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## Customer Information

**Operator:** Noble Energy Inc  
1625 Broadway  
Suite 2200  
Denver, Colorado 80202

**Geologist:** Holly Duncan  
Noble Energy Inc.

## Mud Logging Details

**Logger:** Tom Wacholz &  
Mark Dennis

**Log Interval:** 2500' MD to 5560' MD

**Start Date:** November 30, 2014

**Release Date:** December 5, 2014

## Well Information

**Well Name:** McCaffrey State  
LD12-74-1AHN

**Location:** 1-T9N-R58W  
250' FSL, 2200' FEL

**County:** Weld  
**State:** Colorado

**Drilling Rig:** H&P 343

**Total Depth:** 10391' MD

**TD Date:** December 5, 2014

**Formation:** Niobrara B Chalk

**KB Elevation:** 4657'

**GR Elevation:** 4633'

**API Number:** 05-123-39672-0000

## ROCK TYPES

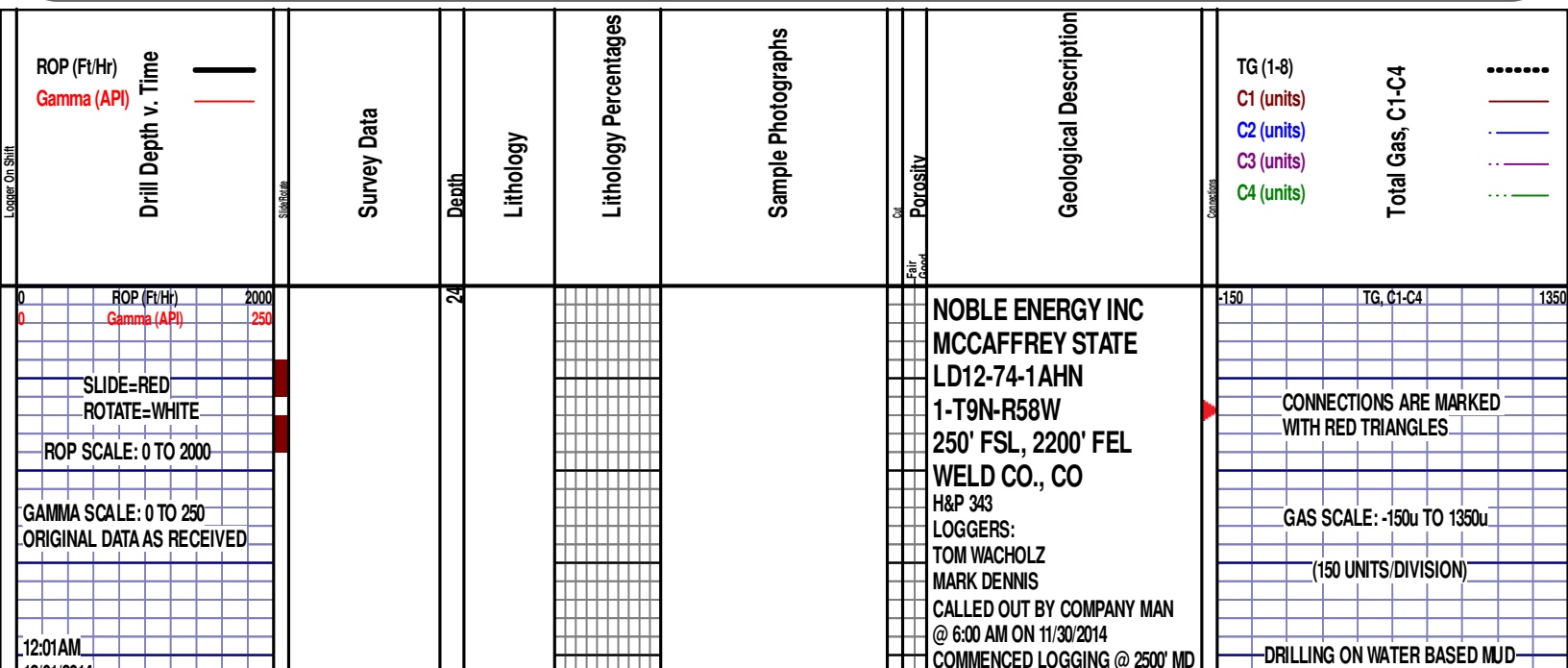
shale  
Anhy  
Bent  
Brec  
Cht  
Clyst  
Coal

Congl  
Dol  
Gyp  
Igne  
Lmst  
Meta  
Mrlist

Salt  
Shale  
Shcol  
Shgy  
Sltst  
Ss  
Till

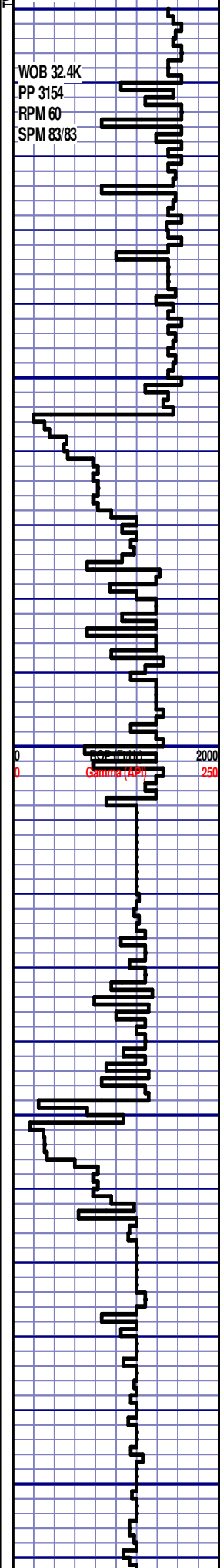
gw  
lmywash  
ogw  
olmywash  
oshly gw  
shly gw  
sdygw

hvyrcrbsh  
nosmpl  
Lsdetrst  
sltst  
sdy sh



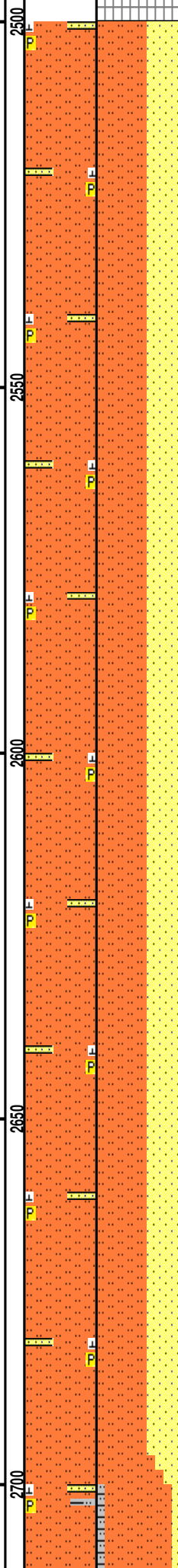
12/01/2014  
DAY 02  
0 FT/24HRS

WOB 32.4K  
PP 3154  
RPM 60  
SPM 83/83



MD 2594 TVD 2574.13  
INC 11.39 AZ 90.42  
VS 17.16

MD 2689 TVD 2667.32  
INC 11.03 AZ 89.98  
VS 18.71



PIERRE 2500' MD - 2600' MD



@ 1:30 PM ON 12/01/2014 W/BIT # 2,  
8.75", SMITH SDI519 (S/N) JJ7216 IN  
@ 1227 MD

## PIERRE

BEFORE LOGGING DEPTH

2500' MD-2600' MD: SLTST: 60% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, IMBD  
PYR, INTGR POR, NO STN, NO  
FLOR, NO O FLOR, NO CUT, NO  
RNG

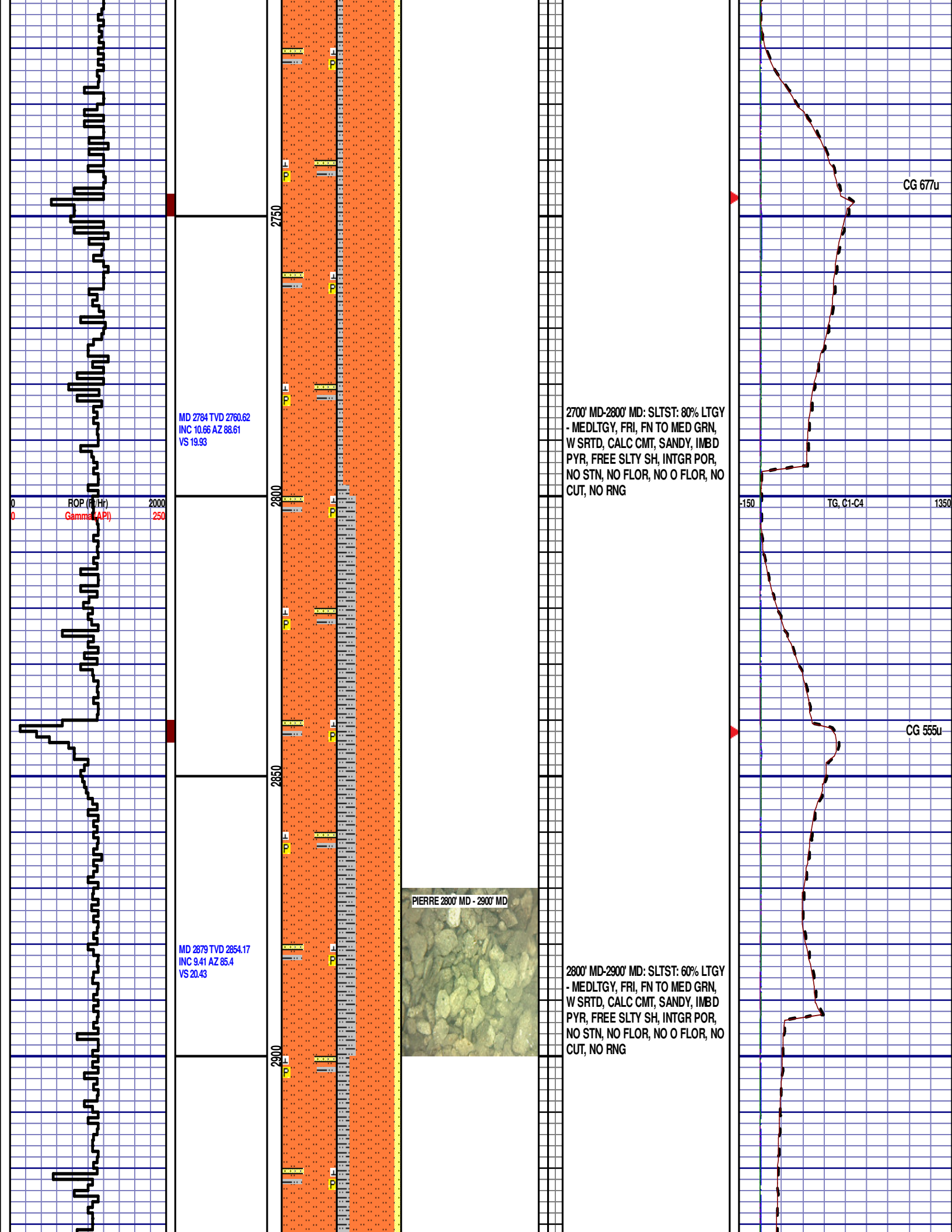
2600' MD-2700' MD: SLTST: 60% LTGY  
- MEDLTGY, FRI, MED GRN, W  
SRTD, CALC CMT, SANDY, IMBD  
PYR, INTGR POR, NO STN, NO  
FLOR, NO O FLOR, NO CUT, NO  
RNG

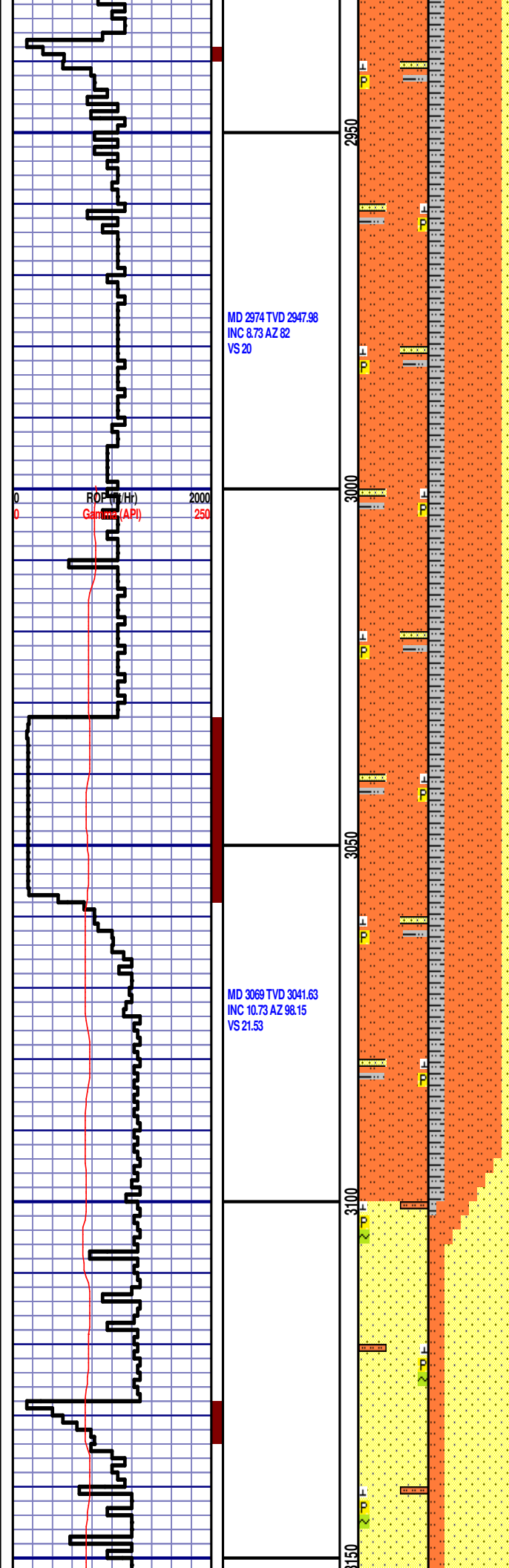
DEPTH 2498'  
WT 8.70  
VIS 27  
PH 10.0  
FIL 84.0  
CL 2800  
CAL 160  
H2O 97.5  
OIL 0.0  
LGS 15.6  
GEL 2/4/5  
PV 2  
YP 3  
CK 3/0  
SOL 2.2

CG 650u

TG, C1-C4

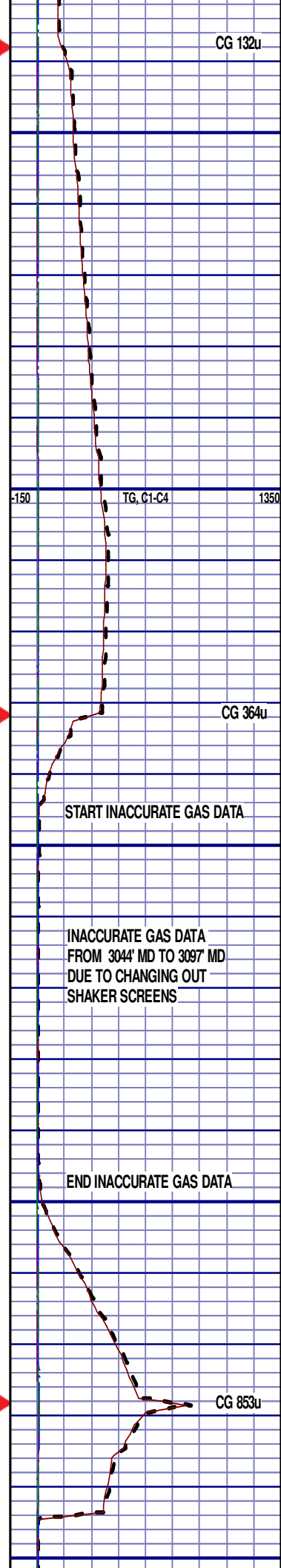
CG 678u

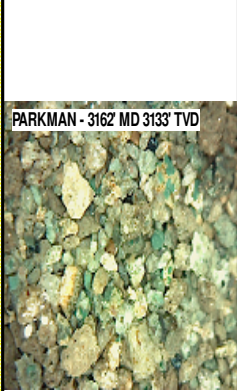
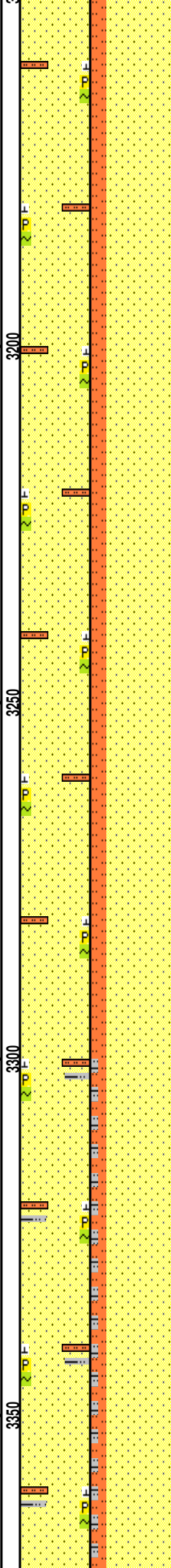
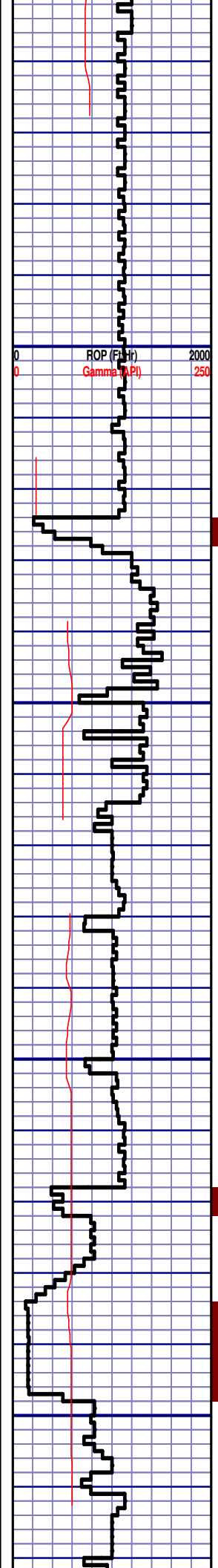




2900' MD-3000' MD: SLTST: 70% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, IMBD  
PYR, FREE SLTY SH, INTGR POR,  
NO STN, NO FLOR, NO O FLOR, NO  
CUT, NO RNG

3000' MD-3100' MD: SLTST: 70% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, IMBD  
PYR, FREE SLTY SH, INTGR POR,  
NO STN, NO FLOR, NO O FLOR, NO  
CUT, NO RNG

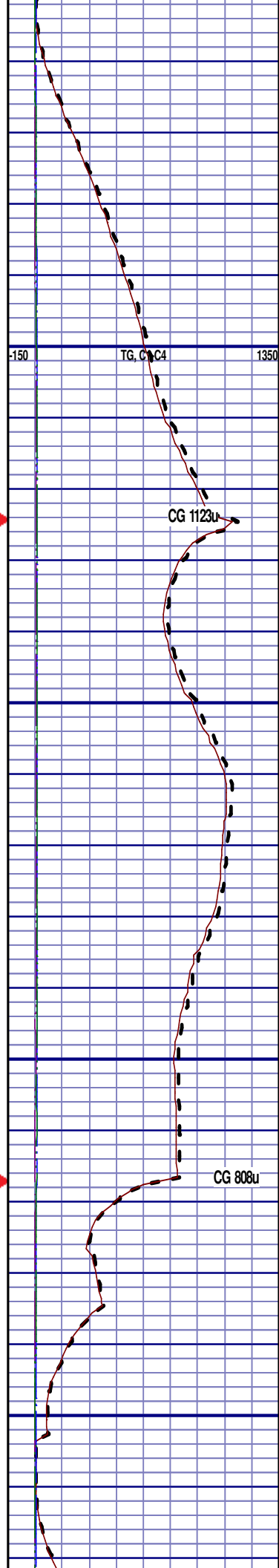


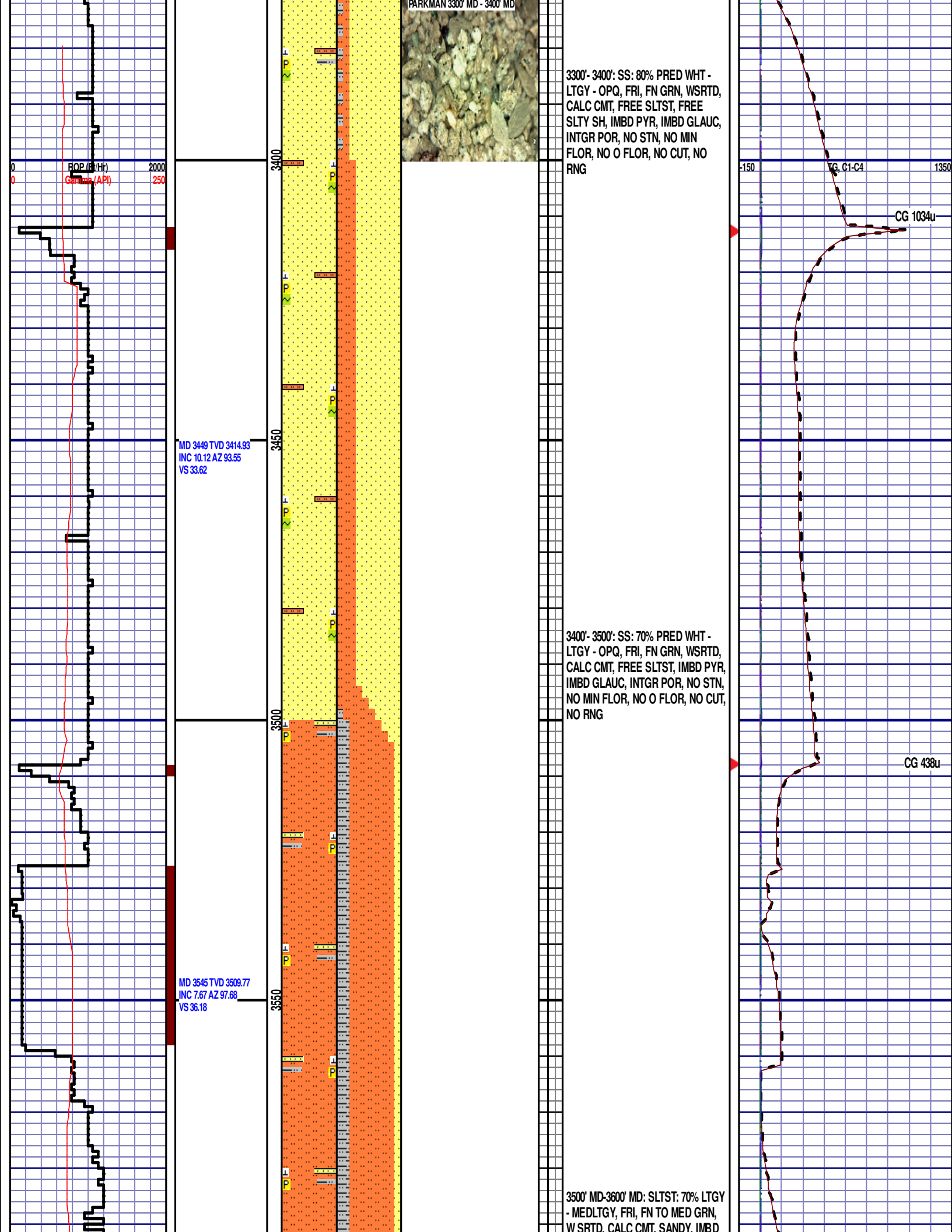


**PARKMAN**  
3162' MD 3133' TVD

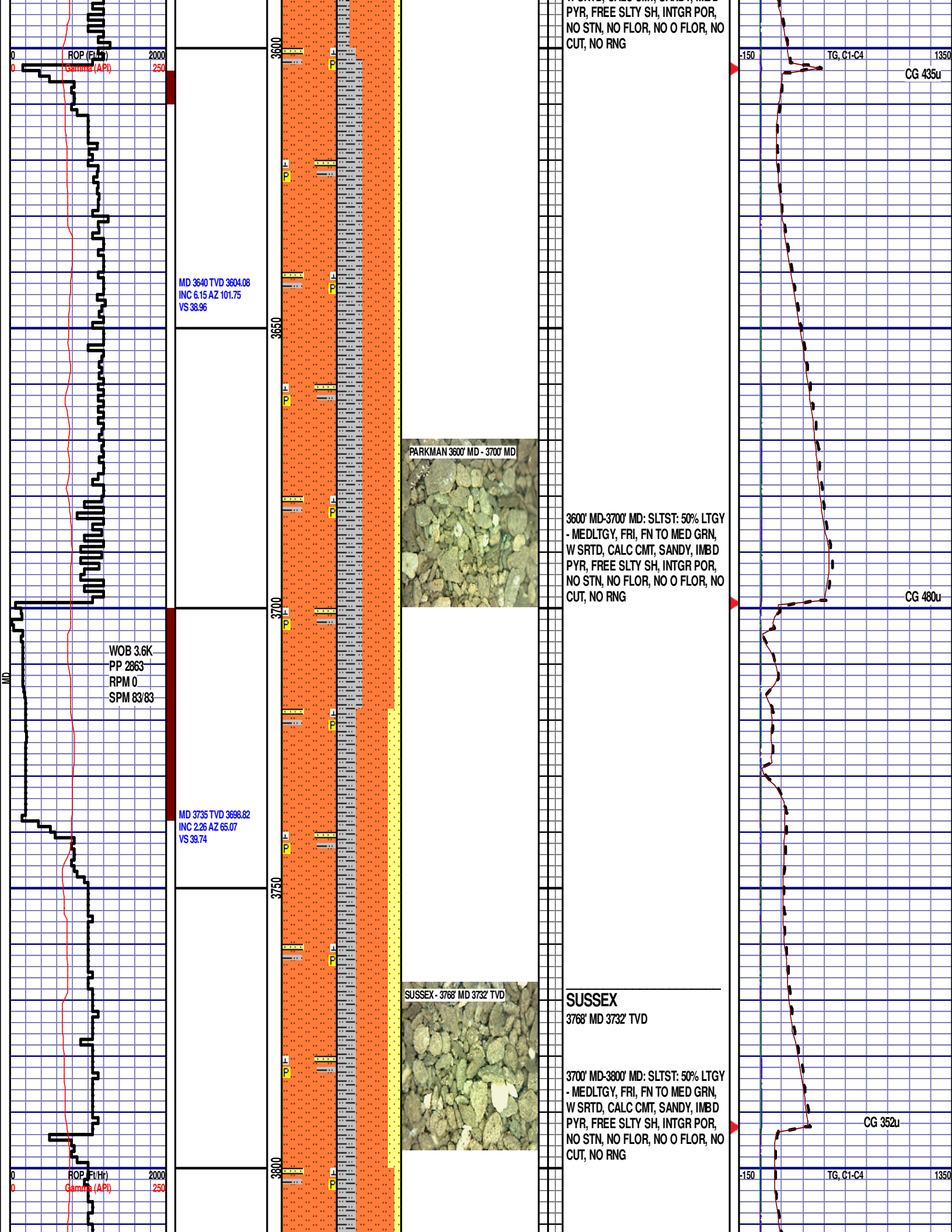
3100'- 3200': SS: 80% PRED WHT -  
LTGY - OPQ, FRI, FN GRN, WSRTD,  
CALC CMT, FREE SLTST, IMBD PYR,  
IMBD GLAUC, INTGR POR, NO STN,  
NO MIN FLOR, NO O FLOR, NO CUT,  
NO RNG

3200'- 3300': SS: 80% PRED WHT -  
LTGY - OPQ, FRI, FN GRN, WSRTD,  
CALC CMT, FREE SLTST, IMBD PYR,  
IMBD GLAUC, INTGR POR, NO STN,  
NO MIN FLOR, NO O FLOR, NO CUT,  
NO RNG









MD 3830 TVD 3793.76  
INC 1.65 AZ 55.86  
VS 38.42

MD 3925 TVD 3888.72  
INC 1.47 AZ 52.37  
VS 37.08

MD 4020 TVD 3983.7  
INC 1.36 AZ 58.64  
VS 35.91

3850

3900

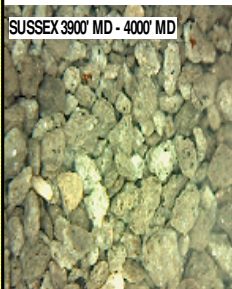
3950

4000

3800' MD-3900' MD: SLTST: 60% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, IMBD  
PYR, FREE SLTY SH, INTGR POR,  
NO STN, NO FLOR, NO O FLOR, NO  
CUT, NO RNG

CG 818u

SUSSEX 3900' MD - 4000' MD



3900' MD-4000' MD: SLTST: 70% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, IMBD  
PYR, FREE SLTY SH, INTGR POR,  
NO STN, NO FLOR, NO O FLOR, NO  
CUT, NO RNG

CG 983u

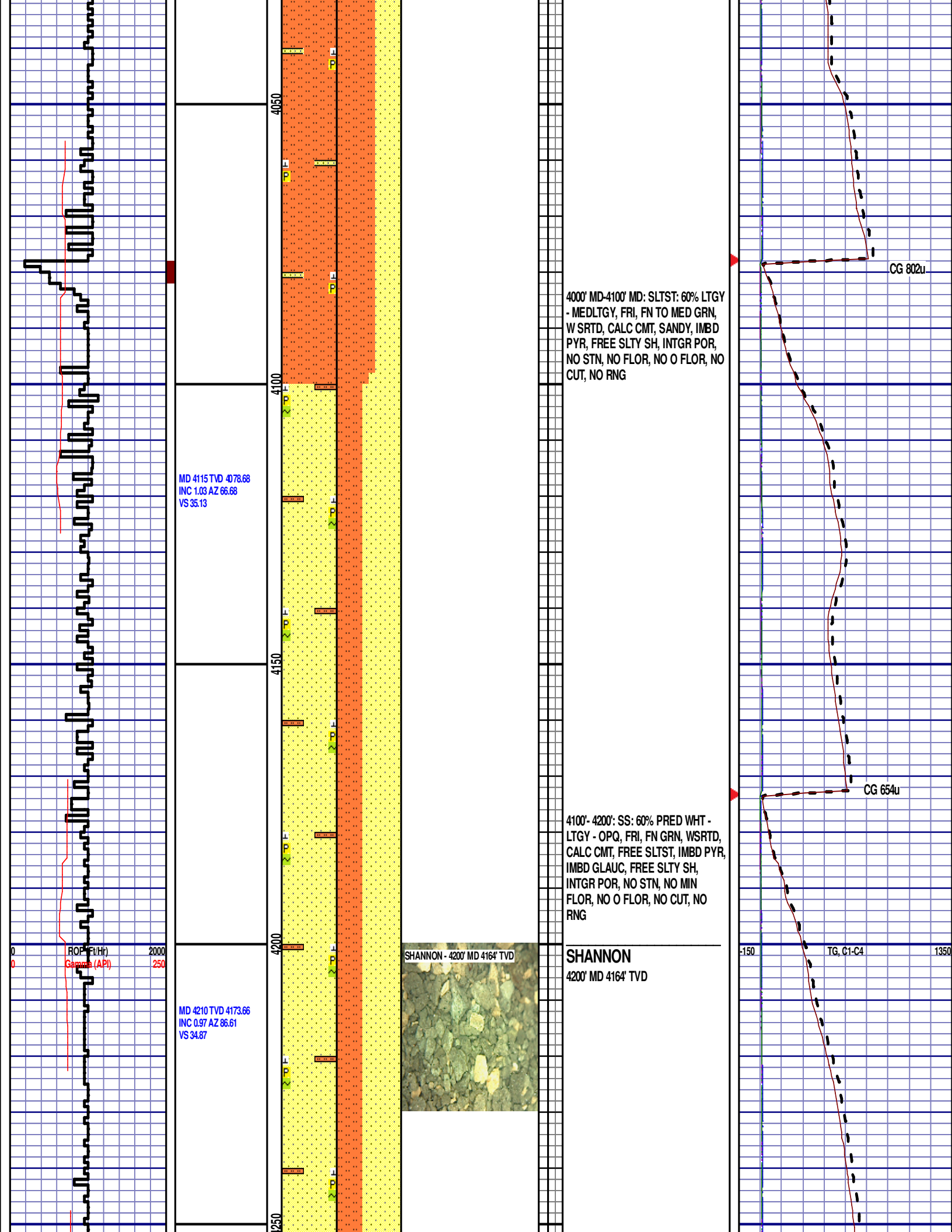
ROP (ft/Hr)  
Gamma (API)

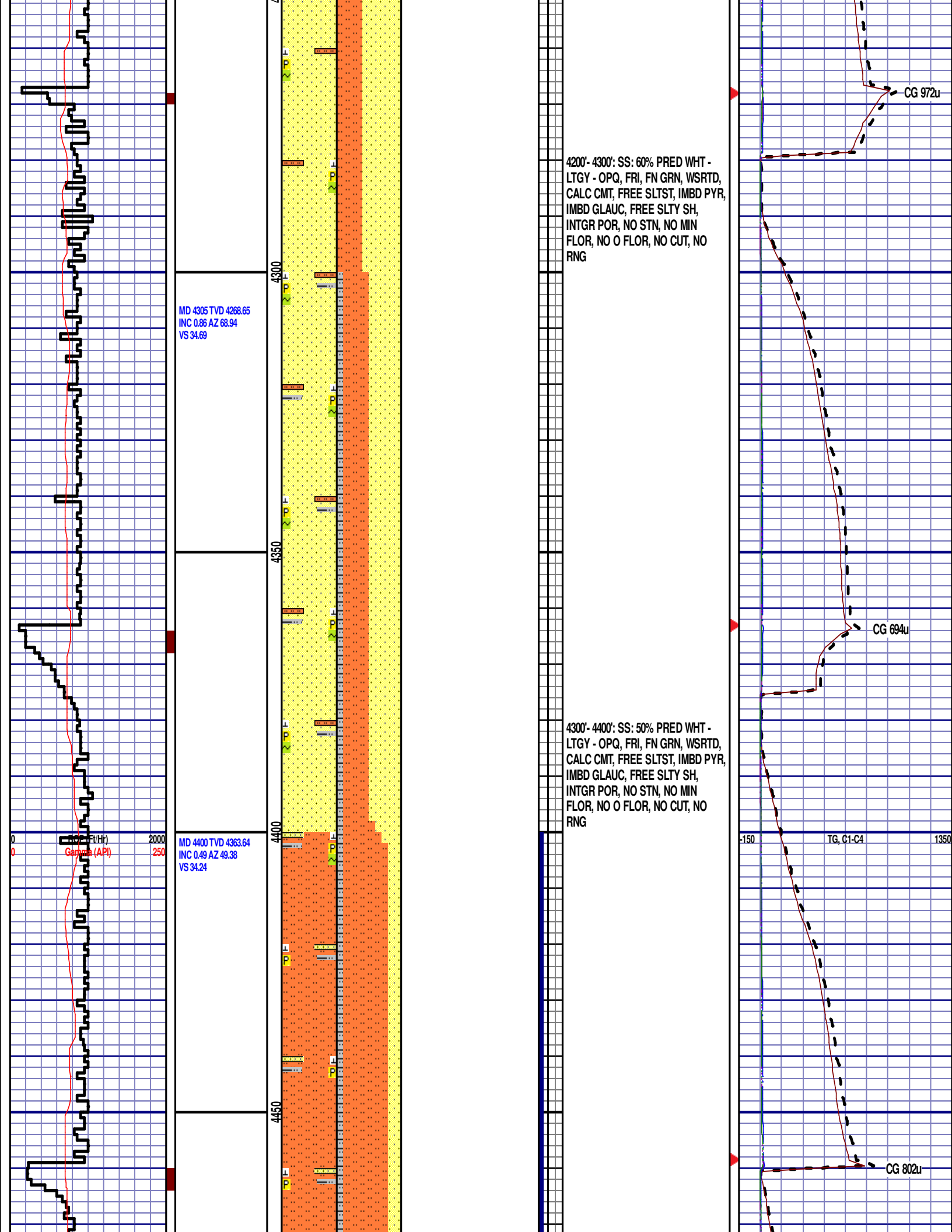
2000  
250

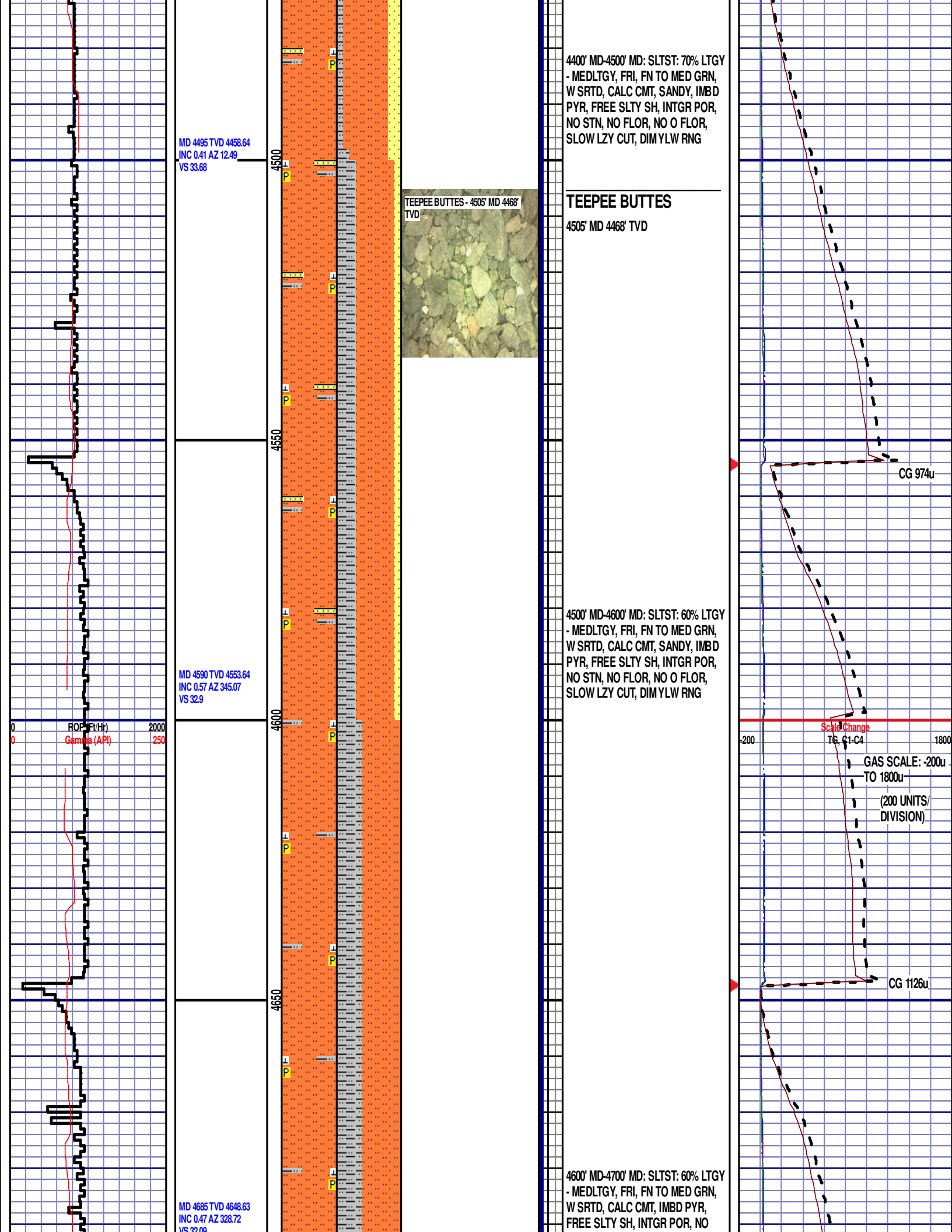
TG, C1-C4

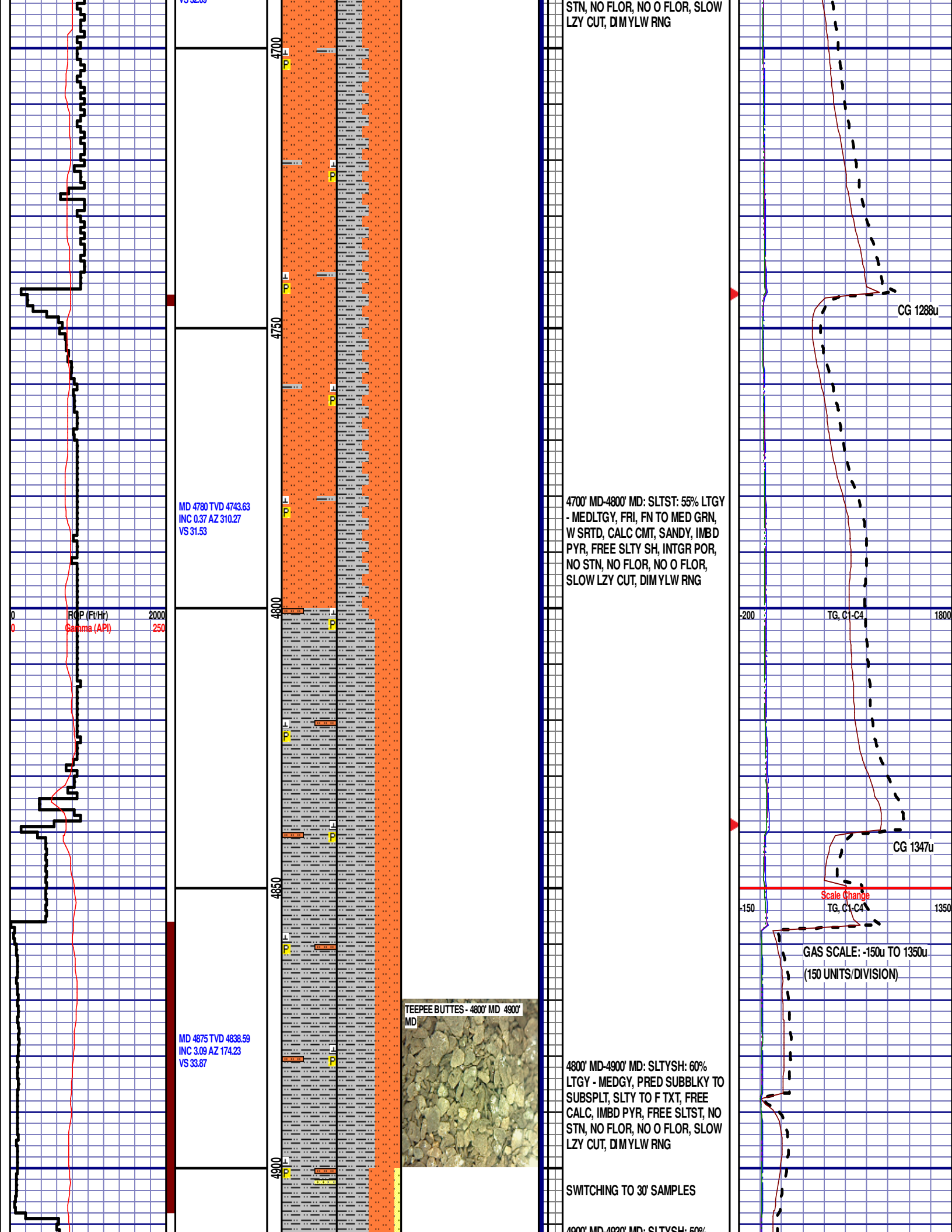
1350











WOB 9.3K  
PP 3004  
RPM 0  
SPM 79/79

MD 4971 TVD 4933.98  
INC 9.3 AZ 173.62  
VS 44.23

ROP (Ft/Hr)  
Gamma (API)

2000  
250

ROP SCALE  
CHANGE: 0 TO 350

Scale Change  
ROP (Ft/Hr)  
Gamma (API)

350  
250

MD 5114 TVD 5073.66  
INC 17.3 AZ 179.58  
VS 74.35

4950

5000

5050

5100

4900' MD-4950' MD: SLTST: 50% LTGY - MEDGY, PRED SUBBLKY TO SUBSPLT, SLTY TO F TXT, FREE CALC, IMBD PYR, FREE SLTST, FREE SS, NO STN, NO FLOR, NO O FLOR, SLOW LZY CUT, DIM YLW RNG

4930' MD-4960' MD: SLTST: 70% LTGY - MEDLTGY, FRI, FN TO MED GRN, W SRTD, CALC CMT, FREE SLTY SH, FREE SS, IMBD PYR, INTGR POR, NO STN, NO FLOR, NO O FLOR, SLOW LZY CUT, DIM YLW RNG

4960' MD-4990' MD: SLTST: 60% LTGY - MEDLTGY, FRI, FN TO MED GRN, W SRTD, CALC CMT, FREE SLTY SH, FREE SS, IMBD PYR, INTGR POR, NO STN, NO FLOR, NO O FLOR, SLOW LZY CUT, DIM YLW RNG

4990' MD-5020' MD: SLTST: 70% LTGY - MEDLTGY, FRI, FN TO MED GRN, W SRTD, CALC CMT, FREE SLTY SH, FREE SS, IMBD PYR, INTGR POR, NO STN, NO FLOR, NO O FLOR, SLOW LZY CUT, DIM YLW RNG

5020' MD-5050' MD: SLTST: 80% LTGY - MEDLTGY, FRI, FN TO MED GRN, W SRTD, CALC CMT, FREE SLTY SH, FREE SS, IMBD PYR, INTGR POR, NO STN, NO FLOR, NO O FLOR, SLOW LZY CUT, DIM YLW RNG

5050' MD-5080' MD: SLTST: 80% LTGY - MEDLTGY, FRI, FN TO MED GRN, W SRTD, CALC CMT, FREE SLTY SH, FREE SS, IMBD PYR, INTGR POR, NO STN, NO FLOR, NO O FLOR, SLOW LZY CUT, DIM YLW RNG

5080' MD-5110' MD: SLTST: 90% LTGY - MEDLTGY, FRI, FN TO MED GRN, W SRTD, CALC CMT, FREE SLTY SH, FREE SS, IMBD PYR, INTGR POR, NO STN, NO FLOR, NO O FLOR, SLOW LZY CUT, DIM YLW RNG

5110' MD-5140' MD: SLTST: 85% LTGY - MEDLTGY, FRI, FN TO MED GRN, W SRTD, CALC CMT, FREE SLTY SH, FREE SS, IMBD PYR, INTGR

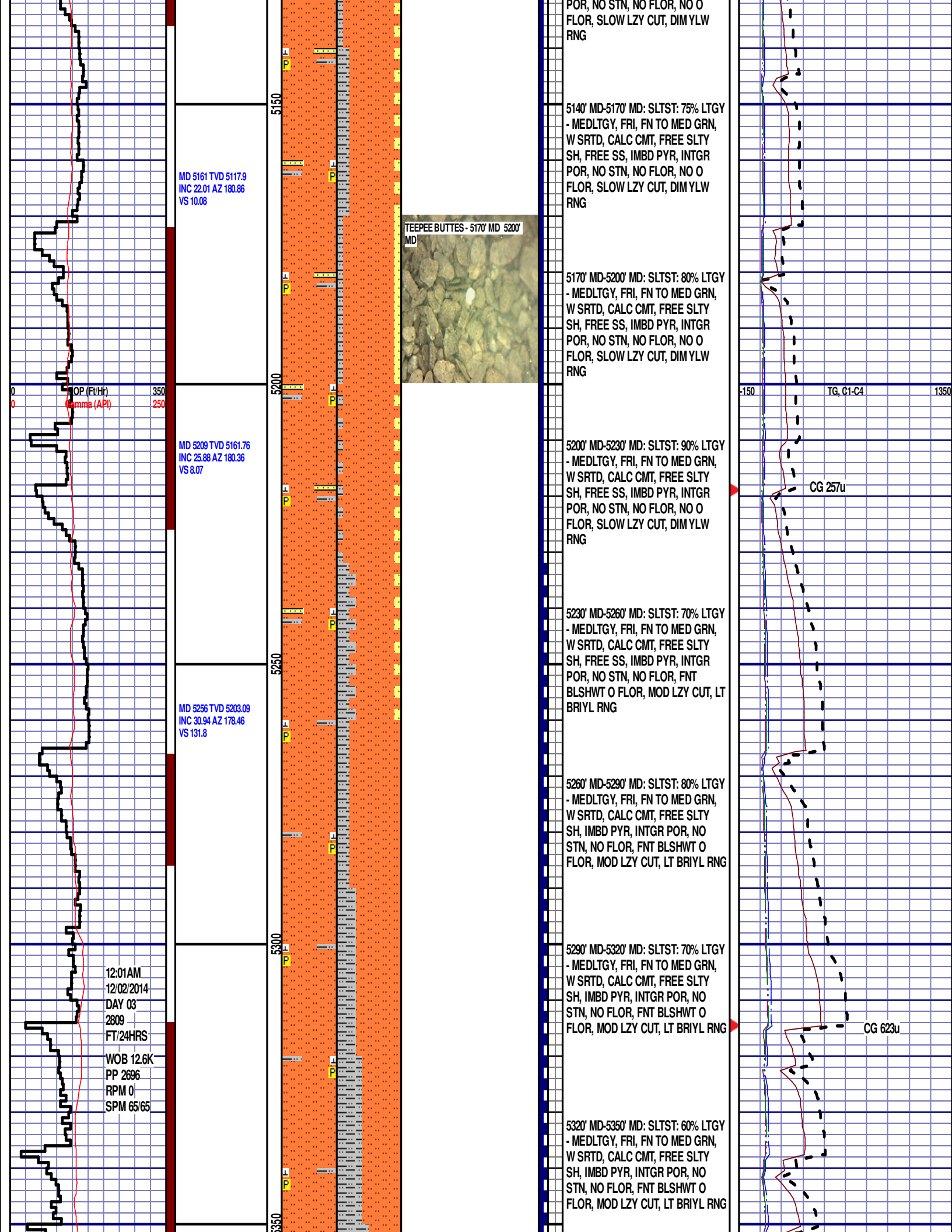
CG 350u

CG 800u

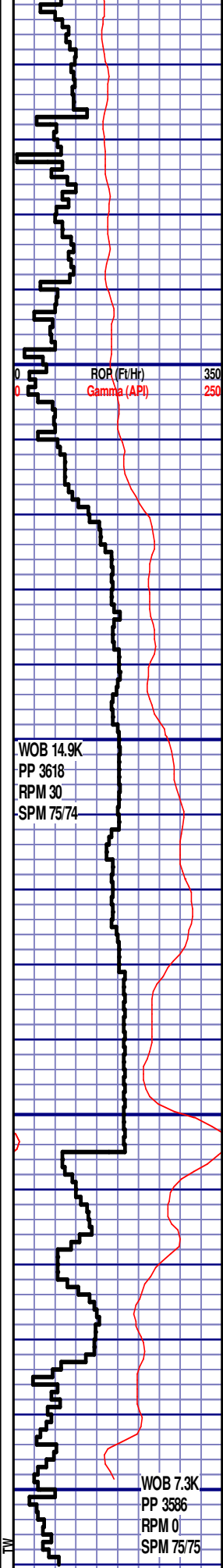
CG 250u

TG, C1-C4





MD 5351 TVD 5279.77  
INC 41.21 AZ 178.21  
VS 187.59



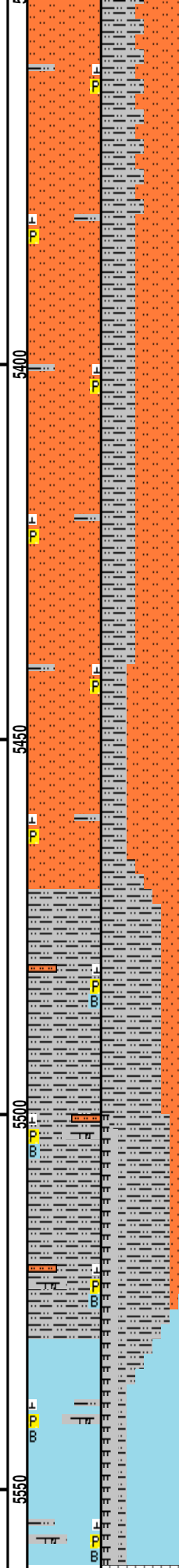
ROR (Ft/Hr)  
Gamma (API)

WOB 14.9K  
PP 3618  
RPM 30  
SPM 75/74

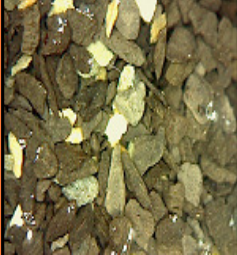
WOB 7.3K  
PP 3586  
RPM 0  
SPM 75/75

MD 5447 TVD 5345.96  
INC 51.48 AZ 178.41  
VS 256.86

MD 5542 TVD 5397.43  
INC 62.79 AZ 177.92  
VS 336.43



TEEPEE BUTTES - 5470' MD 5500' MD



SHARON SPRINGS - 5516' MD 5389' TVD



5350' MD-5380' MD: SLTST: 55% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, FREE SLTY  
SH, IMBD PYR, INTGR POR, NO  
STN, NO FLOR, FNT BLSHWT O  
FLOR, MOD LZ Y CUT, LT BRIYL RNG

5380' MD-5410' MD: SLTST: 60% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, FREE SLTY  
SH, IMBD PYR, INTGR POR, NO  
STN, NO FLOR, FNT BLSHWT O  
FLOR, MOD LZ Y CUT, LT BRIYL RNG

5410' MD-5440' MD: SLTST: 60% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, FREE SLTY  
SH, IMBD PYR, INTGR POR, NO  
STN, NO FLOR, FNT BLSHWT O  
FLOR, MOD LZ Y CUT, LT BRIYL RNG

5440' MD-5470' MD: SLTST: 70% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, FREE SLTY  
SH, IMBD PYR, INTGR POR, NO  
STN, NO FLOR, FNT BLSHWT O  
FLOR, MOD LZ Y CUT, LT BRIYL RNG

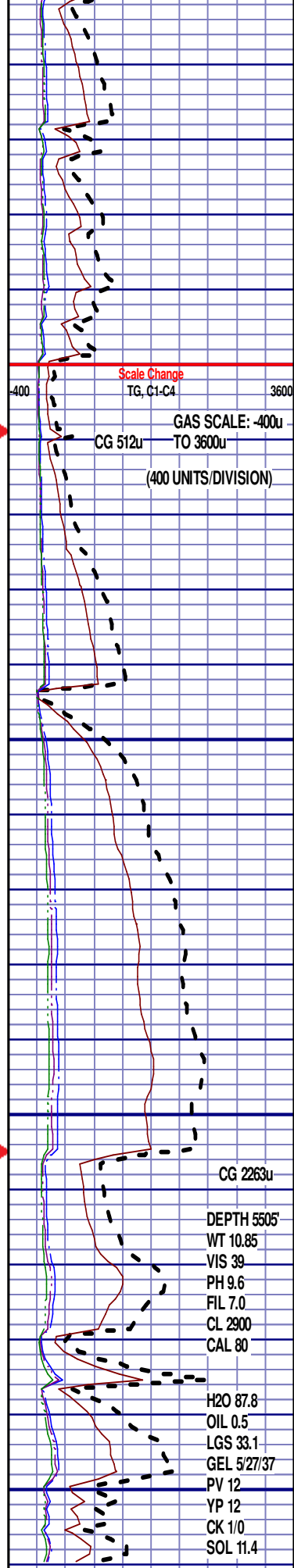
5470' MD-5500' MD: SLTYSH: 70%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, FREE  
CALC, ABDT FREE BENT, IMBD  
PYR, FREE SLTST, NO STN, 20%  
MIN FLOR, FNT BLSHWT O FLOR,  
MOD LZ Y CUT, LT BRIYL RNG

5500' MD-5530' MD: SLTYSH: 60%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, FREE  
CALC, FREE BENT, IMBD PYR,  
FREE SLTST, FREE MARL, NO STN,  
5% MIN FLOR, FNT BLSHWT O  
FLOR, IMED STRMG CUT, HVY  
BLSHWT RNG

### SHARON SPRINGS

5516' MD 5389' TVD

5530' MD-5560' MD: CHK: 70% (CaCO3  
60%) MOTT LTGY - MEDDRKGY -  
DRKGY, BLKY TO SUBBLKY, FXLN  
TO CHLKY, SFT, CHK FRMWK,  
IMBD CALC, FREE PYR, TRC FREE  
BENT, FREE SLTY SH, 20% FREE  
MRL, TRC GRYSBLK STN, TRC  
LTOR MIN FLOR, FNT BLSHWT O  
FLOR, IMED STRMG CUT, HVY  
BLSHWT RNG



Scale Change  
TG, C1-C4

GAS SCALE: -400u  
TO 3600u  
(400 UNITS/DIVISION)

CG 2263u

DEPTH 5505'  
WT 10.85  
VIS 39  
PH 9.6  
FIL 7.0  
CL 2900  
CAL 80

H2O 87.8  
OIL 0.5  
LGS 33.1  
GEL 5/27/37  
PV 12  
YP 12  
CK 1/0  
SOL 11.4

						END OF VERTICAL LOG @ 5560' MD ON 12/02/14, CONTINUED ON HORIZONTAL LOG					
0	ROP (Ft/Hr)	350	5600						-400	TG, C1-C4	3600
0	Gamma (API)	250									