



7136 South Yale Avenue, Suite 414

Tulsa, Oklahoma 74136-6378

phone 918.925.9739

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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 & Jonathan Faulkner  
**Log Interval:** 2500' to 7150' MD  
**Start Date:** February 9, 2013  
**Release Date:** March 15, 2013

### Well Information

**Well Name:** Knaub PC G04-67-1HN

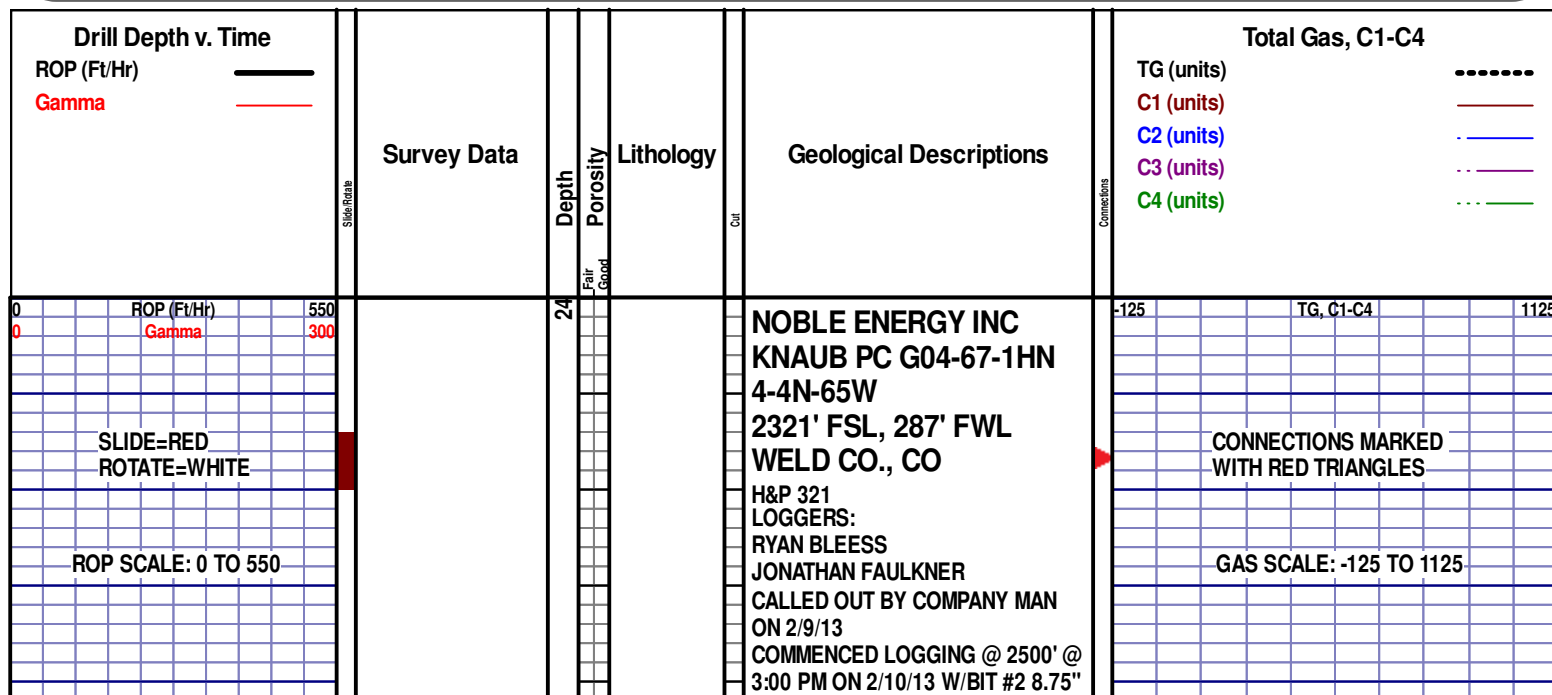
**Location:** 4-4N-65W  
2321' FSL, 287' FWL

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

**Drilling Rig:** H&P 321  
**Total Depth:** 11321'  
**TD Date:** March 15, 2013  
**Formation:** Niobrara C  
**KB Elevation:** 4648'  
**GR Elevation:** 4618'  
**API Number:** 05-123-36284

### ROCK TYPES

	Anhy		Dol		Salt		gw		hvycrbsh
	Bent		Gyp		Shale		lmywash		nosmpl
	Brec		Igne		Shcol		ogw		Lsdetrst
	Cht		Chk		Siltysh		olmywash		sltst
	Clyst		Lmst		Sltst		oshly gw		sdy sh
	Coal		Meta		Ss		shly gw		Cement
	Congl		Mrlst		Till		sdygw		



GAMMA SCALE: 0 TO 300

WOB 25.2K  
PP 2679  
RPM 60  
SPM 67/67

ROP (Ft/Hr) 550  
Gamma 300

MD 2593 TVD 2583.73  
INC 13.65 AZ 0.51  
VS 32.62

MD 2688 TVD 2675.92  
INC 14.25 AZ 0.75  
VS 38.94

SMITH MDI516 IN @ 643' MD

PIERRE  
2500' MD 2493' TVD

SS; 75%; OFF WH TO LT GRY, VF  
TO FGR, SUB-ANG, FROST, FRIBL,  
P/CONSOL, P/SORT, CALC CMNT,  
SILTY, NO FLUOR, NO STRM CUT,  
NO CUT AFTER CRUSH

SS; 65%; OFF WH TO LT GRY, VF  
TO FGR, SUB-ANG, FROST, FRIBL,  
P/CONSOL, P/SORT, CALC CMNT,  
SILTY, NO FLUOR, NO STRM CUT,  
NO CUT AFTER CRUSH

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NO CUT AFTER CRUSH

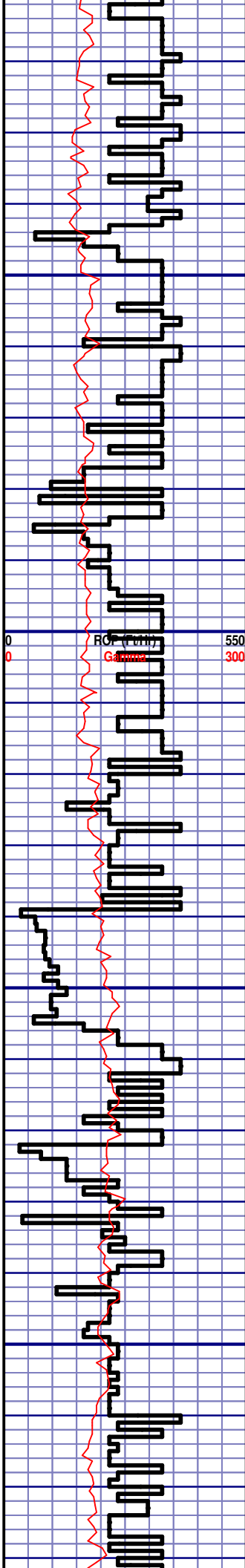
DRILLING ON WBM

MD 2464'  
WT 8.6  
VIS 28.0  
PH 9.1  
FIL 30.3  
CL 1800  
CAL 60.0  
H2O 98.0  
OIL 0.0  
SOL 1.7  
GELS NA  
PV 1.0  
YP 4.0

CG 86u

TG, C1-C4

CG 95u



MD 2783 TVD 2767.98  
INC 14.33 AZ 1.09  
VS 45.52

MD 2878 TVD 2860.29  
INC 13.02 AZ 354.99  
VS 50.78

2750

2800

2850

2900

SS; 85%; OFF WH TO LT GRY, VF  
TO FGR, SUB-ANG, FROST, FRIBL,  
P/CONSOL, P/SORT, CALC CMNT,  
SILTY, NO FLUOR, NO STRM CUT,  
NO CUT AFTER CRUSH

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TO FGR, SUB-ANG, FROST, FRIBL,  
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P/CONSOL, P/SORT, CALC CMNT,  
SILTY, NO FLUOR, NO STRM CUT,  
NO CUT AFTER CRUSH

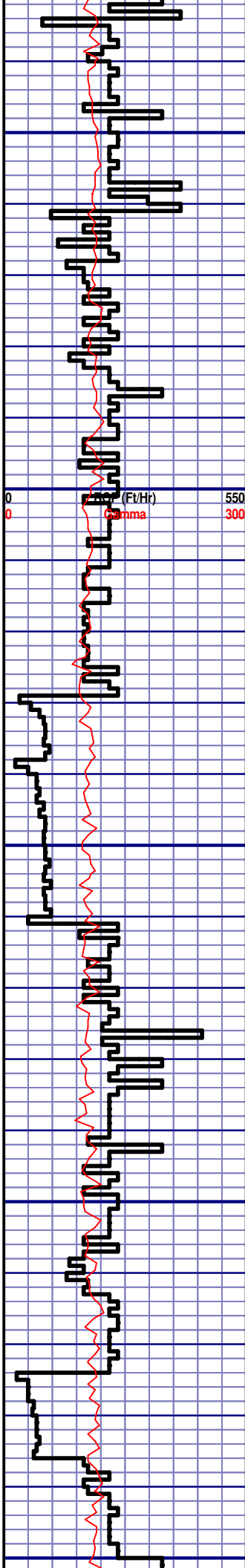
SS; 65%; OFF WH TO LT GRY, VF  
TO FGR, SUB-ANG, FROST, FRIBL,  
P/CONSOL, P/SORT, CALC CMNT,  
SILTY, NO FLUOR, NO STRM CUT,  
NO CUT AFTER CRUSH

SS; 85%; OFF WH TO LT GRY, VF

CG 83u

TG, C1-C4

CG 80u



MD 2972 TVD 2952.08  
INC 11.91 AZ 354.66  
VS 54.37

MD 3067 TVD 3044.77  
INC 13.36 AZ 354.54  
VS 57.98

2950  
3000  
3050  
3100  
3150

SS; 80%; LT GRAY 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; 80%; LT GRAY 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

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SS; 85%; LT GRAY 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; 65%; LT GRAY TO OFF WH, F TO MGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, GLAUC INCLUS, SILTY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

SS; 70%; LT GRAY 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; 70%; LT GRAY 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

-125

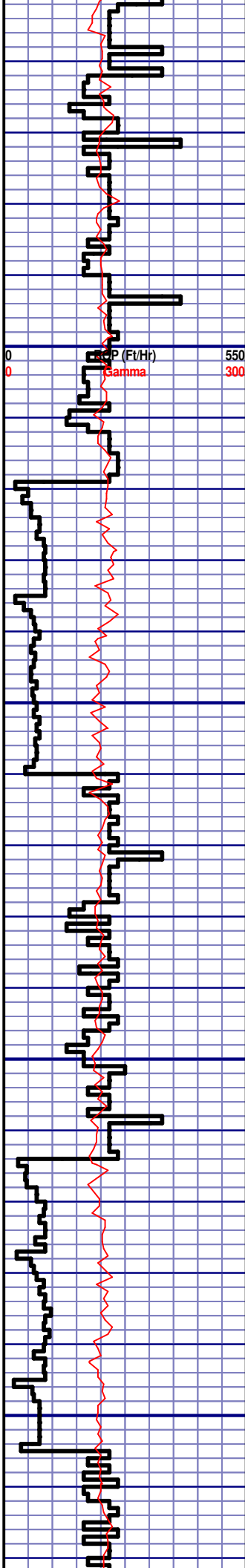
TG, C1-C4

1125

CG 89u

CG 91u

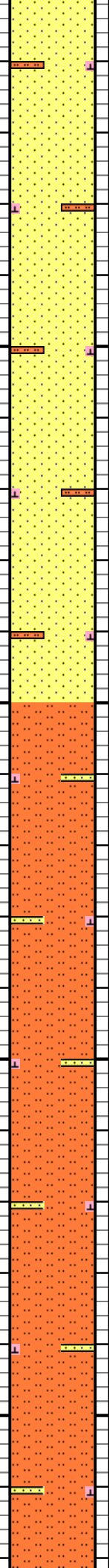
CG 95u



MD 3162 TVD 3137.48  
INC 11.85 AZ 356.35  
VS 61.85

MD 3257 TVD 3230.38  
INC 12.28 AZ 358.53  
VS 66.26

MD 3352 TVD 3323.04  
INC 13.23 AZ 358.34  
VS 71.27

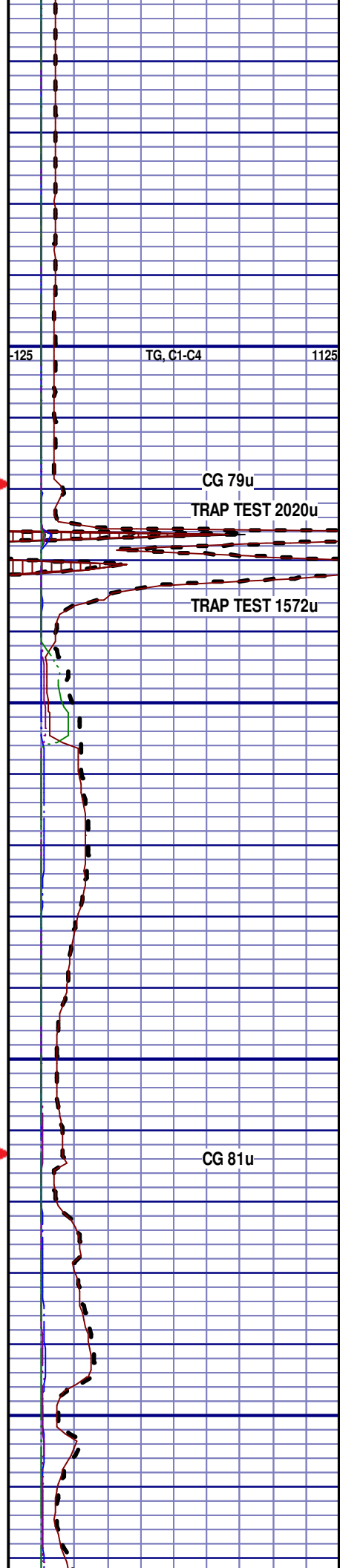


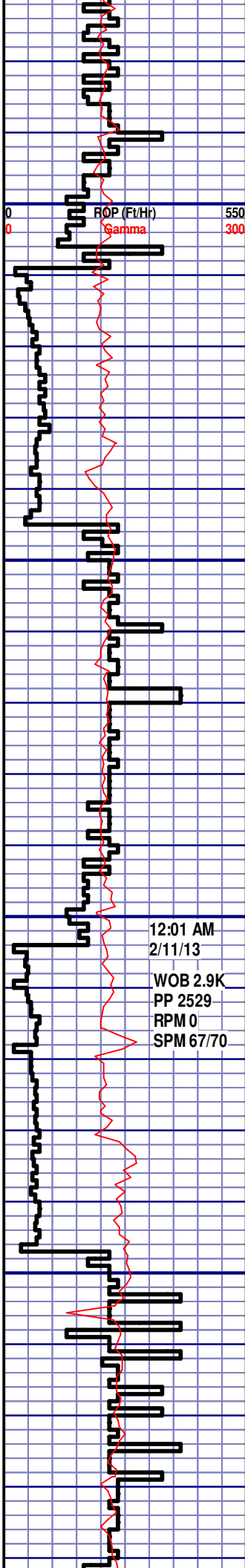
SS; 70%; LT GRY TO OFF WH, F TO MGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, SILTY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

SS; 65%; 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

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; 85%; 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 3447 TVD 3415.51  
INC 13.27 AZ 354.2  
VS 75.55

MD 3541 TVD 3506.93  
INC 13.65 AZ 354.79  
VS 79.3

3400

3450

3500

3550

SILTSTN; 90%; 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; 100%; GRY TO LT GRY, VF TO FGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, PYR INCLUS, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

SILTSTN; 90%; GRY TO LT GRY, VF TO FGR, SUB-ANG, OPA, FRIBL, M/CONSOL, W TO M/SORT, CALC CMNT, PYR INCLUS, SANDY, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

SILTY SH; 70%; GRY TO LT GRY, FINE TXT, SOFT TO FIRM, PYR INCLUS, SILTY, SANDY, PYR NODULES, NO VIS FRACT, NO FLUOR, WEAK, BLU STRM CUT, YLW RING CUT, MINOR CALC, PLATY, NO ODOR

SILTY SH; 75%; GRY TO LT GRY, FINE TXT, SOFT TO FIRM, PYR INCLUS, SILTY, SANDY, PYR NODULES, NO VIS FRACT, NO

-125

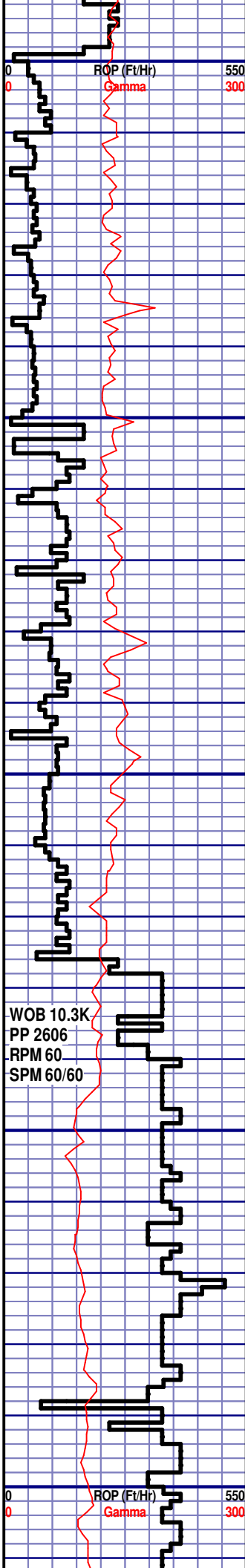
TG, C1-C4

1125

CG 215u

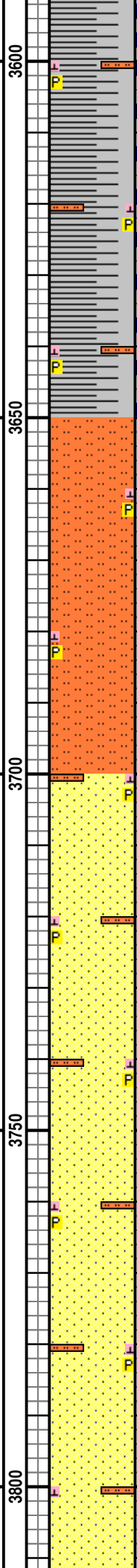
CG 253u





MD 3636 TVD 3599  
INC 14.89 AZ 357.96  
VS 84.1

MD 3730 TVD 3689.82  
INC 15 AZ 357.62  
VS 89.62



FLUOR, SLOW, BLU STRM CUT,  
YLW RING CUT, MINOR CALC,  
PLATY, NO ODOR

SILTY SH; 80%; GRY TO LT GRY,  
FINE TXT, SOFT TO FIRM, PYR  
INCLUS, SILTY, NO VIS FRACT, NO  
FLUOR, WEAK, BLU STRM CUT,  
YLW RING CUT, MINOR CALC,  
PLATY, NO ODOR

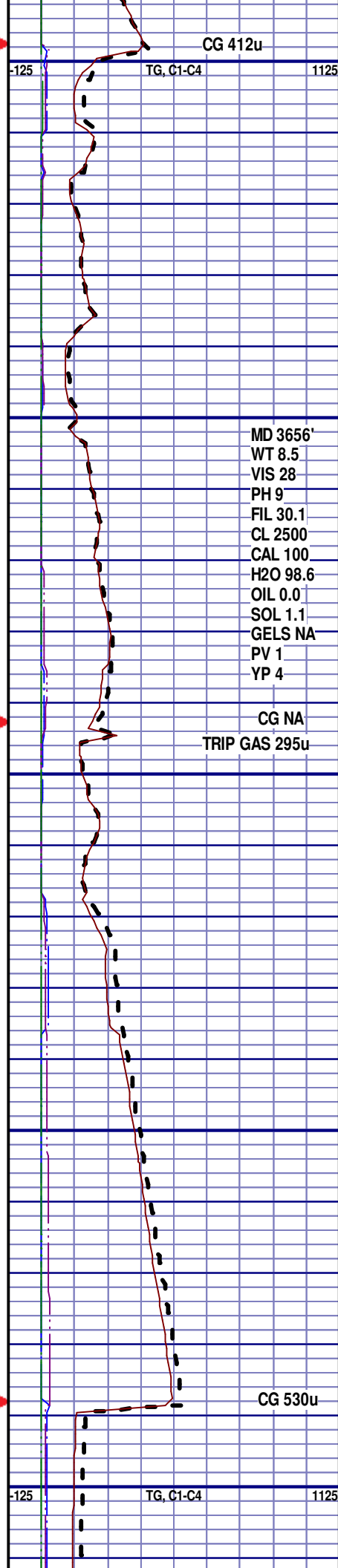
**PARKMAN**  
3660' MD 3622' TVD

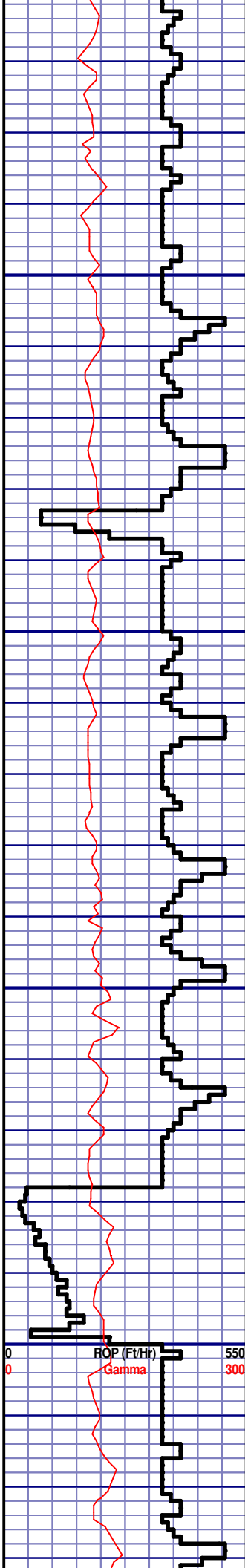
SILTSTN; 100%; GRY TO LT GRY,  
VF TO FGR, SUB-ANG, OPA, FRIBL,  
M/CONSOL, W TO M/SORT, CALC  
CMNT, PYR INCLUS, INTRGRAN  
POR, NO FLUOR, NO STRM CUT,  
NO CUT AFTER CRUSH, YLW RING  
CUT, NO VIS STAIN, NO ODOR

TOOH @ 3:45 AM ON 2/11/13 @  
3694' MD FOR MUD MOTOR AND  
BIT  
TIH @ 7:00 AM ON 2/11/13  
RESUMED DRILLING AT 9:15 AM  
ON 2/11/13 W/ BIT #3 8.750" SMITH  
MDI516 IN @ 3694' MD

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; 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





MD 3825 TVD 3781.47  
INC 15.53 AZ 353.97  
VS 94.45

MD 3919 TVD 3871.99  
INC 15.74 AZ 350.89  
VS 97.89

MD 4014 TVD 3963.81  
INC 14.01 AZ 357.4  
VS 101.84

3850

3900

3950

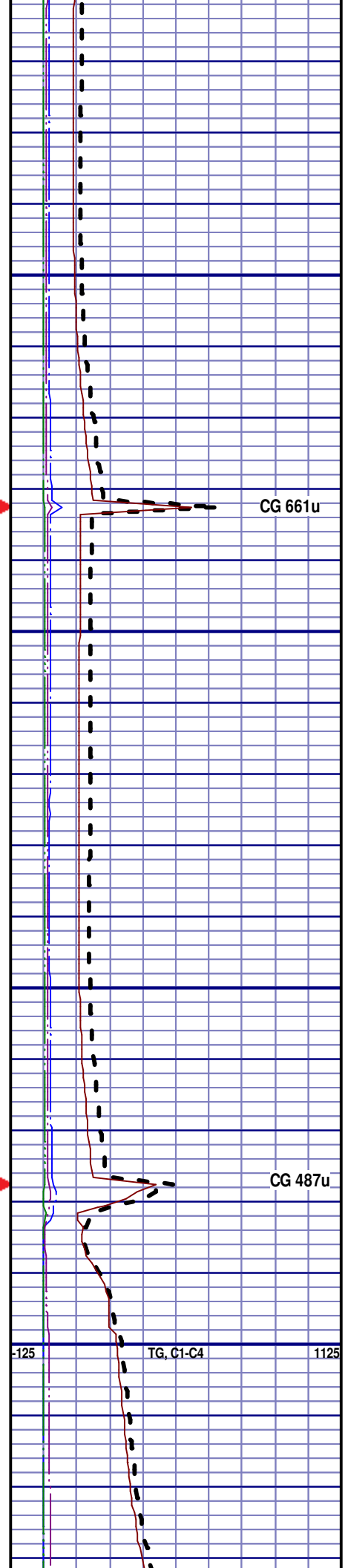
4000

SS; 80%; OFF WH TO LT GRY, VF  
TO FGR, SUB-ANG, FROST, FRIBL,  
P/CONSOL, P/SORT, CALC CMNT,  
SILTYS, NO FLUOR, NO STRM CUT,  
NO CUT AFTER CRUSH

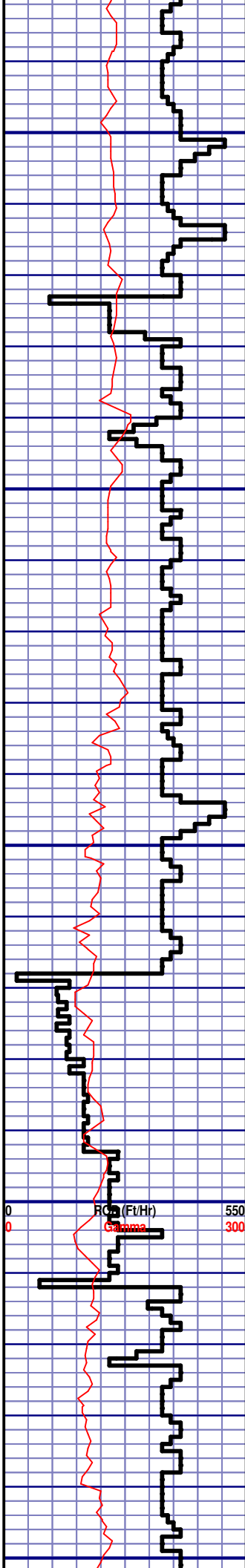
SS; 80%; OFF WH TO LT GRY, VF  
TO FGR, SUB-ANG, FROST, FRIBL,  
M/CONSOL, P/SORT, CALC CMNT,  
SILTYS, NO FLUOR, NO STRM CUT,  
NO CUT AFTER CRUSH

SS; 80%; OFF WH TO LT GRY, VF  
TO FGR, SUB-ANG, FROST, FRIBL,  
P/CONSOL, P/SORT, CALC CMNT,  
SILTYS, NO FLUOR, NO STRM CUT,  
NO CUT AFTER CRUSH

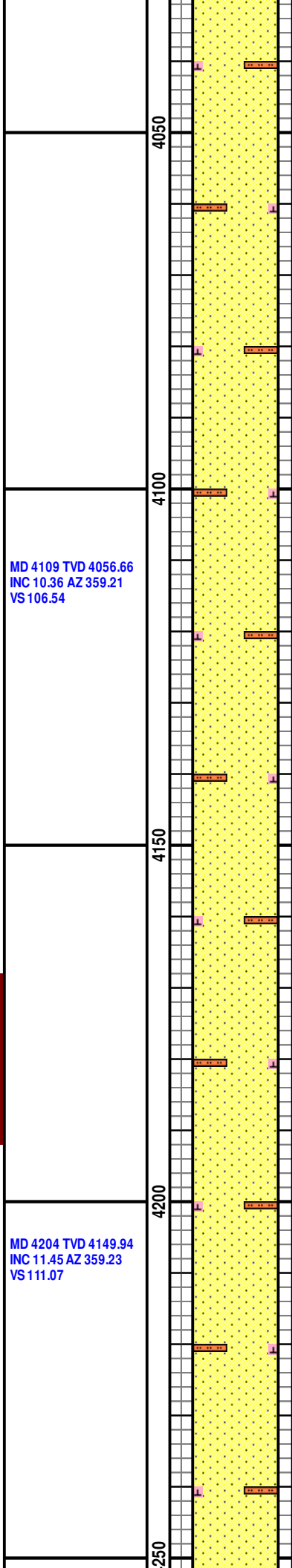
SS; 60%; OFF WH TO LT GRY, VF  
TO FGR, SUB-ANG, FROST, FRIBL,  
M/CONSOL, P/SORT, CALC CMNT,  
SILTYS, NO FLUOR, NO STRM CUT,  
NO CUT AFTER CRUSH





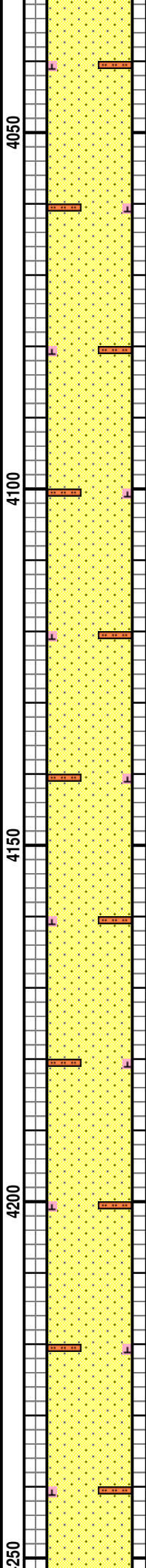


0 550  
0 300  
RC (Ft/Hr)  
Gamma



MD 4109 TVD 4056.66  
INC 10.36 AZ 359.21  
VS 106.54

MD 4204 TVD 4149.94  
INC 11.45 AZ 359.23  
VS 111.07



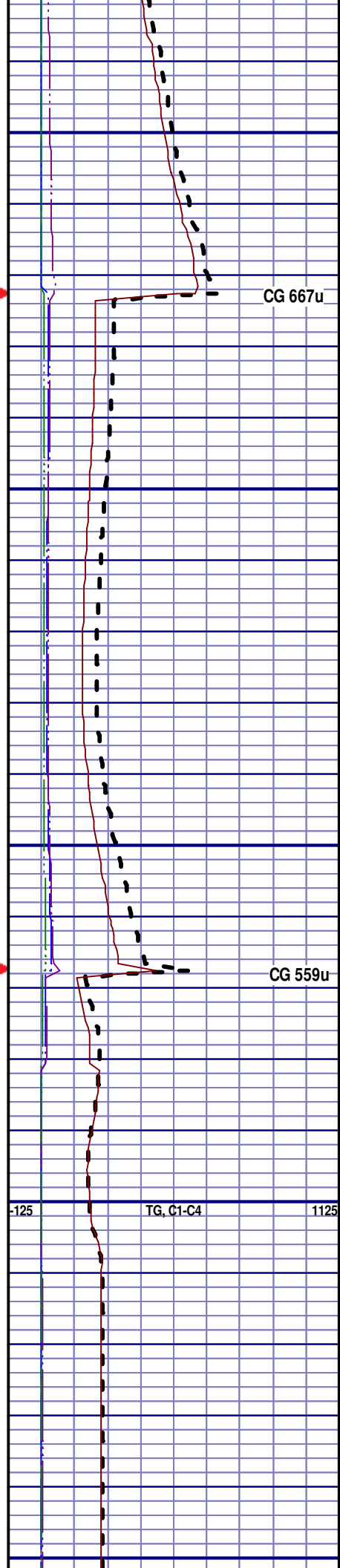
SS; 60%; OFF WH TO LT GRY, VF TO FGR, SUB-ANG, FROST, FRIBL, M/CONSOL, P/SORT, CALC CMNT, SILTYS, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH

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

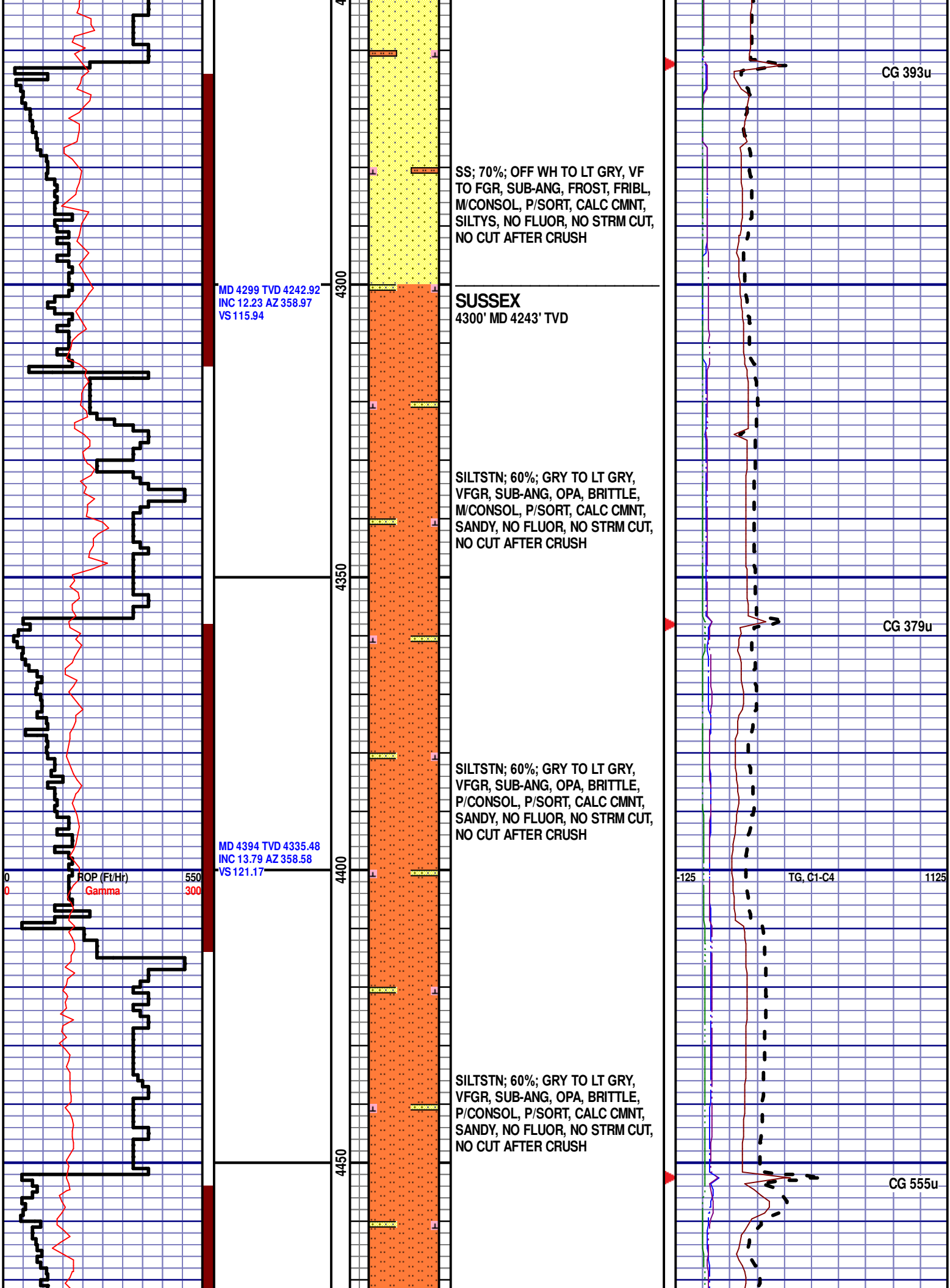
SS; 70%; OFF WH TO LT GRY, VF TO FGR, SUB-ANG, FROST, FRIBL, M/CONSOL, P/SORT, CALC CMNT, SILTYS, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH

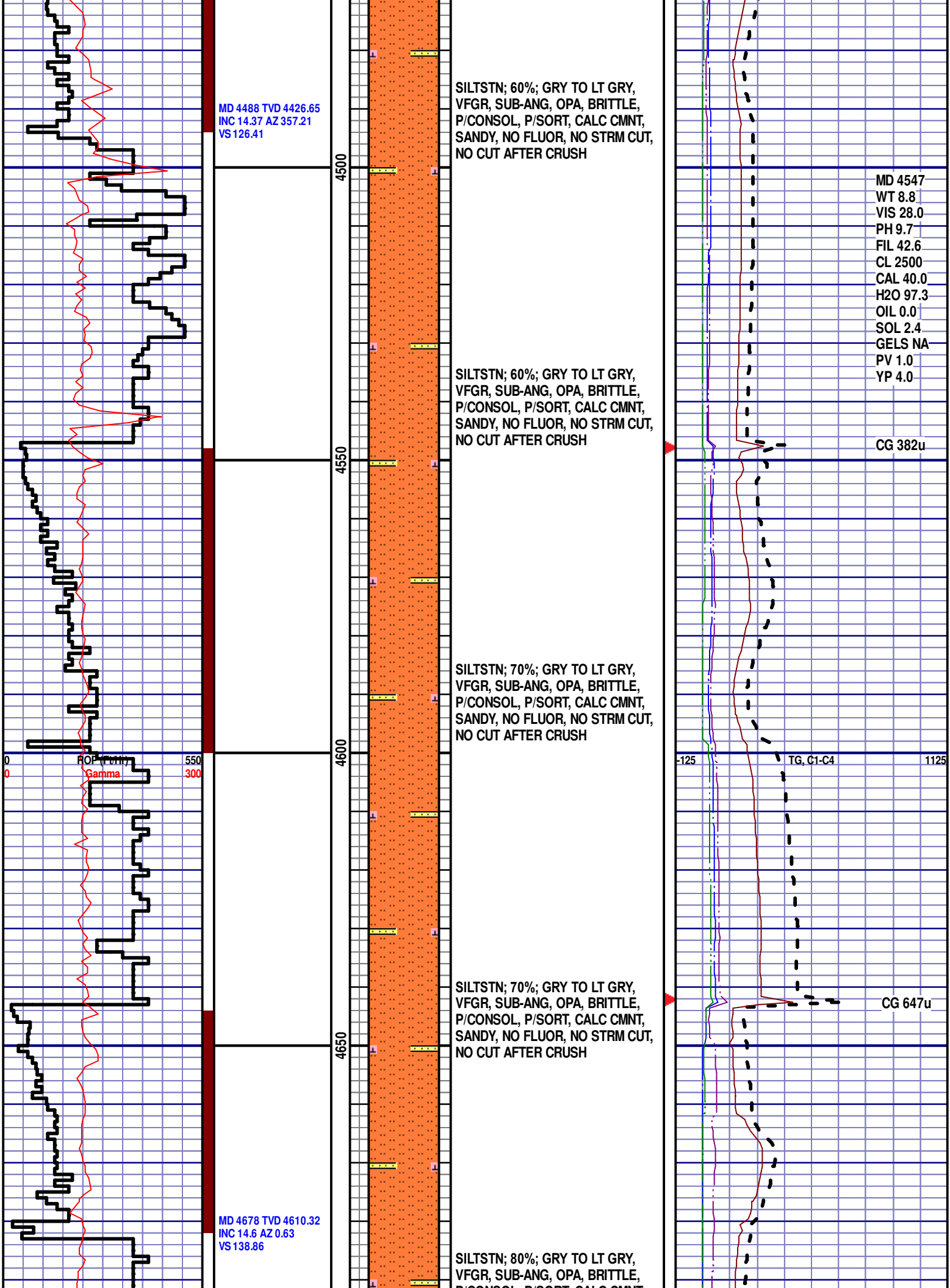
SS; 70%; OFF WH TO LT GRY, VF TO FGR, SUB-ANG, FROST, FRIBL, M/CONSOL, P/SORT, CALC CMNT, SILTYS, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH

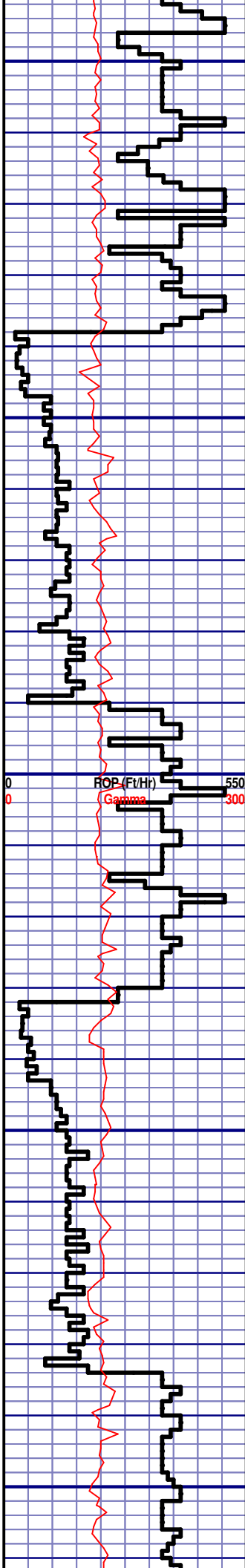
SS; 70%; OFF WH TO LT GRY, VF TO FGR, SUB-ANG, FROST, FRIBL, M/CONSOL, P/SORT, CALC CMNT, SILTYS, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH



-125 1125  
TG, C1-C4







MD 4773 TVD 4702.17  
INC 15.02 AZ 357.46  
VS 144.9

MD 4867 TVD 4792.88  
INC 15.36 AZ 357.24  
VS 150.32

4700  
4750  
4800  
4850  
4900

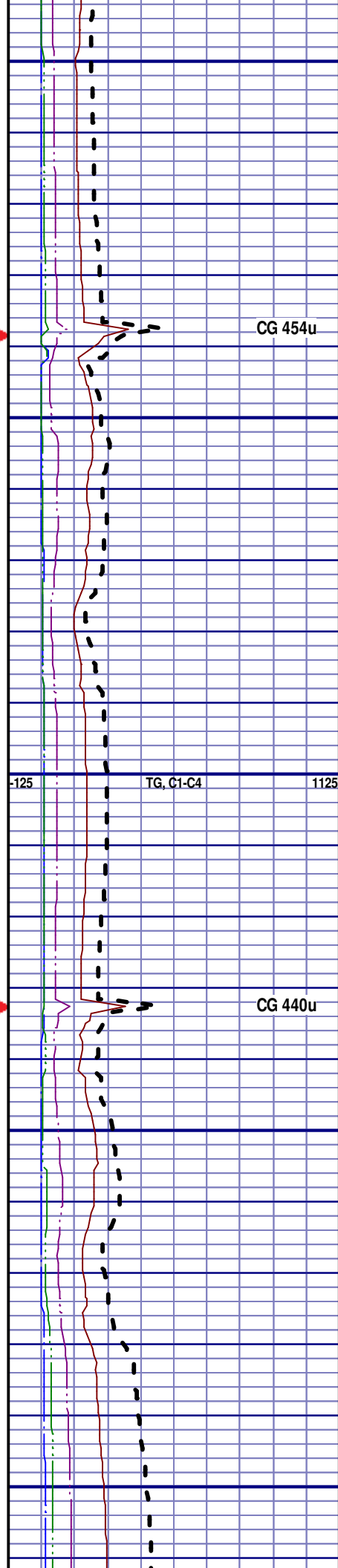
P/CONSOL, P/SORT, CALC CMNT,  
SANDY, NO FLUOR, NO STRM CUT,  
NO CUT AFTER CRUSH

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

SILTSTN; 90%; GRY TO LT GRY, F  
TO MGR, SUB-ANG, OPA, BRITTLE,  
M/CONSOL, W TO M/SORT, CALC  
CMNT, PYR INCLUS, SILTY SH  
INCLUS, INTRGRAN POR, NO  
FLUOR, NO STRM CUT, NO CUT  
AFTER CRUSH, NO RING CUT, NO  
VIS STAIN, NO ODOR

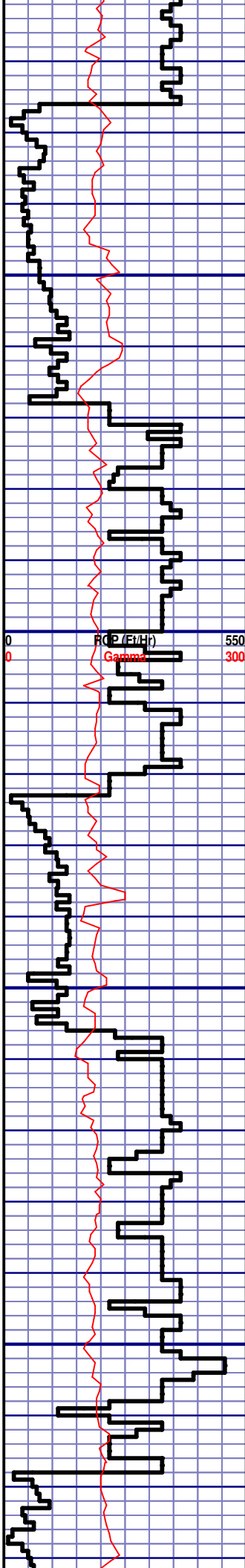
SILTSTN; 85%; GRY TO LT GRY, F  
TO MGR, SUB-ANG, OPA, BRITTLE,  
M/CONSOL, W TO M/SORT, CALC  
CMNT, PYR INCLUS, SANDY, SILTY  
SH INCLUS, INTRGRAN POR, NO  
FLUOR, NO STRM CUT, NO CUT  
AFTER CRUSH, NO RING CUT, NO  
VIS STAIN, NO ODOR



CG 454u

TG, C1-C4

CG 440u



MD 4962 TVD 4884.49  
INC 15.36 AZ 356.92  
VS155.75

MD 5057 TVD 4976  
INC 15.72 AZ 356.45  
VS161.07

4950

5000

5050

5100

SS; 85%; GRY TO OFF WH, F TO MGR, SUB-ANG, OPA, BRITTLE, M/CONSOL, M/SORT, CALC CMNT, PYR INCLUS, SILTY, SH INCLUS, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

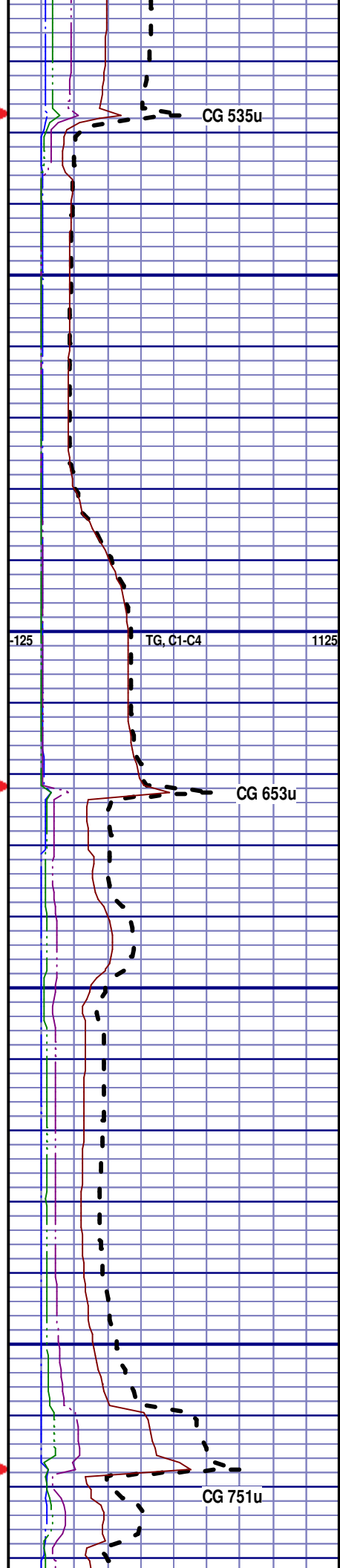
**SHANNON**  
4950' MD 4872' TVD

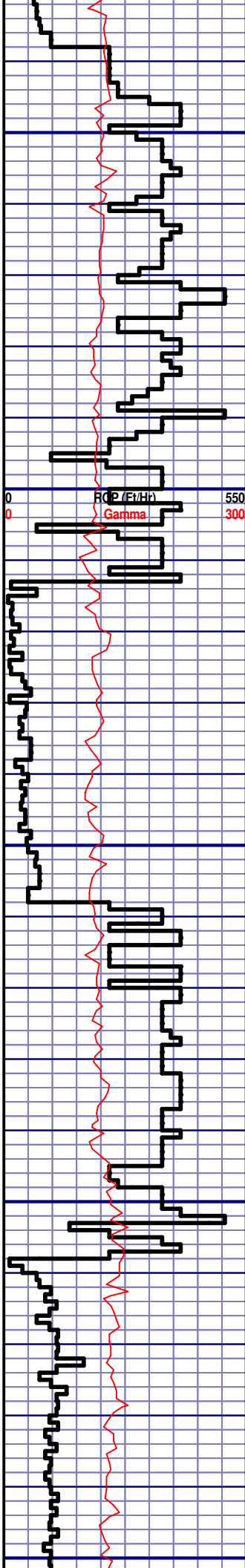
SS; 65%; GRY TO OFF WH, F TO MGR, SUB-ANG, OPA, BRITTLE, M/CONSOL, M/SORT, CALC CMNT, SILTY, SH INCLUS, GLAUC INCLUS, INTRGRAN POR, NO FLUOR, NO STRM CUT, NO CUT AFTER CRUSH, NO RING CUT, NO VIS STAIN, NO ODOR

SS; 90%; GRY TO OFF WH, F TO MGR, SUB-ANG, OPA, BRITTLE, M/CONSOL, M/SORT, CALC CMNT, SILTY, INTRGRAN POR, NO FLUOR, SLOW STRM CUT: BLU, YLW RING CUT, NO VIS STAIN, NO ODOR

SS; 90%; GRY TO OFF WH, F TO MGR, SUB-ANG, OPA, BRITTLE, M/CONSOL, M/SORT, CALC CMNT, SILTY, INTRGRAN POR, NO FLUOR, SLOW STRM CUT: BLU, YLW RING CUT, NO VIS STAIN, NO ODOR

SILTSTN; 85%; GRY TO LT GRY, VF TO FGR, SUB-ANG, OPA, BRITTLE



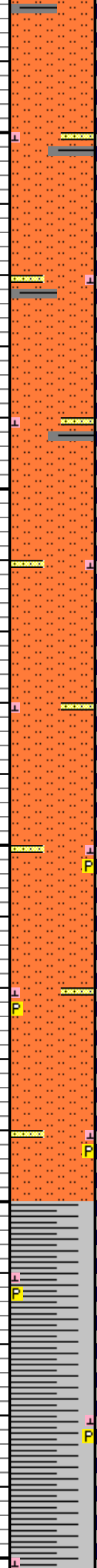


MD 5152 TVD 5067.99  
INC 13.29 AZ 0.72  
VS 166.74

MD 5246 TVD 5159.56  
INC 12.8 AZ 0.95  
VS 172.66

MD 5341 TVD 5252.12  
INC 13.24 AZ 359.13  
VS 178.34

5150  
5200  
5250  
5300  
5350



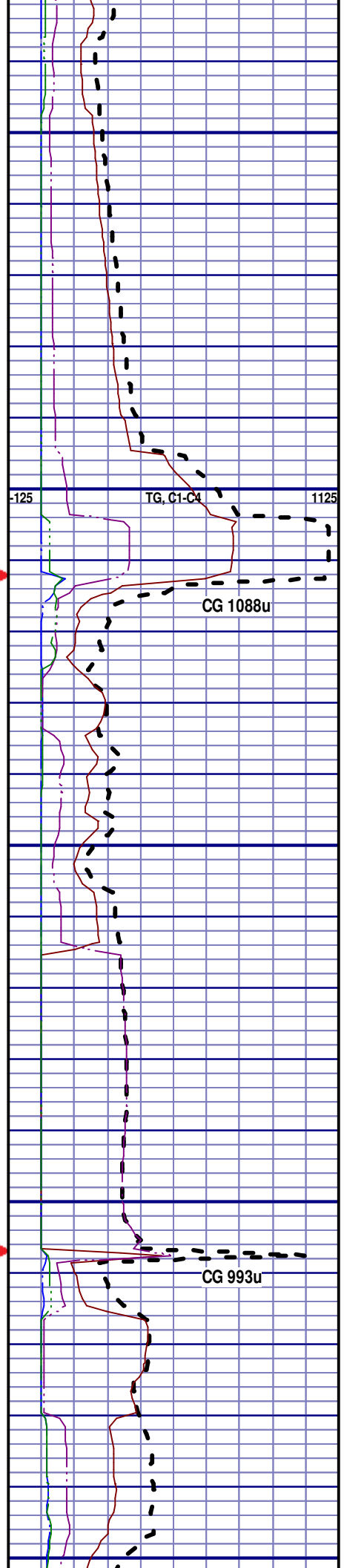
TO FGR, SUB-ANG, OPA, BRITTLE,  
M/CONSOL, W TO M/SORT, CALC  
CMNT, SANDY, SH INCLUS, CALC  
NODULES, INTRGRAN POR, NO  
FLUOR, SLOW STRM CUT: BLU,  
YLW RING CUT, NO VIS STAIN, NO  
ODOR

SILTSTN; 90%; GRY TO LT GRY, VF  
TO FGR, SUB-ANG, OPA, BRITTLE,  
M/CONSOL, W TO M/SORT, CALC  
CMNT, SANDY, SH INCLUS, CALC  
NODULES, INTRGRAN POR, NO  
FLUOR, SLOW STRM CUT: BLU,  
YLW RING CUT, NO VIS STAIN, NO  
ODOR

SILTSTN; 85%; GRY TO LT GRY, VF  
TO FGR, SUB-ANG, OPA, BRITTLE,  
M/CONSOL, W TO M/SORT, CALC  
CMNT, SANDY, INTRGRAN POR, NO  
FLUOR, SLOW STRM CUT: BLU,  
YLW RING CUT, NO VIS STAIN, NO  
ODOR

SILTSTN; 85%; GRY TO LT GRY, VF  
TO FGR, SUB-ANG, OPA, BRITTLE,  
M/CONSOL, W TO M/SORT, CALC  
CMNT, PYR INCLUS, SANDY, SH  
INCLUS, INTRGRAN POR, NO  
FLUOR, SLOW STRM CUT: BLU,  
YLW RING CUT, NO VIS STAIN, NO  
ODOR

SILTY SH; 100%; GRY TO LT GRY,  
FINE TXT, SOFT TO FIRM, PYR  
INCLUS, NO VIS FRACT, NO FLUOR,  
SLOW STRM CUT: BLU, YLW RING  
CUT, MINOR CALC, PLATY, NO  
ODOR



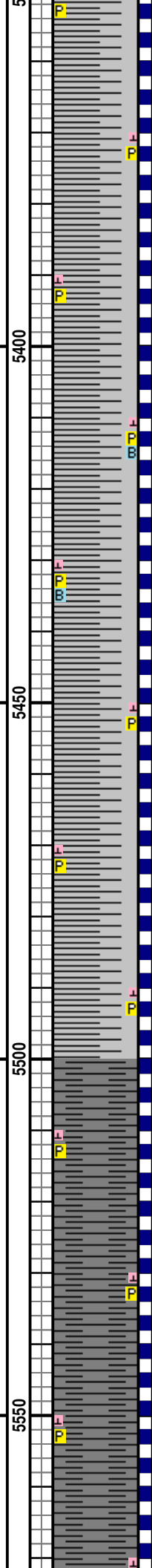


12:01 AM  
2/12/13

RO (Ft/Hr) 550  
Gamma 300  
WOB 8.5K  
PP 2341  
RPM 0  
SPM 66/66

MD 5436 TVD 5344.58  
INC 13.32 AZ 357.94  
VS 183.59

MD 5531 TVD 5436.9  
INC 13.99 AZ 355.92  
VS 188.36

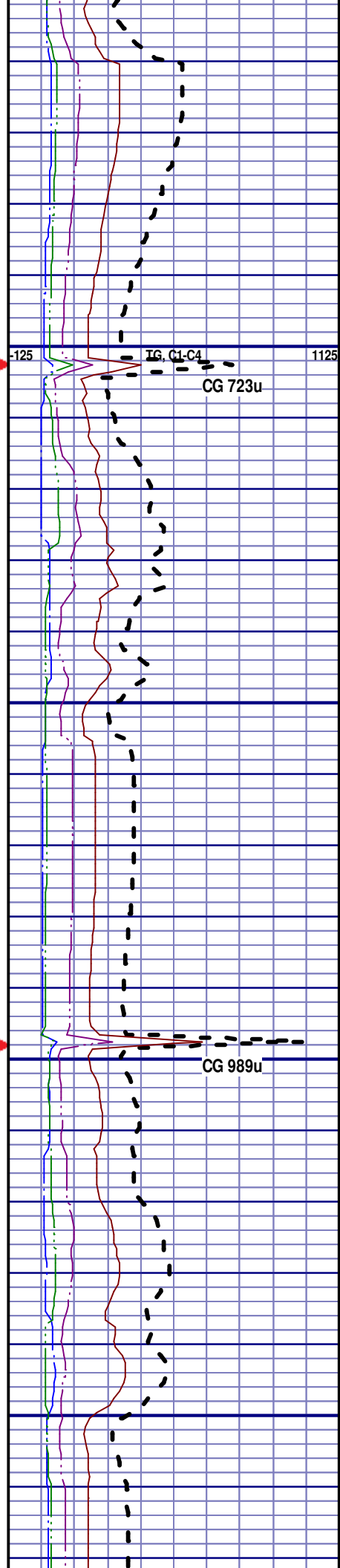


SILTY SH; 100%; GRY TO LT GRY,  
FINE TXT, SOFT TO FIRM, PYR  
INCLUS, NO VIS FRACT, NO FLUOR,  
SLOW STRM CUT: BLU, YLW RING  
CUT, MINOR CALC, PLATY, NO  
ODOR

SILTY SH; 100%; GRY TO LT GRY,  
FINE TXT, SOFT TO FIRM, PYR  
INCLUS, NO VIS FRACT, NO FLUOR,  
SLOW STRM CUT: BLU, YLW RING  
CUT, MINOR CALC, PLATY, NO  
ODOR

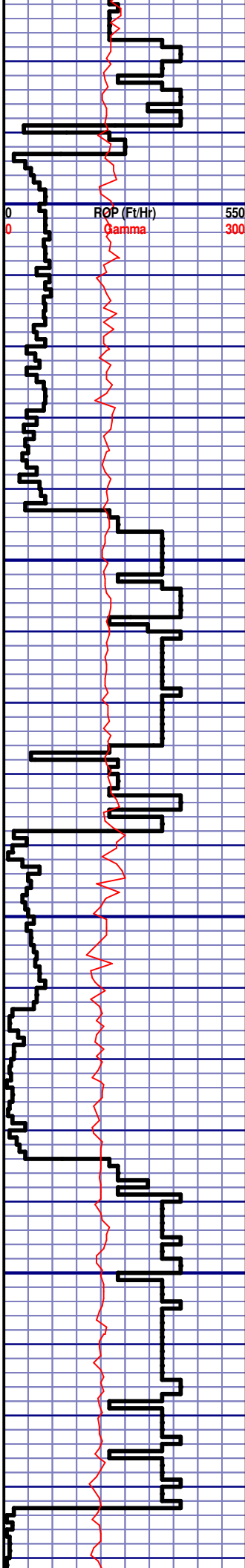
SILTY SH; 100%; GRY TO LT GRY,  
FINE TXT, SOFT TO FIRM, PYR  
INCLUS, NO VIS FRACT, NO FLUOR,  
SLOW STRM CUT: BLU, YLW RING  
CUT, MINOR CALC, PLATY, NO  
ODOR

SH; 100%; GRY TO LT GRY, FINE  
TXT, SOFT TO FIRM, PYR INCLUS,  
CALC NODULES, NO VIS FRACT,  
NO FLUOR, SLOW BLU STRM CUT,  
YLW RING CUT, MINOR CALC,  
PLATY, NO ODOR



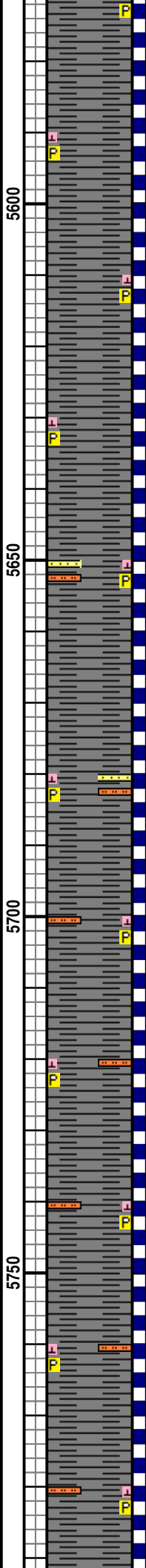
IG, C1-C4  
CG 723u

CG 989u



MD 5626 TVD 5528.99  
INC 14.43 AZ 356.33  
VS 193.01

MD 5721 TVD 5621.09  
INC 13.93 AZ 355.62  
VS 197.6



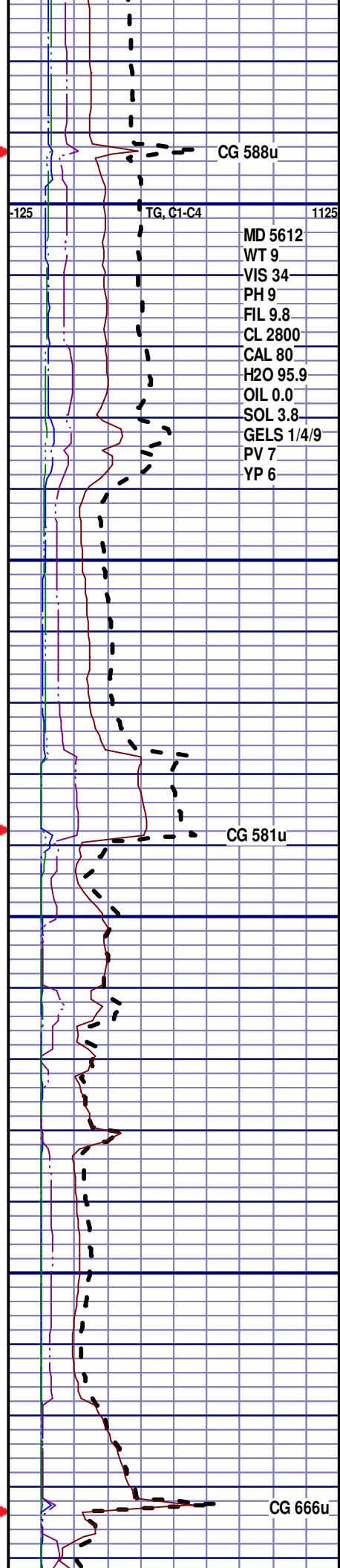
SH; 100%; GRY TO LT GRY, FINE  
TXT, SOFT TO FIRM, PYR INCLUS,  
CALC NODULES, NO VIS FRACT,  
NO FLUOR, SLOW BLU STRM CUT,  
YLW RING CUT, MINOR CALC,  
PLATY, NO ODOR

SH; 100%; GRY TO LT GRY, FINE  
TXT, SOFT TO FIRM, PYR INCLUS,  
NO VIS FRACT, NO FLUOR, SLOW  
BLU STRM CUT, YLW RING CUT,  
MINOR CALC, PLATY, NO ODOR

SH; 85%; GRY TO DK GRY, FINE  
TXT, SOFT TO FIRM, PYR INCLUS,  
SILTY, SANDY, NO VIS FRACT, NO  
FLUOR, SLOW BLU STRM CUT,  
YLW RING CUT, MINOR CALC,  
PLATY, NO ODOR

SH; 85%; GRY TO DK GRY, FINE  
TXT, SOFT TO FIRM, PYR INCLUS,  
SILTY, NO VIS FRACT, NO FLUOR,  
SLOW STRM CUT: BLU, YLW RING  
CUT, MINOR CALC, PLATY, NO  
ODOR

SH; 85%; GRY TO DK GRY, FINE  
TXT, SOFT TO FIRM, PYR INCLUS,  
SILTY, NO VIS FRACT, NO FLUOR,  
SLOW STRM CUT: BLU, YLW RING

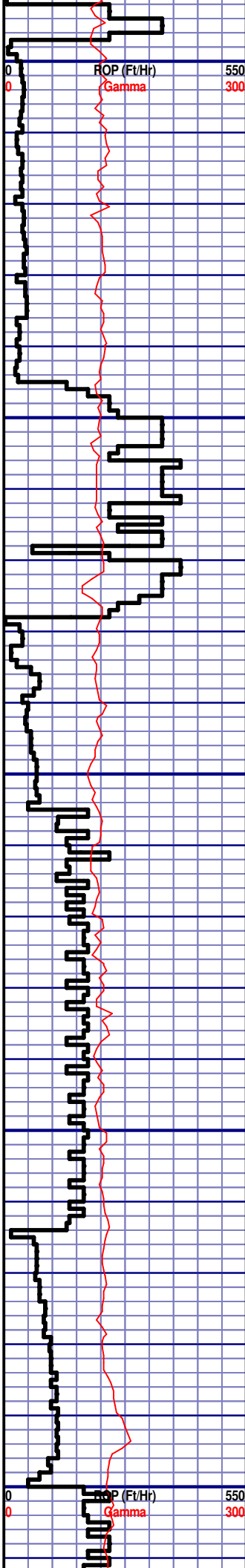


CG 588u

MD 5612  
WT 9  
VIS 34  
PH 9  
FIL 9.8  
CL 2800  
CAL 80  
H2O 95.9  
OIL 0.0  
SOL 3.8  
GELS 1/4/9  
PV 7  
YP 6

CG 581u

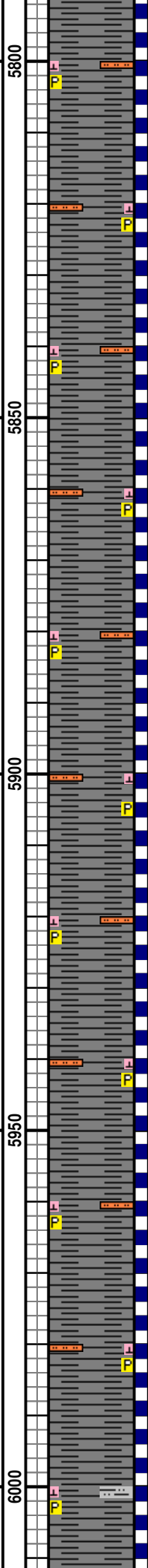
CG 666u



MD 5816 TVD 5713.54  
INC 12.67 AZ 358.12  
VS 202.21

MD 5910 TVD 5805.14  
INC 13.32 AZ 2.89  
VS 208.02

MD 6005 TVD 5897.18  
INC 15.34 AZ 2.45  
VS 215.3



SLOW STRM CUT: BLU, YLW RING CUT, MINOR CALC, PLATY, NO ODOR

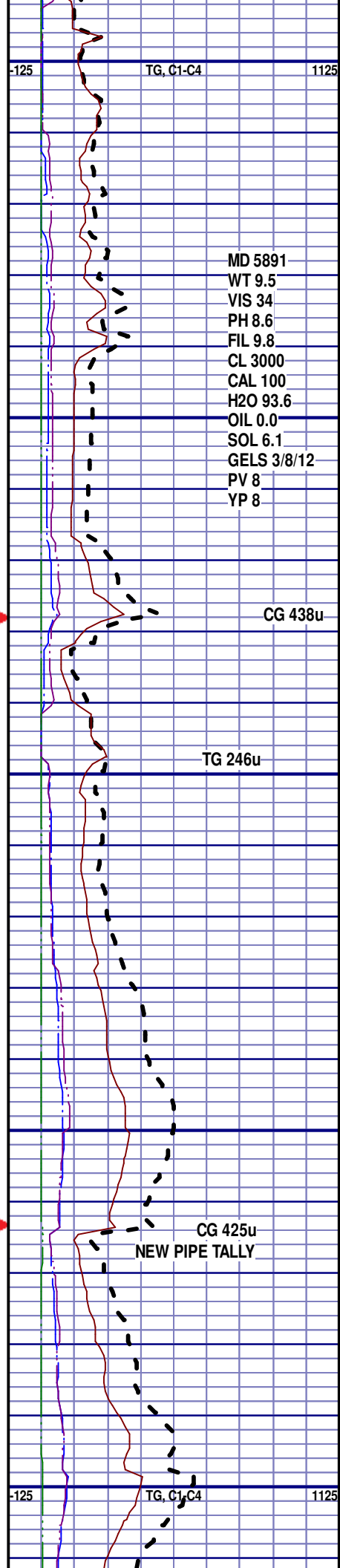
SH; 90%; GRY TO DK GRY, FINE TXT, SOFT TO FIRM, PYR INCLUS, SILTY, NO VIS FRACT, NO FLUOR, SLOW STRM CUT: BLU, YLW RING CUT, MINOR CALC, PLATY, NO ODOR

SH; 90%; GRY TO DK GRY, FINE TXT, SOFT TO FIRM, PYR INCLUS, SILTY, NO VIS FRACT, NO FLUOR, SLOW STRM CUT: BLU, YLW RING CUT, MINOR CALC, PLATY, NO ODOR

TOOH @ 10:30 AM ON 2/12/13 @ 5891' MD FOR MUD MOTOR AND BIT  
TIH @ 3:15 PM ON 2/12/13  
RESUMED DRILLING AT 8:00 PM ON 2/12/13 W/ BIT #4 8.750"  
SECURITY MMD55M IN @ 5891' MD

SH; 95%; GRY TO LT GRY, FINE TXT, SOFT TO FIRM, PYR INCLUS, SILTY, FRACT HEALED W/ PYR, NO FLUOR, SLOW BLU STRM CUT, YLW RING CUT, MINOR CALC, PLATY, NO ODOR

SH; 90%; GRY TO LT GRY, FINE TXT, SOFT TO FIRM, PYR INCLUS, SILTY, NO VIS FRACT, NO FLUOR, SLOW BLU STRM CUT, YLW RING CUT, MINOR CALC, PLATY, NO ODOR



MD 5891  
WT 9.5  
VIS 34  
PH 8.6  
FIL 9.8  
CL 3000  
CAL 100  
H2O 93.6  
OIL 0.0  
SOL 6.1  
GELS 3/8/12  
PV 8  
YP 8

CG 438u

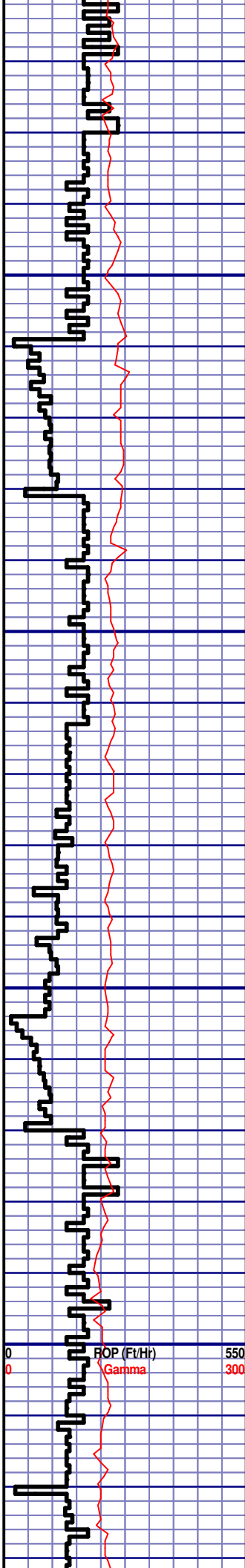
TG 246u

CG 425u  
NEW PIPE TALLY

VS 219.3

MD 6100 TVD 5988.74  
INC 15.58 AZ 357.11  
VS 221.9

MD 6195 TVD 6080.12  
INC 16.17 AZ 353.37  
VS 226.67

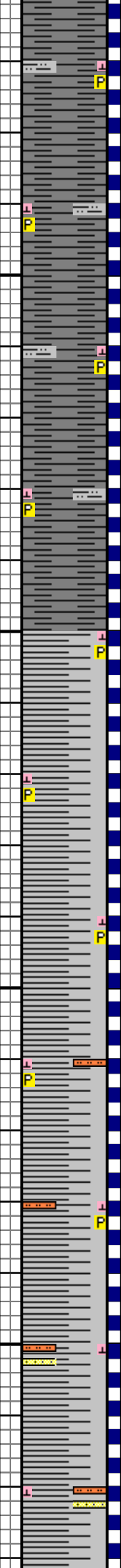


6050

6100

6150

6200



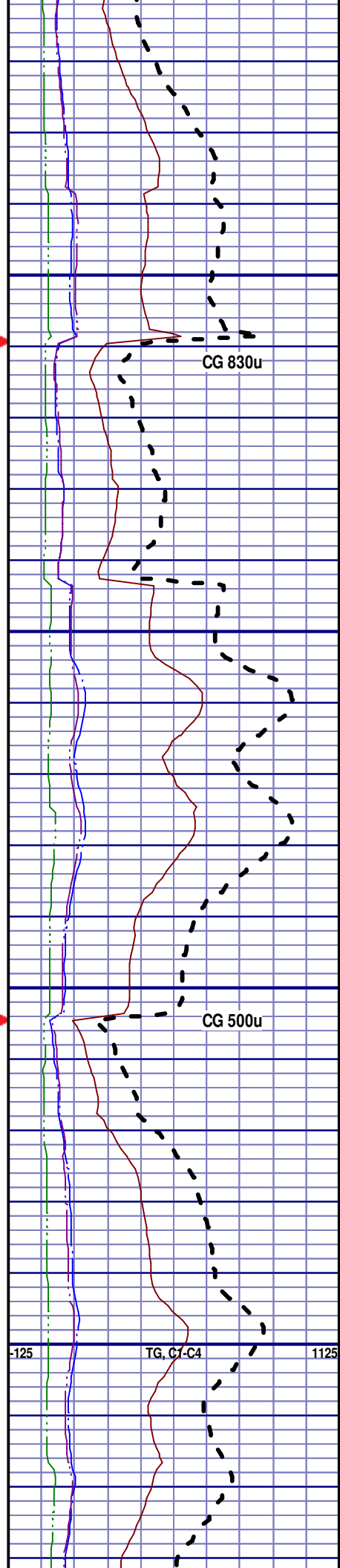
SH; 90%; GRY TO LT GRY, FINE  
TXT, SOFT TO FIRM, PYR INCLUS,  
SILTY SH, NO VIS FRACT, NO  
FLUOR, SLOW BLU STRM CUT,  
YLW RING CUT, MINOR CALC,  
PLATY, NO ODOR

SH; 90%; GRY TO LT GRY, FINE  
TXT, SOFT TO FIRM, PYR INCLUS,  
SILTY SH, NO VIS FRACT, NO  
FLUOR, SLOW BLU STRM CUT,  
YLW RING CUT, MINOR CALC,  
PLATY, NO ODOR

SILTY SH; 100%; GRY TO LT GRY,  
FINE TXT, SOFT TO FIRM, PYR  
INCLUS, NO VIS FRACT, NO FLUOR,  
SLOW BLU STRM CUT, YLW RING  
CUT, MINOR CALC, PLATY, NO  
ODOR

SILTY SH; 90%; GRY TO LT GRY,  
FINE TXT, SOFT TO FIRM, PYR  
INCLUS, SILTY, NO VIS FRACT, NO  
FLUOR, SLOW BLU STRM CUT,  
YLW RING CUT, MINOR CALC,  
PLATY, NO ODOR

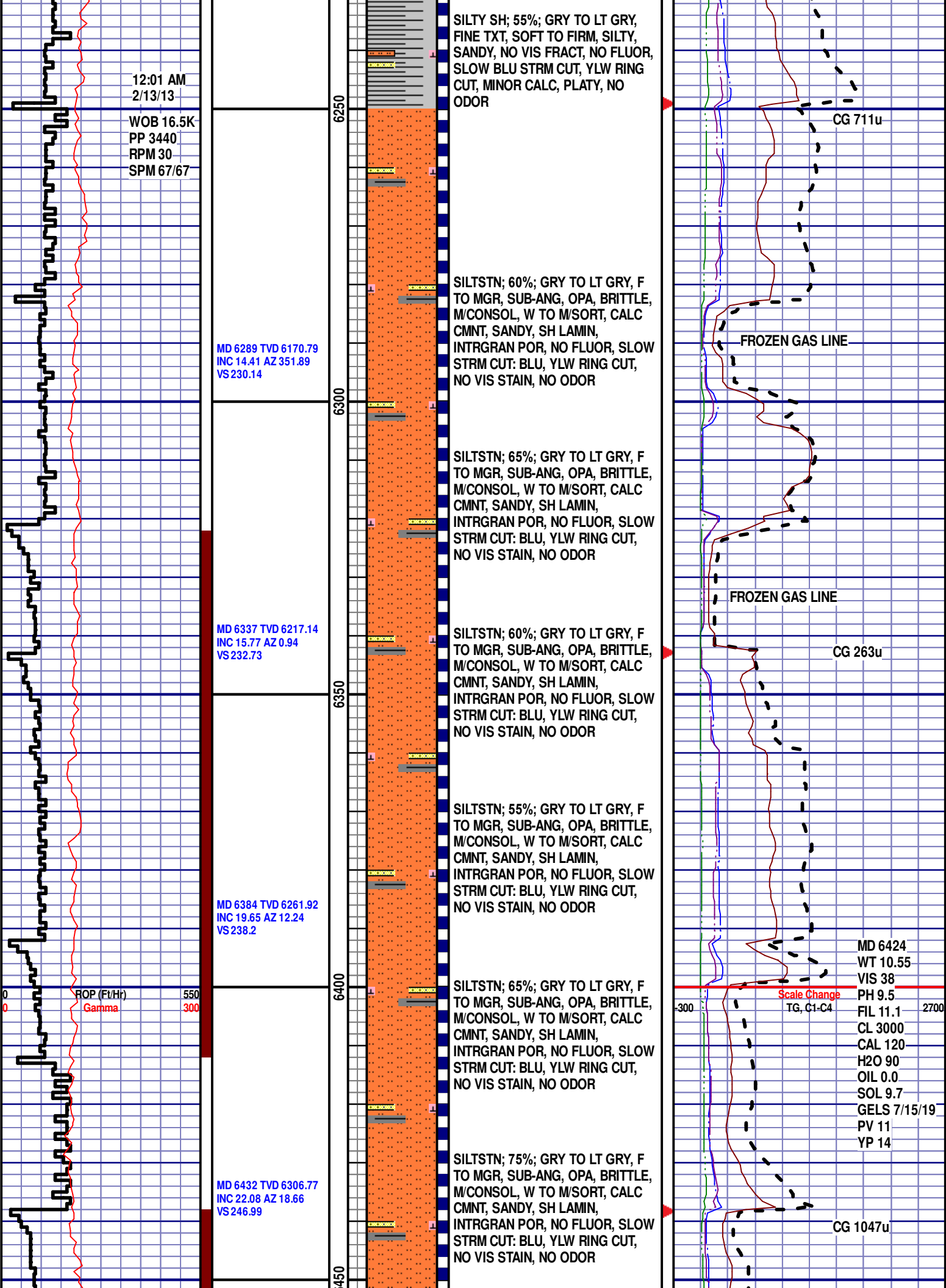
**TEEPEE BUTTES**  
6210 'MD 6095' TVD

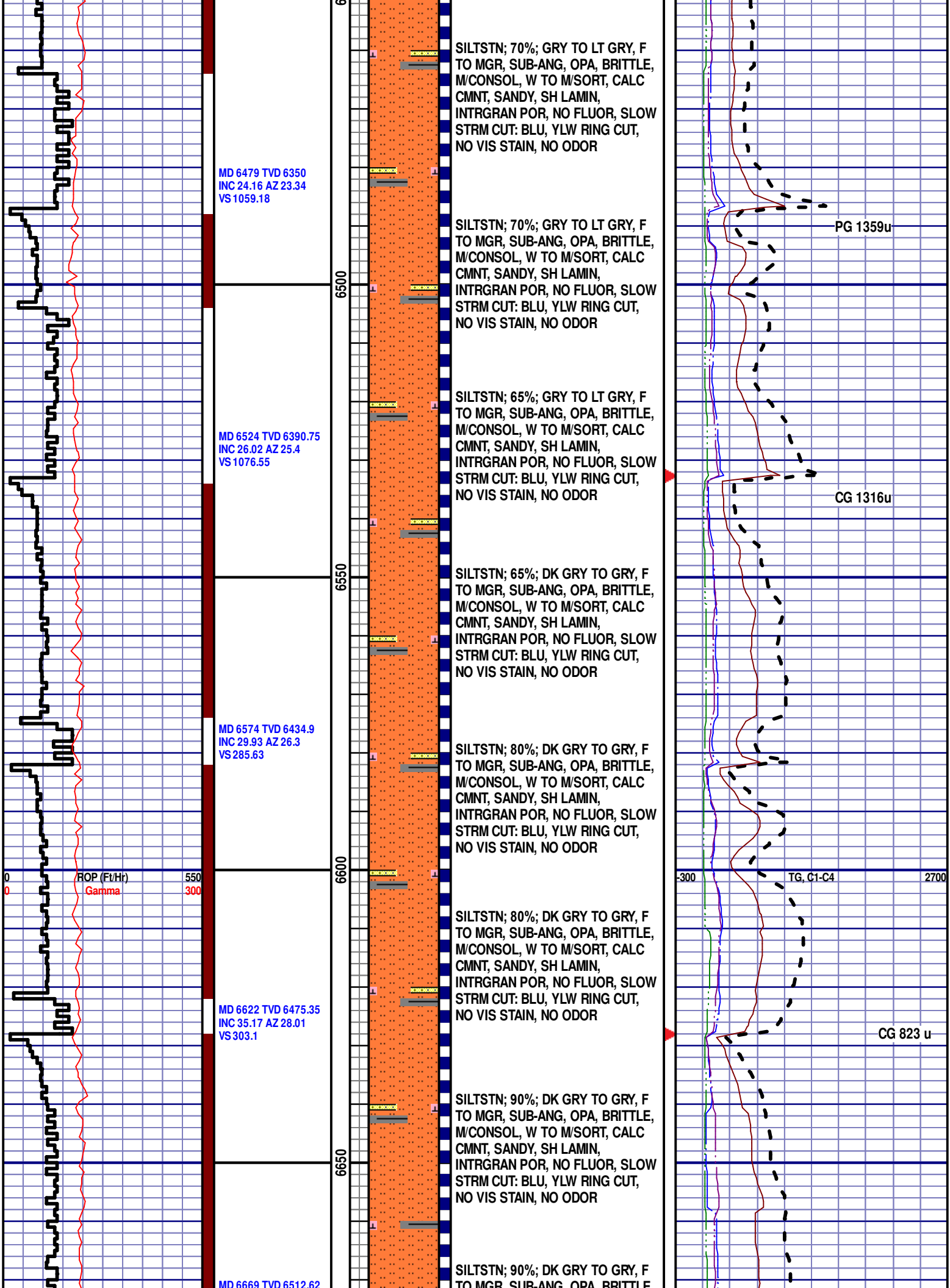


CG 830u

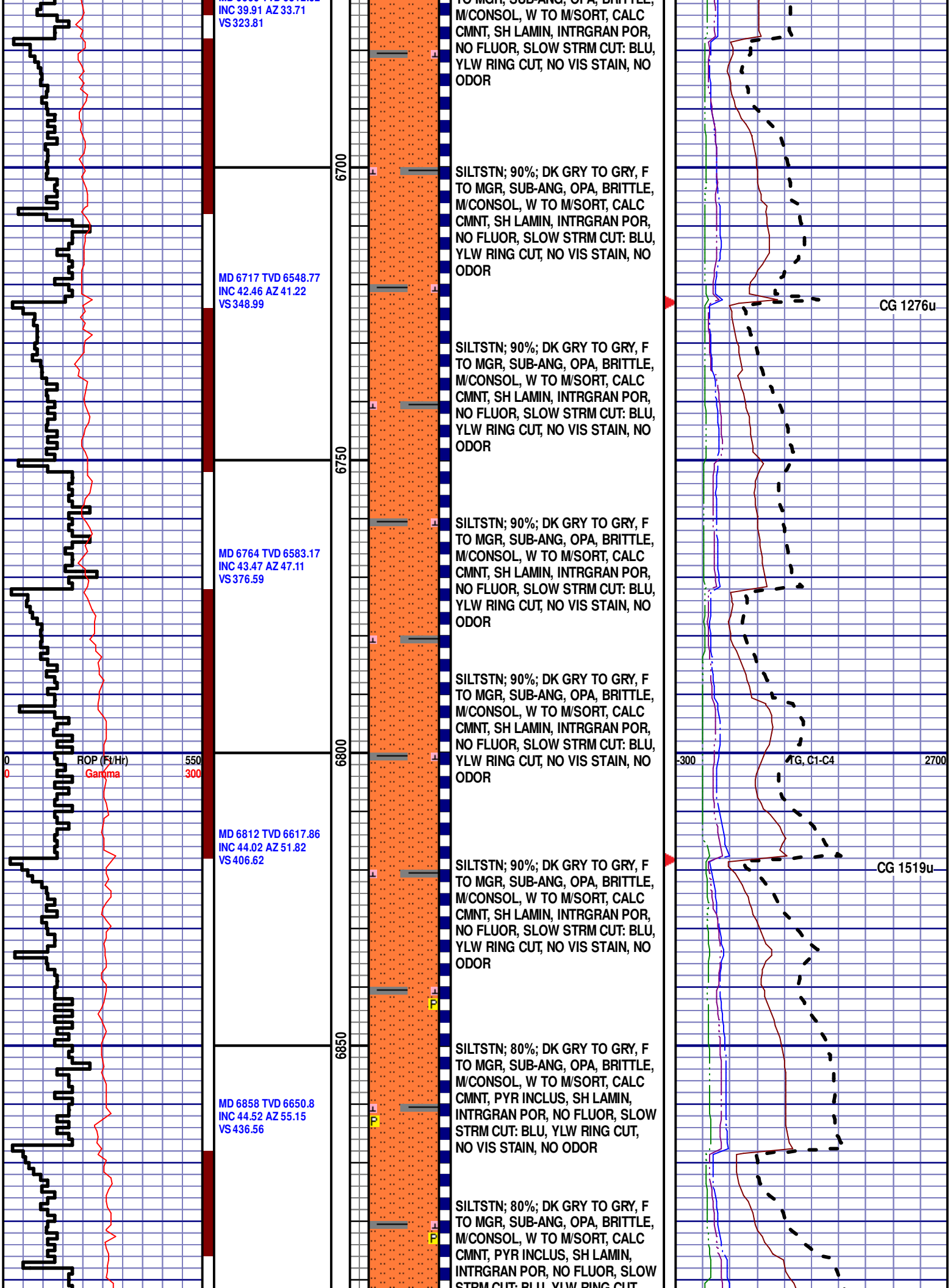
CG 500u

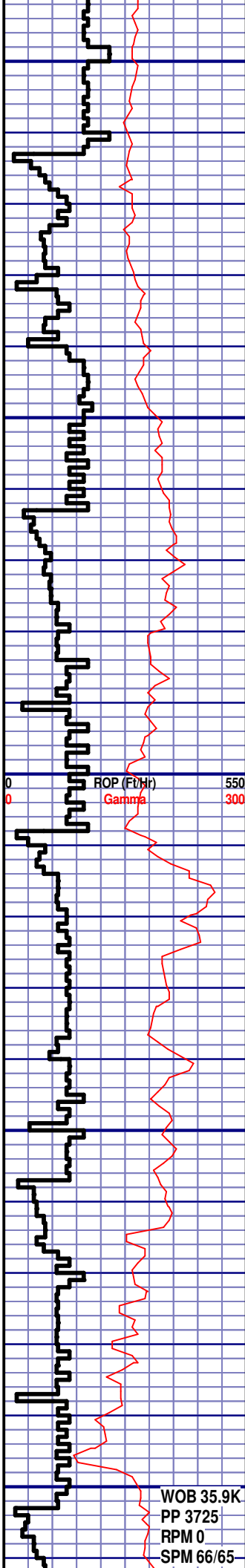
-125 TG, C1-C4 1125











MD 6906 TVD 6684.48  
INC 46.59 AZ 58.56  
VS 468.67

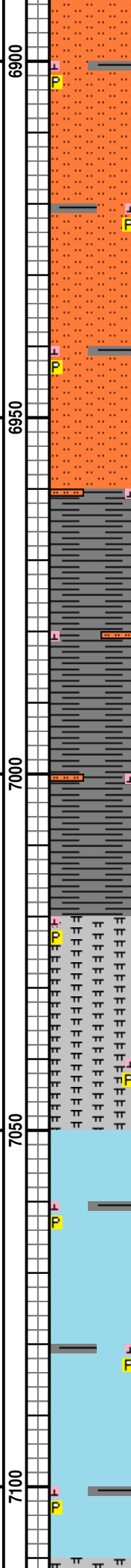
MD 6953 TVD 6716.14  
INC 48.52 AZ 61.35  
VS 502.73

MD 7001 TVD 6747.21  
INC 50.83 AZ 65.62  
VS 538.63

MD 7048 TVD 6775.36  
INC 55.55 AZ 68.31  
VS 575.91

MD 7096 TVD 6801.25  
INC 59.18 AZ 70.82  
VS 616.16

WOB 35.9K  
PP 3725  
RPM 0  
SPM 66/65



STRM CUT: BLU, YLW RING CUT,  
NO VIS STAIN, NO ODOR

SILTSTN; 80%; DK GRY TO GRY, F  
TO MGR, SUB-ANG, OPA, BRITTLE,  
M/CONSOL, W TO M/SORT, CALC  
CMNT, PYR INCLUS, SH LAMIN,  
INTRGRAN POR, NO FLUOR, SLOW  
STRM CUT: BLU, YLW RING CUT,  
NO VIS STAIN, NO ODOR

SILTSTN; 80%; DK GRY TO GRY, F  
TO MGR, SUB-ANG, OPA, BRITTLE,  
M/CONSOL, W TO M/SORT, CALC  
CMNT, PYR INCLUS, SH LAMIN,  
INTRGRAN POR, NO FLUOR, SLOW  
STRM CUT: BLU, YLW RING CUT,  
NO VIS STAIN, NO ODOR

### SHARON SPRINGS

6960' MD 6721' TVD

SH; 60%; BLK TO DK GRY, SMOOTH  
TXT, SOFT TO FIRM, SILTY, NO VIS  
FRACT, NO FLUOR, SLOW, BLU  
STRM CUT, YLW RING CUT, MINOR  
CALC, PYR INCLUS, BLKY TO  
PLATY

SH; 60%; BLK TO DK GRY, SMOOTH  
TXT, SOFT TO FIRM, SILTY, NO VIS  
FRACT, NO FLUOR, SLOW, BLU  
STRM CUT, YLW RING CUT, MINOR  
CALC, PYR INCLUS, BLKY TO  
PLATY

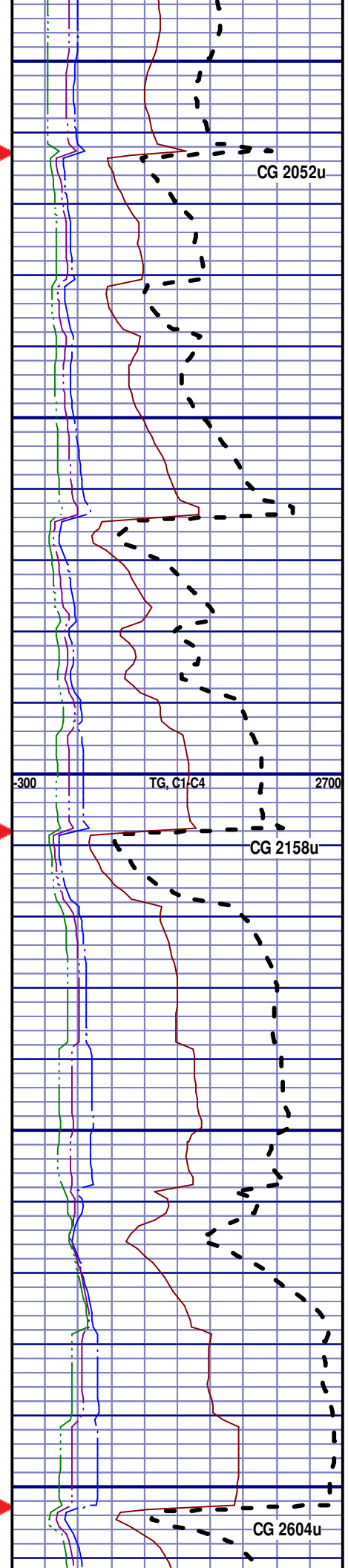
### NIOBRARA A CHALK

7020' MD 6762' 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

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; 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



CG 2052u

TG, C1/C4

CG 2158u

CG 2604u

