

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Waste Management 2Y-441

Location SESE SEC 2, T2N, R64W, 6TH

State COLORADO

Country USA

API Number 05-123-36965-0000

Region DJ BASIN

Spud Date 9/3/2013

Surface Coordinates 230' FSL x 1016' FEL

Bottom Hole Coordinates 500' FNL x 465' FEL

County WELD

Rig Number ENSIGN 119

Field WATTENBERG

Drilling Completed 9/13/2013

Ground Elevation 4893'

K.B. Elevation 4916'

Logged Interval 6176' To 11403'

Total Depth 11403'

Formation SHANNON - NIOBRARA B

Type of Drilling Fluid LSND - WATER POLY MUD

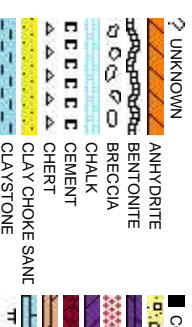
Company PDC ENERGY

Address 1775 Sherman
Denver, Colorado

Name Brian Hoffman

Company PDC Energy

Address 1775 Sherman
Denver, Colorado



Operator

Street, #3000
do 80203

Geologist

Street, #3000
do 80203

Rock Types

CONGLOMERATE

DOLomite

GRANITE

GYPSUM

IGNEOUS

SIDERITE or LIMONITE

LIMESTONE

MARLSTONE

METAMORPHIC

NO SAMPLE

SALT

SANDSTONE

SALT-PEPPER SANC

SHALE

SHALE COLORED

SHALE GRAY

SHALY SANDSTONE

SHALY SILTSTONE

SILTY SHALE

SILTSTONE

TILL

TUFF

WELDED TUFF

Accessories

F FOSSIL

GASTROPOD

OOLITE

AMPHIROA

BELEMITE

BIOCLASTIC

BRACHIOPOD

BRYOZOA

CEPHALOPOD

CORAL

CRINOID

ECHINOID

FISH

FORAMINIFERA

ARGILLACEOUS

ARGILLITE GRAIN

B BENTONITE

BITUMENOUS SUBSTANCE

BRECCIA FRAGMENTS

CALCAREOUS

CARBONACEOUS FLAKES

CHTDK

CHTLT

COAL - THIN BEDS

DOLOMITIC

FELDSPAR

FERRUGINOUS PELLET

FERRUGINOUS

SILICEOUS

SILTY

SILTSTONE STRINGER

GLAUCONITE

GYPSIFEROUS

HEAVY MINERAL

INOCERAMUS

KAOLIN

MARLSTONE

MINERAL CRYSTALS

NODULES

PHOSPHATE PELLET:

PYRITE

SALT CAST

SANDY

TUFFACEOUS

ANHYDRITE STRINGER

BENTONITE STRINGER

COAL STRINGER

DOLOMITE STRINGER

GYPSUM STRINGER

LIMESTONE STRINGER

MARLSTONE (CALC) STRG

MARLSTONE (DOL) STRG

SANDSTONE STRINGER

Other Symbols

MOLDIC

ORGANIC

DEAD

EVEN

QUESTIONABLE

SPOTTED STAINING

FAULT

FORMATION TOP

GAS SHOW

MINDEPTH MN DEPTH

NORMAL FAULT

OIL SHOW

OVERTURNED STRATA

REVERSE FAULT

SIDEWALL CORE (LEFT)

SIDEWALL CORE (RIGHT)

WIRELINE TESTED - LEFT

WIRELINE TESTED - RT

ANGULAR

ROUNDED

SUBANG

SUBBRND

TEXTURES

BOUNDSTONE

CHALKY

CRYPTOXLN

E EARTHY

FN FINELYXLN

ES GRAINSTONE

L LITHOGRAPHIC

MX MICROXLN

MS MUDSTONE

PS PACKSTONE

WS WACKSTONE

Porosity

E EARTHY

F FRACTURE

INTERCRYSTALLINE

INTEROOLITIC

CONNECTION (LEFT)

CONNECTION (RIGHT)

CONNECTION GAS

CORE - LOST

CORE - RECOVERED

DST INTERVAL

Engineering

BIT

CONNECTION (LEFT)

CONNECTION (RIGHT)

CONNECTION GAS

SIDEWALL CORE (LEFT)

SIDEWALL CORE (RIGHT)

SLIDE

SURVEY

TRIP GAS

Rounding

ANGULAR

ROUNDED

SUBANG

SUBBRND

TEXTURES

BOUNDSTONE

CHALKY

CRYPTOXLN

Sorting

MODERATE

POOR

WELL

Slide/Rotate

ROP
ROF
GAMMA

Total Gas & Chromatograph
GAS
C1
C2
C3
C4
CO2

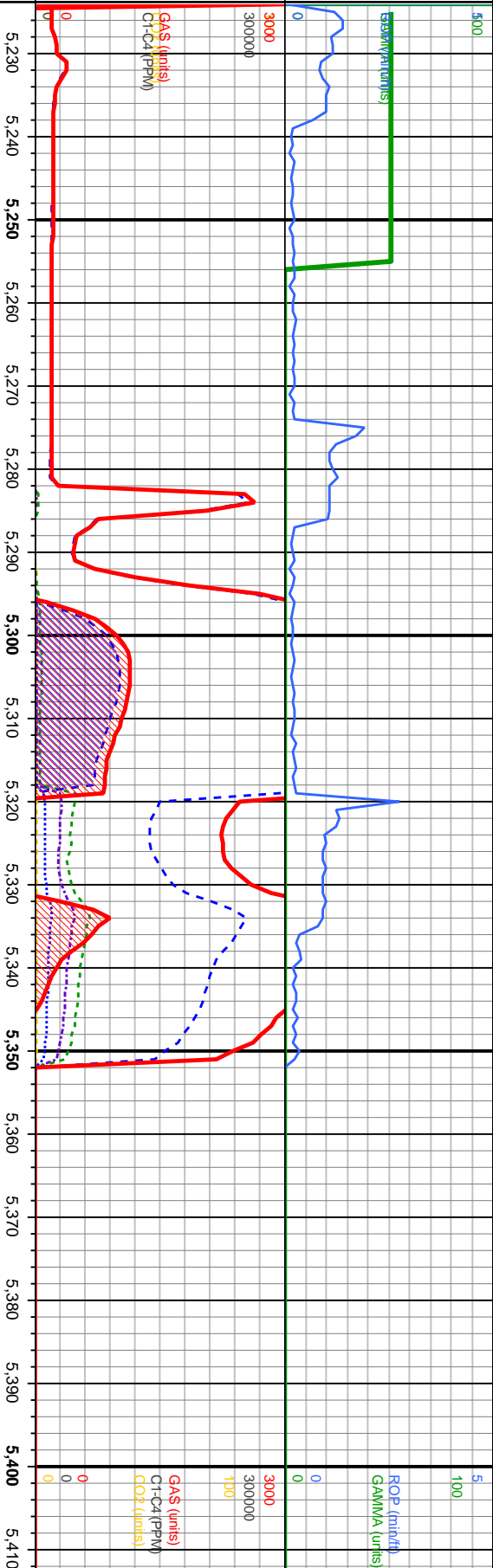
Depth Labels

% Lith

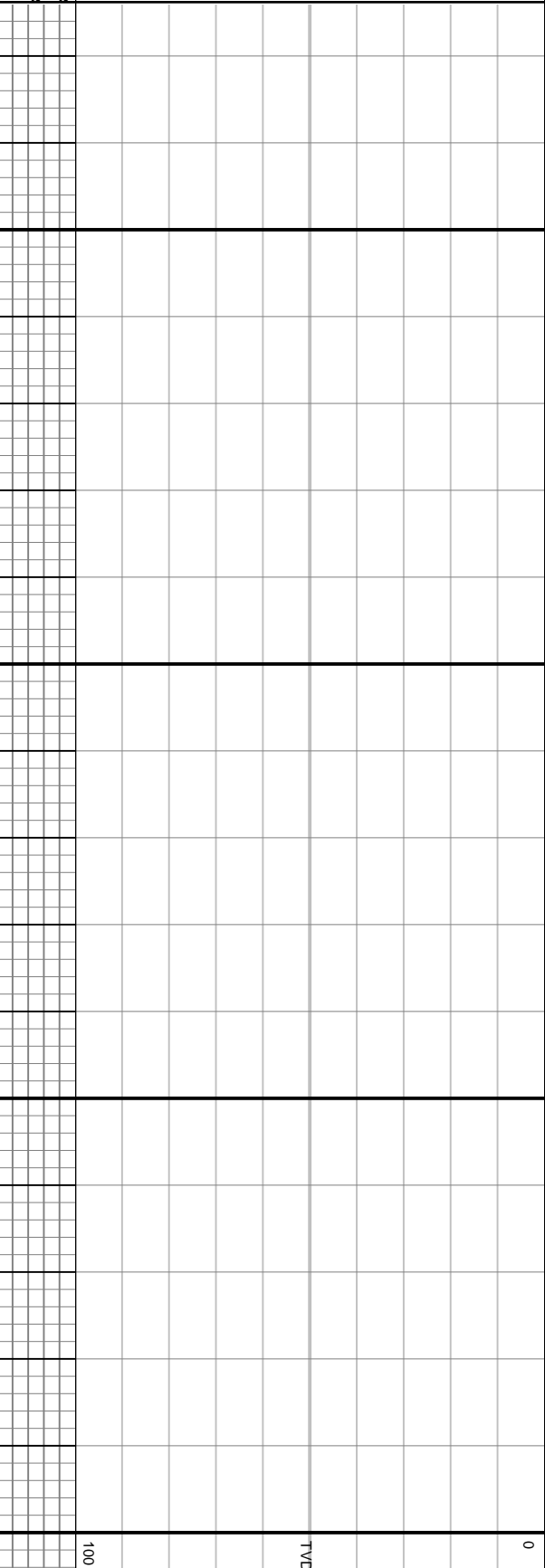
Well Bore
TVD

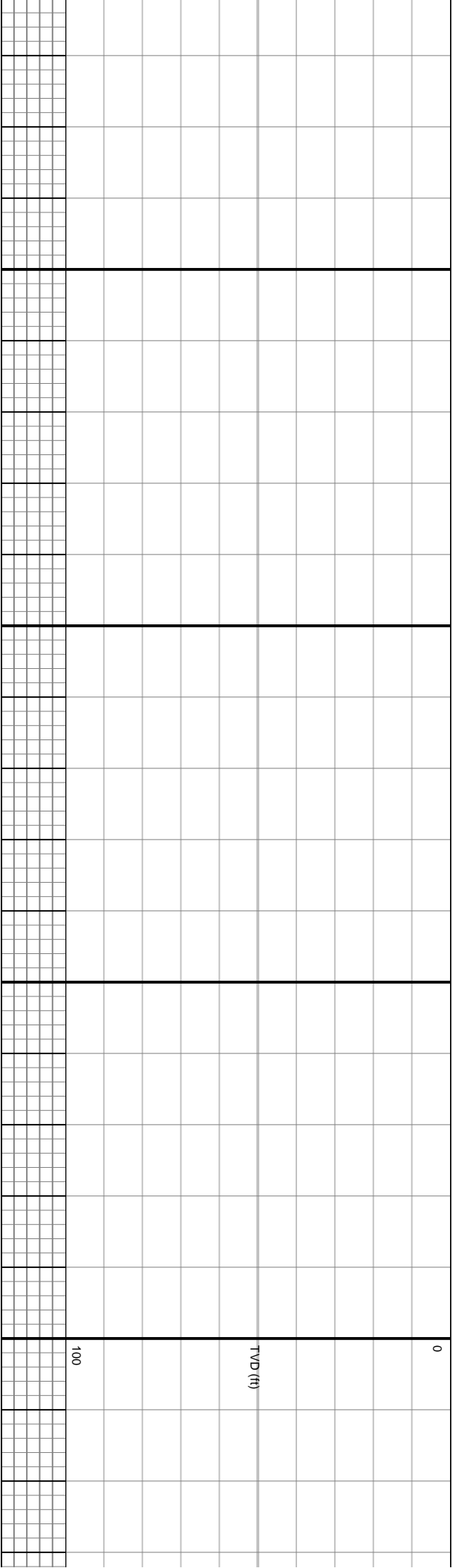
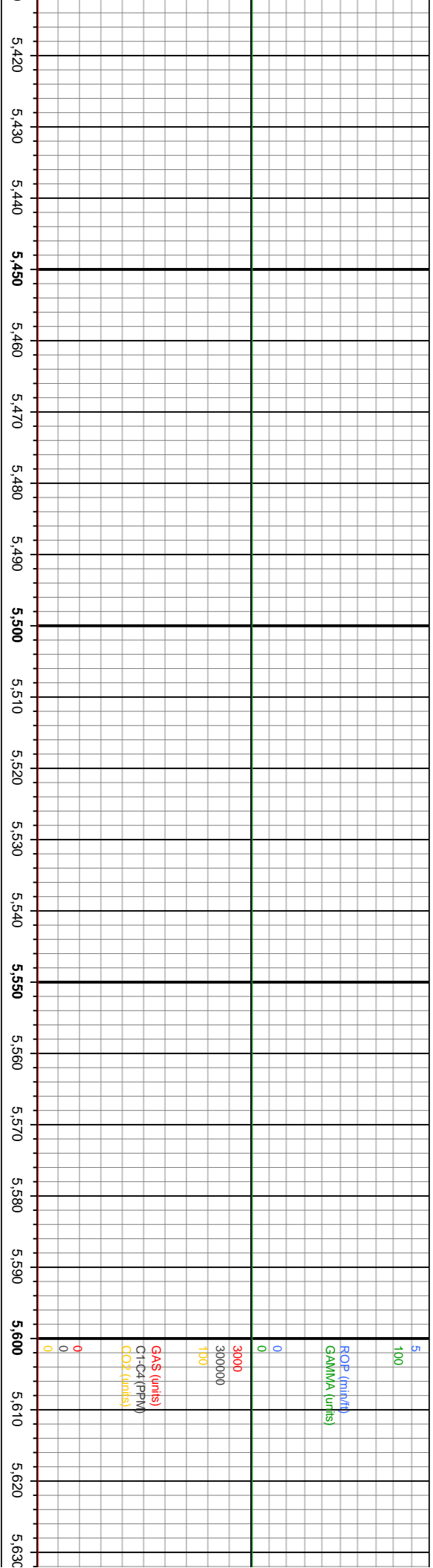
Oil Show

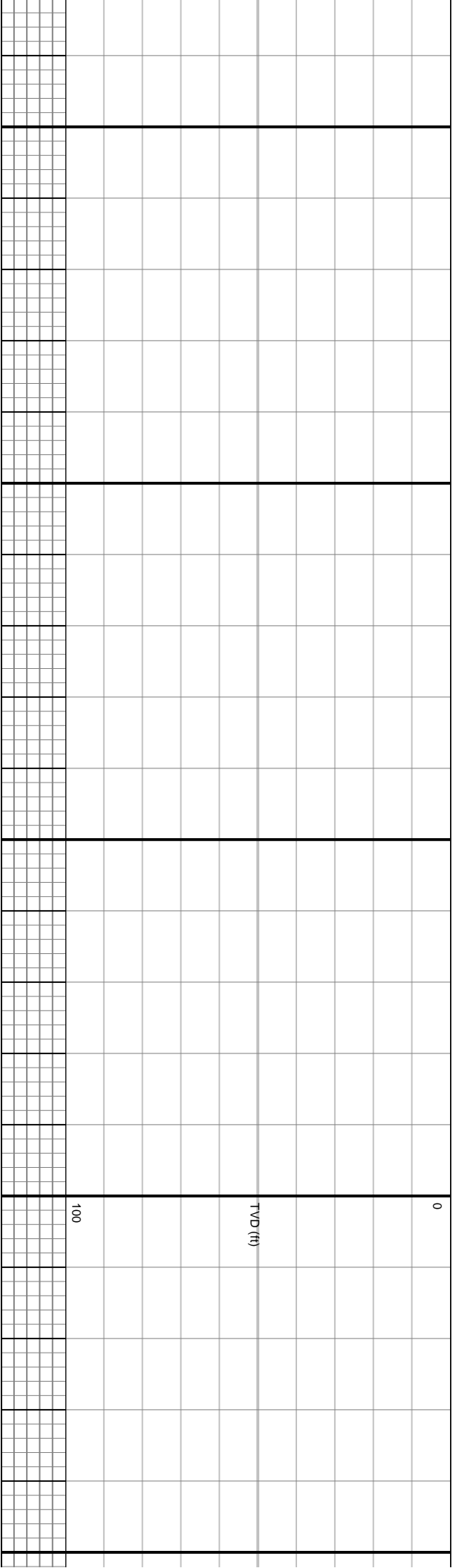
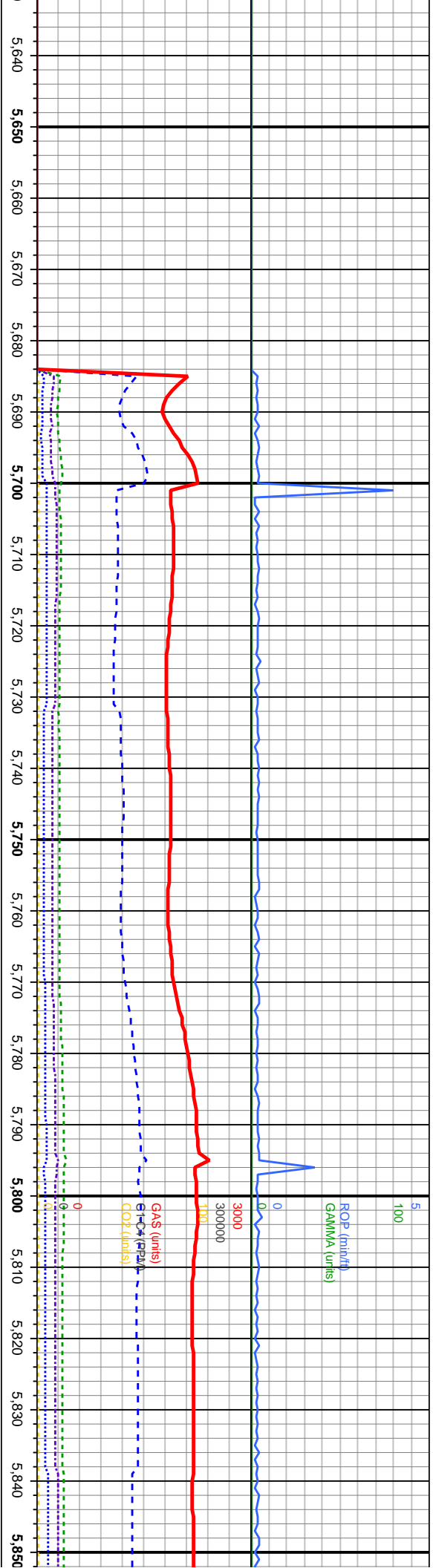
Images

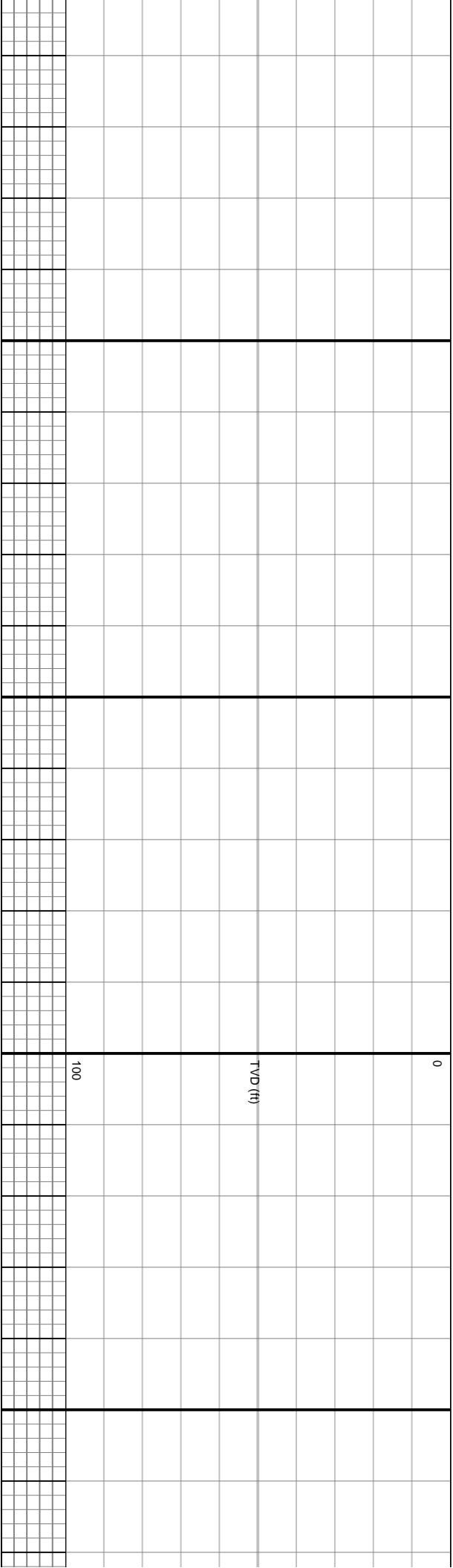
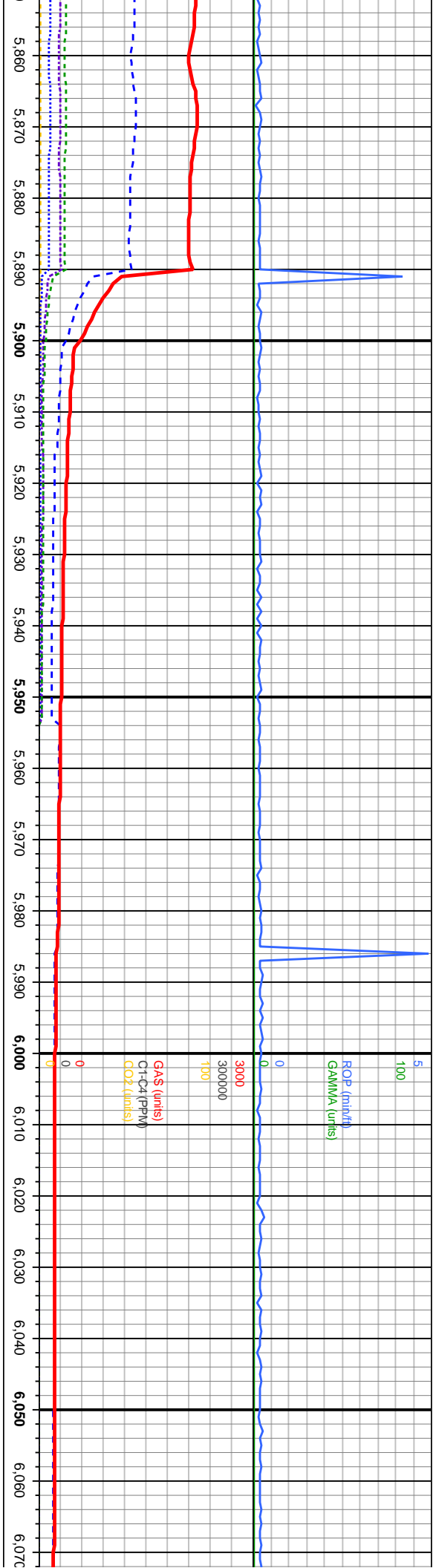


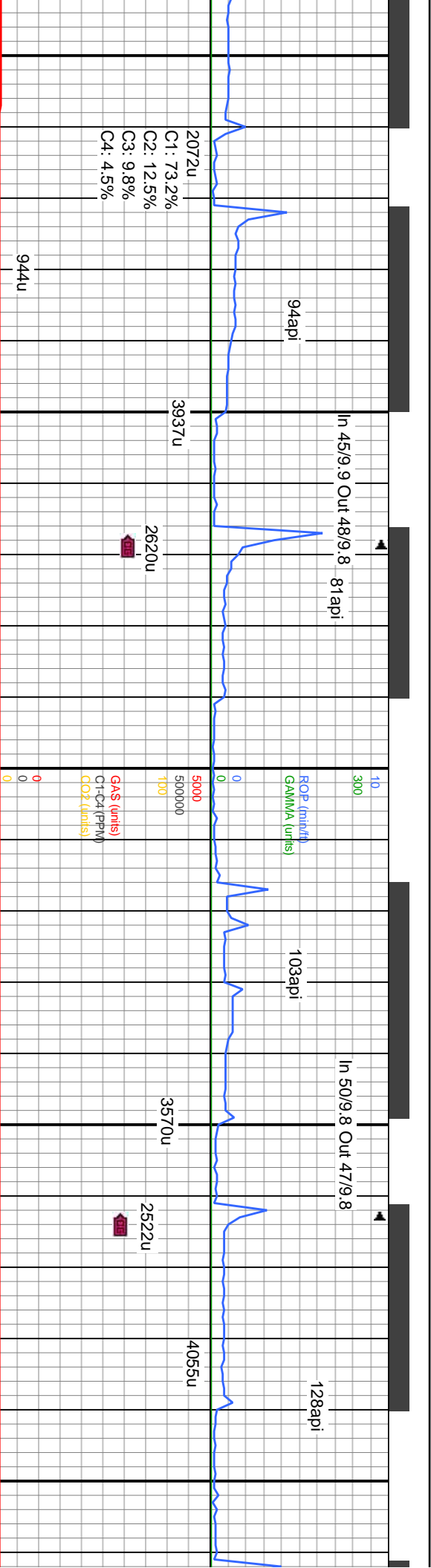
TR
P
FR
G
E





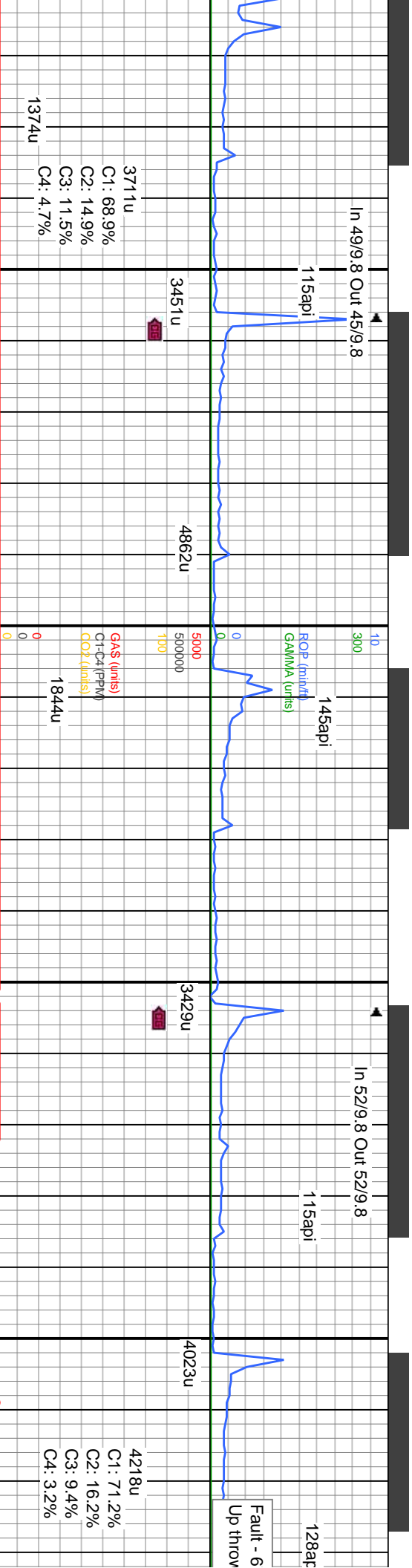






MD: 6,319 TVD: 6,286.4 Inclination: 10.4 ° Azimuth: 11.8 ° VS: -127.51 '		MD: 6,366 TVD: 6,332.39 Inclination: 13.4 ° Azimuth: 10.5 ° VS: -117.86 '		MD: 6,414 TVD: 6,378.96 Inclination: 14.7 ° Azimuth: 359.3 ° VS: -106.26 '		MD: 6,461 TVD: 6,423.89 Inclination: 19.3 ° Azimuth: 358.8 ° VS: -92.62 '		MD: 6,500 TVD: 6,440 Inclination: 19.3 ° Azimuth: 358.8 ° VS: -92.62 '	
SLTY SH: med-It gy, sft, sb pty - pty, silty-grty tex, non calc, tr pyr, grdg to SLTST: It gy-med gy, sft - sl firm, sb blkly, some pty, silty, sl calc, SHY SS: It gy-offwht, vfg, ang-sb rd, w srt, mod w cons, some sl fri, sl calc cm, rr - tr pyr, no mnrl flr, fnt It yel cut, no stn		SLTY SH: med-It gy, sft, sb pty - pty, silty-grty tex, non calc, tr pyr, grdg to SLTST: It gy-med gy, sft - sl firm, sb blkly, some pty, silty, sl calc, SHY SS: It gy-offwht, vfg, ang-sb rd, mod w - w srt, mod w cons, some sl fri, sl calc cm, rr - tr pyr, no mnrl flr, fnt It yel cut, no stn		SLTY SH: med-It gy, sft, sb pty - pty, silty-grty tex, non calc, tr pyr, grdg to SLTST: It gy-med gy, sft - sl firm, sb blkly, some pty, silty, sl calc, SHY SS: It gy-offwht, vfg, ang-sb rd, mod w - w srt, mod w cons, some sl fri, sl calc cm, rr - tr pyr, no mnrl flr, fnt It yel cut, no stn		SLTY SH: med-It gy, sft, sb pty - pty, silty-grty tex, non calc, tr pyr, grdg to SLTST: It gy-med gy, sft - sl firm, sb blkly, some pty, silty, sl calc, SHY SS: It gy-offwht, vfg, ang-sb rd, mod w - w srt, mod w cons, some sl fri, sl calc cm, rr - tr pyr, no mnrl flr, fnt It yel cut, no stn		SLTY SH: med-It gy, sft, sb pty - pty, silty-grty tex, non calc, tr pyr, grdg to SLTST: It gy-med gy, sft - sl firm, sb blkly, some pty, silty, sl calc, SHY SS: It gy-offwht, vfg, ang-sb rd, mod w - w srt, mod w cons, some sl fri, sl calc cm, rr - tr pyr, no mnrl flr, fnt It yel cut, no stn	





MD: 6,556 TVD: 6,512.11' Inclination: 24.3 ° Azimuth: 359.3 ° VS: -57.61'	MD: 6,605 TVD: 6,556.19' Inclination: 27.5 ° Azimuth: 0.3 ° VS: -36.33'	MD: 6,652 TVD: 6,597.33' Inclination: 30.3 ° Azimuth: 359.3 ° VS: -13.74'	MD: 6,700 TVD: 6,637.94' Inclination: 34.1 ° Azimuth: 358.2 ° VS: 11.63'
---	---	---	--

med-lt gy, sft, sb ply - ply, ax, non calc, tr pyr, grdg to gy-med gy, sft - sl firm, sb blk, silty, sl calc, SHY SS: lt vfg, ang-sb rd, mod w - w srt, ngs, some sl fri, sl calc cm, rr - tr mnl flr, frt lt yel cut, no stn	SLTY SH: med-lt gy, sft, sb ply - ply, silty-grty tex, non calc, tr-mod abnt diss pyr, grdg to SLTST: lt gy-med gy, sft - sl firm, sb blk, some ply, silty, sl calc, no mnl flr, frt lt yel gn cut, no stn	SLTY SH: med-lt gy, sft, sb ply - ply, silty-grty tex, non calc, tr-mod abnt diss pyr, grdg to SLTST: lt gy-med gy, sft - sl firm, sb blk, some ply, silty, sl calc, no mnl flr, frt lt yel gn cut, no stn	SLTY SH: med-lt gy, sft, sb ply - ply, silty-grty tex, non calc, tr-mod abnt diss pyr, grdg to SLTST: lt gy-med gy, sft - sl firm, sb blk, some ply, silty, sl calc, tr chk, no mnl flr, frt lt yel gn cut, no stn
---	--	--	--



Out 44/9.7

In 43/9.95 Out 44/9.7

In 44/9.9 Out 44/9.75

In 45/9.9 Out 45/9.8

107api

ROP (min/ft) 111api
GAMMA (units)

9/8/2013
[TIME DEPTH]

73api

81api

6461u

6381u

4486u

5090u

5451u

C1: 72.0%

C2: 15.4%

C3: 8.9%

C4: 3.7%

6.960 6.970 6.980 6.990 7.000 7.010 7.020 7.030 7.040 7.050 7.060 7.070 7.080 7.090 7.100 7.110 7.120 7.130 7.140 7.150 7.160 7.170



CHK: It gy crm, sft, sb blk, sb fls, rthy lstr, silty & chky tex, v calc intbd w/ MRLST: d-dk gy, blk, sft, sb blk, rthy-silty org mat, v calc, some bent, str wh fos frag, tr siltysh, tr It yel chk flr, stmg bri yel cut, It yel str

CHK: It gy crm, sft, sb blk, sb fls, rthy lstr, silty & chky tex, v calc intbd w/ MRLST: d-dk gy, blk, sft, sb blk, rthy-silty org mat, v calc, some bent, str wh fos frag, tr siltysh, tr It yel chk flr, stmg bri yel cut, It yel str

CHK: It gy crm, sft, sb blk, sb fls, sm lstr, chky- occ silty tex, v calc intbd w/ MRLST: d-dk gy, blk, sft, sb blk, rthy-silty org mat, v calc, some bent, str wh fos frag, tr siltysh, tr It yel chk flr, stmg bri yel cut, It yel str

CHK: It gy crm, sft, sb blk, sb fls, sm lstr, chky- occ silty tex, v calc intbd w/ MRLST: d-dk gy, blk, sft, sb blk, rthy-silty org mat, v calc, some bent, str wh fos frag, tr siltysh, tr It yel chk flr, stmg bri yel cut, It yel str

CHK: It gy crm, sft, sb blk, sb fls, sm lstr, chky- occ silty tex, v calc intbd w/ MRLST: d-dk gy, blk, sft, sb blk, rthy-silty org mat, v calc, some bent, str wh fos frag, tr siltysh, tr It yel chk flr, stmg bri yel cut, It yel str

MD: 6.985
TVD: 6.840.17
Inclination: 56.4 °
Azimuth: 0.9 °
VS: 208.58'

MD: 7.032
TVD: 6.864.62
Inclination: 60.9 °
Azimuth: 359.8 °
VS: 248.53'

MD: 7.080
TVD: 6.886.22
Inclination: 65.6 °
Azimuth: 0.5 °
VS: 291.17'

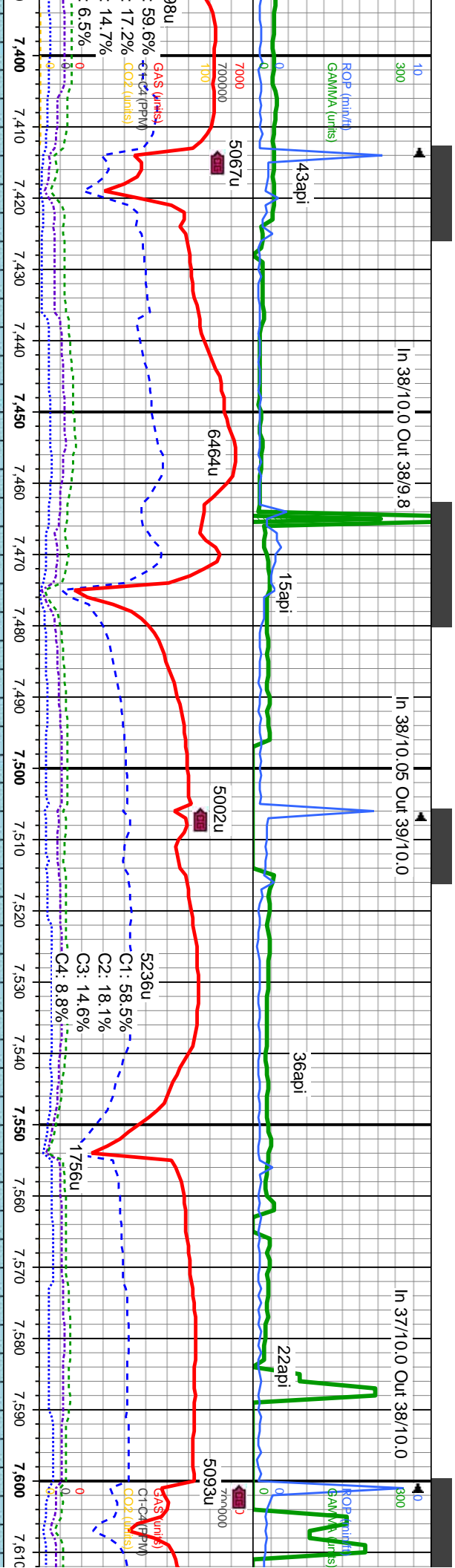
MD: 7.127
TVD: 6.904.39
Inclination: 68.9 °
Azimuth: 359.8 °
VS: 334.3'

MD: 7.127
TVD: 6.904.39
Inclination: 68.9 °
Azimuth: 359.8 °
VS: 334.3'

LOGGER'S TOP NIOBRARA C
7.072' MD / 6.883' TVD

7200

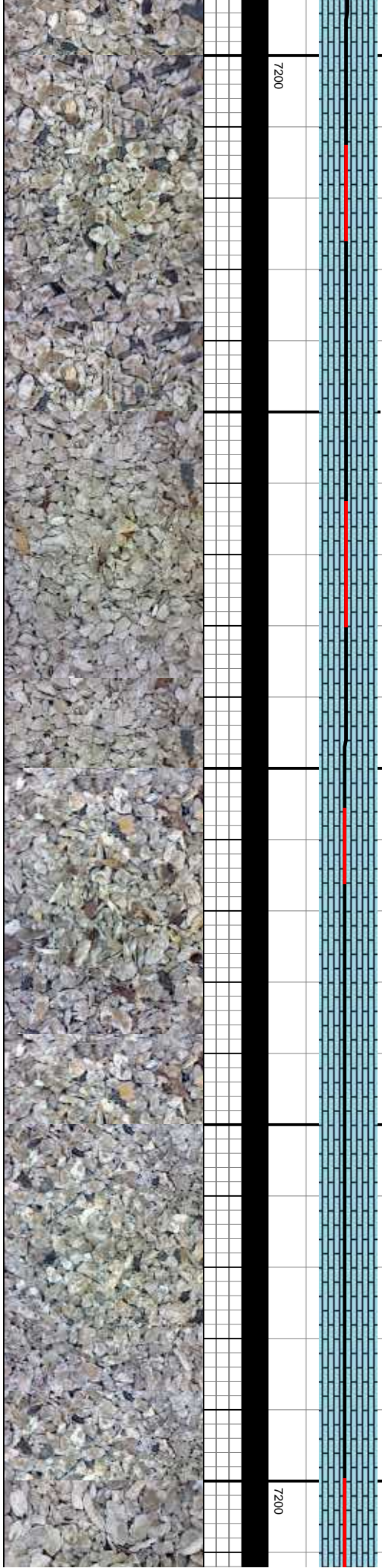




Depth (ft)	6000	6000	6000	6000	
LS:	crm- buff wh, sft- m firm, sb pty- sb blk,	LS:	crm- buff wh, sft- m firm, sb pty- sb blk,	LS:	crm- buff wh, sft- m firm, sb pty- sb blk,
dull- semi dull lstr, semi mic xl tex, v calc w/	dull- semi dull lstr, semi mic xl tex, v calc w/	dull- semi dull lstr, semi mic xl tex, v calc w/	dull- semi dull lstr, semi mic xl tex, v calc w/	dull- semi dull lstr, semi mic xl tex, v calc w/	
occ fos incl, tr lt gn min flr, sting bri yel gn	occ fos incl, tr lt gn min flr, sting bri yel gn	occ fos incl, tr lt gn min flr, sting bri yel gn	occ fos incl, tr lt gn min flr, sting bri yel gn	occ fos incl, tr lt gn min flr, sting bri yel gn	
cut, lt yel stn	cut, lt yel stn	cut, lt yel stn	cut, lt yel stn	bri yel gn c	

MD: 7.452	MD: 7.547
TVD: 6,958.73	TVD: 6,961.46
Inclination: 88.1 °	Inclination: 88.6 °
Azimuth: 2.1 °	Azimuth: 359.6 °
VS: 651.41 '	VS: 746.01 '

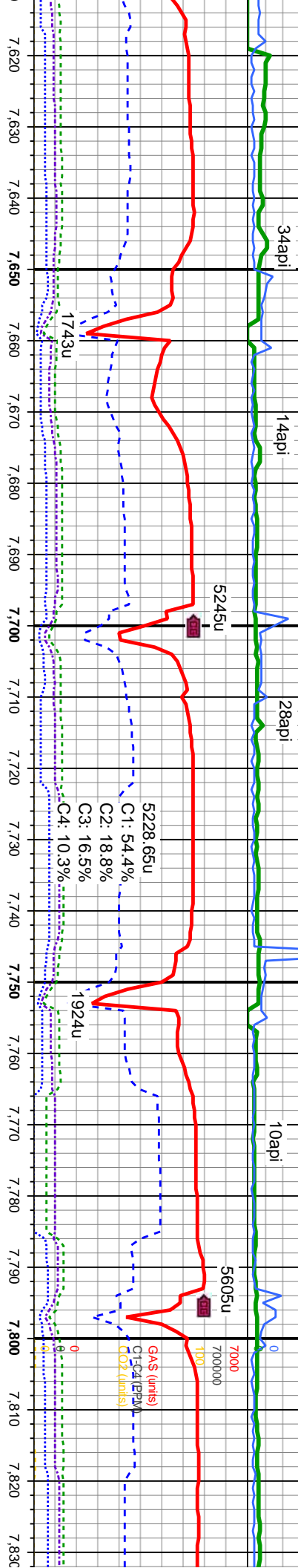
LOGGERS TOP FORT HAYES
7,414' MD / 6,956' TVD



In 39/10.0 Out 36/10.1

In 37/10.1 Out 36/10.0

ROP (m/hr)
GAMMA (uhrs)



uff wh, sft- m firm, sb ply- sb blkly,
dull- semi dull lstr, semi mic xl tex, v calc w/
l, tr silty mat, tr lt gn min flor, string
cut, lt yel stn

LS: crm- buff wh, sft- m firm, sb ply- sb blkly,
dull- semi dull lstr, semi mic xl tex, tr silty &
org mat, v calc w/ occ fos incl, tr lt gn min
flor, string bri yel gn cut, lt yel stn

LS: crm- buff wh, sft- m firm, sb ply- sb blkly,
dull- semi dull lstr, semi mic xl tex, tr silty &
org mat, v calc w/ occ fos incl, tr lt gn min
flor, string bri yel gn cut, lt yel stn

LS: crm- buff wh, sft- m firm, sb ply- sb blkly,
dull- semi dull lstr, semi mic xl tex, tr silty &
org mat, v calc w/ occ fos incl, tr lt gn min
flor, string bri yel gn cut, lt yel stn

LS: crm- buff wh, sft- m firm,
dull- semi dull lstr, semi mic x
org mat, v calc w/ occ fos incl
flor, string bri yel gn cut, lt yel

MD: 7.642
TVD: 6,961.88
Inclination: 90.9 °
Azimuth: 359.3 °
VS: 840.42 '

MD: 7.737
TVD: 6,960.88
Inclination: 90.3 °
Azimuth: 357.5 °
VS: 934.62 '

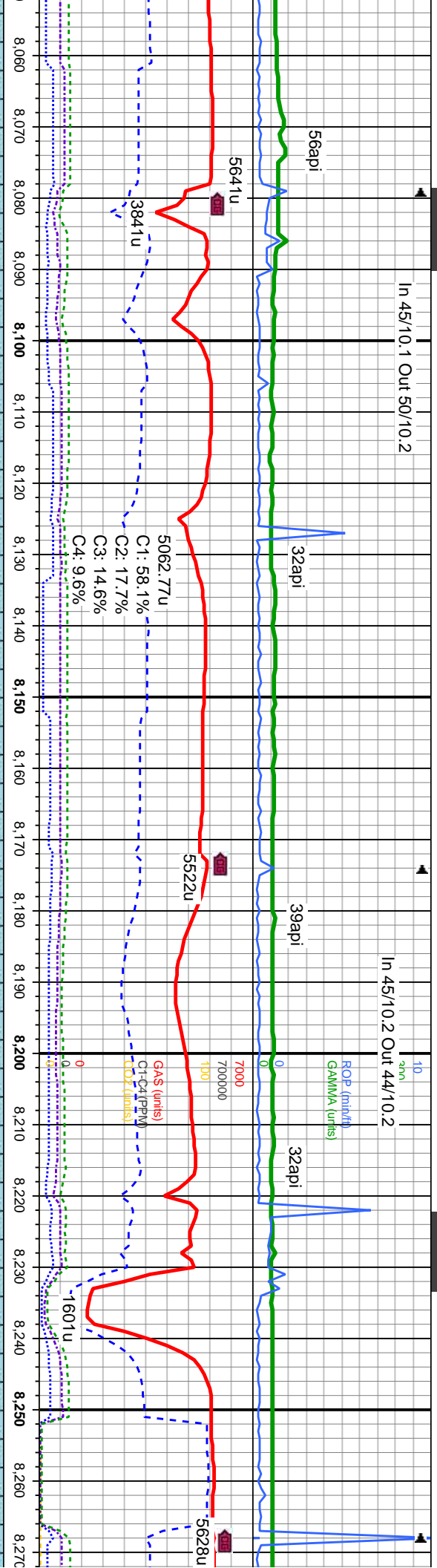
MD: 7
TVD: 1
Incline
Azimu
VS: 1,

7200



In 45/10.1 Out 50/10.2

In 45/10.2 Out 44/10.2



LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat, v calc w/ occ fos incl, tr lt gn min

LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat, v calc w/ occ fos incl, tr lt gn min

LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat, v calc w/ occ fos incl, tr lt gn min

LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat, v calc w/ occ fos incl, tr lt gn min

LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat, v calc w/ occ fos incl, tr lt gn min

MD: 8,118
TVD: 6,964.29
Inclination: 89.6 °
Azimuth: 360 °
VS: 1,311.79 '

MD: 8,213
TVD: 6,964.7
Inclination: 89.9 °
Azimuth: 357.7 °
VS: 1,406.09 '

7200



In 44/10.2 Out 46/10.2

In 50/10.1 Out 47/10.1

ROP (min/ft)
GAMMA (u/mis)

41api

45api

58api

7000 5763u

5722u

5972u

C1: 62.0%
C2: 17.3%
C3: 13.2%
C4: 7.5%

GAS (u/mis)
CO2 (u/mis)

2096u

8.280 8.290 8.300 8.310 8.320 8.330 8.340 8.350 8.360 8.370 8.380 8.390 8.400 8.410 8.420 8.430 8.440 8.450 8.460 8.470 8.480 8.490

LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat w/sl tr pyr, v calc w/ occ fos incl, tr lt gn min flr, stmg bri yel gn cut, lt yel stn

LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat w/sl tr pyr, v calc w/ occ fos incl, tr lt gn min flr, stmg bri yel gn cut, lt yel stn

LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat w/sl tr pyr, v calc w/ occ fos incl, tr lt gn min flr, stmg bri yel gn cut, lt yel stn

LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat w/sl tr pyr, v calc w/ occ fos incl, tr lt gn min flr, stmg bri yel gn cut, lt yel stn

MD: 8,308
TVD: 6,964.79
Inclination: 90.0
Azimuth: 359.1
VS: 1,500.3'

MD: 8,404
TVD: 6,964.2
Inclination: 90.7
Azimuth: 0.5
VS: 1,595.77'

7200



In 45/10.1 Out 45/10.1

In 46/10.1 Out 45/10.1

In 45/10.1 Out 45/10

ROP (m/hr)
GAMMA (uhrs)

Fault- 8672' MD
Down Throw

36api

39api

5699u

5789u

5305u

5689u

6086u

C1: 59.2%
C2: 18.0%
C3: 14.6%
C4: 8.2%

GAS (mins)
C-DC (PPM)
C-DC (mins)

8,500 8,510 8,520 8,530 8,540 8,550 8,560 8,570 8,580 8,590 8,600 8,610 8,620 8,630 8,640 8,650 8,660 8,670 8,680 8,690 8,700 8,710

LS: crm- buff wh, sft- m firm, sb pty- sb blk,
dull- semi dull lstr, semi mic xl tex, tr silty &
org mat w/sl tr pyr, v calc w/ occ fos incl, tr
siltysh, tr lt gn min flor, stmg bri yel gn cut, lt
yel stn

LS: crm- buff wh, sft- m firm, sb pty- sb blk,
dull- semi dull lstr, semi mic xl tex, tr silty &
org mat w/sl tr pyr, v calc w/ occ fos incl, tr
siltysh, tr lt gn min flor, stmg bri yel gn cut, lt
yel stn

6000
LS: crm- buff wh, sft- m firm, sb pty- sb blk,
dull- semi dull lstr, semi mic xl tex, tr silty &
org mat w/sl tr pyr, v calc w/ occ fos incl, tr
siltysh, tr lt gn min flor, stmg bri yel gn cut, lt
yel stn

LS: crm- buff wh, sft- m firm, sb pty- sb blk,
dull- semi dull lstr, semi mic xl tex, tr silty &
org mat w/sl tr pyr, v calc w/ occ fos incl, tr
siltysh, str ss, tr lt gn min flor, stmg bri yel gn
cut, lt yel stn

LS: crm- b
dull- semi
org mat w
siltysh, str
cut, lt yel s

ID: 8,499
VD: 6,963.62
Inclination: 90 °
Azimuth: 359.3 °
S: 1,690.26 '

MD: 8,594
TVD: 6,964.45 yrm
Inclination: 89 °
Azimuth: 359.8 °
VS: 1,784.69 '

MD: 8,689
TVD: 6,967.18
Inclination: 87.8 °
Azimuth: 0.1 °
VS: 1,879.16 '

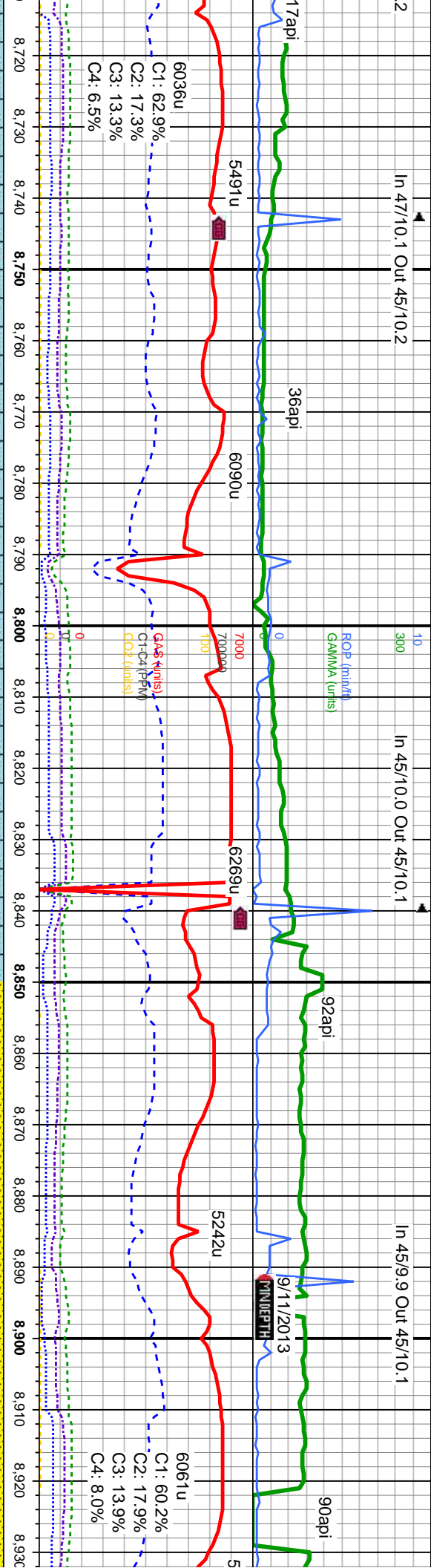
7200



In 47/10.1 Out 45/10.2

In 45/10.0 Out 45/10.1

In 45/9.9 Out 45/10.1



uff wh, sft- m firm, sb ply- sb blk, dull lstr, semi mic xl tex, tr silty & ls tr pyr, v calc w/ occ fos incl, tr gn min flr, stmg bri yel gn

LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat w/sl tr pyr, v calc w/ occ fos incl, tr gn min flr, stmg bri yel gn cut, lt yel stn

6000 LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat w/sl tr pyr, v calc w/ occ fos incl, tr silty sh, str ss, tr lt gn min flr, stmg bri yel gn cut, lt yel stn

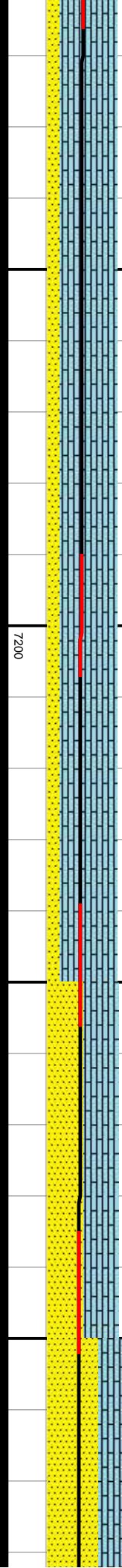
SS: lt- m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg trnsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat w/sl tr pyr, v calc w/ occ fos incl, tr lt gn min flr, stmg bri yel gn cut, lt yel stn

SS: lt- m gybrn, tmsl, occ dkgy, cluster, lrg trnsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- sb blk, dull- semi dull lstr, semi mic xl tex, tr silty & org mat w/sl tr pyr, v calc w/ occ fos incl, tr lt gn min flr, stmg bri yel gn cut, lt yel stn

MD: 8,784
TVD: 6,972.32
Inclination: 85.9 °
Azimuth: 359.1 °
VS: 1,973.46'

LOGGER'S TOP CODELL
8,841' MD / 6,975' TVD

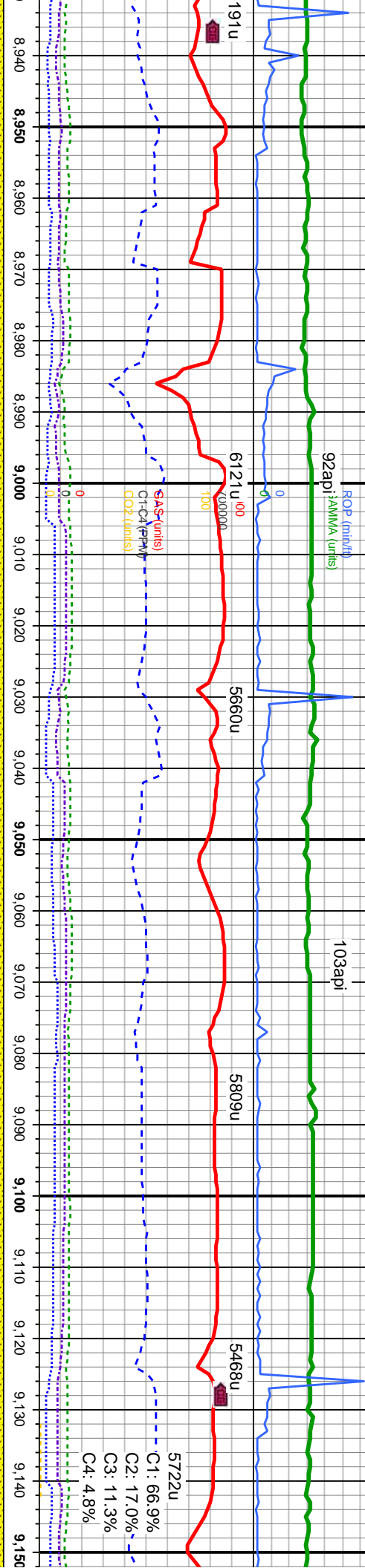
MD: 8,880
TVD: 6,977.76
Inclination: 87.6 °
Azimuth: 358.2 °
VS: 2,068.56'



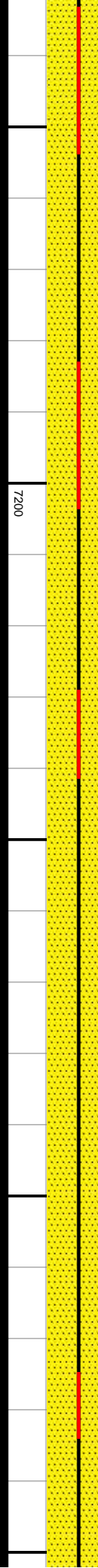
In 47/9.9 Out 45/10.0

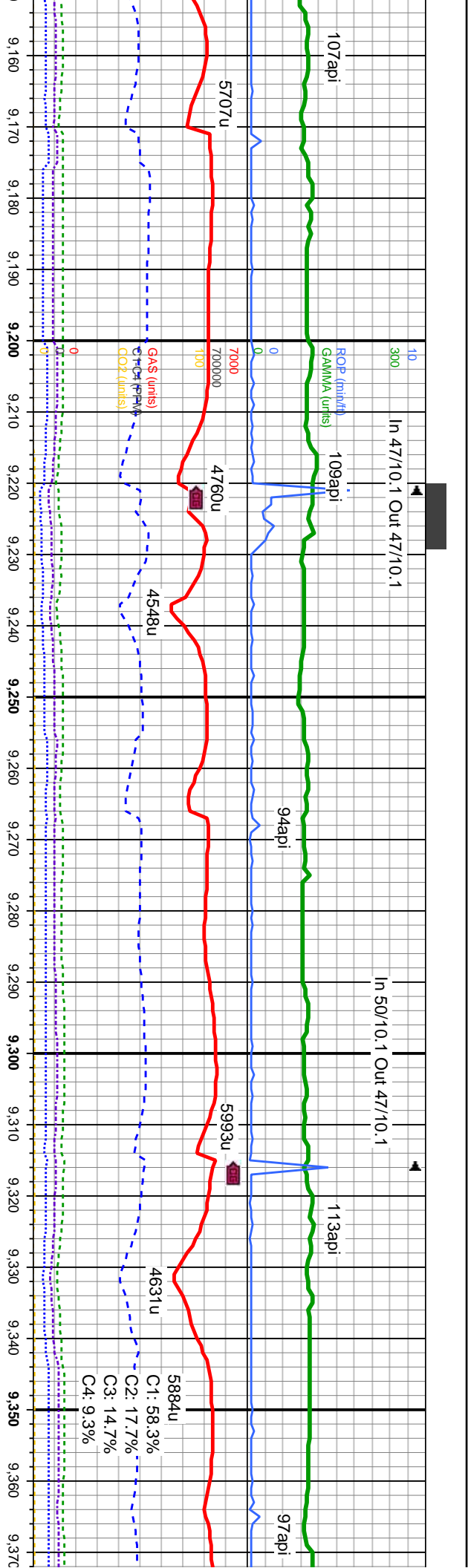
10 In 50/9.9 Out 47/10.0

In 47/10.1 Out 47/10.1

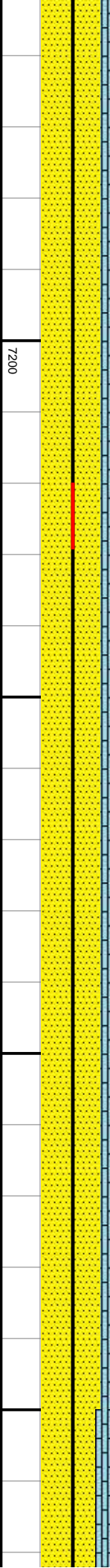


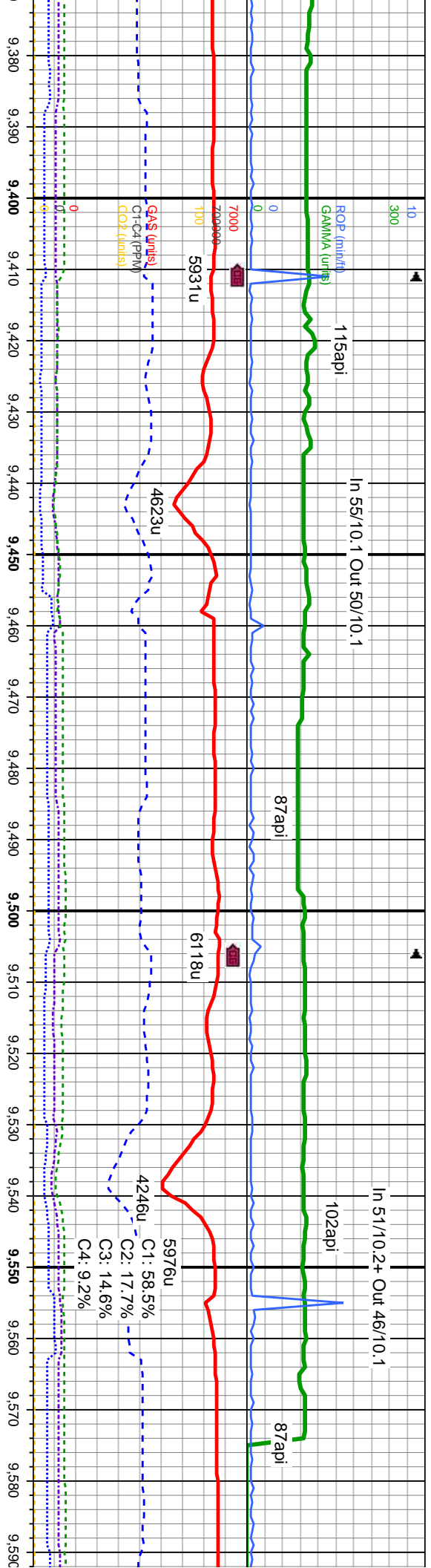
m-f gr, sb rd, m-w srt, n firm, sb ply- mic xl tex, tr sly & org mat w/ occ fos gn cut, lt yel	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lng tmnp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- sb blkyy, dull- semi dull lstr, semi mic xl tex, tr sly & org mat w/ occ fos incl, tr lt gn min flr, sting bri yel gn cut, lt yel stn	MD: 8.975 TVD: 6,980.75 Inclination: 88.8 ° Azimuth: 359.8 ° VS: 2.162.84 '	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lng tmnp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- sb blkyy, dull- semi dull lstr, semi mic xl tex, tr sly & org mat w/ occ fos incl, tr lt gn min flr, sting bri yel gn cut, lt yel stn	MD: 9.070 TVD: 6,981.25 Inclination: 90.6 ° Azimuth: 359.6 ° VS: 2.257.3 '	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lng tmnp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- sb blkyy, dull- semi dull lstr, semi mic xl tex, tr sly & org mat w/ occ fos incl, occ sly sh, tr lt gn min flr, sting bri yel gn cut, lt yel stn
--	---	---	---	--	---



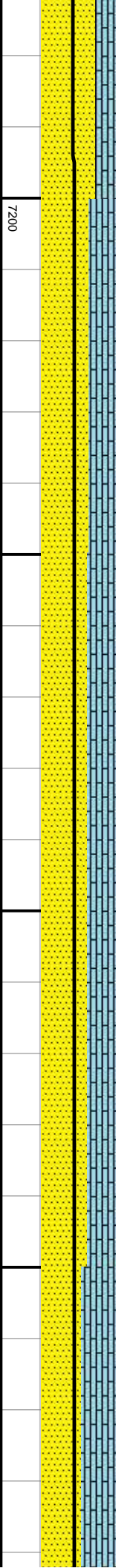


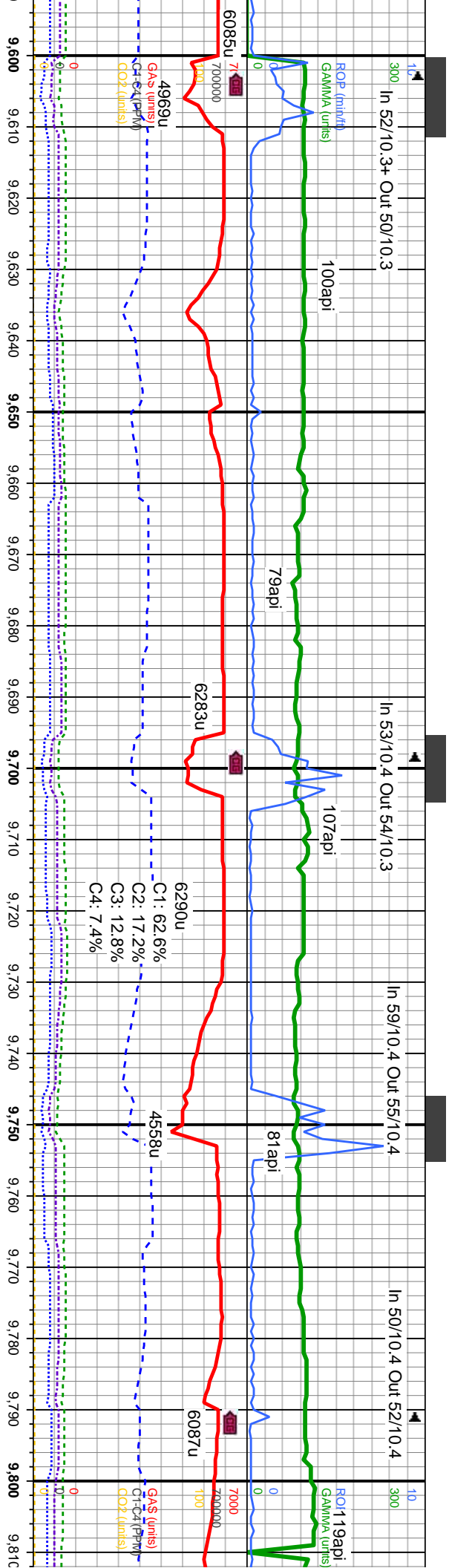
SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tnsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- b biky, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyr, v calc w/ occ fos incl, occ sily sh, tr lt gn min flr, stmg bri yel gn cut, lt yel strn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tnsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- b biky, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyr, v calc w/ occ fos incl, occ sily sh, tr lt gn min flr, stmg bri yel gn cut, lt yel strn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tnsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- b biky, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyr, v calc w/ occ fos incl, occ sily sh, tr lt gn min flr, stmg bri yel gn cut, lt yel strn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tnsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- b biky, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyr, v calc w/ occ fos incl, occ sily sh, tr lt gn min flr, stmg bri yel gn cut, lt yel strn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tnsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- b biky, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyr, v calc w/ occ fos incl, occ sily sh, tr lt gn min flr, stmg bri yel gn cut, lt yel strn
	6000			
	MD: 9,166	TVD (ft)	MD: 9,261	MD: 9,356
	TVD: 6,980.32 Inclination: 90.5 ° Azimuth: 358.4 ° VS: 2,352.62 '		TVD: 6,979.33 Inclination: 90.7 ° Azimuth: 358.4 ° VS: 2,446.82 '	TVD: 6,978.25 Inclination: 90.6 ° Azimuth: 359.3 ° VS: 2,541.12 '



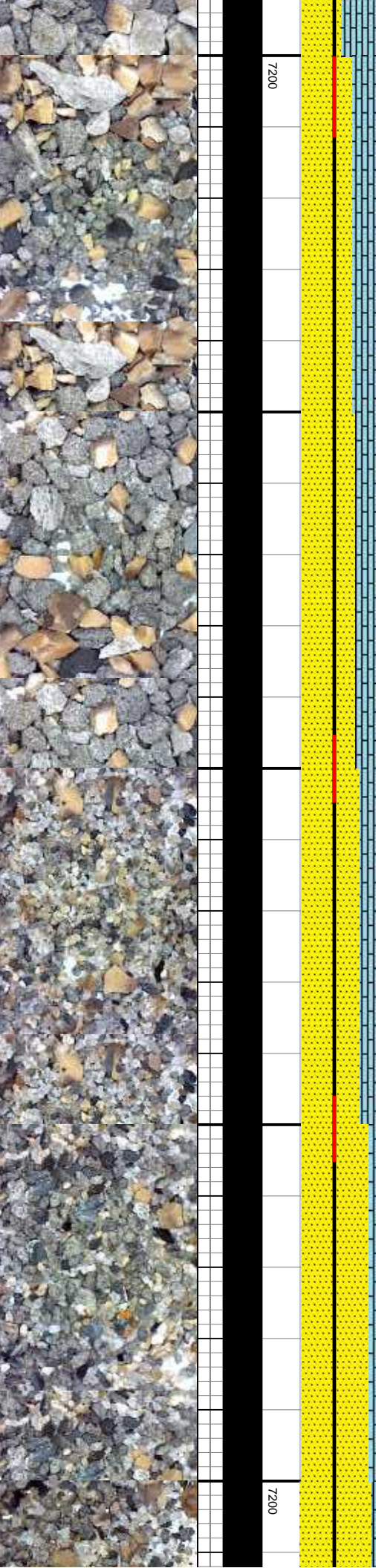


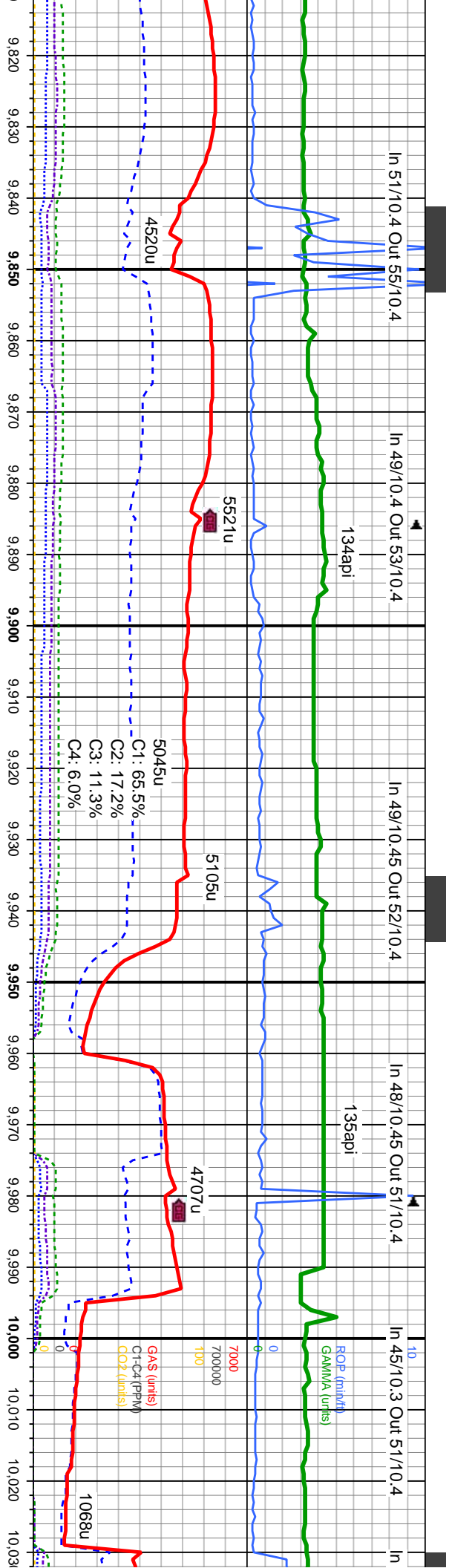
SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg trnsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb pty- sb blkyy, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyf, v calc w/ occ fos incl, occ sily sh, tr lt gn min flor, stmg bri yel gn cut, lt yel strn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg trnsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb pty- sb blkyy, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyf, v calc w/ occ fos incl, occ sily sh, tr lt gn min flor, stmg bri yel gn cut, lt yel strn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg trnsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb pty- sb blkyy, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyf, v calc w/ occ fos incl, occ sily sh, tr lt gn min flor, stmg bri yel gn cut, lt yel strn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg trnsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb pty- sb blkyy, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyf, v calc w/ occ fos incl, occ sily sh, tr lt gn min flor, stmg bri yel gn cut, lt yel strn
MD: 9,451 TVD: 6,977.09 ° Inclination: 90.8 ° Azimuth: 358.7 ° VS: 2,636.45 '	MD: 9,451 TVD: 6,977.09 ° Inclination: 90.8 ° Azimuth: 358.7 ° VS: 2,636.45 '	MD: 9,546 TVD: 6,975.6 ° Inclination: 91 ° Azimuth: 359.1 ° VS: 2,729.75 '	MD: 9,546 TVD: 6,975.6 ° Inclination: 91 ° Azimuth: 359.1 ° VS: 2,729.75 '



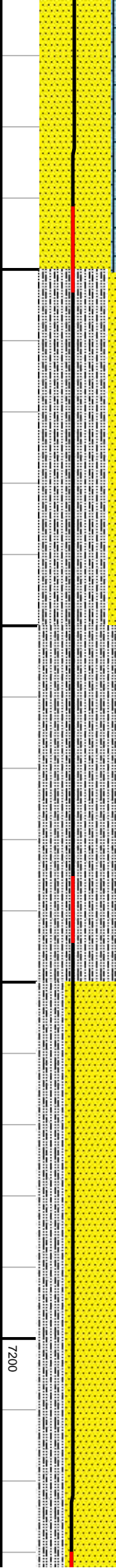


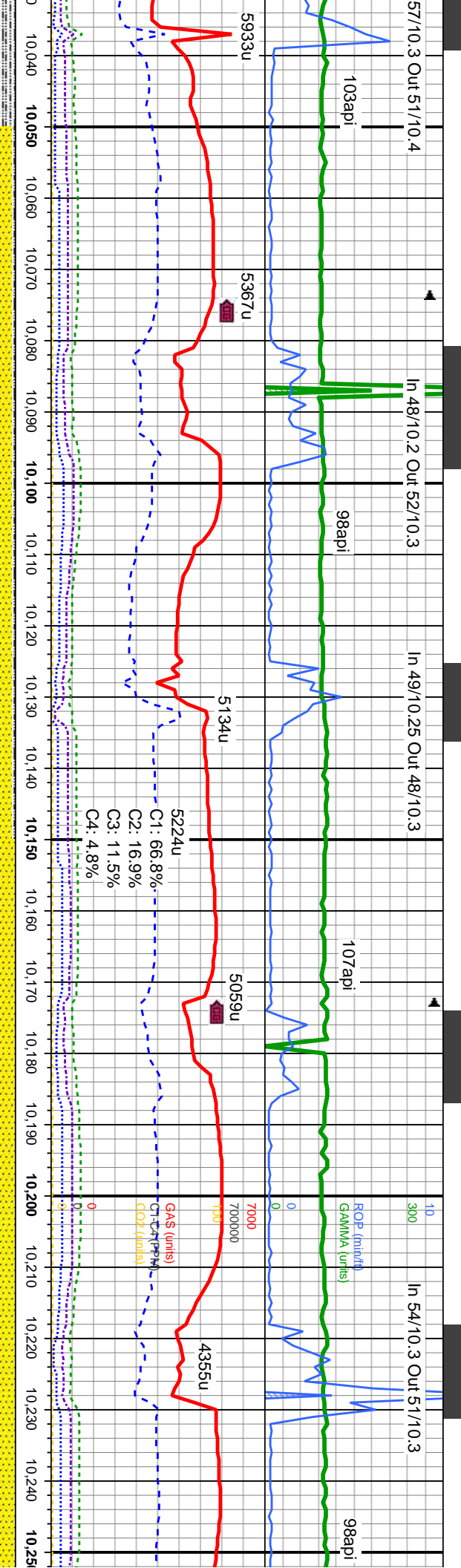
SS: It-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- sb blkyy, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyr, v calc w/ occ fos incl, occ sily sh, tr lt gn min flor, sting bri yel gn cut, lt yel strn	SS: It-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- sb blkyy, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyr, v calc w/ occ fos incl, occ sily sh, tr lt gn min flor, sting bri yel gn cut, lt yel strn	SS: It-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- sb blkyy, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyr, v calc w/ occ fos incl, occ sily sh, tr lt gn min flor, sting bri yel gn cut, lt yel strn	SS: It-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmsp qtz gm, ang- sb rd, m-w srt, n calc, LS: crm- buff wh, sft- m firm, sb ply- sb blkyy, dull- semi dull lstr, semi mic xl tex, tr sily & org mat w/sl tr pyr, v calc w/ occ fos incl, occ sily sh, tr lt gn min flor, sting bri yel gn cut, lt yel strn
TVD (m)	MD: 9,642 ' TVD: 6,974.76 ' Inclination: 90 ° Azimuth: 358.4 ° VS: 2,825.02 '	MD: 9,737 ' TVD: 6,975.34 ' Inclination: 89.3 ° Azimuth: 358.2 ° VS: 2,919.21 '	TVD (m)



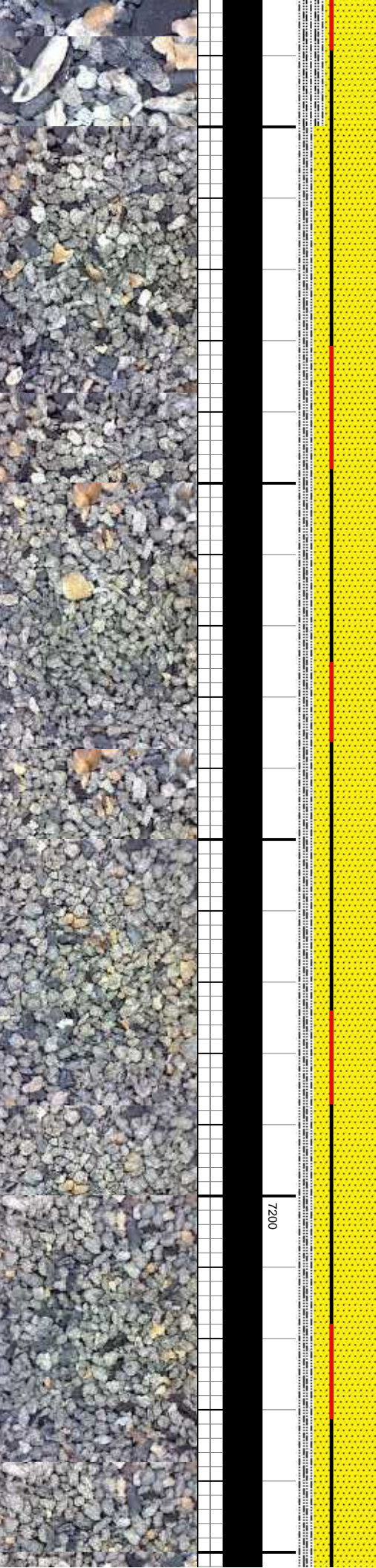


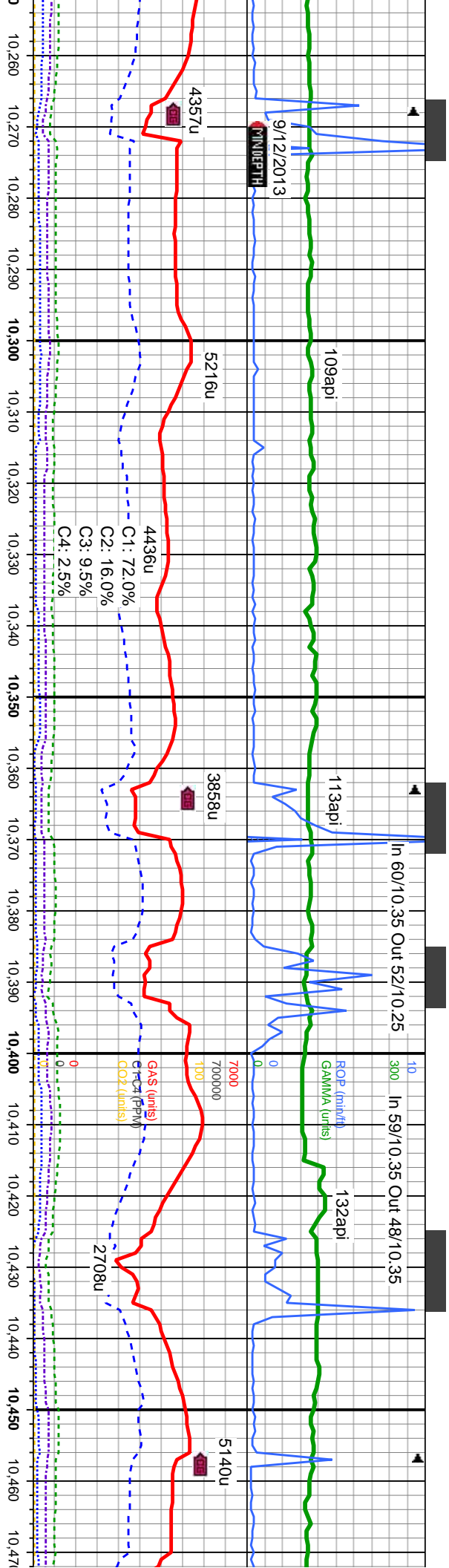
brn, tmsl, occ dkgy, m-f gr, tmsp qtz grn, ang- sb rd, m-w srt, crm- buft wh, sft- m firm, sb ply- ill- semi dull lstr, semi mic xl tex, g mat w/sl tr pyr, v calc w/ occ fos ly sh, tr lt gn min flr, stmg bri yel el str	SLTY SH: med-dk gy, sft- sl firm, sb ply - ply, silty-grty tex, rthy lstr, sl-mod calc, tr-mod abnt diss & nod pyr, tr fos frag; SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmsp qtz grn, ang- sb rd, m-w srt, n calc; mlky dull yel or cut, lt tan strn	SLTY SH: med-dk gy, sft- sl firm, sb ply - ply, silty-grty tex, rthy lstr, sl-mod calc, tr-mod abnt diss & nod pyr, tr fos frag; mlky dull yel or cut, lt tan strn	SLTY SH: med-dk gy, sft- sl firm, sb ply - ply, silty-grty tex, rthy lstr, sl-mod calc, tr-mod abnt diss & nod pyr, tr fos frag; SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmsp qtz grn, ang- sb rd, m-w srt, n calc; mlky dull yel or cut, lt tan strn	SLTY SH: med-dk gy, sft- sl firm, sb ply - ply, silty-grty tex, rthy lstr, sl-mod calc, tr-mod abnt diss & nod pyr, tr fos frag; SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmsp qtz grn, ang- sb rd, m-w srt, n calc; mlky dull yel or cut, lt tan strn	6000	MD: 9,832 ' TVD: 6,977.75 Inclination: 87.8 ° Azimuth: 357.2 ° VS: 3,013.23 '	MD: 9,927 ' TVD: 6,980.65 Inclination: 88.7 ° Azimuth: 358.6 ° VS: 3,107.28 '	MD: 10,022 ' TVD: 6,982.22 Inclination: 89.4 Azimuth: 357.5 VS: 3,201.4 '





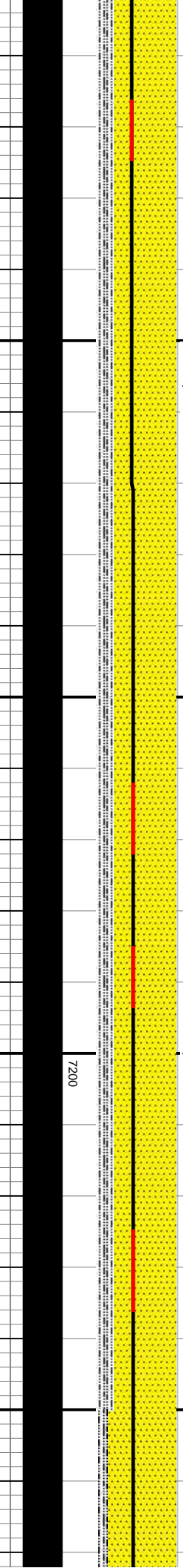
firm, sb ply - mod calc. tr fos frag: SS: -f-gr, cluster, lrg srt, n calc;	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmsp qtz gm, ang- sb rd, m-w srt, n calc; SLTY SH: med-dk gy, sft- sl firm, sb ply - ply, silty-grty tex, rthy lstr, sl-mod calc, tr-mod abnt dissm & nod pyr, tr fos frag; milky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmsp qtz gm, ang- sb rd, m-w srt, n calc; SLTY SH: med-dk gy, sft- sl firm, sb ply - ply, silty-grty tex, rthy lstr, sl-mod calc, tr-mod abnt dissm & nod pyr, tr fos frag; milky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmsp qtz gm, ang- sb rd, m-w srt, n calc, tr silty sh, milky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmsp qtz gm, ang- sb rd, m-w srt, n calc, tr silty sh, milky dull yel or cut, lt tan stn
		MD: 10,117 TVD: 6,983.05 Inclination: 89.6 ° Azimuth: 358.6 ° VS: 3,295.53 '		MD: 10,213 TVD: 6,983.13 Inclination: 90.3 ° Azimuth: 358.9 ° VS: 3,390.81 '

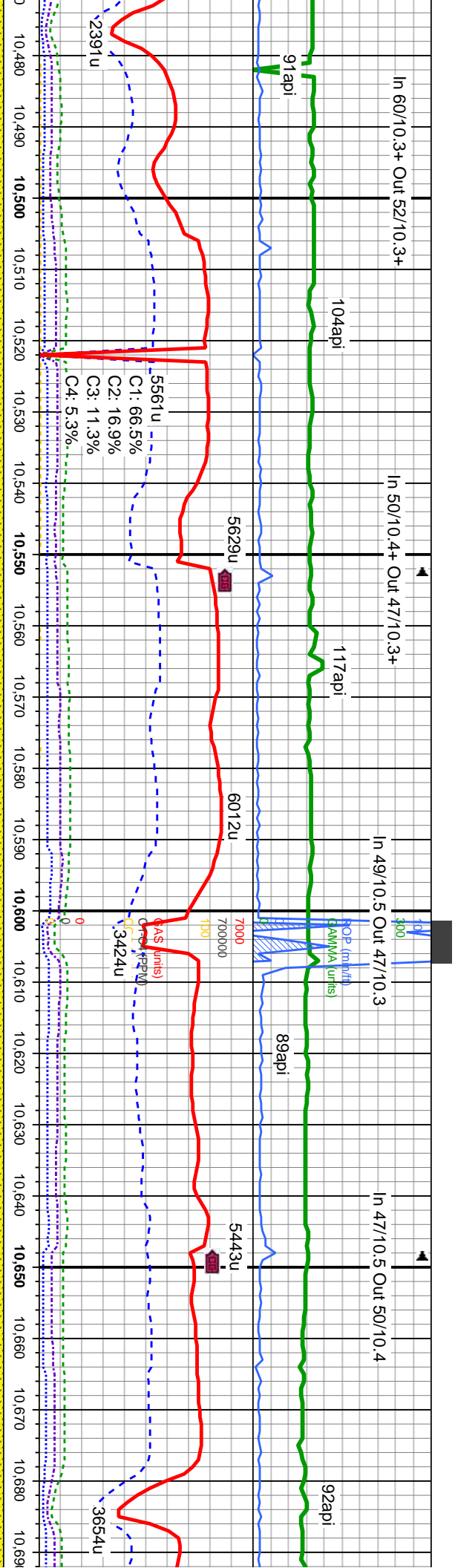




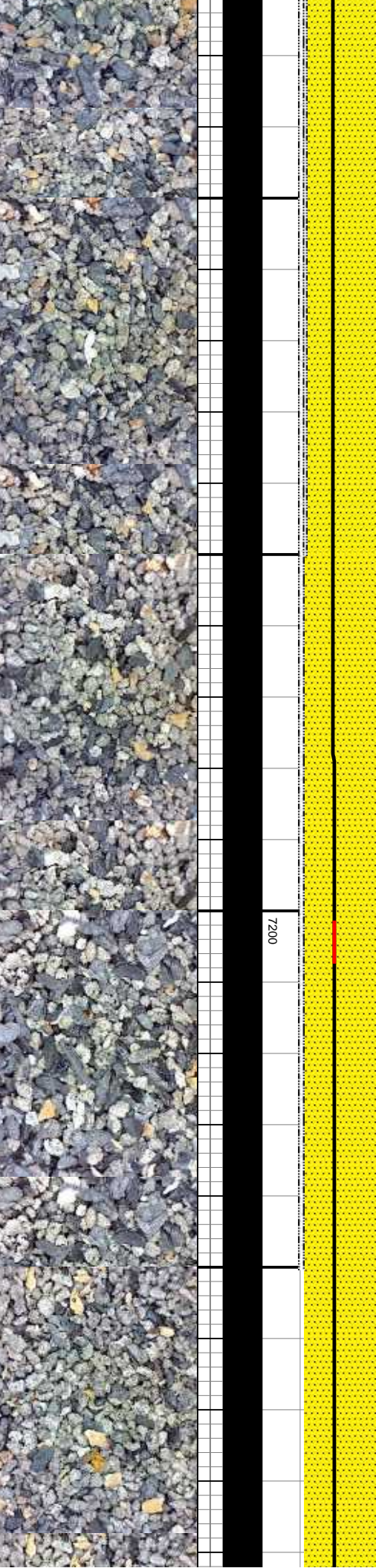
SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg trnsp qtz gm, ang- sb rd, m-w srt, n calc, tr slty sh, mlky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg trnsp qtz gm, ang- sb rd, m-w srt, n calc, tr slty sh, mlky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg trnsp qtz gm, ang- sb rd, m-w srt, n calc, tr slty sh, mlky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg trnsp qtz gm, ang- sb rd, m-w srt, n calc, tr slty sh, mlky dull yel or cut, lt tan stn
MD: 10,308 ' TVD: 6,982.39 ' Inclination: 90.6 ° Azimuth: 0.5 ° VS: 3,485.26 '	MD: 10,403 ' TVD: 6,981.15 ' Inclination: 90.9 ° Azimuth: 0.9 ° VS: 3,579.88 '		

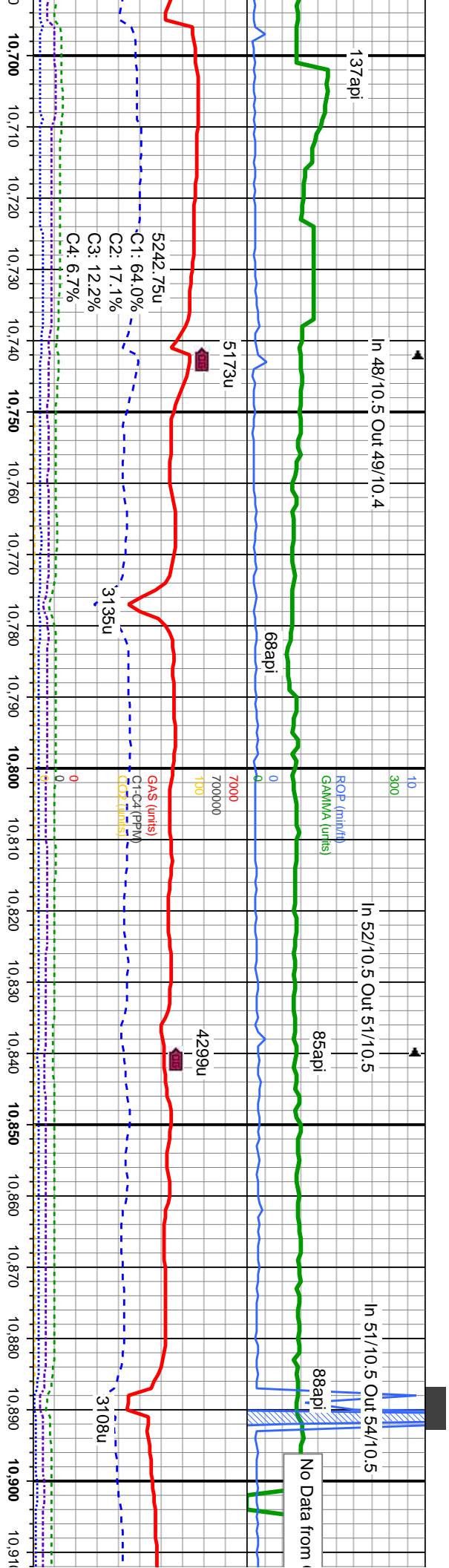
7200



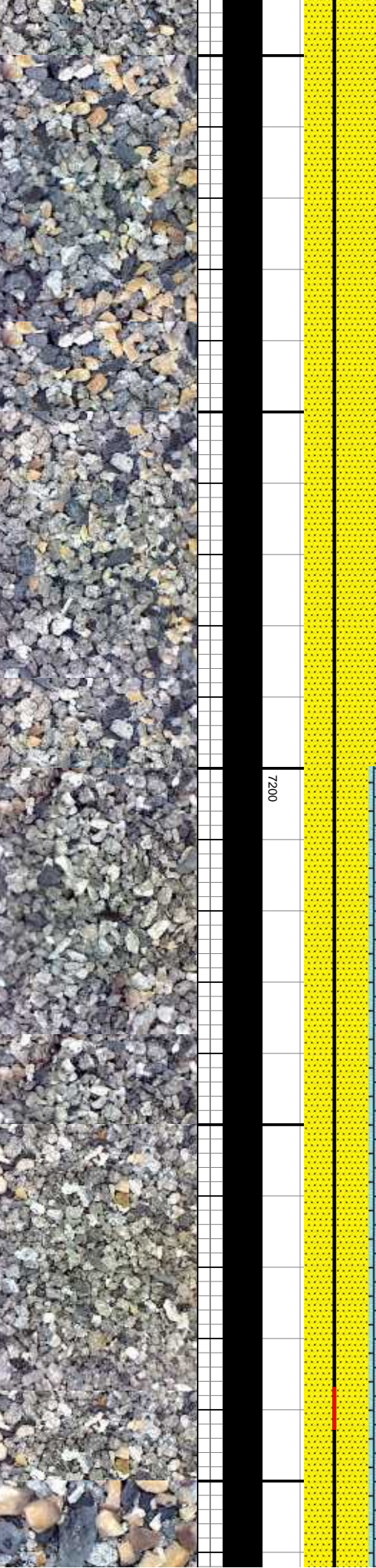


, occ dkgy, m-f gr, gm, ang- sb rd, m-w srt, xy dull yel or cut, lt tan	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lng trnsp qtz gm, ang- sb rd, m-w srt, n calc, tr stly sh, milky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lng trnsp qtz gm, ang- sb rd, m-w srt, n calc, tr stly sh, milky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lng trnsp qtz gm, ang- sb rd, m-w srt, n calc, tr stly sh, milky dull yel or cut, lt tan stn
	MD: 10,493 ' TVD: 6,979.5 Inclination: 91.2 ° Azimuth: 0.1 ° VS: 3,669.48	MD: 10,593 ' TVD: 6,977.49 Inclination: 91.1 ° Azimuth: 360 ° VS: 3,768.96	MD: 10,663 ' TVD: 6,97 Inclination: Azimuth: 1 VS: 3,864



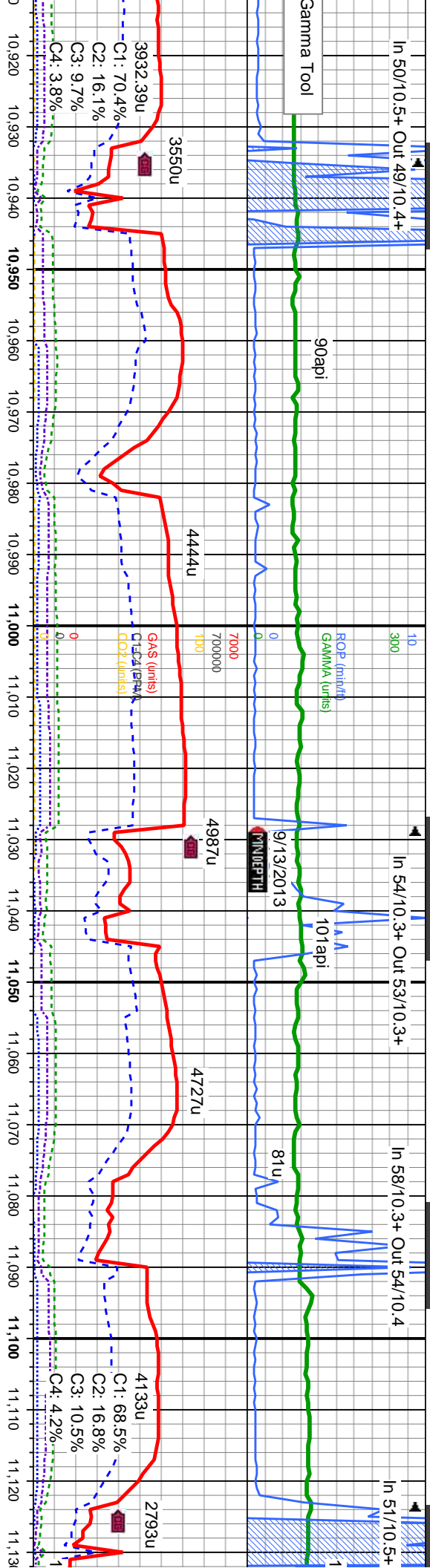


SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmstp qtz gm, ang- sb rd, m-w srt, n calc, tr silty sh, milky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmstp qtz gm, ang- sb rd, m-w srt, n calc, tr silty sh, milky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmstp qtz gm, ang- sb rd, m-w srt, n calc, tr silty sh; LS: crm - buff wh, sft, sb blkly, dull- semi dull lstr, semi mic xl tex, v calc w/ occ fos incl; milky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmstp qtz gm, ang- sb rd, m-w srt, n calc, tr silty sh; LS: crm - buff wh, sft, sb blkly, dull- semi dull lstr, semi mic xl tex, v calc w/ occ fos incl; milky dull yel or cut, lt tan stn	SS: lt-m gybrn, tmsl, occ dkgy, m-f gr, cluster, lrg tmstp qtz gm, ang- sb rd, m-w srt, n calc, tr silty sh, milky dull- v calc w/ occ
MD: 10,784 TVD: 6,974.41 Inclination: 90.6 ° Azimuth: 359.6 ° VS: 3,959.18 '	MD: 10,784 TVD: 6,974.41 Inclination: 90.6 ° Azimuth: 359.6 ° VS: 3,959.18 '	MD: 10,879 TVD: 6,974.91 Inclination: 88.8 ° Azimuth: 0.1 ° VS: 4,053.66 '	MD: 10,879 TVD: 6,974.91 Inclination: 88.8 ° Azimuth: 0.1 ° VS: 4,053.66 '	



In 50/10.5+ Out 49/10.4+

Gamma Tool



In 54/10.3+ Out 53/10.3+

In 58/10.3+ Out 54/10.4

In 51/10.5+

brn, tmsl, occ dkgy, m-f gr,
trsp qtz gm, ang- sb rd, m-w srt,
ly sh; LS: crm - buff wh, sft, sb
semi dull lstr, semi mic xl tex, v
f os inci; milky dull yel or cut, lt tan
strn

SS: lt-m gybrn, tmsl, occ dkgy, m-f gr,
cluster, lrg trsp qtz gm, ang- sb rd, m-w srt,
n calc, tr sily sh; LS: crm - buff wh, sft, sb
biky, dull- semi dull lstr, semi mic xl tex, v
calc w/ occ f os inci; milky dull yel or cut, lt tan
strn

6000

SS: lt-m gybrn, tmsl, occ dkgy, m-f gr,
cluster, lrg trsp qtz gm, ang- sb rd, m-w srt,
n calc, tr sily sh; LS: crm - buff wh, sft, sb
biky, dull- semi dull lstr, semi mic xl tex, v
calc w/ occ f os inci; milky dull yel or cut, lt tan
strn

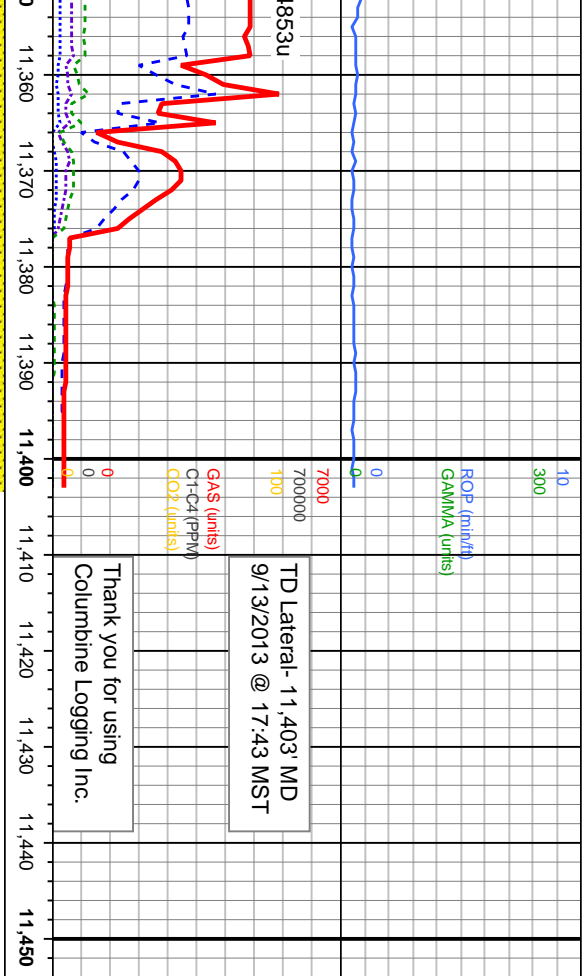
SS: lt-m gybrn, tmsl, occ dkgy, m-f gr,
cluster, lrg trsp qtz gm, ang- sb rd, m-w srt,
n calc, tr sily sh; LS: crm - buff wh, sft, sb
biky, dull- semi dull lstr, semi mic xl tex, v
calc w/ occ f os inci; milky dull yel or cut, lt tan
strn

MD: 10,974
TVD: 6,977.06
Inclination: 88.6 °
Azimuth: 359.6 °
VS: 4,148.13 '

MD: 11,070
TVD: 6,979.08
Inclination: 89 °
Azimuth: 0.7 °
VS: 4,243.64 '

7200





TD Lateral- 11,403' MD
9/13/2013 @ 17:43 MST

Thank you for using
Columbine Logging Inc.

S: lt-m gy/brn, tmsl, occ dkgy, m-f gr,
luster, lng tmsp qtz gm, ang- sb rd, m-w srl,
calc, tr - some silty sh; milky dull yel gr cut,
yel stn

Projection to Bit

MD: 11,403 '
TVD: 6,979.55 '
Inclination: 90.4 °
Azimuth: 3.1 °
VS: 4,575.81 '

