



7136 South Yale Avenue, Suite 414

Tulsa, Oklahoma 74136-6378

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WWW.HZMUD.COM

Customer Information

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

Geologist: Cassidy Miller
Noble Energy Inc

Mud Logging Details

Logger: Ryan Bleess & Alec Walker

Log Interval: 2500' MD to 7110' MD
Start Date: February 19, 2013
Release Date: February 27, 2013

Well Information

Well Name: Knaub PC G04-64-1HN

Location: 4-4N-65W
2253' FSL, 290' FWL

County: Weld
State: Colorado

Drilling Rig: H&P 321
Total Depth: 11410' MD
TD Date: February 26, 2013
Formation: Niobrara C
KB Elevation: 4678'
GR Elevation: 4708'
API Number: 05-123-36286

ROCK TYPES

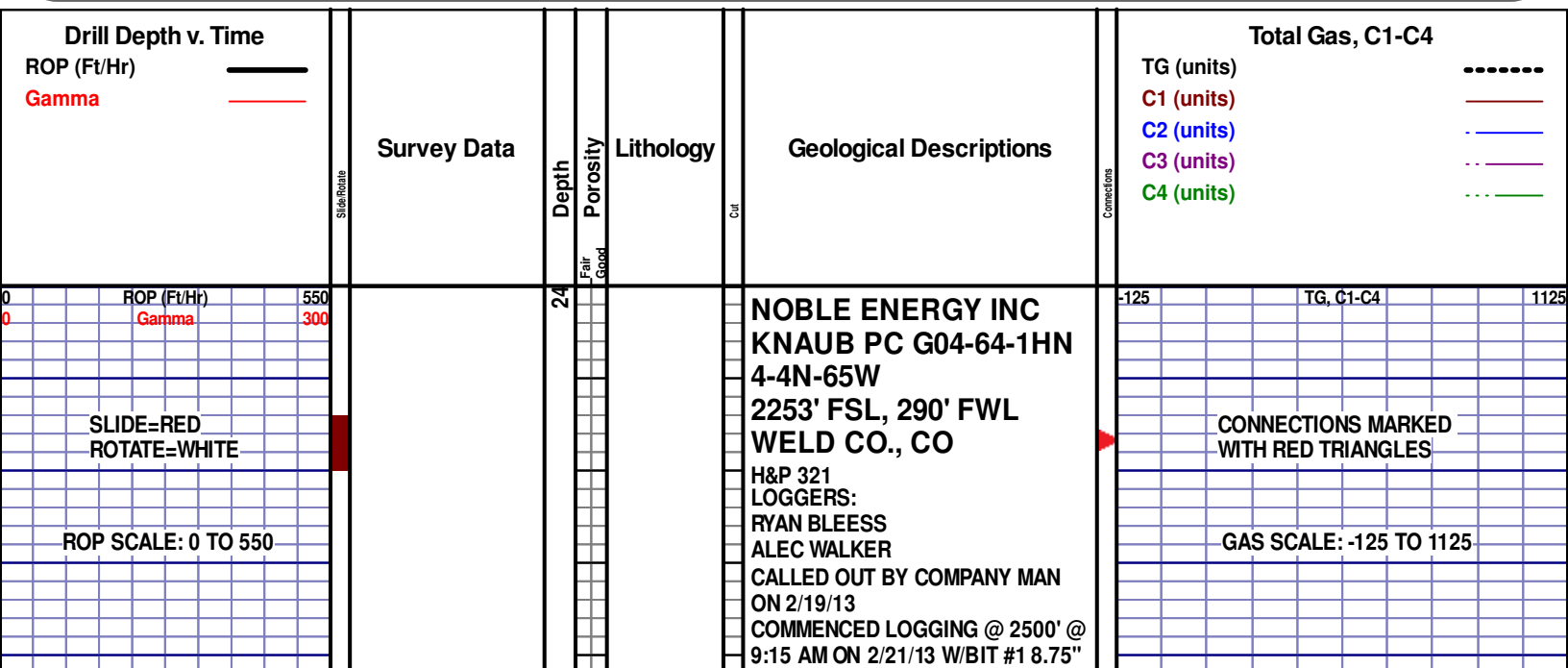
Anhy
 Bent
 Brec
 Cht
 Clyst
 Coal
 Congl

Dol
 Gyp
 Igne
 Chk
 Lmst
 Meta
 Mrlst

Salt
 Shale
 Shcol
 Siltysh
 Sltst
 Ss
 Till

gw
 lmywash
 ogw
 olmywash
 oshly gw
 shly gw
 sdygw

hvycrbsh
 NO SMPL
 Lsdetrst
 sltst
 sdy sh
 Cement



GAMMA SCALE: 0 TO 300

WOB 8.2K
PP 2561
RPM 60
SPM 69/66

DRILLING ON WBM

MD 642'
WT 8.6
VIS 29.0
PH 8.9
FIL 12.6
CL 2250
CAL 0.0
H2O 98.5
OIL 0.0
SOL 1.2
GELS 1/2/3
PV 4.0
YP 1.0

SILTSTN; 80%; GRY TO LT GRY, VF TO FGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, SANDY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

PIERRE
2550' MD 2549' TVD

SS; 90%; LT GRY TO OFF WH, F TO MGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, SILTY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

SS; 90%; LT GRY TO OFF WH, F TO MGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, SILTY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

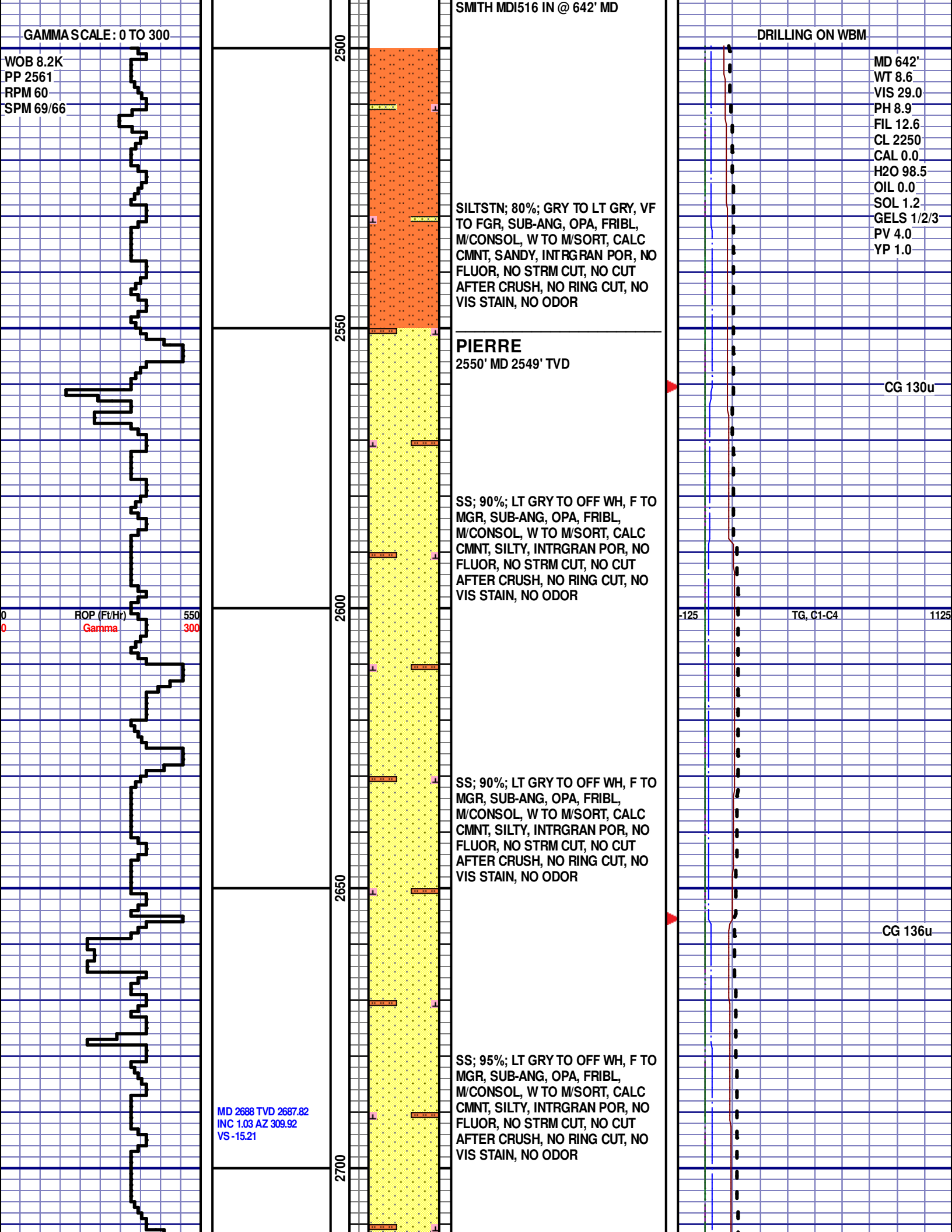
SS; 95%; LT GRY TO OFF WH, F TO MGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, SILTY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

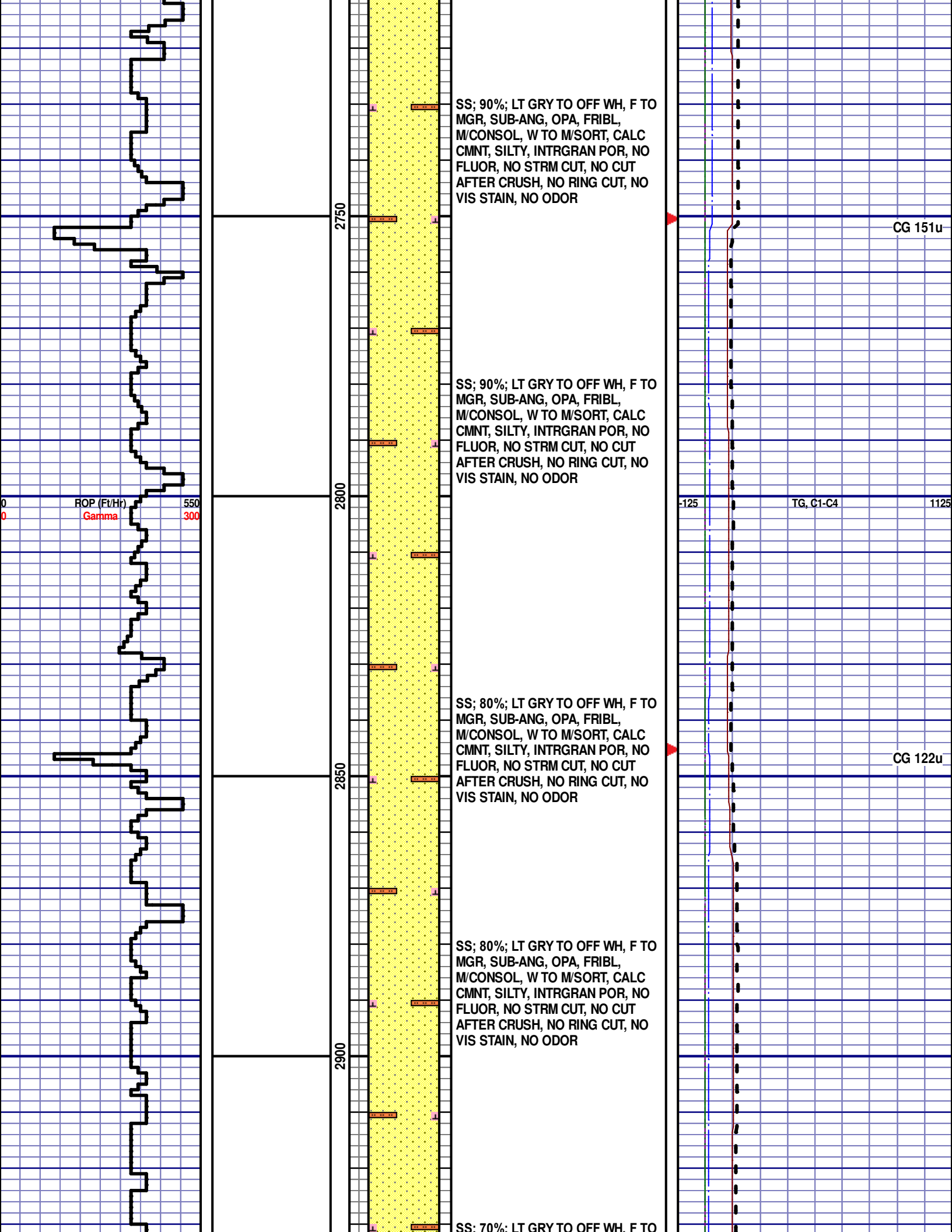
CG 130u

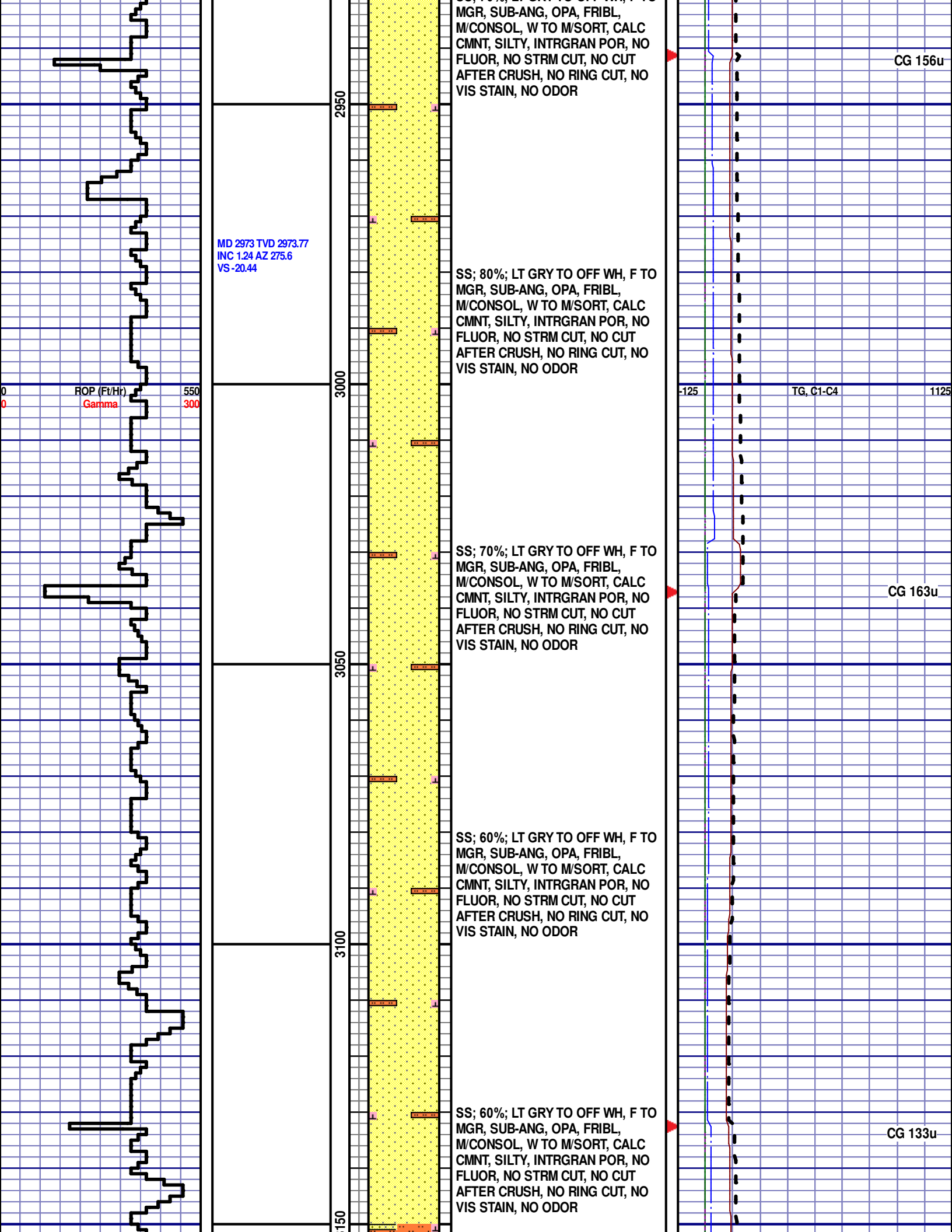
TG, C1-C4

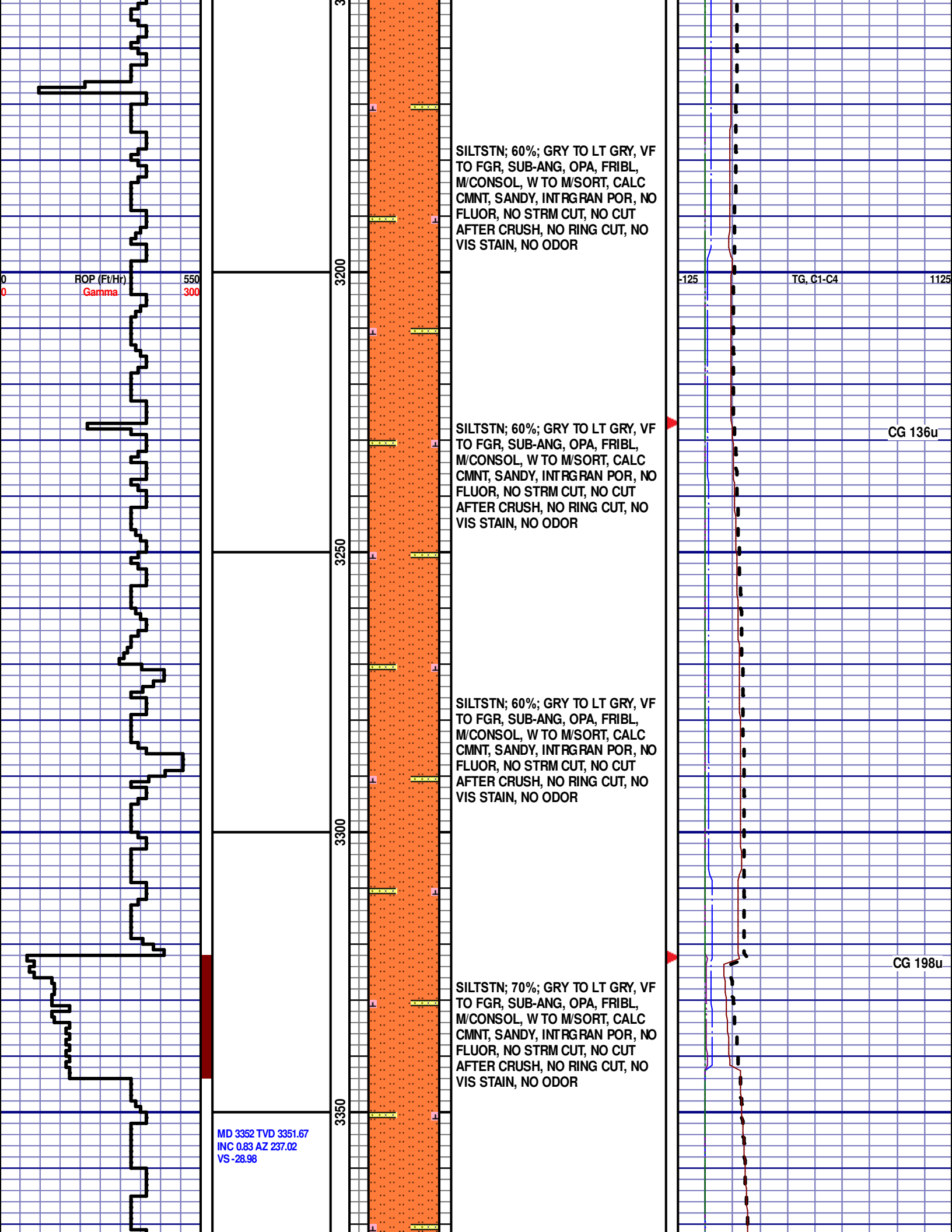
CG 136u

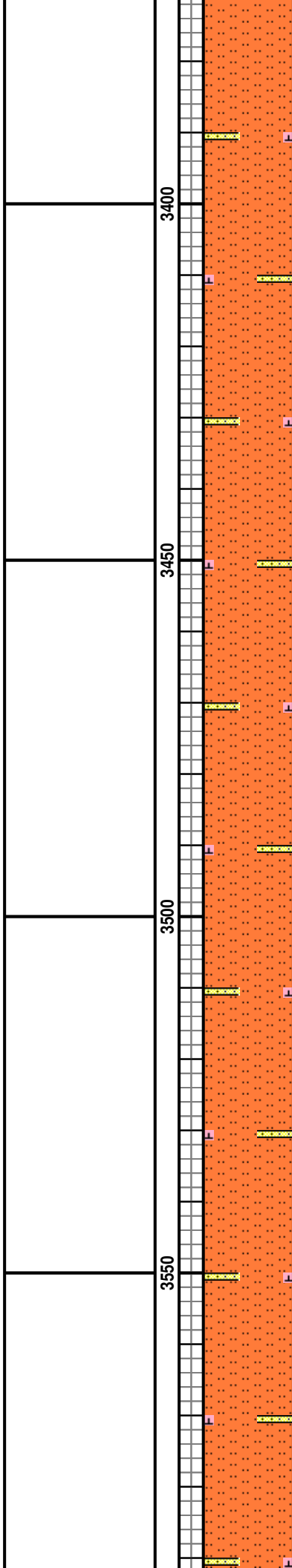
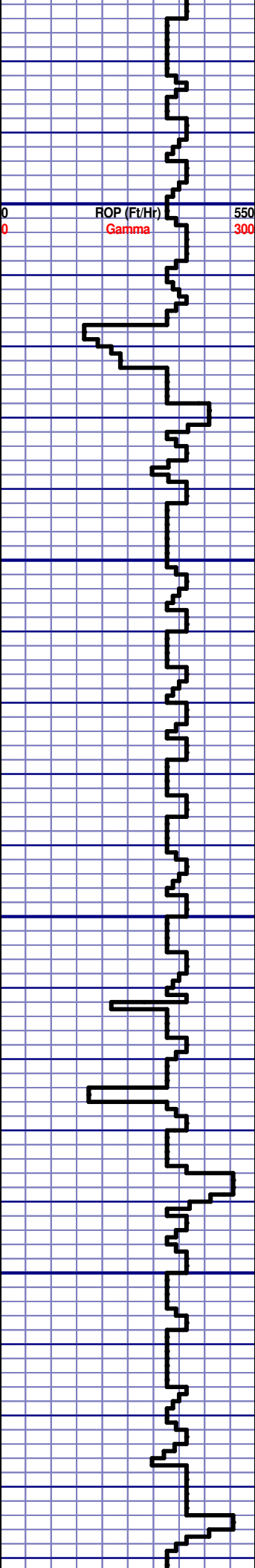
MD 2688 TVD 2687.82
INC 1.03 AZ 309.92
VS -15.21











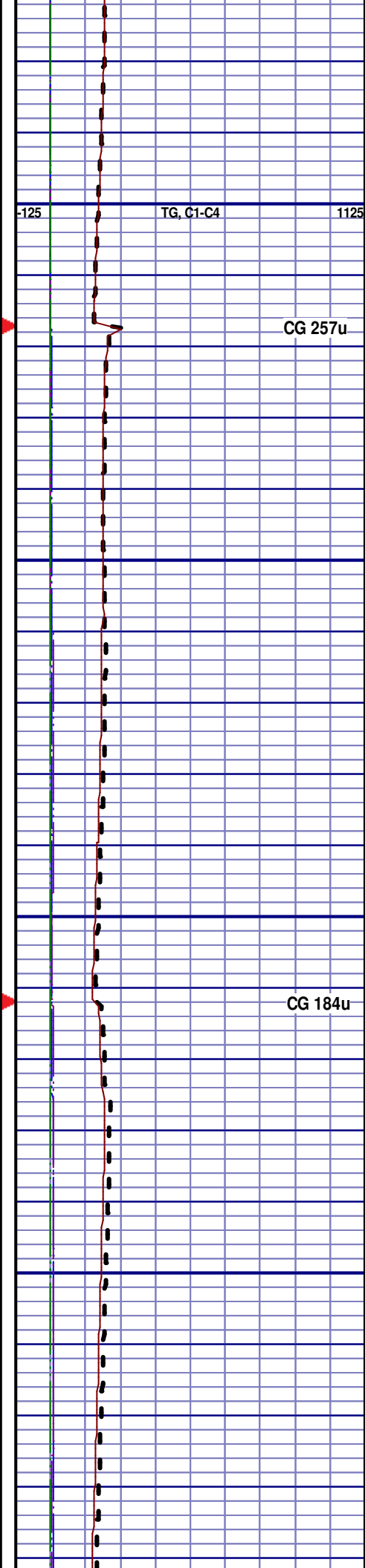
SILTSTN; 70%; GRY TO LT GRY, VF TO FGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, SANDY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

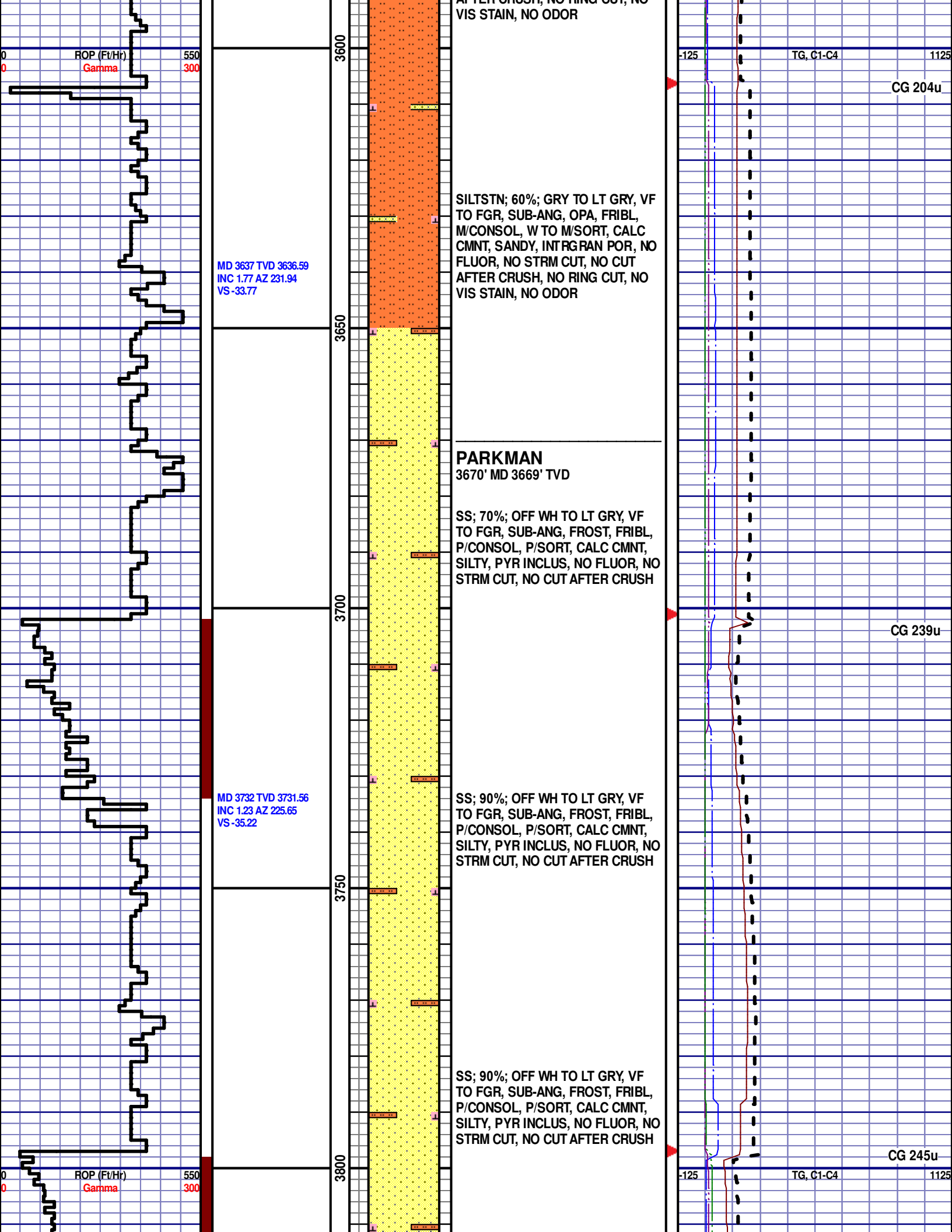
SILTSTN; 60%; GRY TO LT GRY, VF TO FGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, SANDY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

SILTSTN; 80%; GRY TO LT GRY, VF TO FGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, SANDY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

SILTSTN; 80%; GRY TO LT GRY, VF TO FGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, SANDY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

SILTSTN; 80%; GRY TO LT GRY, VF TO FGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, SANDY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR





MD 3826 TVD 3825.54
INC 1.28 AZ 138.7
VS -35.04

SS; 90%; OFF WH TO LT GRY, VF
TO FGR, SUB-ANG, FROST, FRIBL,
P/CONSOL, P/SORT, CALC CMNT,
SILTY, PYR INCLUS, NO FLUOR, NO
STRM CUT, NO CUT AFTER CRUSH

SS; 90%; OFF WH TO LT GRY, VF
TO FGR, SUB-ANG, FROST, FRIBL,
P/CONSOL, P/SORT, CALC CMNT,
SILTY, PYR INCLUS, NO FLUOR, NO
STRM CUT, NO CUT AFTER CRUSH

SS; 70%; OFF WH TO LT GRY, VF
TO FGR, SUB-ANG, FROST, FRIBL,
P/CONSOL, P/SORT, CALC CMNT,
SILTY, PYR INCLUS, NO FLUOR, NO
STRM CUT, NO CUT AFTER CRUSH

SS; 60%; OFF WH TO LT GRY, VF
TO FGR, SUB-ANG, FROST, FRIBL,
P/CONSOL, P/SORT, CALC CMNT,
SILTY, PYR INCLUS, NO FLUOR, NO
STRM CUT, NO CUT AFTER CRUSH

SS; 60%; OFF WH TO LT GRY, VF

CG 239u

CG 238u

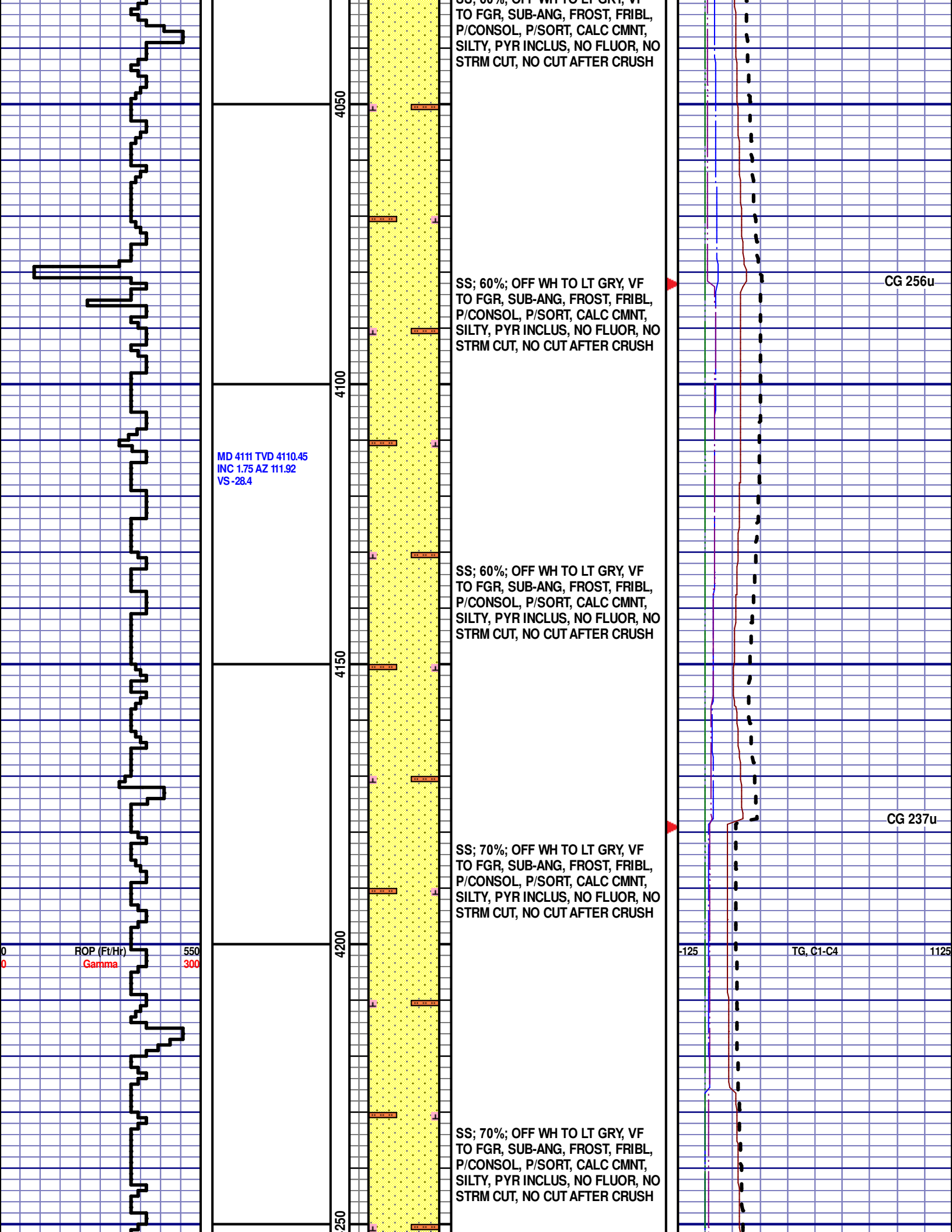
-125

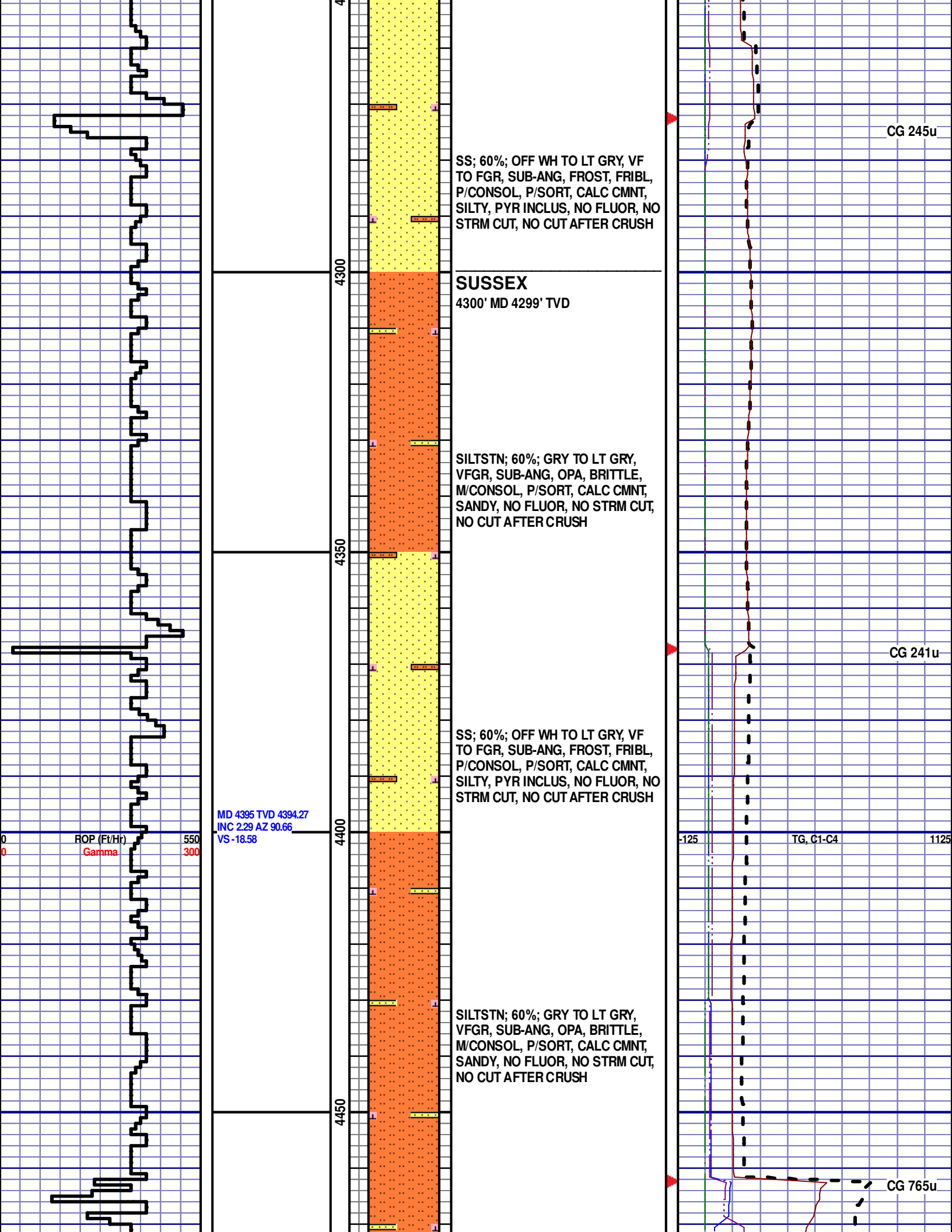
TG, C1-C4

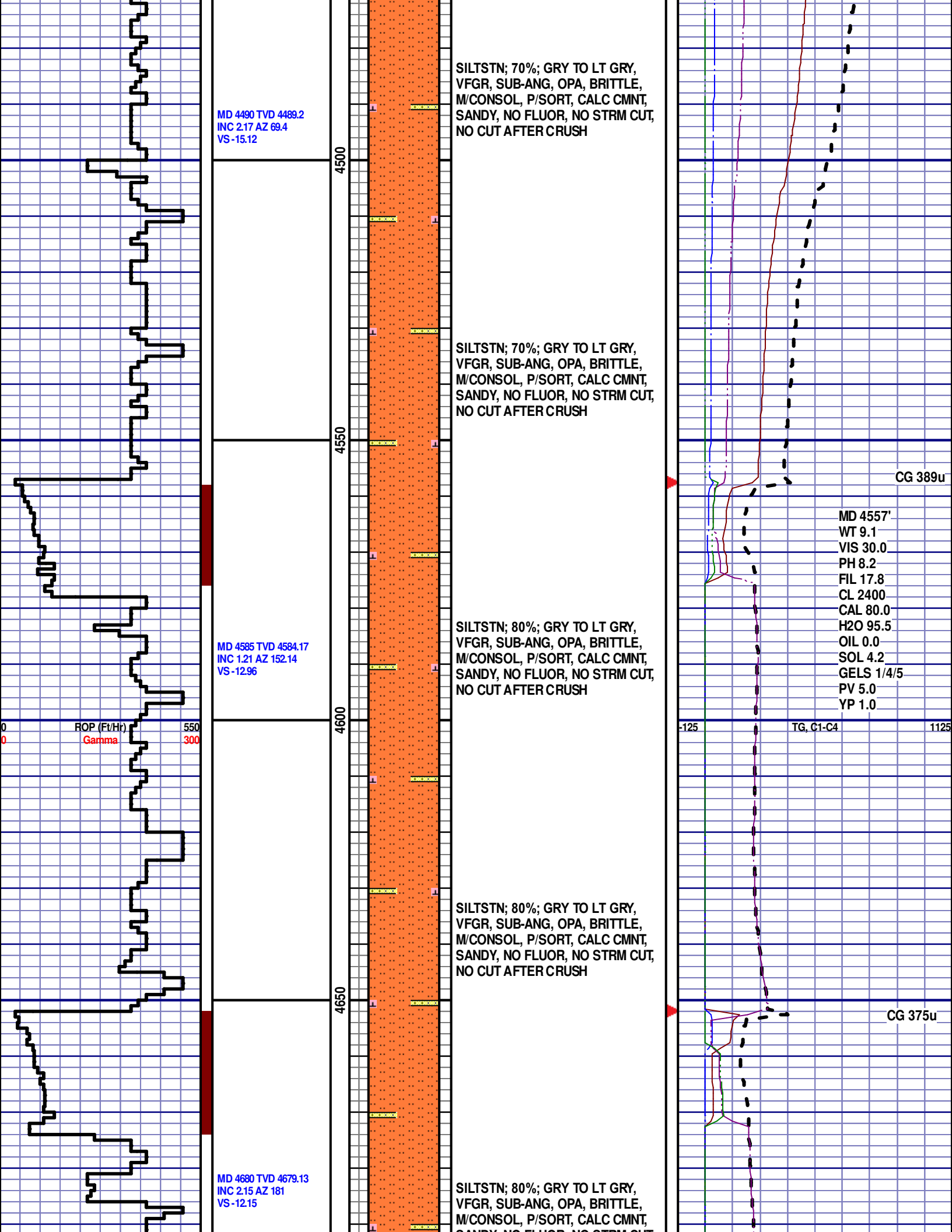
1125

ROP (Ft/Hr)
Gamma

550
300







MD 4490 TVD 4489.2
INC 2.17 AZ 69.4
VS-15.12

MD 4585 TVD 4584.17
INC 1.21 AZ 152.14
VS-12.96

MD 4680 TVD 4679.13
INC 2.15 AZ 181
VS-12.15

SILTSTN; 70%; GRY TO LT GRY,
VFGR, SUB-ANG, OPA, BRITTLE,
M/CONSOL, P/SORT, CALC CMNT,
SANDY, NO FLUOR, NO STRM CUT,
NO CUT AFTER CRUSH

SILTSTN; 70%; GRY TO LT GRY,
VFGR, SUB-ANG, OPA, BRITTLE,
M/CONSOL, P/SORT, CALC CMNT,
SANDY, NO FLUOR, NO STRM CUT,
NO CUT AFTER CRUSH

SILTSTN; 80%; GRY TO LT GRY,
VFGR, SUB-ANG, OPA, BRITTLE,
M/CONSOL, P/SORT, CALC CMNT,
SANDY, NO FLUOR, NO STRM CUT,
NO CUT AFTER CRUSH

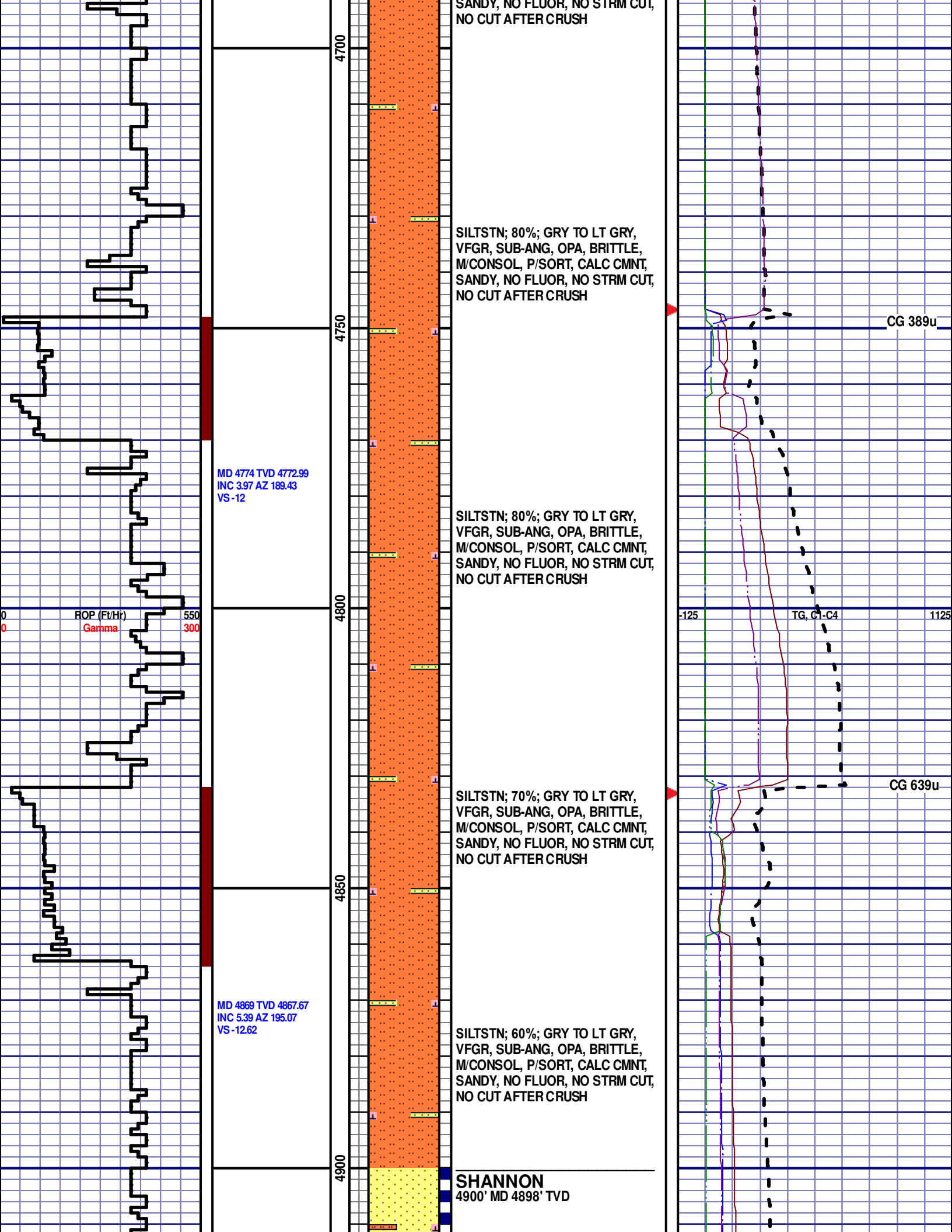
SILTSTN; 80%; GRY TO LT GRY,
VFGR, SUB-ANG, OPA, BRITTLE,
M/CONSOL, P/SORT, CALC CMNT,
SANDY, NO FLUOR, NO STRM CUT,
NO CUT AFTER CRUSH

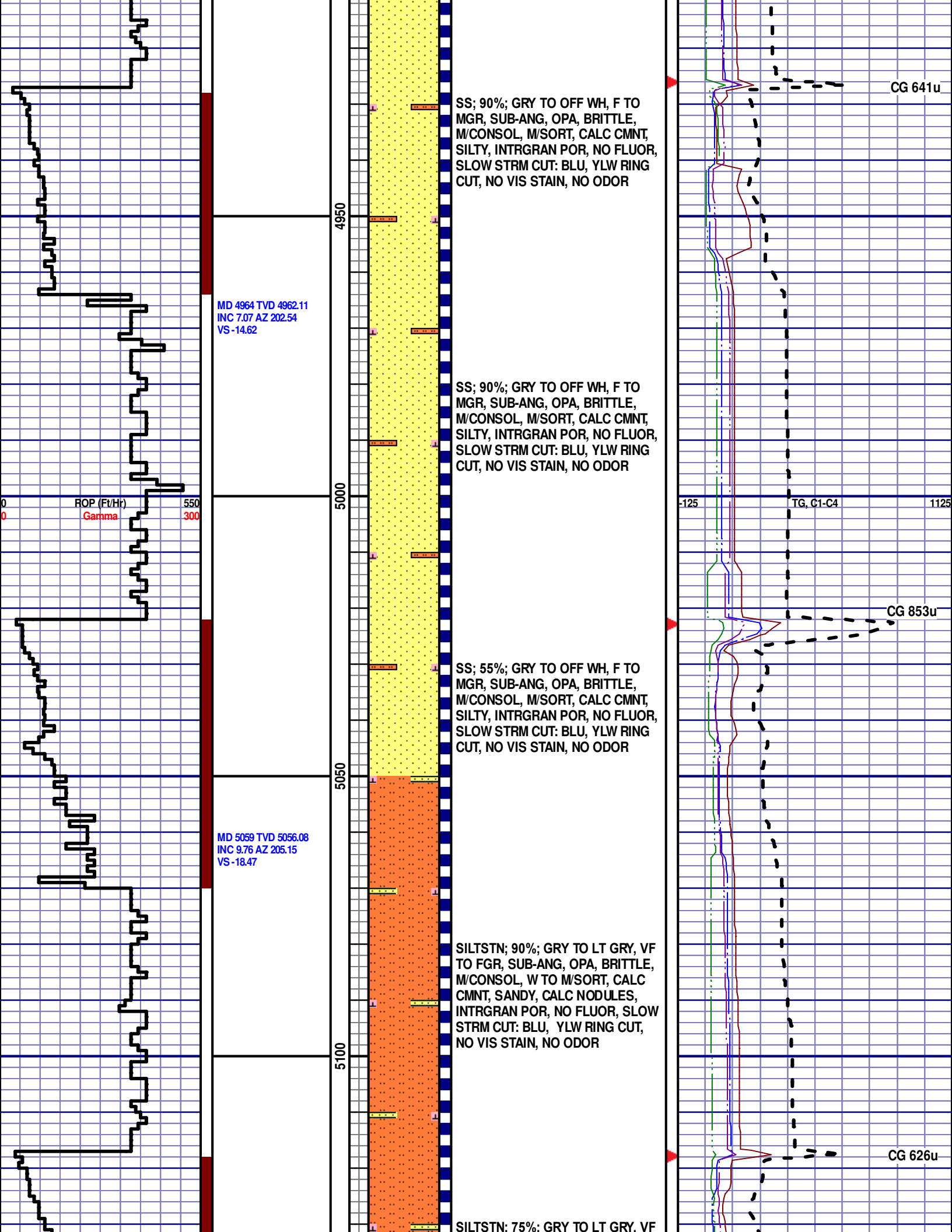
SILTSTN; 80%; GRY TO LT GRY,
VFGR, SUB-ANG, OPA, BRITTLE,
M/CONSOL, P/SORT, CALC CMNT,
SANDY, NO FLUOR, NO STRM CUT,
NO CUT AFTER CRUSH

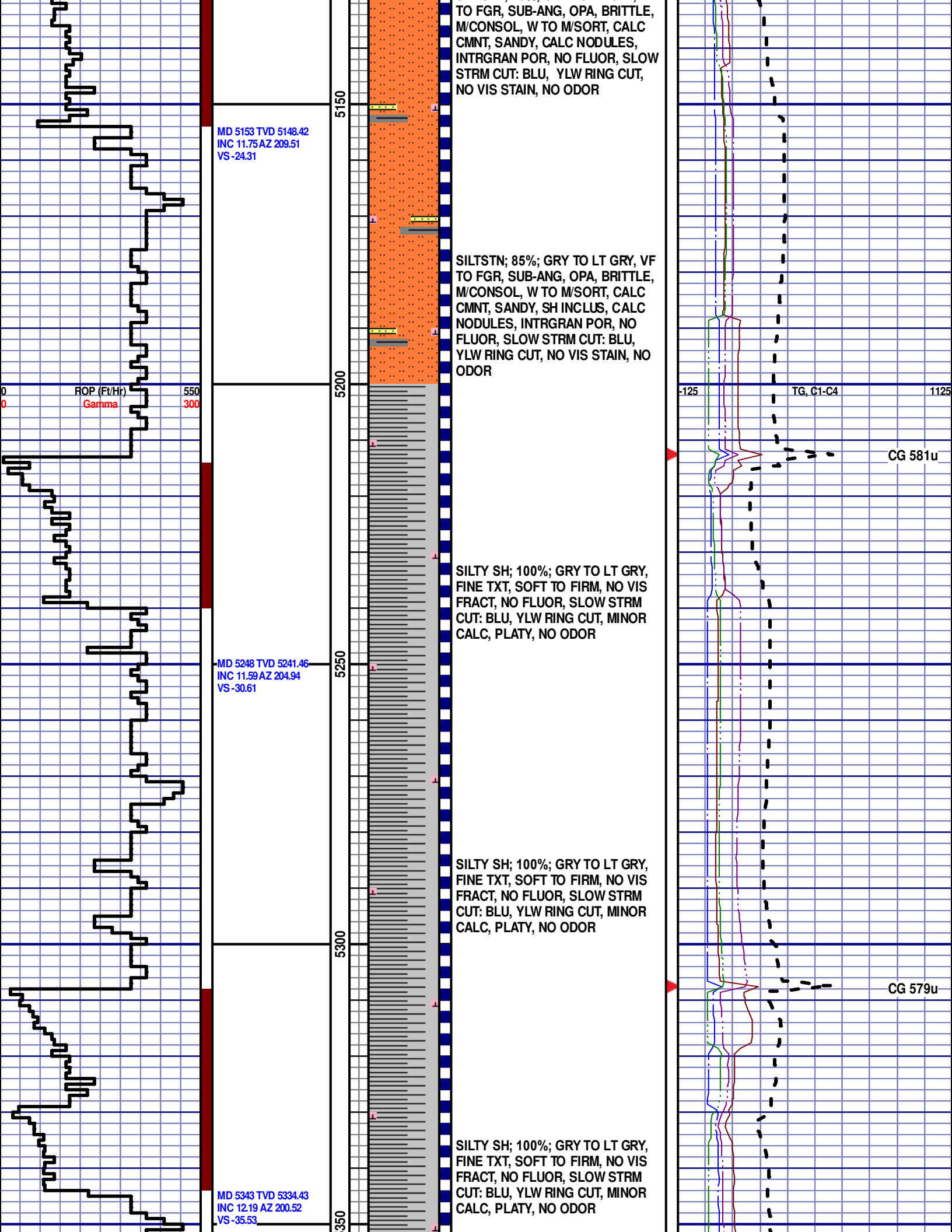
CG 389u

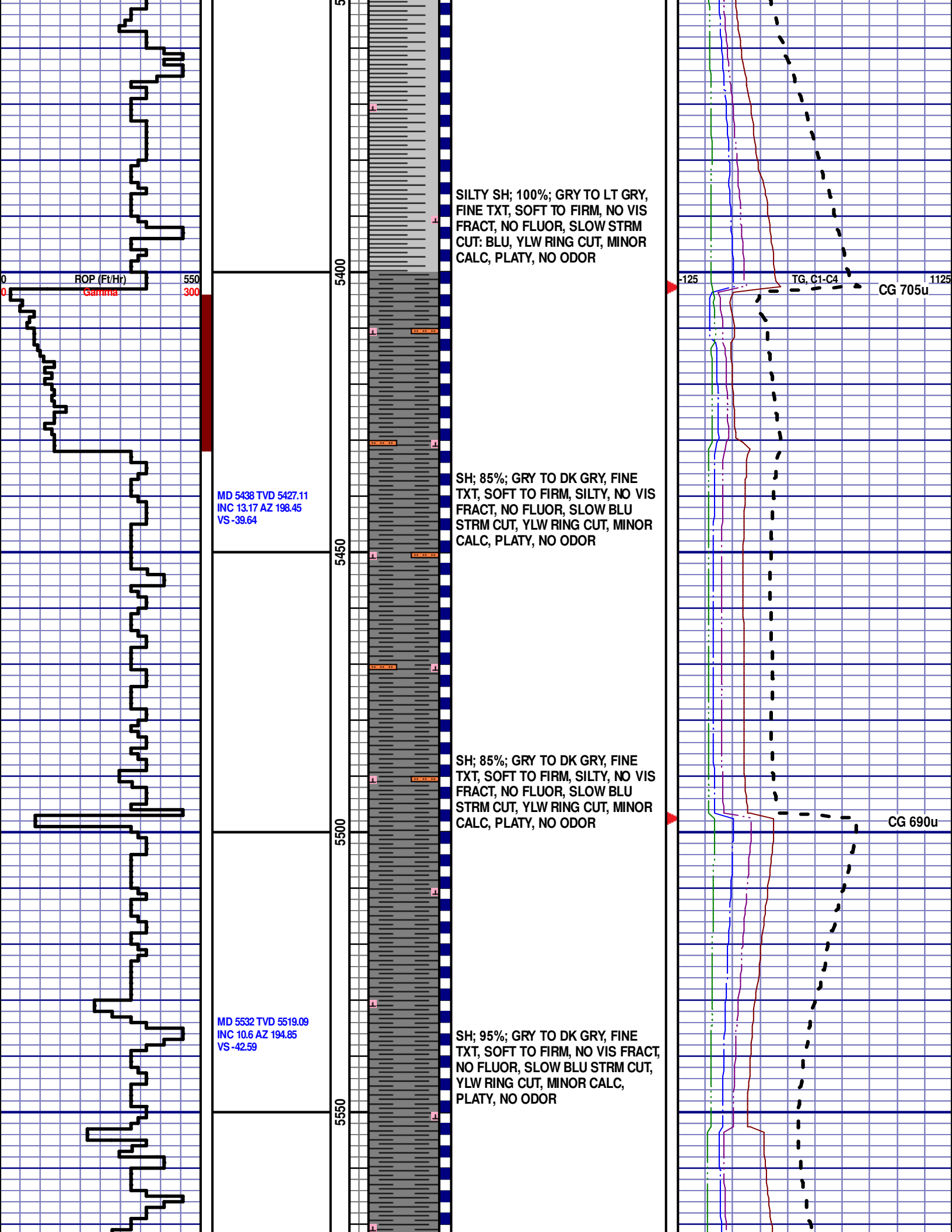
MD 4557'
WT 9.1
VIS 30.0
PH 8.2
FIL 17.8
CL 2400
CAL 80.0
H2O 95.5
OIL 0.0
SOL 4.2
GELS 1/4/5
PV 5.0
YP 1.0

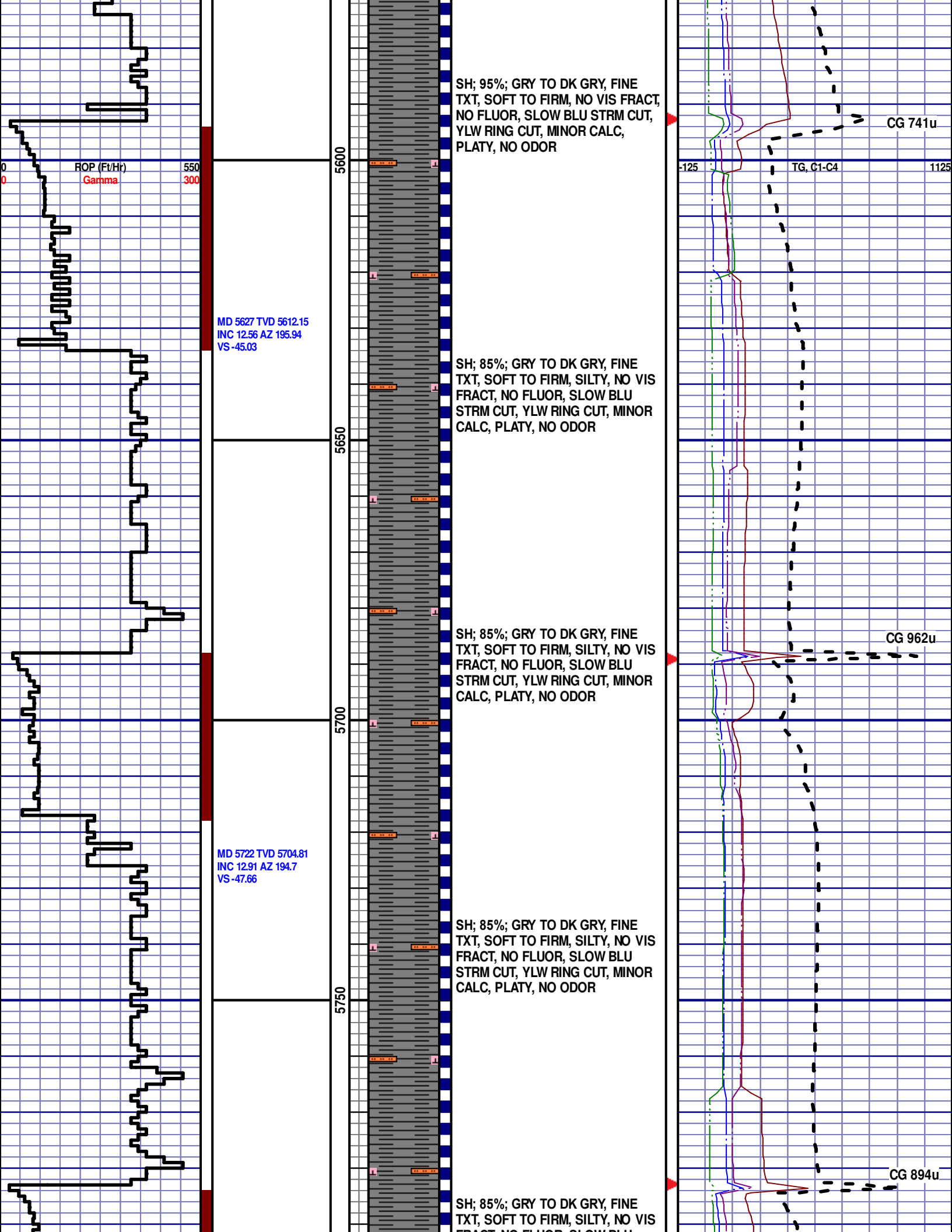
CG 375u

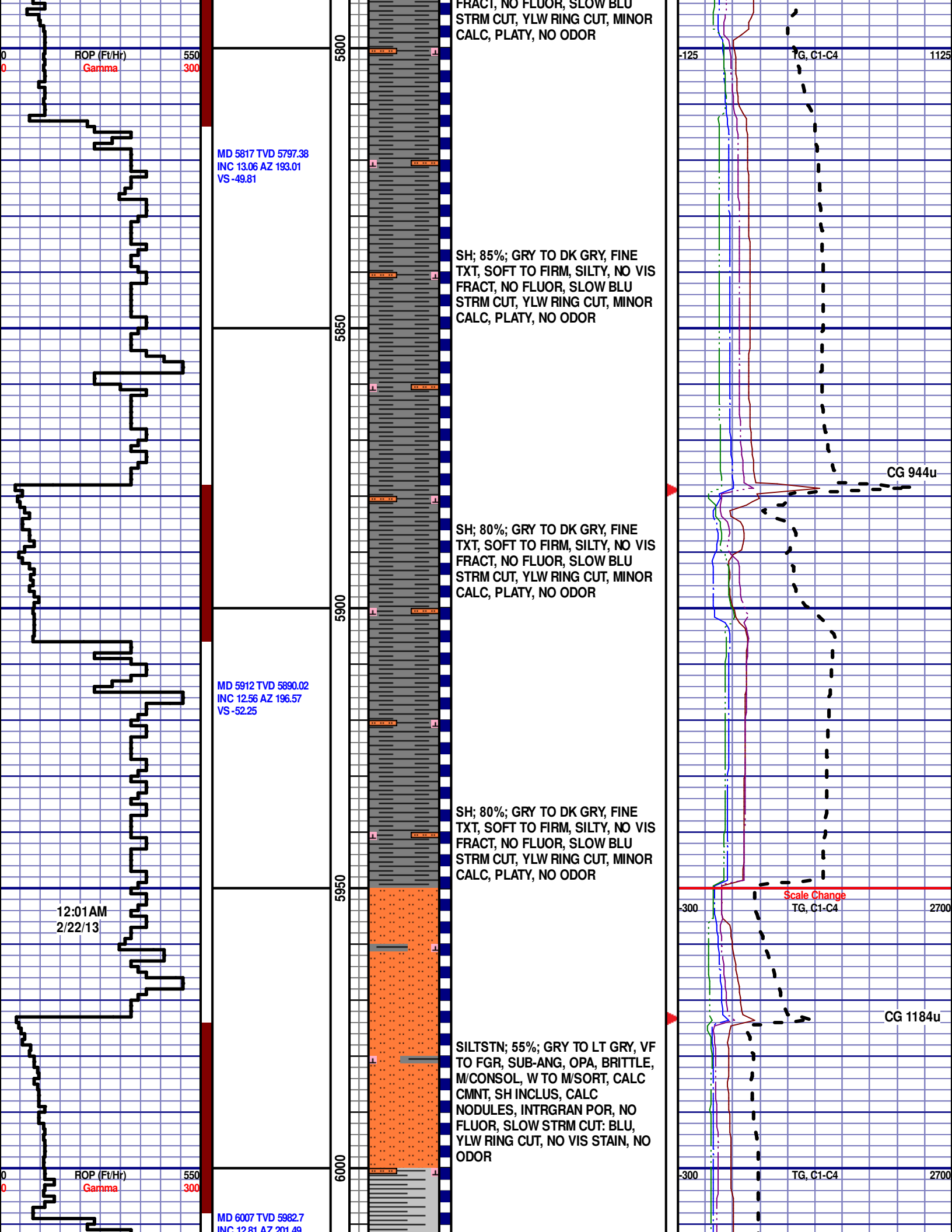


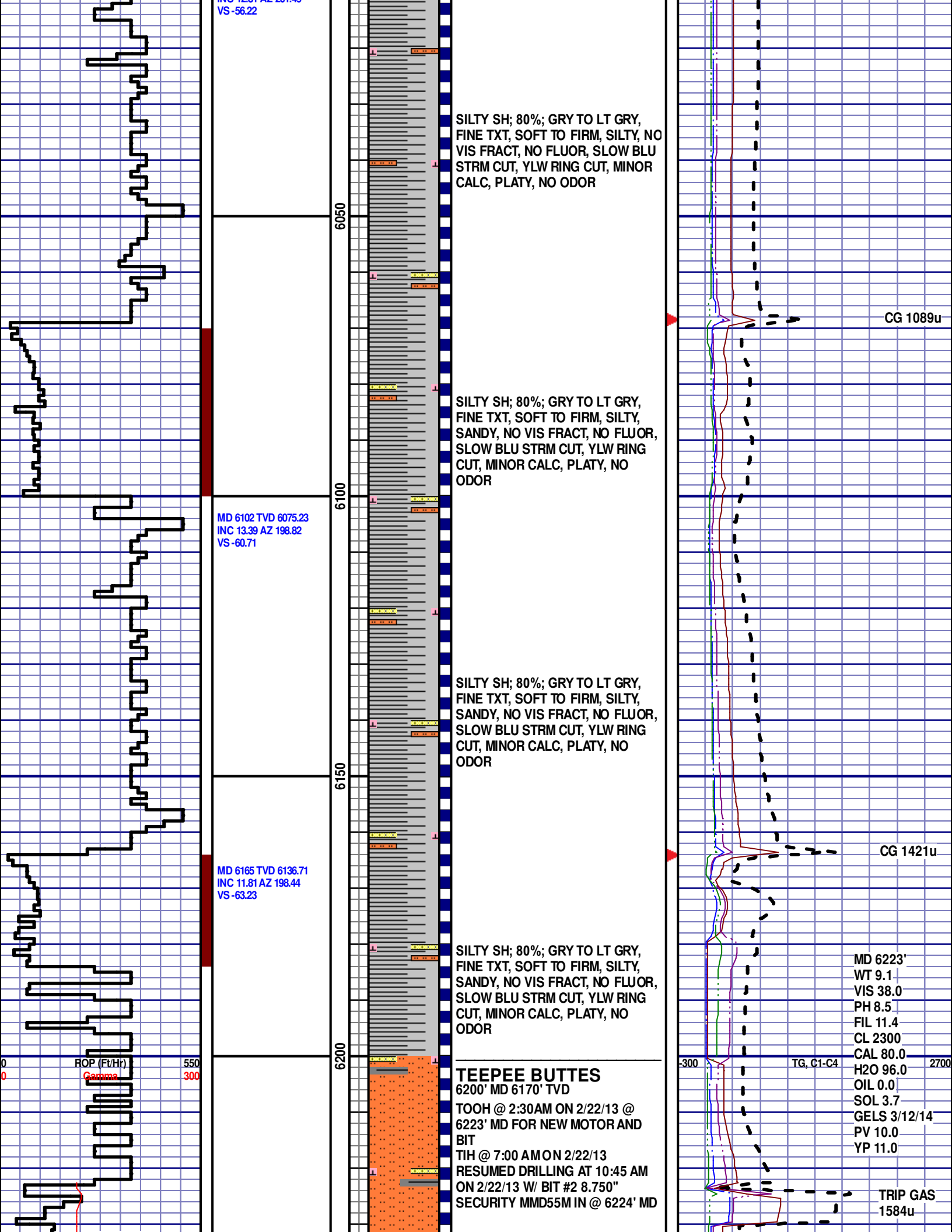


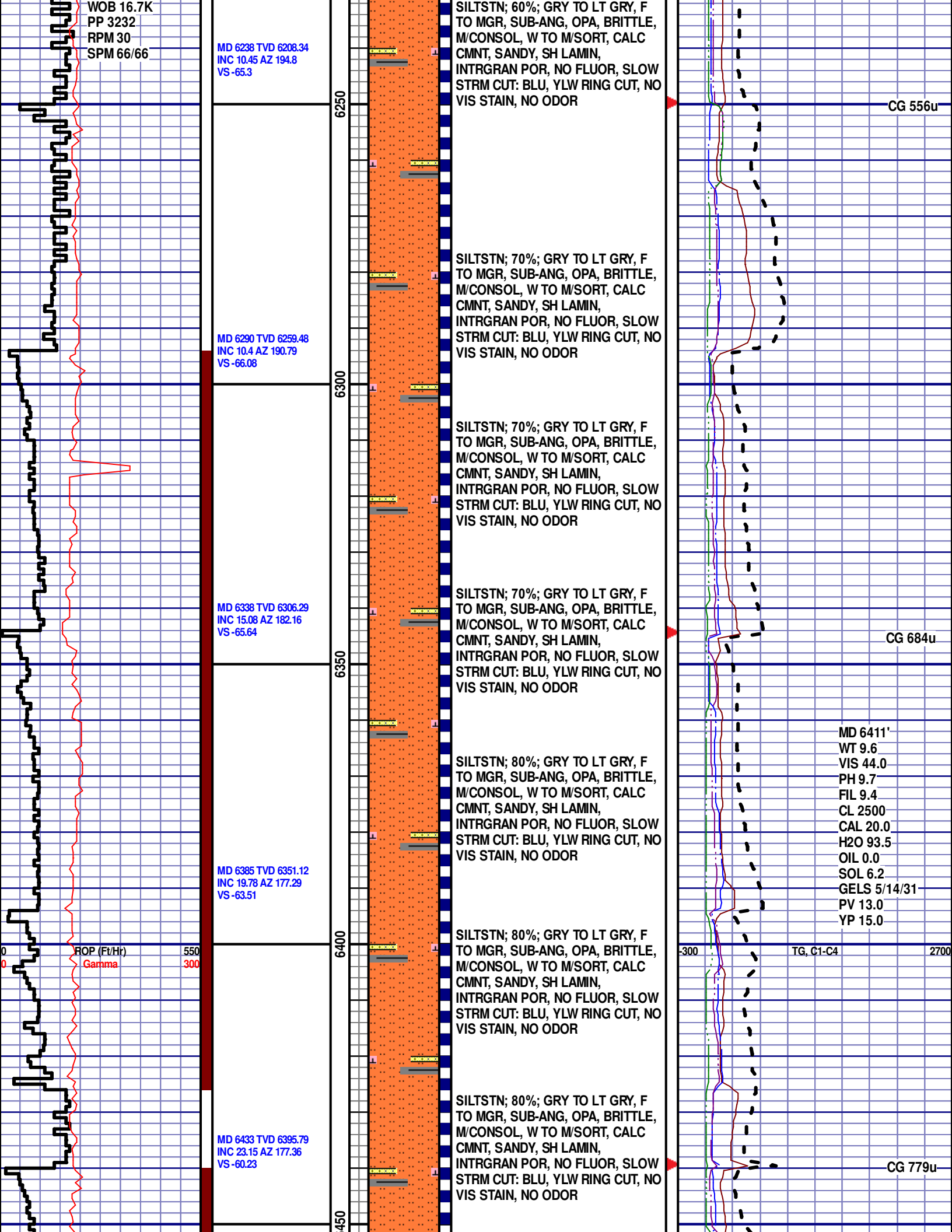


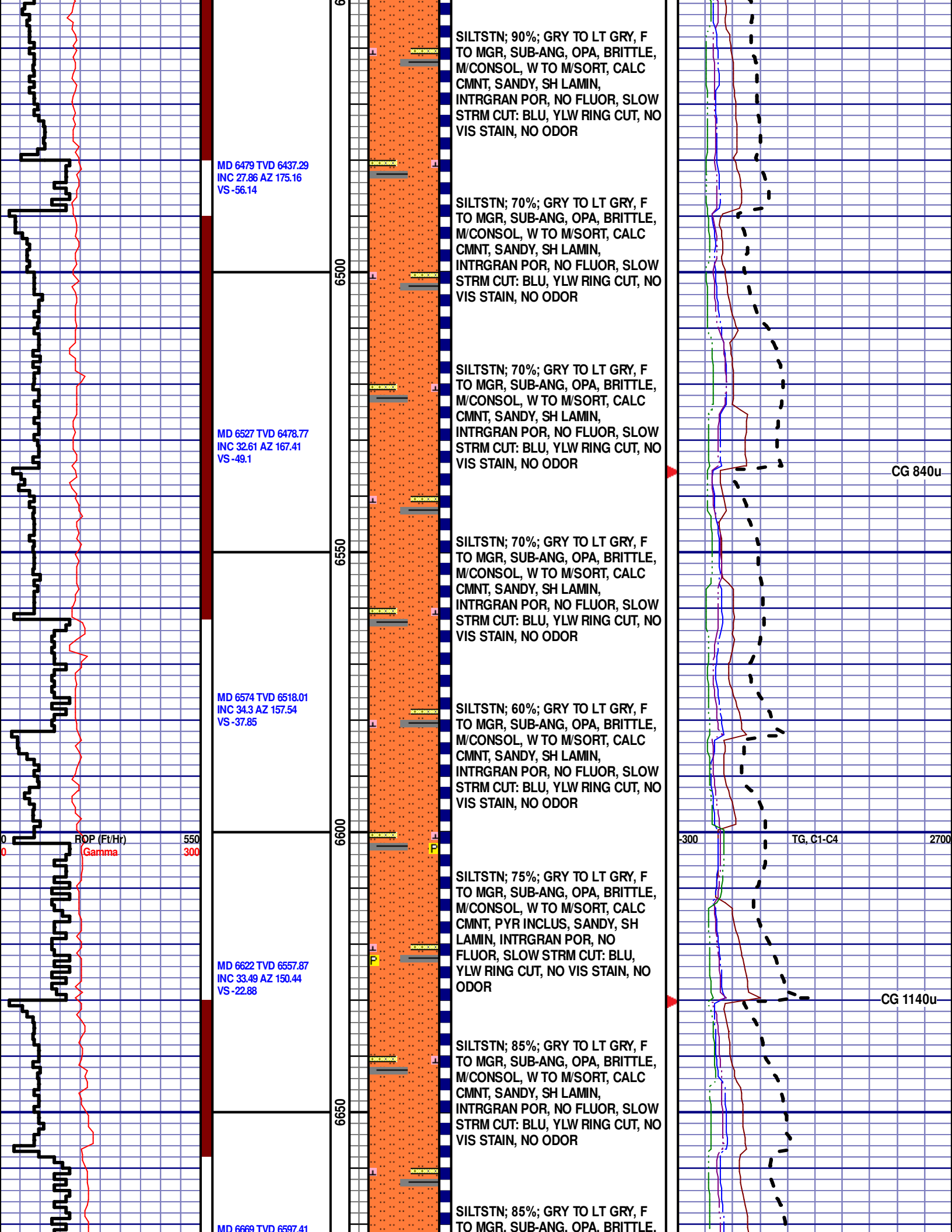


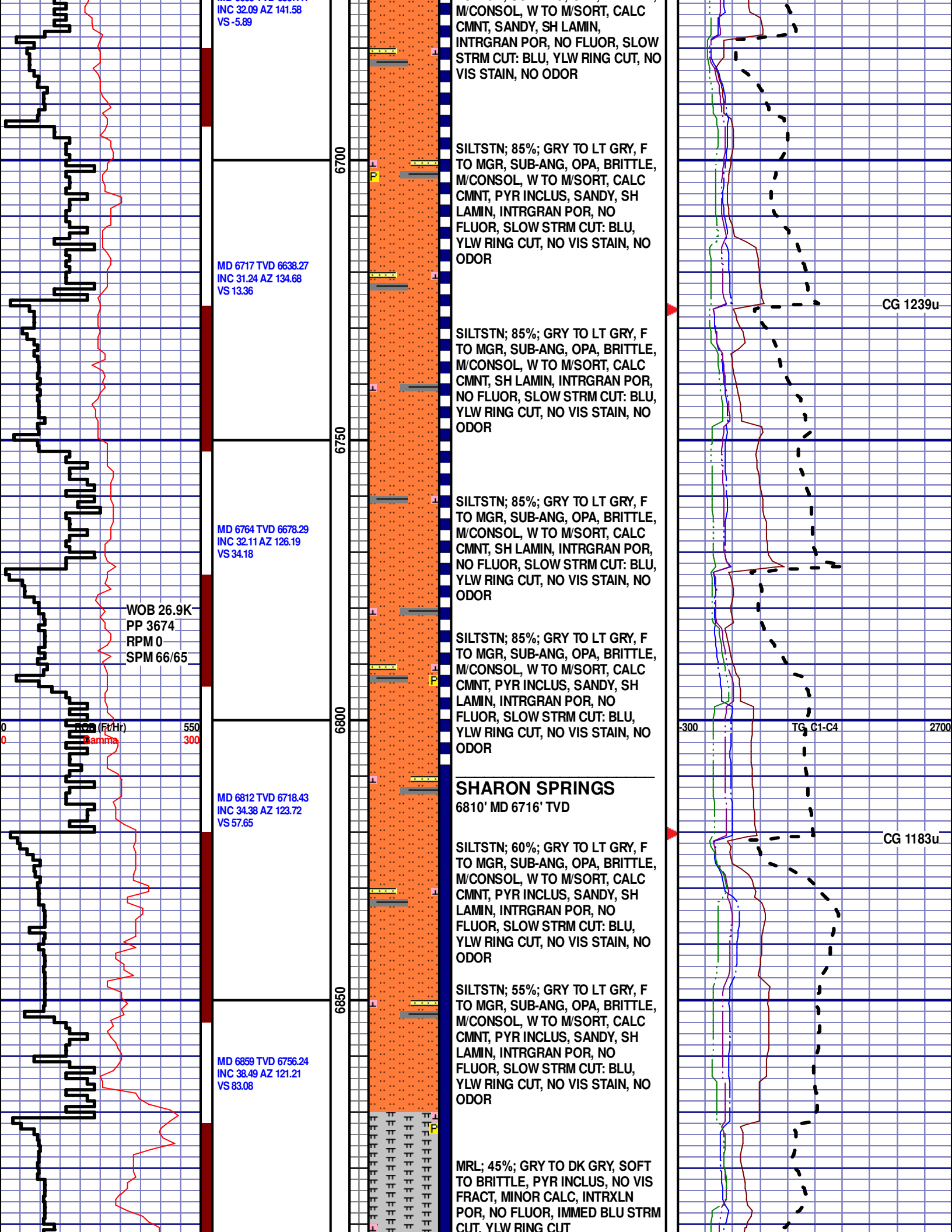


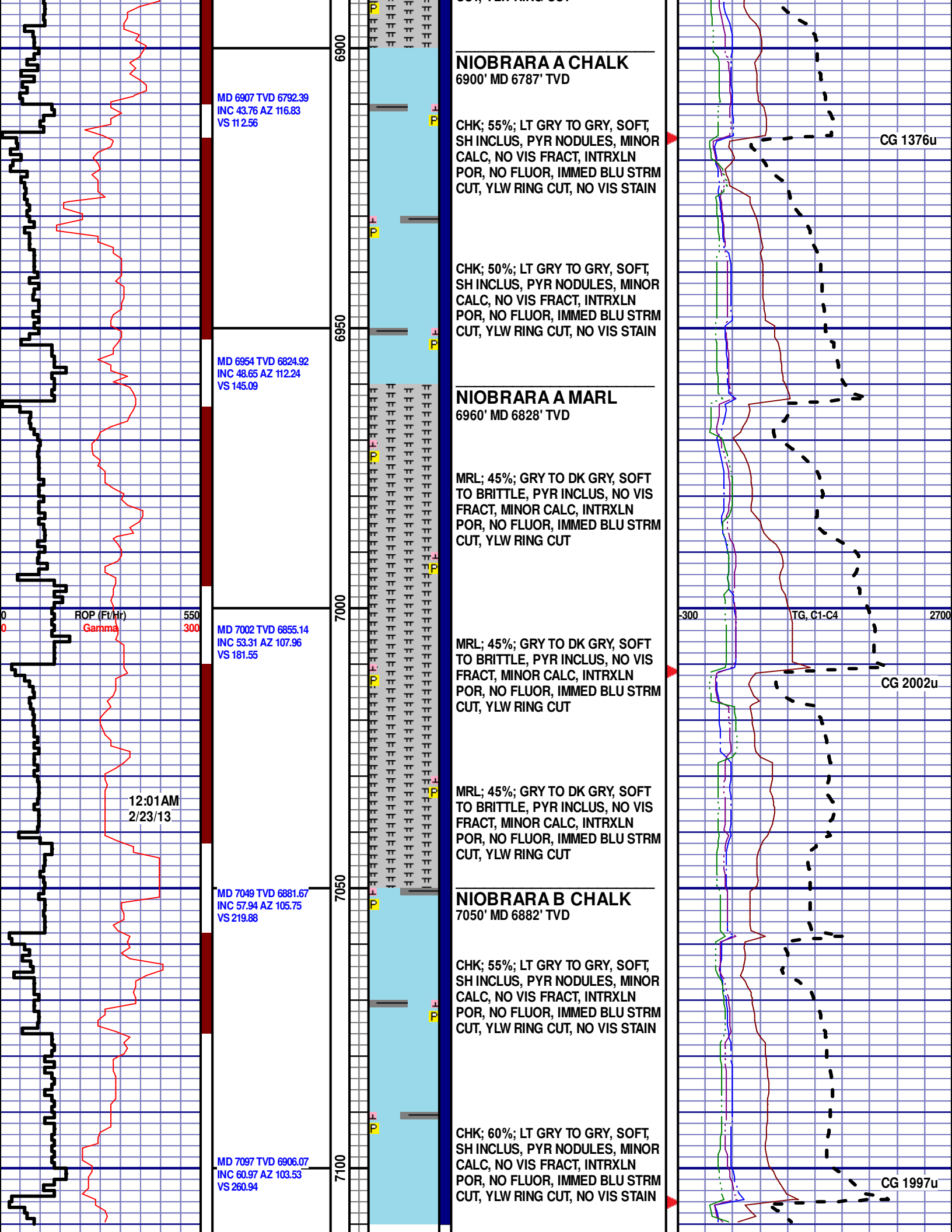












NIOBRARA A CHALK
6900' MD 6787' TVD

CHK; 55%; LT GRY TO GRY, SOFT, SH INCLUS, PYR NODULES, MINOR CALC, NO VIS FRACT, INTRXLN POR, NO FLUOR, IMMED BLU STRM CUT, YLW RING CUT, NO VIS STAIN

CHK; 50%; LT GRY TO GRY, SOFT, SH INCLUS, PYR NODULES, MINOR CALC, NO VIS FRACT, INTRXLN POR, NO FLUOR, IMMED BLU STRM CUT, YLW RING CUT, NO VIS STAIN

NIOBRARA A MARL
6960' MD 6828' TVD

MRL; 45%; GRY TO DK GRY, SOFT TO BRITTLE, PYR INCLUS, NO VIS FRACT, MINOR CALC, INTRXLN POR, NO FLUOR, IMMED BLU STRM CUT, YLW RING CUT

MRL; 45%; GRY TO DK GRY, SOFT TO BRITTLE, PYR INCLUS, NO VIS FRACT, MINOR CALC, INTRXLN POR, NO FLUOR, IMMED BLU STRM CUT, YLW RING CUT

MRL; 45%; GRY TO DK GRY, SOFT TO BRITTLE, PYR INCLUS, NO VIS FRACT, MINOR CALC, INTRXLN POR, NO FLUOR, IMMED BLU STRM CUT, YLW RING CUT

NIOBRARA B CHALK
7050' MD 6882' TVD

CHK; 55%; LT GRY TO GRY, SOFT, SH INCLUS, PYR NODULES, MINOR CALC, NO VIS FRACT, INTRXLN POR, NO FLUOR, IMMED BLU STRM CUT, YLW RING CUT, NO VIS STAIN

CHK; 60%; LT GRY TO GRY, SOFT, SH INCLUS, PYR NODULES, MINOR CALC, NO VIS FRACT, INTRXLN POR, NO FLUOR, IMMED BLU STRM CUT, YLW RING CUT, NO VIS STAIN

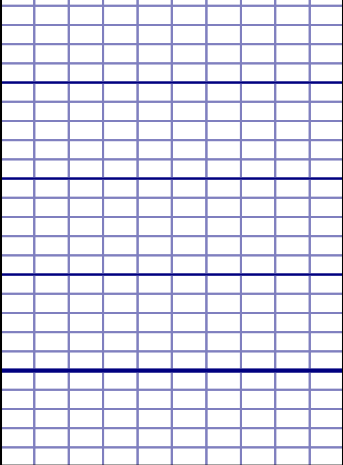


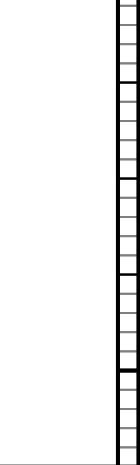
CG 1376u

CG 2002u

CG 1997u

TG, C1-C4

12:01AM
2/23/13

		<div>7150</div> 		<div>END OF VERTICAL LOG @ 7110' MD ON 2/23/13, CONTINUED ON HORIZONTAL LOG.</div>	