Scale 1:240 (5"=100') Imperial
Measured Depth Log

Well Name:	Razor 21-SWD-1		
Well Id:	05-123-40777-00		
Location:	NWSE 21-T10N-R58W Weld County, Colorado		
License Number:	05-123-40777-00	Region:	Redtail
Spud Date:	2/4/2015	Drilling Completed:	2/10/2015
Surface Coordinates:	2317' FEL & 2595' FSL		
Bottom Hole Coordinates:	2317' FEL & 2595' FSL		
Ground Elevation (ft):	4819	K.B. Elevation (ft):	4842
Logged Interval (ft):	1600 To: 8550	Total Depth (ft):	8550
Formation:	Pierre, Hygiene, Niobrara, Bridge Creek, Entrada, Lyons and Pennsylvanian		
Type of Drilling Fluid:	Water Based Mud		

OPERATOR

Company: Whiting Oil & Gas Corporation
Address: 1700 Broadway Suite 2300
Denver, CO 80290
303-837-1661

GEOLOGIST

Name: Craig Dreiling, Jim Wenger
Company: Acme Geologic Consulting
Address: 108 Berry Street
Little Rock, AR 72205
www.acmegeo.com

Drilling Company

Pioneer Rig #54

Comments

Lithologies and tops at drilled depths, not corrected to elogs. Where the well bore gas is 100% methane, the C1 line is moved to 85% for graphical purposes only.

ROCK TYPES

- Anhy
- Bent
- Brec
- Cht
- Clyst
- Coal
- Congl
- Dol
- Gyp
- Igne
- Lmst
- Meta
- Mrlst
- Salt
- Shale
- Shcol
- Shgy
- Sltst
- Ss
- Till
- Cyan mrlst
- Cyan chk
- Grnt wsh

ACCESSORIES

MINERAL

- Anhy
- Arggrn
- Arg
- Bent
- Bit
- Brecfrag
- Calc
- Carb
- Chtdk
- Chtlt
- Dol
- Feldspar
- Ferrpel
- Ferr
- Glau
- Gyp
- Hvymin
- Kaol
- Marl
- Minxl
- Nodule
- Phos
- Pyr
- Salt
- Sandy
- Silt
- Sil
- Sulphur
- Tuff

FOSSIL

- Algae
- Amph
- Belm
- Bioclst
- Brach
- Bryozoa
- Cephal
- Coral
- Crin
- Echin
- Fish
- Foram
- Fossil
- Gastro
- Oolite
- Ostra
- Pelec
- Pellet
- Pisolite
- Plant
- Strom

STRINGER

- Anhy
- Shstrg
- Bent
- Coal
- Dol
- Gyp
- Ls
- Mrst
- Sltstrg
- Ssstrg

TEXTURE

- Boundst
- Chalky
- Cryxln
- Earthy
- Finexln
- Grainst
- Lithogr
- Microxln
- Mudst
- Packst
- Wackest

OTHER SYMBOLS

POROSITY TYPE

- Earthy
- Fenest
- Fracture
- Inter
- Moldic
- Organic
- Pinpoint
- Vuggy

SORTING

- Well
- Moderate
- Poor

ROUNDING

- Rounded
- Subrnd
- Subang
- Angular

OIL SHOWS

- Good
- Fair
- Poor
- Dead

INTERVALS

- Core
- Dst
- Srfcsg
- Cv-v
- Cv-c
- Conductor

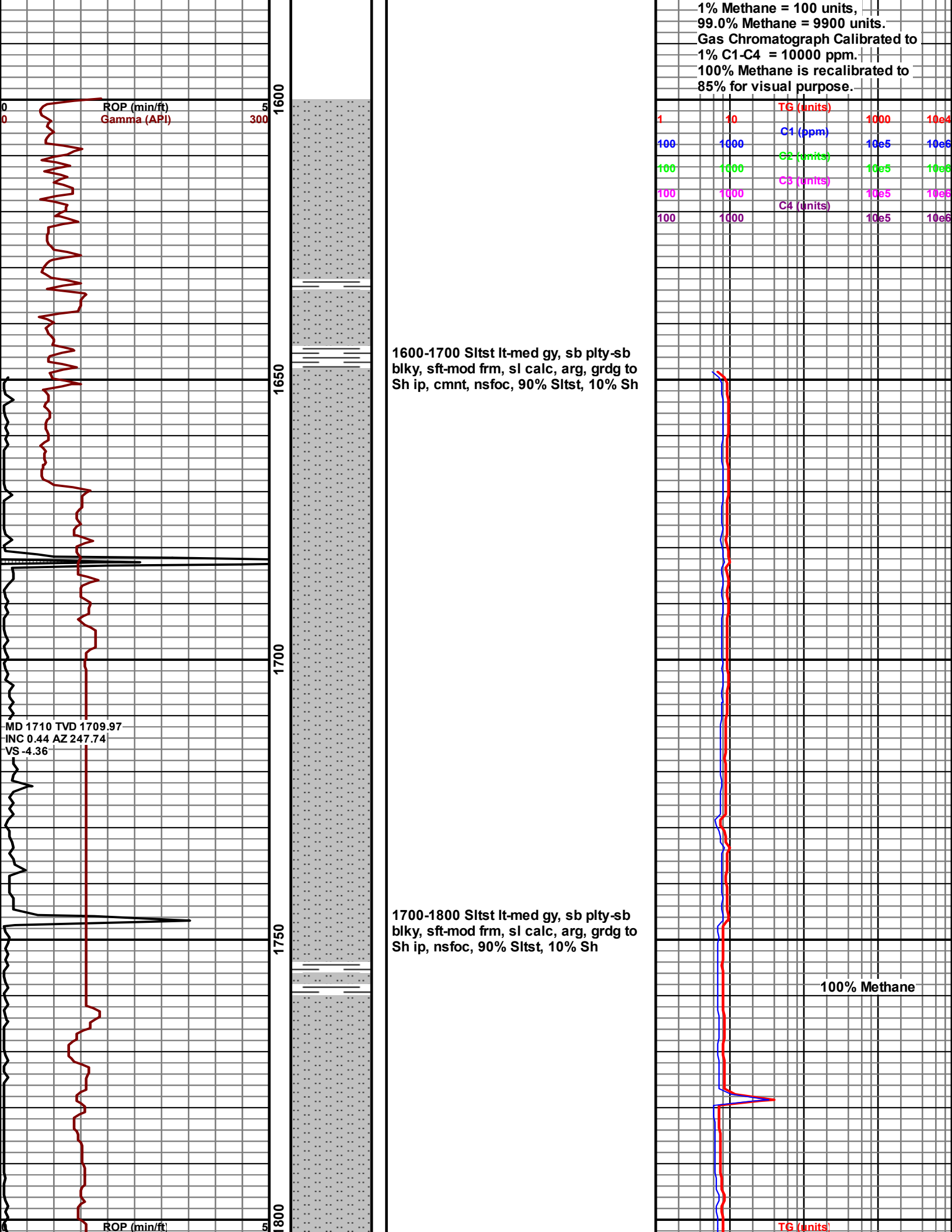
EVENTS

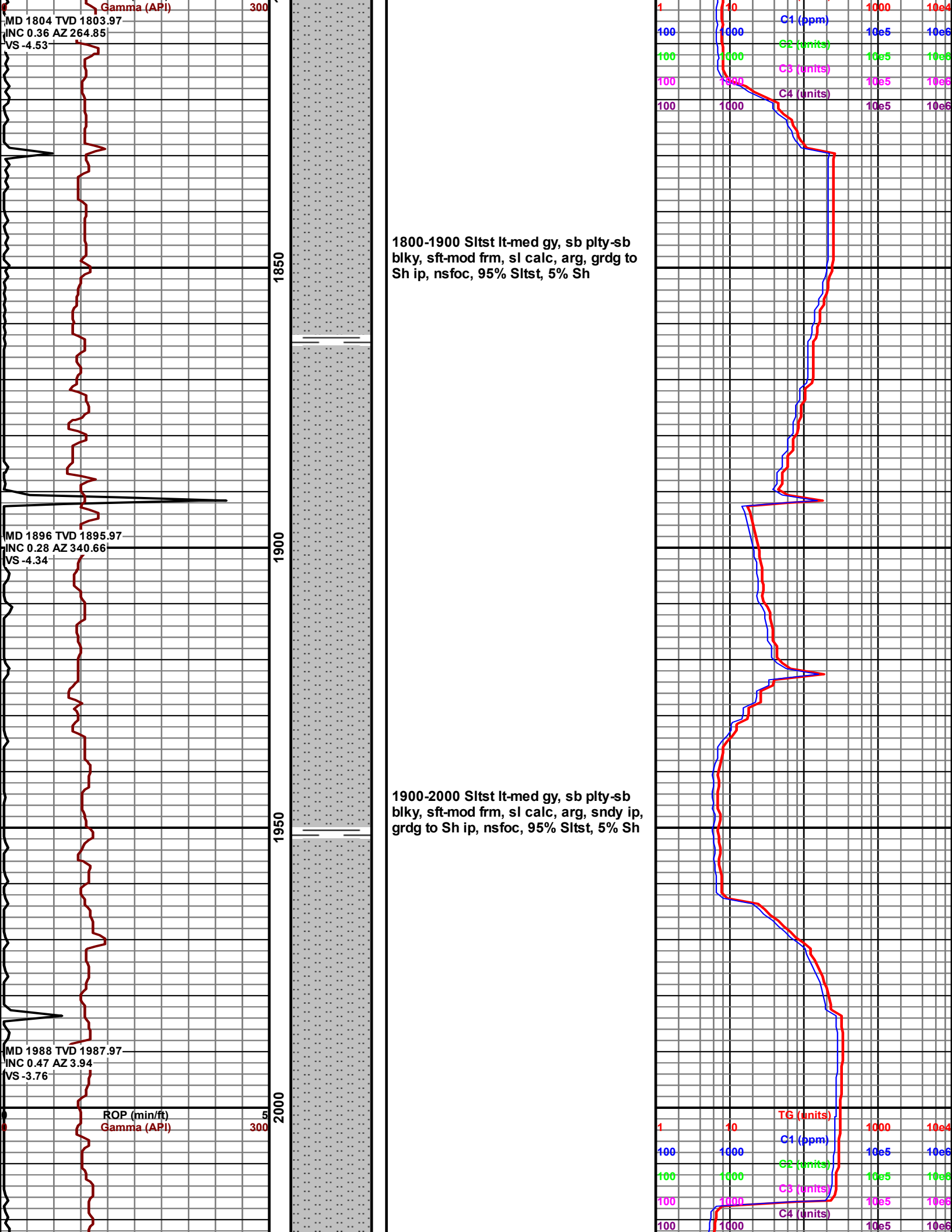
- Rft
- Sidewall
- Srfcsg

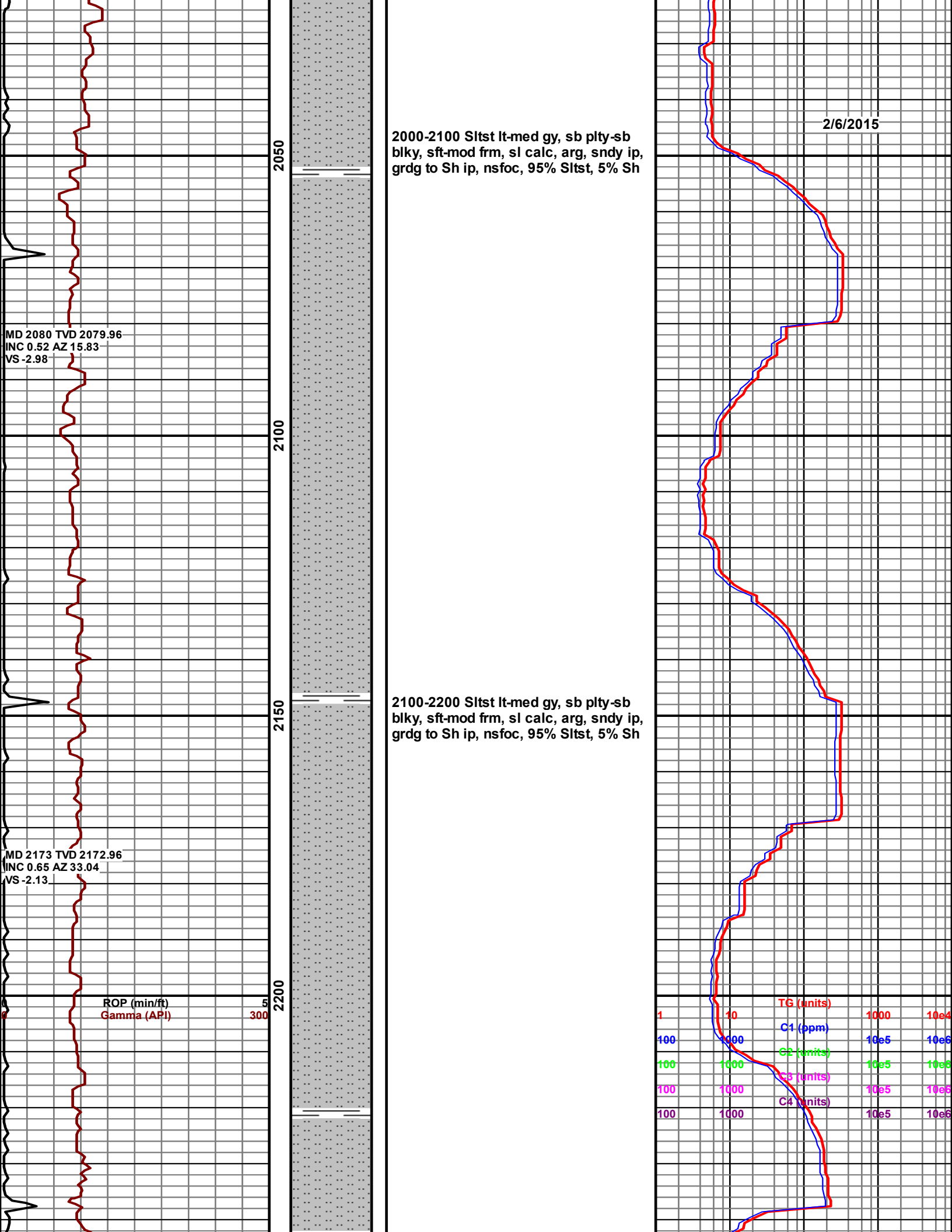
Curve Track 1	Depth	Lithology	Oil Shows	Geological Descriptions	TG
ROP (min/ft) Gamma (API)					TG (units) C1 (ppm) C2 (units) C3 (units) C4 (units)
0 ROP (min/ft) 5 0 Gamma (API) 300	15			Acme Geologic Consulting arrived and rigged up on 2/4/2015, drilled out of the surface at 21:15; 2/5/2015	1 10 1000 10e4 100 1000 10e5 10e6 100 1000 10e5 10e6 100 1000 10e5 10e6 100 1000 10e5 10e6

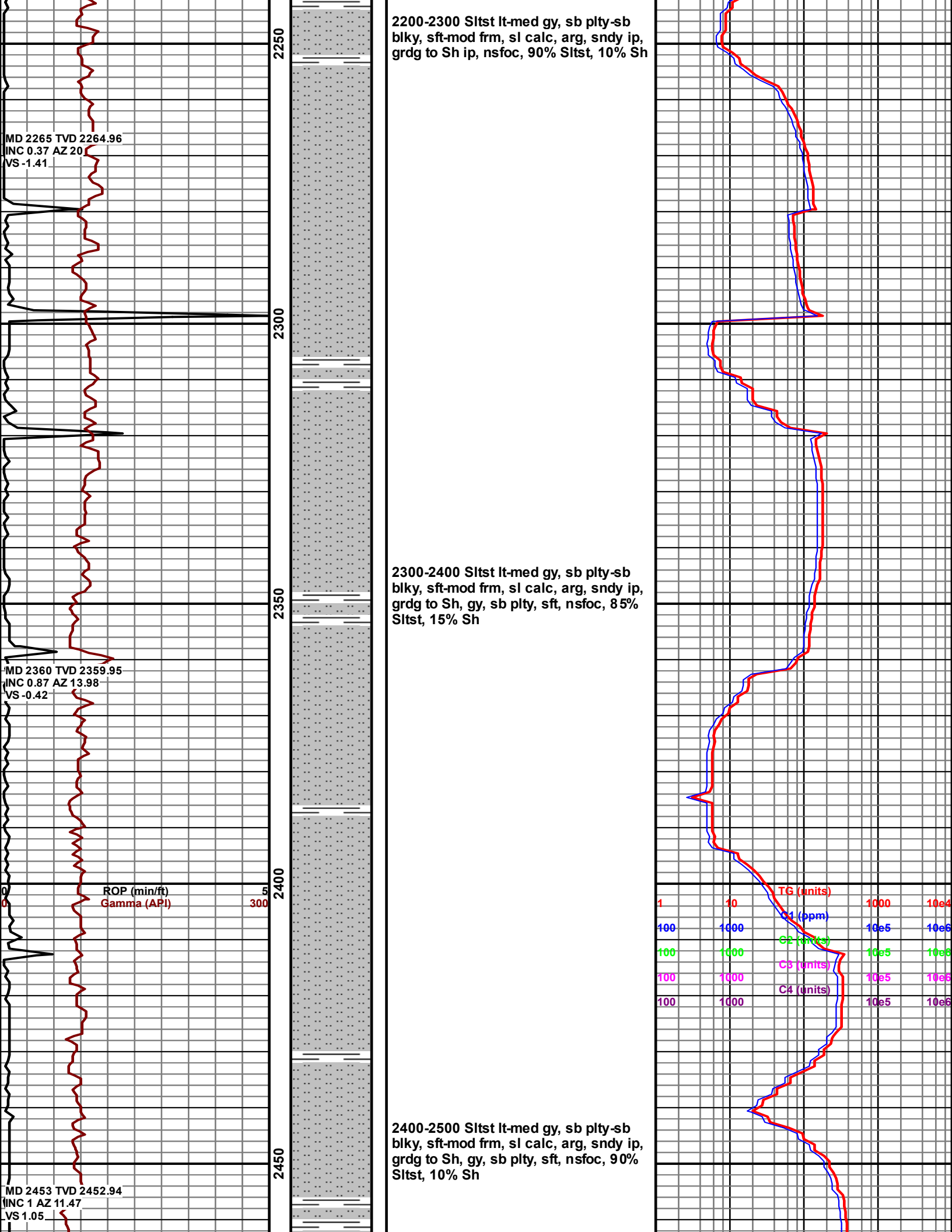
Pioneer rig #54

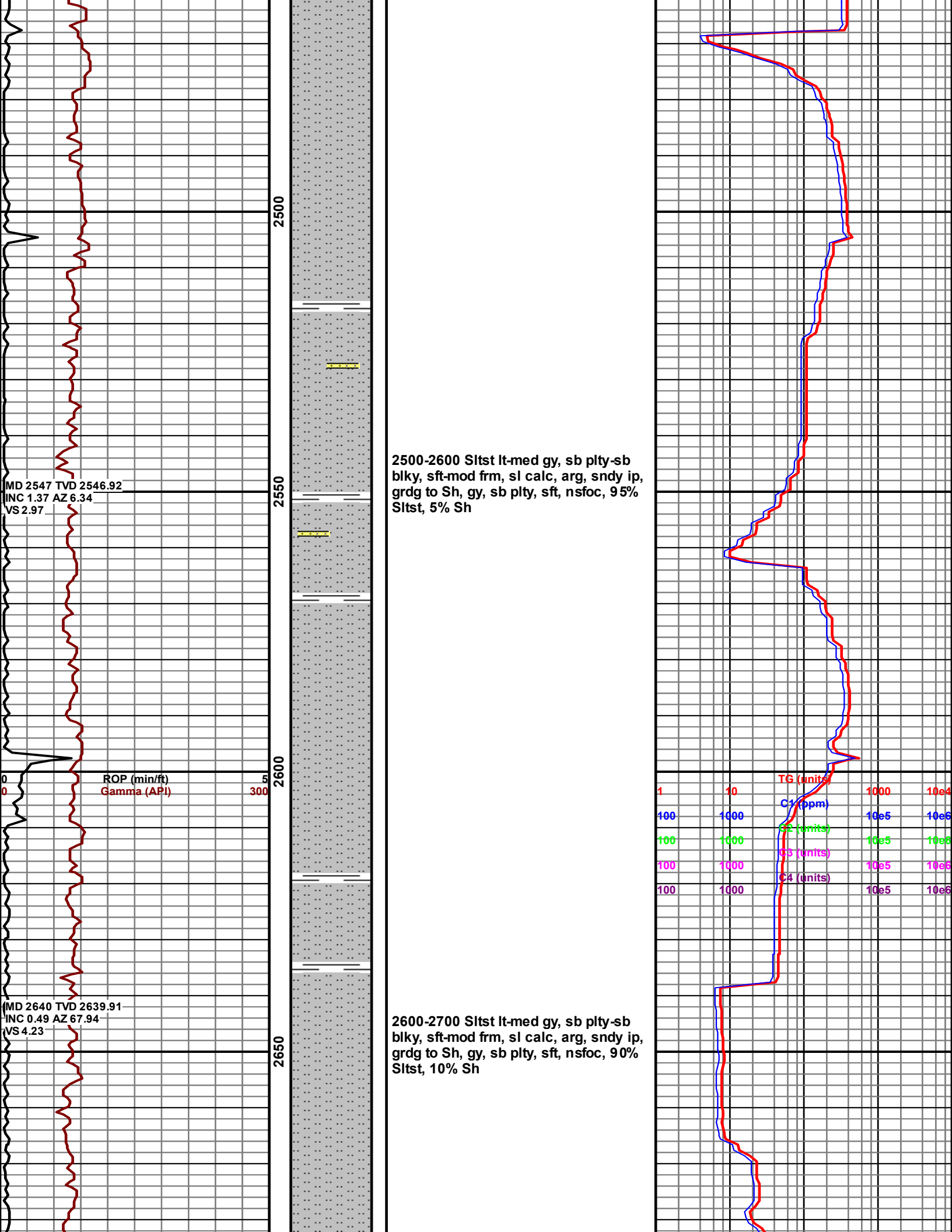
MSI Model TGC Total Gas and Chromatograph
Total Gas Calibrated to

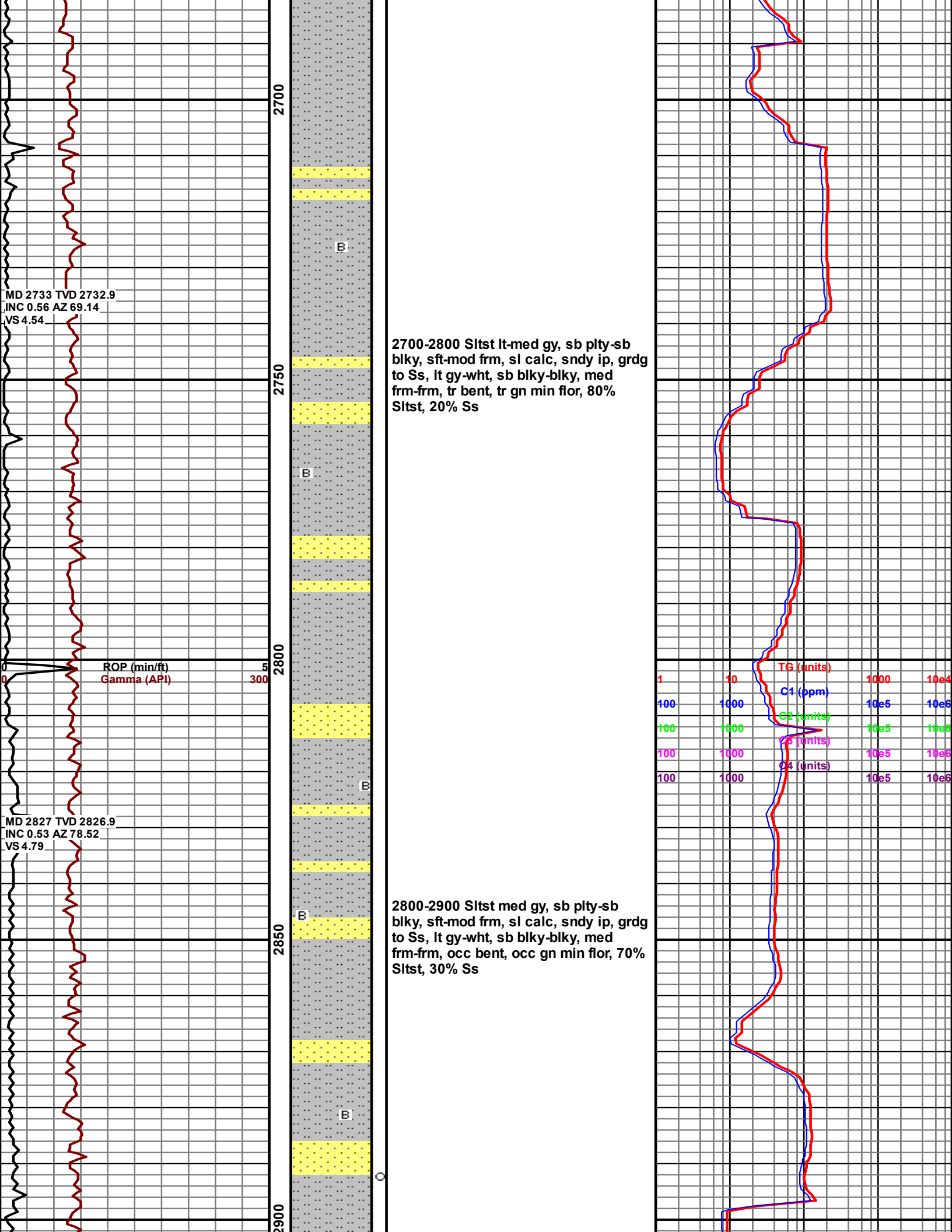

1% Methane = 100 units,
99.0% Methane = 9900 units.
Gas Chromatograph Calibrated to
1% C1-C4 = 10000 ppm.
100% Methane is recalibrated to
85% for visual purpose.
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e8
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6
0
ROP (min/ft)
5
0
Gamma (API)
300
1600
1650
1700
1750
1800
MD 1710 TVD 1709.97
INC 0.44 AZ 247.74
VS -4.36
1600-1700 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, arg, grdg to Sh ip, cmnt, nsfoc, 90% Sltst, 10% Sh
1700-1800 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, arg, grdg to Sh ip, nsfoc, 90% Sltst, 10% Sh
100% Methane
ROP (min/ft)
5
TG (units)

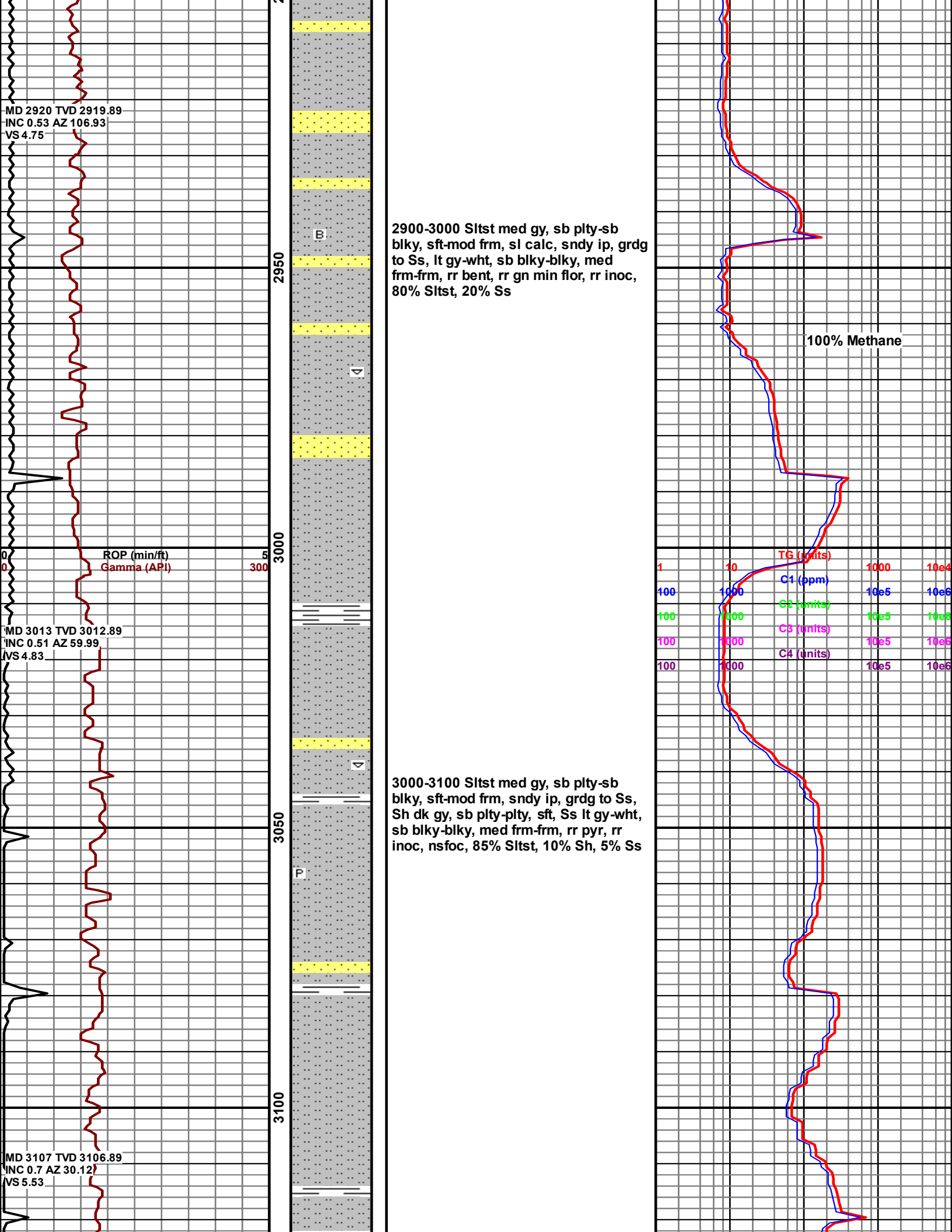

Gamma (API)
300
MD 1804 TVD 1803.97
INC 0.36 AZ 264.85
VS -4.53
1850
MD 1896 TVD 1895.97
INC 0.28 AZ 340.66
VS -4.34
1900
1800-1900 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, arg, grdg to Sh ip, nsfoc, 95% Sltst, 5% Sh
1950
MD 1988 TVD 1987.97
INC 0.47 AZ 3.94
VS -3.76
2000
1900-2000 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, arg, sndy ip, grdg to Sh ip, nsfoc, 95% Sltst, 5% Sh
ROP (min/ft)
5
Gamma (API)
300
TG (units)
C1 (ppm)
C2 (units)
C3 (units)
C4 (units)
1
10
100
1000
10e4
10e5
10e6

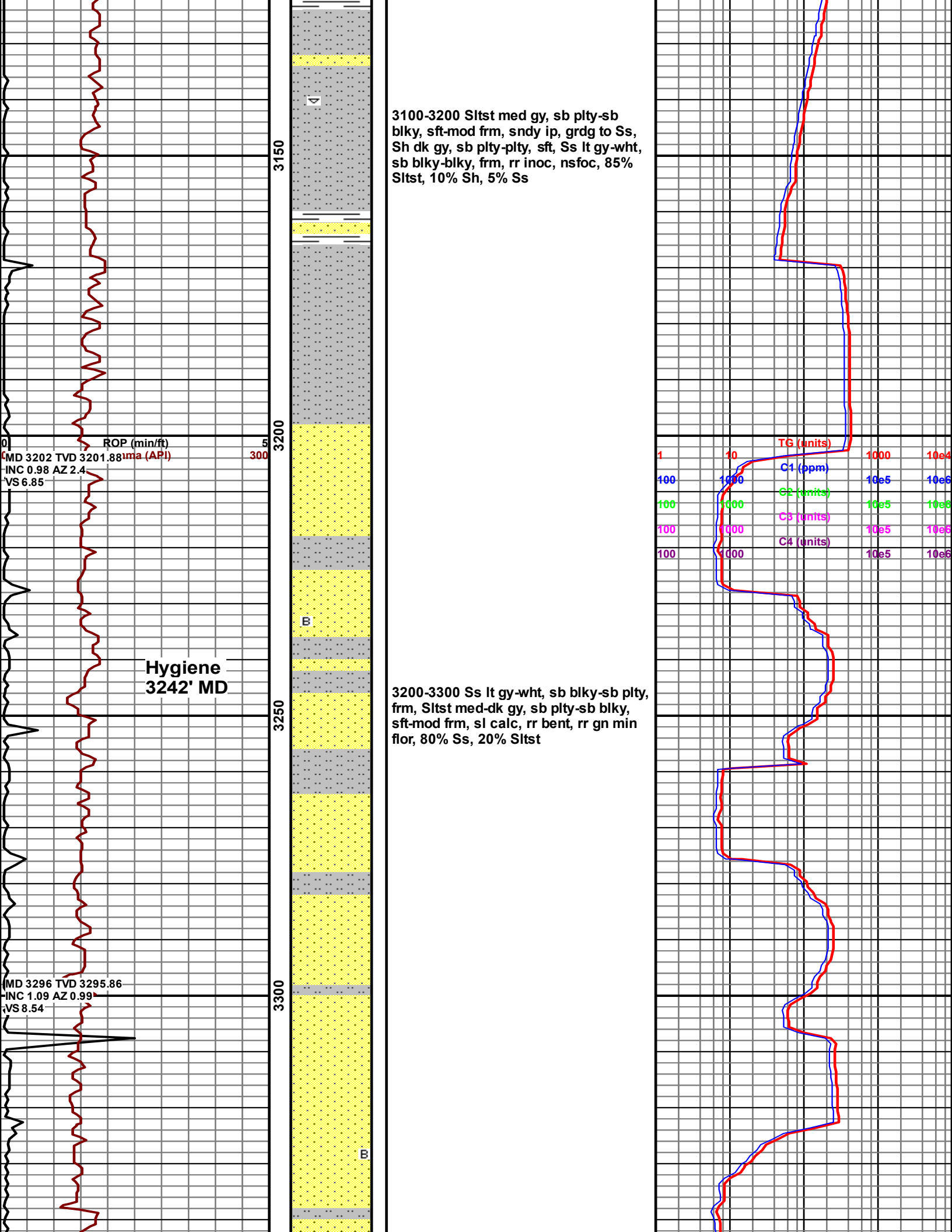

MD 2080 TVD 2079.96
INC 0.52 AZ 15.83
VS -2.98
MD 2173 TVD 2172.96
INC 0.65 AZ 33.04
VS -2.13
ROP (min/ft)
Gamma (API)
300
2050
2100
2150
2200
2000-2100 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, arg, sndy ip, grdg to Sh ip, nsfoc, 95% Sltst, 5% Sh
2100-2200 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, arg, sndy ip, grdg to Sh ip, nsfoc, 95% Sltst, 5% Sh
2/6/2015
TG (units)
C1 (ppm)
C2 (units)
C3 (units)
C4 (units)
1
10
100
1000
10e4
10e5
10e6

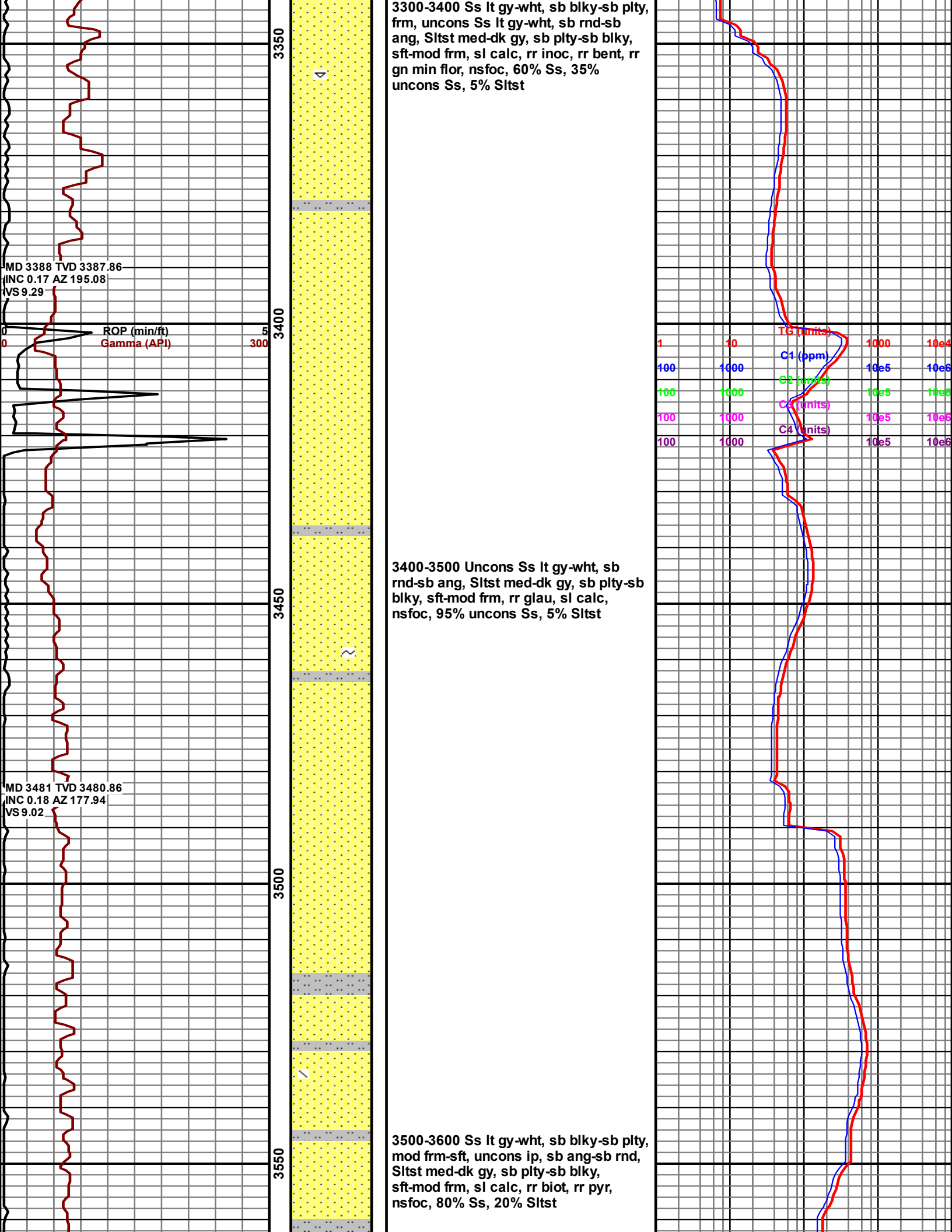

2200-2300 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, arg, sndy ip, grdg to Sh ip, nsfoc, 90% Sltst, 10% Sh
2300-2400 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, arg, sndy ip, grdg to Sh, gy, sb plty, sft, nsfoc, 85% Sltst, 15% Sh
2400-2500 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, arg, sndy ip, grdg to Sh, gy, sb plty, sft, nsfoc, 90% Sltst, 10% Sh
MD 2265 TVD 2264.96
INC 0.37 AZ 20
VS -1.41
MD 2360 TVD 2359.95
INC 0.87 AZ 13.98
VS -0.42
MD 2453 TVD 2452.94
INC 1 AZ 11.47
VS 1.05
2250
2300
2350
2400
2450
ROP (min/ft)
Gamma (API)
0
5
0
300
TG (units)
C1 (ppm)
C2 (units)
C3 (units)
C4 (units)
1
10
100
1000
10e4
10e5
10e6

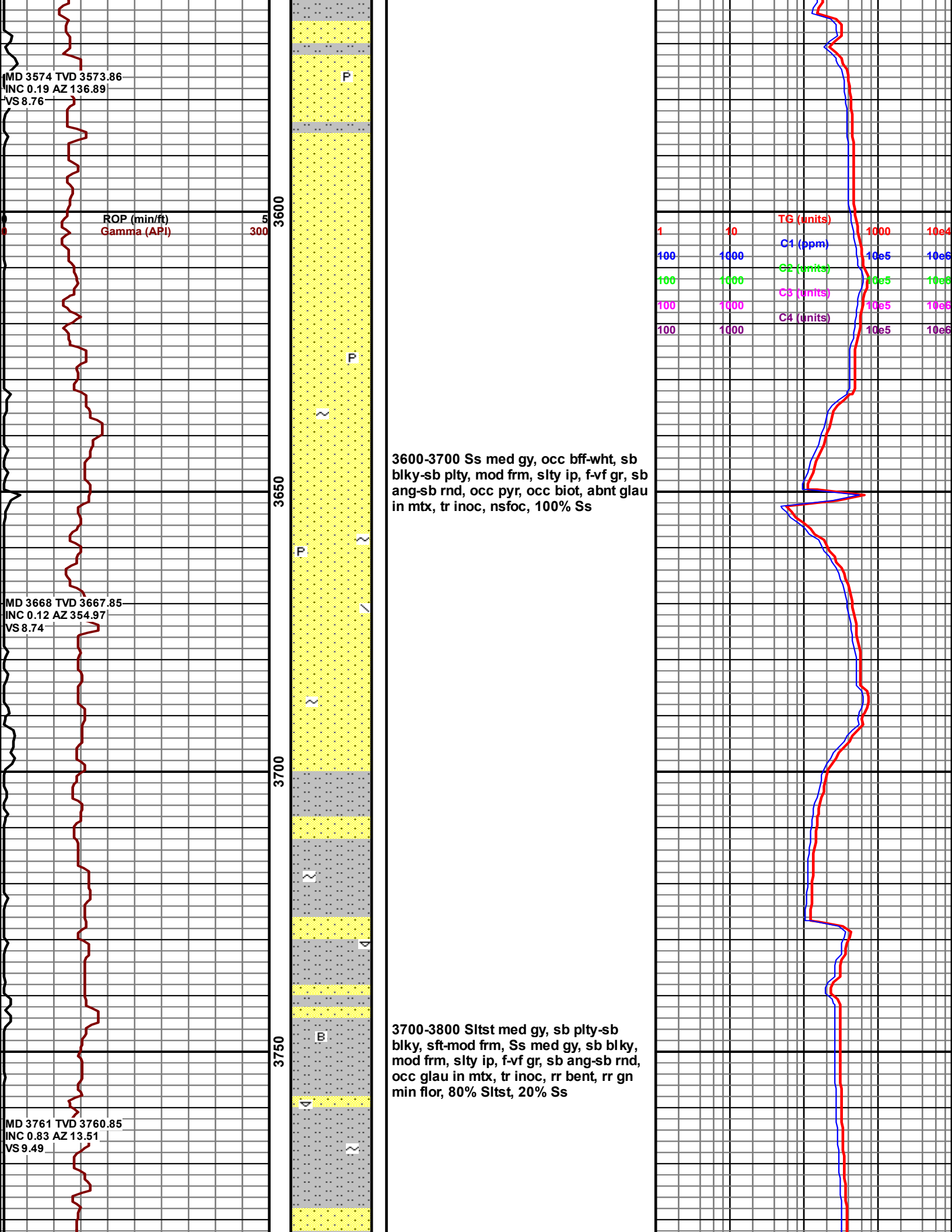

2500
2550
2600
2650
MD 2547 TVD 2546.92
INC 1.37 AZ 6.34
VS 2.97
MD 2640 TVD 2639.91
INC 0.49 AZ 67.94
VS 4.23
0
0
ROP (min/ft)
Gamma (API)
5
300
2500-2600 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, arg, sndy ip, grdg to Sh, gy, sb plty, sft, nsfoc, 95% Sltst, 5% Sh
2600-2700 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, arg, sndy ip, grdg to Sh, gy, sb plty, sft, nsfoc, 90% Sltst, 10% Sh
TG (units)
1
10
100
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6

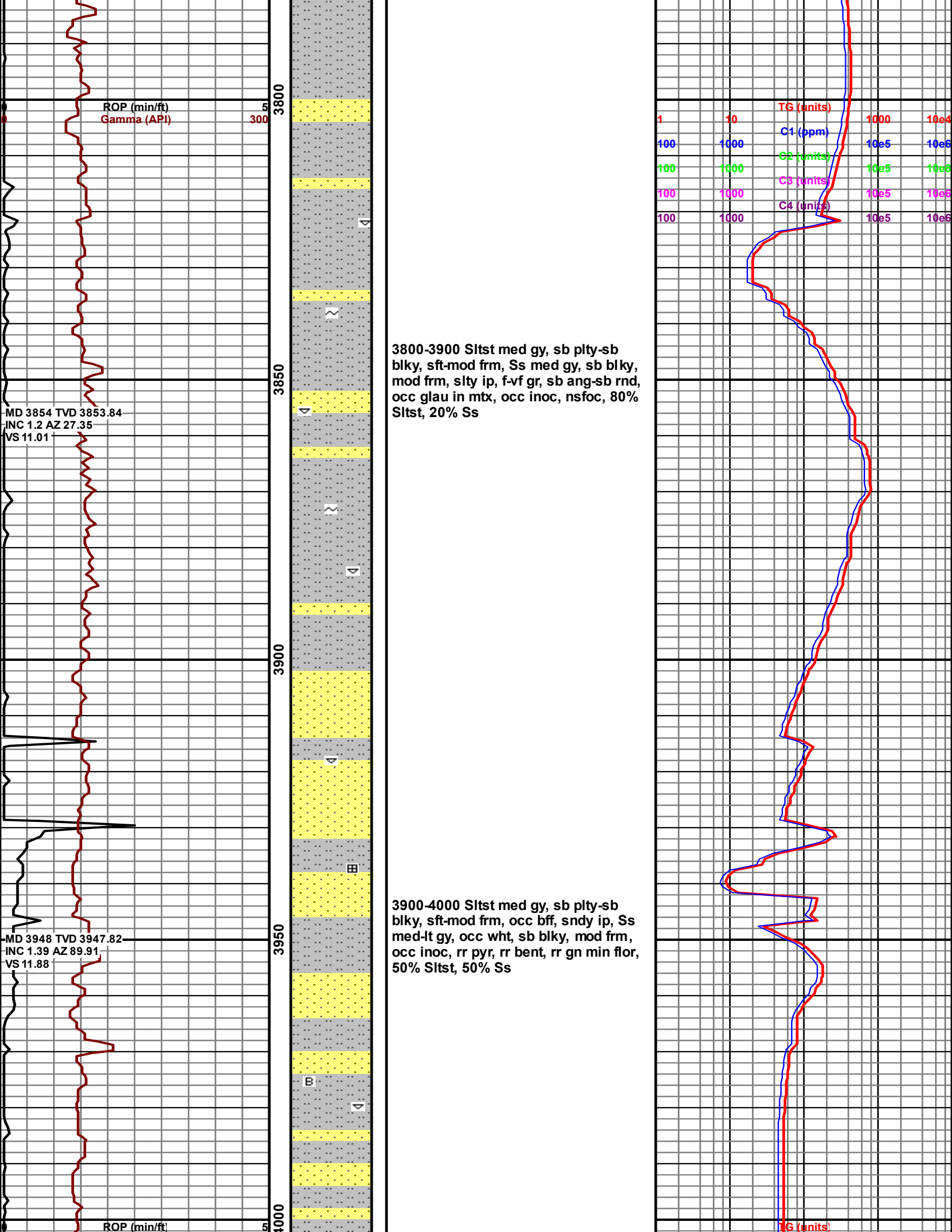

MD 2733 TVD 2732.9
INC 0.56 AZ 69.14
VS 4.54
MD 2827 TVD 2826.9
INC 0.53 AZ 78.52
VS 4.79
0
ROP (min/ft)
5
0
Gamma (API)
300
2700
2750
2800
2850
2900
B
B
B
B
B
2700-2800 Sltst lt-med gy, sb plty-sb blky, sft-mod frm, sl calc, sndy ip, grdg to Ss, lt gy-wht, sb blky-blky, med frm-frm, tr bent, tr gn min flor, 80% Sltst, 20% Ss
2800-2900 Sltst med gy, sb plty-sb blky, sft-mod frm, sl calc, sndy ip, grdg to Ss, lt gy-wht, sb blky-blky, med frm-frm, occ bent, occ gn min flor, 70% Sltst, 30% Ss
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6


MD 2920 TVD 2919.89
INC 0.53 AZ 106.93
VS 4.75
ROP (min/ft)
Gamma (API)
0
0
5
300
MD 3013 TVD 3012.89
INC 0.51 AZ 59.99
VS 4.83
MD 3107 TVD 3106.89
INC 0.7 AZ 30.12
VS 5.53
2950
3000
3050
3100
B
P
2900-3000 Sltst med gy, sb plty-sb blky, sft-mod frm, sl calc, sndy ip, grdg to Ss, lt gy-wht, sb blky-blky, med frm-frm, rr bent, rr gn min flor, rr inoc, 80% Sltst, 20% Ss
3000-3100 Sltst med gy, sb plty-sb blky, sft-mod frm, sndy ip, grdg to Ss, Sh dk gy, sb plty-plty, sft, Ss lt gy-wht, sb blky-blky, med frm-frm, rr pyr, rr inoc, nsfoc, 85% Sltst, 10% Sh, 5% Ss
100% Methane
TG (units)
1
10
100
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6


3100-3200 Sltst med gy, sb plty-sb blky, sft-mod frm, sndy ip, grdg to Ss, Sh dk gy, sb plty-plty, sft, Ss lt gy-wht, sb blky-blky, frm, rr inoc, nsfoc, 85% Sltst, 10% Sh, 5% Ss
3200-3300 Ss lt gy-wht, sb blky-sb plty, frm, Sltst med-dk gy, sb plty-sb blky, sft-mod frm, sl calc, rr bent, rr gn min flor, 80% Ss, 20% Sltst
3150
3200
3250
3300
ROP (min/ft)
5
MD 3202 TVD 3201.88
INC 0.98 AZ 2.4
VS 6.85
Hygiene
3242' MD
MD 3296 TVD 3295.86
INC 1.09 AZ 0.99
VS 8.54
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6

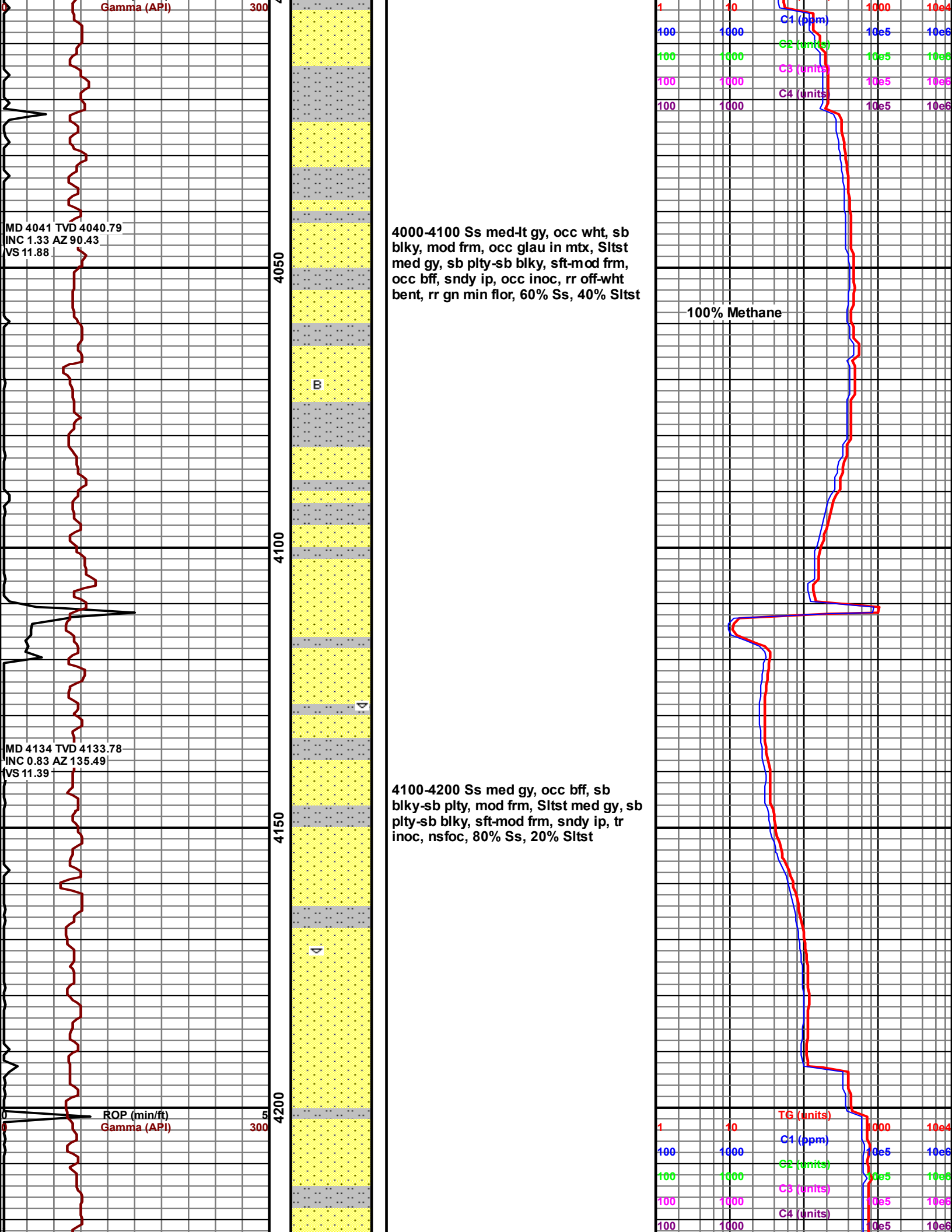

3350
3400
3450
3500
3550
MD 3388 TVD 3387.86
INC 0.17 AZ 195.08
VS 9.29
ROP (min/ft)
Gamma (API)
0
0
5
300
MD 3481 TVD 3480.86
INC 0.18 AZ 177.94
VS 9.02
3300-3400 Ss lt gy-wht, sb blky-sb plty, frm, uncons Ss lt gy-wht, sb rnd-sb ang, Sltst med-dk gy, sb plty-sb blky, sft-mod frm, sl calc, rr inoc, rr bent, rr gn min flor, nsfoc, 60% Ss, 35% uncons Ss, 5% Sltst
3400-3500 Uncons Ss lt gy-wht, sb rnd-sb ang, Sltst med-dk gy, sb plty-sb blky, sft-mod frm, rr glau, sl calc, nsfoc, 95% uncons Ss, 5% Sltst
3500-3600 Ss lt gy-wht, sb blky-sb plty, mod frm-sft, uncons ip, sb ang-sb rnd, Sltst med-dk gy, sb plty-sb blky, sft-mod frm, sl calc, rr biot, rr pyr, nsfoc, 80% Ss, 20% Sltst
TG (units)
1
10
100
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (ppm)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6

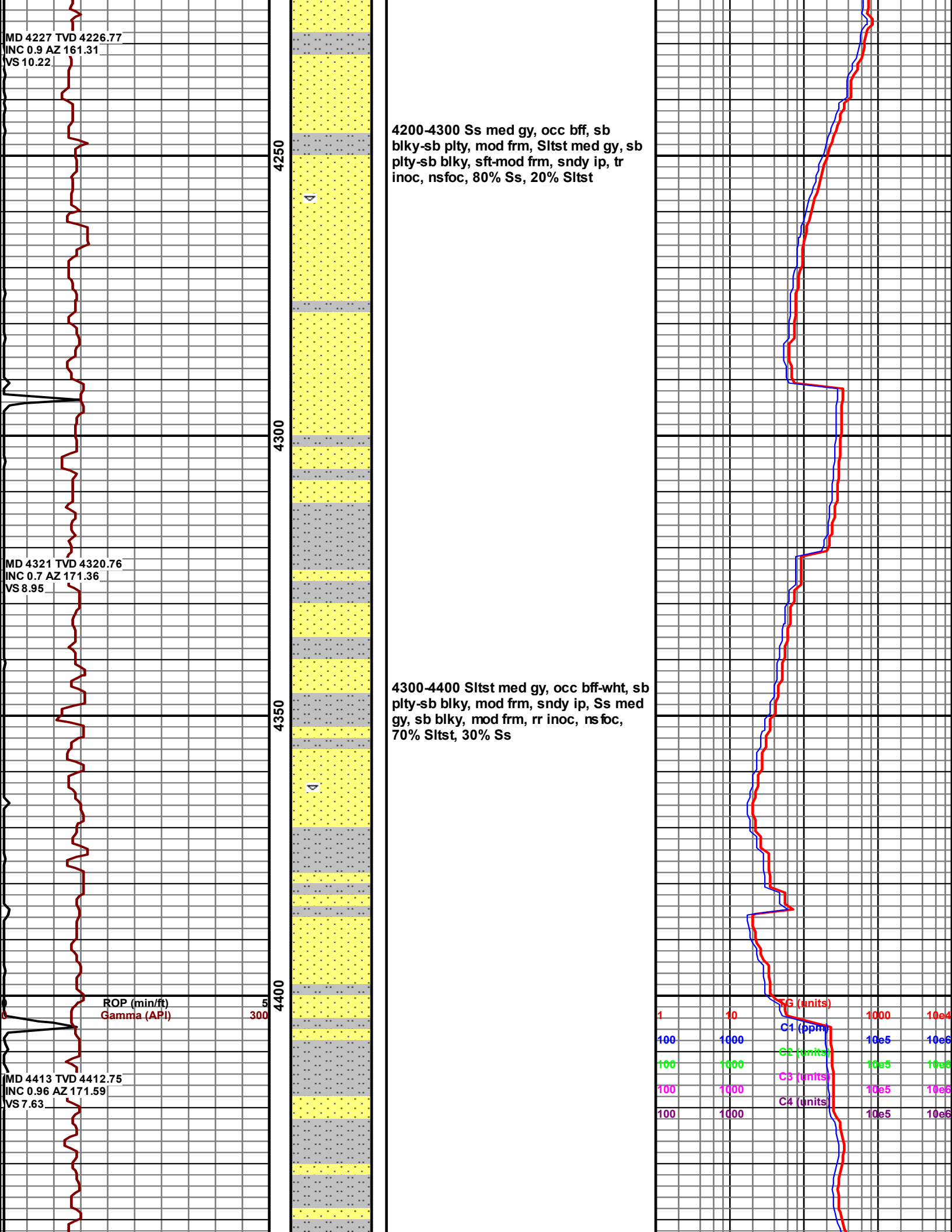

MD 3574 TVD 3573.86
INC 0.19 AZ 136.89
VS 8.76
ROP (min/ft)
Gamma (API)
0
0
5
300
3600
3650
3700
3750
P
P
P
B
MD 3668 TVD 3667.85
INC 0.12 AZ 354.97
VS 8.74
MD 3761 TVD 3760.85
INC 0.83 AZ 13.51
VS 9.49
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6
3600-3700 Ss med gy, occ bff-wht, sb blky-sb plty, mod frm, slty ip, f-vf gr, sb ang-sb rnd, occ pyr, occ biot, abnt glau in mtx, tr inoc, nsfoc, 100% Ss
3700-3800 Sltst med gy, sb plty-sb blky, sft-mod frm, Ss med gy, sb blky, mod frm, slty ip, f-vf gr, sb ang-sb rnd, occ glau in mtx, tr inoc, rr bent, rr gn min flor, 80% Sltst, 20% Ss

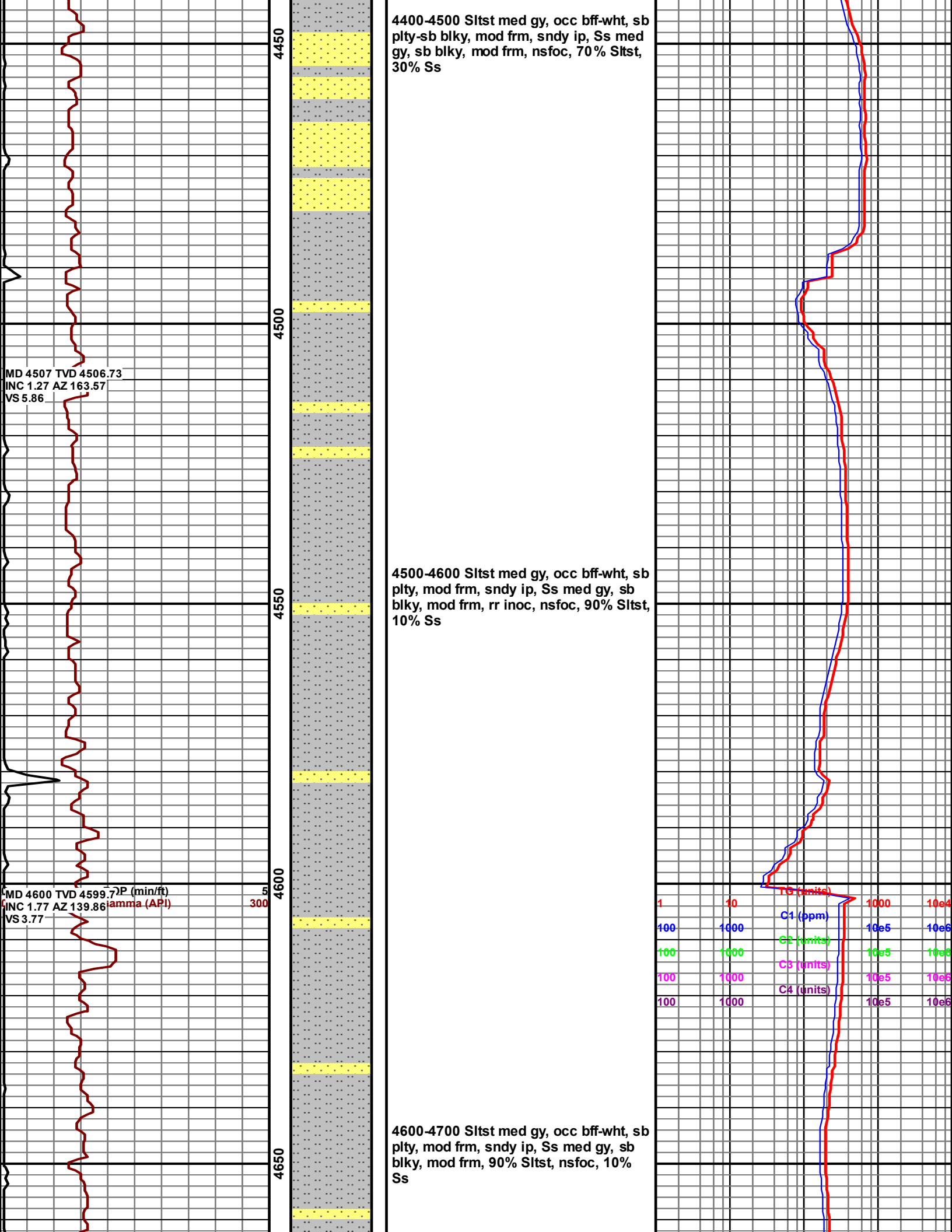


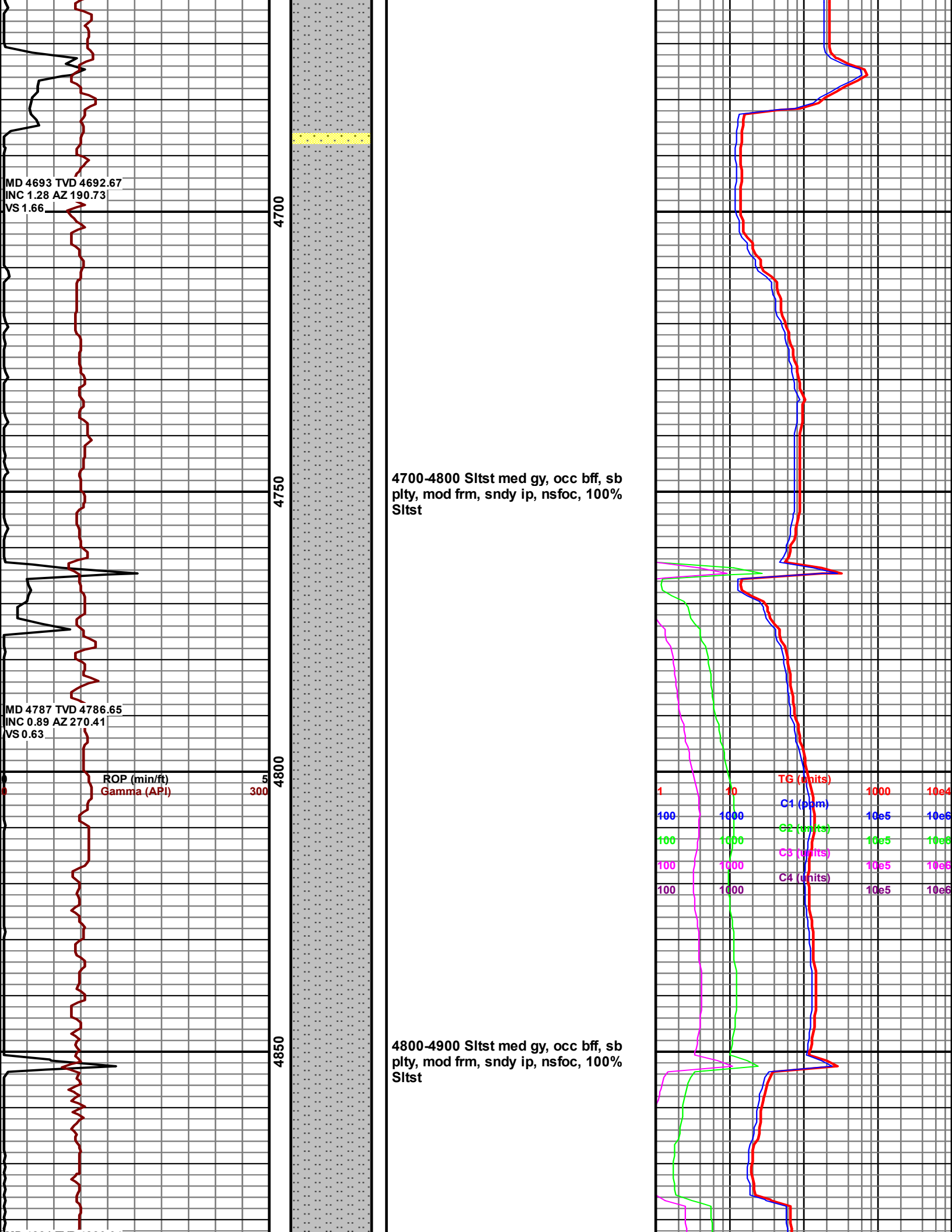
3800-3900 Sltst med gy, sb plty-sb blky, sft-mod frm, Ss med gy, sb blky, mod frm, slty ip, f-vf gr, sb ang-sb rnd, occ glau in mtx, occ inoc, nsfoc, 80% Sltst, 20% Ss

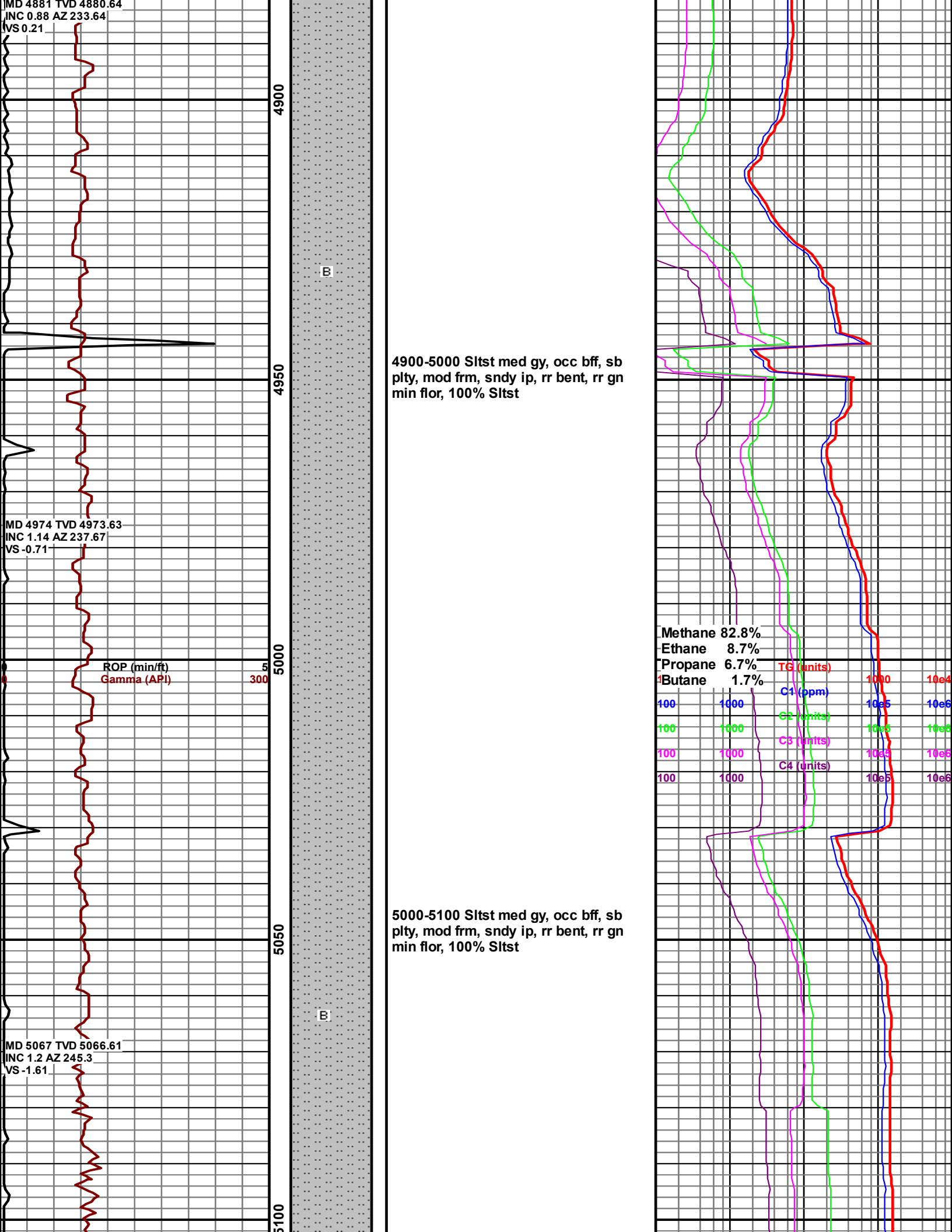
3900-4000 Sltst med gy, sb plty-sb blky, sft-mod frm, occ bff, sndy ip, Ss med-lt gy, occ wht, sb blky, mod frm, occ inoc, rr pyr, rr bent, rr gn min flor, 50% Sltst, 50% Ss

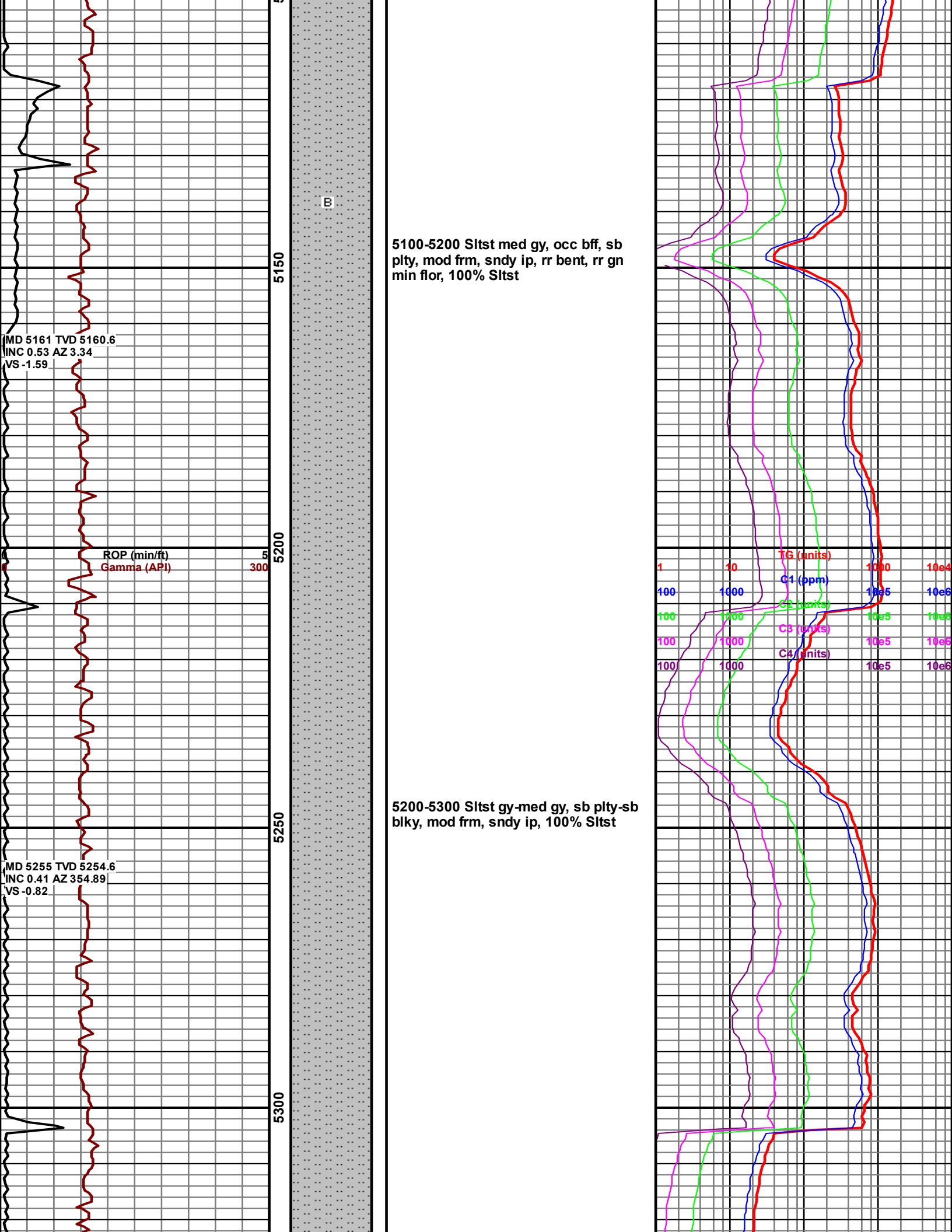

Gamma (API)
300
MD 4041 TVD 4040.79
INC 1.33 AZ 90.43
VS 11.88
4050
B
4100
MD 4134 TVD 4133.78
INC 0.83 AZ 135.49
VS 11.39
4150
4200
ROP (min/ft)
5
Gamma (API)
300
4000-4100 Ss med-lt gy, occ wht, sb blky, mod frm, occ glau in mtx, Sltst med gy, sb plty-sb blky, sft-mod frm, occ bff, sndy ip, occ inoc, rr off-wht bent, rr gn min flor, 60% Ss, 40% Sltst
4100-4200 Ss med gy, occ bff, sb blky-sb plty, mod frm, Sltst med gy, sb plty-sb blky, sft-mod frm, sndy ip, tr inoc, nsfoc, 80% Ss, 20% Sltst
100% Methane
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
C3 (units)
C4 (units)

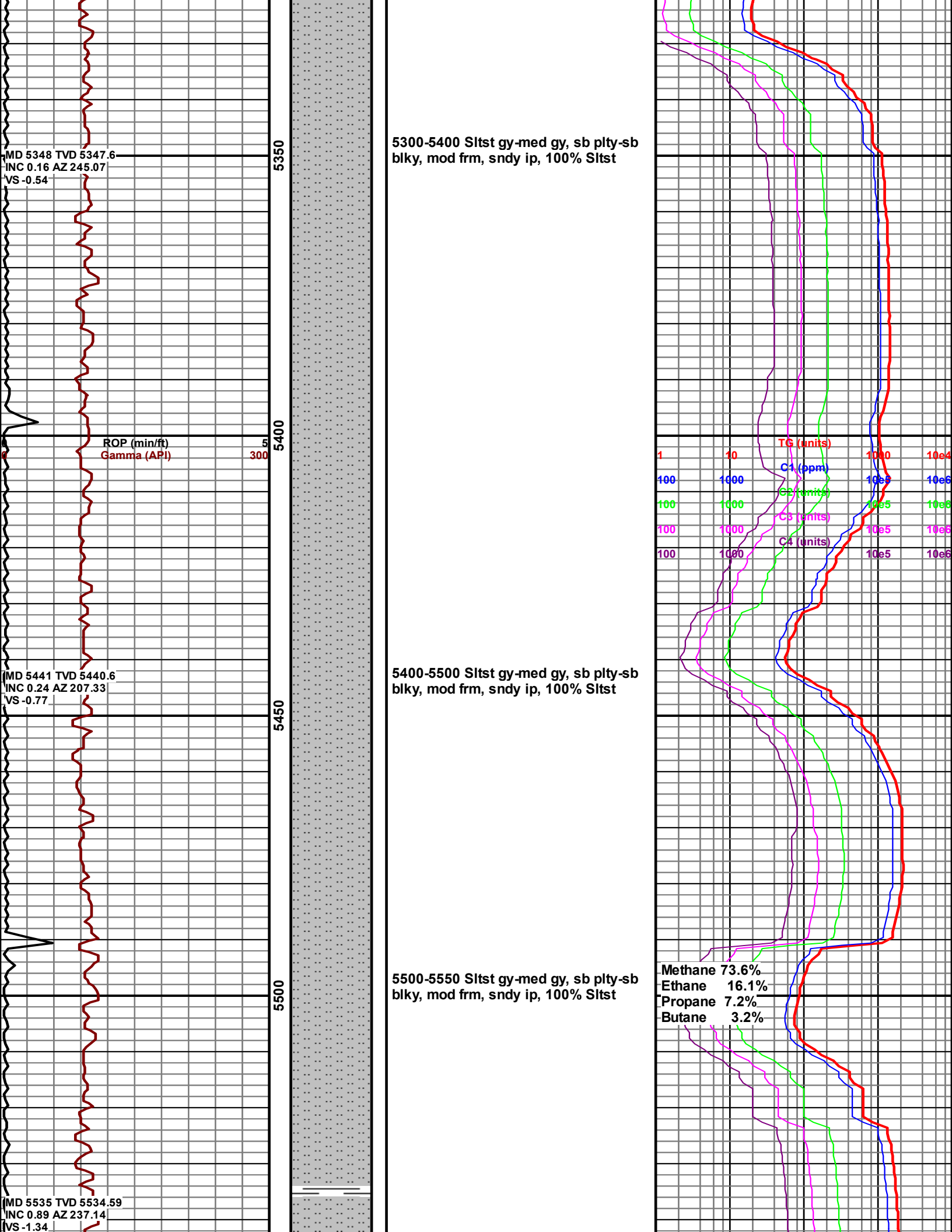

MD 4227 TVD 4226.77
INC 0.9 AZ 161.31
VS 10.22
4250
4200-4300 Ss med gy, occ bff, sb blky-sb plty, mod frm, Sltst med gy, sb plty-sb blky, sft-mod frm, sndy ip, tr inoc, nsfoc, 80% Ss, 20% Sltst
4300
MD 4321 TVD 4320.76
INC 0.7 AZ 171.36
VS 8.95
4350
4300-4400 Sltst med gy, occ bff-wht, sb plty-sb blky, mod frm, sndy ip, Ss med gy, sb blky, mod frm, rr inoc, nsfoc, 70% Sltst, 30% Ss
4400
ROP (min/ft)
Gamma (API)
300
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6
MD 4413 TVD 4412.75
INC 0.96 AZ 171.59
VS 7.63

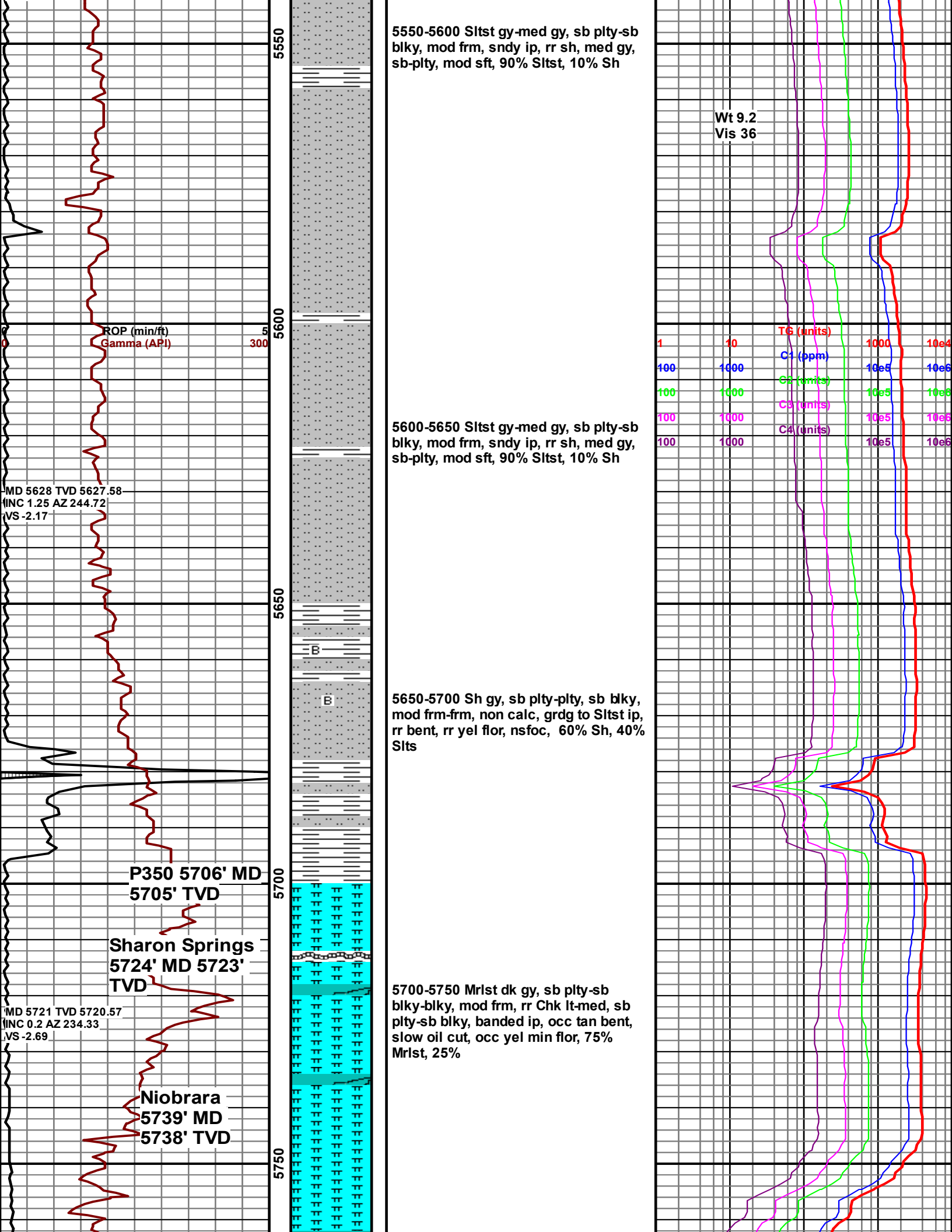

4400-4500 Sltst med gy, occ bff-wht, sb plty-sb blky, mod frm, sndy ip, Ss med gy, sb blky, mod frm, nsfoc, 70% Sltst, 30% Ss
4500-4600 Sltst med gy, occ bff-wht, sb plty, mod frm, sndy ip, Ss med gy, sb blky, mod frm, rr inoc, nsfoc, 90% Sltst, 10% Ss
4600-4700 Sltst med gy, occ bff-wht, sb plty, mod frm, sndy ip, Ss med gy, sb blky, mod frm, 90% Sltst, nsfoc, 10% Ss
4450
4500
4550
4600
4650
MD 4507 TVD 4506.73
INC 1.27 AZ 163.57
VS 5.86
MD 4600 TVD 4599.7
INC 1.77 AZ 139.86
VS 3.77
ROP (min/ft)
Gamma (API)
300
TG (units)
C1 (ppm)
C2 (units)
C3 (units)
C4 (units)
1
10
100
1000
10e4
10e5
10e6

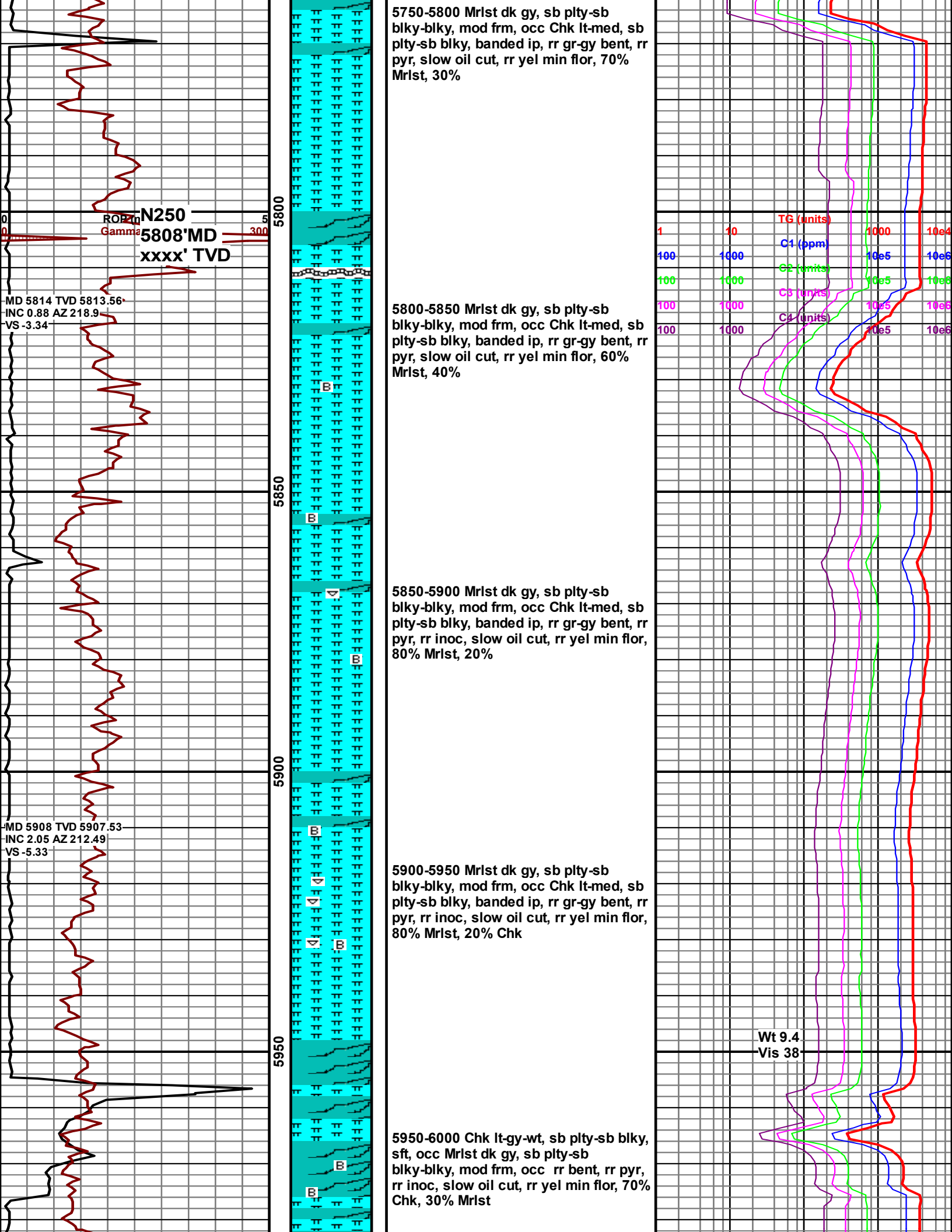

MD 4693 TVD 4692.67
INC 1.28 AZ 190.73
VS 1.66
MD 4787 TVD 4786.65
INC 0.89 AZ 270.41
VS 0.63
ROP (min/ft)
Gamma (API)
4700
4750
4800
4850
4700-4800 Sltst med gy, occ bff, sb plty, mod frm, sndy ip, nsfoc, 100% Sltst
4800-4900 Sltst med gy, occ bff, sb plty, mod frm, sndy ip, nsfoc, 100% Sltst
TG (units)
C1 (ppm)
C2 (units)
C3 (units)
C4 (units)


MD 4881 TVD 4880.64
INC 0.88 AZ 233.64
VS 0.21
4900
4950
5000
5050
5100
B
B
4900-5000 Sltst med gy, occ bff, sb plty, mod frm, sndy ip, rr bent, rr gn min flor, 100% Sltst
MD 4974 TVD 4973.63
INC 1.14 AZ 237.67
VS -0.71
ROP (min/ft)
Gamma (API)
300
Methane 82.8%
Ethane 8.7%
Propane 6.7%
Butane 1.7%
TG (units)
C1 (ppm)
C2 (units)
C3 (units)
C4 (units)
1000
10e4
100
10e5
10e6
5000-5100 Sltst med gy, occ bff, sb plty, mod frm, sndy ip, rr bent, rr gn min flor, 100% Sltst
MD 5067 TVD 5066.61
INC 1.2 AZ 245.3
VS -1.61


B
5150
5200
5250
5300
MD 5161 TVD 5160.6
INC 0.53 AZ 3.34
VS -1.59
MD 5255 TVD 5254.6
INC 0.41 AZ 354.89
VS -0.82
ROP (min/ft)
Gamma (API)
300
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6
5100-5200 Sltst med gy, occ bff, sb plty, mod frm, sndy ip, rr bent, rr gn min flor, 100% Sltst
5200-5300 Sltst gy-med gy, sb plty-sb blky, mod frm, sndy ip, 100% Sltst


MD 5348 TVD 5347.6
INC 0.16 AZ 245.07
VS -0.54
5350
ROP (min/ft)
Gamma (API)
300
5400
5300-5400 Sltst gy-med gy, sb plty-sb blky, mod frm, sndy ip, 100% Sltst
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6
MD 5441 TVD 5440.6
INC 0.24 AZ 207.33
VS -0.77
5450
5400-5500 Sltst gy-med gy, sb plty-sb blky, mod frm, sndy ip, 100% Sltst
5500
5500-5550 Sltst gy-med gy, sb plty-sb blky, mod frm, sndy ip, 100% Sltst
Methane 73.6%
Ethane 16.1%
Propane 7.2%
Butane 3.2%
MD 5535 TVD 5534.59
INC 0.89 AZ 237.14
VS -1.34


5550
5600
5650
5700
5750
ROP (min/ft)
Gamma (API)
300
MD 5628 TVD 5627.58
INC 1.25 AZ 244.72
VS -2.17
B
B
P350 5706' MD
5705' TVD
Sharon Springs
5724' MD 5723'
TVD
MD 5721 TVD 5720.57
INC 0.2 AZ 234.33
VS -2.69
Niobrara
5739' MD
5738' TVD
5550-5600 Sltst gy-med gy, sb plty-sb blky, mod frm, sndy ip, rr sh, med gy, sb-plty, mod sft, 90% Sltst, 10% Sh
Wt 9.2
Vis 36
TG (units)
C1 (ppm)
C2 (units)
C3 (units)
C4 (units)
1
10
100
1000
10e4
10e5
10e6
5600-5650 Sltst gy-med gy, sb plty-sb blky, mod frm, sndy ip, rr sh, med gy, sb-plty, mod sft, 90% Sltst, 10% Sh
5650-5700 Sh gy, sb plty-plty, sb blky, mod frm-frm, non calc, grdg to Sltst ip, rr bent, rr yel flor, nsfoc, 60% Sh, 40% Slts
5700-5750 Mrlst dk gy, sb plty-sb blky-blky, mod frm, rr Chk lt-med, sb plty-sb blky, banded ip, occ tan bent, slow oil cut, occ yel min flor, 75% Mrlst, 25%



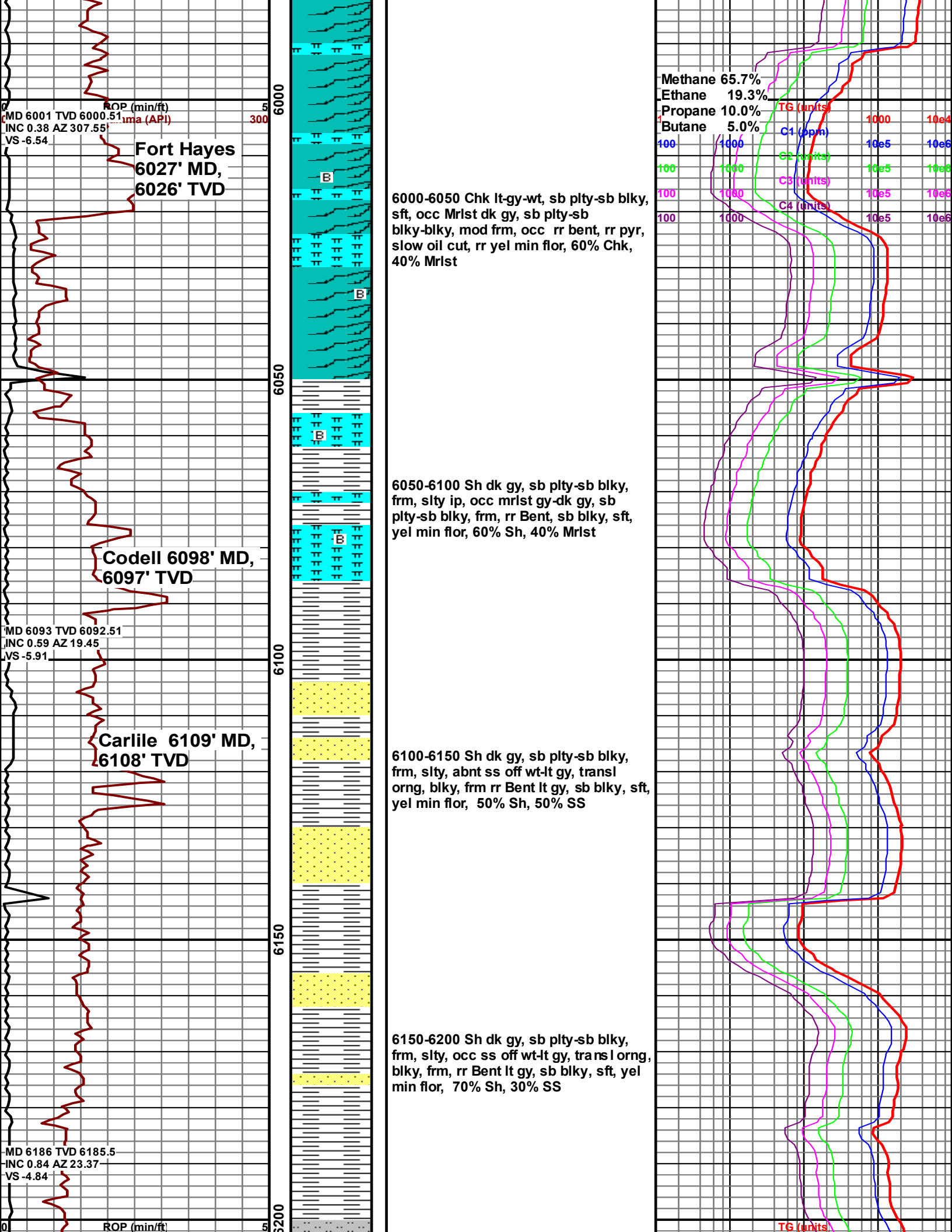
5750-5800 Mrlst dk gy, sb plty-sb blky-blky, mod frm, occ Chk lt-med, sb plty-sb blky, banded ip, rr gr-gy bent, rr pyr, slow oil cut, rr yel min flor, 70% Mrlst, 30%

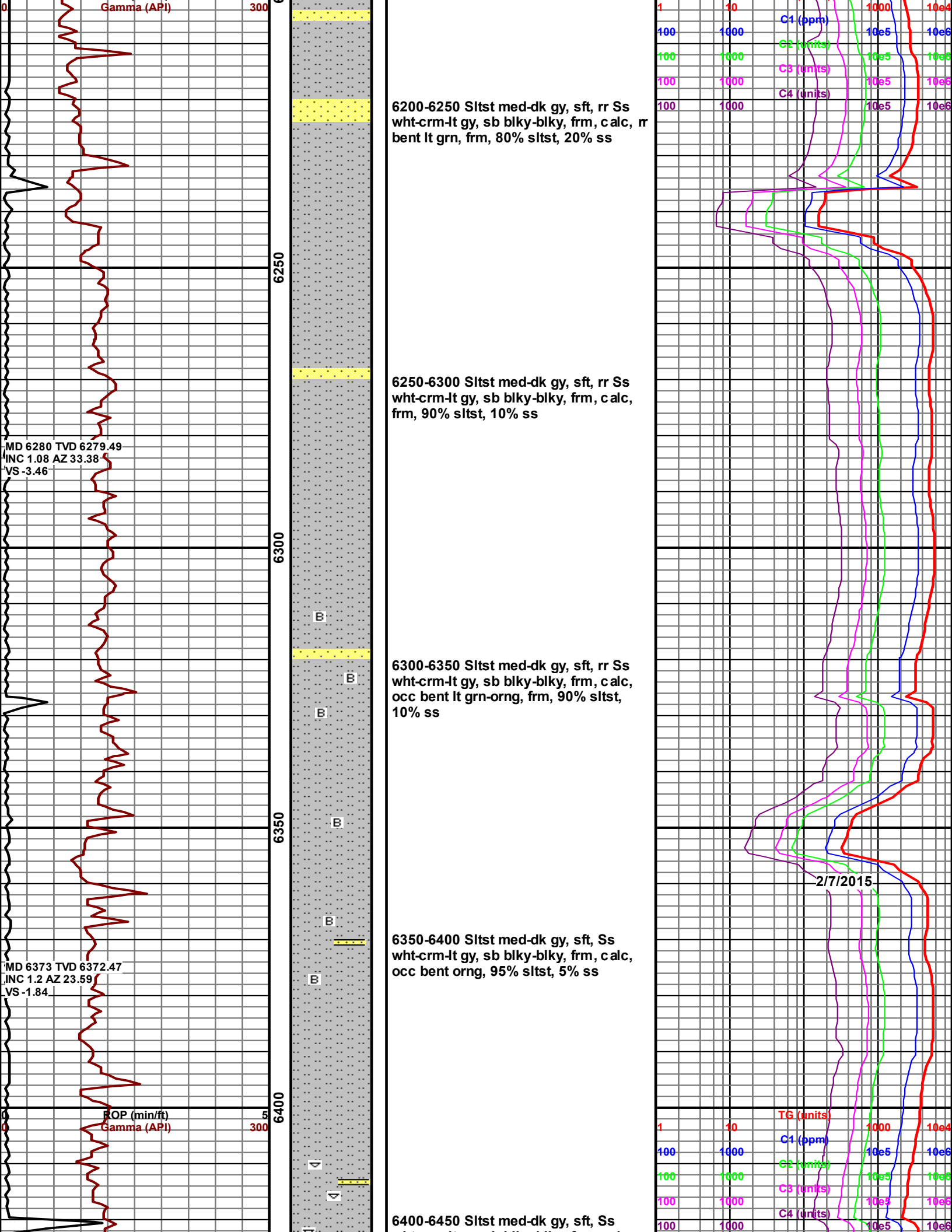
5800-5850 Mrlst dk gy, sb plty-sb blky-blky, mod frm, occ Chk lt-med, sb plty-sb blky, banded ip, rr gr-gy bent, rr pyr, slow oil cut, rr yel min flor, 60% Mrlst, 40%

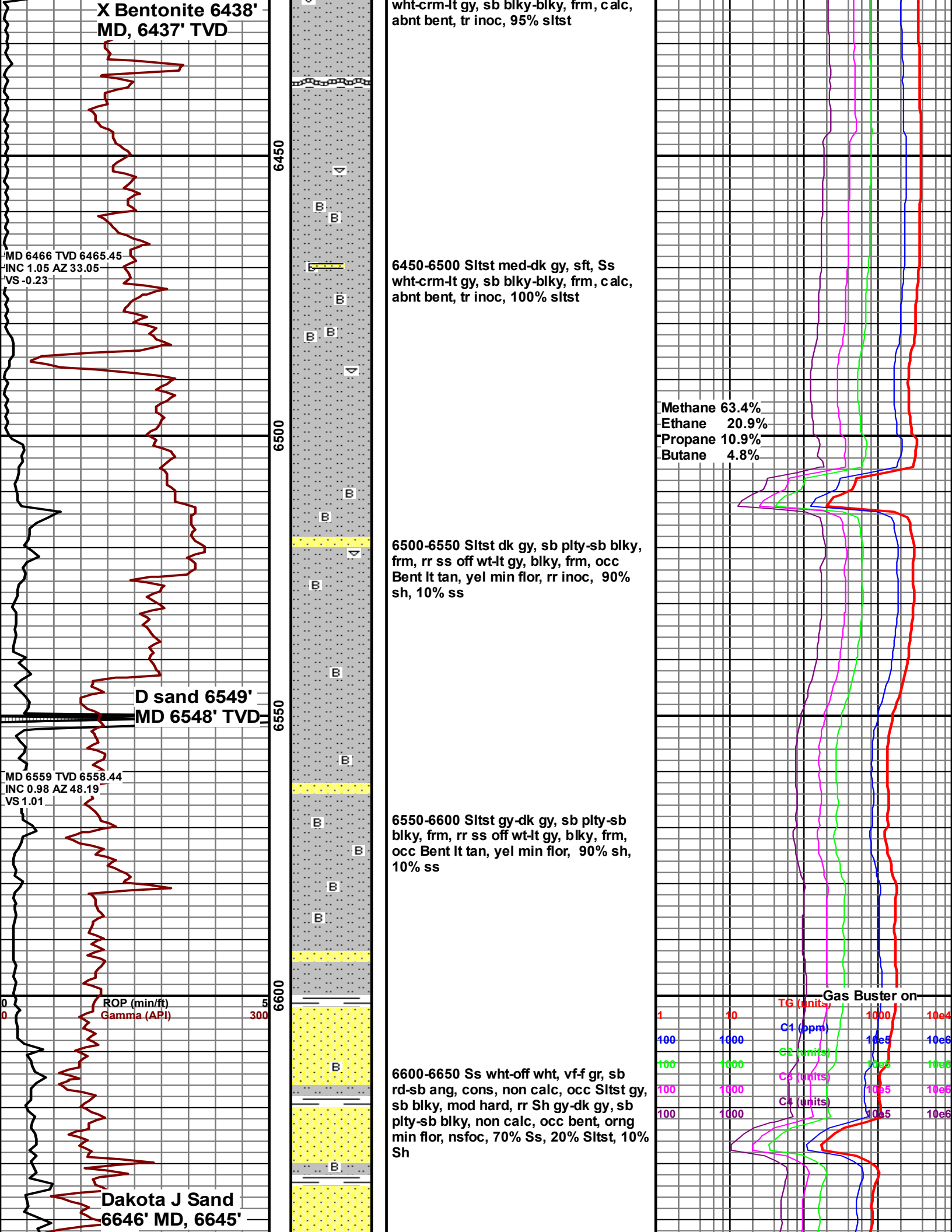
5850-5900 Mrlst dk gy, sb plty-sb blky-blky, mod frm, occ Chk lt-med, sb plty-sb blky, banded ip, rr gr-gy bent, rr pyr, rr inoc, slow oil cut, rr yel min flor, 80% Mrlst, 20%

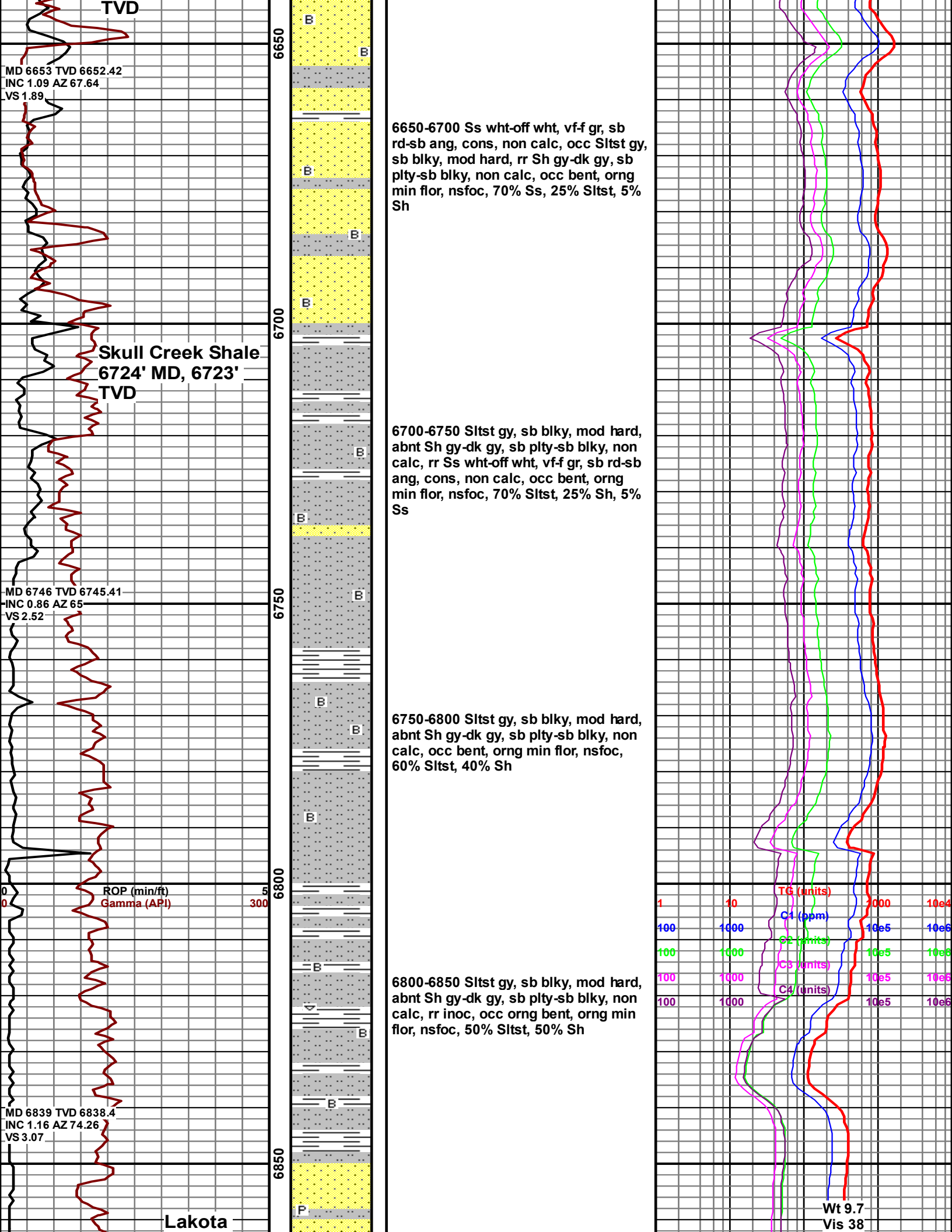
5900-5950 Mrlst dk gy, sb plty-sb blky-blky, mod frm, occ Chk lt-med, sb plty-sb blky, banded ip, rr gr-gy bent, rr pyr, rr inoc, slow oil cut, rr yel min flor, 80% Mrlst, 20% Chk

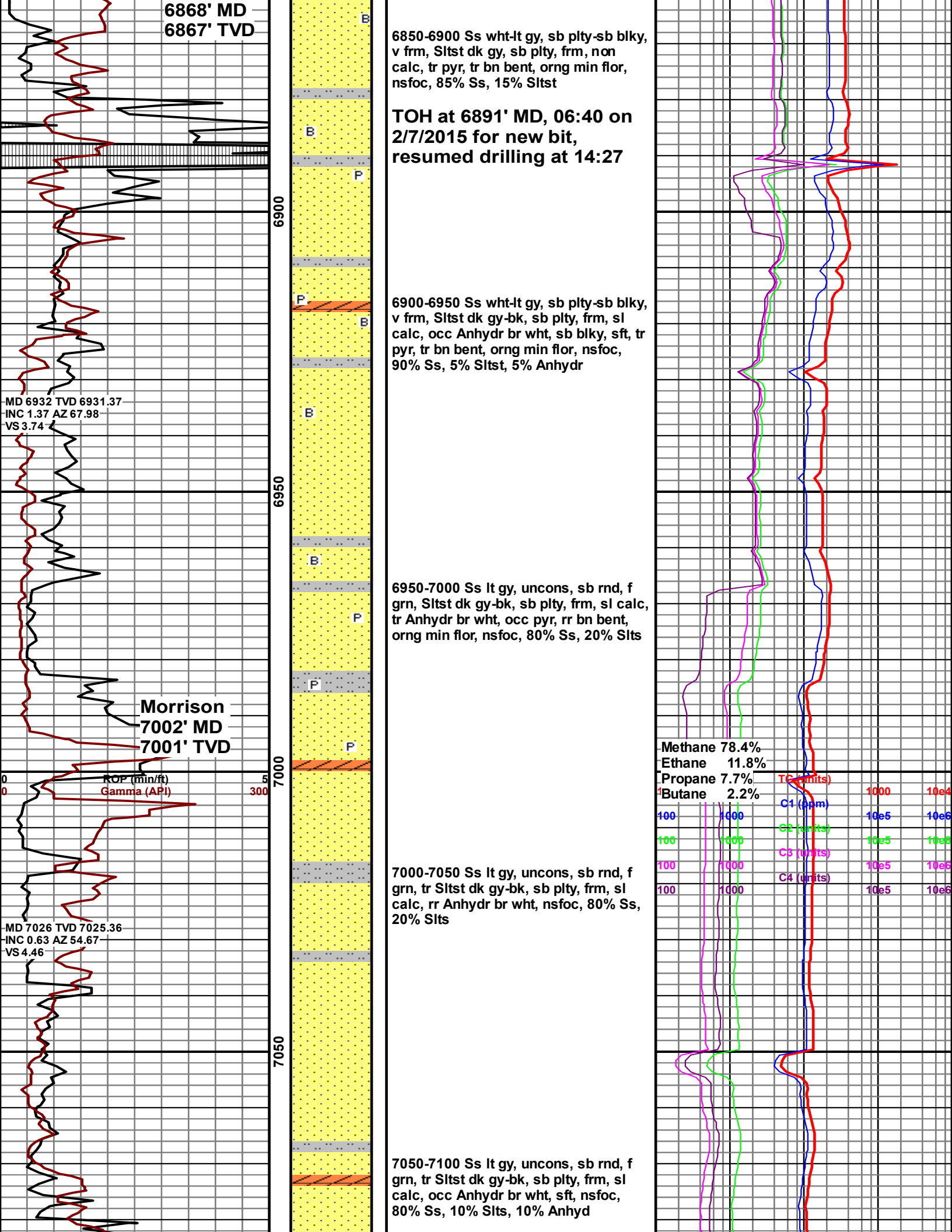
5950-6000 Chk lt-gy-wt, sb plty-sb blky, sft, occ Mrlst dk gy, sb plty-sb blky-blky, mod frm, occ rr bent, rr pyr, rr inoc, slow oil cut, rr yel min flor, 70% Chk, 30% Mrlst

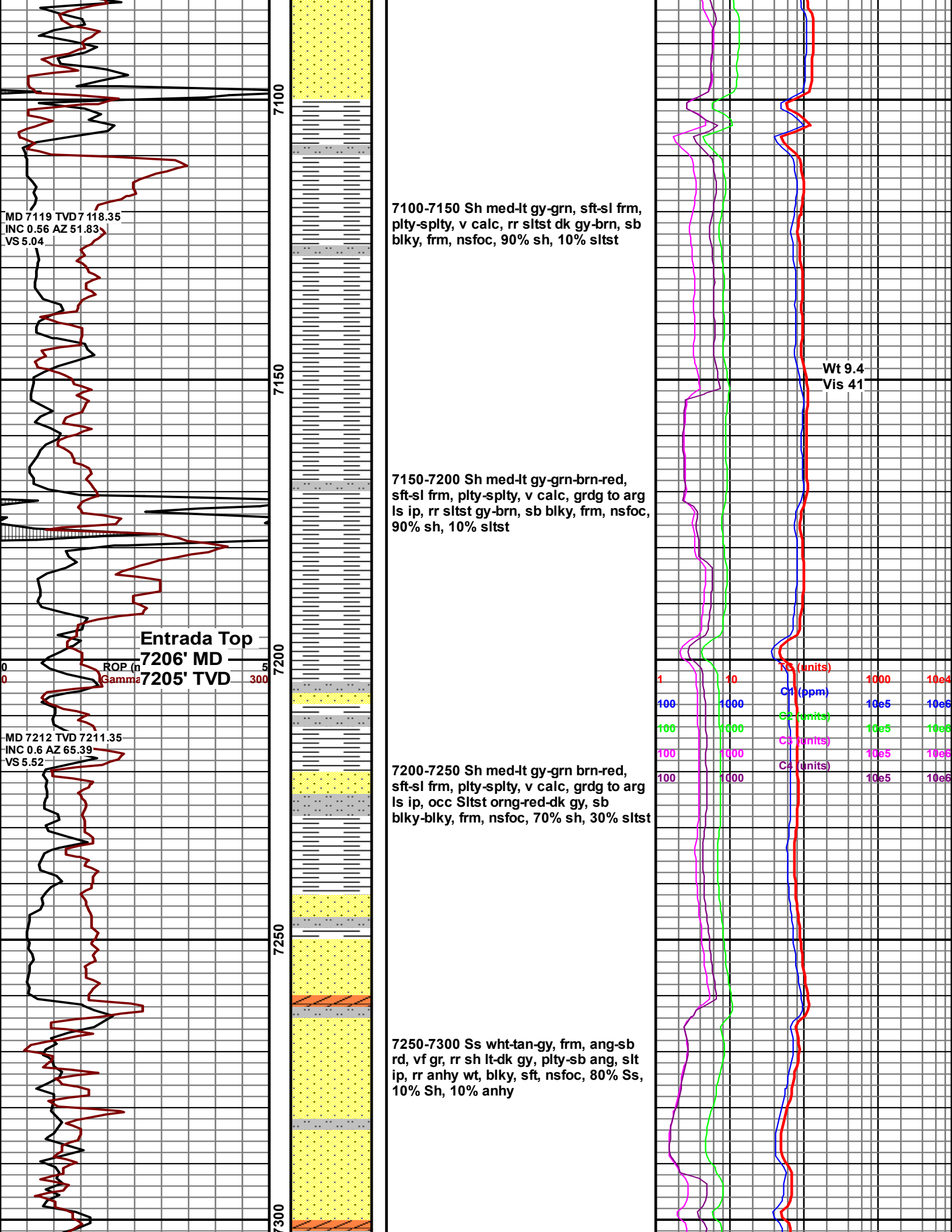

ROP (min/ft)
5
MD 6001 TVD 6000.51
INC 0.38 AZ 307.55
VS -6.54
Gamma (API)
300
Fort Hayes
6027' MD,
6026' TVD
6000
6050
6100
6150
6200
6000-6050 Chk lt-gy-wt, sb plty-sb blky, sft, occ Mrlst dk gy, sb plty-sb blky-blky, mod frm, occ rr bent, rr pyr, slow oil cut, rr yel min flor, 60% Chk, 40% Mrlst
Codell 6098' MD,
6097' TVD
MD 6093 TVD 6092.51
INC 0.59 AZ 19.45
VS -5.91
6050-6100 Sh dk gy, sb plty-sb blky, frm, slty ip, occ mrlst gy-dk gy, sb plty-sb blky, frm, rr Bent, sb blky, sft, yel min flor, 60% Sh, 40% Mrlst
Carlile 6109' MD,
6108' TVD
6100-6150 Sh dk gy, sb plty-sb blky, frm, slty, abnt ss off wt-lt gy, transl orng, blky, frm rr Bent lt gy, sb blky, sft, yel min flor, 50% Sh, 50% SS
6150-6200 Sh dk gy, sb plty-sb blky, frm, slty, occ ss off wt-lt gy, transl orng, blky, frm, rr Bent lt gy, sb blky, sft, yel min flor, 70% Sh, 30% SS
MD 6186 TVD 6185.5
INC 0.84 AZ 23.37
VS -4.84
ROP (min/ft)
5
Methane 65.7%
Ethane 19.3%
Propane 10.0%
Butane 5.0%
TG (units)
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
C3 (units)
C4 (units)
TG (units)

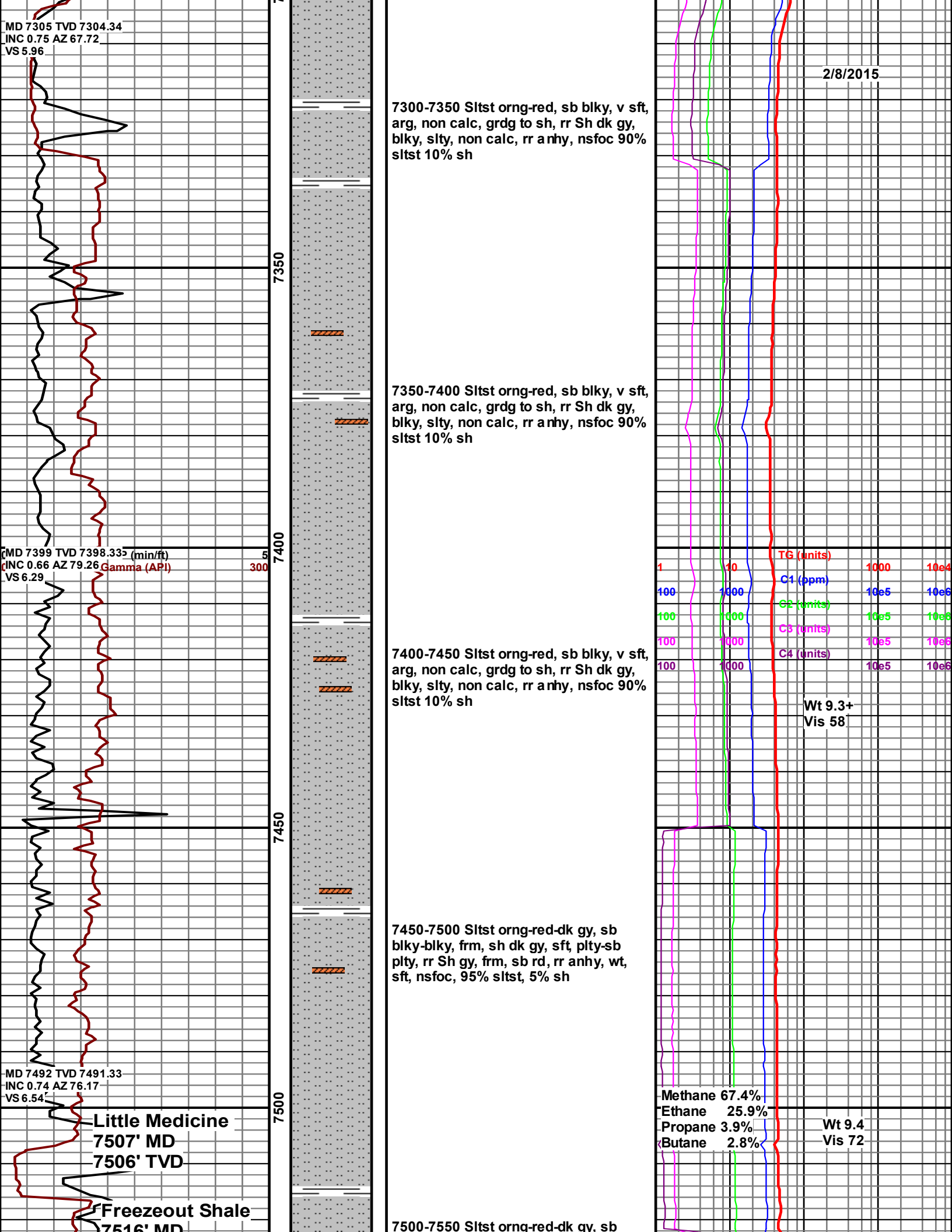

Gamma (API)
300
6250
6300
6350
6400
MD 6280 TVD 6279.49
INC 1.08 AZ 33.38
VS -3.46
MD 6373 TVD 6372.47
INC 1.2 AZ 23.59
VS -1.84
ROP (min/ft)
5
Gamma (API)
300
6200-6250 Sltst med-dk gy, sft, rr Ss wht-crm-lt gy, sb blky-blky, frm, calc, rr bent lt grn, frm, 80% sltst, 20% ss
6250-6300 Sltst med-dk gy, sft, rr Ss wht-crm-lt gy, sb blky-blky, frm, calc, frm, 90% sltst, 10% ss
6300-6350 Sltst med-dk gy, sft, rr Ss wht-crm-lt gy, sb blky-blky, frm, calc, occ bent lt grn-orng, frm, 90% sltst, 10% ss
6350-6400 Sltst med-dk gy, sft, Ss wht-crm-lt gy, sb blky-blky, frm, calc, occ bent orng, 95% sltst, 5% ss
6400-6450 Sltst med-dk gy, sft, Ss
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6
2/7/2015

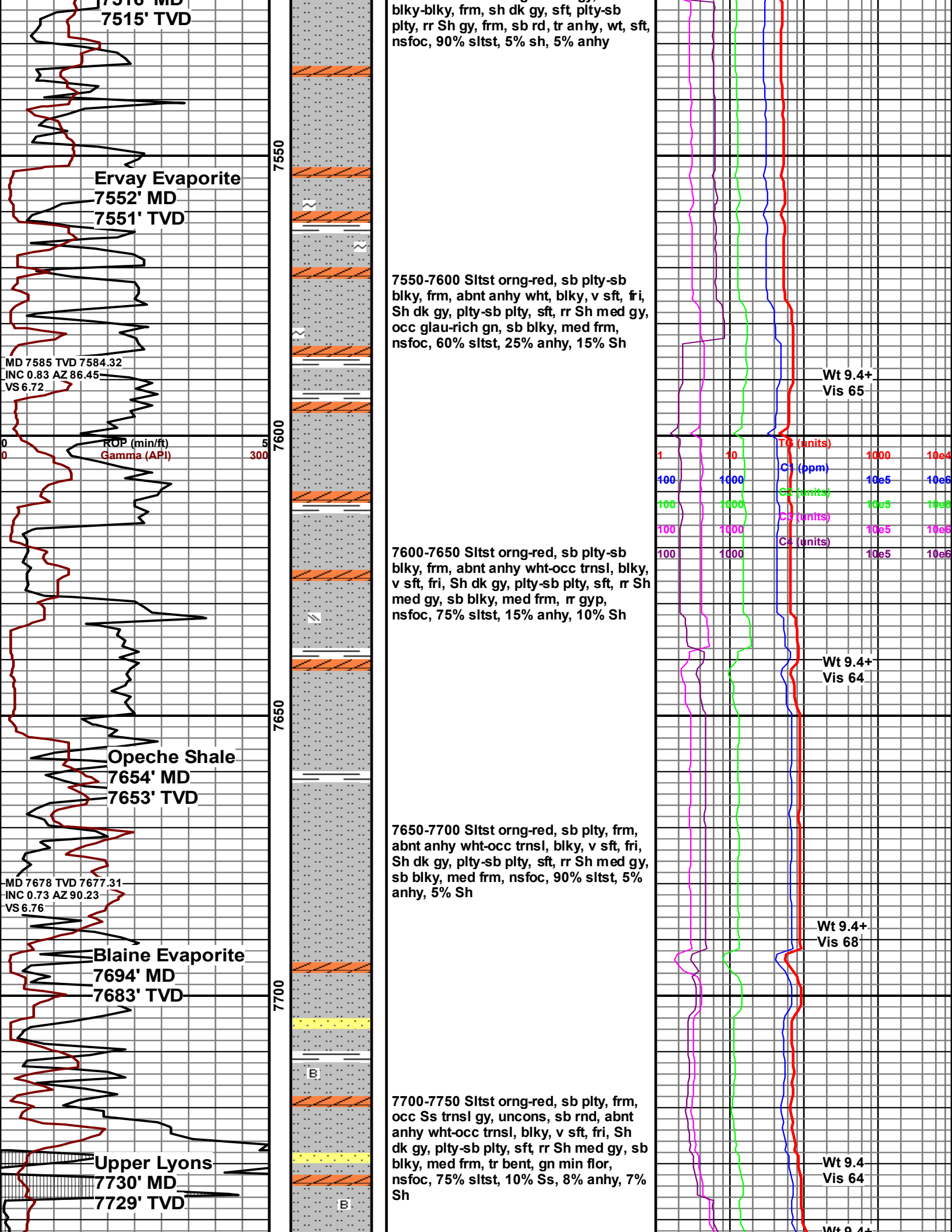

X Bentonite 6438' MD, 6437' TVD
MD 6466 TVD 6465.45
INC 1.05 AZ 33.05
VS -0.23
D sand 6549' MD 6548' TVD
MD 6559 TVD 6558.44
INC 0.98 AZ 48.19
VS 1.01
ROP (min/ft)
Gamma (API)
Dakota J Sand 6646' MD, 6645'
6450
6500
6550
6600
wht-crm-lt gy, sb blky-blky, frm, calc, abnt bent, tr inoc, 95% sltst
6450-6500 Sltst med-dk gy, sft, Ss wht-crm-lt gy, sb blky-blky, frm, calc, abnt bent, tr inoc, 100% sltst
6500-6550 Sltst dk gy, sb plty-sb blky, frm, rr ss off wt-lt gy, blky, frm, occ Bent lt tan, yel min flor, rr inoc, 90% sh, 10% ss
6550-6600 Sltst gy-dk gy, sb plty-sb blky, frm, rr ss off wt-lt gy, blky, frm, occ Bent lt tan, yel min flor, 90% sh, 10% ss
6600-6650 Ss wht-off wht, vf-f gr, sb rd-sb ang, cons, non calc, occ Sltst gy, sb blky, mod hard, rr Sh gy-dk gy, sb plty-sb blky, non calc, occ bent, orng min flor, nsfoc, 70% Ss, 20% Sltst, 10% Sh
Methane 63.4%
Ethane 20.9%
Propane 10.9%
Butane 4.8%
Gas Buster on
TG (units)
C1 (ppm)
C2 (units)
C3 (units)
C4 (units)

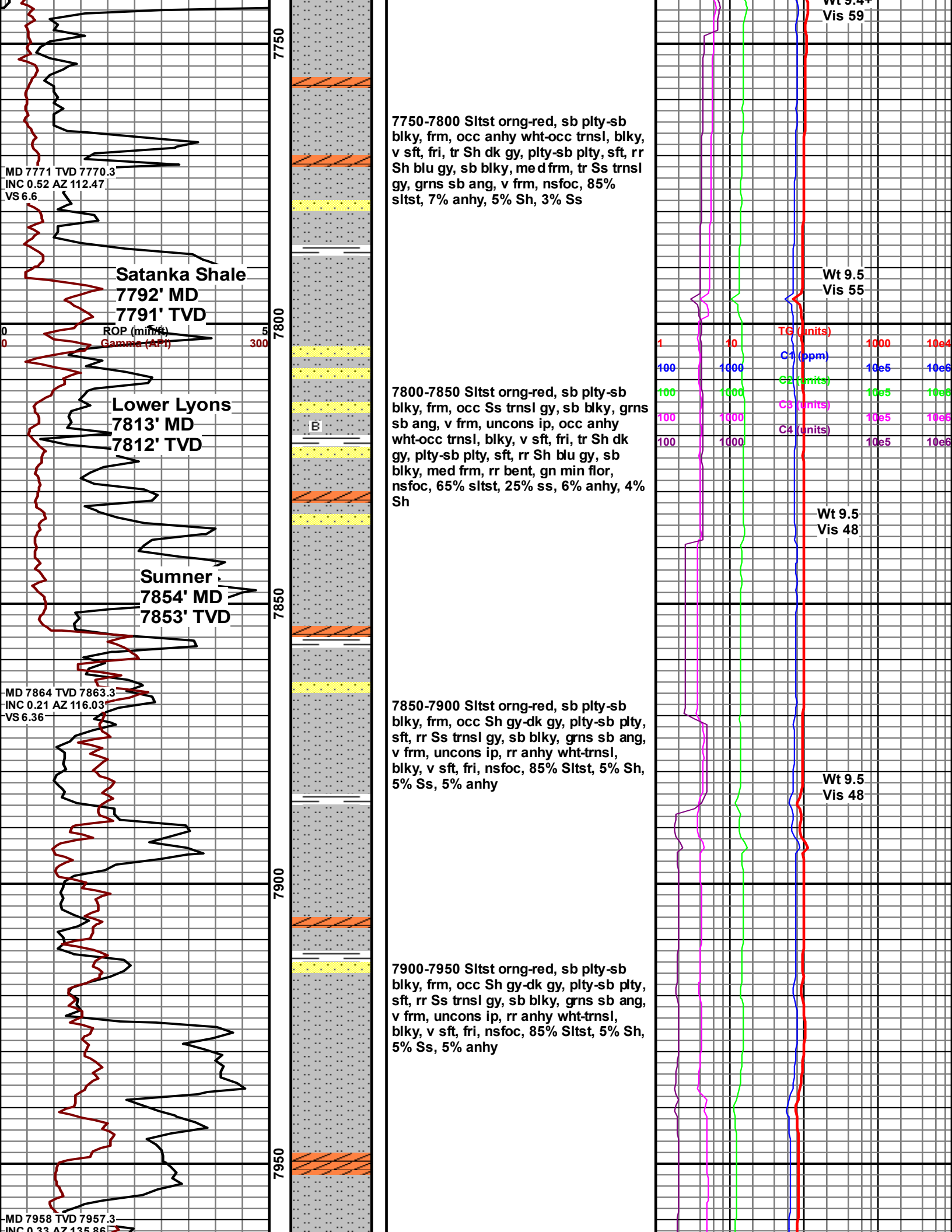

TVD
MD 6653 TVD 6652.42
INC 1.09 AZ 67.64
VS 1.89
6650
6650-6700 Ss wht-off wht, vf-f gr, sb rd-sb ang, cons, non calc, occ Sltst gy, sb blky, mod hard, rr Sh gy-dk gy, sb plty-sb blky, non calc, occ bent, orng min flor, nsfoc, 70% Ss, 25% Sltst, 5% Sh
6700
Skull Creek Shale
6724' MD, 6723' TVD
6700-6750 Sltst gy, sb blky, mod hard, abnt Sh gy-dk gy, sb plty-sb blky, non calc, rr Ss wht-off wht, vf-f gr, sb rd-sb ang, cons, non calc, occ bent, orng min flor, nsfoc, 70% Sltst, 25% Sh, 5% Ss
MD 6746 TVD 6745.41
INC 0.86 AZ 65
VS 2.52
6750
6750-6800 Sltst gy, sb blky, mod hard, abnt Sh gy-dk gy, sb plty-sb blky, non calc, occ bent, orng min flor, nsfoc, 60% Sltst, 40% Sh
6800
0
ROP (min/ft)
5
0
Gamma (API)
300
TG (units)
1
10
100
1000
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6
6800-6850 Sltst gy, sb blky, mod hard, abnt Sh gy-dk gy, sb plty-sb blky, non calc, rr inoc, occ orng bent, orng min flor, nsfoc, 50% Sltst, 50% Sh
MD 6839 TVD 6838.4
INC 1.16 AZ 74.26
VS 3.07
6850
Lakota
Wt 9.7
Vis 38

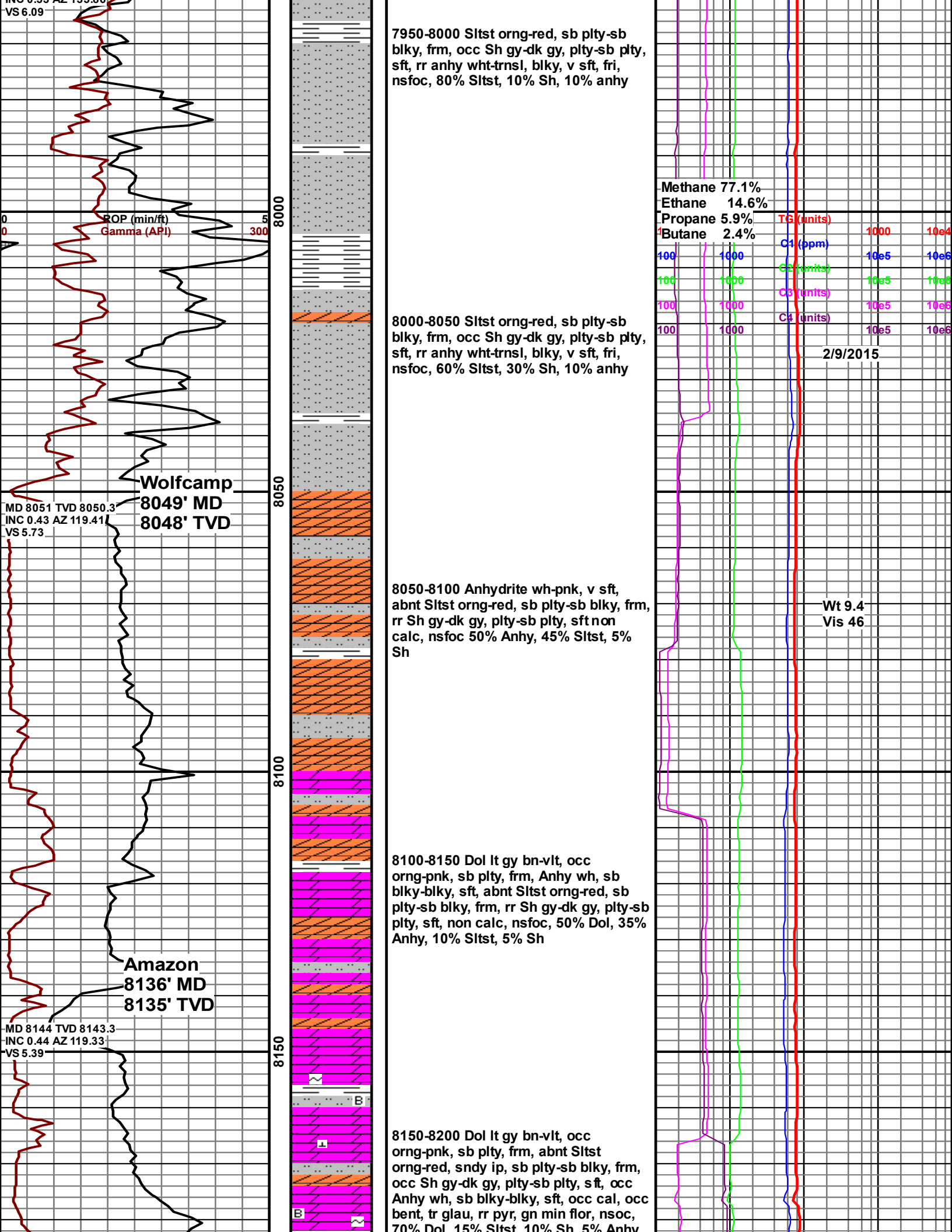

6868' MD
6867' TVD
MD 6932 TVD 6931.37
INC 1.37 AZ 67.98
VS 3.74
Morrison
7002' MD
7001' TVD
0
ROP (min/ft)
5
0
Gamma (API)
300
MD 7026 TVD 7025.36
INC 0.63 AZ 54.67
VS 4.46
6900
6950
7000
7050
B
P
6850-6900 Ss wht-lt gy, sb plty-sb blky, v frm, Sltst dk gy, sb plty, frm, non calc, tr pyr, tr bn bent, orng min flor, nsfoc, 85% Ss, 15% Sltst
TOH at 6891' MD, 06:40 on 2/7/2015 for new bit, resumed drilling at 14:27
6900-6950 Ss wht-lt gy, sb plty-sb blky, v frm, Sltst dk gy-bk, sb plty, frm, sl calc, occ Anhydr br wht, sb blky, sft, tr pyr, tr bn bent, orng min flor, nsfoc, 90% Ss, 5% Sltst, 5% Anhydr
6950-7000 Ss lt gy, uncons, sb rnd, f grn, Sltst dk gy-bk, sb plty, frm, sl calc, tr Anhydr br wht, occ pyr, rr bn bent, orng min flor, nsfoc, 80% Ss, 20% Slts
7000-7050 Ss lt gy, uncons, sb rnd, f grn, tr Sltst dk gy-bk, sb plty, frm, sl calc, rr Anhydr br wht, nsfoc, 80% Ss, 20% Slts
7050-7100 Ss lt gy, uncons, sb rnd, f grn, tr Sltst dk gy-bk, sb plty, frm, sl calc, occ Anhydr br wht, sft, nsfoc, 80% Ss, 10% Slts, 10% Anhyd
Methane 78.4%
Ethane 11.8%
Propane 7.7%
Butane 2.2%
TG (units)
C1 (ppm)
C2 (units)
C3 (units)
C4 (units)
100
1000
10e4
10e5
10e6

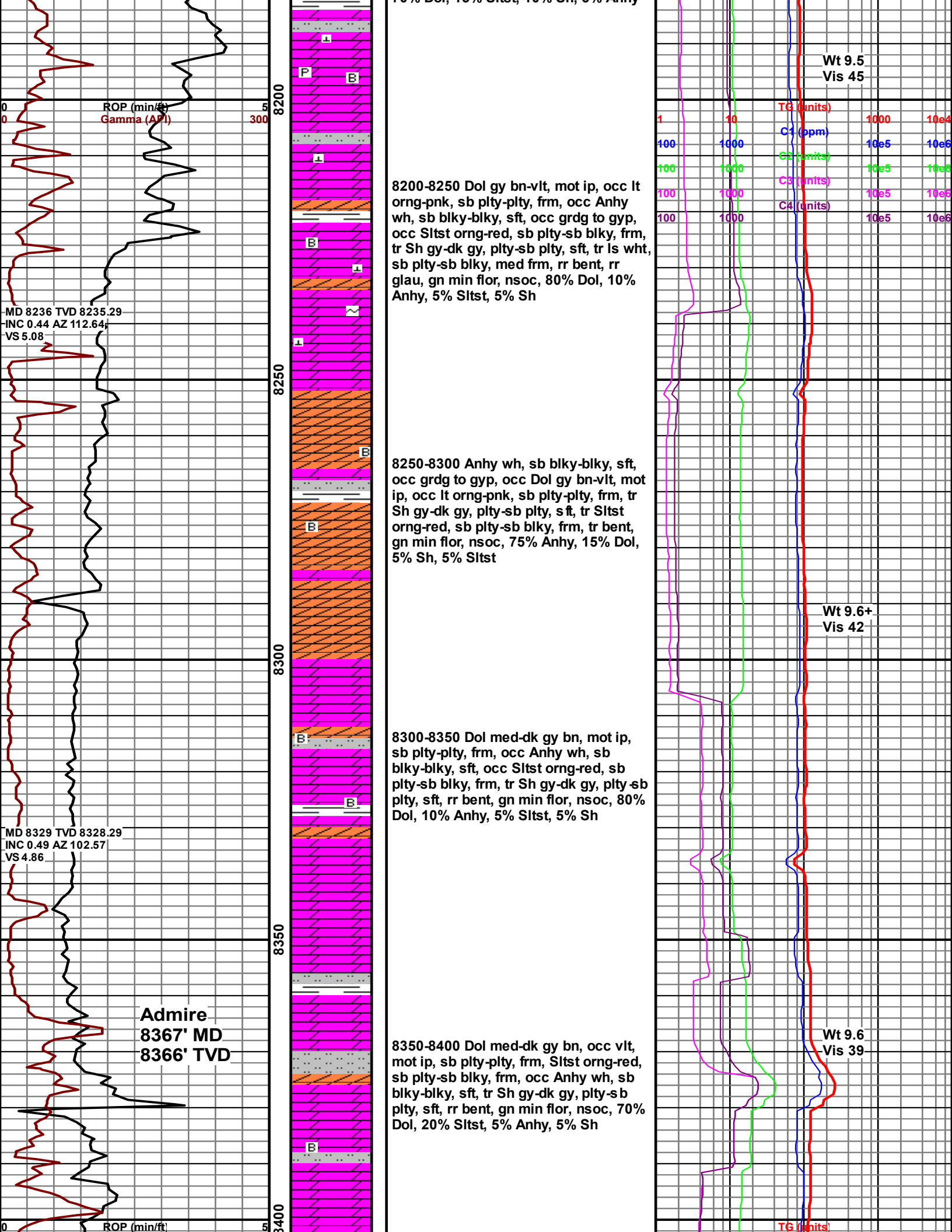

MD 7119 TVD 7118.35
INC 0.56 AZ 51.83
VS 5.04
MD 7212 TVD 7211.35
INC 0.6 AZ 65.39
VS 5.52
Entrada Top
7206' MD
7205' TVD
ROP (n
Gamma
0
0
5
300
7100
7150
7200
7250
7300
7100-7150 Sh med-lt gy-grn, sft-sl frm, plty-splty, v calc, rr sltst dk gy-brn, sb blky, frm, nsfoc, 90% sh, 10% sltst
7150-7200 Sh med-lt gy-grn-brn-red, sft-sl frm, plty-splty, v calc, grdg to arg ls ip, rr sltst gy-brn, sb blky, frm, nsfoc, 90% sh, 10% sltst
7200-7250 Sh med-lt gy-grn brn-red, sft-sl frm, plty-splty, v calc, grdg to arg ls ip, occ Sltst orng-red-dk gy, sb blky-blky, frm, nsfoc, 70% sh, 30% sltst
7250-7300 Ss wht-tan-gy, frm, ang-sb rd, vf gr, rr sh lt-dk gy, plty-sb ang, slt ip, rr anhy wt, blky, sft, nsfoc, 80% Ss, 10% Sh, 10% anhy
Wt 9.4
Vis 41
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6

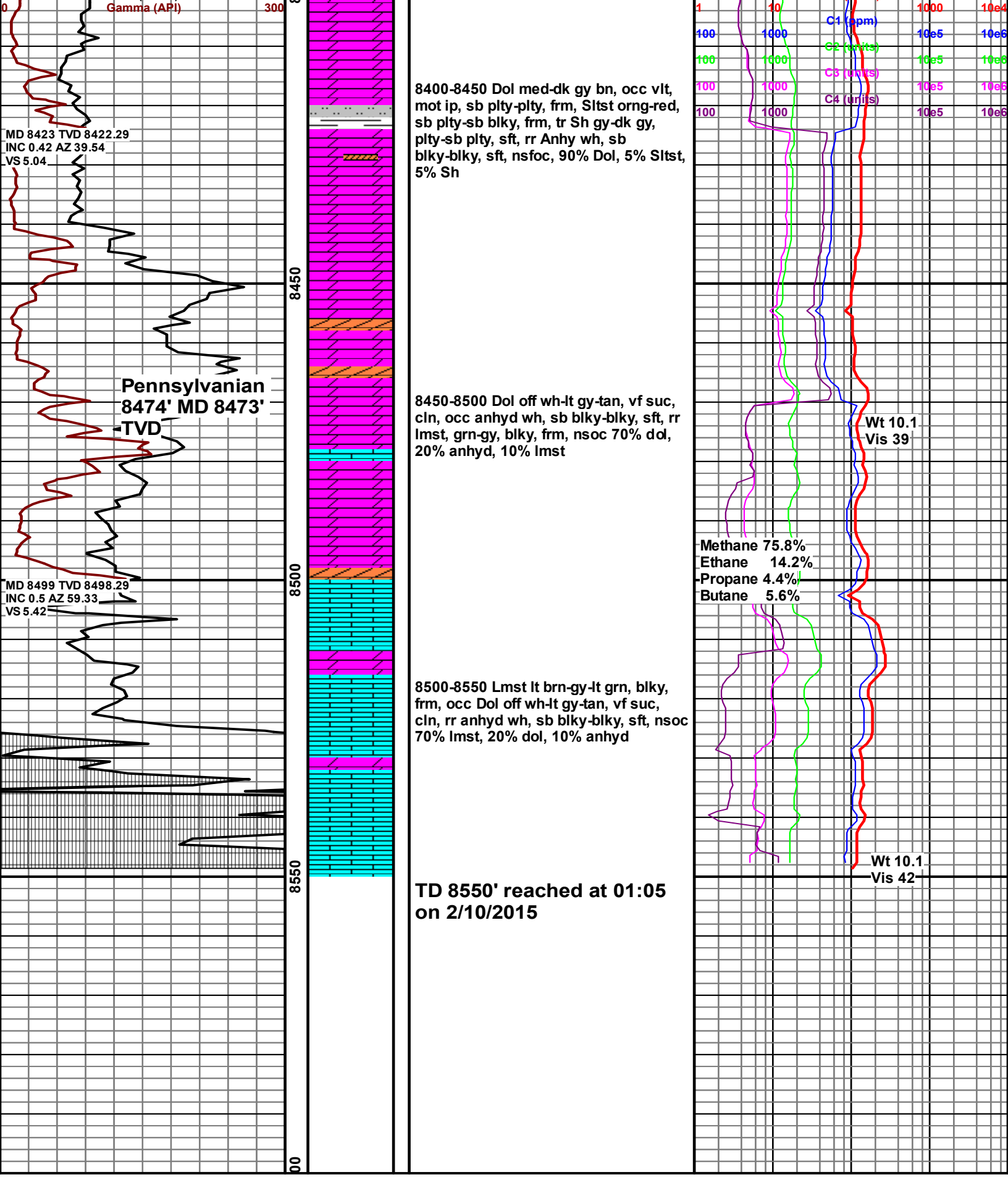

MD 7305 TVD 7304.34
INC 0.75 AZ 67.72
VS 5.96
7350
7400
7450
7500
2/8/2015
7300-7350 Sltst orng-red, sb blky, v sft, arg, non calc, grdg to sh, rr Sh dk gy, blky, slty, non calc, rr anhy, nsfoc 90% sltst 10% sh
7350-7400 Sltst orng-red, sb blky, v sft, arg, non calc, grdg to sh, rr Sh dk gy, blky, slty, non calc, rr anhy, nsfoc 90% sltst 10% sh
MD 7399 TVD 7398.33
INC 0.66 AZ 79.26
VS 6.29
(min/ft)
Gamma (API)
5
300
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6
7400-7450 Sltst orng-red, sb blky, v sft, arg, non calc, grdg to sh, rr Sh dk gy, blky, slty, non calc, rr anhy, nsfoc 90% sltst 10% sh
Wt 9.3+
Vis 58
MD 7492 TVD 7491.33
INC 0.74 AZ 76.17
VS 6.54
Methane 67.4%
Ethane 25.9%
Propane 3.9%
Butane 2.8%
Wt 9.4
Vis 72
Little Medicine
7507' MD
7506' TVD
Freezeout Shale
7516' MD
7450-7500 Sltst orng-red-dk gy, sb blky-blky, frm, sh dk gy, sft, plty-sb plty, rr Sh gy, frm, sb rd, rr anhy, wt, sft, nsfoc, 95% sltst, 5% sh
7500-7550 Sltst orng-red-dk gy, sb


7515' TVD
Ervay Evaporite
7552' MD
7551' TVD
MD 7585 TVD 7584.32
INC 0.83 AZ 86.45
VS 6.72
0
ROP (min/ft)
5
0
Gamma (API)
300
Opeche Shale
7654' MD
7653' TVD
MD 7678 TVD 7677.31
INC 0.73 AZ 90.23
VS 6.76
Blaine Evaporite
7694' MD
7683' TVD
Upper Lyons
7730' MD
7729' TVD
7550
7600
7650
7700
B
B
blky-blky, frm, sh dk gy, sft, plty-sb plty, rr Sh gy, frm, sb rd, tr anhy, wt, sft, nsfoc, 90% sltst, 5% sh, 5% anhy
7550-7600 Sltst orng-red, sb plty-sb blky, frm, abnt anhy wht, blky, v sft, fri, Sh dk gy, plty-sb plty, sft, rr Sh med gy, occ glau-rich gn, sb blky, med frm, nsfoc, 60% sltst, 25% anhy, 15% Sh
Wt 9.4+
Vis 65
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6
7600-7650 Sltst orng-red, sb plty-sb blky, frm, abnt anhy wht-occ trnsl, blky, v sft, fri, Sh dk gy, plty-sb plty, sft, rr Sh med gy, sb blky, med frm, rr gyp, nsfoc, 75% sltst, 15% anhy, 10% Sh
Wt 9.4+
Vis 64
7650-7700 Sltst orng-red, sb plty, frm, abnt anhy wht-occ trnsl, blky, v sft, fri, Sh dk gy, plty-sb plty, sft, rr Sh med gy, sb blky, med frm, nsfoc, 90% sltst, 5% anhy, 5% Sh
Wt 9.4+
Vis 68
7700-7750 Sltst orng-red, sb plty, frm, occ Ss trnsl gy, uncons, sb rnd, abnt anhy wht-occ trnsl, blky, v sft, fri, Sh dk gy, plty-sb plty, sft, rr Sh med gy, sb blky, med frm, tr bent, gn min flor, nsfoc, 75% sltst, 10% Ss, 8% anhy, 7% Sh
Wt 9.4
Vis 64


MD 7771 TVD 7770.3
INC 0.52 AZ 112.47
VS 6.6
Satanka Shale
7792' MD
7791' TVD
0
ROP (min/ft)
5
0
Gamma (API)
300
Lower Lyons
7813' MD
7812' TVD
Sumner
7854' MD
7853' TVD
MD 7864 TVD 7863.3
INC 0.21 AZ 116.03
VS 6.36
MD 7958 TVD 7957.3
7750
7800
7850
7900
7950
B
7750-7800 Sltst orng-red, sb plty-sb blky, frm, occ anhy wht-occ trnsl, blky, v sft, fri, tr Sh dk gy, plty-sb plty, sft, rr Sh blu gy, sb blky, med frm, tr Ss trnsl gy, grns sb ang, v frm, nsfoc, 85% sltst, 7% anhy, 5% Sh, 3% Ss
Wt 9.4+
Vis 59
Wt 9.5
Vis 55
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6
7800-7850 Sltst orng-red, sb plty-sb blky, frm, occ Ss trnsl gy, sb blky, grns sb ang, v frm, uncons ip, occ anhy wht-occ trnsl, blky, v sft, fri, tr Sh dk gy, plty-sb plty, sft, rr Sh blu gy, sb blky, med frm, rr bent, gn min flor, nsfoc, 65% sltst, 25% ss, 6% anhy, 4% Sh
Wt 9.5
Vis 48
7850-7900 Sltst orng-red, sb plty-sb blky, frm, occ Sh gy-dk gy, plty-sb plty, sft, rr Ss trnsl gy, sb blky, grns sb ang, v frm, uncons ip, rr anhy wht-trnsl, blky, v sft, fri, nsfoc, 85% Sltst, 5% Sh, 5% Ss, 5% anhy
Wt 9.5
Vis 48
7900-7950 Sltst orng-red, sb plty-sb blky, frm, occ Sh gy-dk gy, plty-sb plty, sft, rr Ss trnsl gy, sb blky, grns sb ang, v frm, uncons ip, rr anhy wht-trnsl, blky, v sft, fri, nsfoc, 85% Sltst, 5% Sh, 5% Ss, 5% anhy


VS 6.09
0
0
ROP (min/ft)
Gamma (API)
5
300
8000
8050
8100
8150
Wolfcamp
8049' MD
8048' TVD
MD 8051 TVD 8050.3
INC 0.43 AZ 119.41
VS 5.73
Amazon
8136' MD
8135' TVD
MD 8144 TVD 8143.3
INC 0.44 AZ 119.33
VS 5.39
7950-8000 Sltst orng-red, sb plty-sb blky, frm, occ Sh gy-dk gy, plty-sb plty, sft, rr anhy wht-trnsl, blky, v sft, fri, nsfoc, 80% Sltst, 10% Sh, 10% anhy
8000-8050 Sltst orng-red, sb plty-sb blky, frm, occ Sh gy-dk gy, plty-sb plty, sft, rr anhy wht-trnsl, blky, v sft, fri, nsfoc, 60% Sltst, 30% Sh, 10% anhy
8050-8100 Anhydrite wh-pnk, v sft, abnt Sltst orng-red, sb plty-sb blky, frm, rr Sh gy-dk gy, plty-sb plty, sft non calc, nsfoc 50% Anhy, 45% Sltst, 5% Sh
8100-8150 Dol lt gy bn-vlt, occ orng-pnk, sb plty, frm, Anhy wh, sb blky-blky, sft, abnt Sltst orng-red, sb plty-sb blky, frm, rr Sh gy-dk gy, plty-sb plty, sft, non calc, nsfoc, 50% Dol, 35% Anhy, 10% Sltst, 5% Sh
8150-8200 Dol lt gy bn-vlt, occ orng-pnk, sb plty, frm, abnt Sltst orng-red, sndy ip, sb plty-sb blky, frm, occ Sh gy-dk gy, plty-sb plty, sft, occ Anhy wh, sb blky-blky, sft, occ cal, occ bent, tr glau, rr pyr, gn min flor, nsoc, 70% Dol, 15% Sltst, 10% Sh, 5% Anhy
Methane 77.1%
Ethane 14.6%
Propane 5.9%
Butane 2.4%
TG (units)
C1 (ppm)
C2 (units)
C3 (units)
C4 (units)
100
1000
10e4
10e5
10e6
2/9/2015
Wt 9.4
Vis 46


0
ROP (min/ft)
5
0
Gamma (API)
300
MD 8236 TVD 8235.29
INC 0.44 AZ 112.64
VS 5.08
MD 8329 TVD 8328.29
INC 0.49 AZ 102.57
VS 4.86
Admire
8367' MD
8366' TVD
0
ROP (min/ft)
5
8200
8250
8300
8350
8400
8200-8250 Dol gy bn-vlt, mot ip, occ lt orng-pnk, sb plty-plty, frm, occ Anhy wh, sb blky-blky, sft, occ grdg to gyp, occ Sltst orng-red, sb plty-sb blky, frm, tr Sh gy-dk gy, plty-sb plty, sft, tr ls wht, sb plty-sb blky, med frm, rr bent, rr glau, gn min flor, nsoc, 80% Dol, 10% Anhy, 5% Sltst, 5% Sh
8250-8300 Anhy wh, sb blky-blky, sft, occ grdg to gyp, occ Dol gy bn-vlt, mot ip, occ lt orng-pnk, sb plty-plty, frm, tr Sh gy-dk gy, plty-sb plty, sft, tr Sltst orng-red, sb plty-sb blky, frm, tr bent, gn min flor, nsoc, 75% Anhy, 15% Dol, 5% Sh, 5% Sltst
8300-8350 Dol med-dk gy bn, mot ip, sb plty-plty, frm, occ Anhy wh, sb blky-blky, sft, occ Sltst orng-red, sb plty-sb blky, frm, tr Sh gy-dk gy, plty-sb plty, sft, rr bent, gn min flor, nsoc, 80% Dol, 10% Anhy, 5% Sltst, 5% Sh
8350-8400 Dol med-dk gy bn, occ vlt, mot ip, sb plty-plty, frm, Sltst orng-red, sb plty-sb blky, frm, occ Anhy wh, sb blky-blky, sft, tr Sh gy-dk gy, plty-sb plty, sft, rr bent, gn min flor, nsoc, 70% Dol, 20% Sltst, 5% Anhy, 5% Sh
Wt 9.5
Vis 45
TG (units)
1
10
1000
10e4
C1 (ppm)
100
1000
10e5
10e6
C2 (units)
100
1000
10e5
10e6
C3 (units)
100
1000
10e5
10e6
C4 (units)
100
1000
10e5
10e6
Wt 9.6+
Vis 42
Wt 9.6
Vis 39
TG (units)


Gamma (API)
0
300
MD 8423 TVD 8422.29
INC 0.42 AZ 39.54
VS 5.04
Pennsylvanian
8474' MD 8473'
-TVD
MD 8499 TVD 8498.29
INC 0.5 AZ 59.33
VS 5.42
8450
8500
8550
8400-8450 Dol med-dk gy bn, occ vlt, mot ip, sb plty-plty, frm, Sltst orng-red, sb plty-sb blky, frm, tr Sh gy-dk gy, plty-sb plty, sft, rr Anhy wh, sb blky-blky, sft, nsfoc, 90% Dol, 5% Sltst, 5% Sh
8450-8500 Dol off wh-lt gy-tan, vf suc, cln, occ anhyd wh, sb blky-blky, sft, rr lmst, grn-gy, blky, frm, nsoc 70% dol, 20% anhyd, 10% lmst
8500-8550 Lmst lt brn-gy-lt grn, blky, frm, occ Dol off wh-lt gy-tan, vf suc, cln, rr anhyd wh, sb blky-blky, sft, nsoc 70% lmst, 20% dol, 10% anhyd
TD 8550' reached at 01:05 on 2/10/2015
1
10
100
1000
10e4
10e5
10e6
C1 (ppm)
C2 (units)
C3 (units)
C4 (units)
Wt 10.1
Vis 39
Methane 75.8%
Ethane 14.2%
Propane 4.4%
Butane 5.6%
Wt 10.1
Vis 42