



7136 South Yale Avenue, Suite 414

Tulsa, Oklahoma 74136-6378

phone 918.925.9739

fax 866.534.4559

WWW.HZMUD.COM/25

## Customer Information

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

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

## Mud Logging Details

**Logger:** Casey Sensecqua &  
Robert Gulliksen

**Log Interval:** 2500' MD to 6650' MD

**Start Date:** September 14, 2013

**Release Date:** September 18, 2013

## Well Information

**Well Name:** Wells Ranch AE20-62HN

**Location:** 20-T6N-R62W  
1606' FSL, 215' FWL

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

**Drilling Rig:** H&P 343

**Total Depth:** 11066' MD

**TD Date:** September 18, 2013

**Formation:** Niobrara B Chalk

**KB Elevation:** 4809'

**GR Elevation:** 4785'

**API Number:** 05-123-37224-0000

## ROCK TYPES

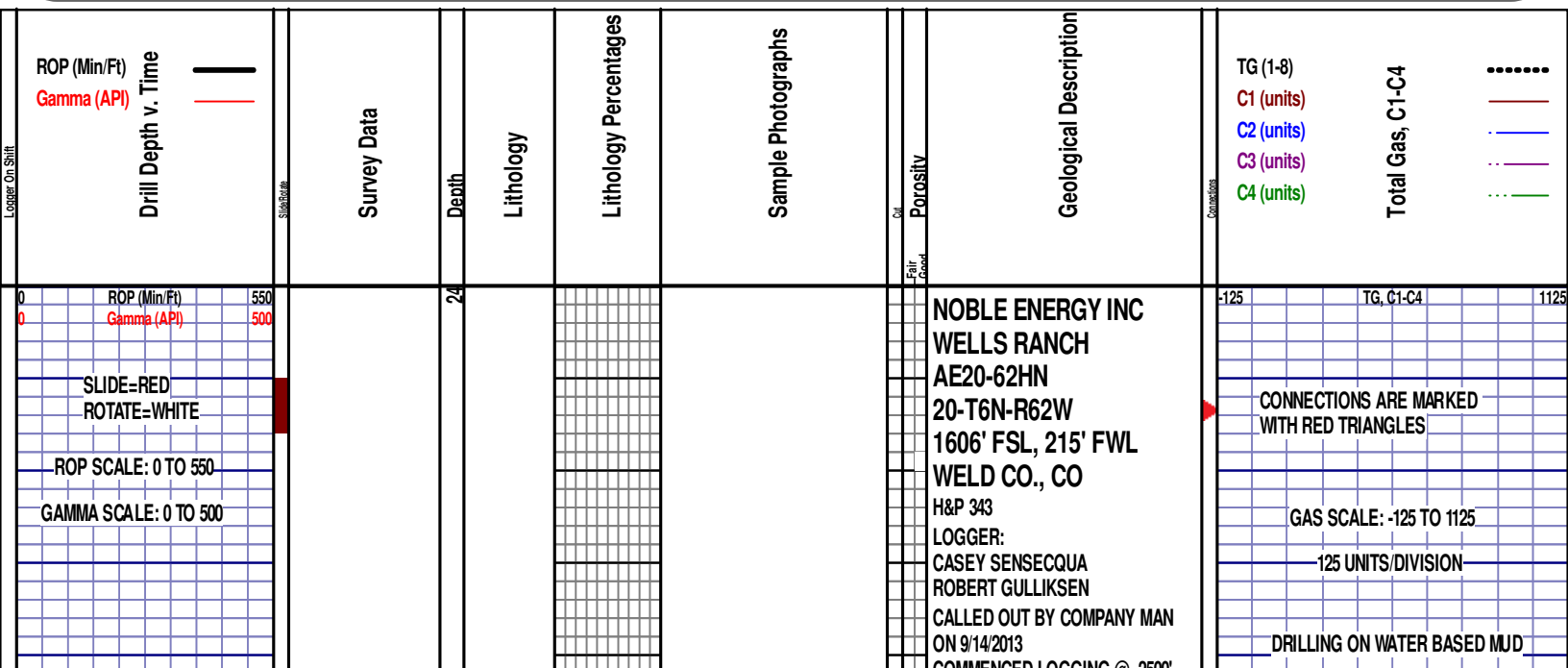
shale  
Anhy  
Bent  
Brec  
Cht  
Clyst  
Coal

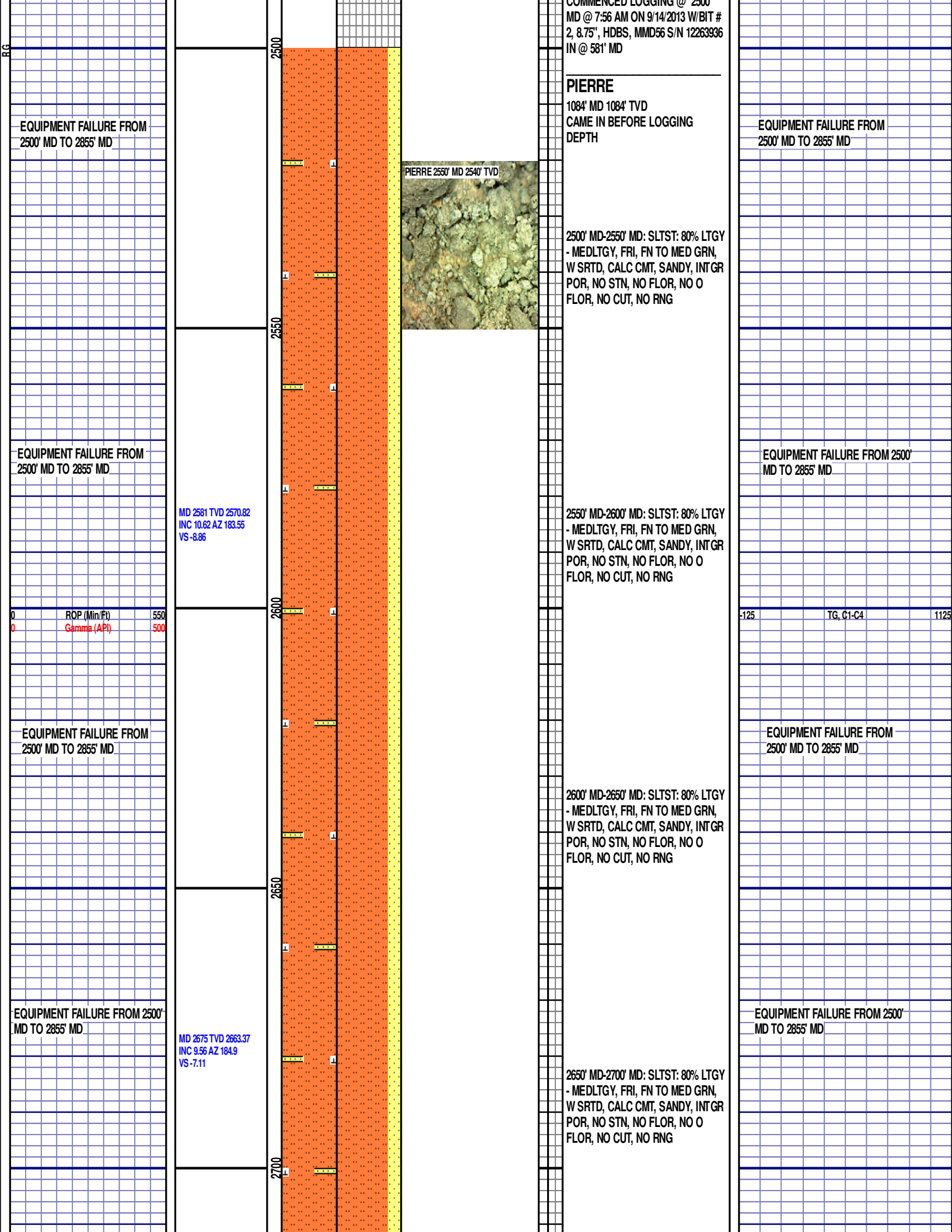
Congl  
Dol  
Gyp  
Igne  
Lmst  
Meta  
Mrlist

Salt  
Shale  
Shcol  
Shgy  
Sltst  
Ss  
Till

gw  
lmywash  
ogw  
olmywash  
oshly gw  
shly gw  
sdygw

hvyrcrbsh  
nosmpl  
Lsdetrst  
sltst  
sdy sh





EQUIPMENT FAILURE FROM 2500'  
MD TO 2855' MD

EQUIPMENT FAILURE FROM 2500'  
MD TO 2855' MD

ROP (Min/Ft)  
Gamma (API)

EQUIPMENT FAILURE FROM 2500'  
MD TO 2855' MD

MD 2770 TVD 2756.78  
INC 11.38 AZ 181.46  
VS -4.92

MD 2865 TVD 2850.07  
INC 10.39 AZ 180.71  
VS -2.06

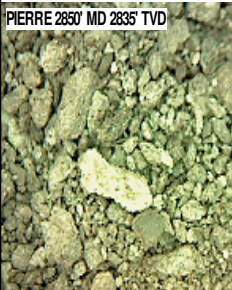
2750

2800

2850

2900

PIERRE 2850' MD 2835' TVD



2700' MD-2750' MD: SLTST: 80% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, NO FLOR, NO O  
FLOR, NO CUT, NO RNG

2750' MD-2800' MD: SLTST: 80% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, NO FLOR, NO O  
FLOR, NO CUT, NO RNG

2800' MD-2850' MD: SLTST: 70% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, NO FLOR, NO O  
FLOR, NO CUT, NO RNG

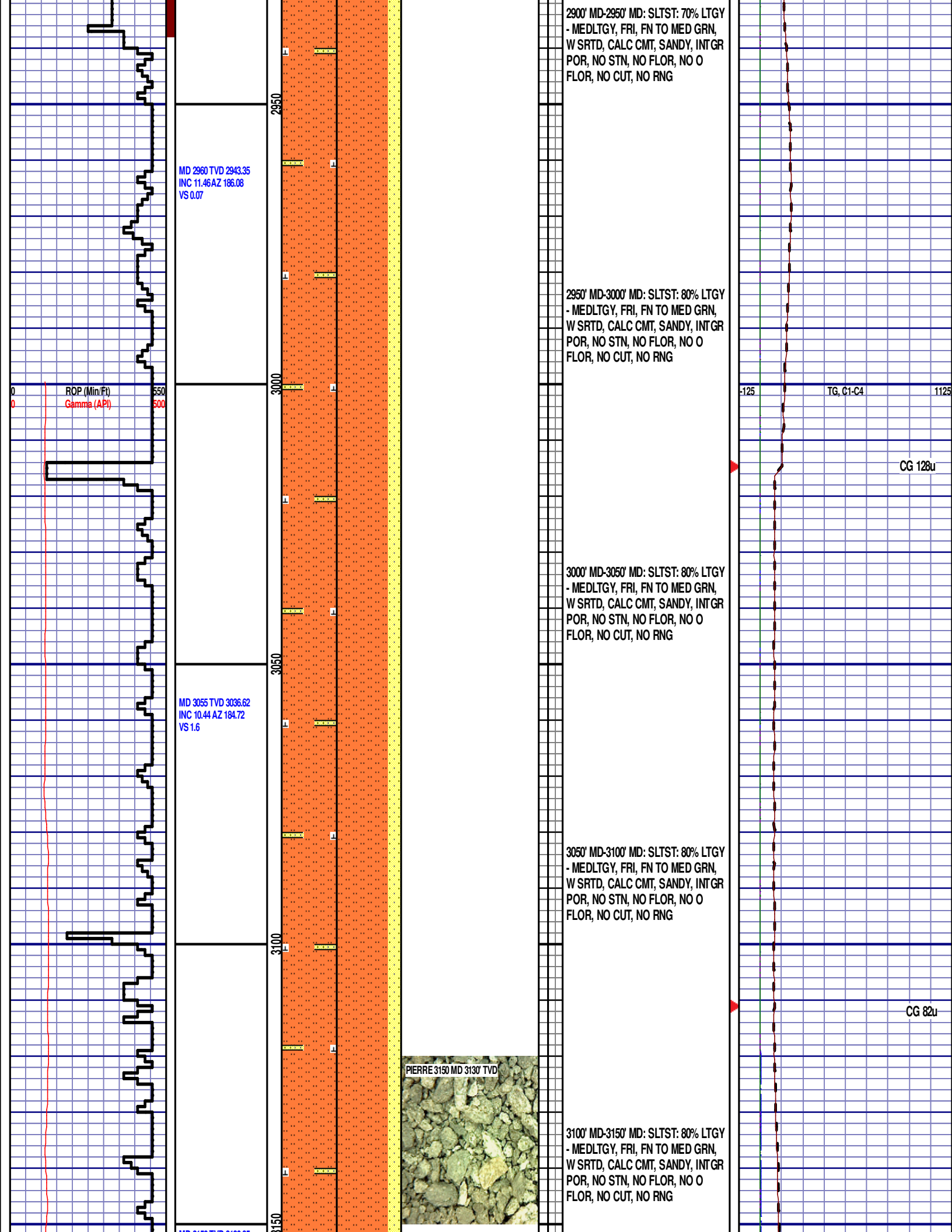
2850' MD-2900' MD: SLTST: 70% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, NO FLOR, NO O  
FLOR, NO CUT, NO RNG

EQUIPMENT FAILURE FROM 2500'  
MD TO 2855' MD

EQUIPMENT FAILURE FROM 2500'  
MD TO 2855' MD

-125 TG, C1-C4 1125

EQUIPMENT FAILURE FROM  
2500' MD TO 2855' MD



MD 3150 TVD 3130.35  
INC 8.3 AZ 183.86  
VS 3.2

ROP (Min/Ft)  
Gamma (API)

MD 3245 TVD 3224.29  
INC 8.79 AZ 187.17  
VS 4.37

MD 3340 TVD 3318.17  
INC 8.85 AZ 192.67  
VS 4.46

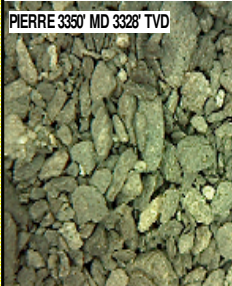
3150' MD-3200' MD: SLTST: 80% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, NO FLOR, NO O  
FLOR, NO CUT, NO RNG

3200' MD-3250' MD: SLTST: 80% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, NO FLOR, NO O  
FLOR, NO CUT, NO RNG

3250' MD-3300' MD: SLTST: 80% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, NO FLOR, NO O  
FLOR, NO CUT, NO RNG

3300' MD-3350' MD: SLTST: 80% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, NO FLOR, NO O  
FLOR, NO CUT, NO RNG

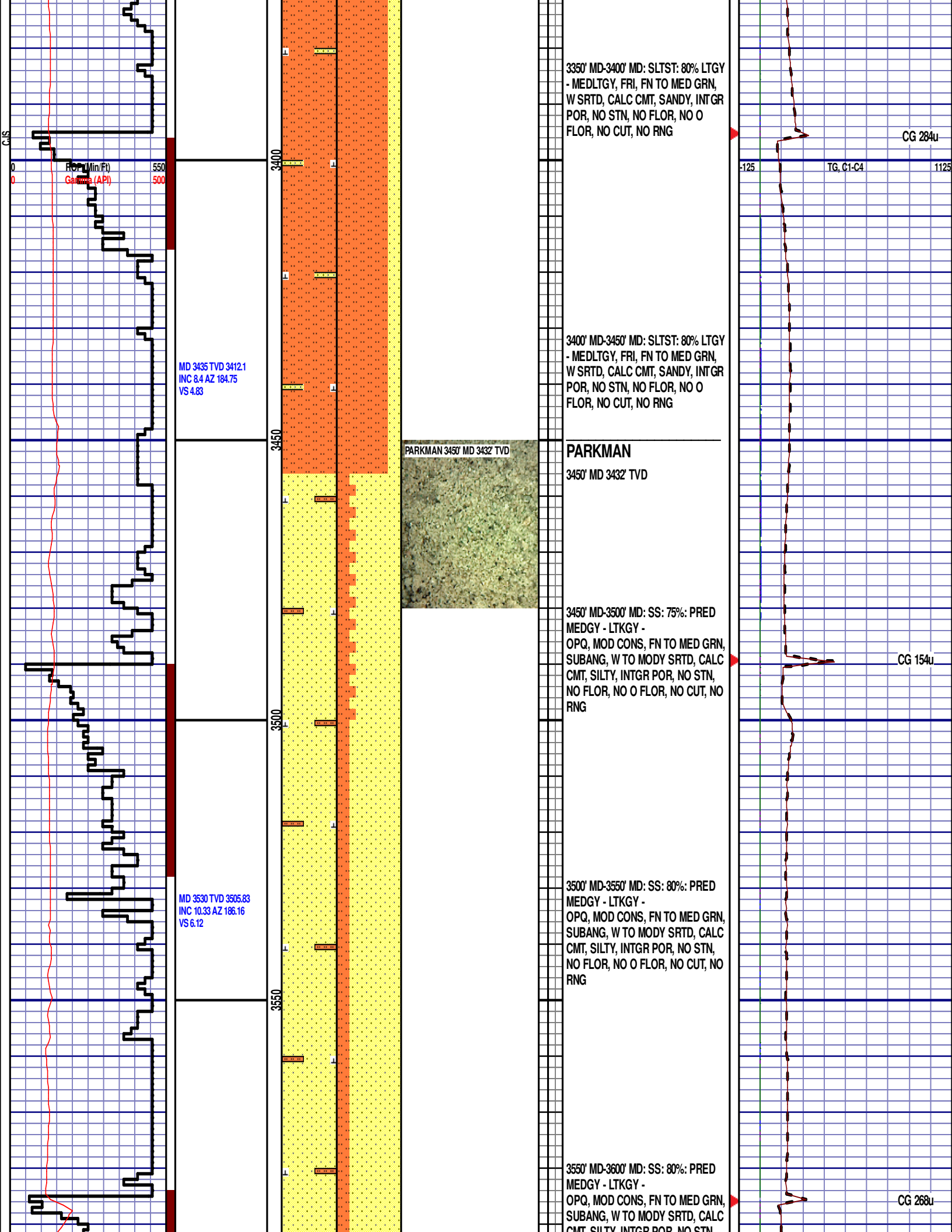
PIERRE 3350' MD 3328' TVD

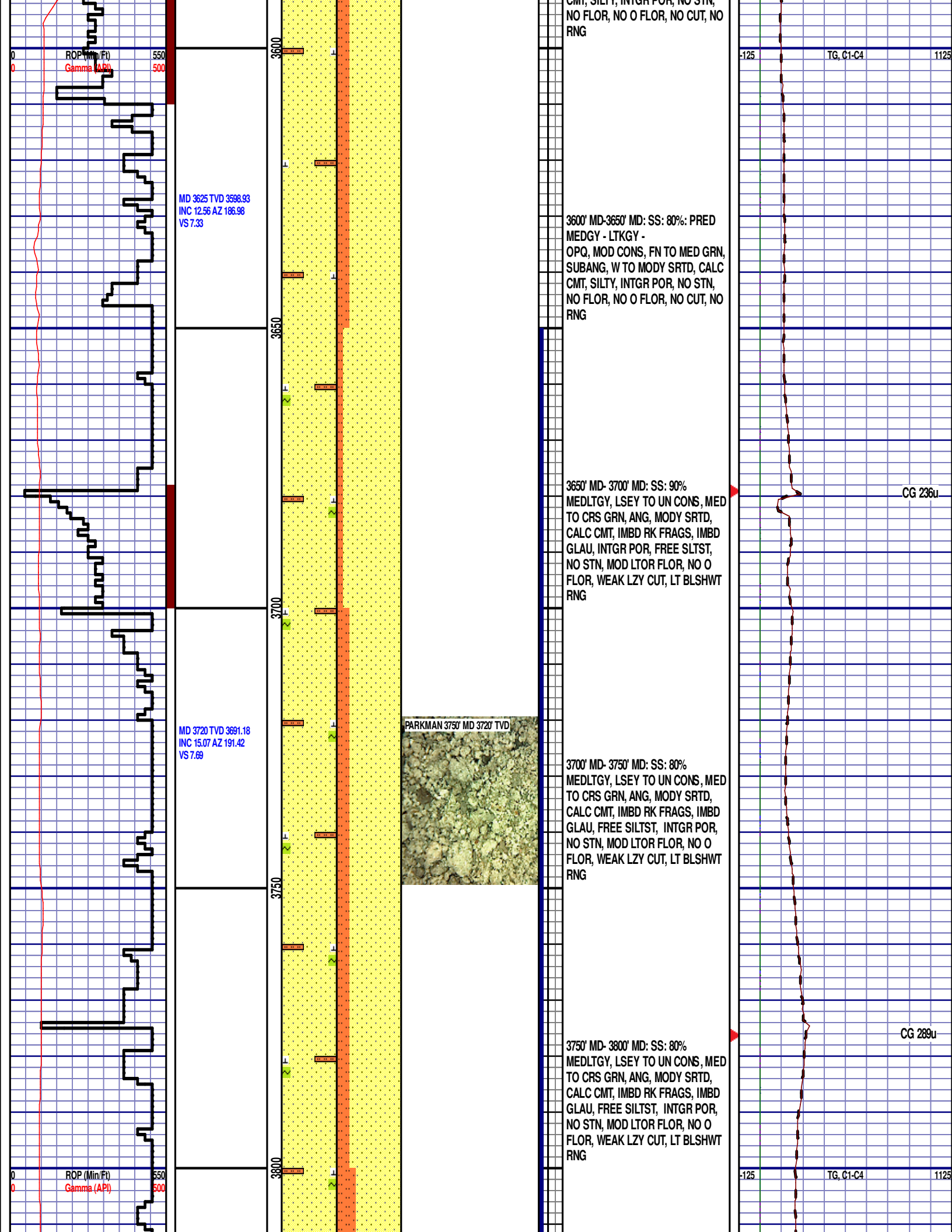


125 TG, C1-C4 1125  
CG 278u

CG 246u







MD 3815 TVD 3782.67  
INC 16.18 AZ 188.42  
VS 7.88

MD 3910 TVD 3873.72  
INC 16.97 AZ 190.17  
VS 8.35

MD 4005 TVD 3965.25  
INC 14.13 AZ 198.82  
VS 6.66

ROP (Mett)  
Gamma (API)

550  
500

3850

3900

3950

4000

3800' MD- 3850' MD: SS: 70%  
MEDLTGY, LSEY TO UN CONS, MED  
TO CRS GRN, ANG, MODY SRTD,  
CALC CMT, IMBD RK FRAGS, IMBD  
GLAU, FREE SILTST, INTGR POR,  
NO STN, MOD LTOR FLOR, NO O  
FLOR, WEAK LZY CUT, LT BLSHWT  
RNG

3850' MD- 3900' MD: SS: 70%  
MEDLTGY, LSEY TO UN CONS, MED  
TO CRS GRN, ANG, MODY SRTD,  
CALC CMT, IMBD RK FRAGS, IMBD  
GLAU, FREE SILTST, INTGR POR,  
NO STN, MOD LTOR FLOR, NO O  
FLOR, WEAK LZY CUT, LT BLSHWT  
RNG

3900' MD- 3950' MD: SS: 60%  
MEDLTGY, LSEY TO UN CONS, MED  
TO CRS GRN, ANG, MODY SRTD,  
CALC CMT, IMBD RK FRAGS, IMBD  
GLAU, FREE SILTST, INTGR POR,  
NO STN, MOD LTOR FLOR, NO O  
FLOR, WEAK LZY CUT, LT BLSHWT  
RNG

3950' MD- 4000' MD: SS: 70%  
MEDLTGY, LSEY TO UN CONS, MED  
TO CRS GRN, ANG, MODY SRTD,  
CALC CMT, IMBD RK FRAGS, IMBD  
GLAU, FREE SILTST, INTGR POR,  
NO STN, MOD LTOR FLOR, NO O  
FLOR, WEAK LZY CUT, LT BLSHWT  
RNG

4000' MD- 4050' MD: SS: 60%  
MEDLTGY, LSEY TO MOD CONS,  
MED TO CRS GRN, ANG, MODY

CG 305u

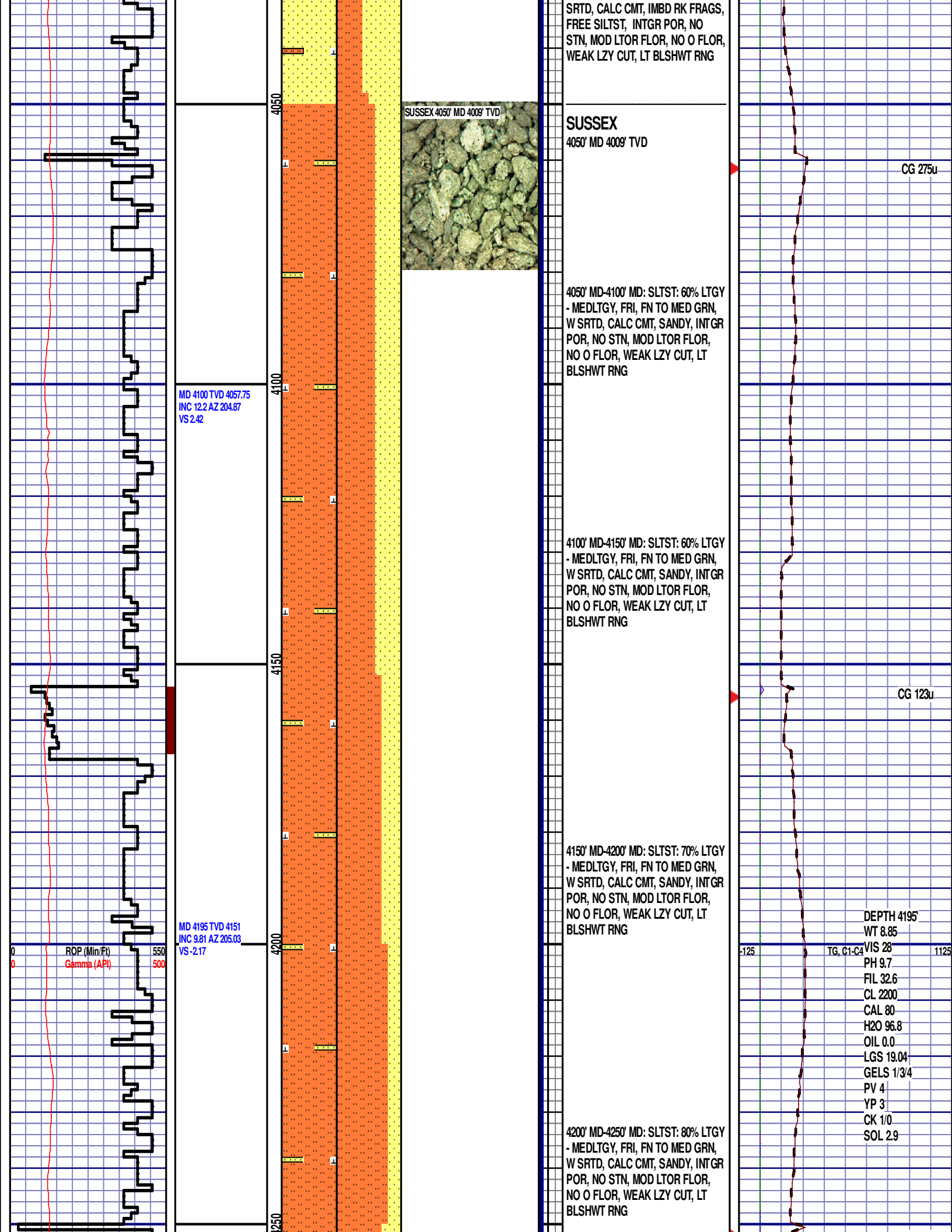
CG 242u

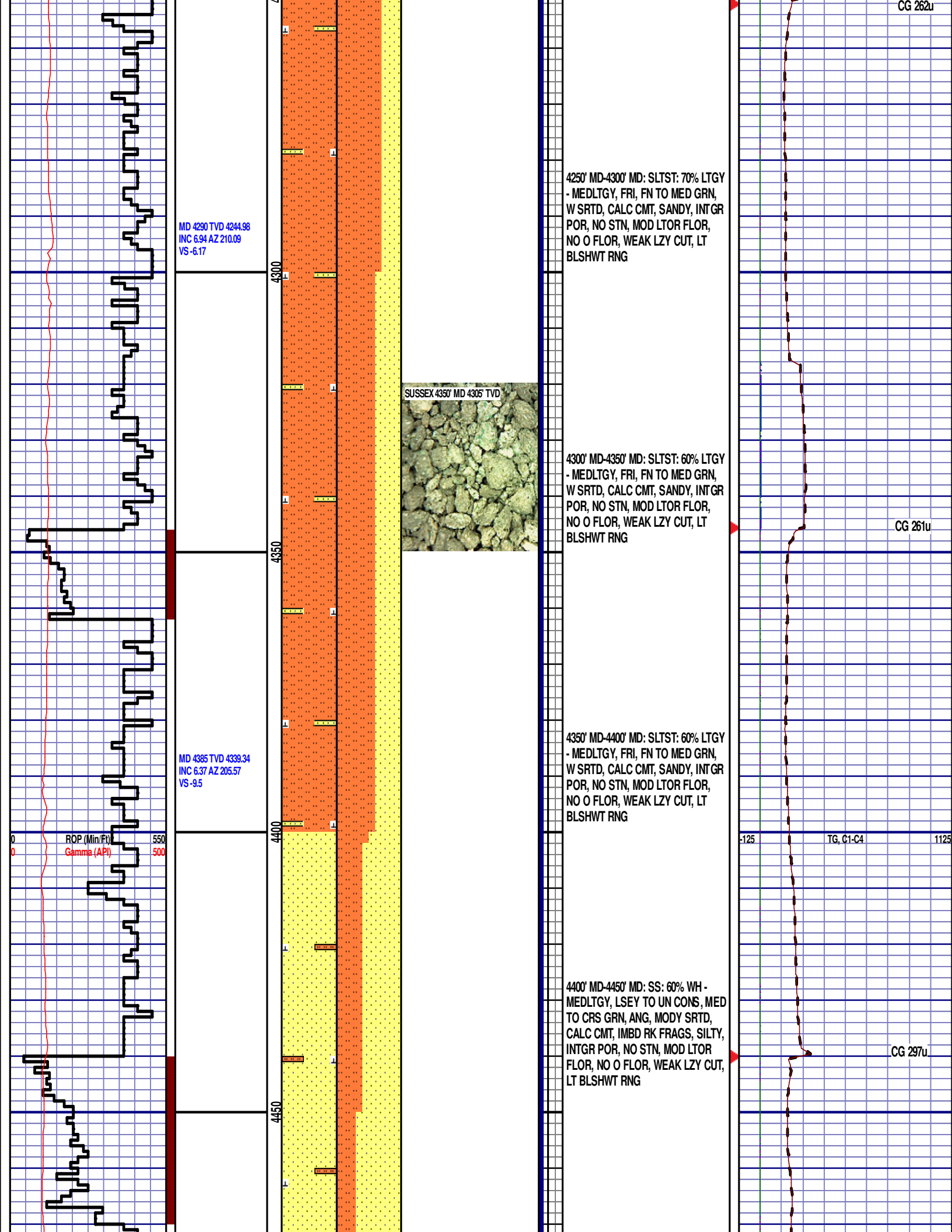
-125

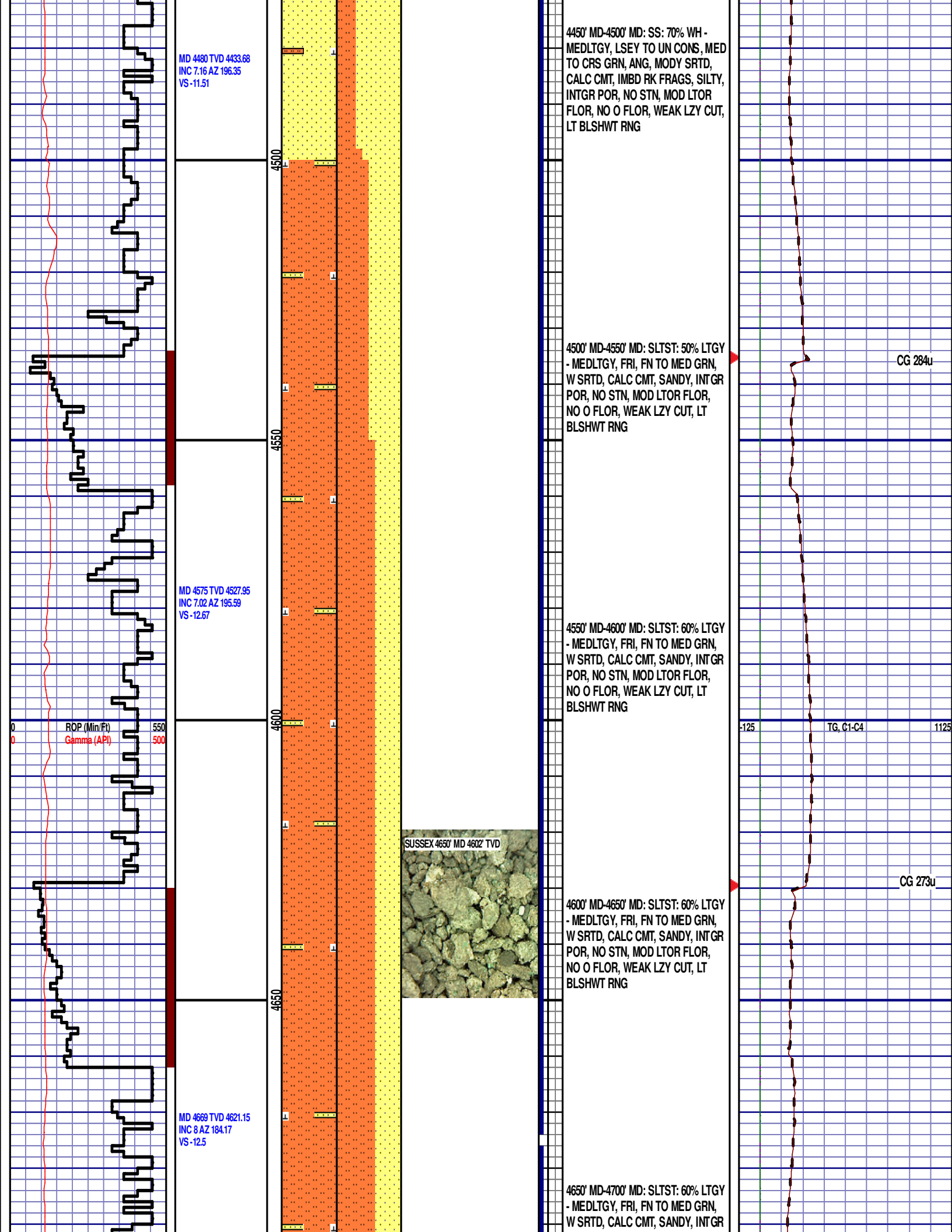
TG, C1-C4

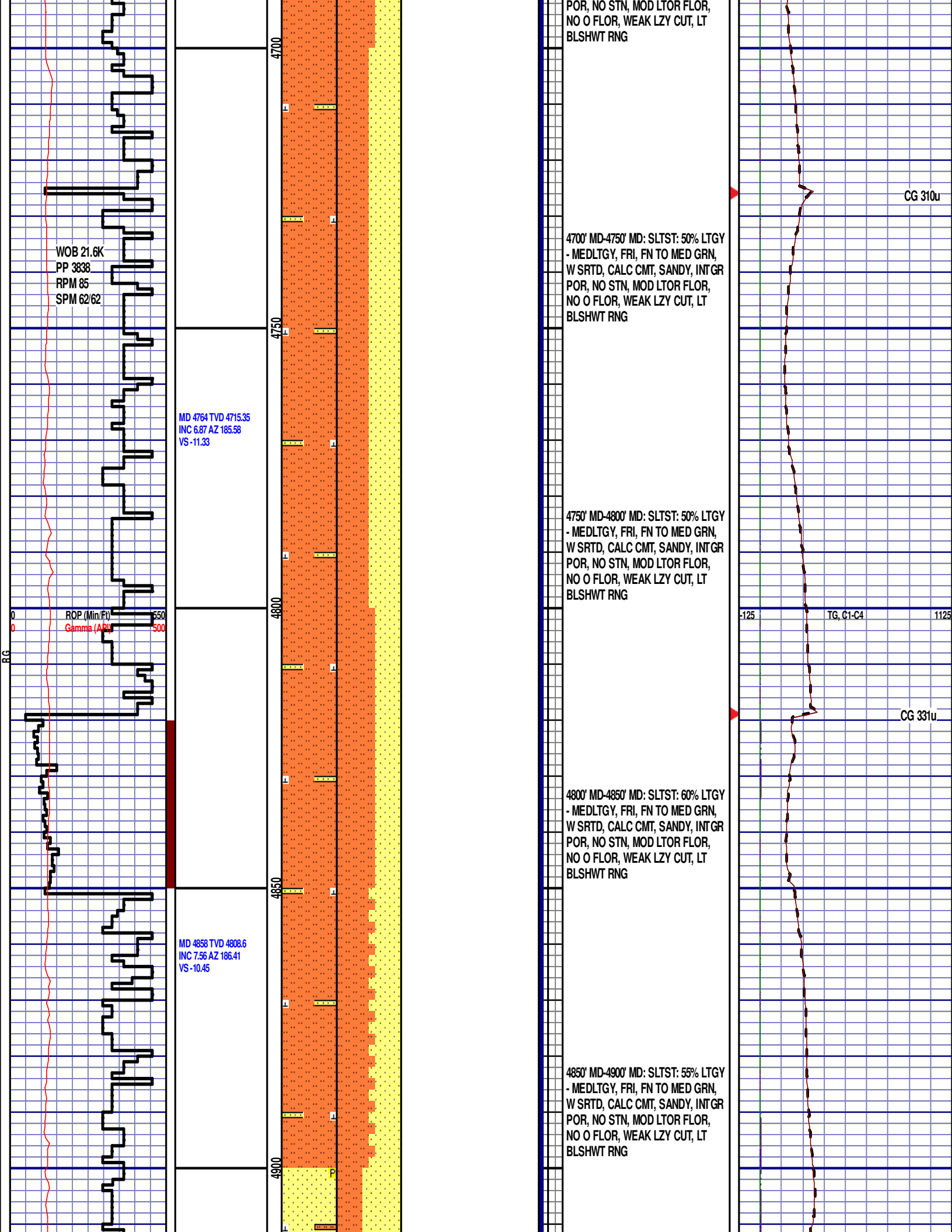
1125











WOB 21.6K  
PP 3838  
RPM 85  
SPM 62/62

MD 4764 TVD 4715.35  
INC 6.87 AZ 185.58  
VS -11.33

ROP (Min/Ft)  
Gamma (API)

MD 4858 TVD 4808.6  
INC 7.56 AZ 186.41  
VS -10.45

POR, NO STN, MOD LTOR FLOR,  
NO O FLOR, WEAK LZV CUT, LT  
BLSHWT RNG

4700' MD-4750' MD: SLTST: 50% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, MOD LTOR FLOR,  
NO O FLOR, WEAK LZV CUT, LT  
BLSHWT RNG

4750' MD-4800' MD: SLTST: 50% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, MOD LTOR FLOR,  
NO O FLOR, WEAK LZV CUT, LT  
BLSHWT RNG

4800' MD-4850' MD: SLTST: 60% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, MOD LTOR FLOR,  
NO O FLOR, WEAK LZV CUT, LT  
BLSHWT RNG

4850' MD-4900' MD: SLTST: 55% LTGY  
- MEDLTGY, FRI, FN TO MED GRN,  
W SRTD, CALC CMT, SANDY, INTGR  
POR, NO STN, MOD LTOR FLOR,  
NO O FLOR, WEAK LZV CUT, LT  
BLSHWT RNG

CG 310u

-125 TG, C1-C4 1125

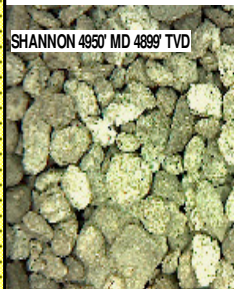
CG 331u

4900' MD-4950' MD SS: 60%  
MEDLTGY - WH, LSEY TO UN  
CONS, MED TO CRS GRN, ANG,  
MODY SRTD, CALC CMT, IMBD PYR,  
IMBD RK FRAGS, SILTY, INTGR  
POR, NO STN, MOD LTOR FLOR,  
NO O FLOR, WEAK LZY CUT, LT  
BLSHWT RNG

## SHANNON

4950' MD 4899' TVD

SHANNON 4950' MD 4899' TVD



4950' MD-5000' MD SS: 70%  
MEDLTGY - WH, LSEY TO UN  
CONS, MED TO CRS GRN, ANG,  
MODY SRTD, CALC CMT, IMBD PYR,  
IMBD RK FRAGS, SILTY, INTGR  
POR, NO STN, MOD LTOR FLOR,  
NO O FLOR, WEAK LZY CUT, LT  
BLSHWT RNG

5000' MD-5050' MD SS: 55%  
MEDLTGY - WH, LSEY TO UN  
CONS, MED TO CRS GRN, ANG,  
MODY SRTD, CALC CMT, IMBD PYR,  
IMBD RK FRAGS, IMBD GLAU,  
FREE SLTST, FREE SILTY SH,  
INTGR POR, NO STN, MOD LTOR  
FLOR, NO O FLOR, WEAK LZY CUT,  
LT BLSHWT RNG

5050' MD-5100' MD: SLTYSH: 60%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, HD, SS  
LAMN, TR IMBD CALC FLK &  
MICROXLN PYR W/ SLTST. NO STN,  
MOD LTOR FLOR, NO O FLOR,  
WEAK LZY CUT, LT BLSHWT RNG

5100' MD-5150' MD: SLTYSH: 60%  
LTGY - MEDGY, PRED SUBBLKY TO

MD 4953 TVD 4902.58  
INC 9.24 AZ 188.29  
VS -9.76

ROP (Min/ft)  
Gamma (API)

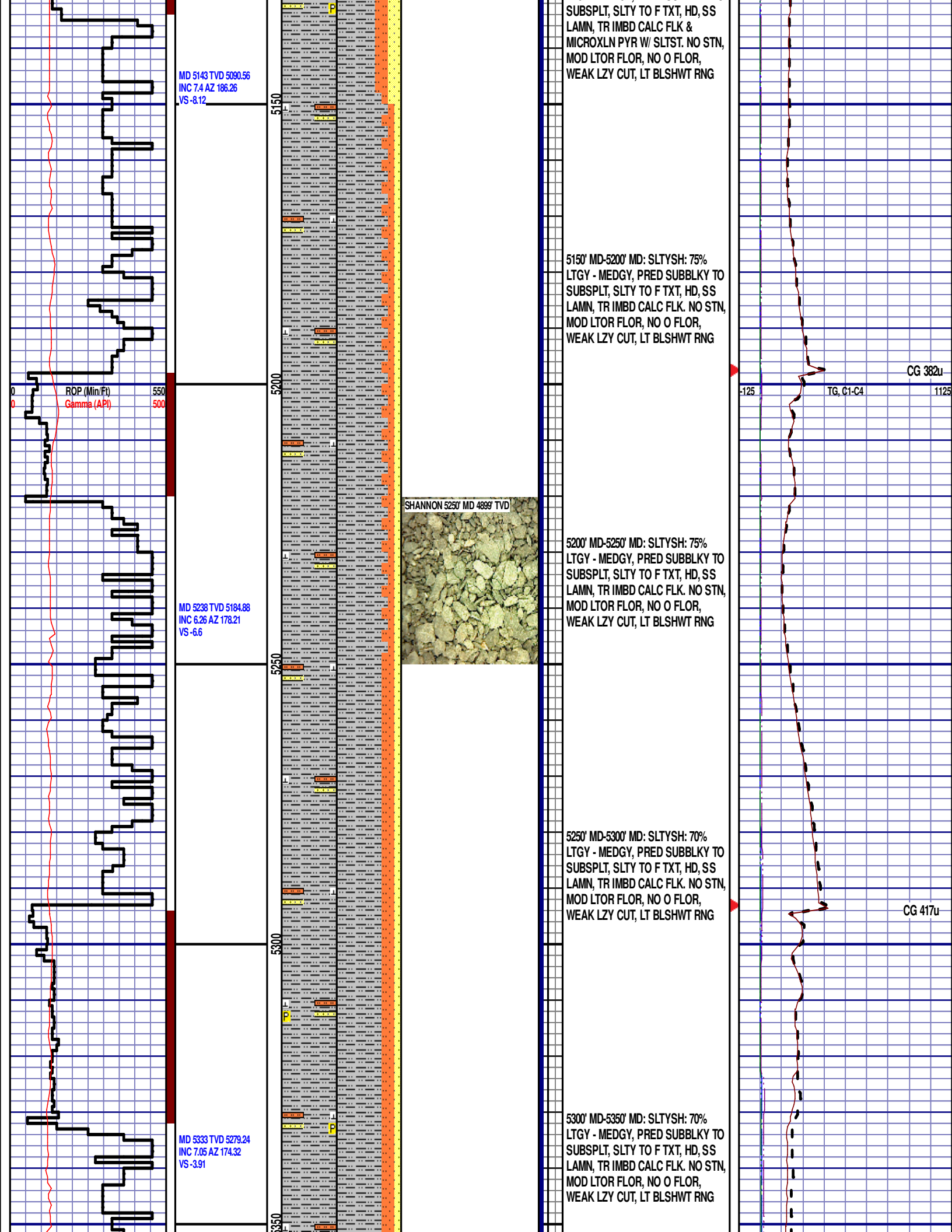
MD 5048 TVD 4996.46  
INC 8.39 AZ 186.42  
VS -9.02

-125 TG, C1-C4 1125

CG 324u

CG 395u





MD 5143 TVD 5090.56  
INC 7.4 AZ 186.26  
VS -8.12

ROP (Min/Ft)  
Gamma (API)

MD 5238 TVD 5184.88  
INC 6.26 AZ 178.21  
VS -6.6

MD 5333 TVD 5279.24  
INC 7.05 AZ 174.32  
VS -3.91

SHANNON 5250' MD 4899' TVD



SUBSPLT, SLTY TO F TXT, HD, SS  
LAMN, TR IMBD CALC FLK &  
MICROXLN PYR W/ SLTST. NO STN,  
MOD LTOR FLOR, NO O FLOR,  
WEAK LZY CUT, LT BLSHWT RNG

5150' MD-5200' MD: SLTYSH: 75%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, HD, SS  
LAMN, TR IMBD CALC FLK. NO STN,  
MOD LTOR FLOR, NO O FLOR,  
WEAK LZY CUT, LT BLSHWT RNG

5200' MD-5250' MD: SLTYSH: 75%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, HD, SS  
LAMN, TR IMBD CALC FLK. NO STN,  
MOD LTOR FLOR, NO O FLOR,  
WEAK LZY CUT, LT BLSHWT RNG

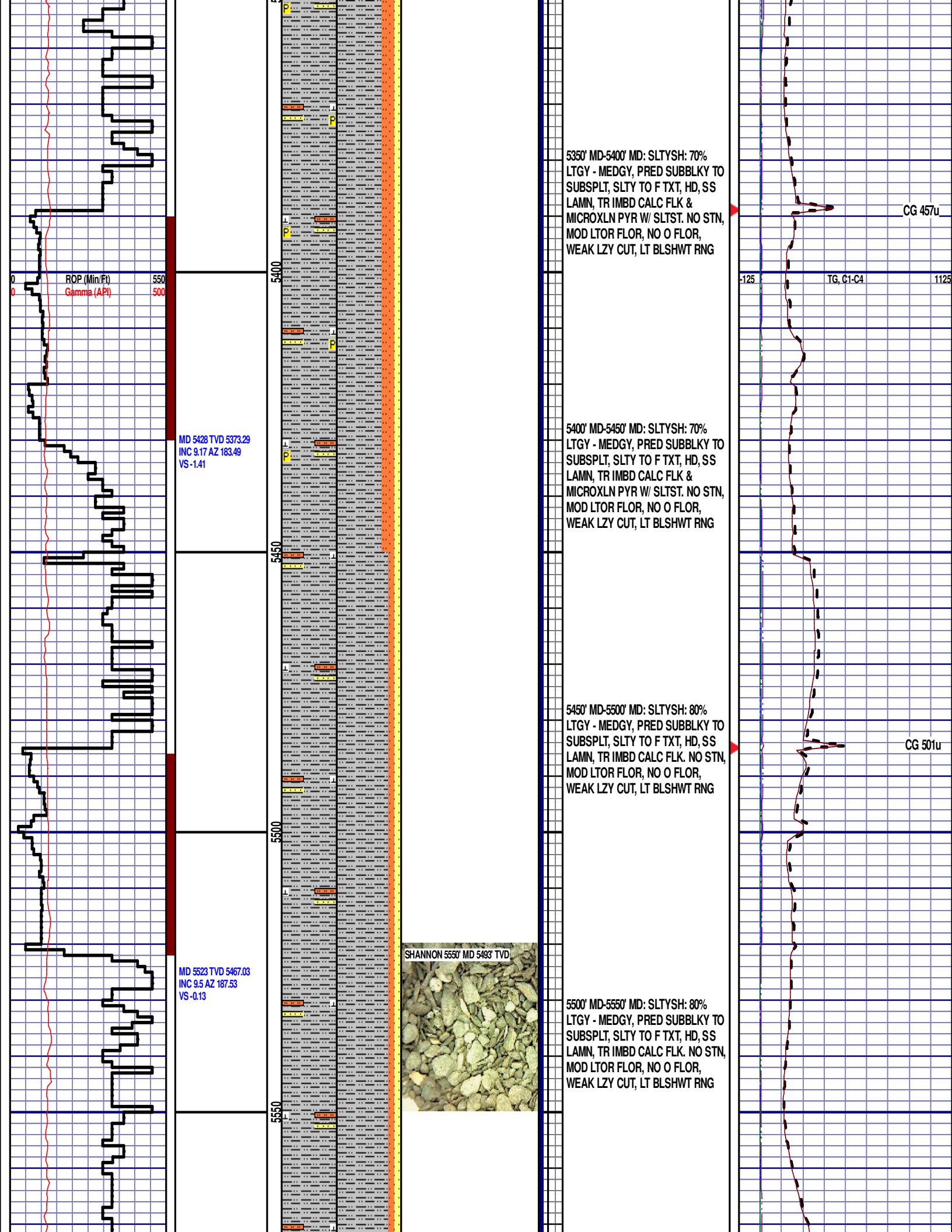
5250' MD-5300' MD: SLTYSH: 70%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, HD, SS  
LAMN, TR IMBD CALC FLK. NO STN,  
MOD LTOR FLOR, NO O FLOR,  
WEAK LZY CUT, LT BLSHWT RNG

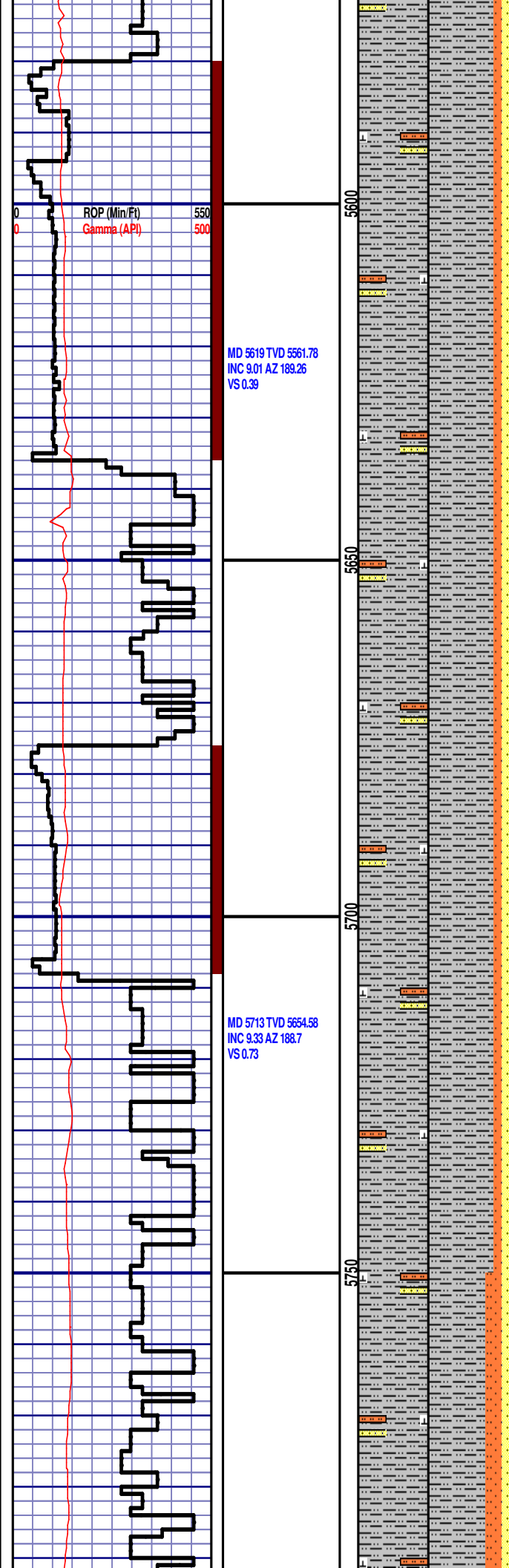
5300' MD-5350' MD: SLTYSH: 70%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, HD, SS  
LAMN, TR IMBD CALC FLK. NO STN,  
MOD LTOR FLOR, NO O FLOR,  
WEAK LZY CUT, LT BLSHWT RNG

CG 382u

TG, C1-C4

CG 417u





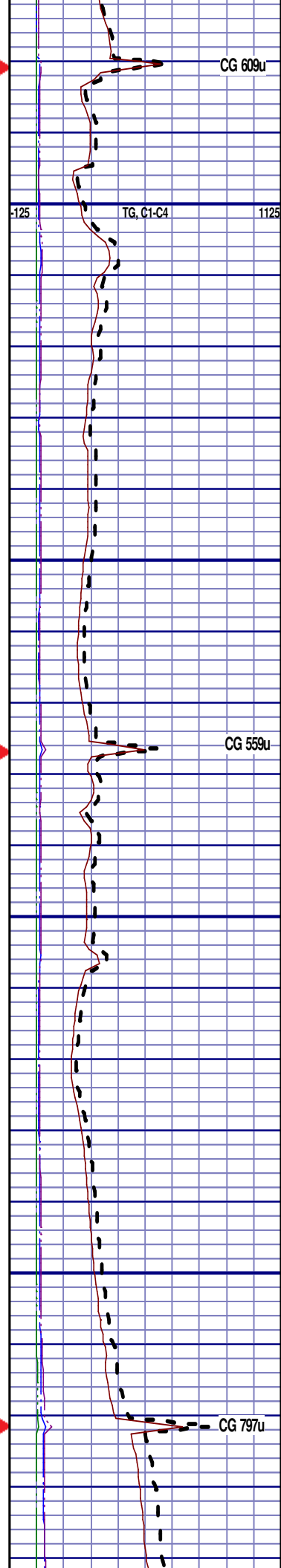
5550' MD-5600' MD: SLTYSH: 80%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, HD, SS  
LAMN, TR IMBD CALC FLK. NO STN,  
MOD LTOR FLOR, NO O FLOR,  
WEAK LZY CUT, LT BLSHWT RNG

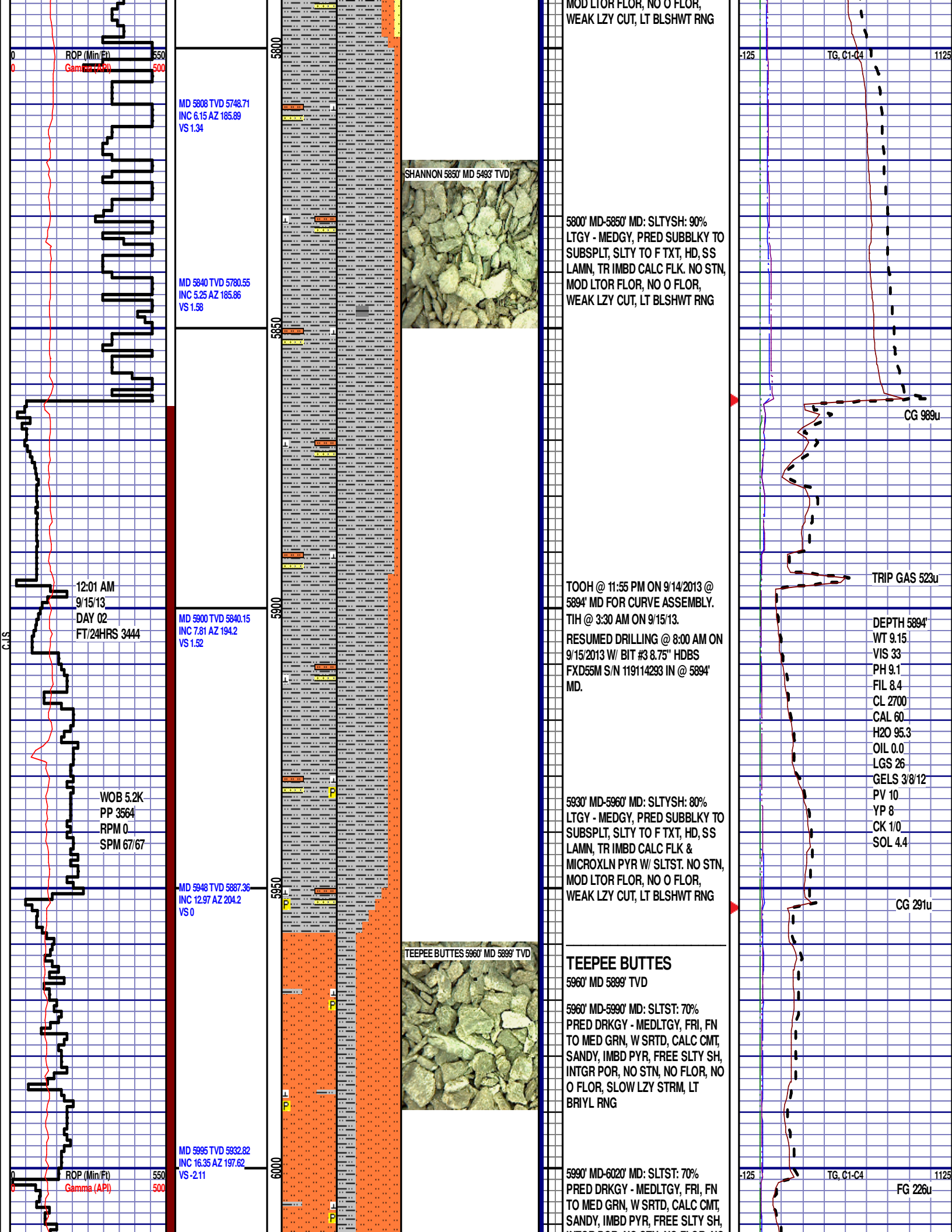
5600' MD-5650' MD: SLTYSH: 80%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, HD, SS  
LAMN, TR IMBD CALC FLK. NO STN,  
MOD LTOR FLOR, NO O FLOR,  
WEAK LZY CUT, LT BLSHWT RNG

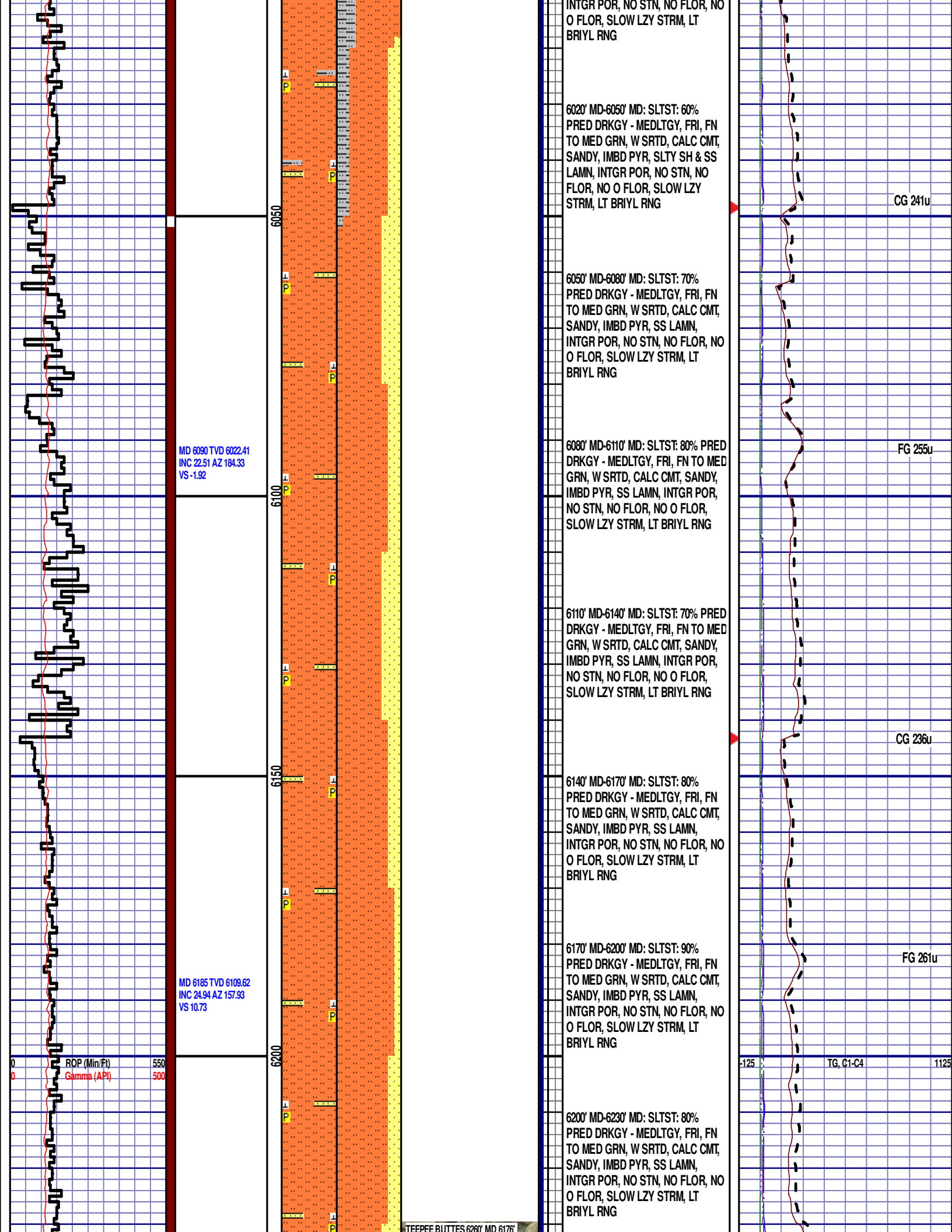
5650' MD-5700' MD: SLTYSH: 80%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, HD, SS  
LAMN, TR IMBD CALC FLK. NO STN,  
MOD LTOR FLOR, NO O FLOR,  
WEAK LZY CUT, LT BLSHWT RNG

5700' MD-5750' MD: SLTYSH: 80%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, HD, SS  
LAMN, TR IMBD CALC FLK. NO STN,  
MOD LTOR FLOR, NO O FLOR,  
WEAK LZY CUT, LT BLSHWT RNG

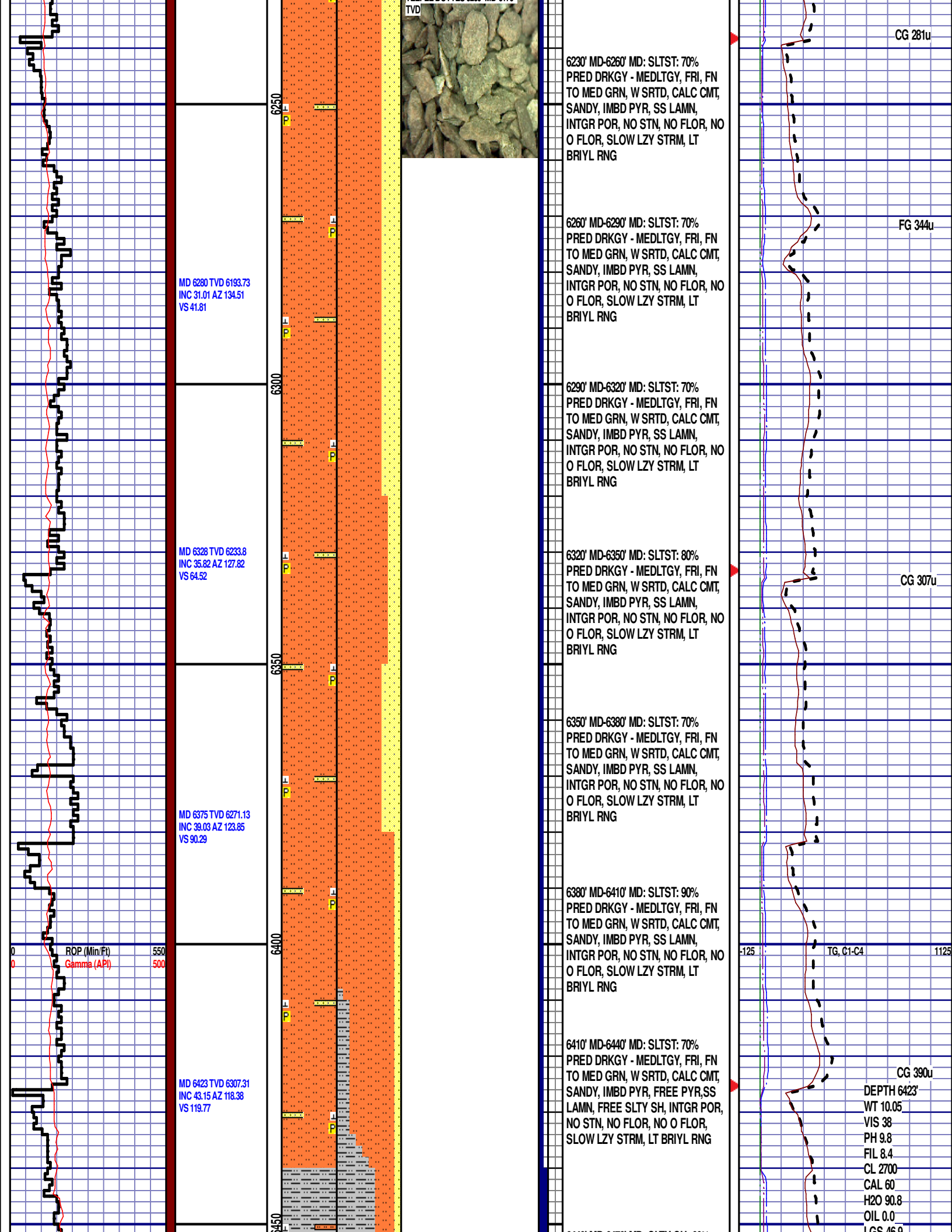
5750' MD-5800' MD: SLTYSH: 70%  
LTGY - MEDGY, PRED SUBBLKY TO  
SUBSPLT, SLTY TO F TXT, HD, SS  
LAMN, TR IMBD CALC FLK. NO STN,  
MOD LTOR FLOR, NO O FLOR,

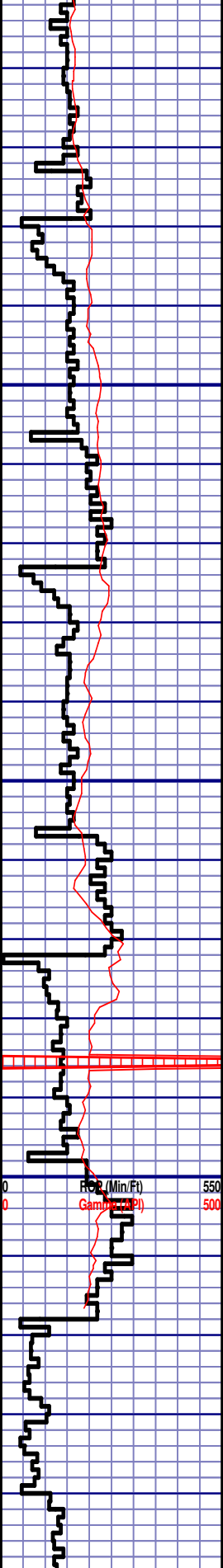










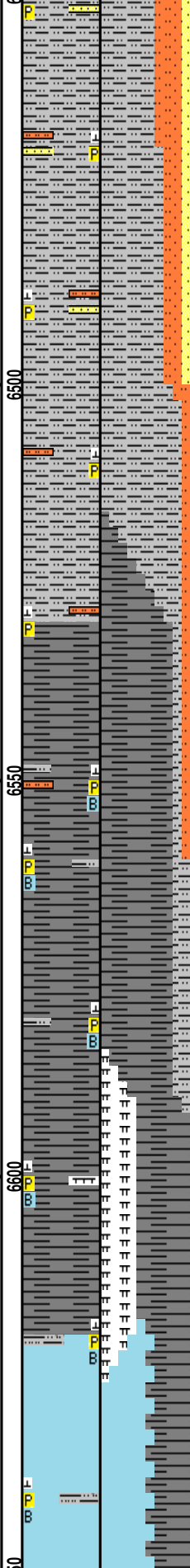


MD 6470 TVD 6340.14  
INC 48.22 AZ 115.04  
VS 152.02

MD 6518 TVD 6370.85  
INC 52.21 AZ 111.9  
VS 187.93

MD 6565 TVD 6398.41  
INC 56 AZ 108.68  
VS 225.42

MD 6613 TVD 6429.95  
INC 59.7 AZ 107.17  
VS 265.69



6440' MD-6470' MD: SLTY SH: 60% MEDDRKGY -MEDLTGY, BLKY TO SUBBLKY, GRTY TO SLTY TXT, FRM TO BRIT, SLTST & SS LAMN, FREE CAL, FREE PYR, NO STN, 5% FLOR, NO O FLOR, FAST STRMG CUT, MOD BLSHWT RNG

6470' MD-6500' MD: SLTY SH: 70% MEDDRKGY -MEDLTGY, BLKY TO SUBBLKY, GRTY TO SLTY TXT, FRM TO BRIT, SLTST & SS LAMN, FREE CAL, FREE PYR, NO STN, 5% FLOR, NO O FLOR, FAST STRMG CUT, MOD BLSHWT RNG

6500' MD-6530' MD: SLTY SH: 90% MEDDRKGY -MEDLTGY, BLKY TO SUBBLKY, GRTY TO SLTY TXT, FRM TO BRIT, SLTST LAMN, FREE CAL, FREE PYR, NO STN, 5% FLOR, NO O FLOR, FAST STRMG CUT, MOD BLSHWT RNG

**SHARON SPRINGS**  
6530' MD 6377 MD

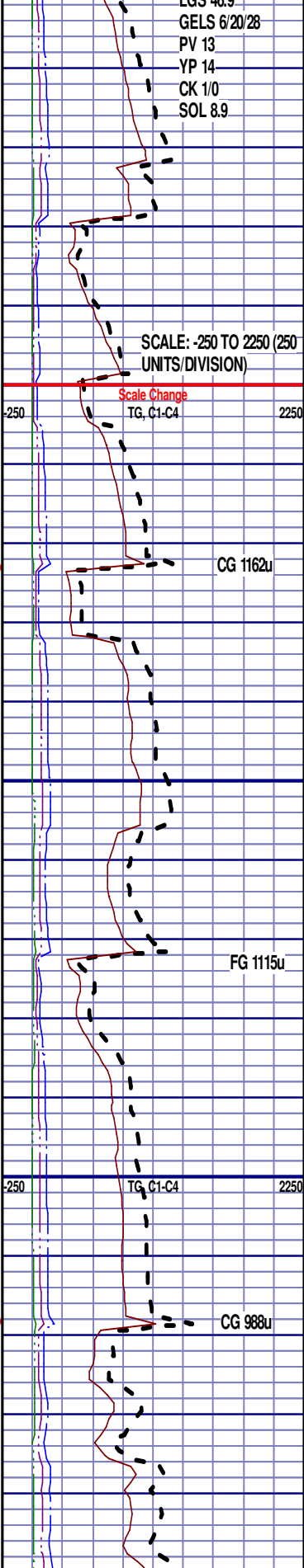
6530' MD-6560' MD: SH: 80% MEDGY - MEDDRKGY, PRED BLKY TO SUBBLKY, GRTY TO SLTY TXT, FRM TO BRIT, IMBD SLTST LAMN, FREE PYR & FREE CAL, FREE BENT, FREE SLTY SH, NO STN, 30% FLOR, NO O FLOR, FAST STRMG CUT, FNT DRKYL RNG

6560' MD-6590' MD: SH: 80% MEDGY - MEDDRKGY, PRED BLKY TO SUBBLKY, GRTY TO SLTY TXT, FRM TO BRIT, FREE PYR & FREE CAL, FREE BENT, FREE SLTY SH, NO STN, 20% FLOR, NO O FLOR, FAST STRMG CUT, FNT DRKYL RNG

6590' MD-6620' MD: SH: 60% MEDGY - MEDDRKGY, PRED BLKY TO SUBBLKY, GRTY TO SLTY TXT, FRM TO BRIT, FREE PYR & FREE CAL, FREE BENT, FREE MARL, NO STN, 30% FLOR, NO O FLOR, FAST STRMG CUT, FNT DRKYL RNG

**NIORARA A CHALK**  
6620' MD 6432' TVD

6620' MD-6650' MD: CHK: 55% V/LTGY - MEDGY -DRKGY, BLKY TO SUBBLKY, FXLN TO CHLKY, SFT, CHK FRMWRK, IMBD PYRC SPEC, FREE BENT, OCC FREE CAL, FREE SH, MOD GYSHBLK STN, 10% LTOR FLOR, FNT BLSHWT O FLOR, IMMED STRMG CUT



SCALE: -250 TO 2250 (250 UNITS/DIVISION)

Scale Change  
TG, C1-C4

CG 1162u

FG 1115u

CG 988u

					<div>END OF VERTICAL LOG @ 6650 MD ON 9/15/13, CONTINUED ON HORIZONTAL LOG</div>	
--	--	--	--	--	--	--

00