVD: 7,936.8'
VS: 6,719.94'
MD: 15,094'
INC: 89.57°
AZM: 178.8°
TVD: 7,937.38'
VS: 6,809.85'
MD: 15,183'
INC: 90.06°
AZM: 178.74°
TVD: 7,937.67'
VS: 6,898.77'
15094' MD: 5' U/D Fault
Scraped Fort Hays
cons, mod-w
lky, mod-hd, brit
85% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, mod calc; 15% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd
85% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly/lmy rch cmt, mod calc; 15% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd

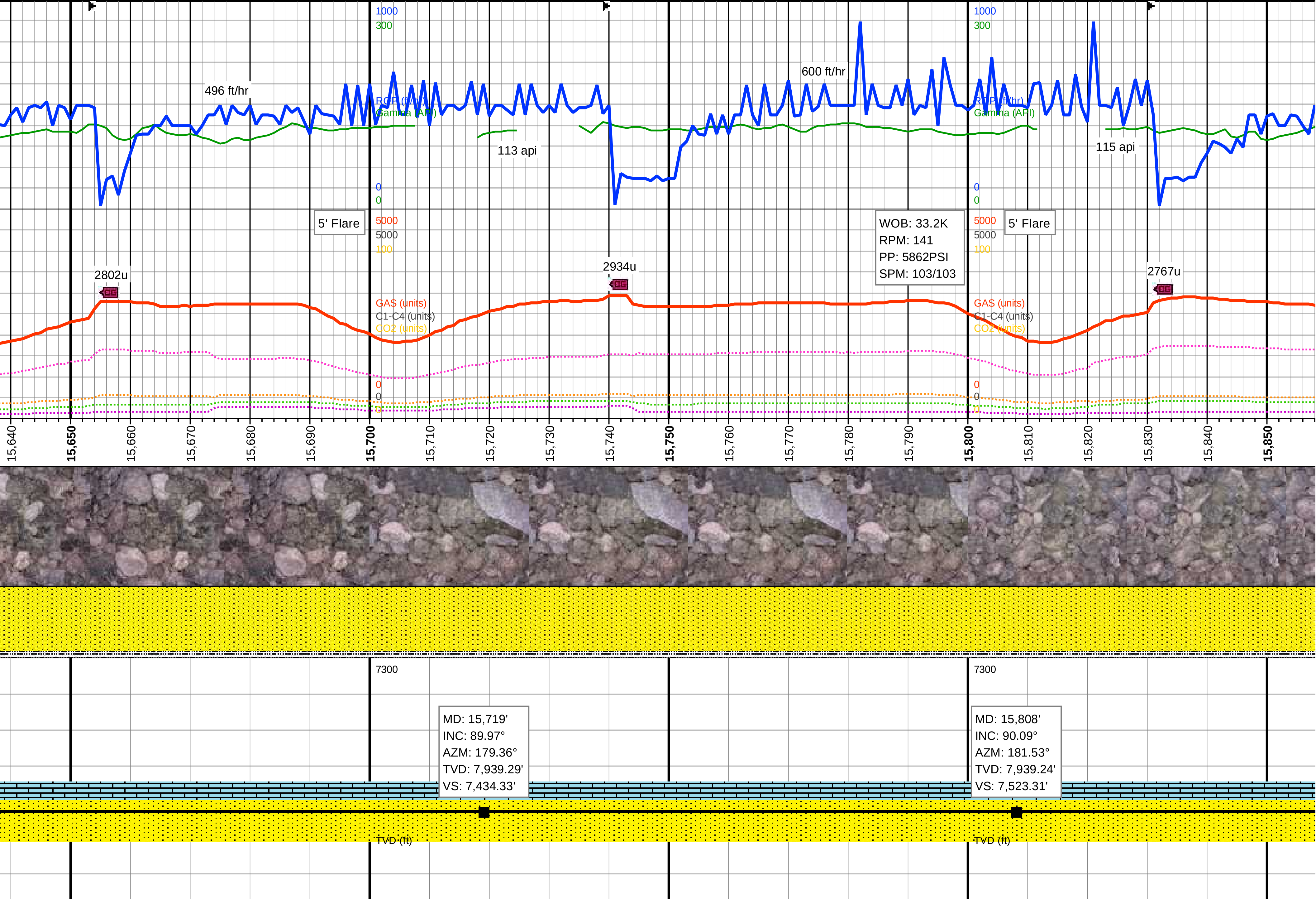


85% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly/lmy rch cmt, mod calc; 15% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd

80% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly/lmy rch cmt, mod-tr calc; 20% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd

80% SS: m
srt, sl arg-s
mod-hd, br


ROP (ft/hr)
Gamma (API)
1000
300
0
0
104 api
451 ft/hr
110 api
149 ft/hr
118 api
GAS (units)
C1-C4 (units)
CO2 (units)
5000
5000
100
0
0
0
2415u
2676u
MW 11.05 / VIS 63
5' Flare
2809u
C1: 56.1%
C2: 21.9%
C3: 14.6%
C4: 7.4%
15,420
15,430
15,440
15,450
15,460
15,470
15,480
15,490
15,500
15,510
15,520
15,530
15,540
15,550
15,560
15,570
15,580
15,590
15,600
15,610
15,620
15,630
7300
TVD (ft)
8800
MD: 15,451'
INC: 90°
AZM: 178.04°
TVD: 7,938.54'
VS: 7,166.6'
MD: 15,540'
INC: 89.91°
AZM: 178.59°
TVD: 7,938.61'
VS: 7,255.48'
MD: 15,630'
INC: 89.63°
AZM: 178.7°
TVD: 7,938.98'
VS: 7,345.39'
med-drkgy, brn, mod sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w
slty, cly/ip lmy rch cmt, sl-tr calc; 20% SLTY SH: drkgy-dk brn, sb blky-plty,
it ip, rthy, slty-aren, sl calc, com intbd wi sd
90% SS: med-drkgy, brn, mod sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w
srt, sl arg-slty, cly rch cmt, sl-non calc; 10% SLTY SH: drkgy-dk brn, sb blky-plty,
mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd
90% SS: med-drkgy, brn, moc
srt, sl arg-slty, cly rch cmt, v s
mod-hd, brit ip, rthy, slty-aren



d sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w
l-non calc; 10% SLTY SH: drkgy-dk brn, sb blky-plty,
, sl calc, com intbd wi sd

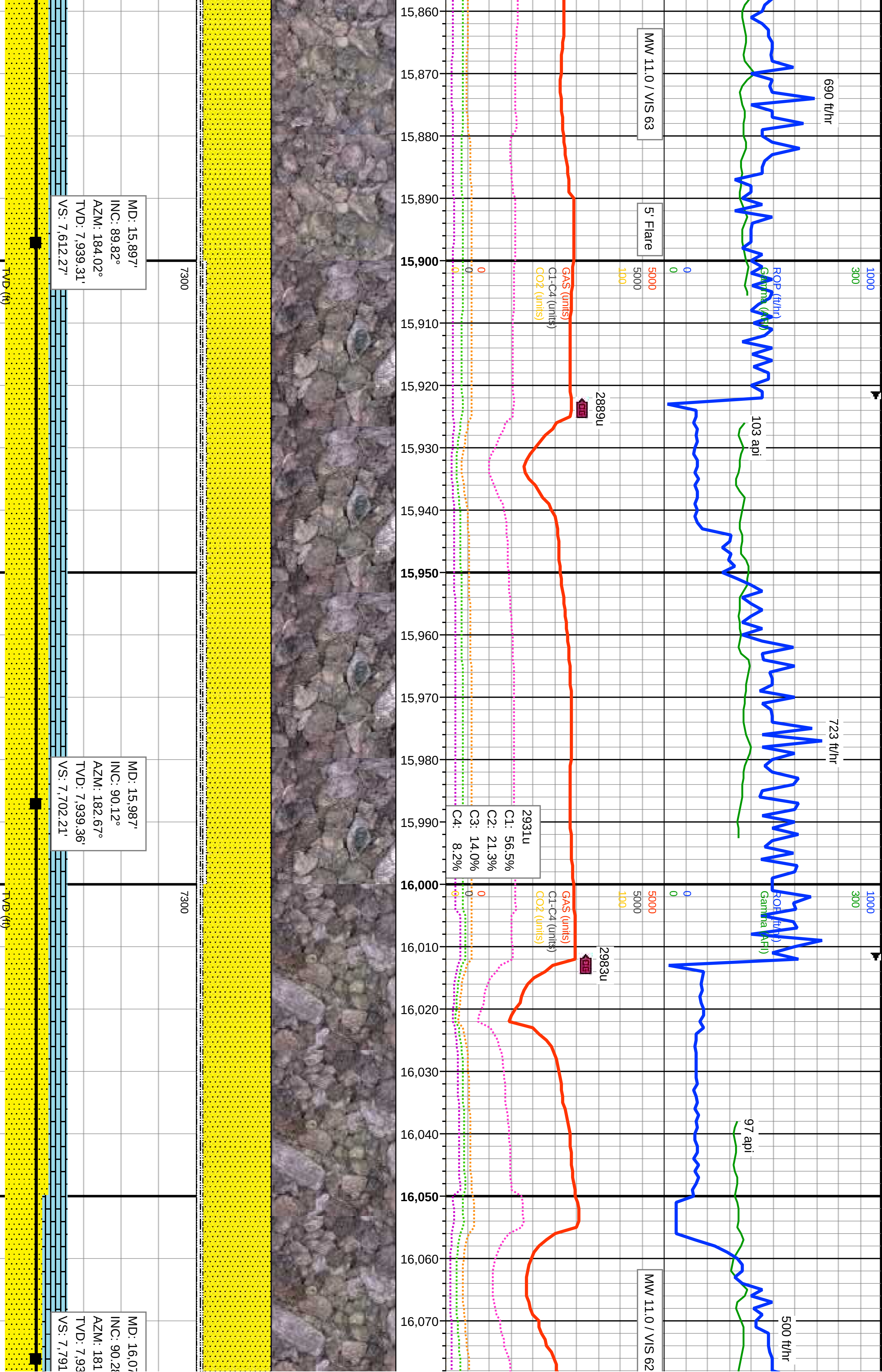
90% SS: med-drkgy, brn, mod sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, v sl-non calc; 10% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd

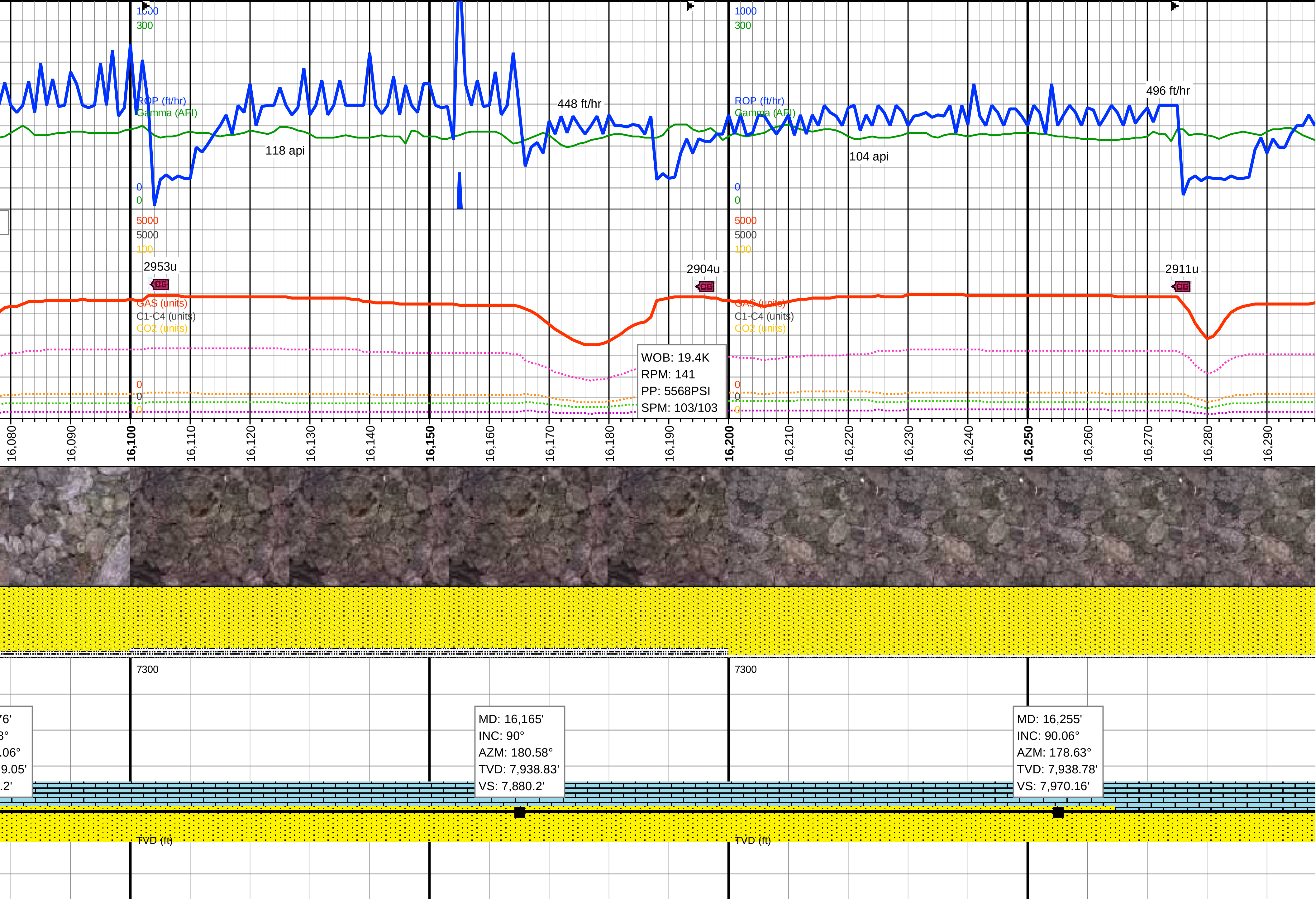
90% SS: med-drkgy, brn, mod sft-sme frm, vfg, s
srt, sl arg-slty, cly rch cmt, sl-non calc, rr bent; 10
blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, c

sb blky-sr clus, pred cons, mod-w
90% SLTY SH: drkgy-dk brn, sb
com intbd wi sd

85% SS: med-drkgy, brn, mod sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, sl-non calc; 15% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd

90% SS: med-drkgy, brn, mod sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, sl-non calc; 10% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd

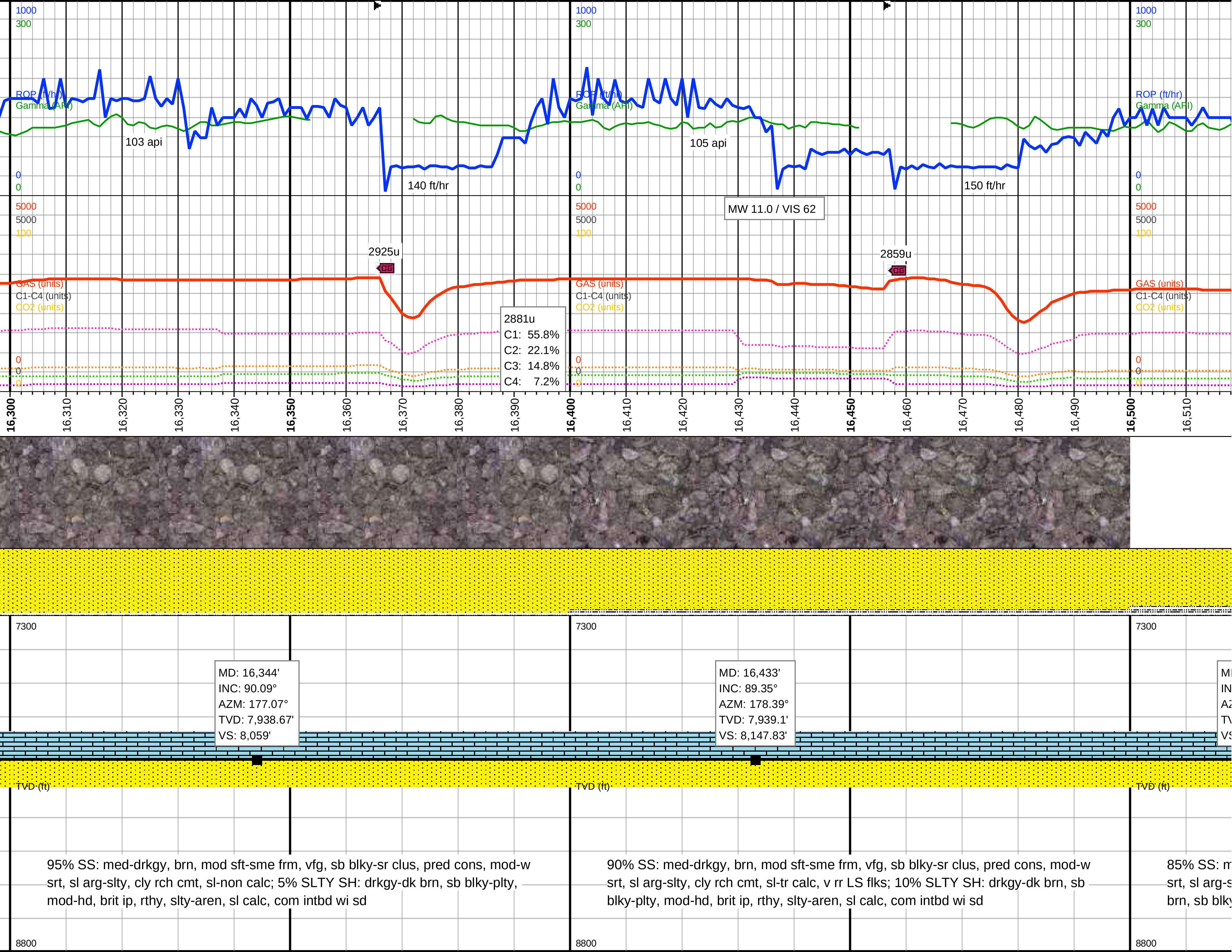




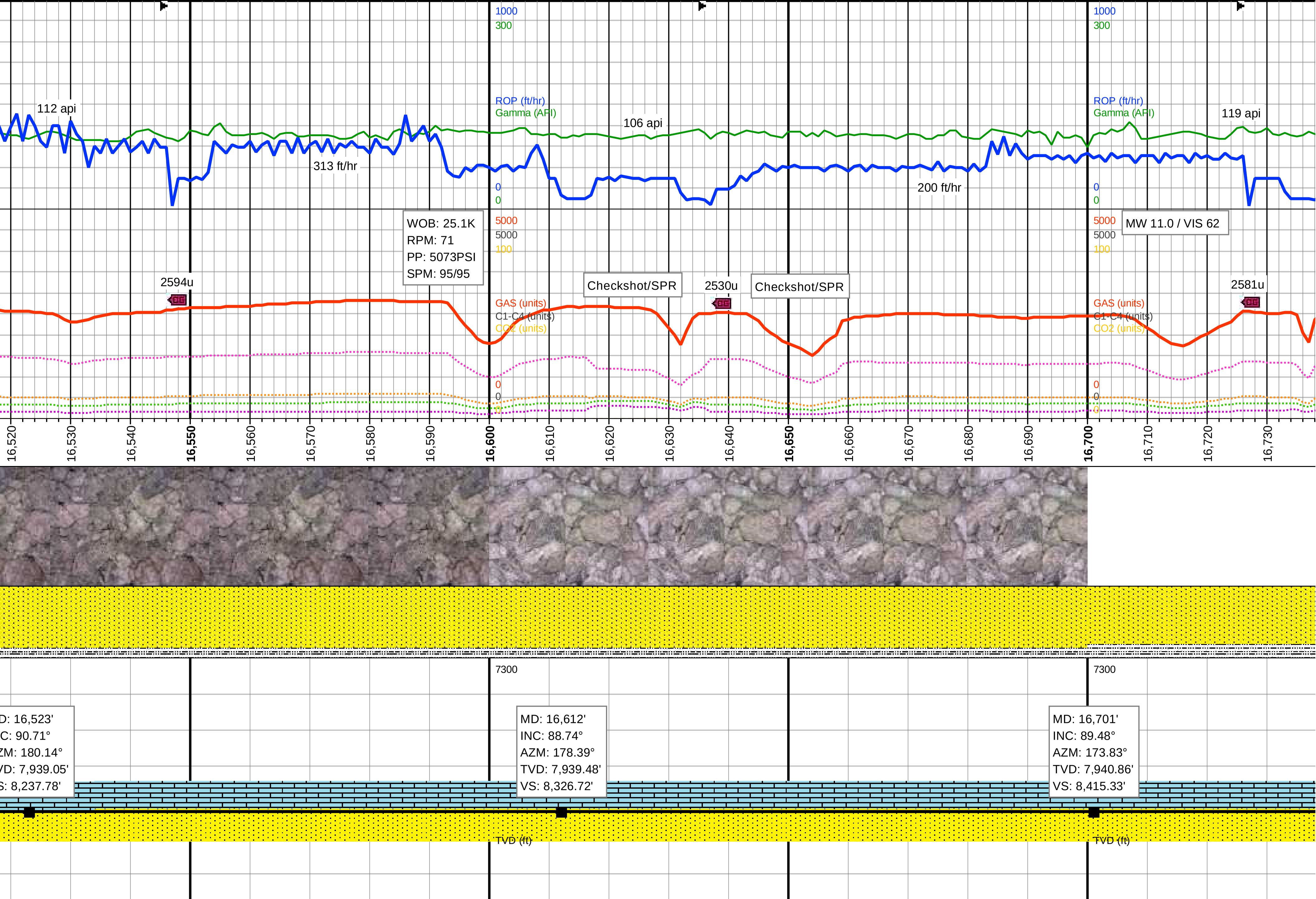
l cons, mod-w
, sb blky-plty,

85% SS: med-drkgy, brn, mod sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, sl-non calc; 15% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd

95% SS: med-drkgy, brn, mod sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, sl-non calc; 5% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd



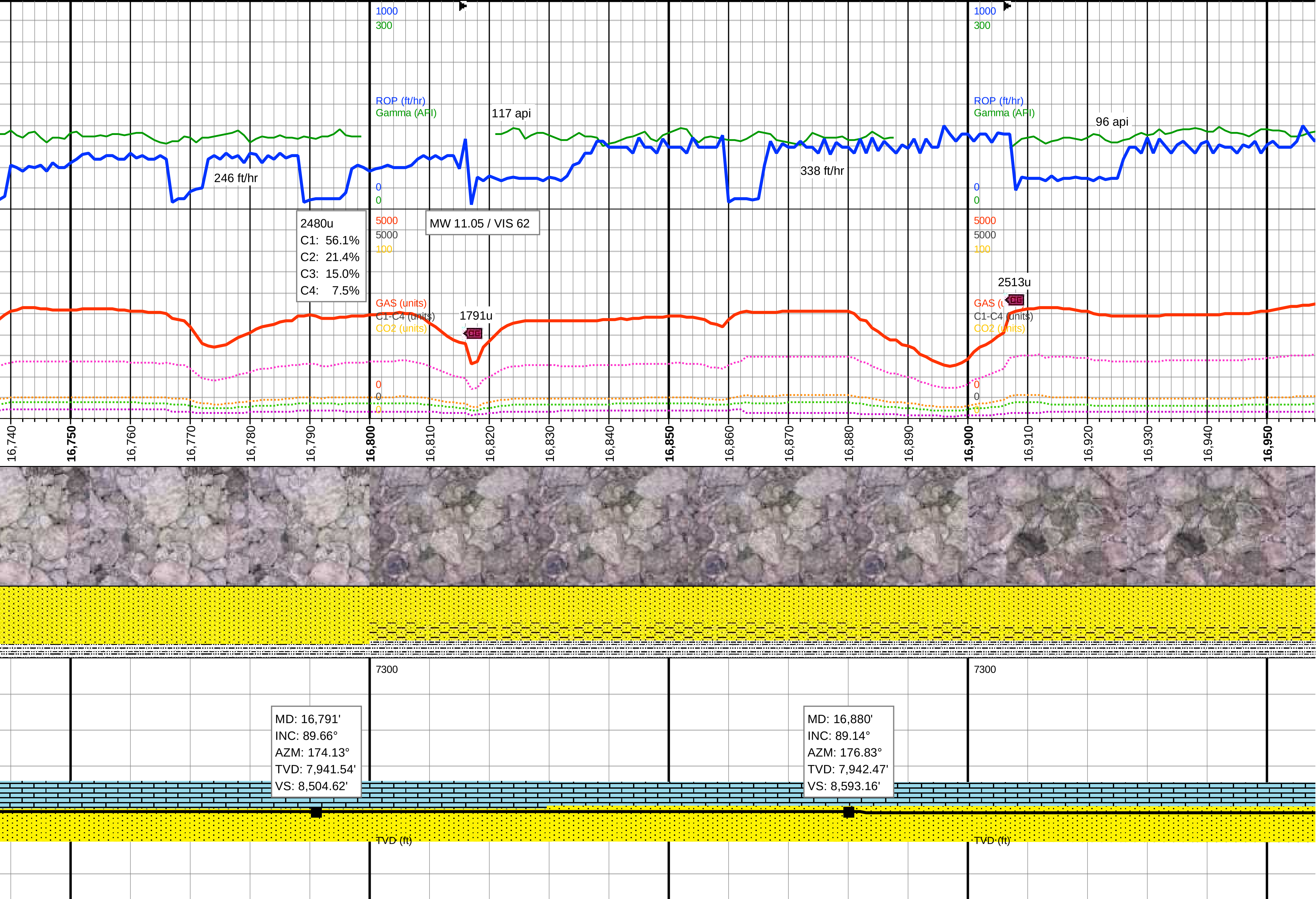
ROP (ft/hr)
Gamma (API)
1000
300
0
0
103 api
140 ft/hr
105 api
150 ft/hr
MW 11.0 / VIS 62
GAS (units)
C1-C4 (units)
CO2 (units)
5000
5000
100
2925u
2859u
2881u
C1: 55.8%
C2: 22.1%
C3: 14.8%
C4: 7.2%
16,300
16,310
16,320
16,330
16,340
16,350
16,360
16,370
16,380
16,390
16,400
16,410
16,420
16,430
16,440
16,450
16,460
16,470
16,480
16,490
16,500
16,510
7300
8800
TVD (ft)
MD: 16,344'
INC: 90.09°
AZM: 177.07°
TVD: 7,938.67'
VS: 8,059'
MD: 16,433'
INC: 89.35°
AZM: 178.39°
TVD: 7,939.1'
VS: 8,147.83'
95% SS: med-drkgy, brn, mod sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, sl-non calc; 5% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd
90% SS: med-drkgy, brn, mod sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, sl-tr calc, v rr LS flks; 10% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd
85% SS: m
srt, sl arg-s
brn, sb blky



ned-drkgy, brn, mod sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w slty, cly rch-ip lmy cmt, tr-mod calc, rr LS flks; 15% SLTY SH: drkgy-dk y-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd

85% SS: med-drkgy, brn, mod sft-sme frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch-ip lmy cmt, mod calc, rr LS flks; 15% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, tr calc, com intbd wi sd

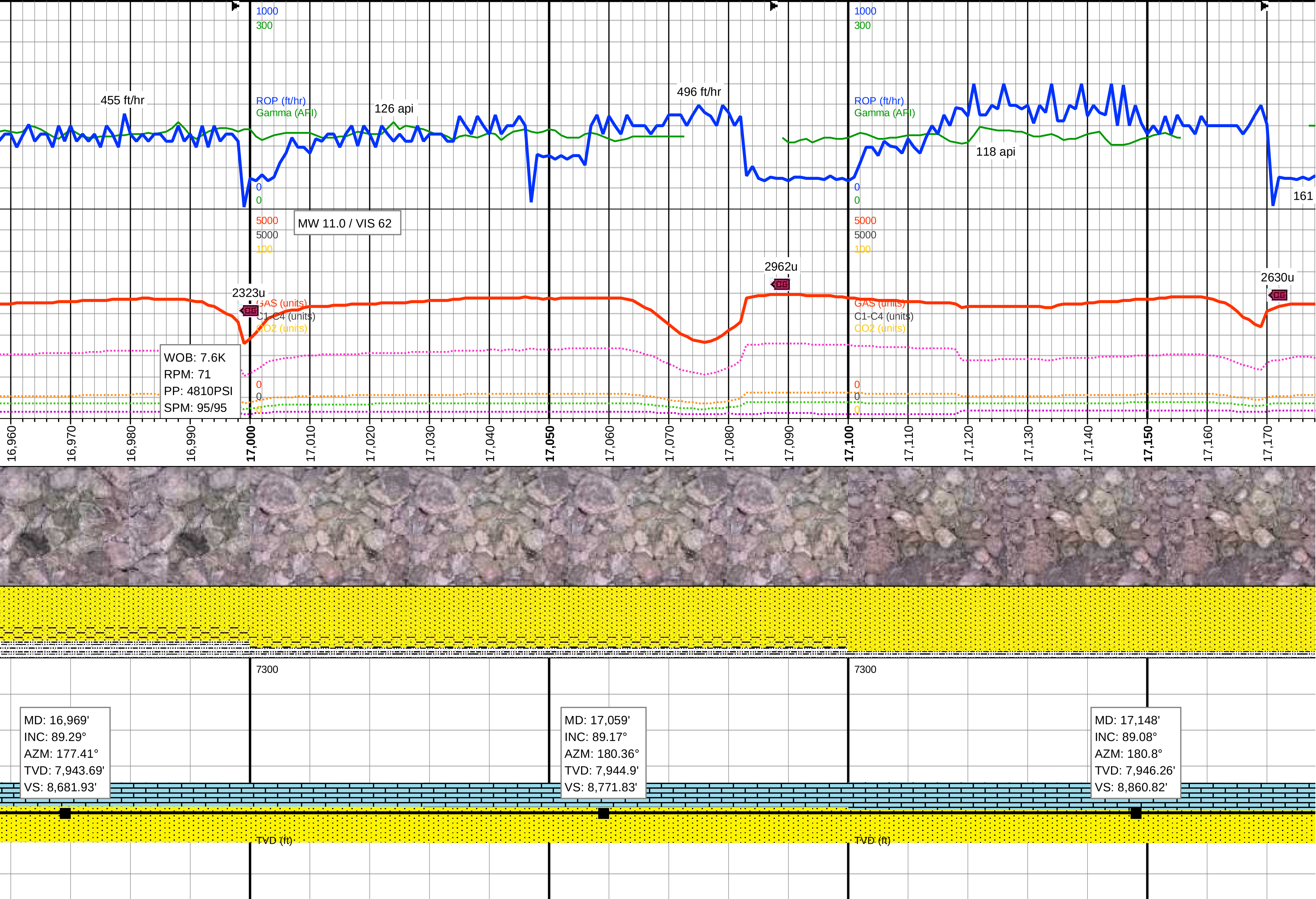
80% SS: med-drkgy, brn, mod sl arg-slty-lmy mtx, cly rch cmt, mod-hd, brit ip, rthy, slty-aren, r



sft-sme frm, vfg, sb blky-sr clus, pred cons, mod srt, mod calc; 20% SLTY SH: drkgy-dk brn, sb blky-plty, mod calc, com intbd wi sd

75% SS-SLTY SS: med-drkgy, lt-med brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, sl arg, slty/cly mtx, ip lmy, mod calc; 25% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, mod calc, com intbd wi sd

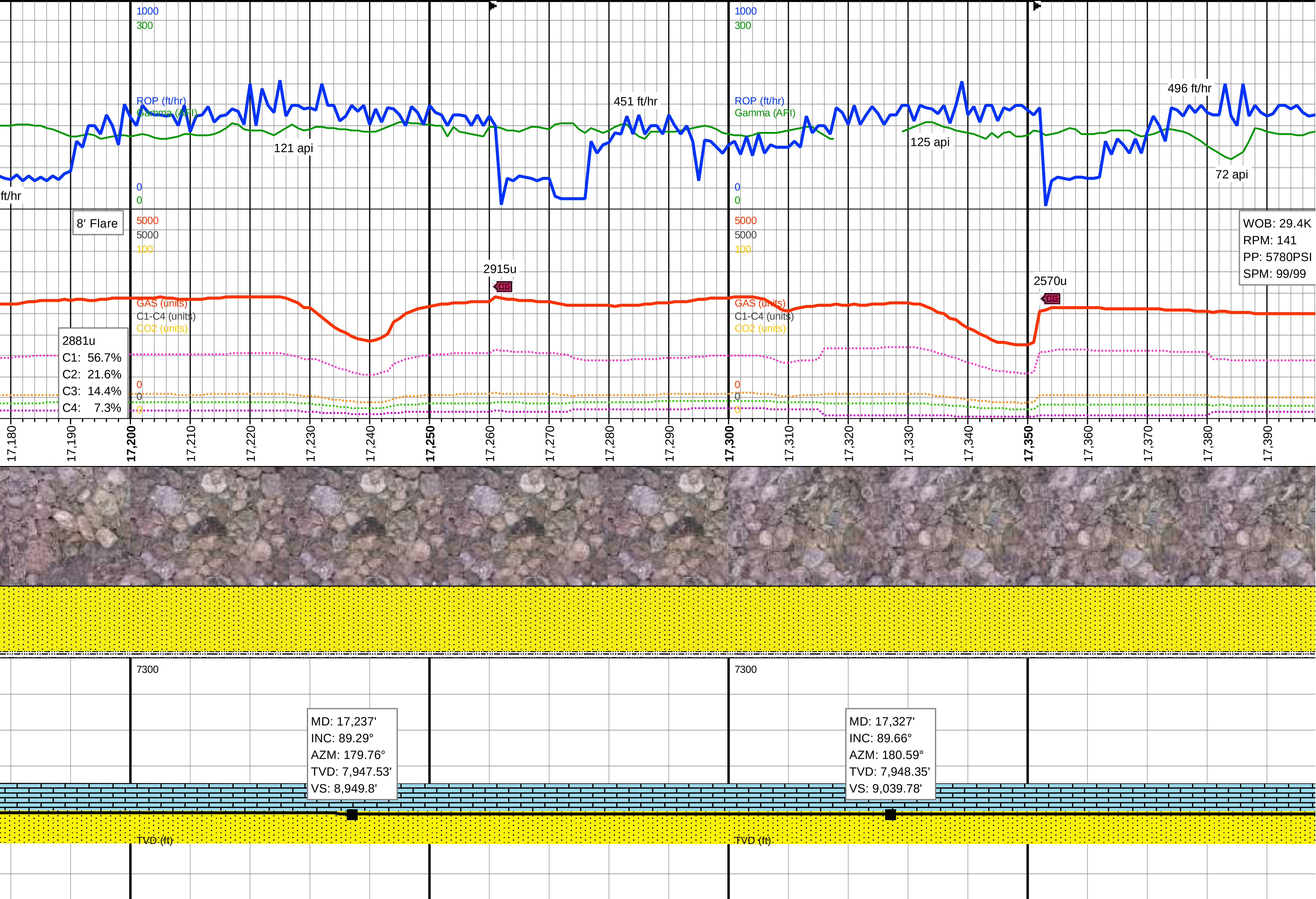
75% SS-SLTY SS: med-drkgy, lt-med brn, mod sft-f mod srt, sl arg, slty/cly mtx, ip lmy, mod calc; 25% S mod-hd, brit ip, rthy, slty-aren, mod calc, com intbd



fri, vfg, sb blky-sr clus, pred cons, SLTY SH: drkgy-dk brn, sb blky-plty, wi sd

85% SS-SLTY SS: med-drkgy, lt-med brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, sl arg, slty/cly mtx, ip lmy, mod-tr calc; 15% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, tr calc, com intbd wi sd

90% SS: med-drkgy, lt-med brn, mod sft-fri, vfg, sb blky-sr clus, pred srt, sl arg, slty/cly mtx, sl-tr calc; 10% SLTY SH: drkgy-dk brn, sb blk brit ip, rthy, slty-aren, sl calc, com intbd wi sd

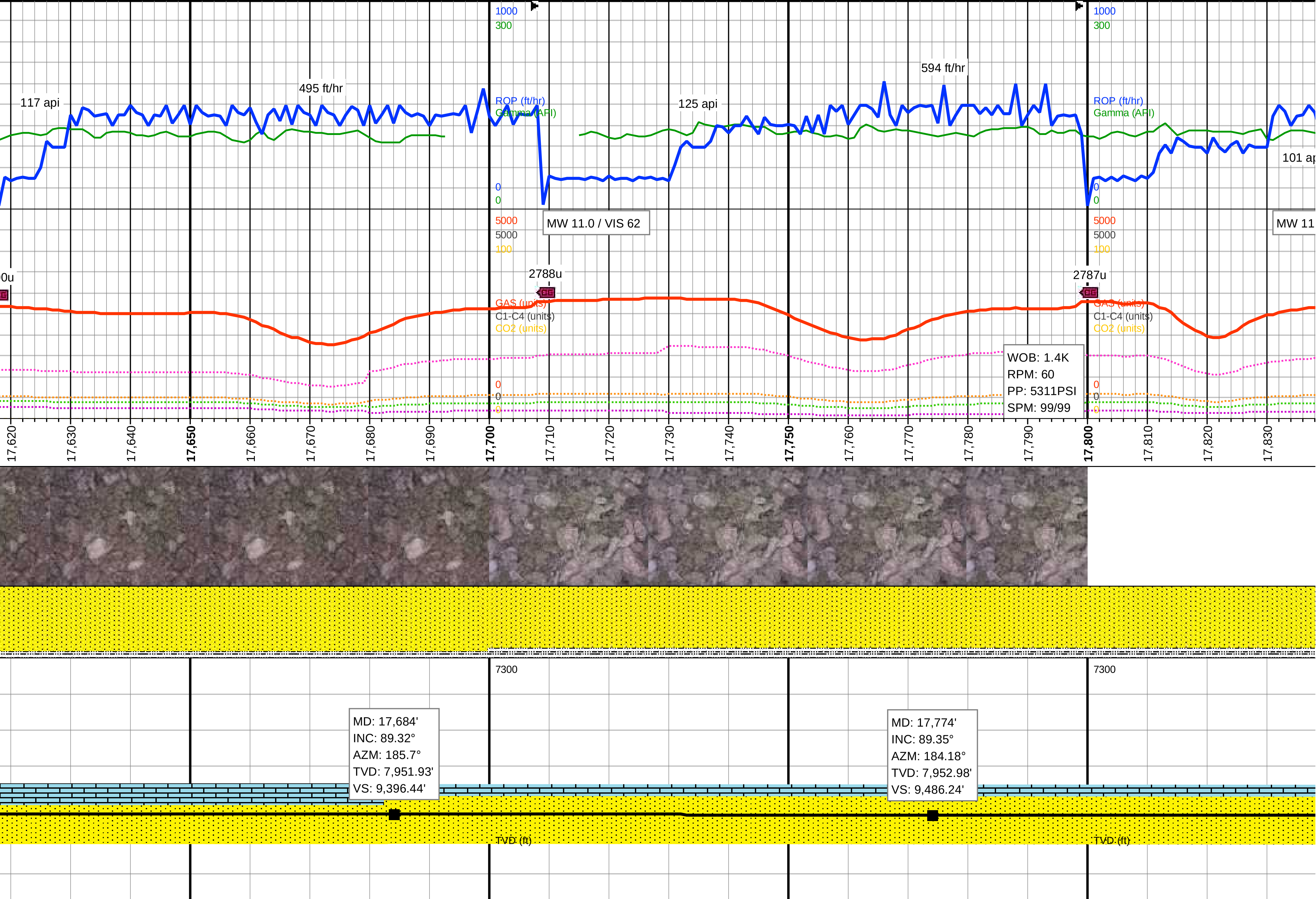


d cons, mod-w
ky-plty, mod-hd,

90% SS: med-drkgy, lt-med brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg, slty/ip lmy mtx, cly rch cmt, tr-mod calc; 10% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd

90% SS: med-drkgy, lt-med brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg, slty/ip lmy mtx, cly rch cmt, tr calc, v rr LS flks; 10% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd

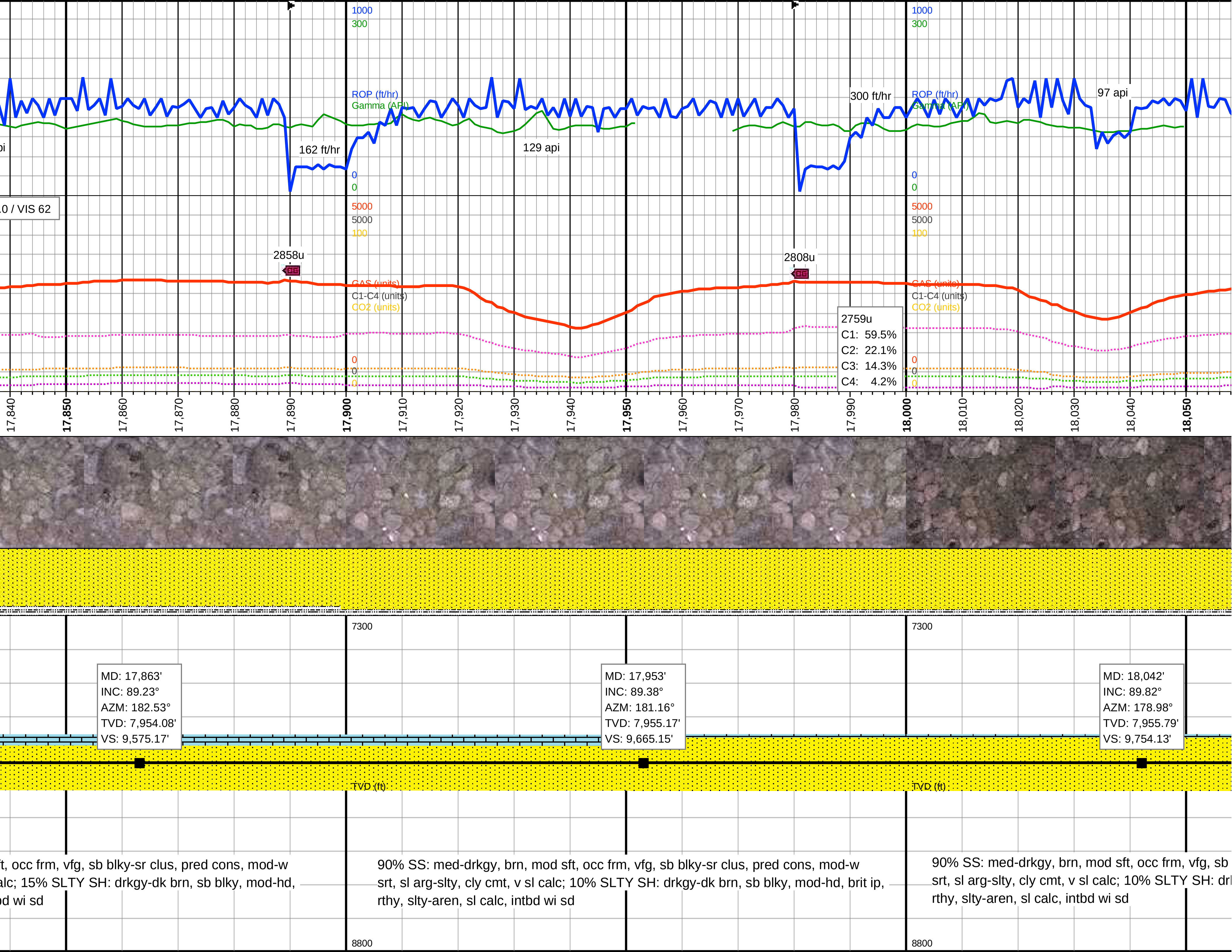
1000
300
ROP (ft/hr)
Gamma (API)
0
0
112 api
465 ft/hr
117 api
697 ft/hr
5000
5000
100
GAS (units)
C1-C4 (units)
CO2 (units)
0
0
0
MW 11.05 / VIS 62
5' Flare
2245u
2820u
Rig Service/SPR
2505u
C1: 56.9%
C2: 21.4%
C3: 14.3%
C4: 7.4%
270
17,400
17,410
17,420
17,430
17,440
17,450
17,460
17,470
17,480
17,490
17,500
17,510
17,520
17,530
17,540
17,550
17,560
17,570
17,580
17,590
17,600
17,610
7300
8800
TVD (ft)
MD: 17,416'
INC: 89.45°
AZM: 180.73°
TVD: 7,949.04'
VS: 9,128.77'
MD: 17,506'
INC: 89.38°
AZM: 183.3°
TVD: 7,949.96'
VS: 9,218.75'
MD: 17,595'
INC: 89.38°
AZM: 184.4°
TVD: 7,950.92'
VS: 9,307.65'
90% SS: med-drkgy, lt-med brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg, slty/ip lmy mtx, cly rch cmt, tr calc, v rr LS flks; 10% SLTY SH: drkgy-dk brn, sb blky-plty, mod-hd, brit ip, rthy, slty-aren, sl calc, com intbd wi sd
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, mod calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
90% SS:
srt, sl arg-
brit ip, rthy



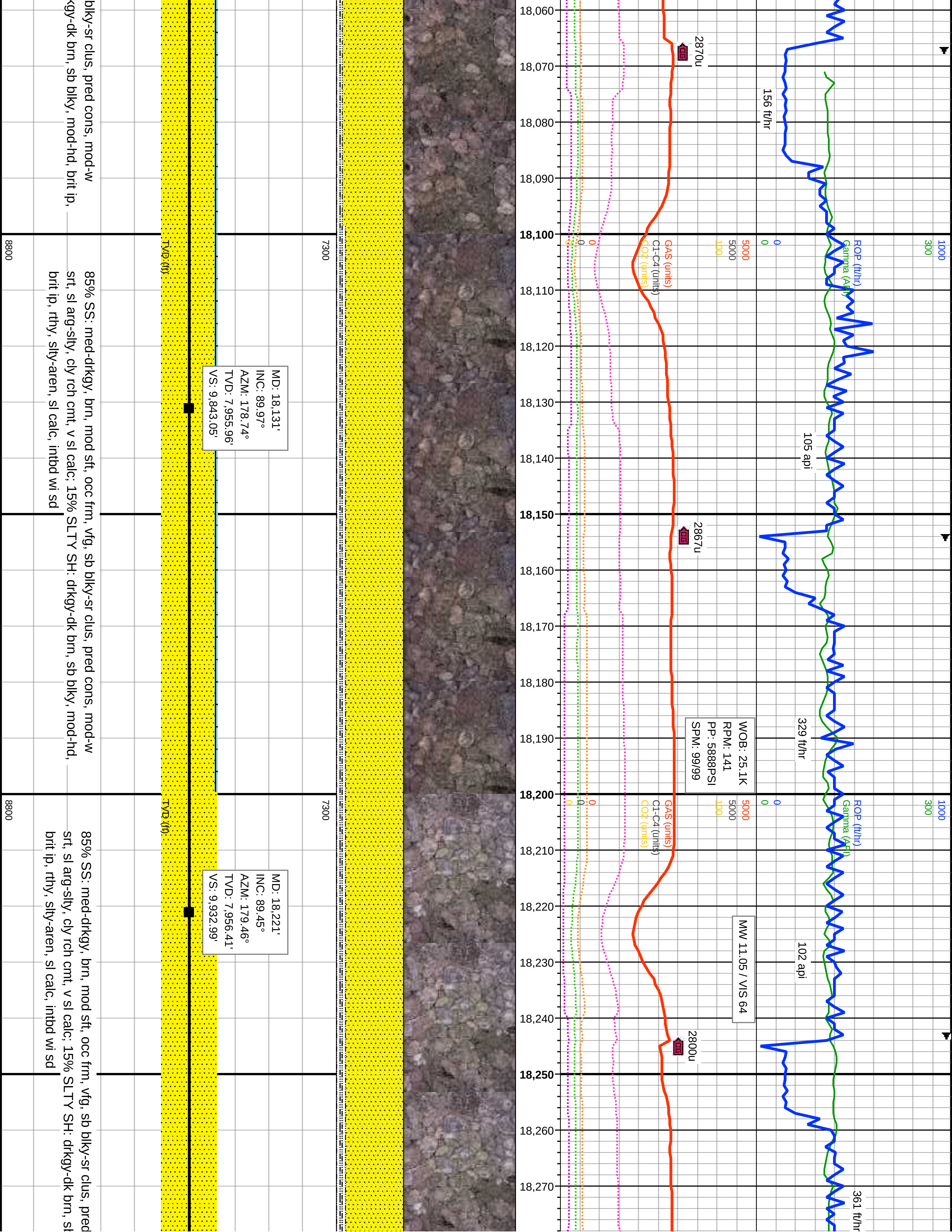
med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w slty, cly rch cmt, mod calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, y, slty-aren, sl calc, intbd wi sd

85% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, v sl calc; 15% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd

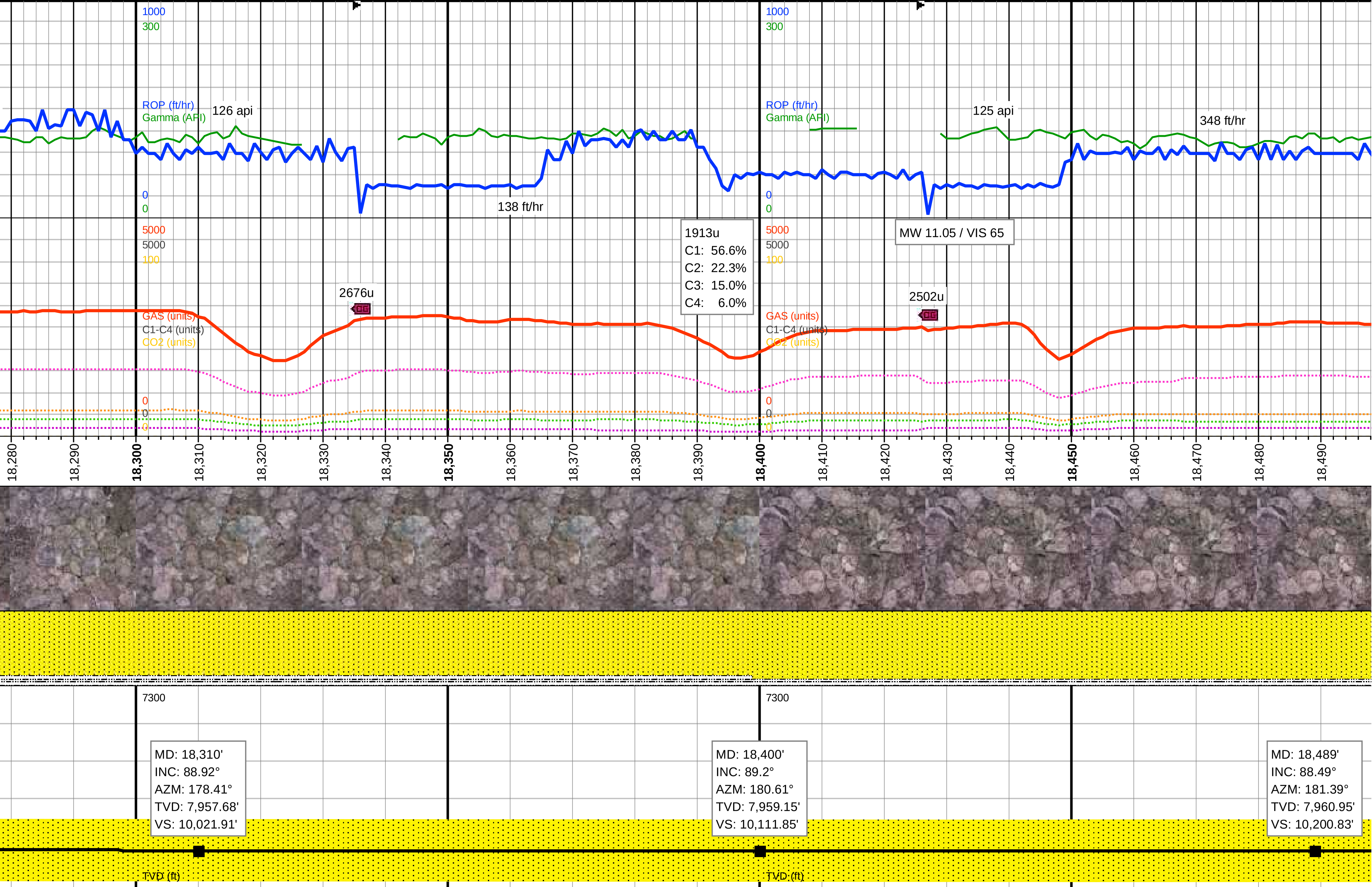
85% SS: med-drkgy, brn, mod sf srt, sl arg-slty, cly rch cmt, v sl ca brit ip, rthy, slty-aren, sl calc, intb



1000
300
ROP (ft/hr)
Gamma (API)
0
0
162 ft/hr
129 api
300 ft/hr
97 api
.0 / VIS 62
5000
5000
100
2858u
2808u
GAS (units)
C1-C4 (units)
CO2 (units)
2759u
C1: 59.5%
C2: 22.1%
C3: 14.3%
C4: 4.2%
17,840
17,850
17,860
17,870
17,880
17,890
17,900
17,910
17,920
17,930
17,940
17,950
17,960
17,970
17,980
17,990
18,000
18,010
18,020
18,030
18,040
18,050
7300
8800
TVD (ft)
MD: 17,863'
INC: 89.23°
AZM: 182.53°
TVD: 7,954.08'
VS: 9,575.17'
MD: 17,953'
INC: 89.38°
AZM: 181.16°
TVD: 7,955.17'
VS: 9,665.15'
MD: 18,042'
INC: 89.82°
AZM: 178.98°
TVD: 7,955.79'
VS: 9,754.13'
ft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w
alc; 15% SLTY SH: drkgy-dk brn, sb blky, mod-hd,
od wi sd
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb
srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: dr
rthy, slty-aren, sl calc, intbd wi sd



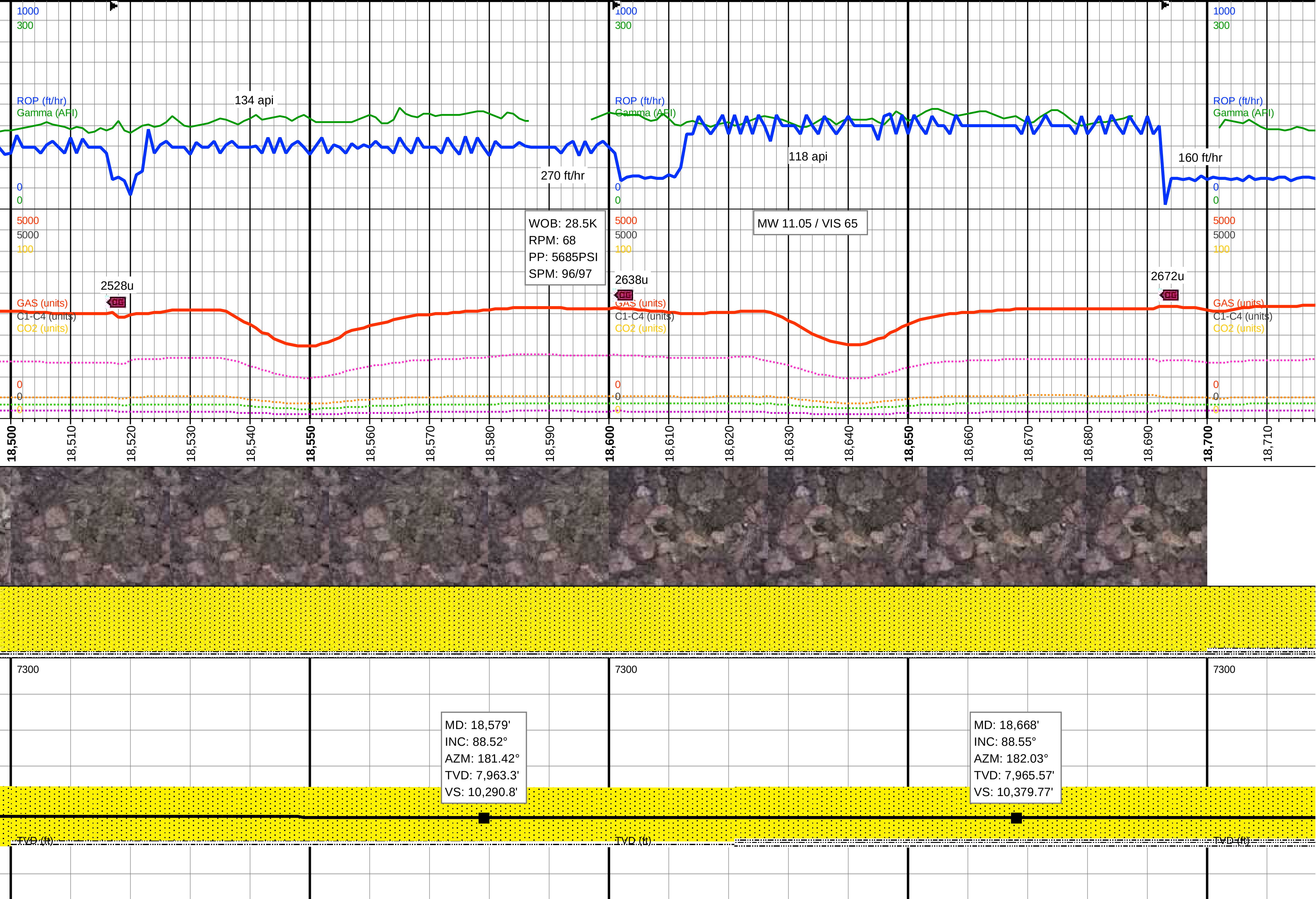
blky-sr clus, pred cons, mod-w
kgy-dk brn, sb blky, mod-hd, brit ip,
18,060
18,070
2870u
156 ft/hr
18,080
18,090
18,100
8800
TVD (ft)
7300
0
0
0
GAS (units)
C1-C4 (units)
CO2 (units)
5000
5000
100
0
0
ROP (ft/hr)
Gamma (API)
300
1000
85% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, v sl calc; 15% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
18,110
18,120
MD: 18,131'
INC: 89.97°
AZM: 178.74°
TVD: 7,955.96'
VS: 9,843.05'
18,130
105 api
18,140
18,150
2867u
18,160
18,170
18,180
WOB: 25.1K
RPM: 141
PP: 5888PSI
SPM: 99/99
329 ft/hr
18,190
18,200
8800
TVD (ft)
7300
0
0
0
GAS (units)
C1-C4 (units)
CO2 (units)
5000
5000
100
0
0
ROP (ft/hr)
Gamma (API)
300
1000
85% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, v sl calc; 15% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
18,210
MD: 18,221'
INC: 89.45°
AZM: 179.46°
TVD: 7,956.41'
VS: 9,932.99'
18,220
MW 11.05 / VIS 64
102 api
18,230
18,240
2800u
18,250
18,260
18,270
361 ft/hr
85% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred
srt, sl arg-slty, cly rch cmt, v sl calc; 15% SLTY SH: drkgy-dk brn, sb



cons, mod-w
b blky, mod-hd,

85% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, v sl calc; 15% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd

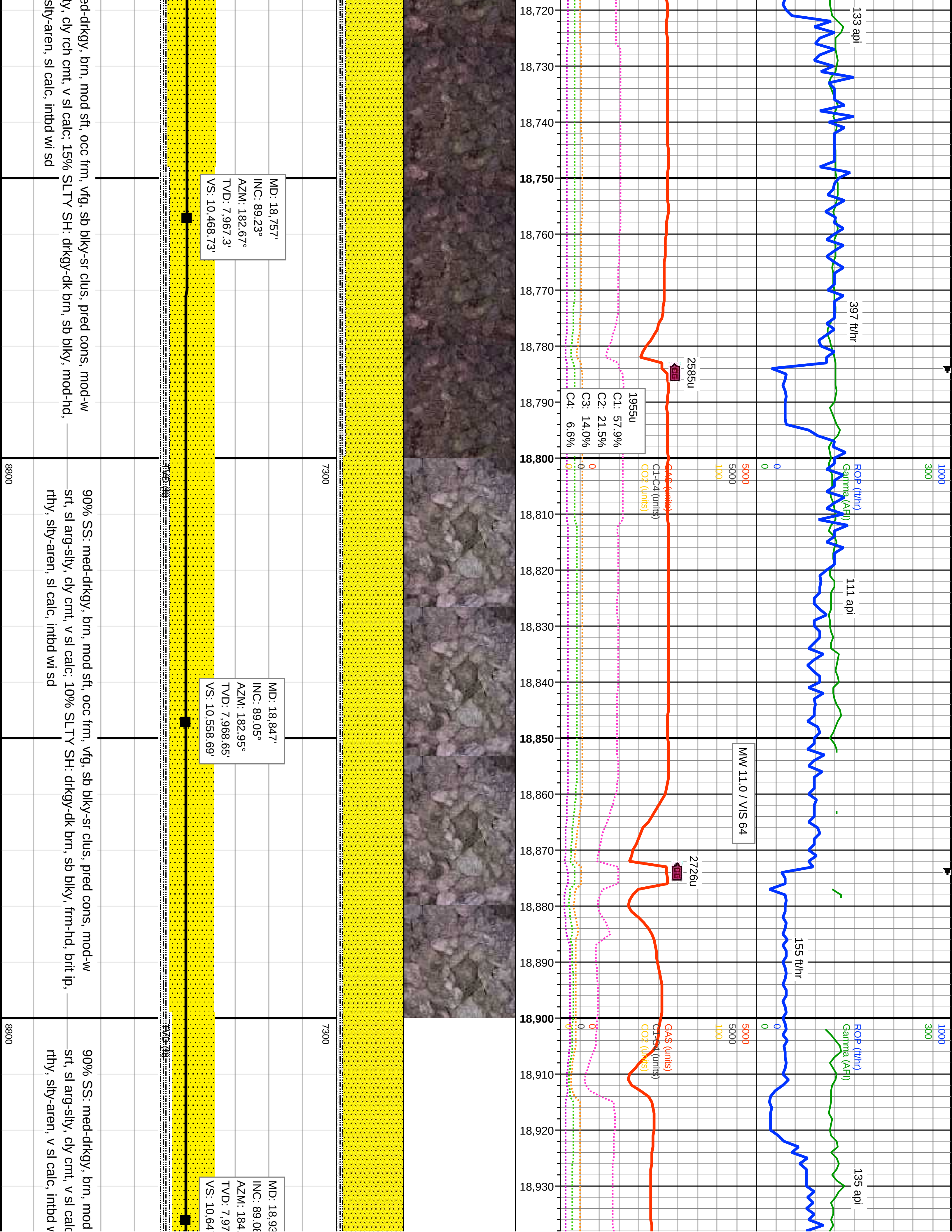
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd



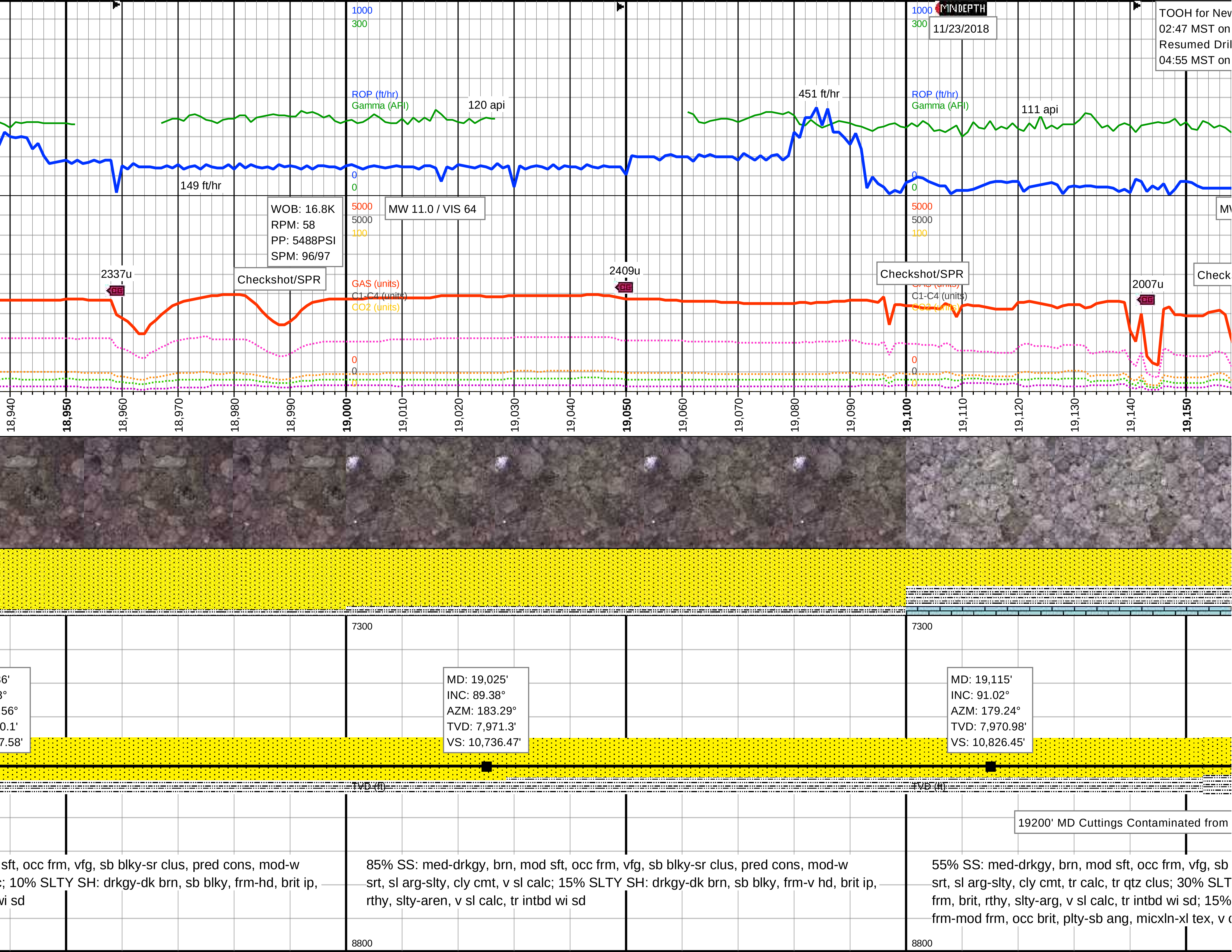
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd

90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly rch cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, mod-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd

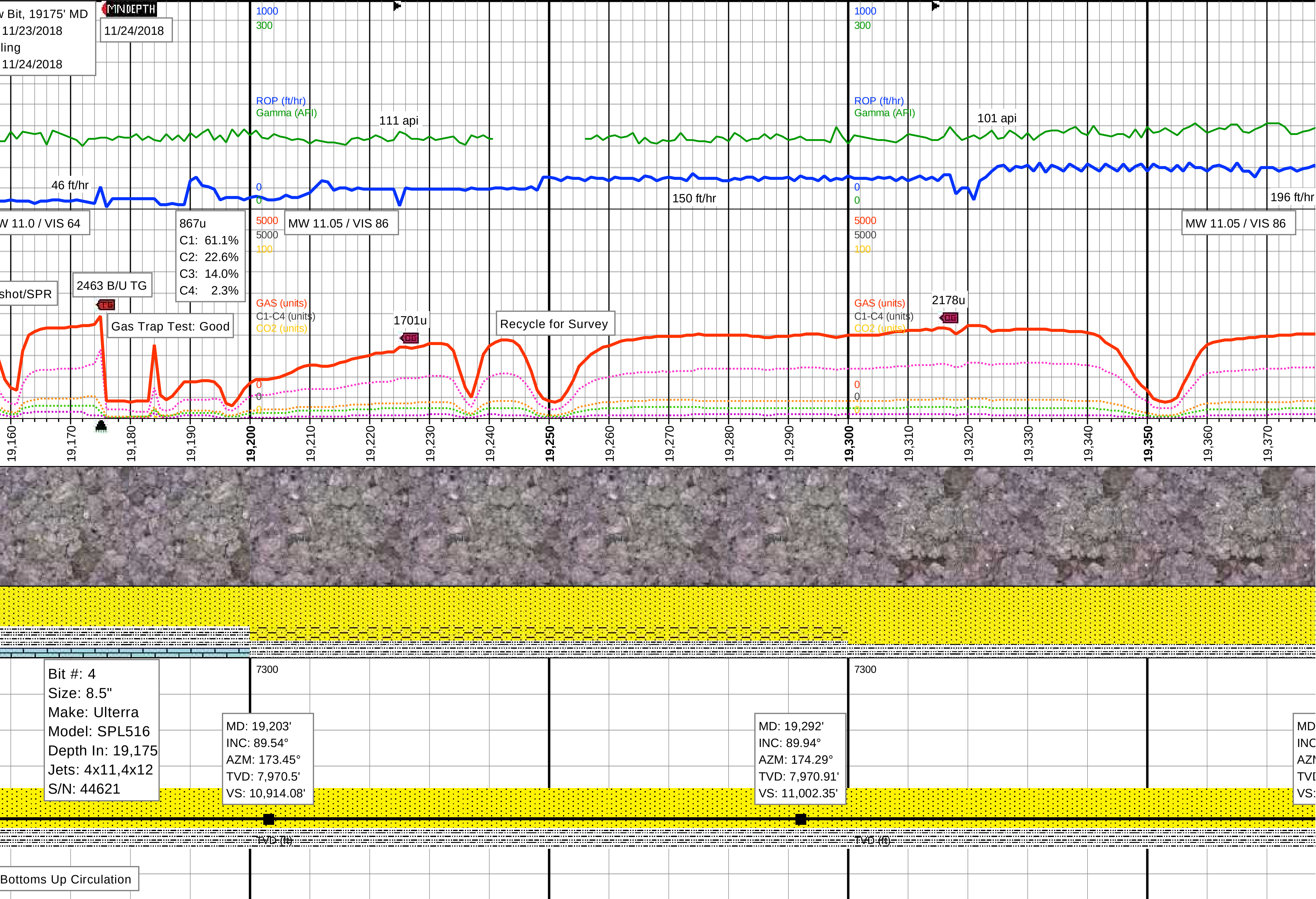
85% SS: me
srt, sl arg-sl
brit ip, rthy,



90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 15% SLTY SH: drkgy-dk brn, sb blky, mod-hd, slty-aren, sl calc, intbd wi sd
MD: 18,757'
INC: 89.23°
AZM: 182.67°
TVD: 7,967.3'
VS: 10,468.73'
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, frm-hd, brit ip, rthy, slty-aren, sl calc, intbd wi sd
MD: 18,847'
INC: 89.05°
AZM: 182.95°
TVD: 7,968.65'
VS: 10,558.69'
8800
7300
TVD (ft)
18,720
18,730
18,740
18,750
18,760
18,770
18,780
18,790
18,800
18,810
18,820
18,830
18,840
18,850
18,860
18,870
18,880
18,890
18,900
18,910
18,920
18,930
133 api
397 ft/hr
2585u
1955u
C1: 57.9%
C2: 21.5%
C3: 14.0%
C4: 6.6%
GAS (units)
C1-C4 (units)
CO2 (units)
ROP (ft/hr)
Gamma (API)
0
5000
100
1000
300
111 api
MW 11.0 / VIS 64
2726u
155 ft/hr
135 api



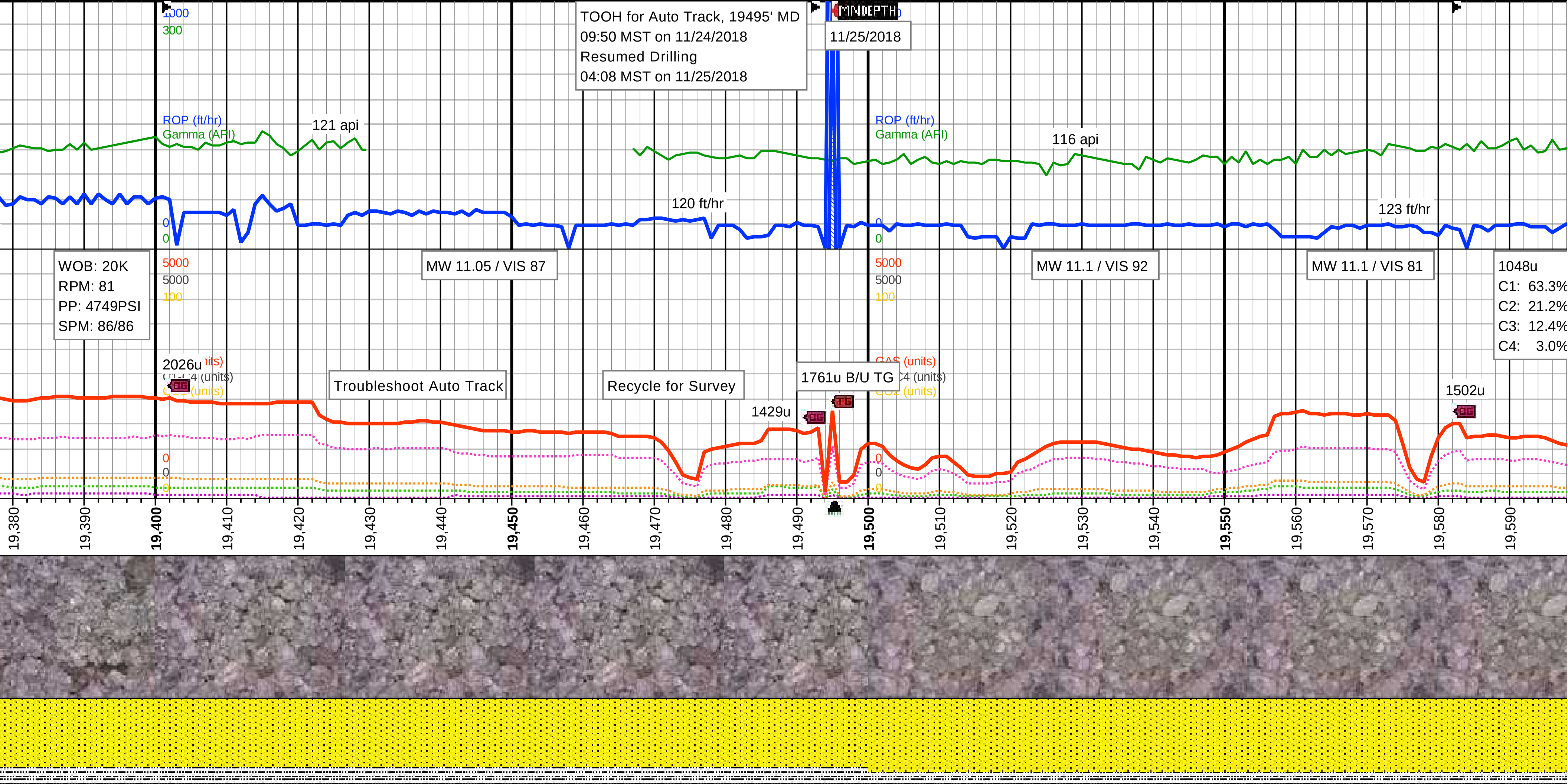
TOOH for New
02:47 MST on
Resumed Dril
04:55 MST on
MNDEPTH
11/23/2018
1000
300
ROP (ft/hr)
Gamma (API)
120 api
451 ft/hr
111 api
149 ft/hr
0
0
WOB: 16.8K
RPM: 58
PP: 5488PSI
SPM: 96/97
MW 11.0 / VIS 64
5000
5000
100
2337u
Checkshot/SPR
2409u
Checkshot/SPR
2007u
Check
GAS (units)
C1-C4 (units)
CO2 (units)
0
0
0
18,940
18,950
18,960
18,970
18,980
18,990
19,000
19,010
19,020
19,030
19,040
19,050
19,060
19,070
19,080
19,090
19,100
19,110
19,120
19,130
19,140
19,150
7300
6'
3°
56°
0.1'
7.58'
MD: 19,025'
INC: 89.38°
AZM: 183.29°
TVD: 7,971.3'
VS: 10,736.47'
MD: 19,115'
INC: 91.02°
AZM: 179.24°
TVD: 7,970.98'
VS: 10,826.45'
TVD (ft)
19200' MD Cuttings Contaminated from
sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w
; 10% SLTY SH: drkgy-dk brn, sb blky, frm-hd, brit ip,
wi sd
85% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w
srt, sl arg-slty, cly cmt, v sl calc; 15% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip,
rthy, slty-aren, v sl calc, tr intbd wi sd
55% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb
srt, sl arg-slty, cly cmt, tr calc, tr qtz clus; 30% SLT
frm, brit, rthy, slty-arg, v sl calc, tr intbd wi sd; 15%
frm-mod frm, occ brit, plty-sb ang, micxln-xl tex, v c
8800



blky-sr clus, pred cons, mod-w
Y SH: drkgy-dk brn, blk, pred plty,
LS: pred med brn, sme ltbn-crm,
calc

75% SS-SLTY SS: med-drkgy, brn, mod sft-fri, vfg, sb blky-sr clus, pred cons, mod srt, sl arg, slty/cly mtx, ip lmy, mod calc, tr qtz clus, tr LS flks; 25% SLTY SH: drkgy-dk brn, plty-sb ang, mod-hd, brit, rthy, slty-aren, mod calc, tr intbd wi sd

80% SS: med-drkgy, brn, mod frm-hd, vfg, sb blky-sr clus, mod cons, mod srt, sl arg-slty, cly rch cmt, tr calc, mod v sml qtz clus; 20% SLT brn, blk, plty-sb ang, mod-hd, brit, rthy, slty, tr calc, tr intbd wi sd



7300

: 19,382'
: 90.12°
M: 176.08°
D: 7,970.86'
11,091.85'

MD: 19,471'
INC: 92.25°
AZM: 176.22°
TVD: 7,969.02'
VS: 11,180.48'

Bit #: 5
Size: 8.5"
Make: Ulterra
Model: SPL516
Depth In: 19,495
Jets: 4x11,4x12
S/N: 43572

MD: 19,561'
INC: 91.97°
AZM: 177.61°
TVD: 7,965.71'
VS: 11,270.17'

TVD (ft)

-tr lse grns,
Y SH: drkgy-dk

80% SS: med-drkgy, lt-med brn, mod frm-hd, vfg, sb blky-sr clus, mod cons-tr lse grns, mod srt, sl arg-slty, cly rch cmt, tr calc, modly abnt v sml qtz grns; 20% SLTY SH: drkgy-dk brn, blk, plty-sb ang, mod-hd, brit, rthy, slty, tr calc, tr intbd wi sd

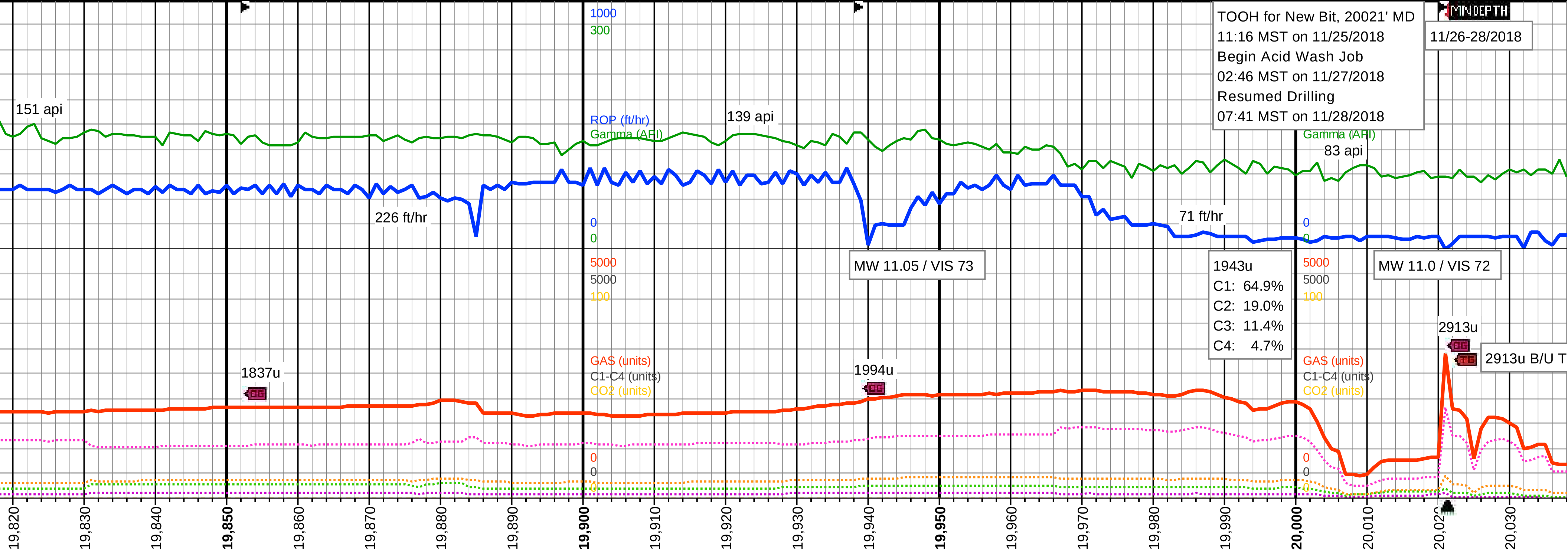
85% SS: med-drkgy, lt-med brn, ip clr-trnsl, mod frm-hd, vfg, sb blky-sr clus, mod cons-tr lse grns, mod srt, sl arg-slty, cly rch cmt, tr calc, tr v sml qtz grns; 15% SLTY SH: drkgy-dk brn, blk, plty-sb ang, mod-hd, brit, rthy, slty, tr calc, tr intbd wi sd

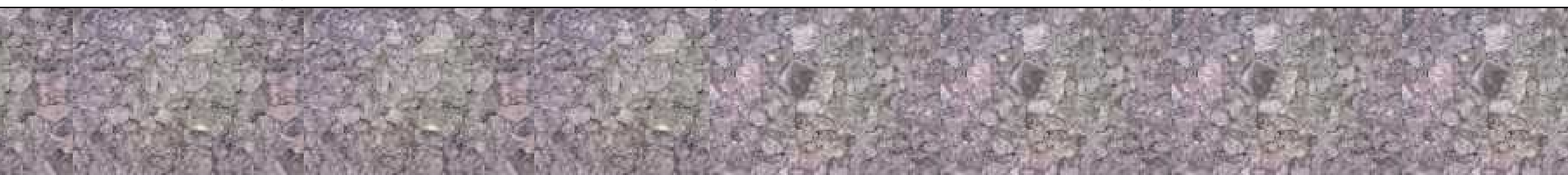
8800

90% SS: med-drkgy, lt-med brn, ip clr-trnsl, mod frm-hd, vfg, sb blky-sr clus, tr lse grns, mod cons, mod srt, sl arg-slty, cly rch cmt, tr calc, tr qtz grns & clus, rr nodr pyr; 10% SLTY SH: drkgy-dk brn, blk, plty-sb ang, mod-hd, brit, rthy, slty, tr calc, tr intbd wi sd

90% SS: med-drkgy, lt-med brn, ip clr-trnsl, mod frm-hd, vfg, sb blky-sr clus, tr lse grns, mod cons, mod srt, sl arg-slty, cly rch cmt, tr calc, rr qtz grns & clus; 10% SLTY SH: drkgy-dk brn, blk, plty-sb ang, mod-hd, brit, rthy, slty, tr calc, tr intbd wi sd

95% SS: m
grns, mod c
drkgy-dk br





7300

7300

MD: 19,829'
INC: 91.14°
AZM: 179.93°
TVD: 7,959.98'
VS: 11,538.04'

MD: 19,919'
INC: 91.32°
AZM: 179.58°
TVD: 7,958.04'
VS: 11,627.98'

MD: 19,999'
INC: 91.08°
AZM: 180.37°
TVD: 7,956.37'
VS: 11,707.94'

Bit #: 6
Size: 8.5"
Make: Ulterra
Model: SPL516
Depth In: 20,021
Jets: 4x11,4x12
S/N: 41226

TVD (ft)

TVD (ft)

19966' MD: 89' U/D Fault
Codell to Lower Niobrara

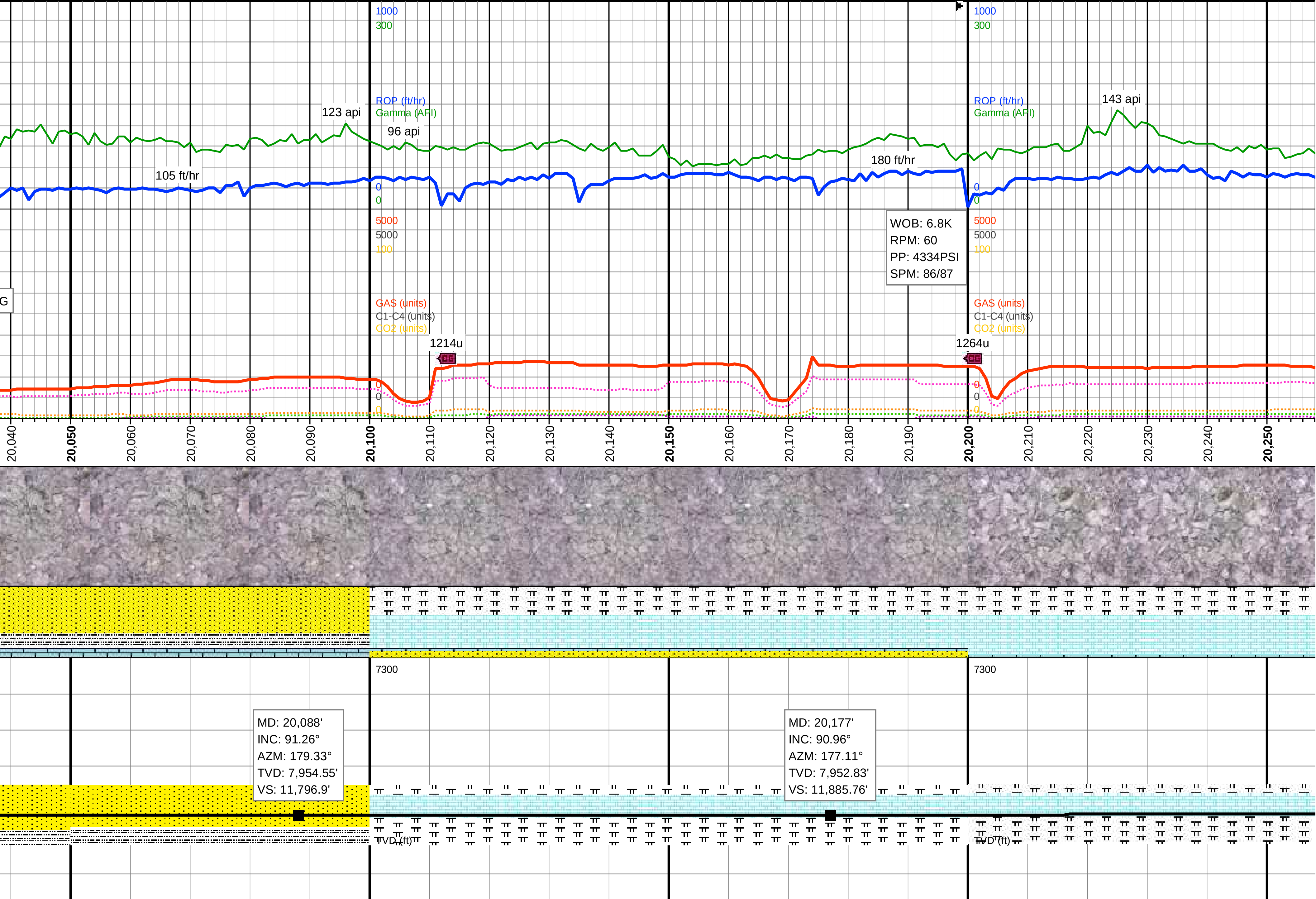
ed-drkgy, lt-med brn, ip clr-trnsl, mod frm-hd, vfg, sb blky-sr clus, tr lse cons, mod srt, sl arg-slty, cly rch cmt, tr calc, v rr qtz; 5% SLTY SH: n, blk, sb blky-plty, mod-hd, brit, rthy, slty-aren, sl calc, com intbd wi sd

95% SS: med-drkgy, lt-med brn, ip clr-trnsl, mod frm-hd, vfg, sb blky-sr clus, tr lse grns, mod cons, mod srt, sl arg-slty, cly rch cmt, tr calc, v rr qtz; 5% SLTY SH: drkgy-dk brn, blk, sb blky-plty, mod sft-hd, brit, rthy, slty-aren, sl calc, com intbd wi sd

65% SS: med-drkgy, lt-med brn, grns, mod cons, mod srt, sl arg-s blk, sb blky-plty, mod sft-hd, brit, pred med brn, sme ltbn-crm, frm

8800

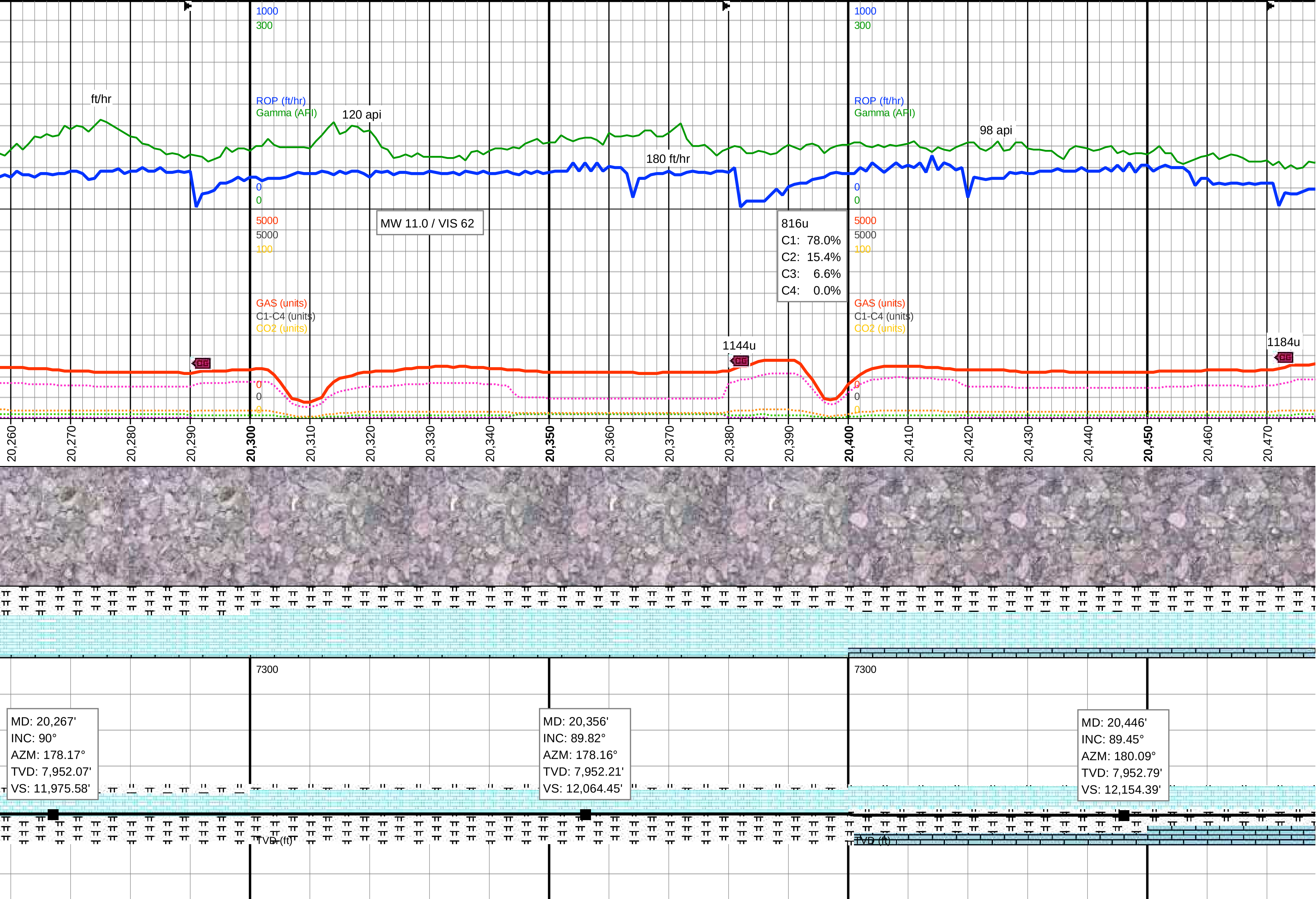
8800



ip clr-trnsl, mod frm-hd, vfg, sb blky-sr clus, tr lse slty, cly rch cmt, tr calc; 20% SLTY SH: drkgy-dk brn, rthy, slty-aren, sl calc, com intbd wi sd; 15% LS: -mod frm, occ brit, plty-sb ang, micxln-xl tex, v calc

45% CHK: lt-med gy, lt gyshbn, mod sft, sb blky, sb wxy txt, v calc; 35% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc; 10% SS: med-drkgy, lt-med brn, ip clr-trnsl, mod frm-hd, vfg, sb blky-sr clus, tr lse grns, mod cons, mod srt, sl arg-slty, cly rch cmt, tr calc; 5% LS: pred med brn, sme ltbn-crm, frm-mod frm, occ brit, plty-sb ang, micxln-xl tex, v calc

55% CHK: lt-med gy, lt gyshbn, mod sft, sb blky, sb med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg ltbn-crm, frm-mod frm, occ brit, plty-sb ang, micxln-



) wxy txt, v calc; 40% MRLST:
, calc; 5% LS: pred med brn, sme
xl tex, v calc

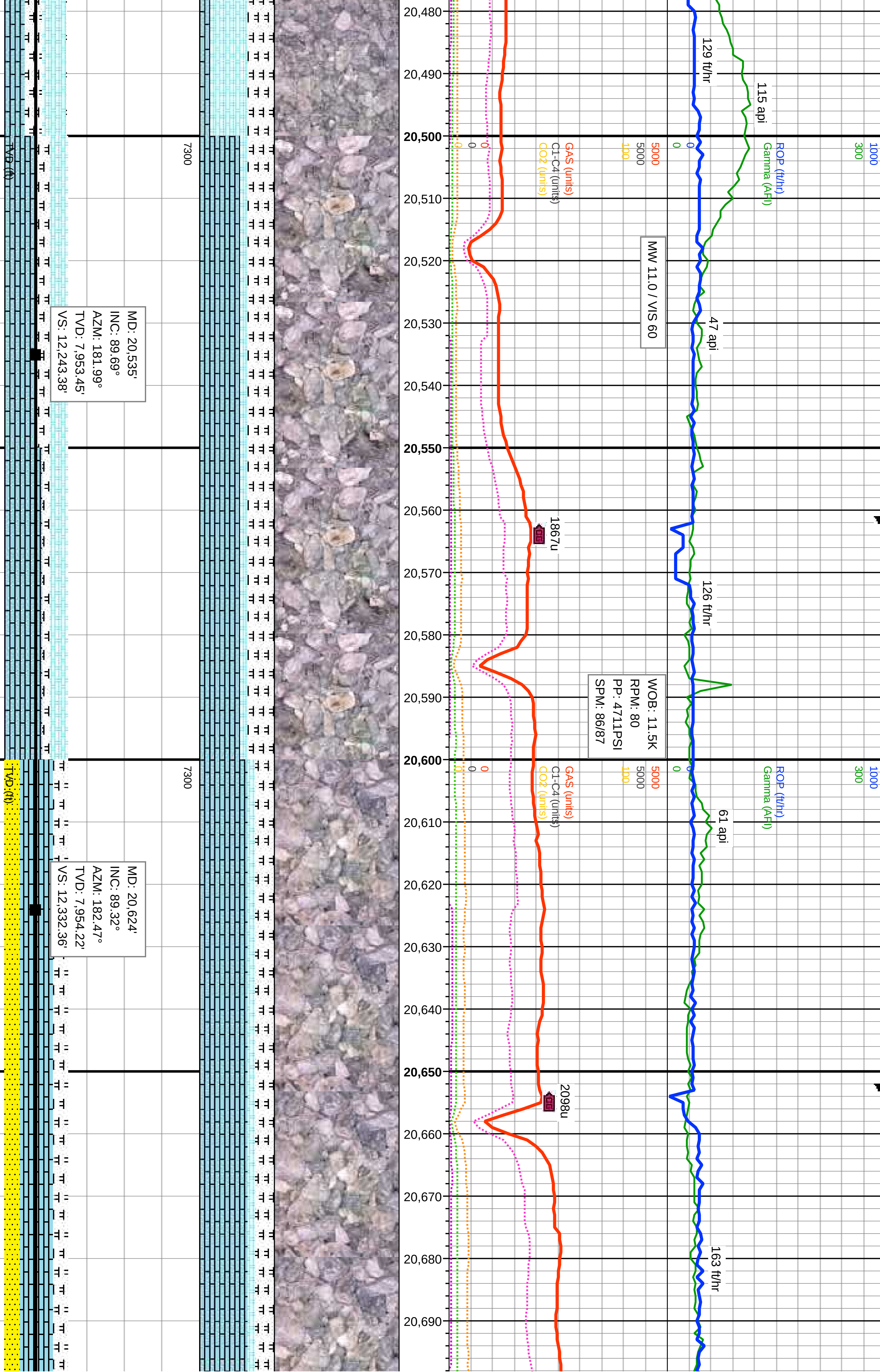
65% CHK: lt-med gy, lt gyshbn, mod sft, sb blky, sb wxy txt, v calc; 30% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc; 5% LS: pred med brn, sme ltbn-crm, frm-mod frm, occ brit, plty-sb ang, micxln-xl tex, v calc

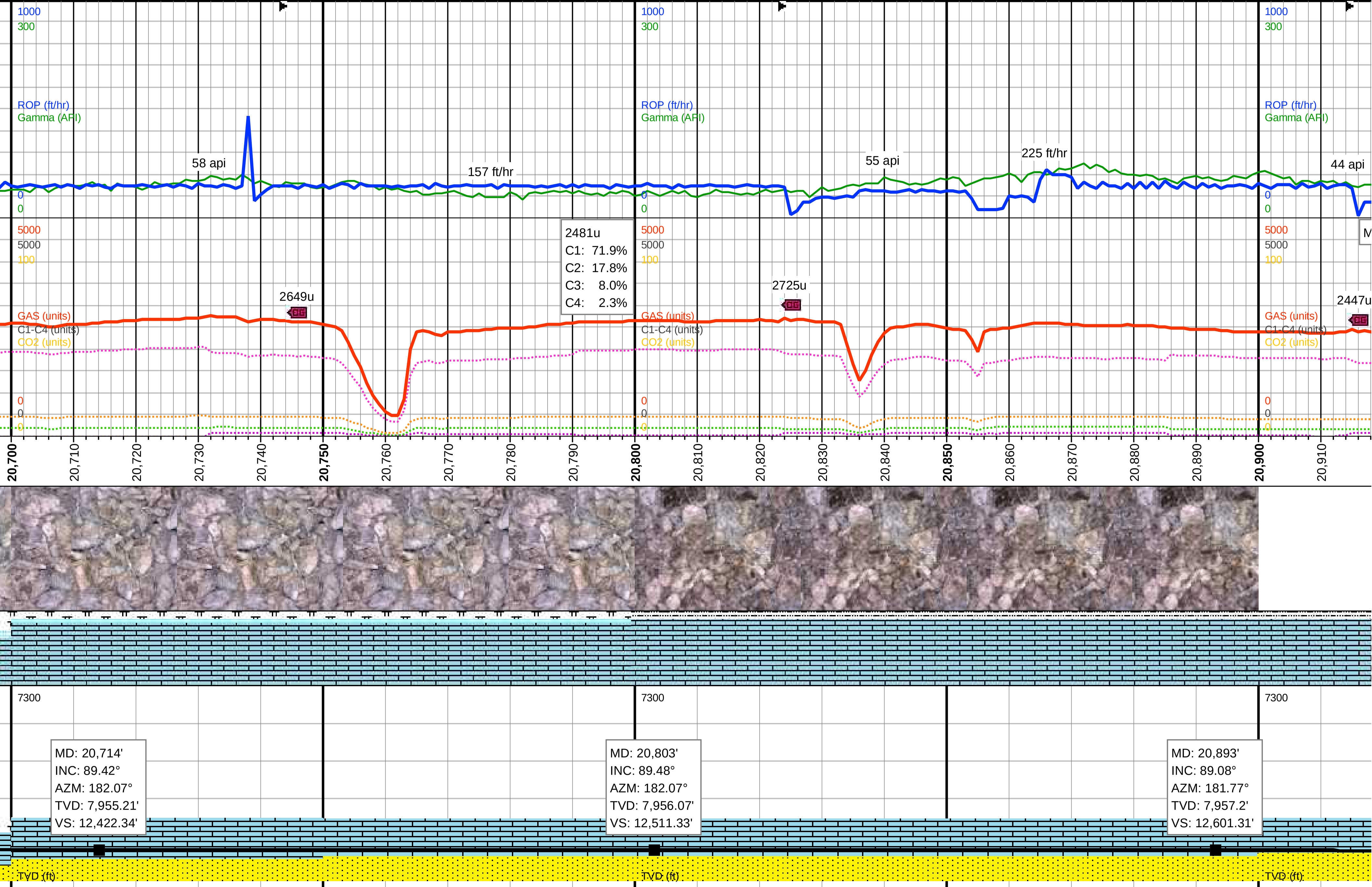
50% CHK: lt-med gy, lt gyshbn, mod sft, sb blky, sb wxy txt, v calc; 35
med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc; 15% LS: pre
ltbn-crm, frm-mod frm, occ brit, plty-sb ang, micxln-xl tex, v calc

% MRLST:
d med brn, sme

55% LS: pred med brn, sme ltbn-crm, frm-mod frm, occ brit, plty-sb ang, micxln-xl tex, v calc; 35% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc; 10% CHK: lt-med gy, lt gyshbn, mod sft, sb blky, sb wxy txt, v calc;

65% LS: med brn, ltbn-crm, frm-mod frm, occ brit, plty-sb ang, micxln-xl tex, v calc; 25% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc; 10% CHK: lt-med gy, lt gyshbn, mod sft, sb blky, sb wxy txt, v calc;



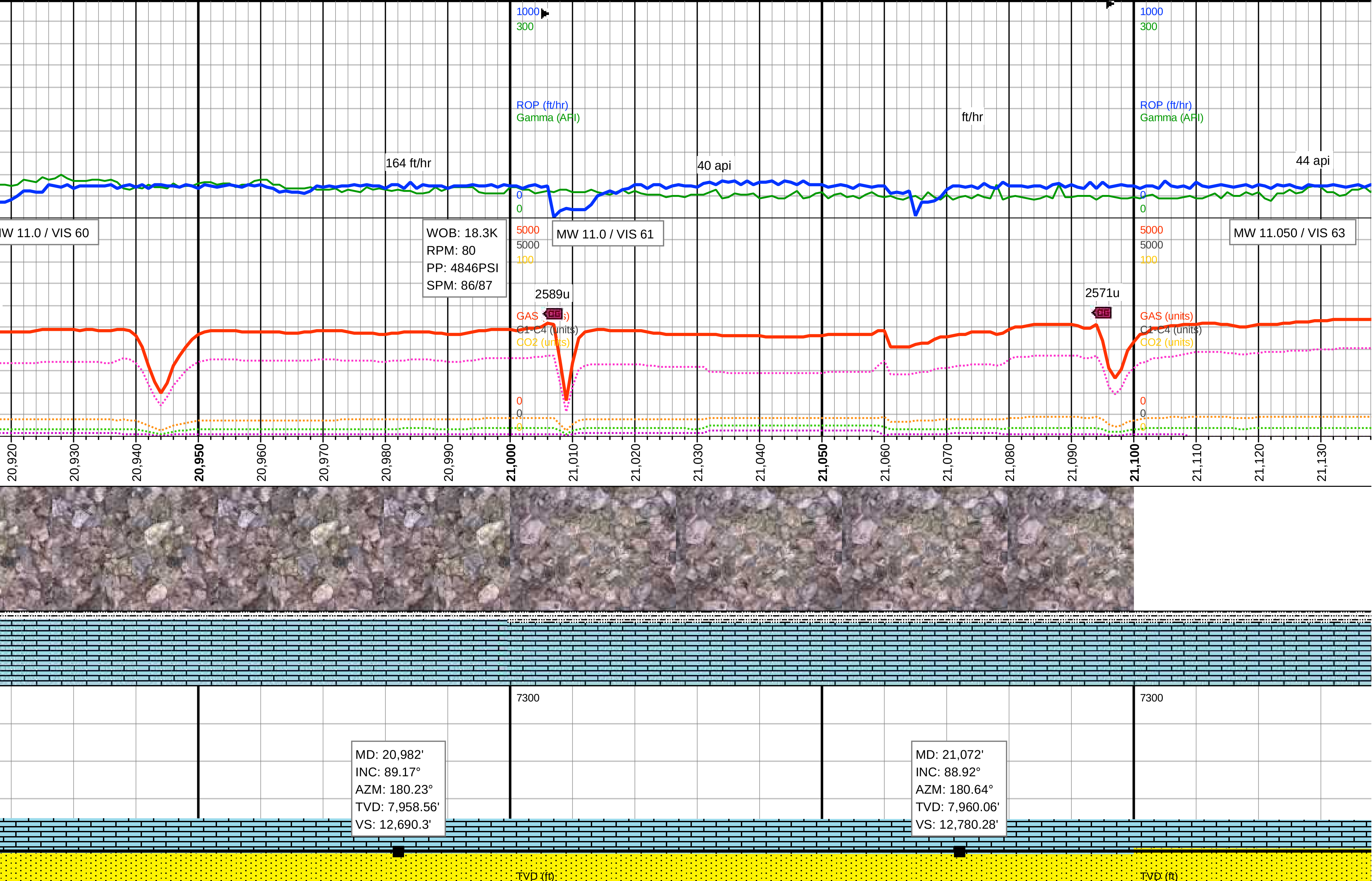


85% LS: med brn, com ltbn-crm, frm-mod frm, occ brit, plty-sb ang, micxln-xl tex, v calc; 10% MRLST: med-dk gy, mod sft- frm, sb blky-ang, rthy, slty, arg, calc; 5% CHK: lt-med gy, lt gyshbn, mod sft, sb blky, sb wxy txt, v calc;

90% LS: med brn, ltbn-crm, occ intbdd calc sh, mod frm-frm, sb blky-ireg, micxln-xl tex, v calc; 10% SLTY SH: dk gy-dk brn, blk ip, sb blky-plty, mod sft-hd, brit, rthy, slty-aren, sl calc, com intbd wi sd

90% LS: med[illegible]
tex, v calc; 1[illegible]
slty-aren, sl c[illegible]

8800



d brn, ltbn-crm, occ intbdd calc sh, mod frm-frm, sb blky-ireg, micxln-xl
0% SLTY SH: dk gy-dk brn, blk ip, sb blky-plty, mod sft-hd, brit, rthy,
calc, com intbd wi sd

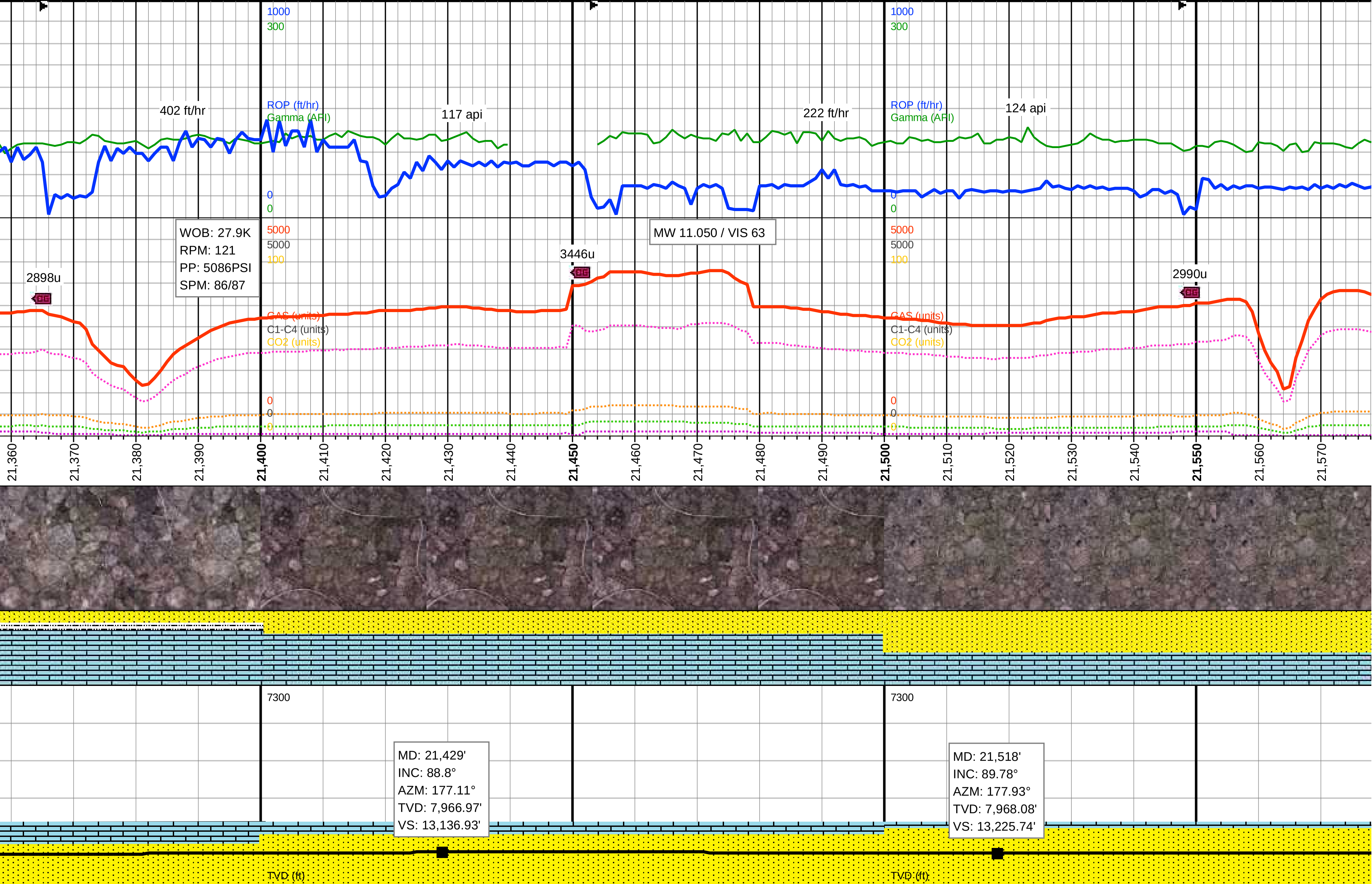
85% LS: med brn, ltbn-crm, occ intbdd calc sh, mod frm-frm, sb blky-ireg, micxln-xl tex, v calc; 15% SLTY SH: dk gy-dk brn, blk ip, sb blky-plty, mod sft-hd, brit, rthy, slty-aren, sl calc, com intbd wi sd

85% LS: med brn, ltbn-crm, occ
tex, v calc; 15% SLTY SH: dk g
slty-aren, sl calc, com intbd wi s

: intbdd calc sh, mod frm-frm, sb blky-ireg, micxln-xl
y-dk brn, blk ip, sb blky-plty, mod sft-hd, brit, rthy,
sd

85% LS: med brn, ltbn-crm, occ intbdd calc sh, mod frm-frm, sb blky-ireg, micxln-xl tex, v calc; 15% SLTY SH: dk gy-dk brn, blk ip, sb blky-plty, mod sft-hd, brit, rthy, slty-aren, sl calc, com intbd wi sd

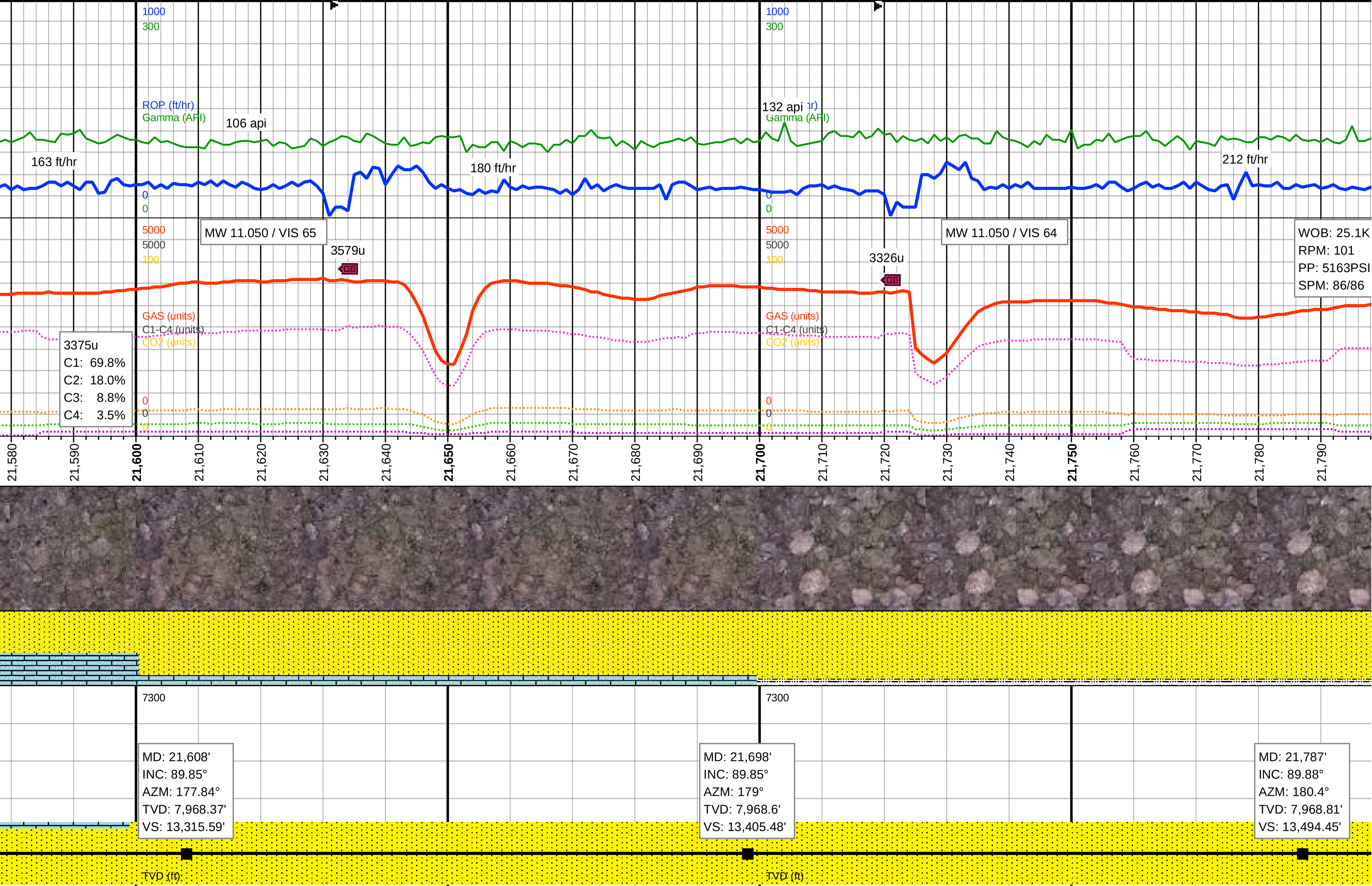
75% LS: med brn, ltbn-crm, occ intbdd calc sh, mo
micxln-xl tex, v calc; 15% SS: med-drkgy, lt-med b
blky-sr clus, tr lse grns, mod cons, mod srt, sl arg-
SLTY SH: dk gy-dk brn, blk ip, sb blky-plty, mod s
com intbd wi sd



od frm-frm, sb blky-sb plty, rn, ip clr-trnsl, mod frm-hd, vfg, sb slty, cly rch cmt, tr calc; 10% ft-hd, brit, rthy, slty-aren, sl calc,

70% LS: med brn, ltbn-crm, occ intbdd calc sh, mod frm-frm, sb blky-sb plty, micxln-xl tex, v calc; 30% SS: med-drkgy, lt-med brn, ip clr-trnsl, mod frm-hd, vfg, sb blky-sr clus, tr lse grns, mod cons, mod srt, sl arg-slty, cly rch cmt, tr calc

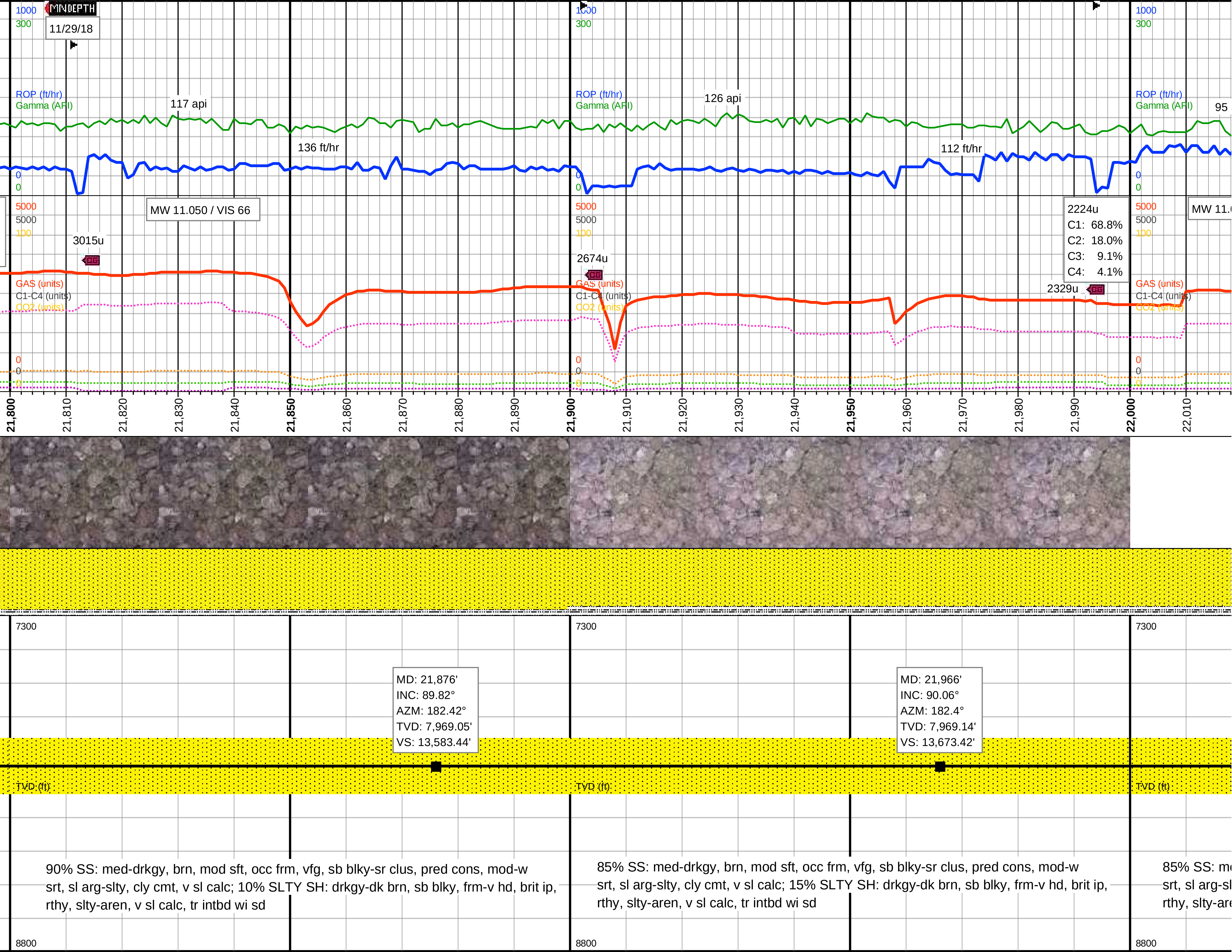
55% SS: med-drkgy, lt-med brn, ip clr-trnsl, mod frm-hd, vfg, sb blky-s grns, mod cons, mod srt, sl arg-slty, cly rch cmt, tr calc; 45% LS: med occ intbdd calc sh, mod frm-frm, sb blky-sb plty, micxln-xl tex, v calc

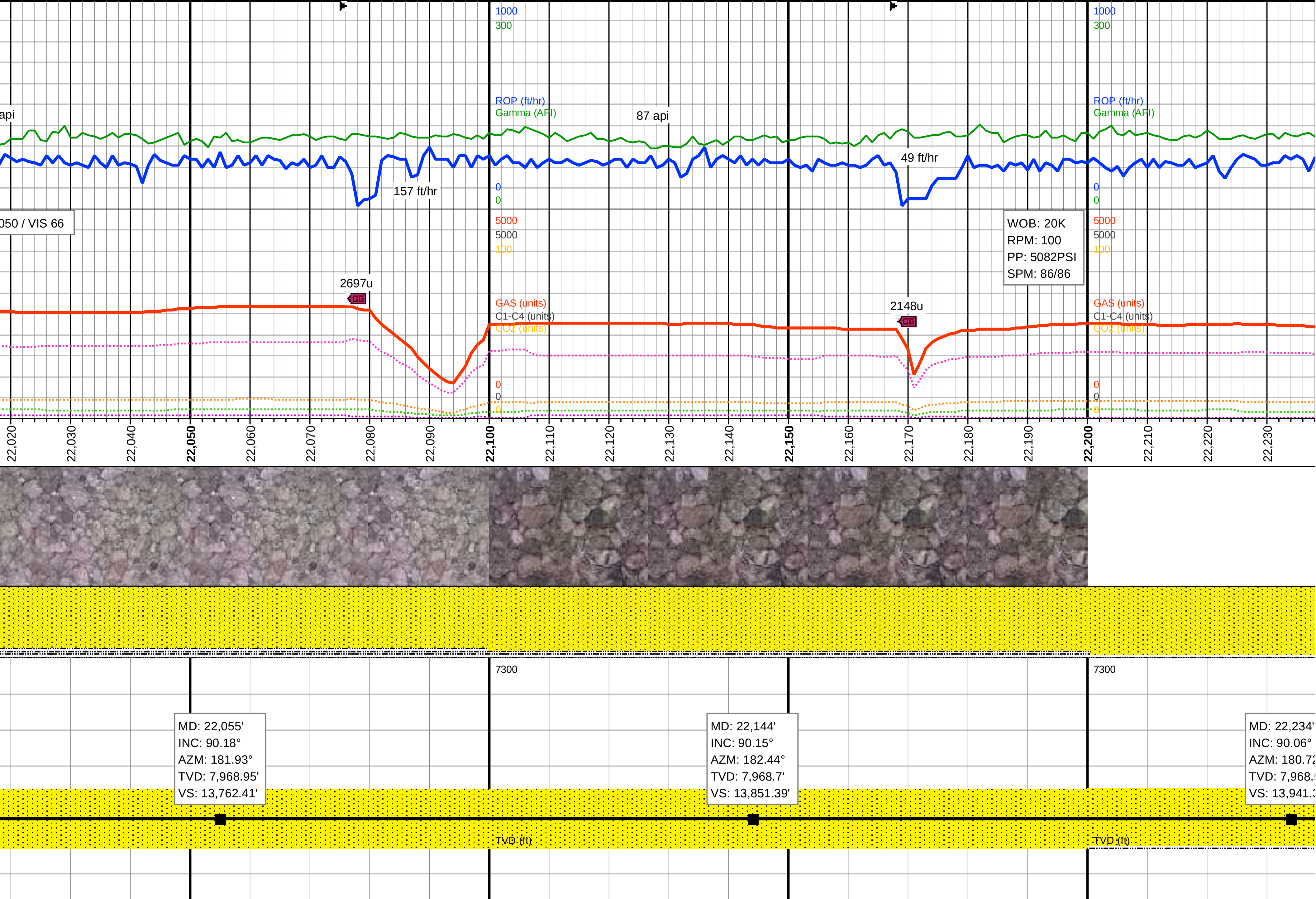


r clus, tr lse
brn, ltbn-crm,

85% SS: med-drkgy, lt-med brn, ip clr-trnsl, mod frm-hd, vfg, sb blky-sr clus, tr lse grns, mod cons, mod srt, sl arg-slty, cly rch cmt, tr calc; 15% LS: med brn, ltbn-crm, occ intbdd calc sh, mod frm-frm, sb blky-sb plty, micxln-xl tex, v calc

90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd

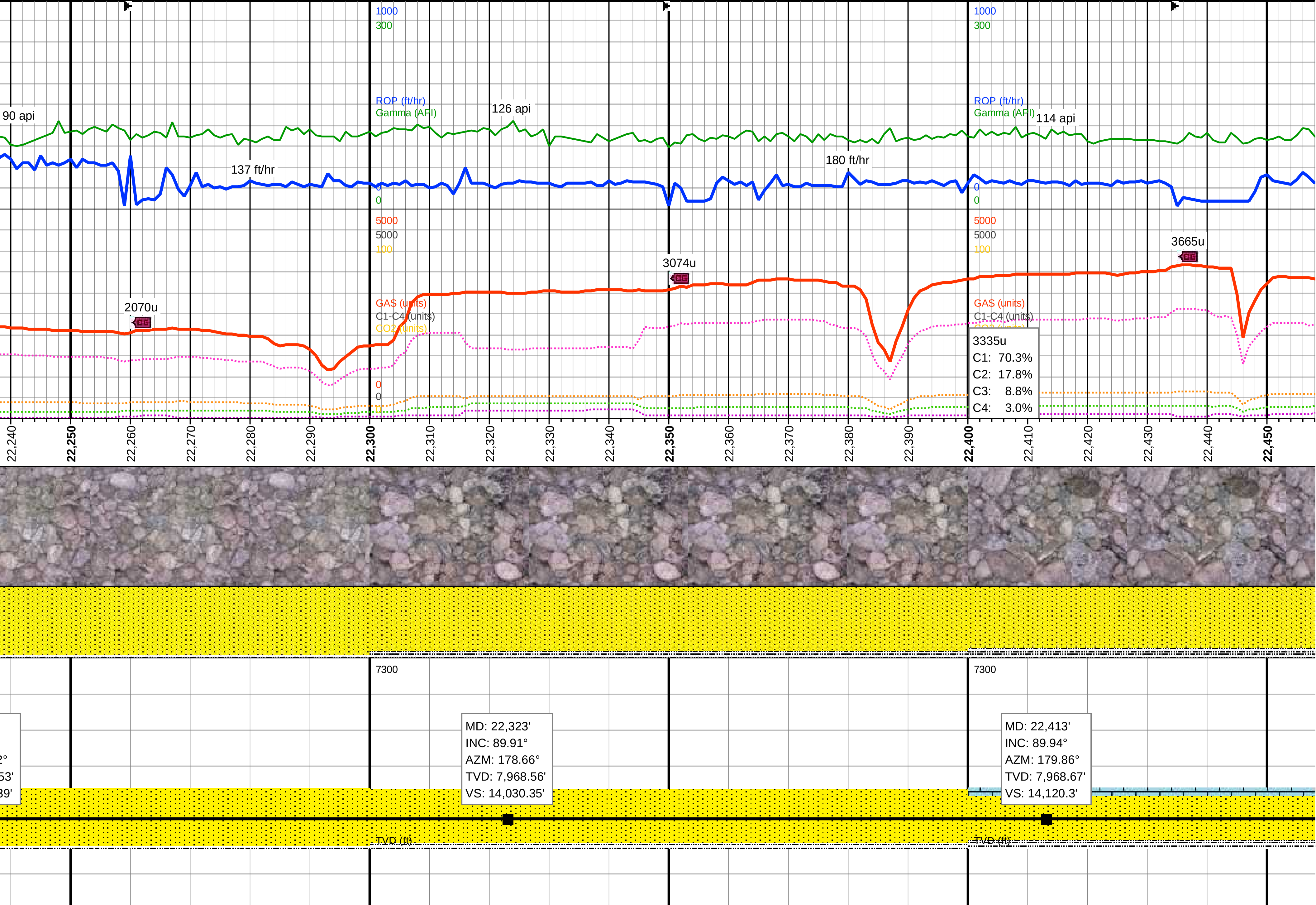

MWDEPTH
11/29/18
ROP (ft/hr)
Gamma (API)
1000
300
0
0
117 api
136 ft/hr
126 api
112 ft/hr
95
GAS (units)
C1-C4 (units)
CO2 (units)
5000
5000
100
0
0
0
MW 11.050 / VIS 66
3015u
2674u
2329u
2224u
C1: 68.8%
C2: 18.0%
C3: 9.1%
C4: 4.1%
21,800
21,810
21,820
21,830
21,840
21,850
21,860
21,870
21,880
21,890
21,900
21,910
21,920
21,930
21,940
21,950
21,960
21,970
21,980
21,990
22,000
22,010
7300
8800
TVD (ft)
MD: 21,876'
INC: 89.82°
AZM: 182.42°
TVD: 7,969.05'
VS: 13,583.44'
MD: 21,966'
INC: 90.06°
AZM: 182.4°
TVD: 7,969.14'
VS: 13,673.42'
90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd
85% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 15% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd
85% SS: m
srt, sl arg-sl
rthy, slty-ar
MW 11.



ed-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w ty, cly cmt, v sl calc; 15% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip, en, v sl calc, tr intbd wi sd

90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd

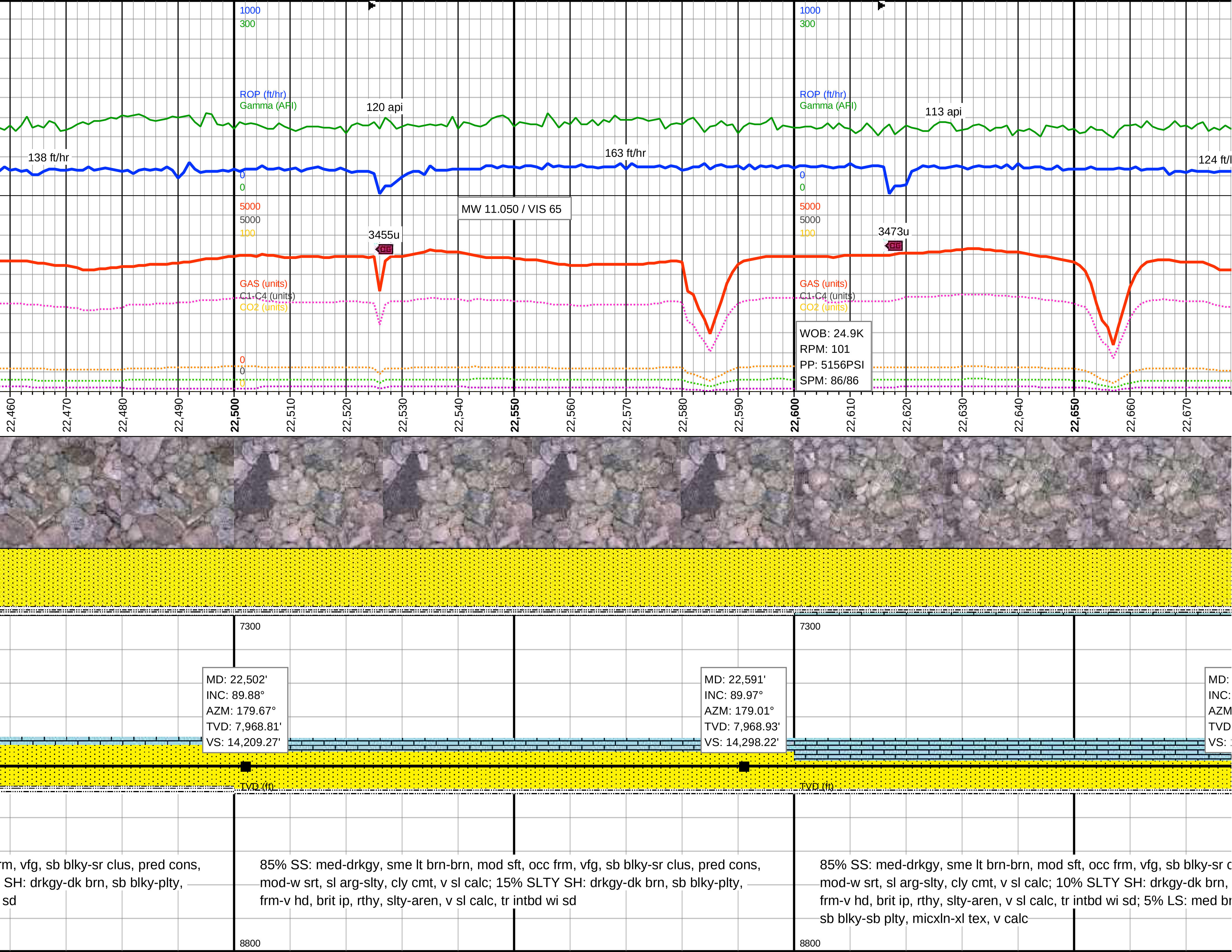
95% SS: brn, med-drkgy, mod srt, sl arg-slty, cly cmt, v sl calc; rthy, slty-aren, v sl calc, tr intbd



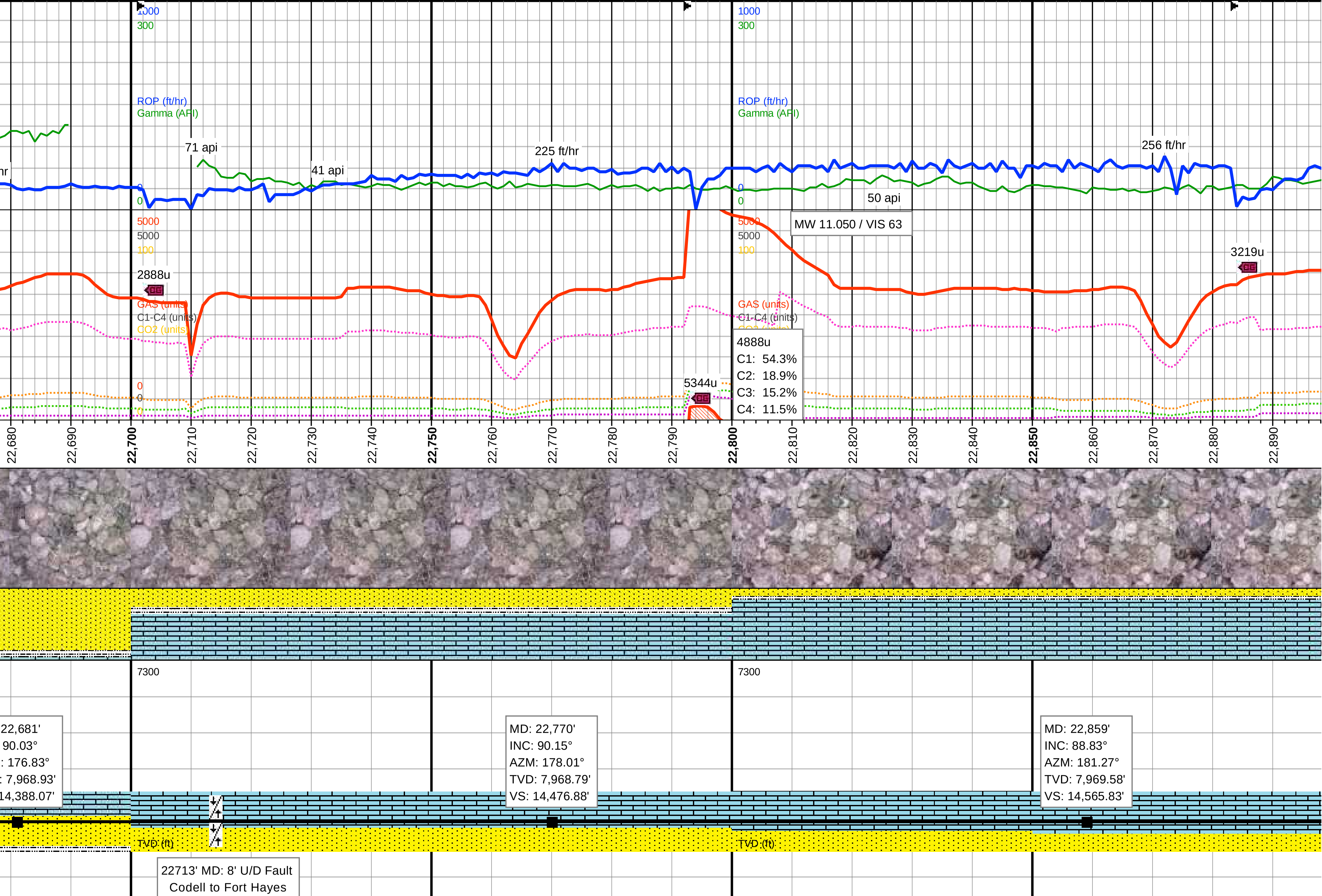
sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w
5% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip,
wi sd

90% SS: med-drkgy, brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd

85% SS: med-drkgy, sme lt brn-brn, mod sft, occ fr
mod-w srt, sl arg-slty, cly cmt, v sl calc; 15% SLTY
frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi



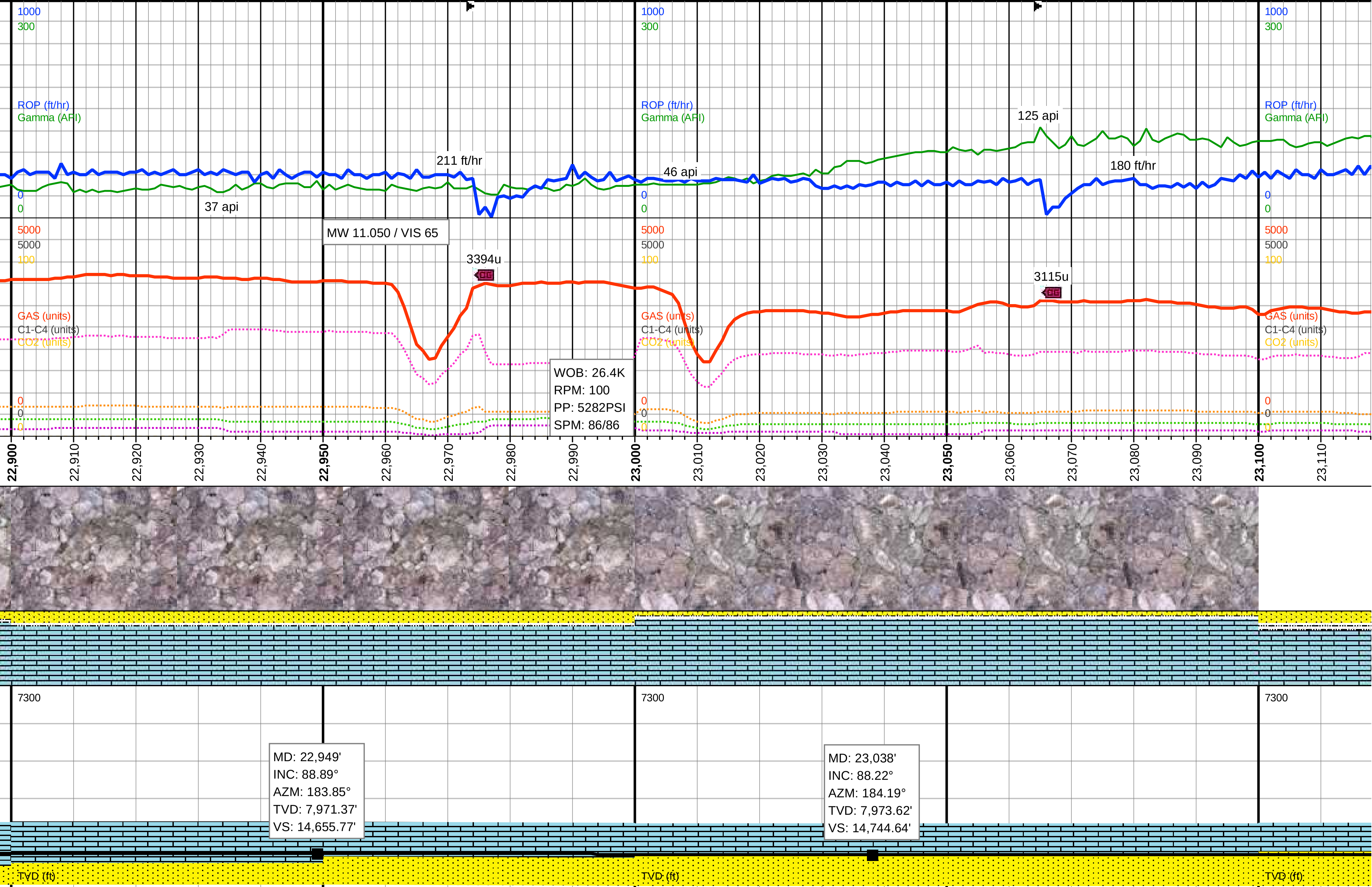
ROP (ft/hr)
Gamma (API)
1000
300
0
0
138 ft/hr
120 api
163 ft/hr
113 api
124 ft/
GAS (units)
C1-C4 (units)
CO2 (units)
5000
5000
100
3455u
3473u
MW 11.050 / VIS 65
WOB: 24.9K
RPM: 101
PP: 5156PSI
SPM: 86/86
22,460
22,470
22,480
22,490
22,500
22,510
22,520
22,530
22,540
22,550
22,560
22,570
22,580
22,590
22,600
22,610
22,620
22,630
22,640
22,650
22,660
22,670
7300
8800
TVD (ft)
MD: 22,502'
INC: 89.88°
AZM: 179.67°
TVD: 7,968.81'
VS: 14,209.27'
MD: 22,591'
INC: 89.97°
AZM: 179.01°
TVD: 7,968.93'
VS: 14,298.22'
MD:
INC:
AZM
TVD
VS:
rm, vfg, sb blky-sr clus, pred cons,
SH: drkgy-dk brn, sb blky-plty,
sd
85% SS: med-drkgy, sme lt brn-brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 15% SLTY SH: drkgy-dk brn, sb blky-plty, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd
85% SS: med-drkgy, sme lt brn-brn, mod sft, occ frm, vfg, sb blky-sr c
mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn,
frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd; 5% LS: med br
sb blky-sb plty, micxln-xl tex, v calc



clus, pred cons,
sb blky-plty,
rn, mod frm-frm,

65% LS: med brn, sme ltbn-crm, mod frm-frm, sb blky-sb plty, micxln-xl tex, v calc; 25% SS: med-drkgy, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky-plty, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd

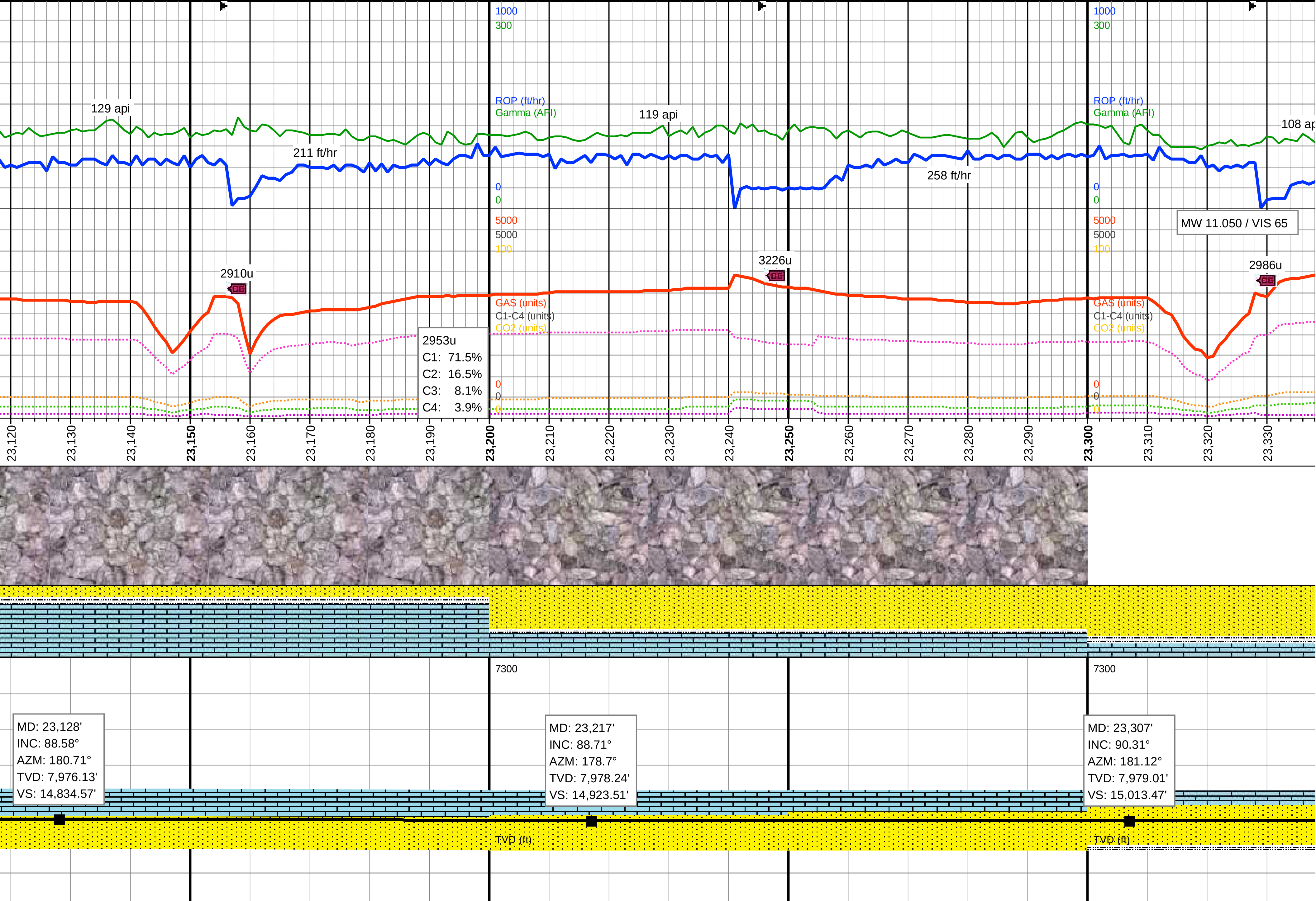
85% LS: med brn, sme ltbn-crm, mod frm-frm, sb blky-sb plty, micxln-xl tex, v calc; 10% SS: med-drkgy, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 5% SLTY SH: drkgy-dk brn, sb blky-plty, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd



80% LS: med brn, sme ltbn-crm, mod frm-frm, sb blky-sb plty, micxln-xl tex, v calc; 15% SS: med-drkgy, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 5% SLTY SH: drkgy-dk brn, sb blky-plty, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd

90% LS: med brn, sme ltbn-crm, mod frm-frm, sb blky-sb plty, micxln-xl tex, v calc; 5% SS: med-drkgy, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 5% SLTY SH: drkgy-dk brn, sb blky-plty, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd

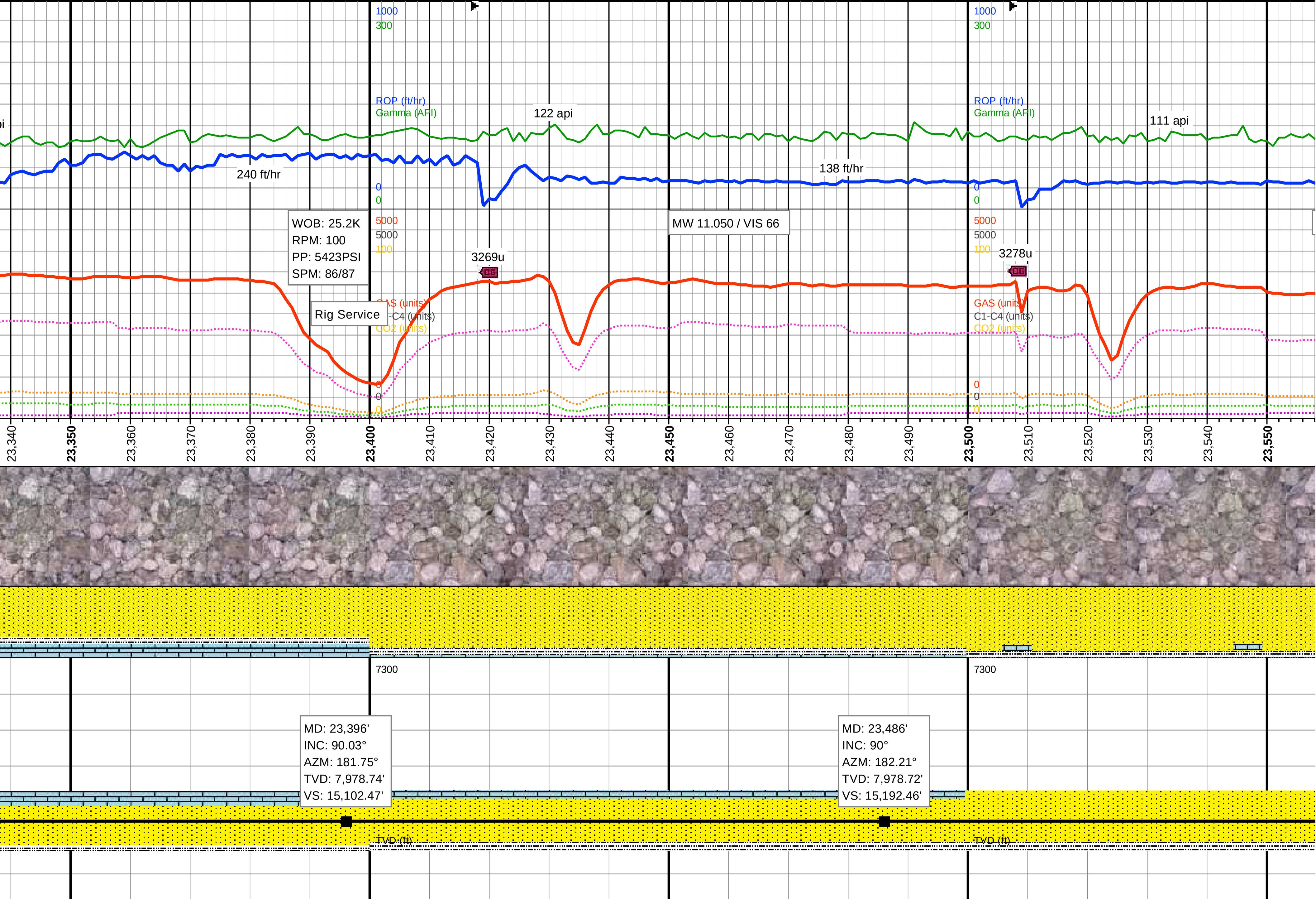
80% LS: me
SS: med-drk
arg-slty, cly c
rthy, slty-are



d brn, ltbn-crm, mod frm-frm, sb blky-sb plty, micxln-xl tex, v calc; 15% gy, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl cmt, v sl calc; 5% SLTY SH: drkgy-dk brn, sb blky-plty, frm-v hd, brit ip, n, v sl calc, tr intbd wi sd

60% SS: med-drkgy, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 35% LS: med brn, ltbn-crm, mod frm-frm, sb blky-sb plty, micxln-xl tex, v calc; 5% SLTY SH: drkgy-dk brn, sb blky-plty, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd

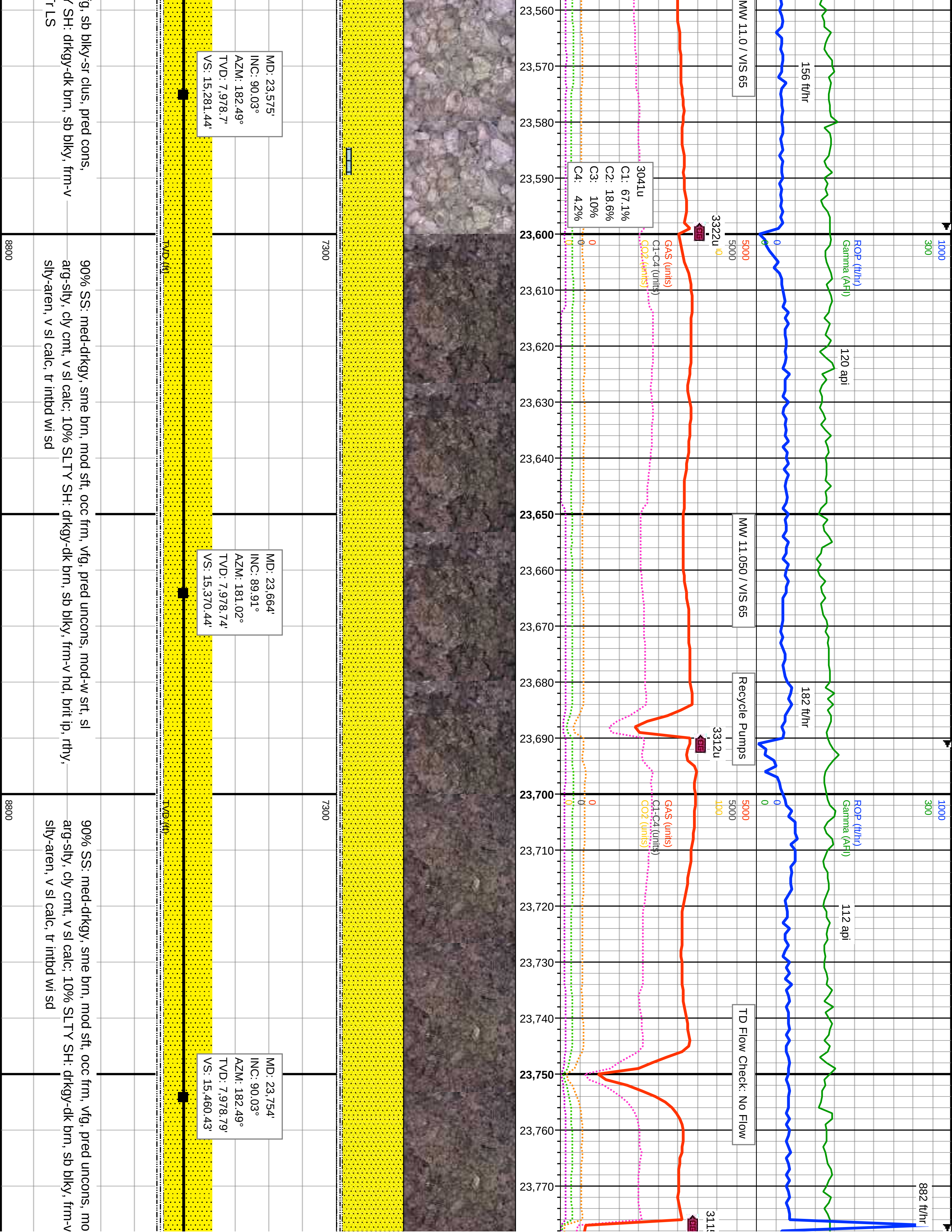
70% SS: med-drkgy, mod sft, o arg-slty, cly cmt, v sl calc; 20% micxln-xl tex, v calc; 10% SLTY slty-aren, v sl calc, tr intbd wi sd



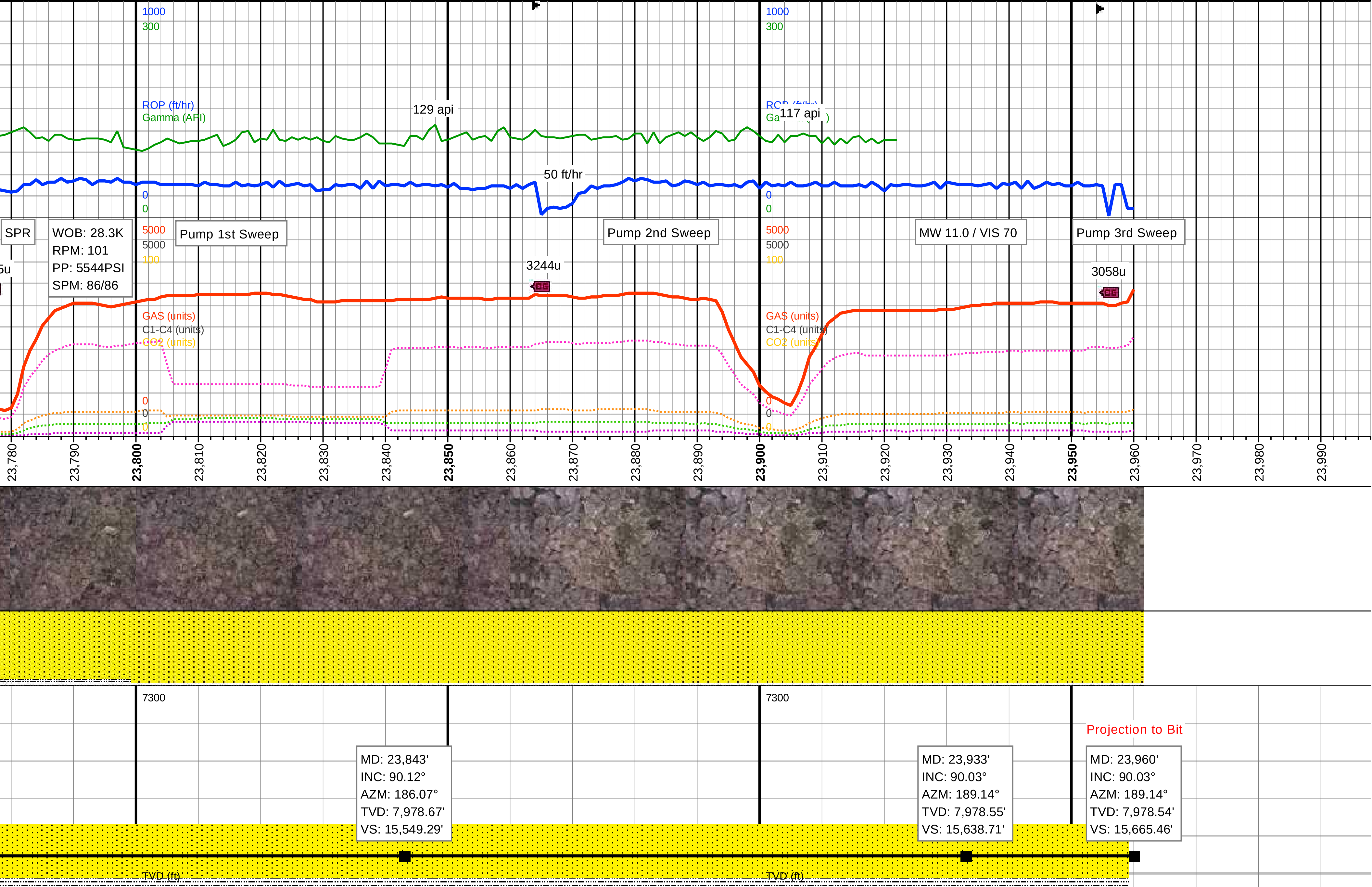
cc frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl
LS: med brn, ltbn-crm, mod frm-frm, sb blky-sb plty,
SH: drkgy-dk brn, sb blky-plty, frm-v hd, brit ip, rthy,

85% SS: med-drkgy, sme brn, mod sft, occ frm, vfg, sb blky-sr clus, pred cons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd; 5% LS: med brn, ltbn-crm, mod frm-frm, sb blky, micxln-xl tex, v calc

90% SS: med-drkgy, sme brn, mod sft, occ frm, vf
mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY
hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd; T

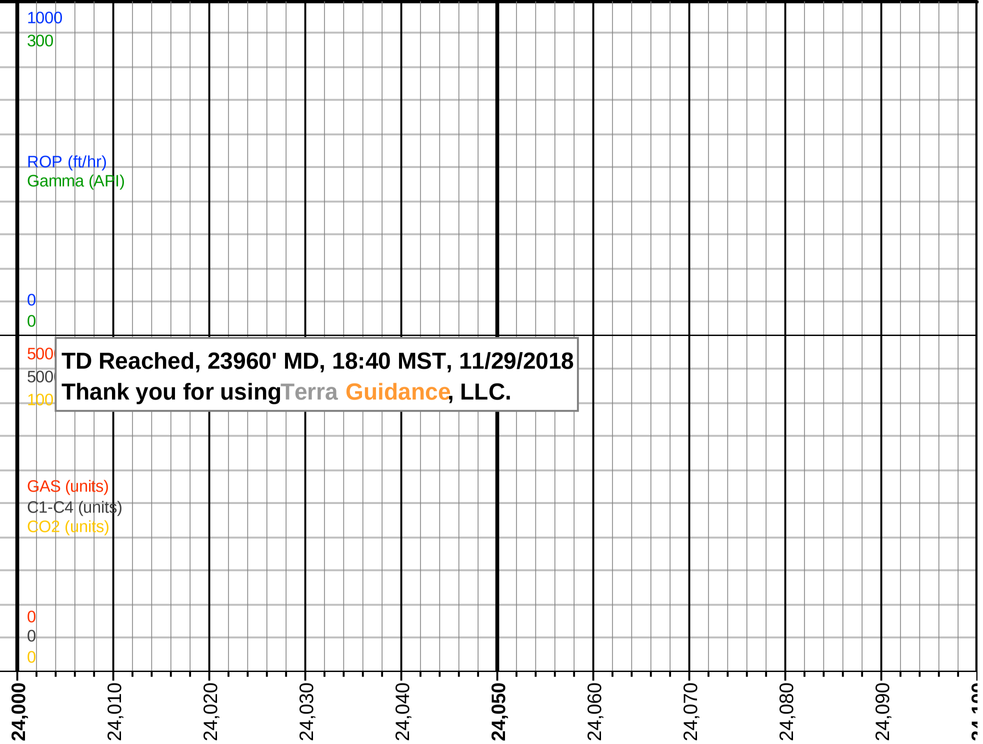


fg, sb blky-sr clus, pred cons,
/ SH: drkgy-dk brn, sb blky, frm-v
r LS
MD: 23,575'
INC: 90.03°
AZM: 182.49°
TVD: 7,978.7'
VS: 15,281.44'
MW 11.0 / VIS 65
156 ft/hr
3041u
C1: 67.1%
C2: 18.6%
C3: 10%
C4: 4.2%
3322u
23,560
23,570
23,580
23,590
23,600
8800
TVD (ft)
7300
GAS (units)
C1-C4 (units)
CO2 (units)
5000
ROP (ft/hr)
Gamma (API)
1000
300
90% SS: med-drkgy, sme brn, mod sft, occ frm, vfg, pred uncons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd
120 api
23,610
23,620
23,630
23,640
23,650
MD: 23,664'
INC: 89.91°
AZM: 181.02°
TVD: 7,978.74'
VS: 15,370.44'
MW 11.050 / VIS 65
23,660
23,670
23,680
Recycle Pumps
182 ft/hr
3312u
23,690
23,700
8800
TVD (ft)
7300
GAS (units)
C1-C4 (units)
CO2 (units)
5000
100
ROP (ft/hr)
Gamma (API)
1000
300
90% SS: med-drkgy, sme brn, mod sft, occ frm, vfg, pred uncons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd
112 api
23,710
23,720
23,730
23,740
TD Flow Check: No Flow
23,750
MD: 23,754'
INC: 90.03°
AZM: 182.49°
TVD: 7,978.79'
VS: 15,460.43'
90% SS: med-drkgy, sme brn, mod sft, occ frm, vfg, pred uncons, mo
arg-slty, cly cmt, v sl calc; 10% SLTY SH: drkgy-dk brn, sb blky, frm-v
slty-aren, v sl calc, tr intbd wi sd
23,760
23,770
882 ft/hr



d-w srt, sl
hd, brit ip, rthy,

95% SS: med-drkgy, sme brn, mod sft, occ frm, vfg, pred uncons, mod-w srt, sl arg-slty, cly cmt, v sl calc; 5% SLTY SH: drkgy-dk brn, sb blky, frm-v hd, brit ip, rthy, slty-aren, v sl calc, tr intbd wi sd



TD Reached, 23960' MD, 18:40 MST, 11/29/2018
Thank you for using Terra Guidance, LLC.

7300

FM Name	Excursion Depths (' MD)					
Sharon Springs	7456					
Niobrara	7654				19966	
Ft Hays	8209	10440	11648		20520	22713
Codell	8398		10911	12327	21240	23040
Carlile						
Greenhorn						

8800