



Scale: 5" / 100'  
Measured Depth Log

Well Name Mahalo State AA09-74-1B HNB\_Horiz

Location Sec. 4 T6N R63W

State Colorado

Country USA

API Number 05-123-39014

Region DJ Basin

Spud Date 1/4/2015

Surface Coordinates 325 FSL ; 2303 FEL  
40.50949000 ; -104.44045000

Bottom Hole Coordinates 30 FNL ; 1510 FEL

County Weld

Rig Number PD 829

AFE # 200332

Field Wattenberg

Drilling Completed 1/11/2015

Ground Elevation 4695'

K.B. Elevation 4711'

Logged Interval 5955' To 11824'

Total Depth 11824'

Formation Niobrara B chalk

Type of Drilling Fluid FW LSND

Company Noble Energy Inc  
Address 1625 BROADWAY  
DENVER, CO 80202

Name Holly Duncan  
Company Noble Energy, Inc  
Address 1625 BROADWAY  
DENVER, CO 80202

Columbine Logging, Inc.  
Well Site Geologists

Operator

nc.  
AY  
0202

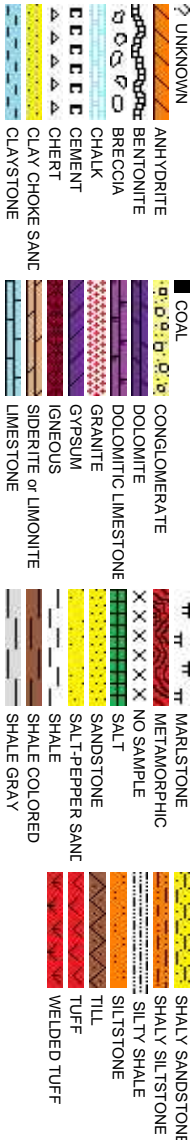
Geologist

nc.  
AY  
0202

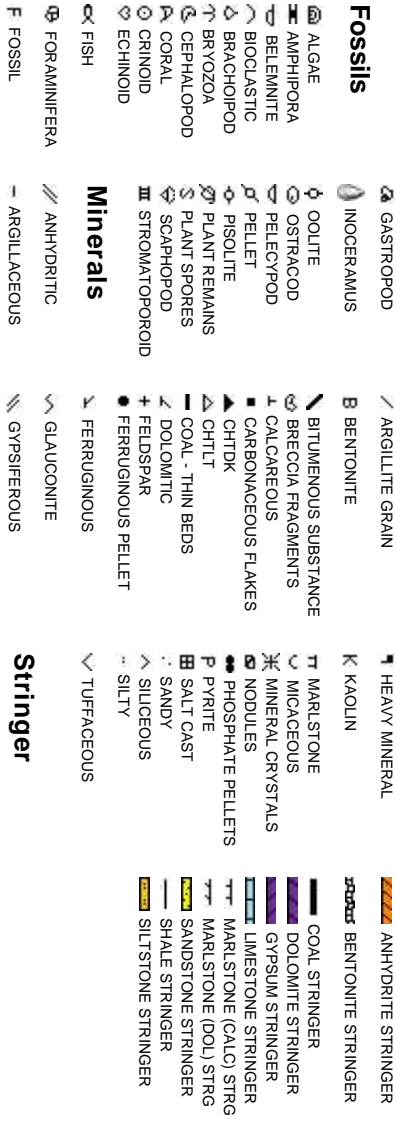
Other

602 S. Lipan St.  
Denver CO, 80223  
  
Ryan Shilling  
Ted Stockwell

Rock Types



Accessories



Stringer

# Other Symbols

<b>Oil Show</b>	P PINPOINT V VUGGY	⋮ DST INTERVAL / FAULT	▽ WIRELINE TESTED - LEFT △ WIRELINE TESTED - RT	E EARTHY FX FINELYXLN
<b>Engineering</b>	D DEAD ● EVEN ○ QUESTIONABLE ● SPOTTED STAINING ▲ CONNECTION (UP)	↕ FORMATION TOP ✳ GAS SHOW ● OIL SHOW MN DEPTH UP MN DEPTH (DOWN)	📏 DRILL STEM TEST MINDEPTH MN DEPTH	ES GRAINSTONE L LITHOGRAPHIC MX MICROXLN MS MUDSTONE
<b>Porosity</b>	▼ CONNECTION (DOWN)	MN DEPTH (DOWN)	▲ ANGULAR	PS PACKSTONE
E EARTHY B FENESTRAL F FRACTURE X INTERCRYSTALLINE Ø INTERPOOLITIC J MOLDIC O ORGANIC	CONNECTION GAS CONNECTION GAS (LEFT) TRIP GAS TRIP GAS (LEFT) DOWN TIME GAS DOWN TIME GAS (LEFT) CORE - LOST CORE - RECOVERED	NORMAL FAULT OVERTURNED STRATA REVERSE FAULT CASING SIDEWALL CORE (LEFT) SIDEWALL CORE (RIGHT) SLIDE SURVEY	R ROUNDED B SUBANG M SUBRND	WS WACKSTONE <b>Sorting</b> M MODERATE P POOR W WELL
			<b>Textures</b>	
			BS BOUNDSTONE C CHALKY CX CRYPTOXLN	

Slide/Rotate

ROP  
ROF  
GAMMA

ROP Scale  
0 - 800 units

116  
ROF (ft/min)  
GAMMA (api)

Gamma Scale  
0 - 200 units

Gas Scale  
0 - 2000 units

KOP = 5955'

3000  
300000

Total Gas & Chromatograph

GAS  
C1  
C2  
C3  
C4

COLUMBINE LOGGING, INC. RIGGED UP  
ON 1/5/2014 MANNED 2-PERSON LOGGING  
WITH BLOODHOUND GAS  
CHROMATOGRAPH UNIT # 0312

WT: 9.4 / VIS: 37  
724u  
340u  
780u  
800u  
WT: 9.5 / VIS: 42

Depth Labels

5,910 5,920 5,930 5,940 5,950 5,960 5,970 5,980 5,990 6,000 6,010 6,020 6,030 6,040 6,050 6,060 6,070 6,080 6

% Lith

TVD Scale  
5800' - 6800'

5800

Well Bore  
TVD

Bit Data  
Bit #: 2  
Type: SDI 519  
Size: 8.75  
Depth In: 846 '  
Depth Out: 7,035 '  
Jets: 7x16  
S/N: JJB325

MD: 5,979  
TVD: 5,920.9  
Inclination: 7.3  
Azimuth: 116.8  
VS: 310.61

TVD (ft)

MD: 6,024  
TVD: 5,965.52  
Inclination: 7.8  
Azimuth: 137.5  
VS: 314.73

MD: 6,068  
TVD: 6,008.95  
Inclination: 10.7  
Azimuth: 151.8  
VS: 320.9

Log Continued From Mahalo State AA09-74-1BHNB

100% SLTY SH: lt-med gy, occ sl tan,  
sft-sl frm, sb pily-sb blkly, silty tex, sl sdy ip,  
sl calc, tr shly ss

100% SLTY SH: lt-med gy, occ sl tan, sft-sl frm, sb  
pily-sb blkly, silty tex, sl sdy ip, sl calc, tr shly ss

100% SLTY SH: lt-med gy, occ sl tan, sft-sl frm, sb  
pily-sb blkly, silty tex, sl sdy ip, sl calc, tr shly ss

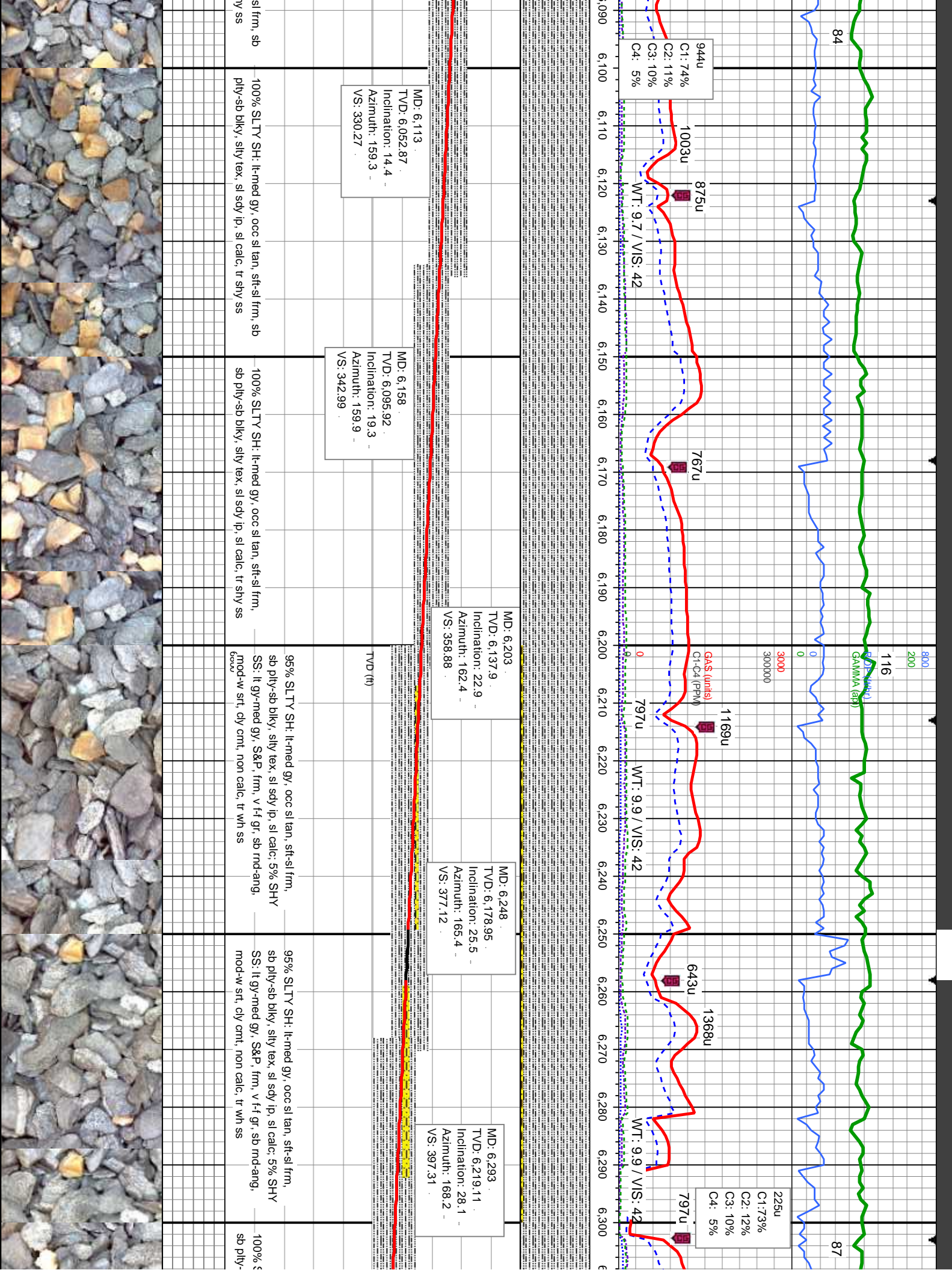
Oil Show

exc  
mod  
tr  
sl

Images



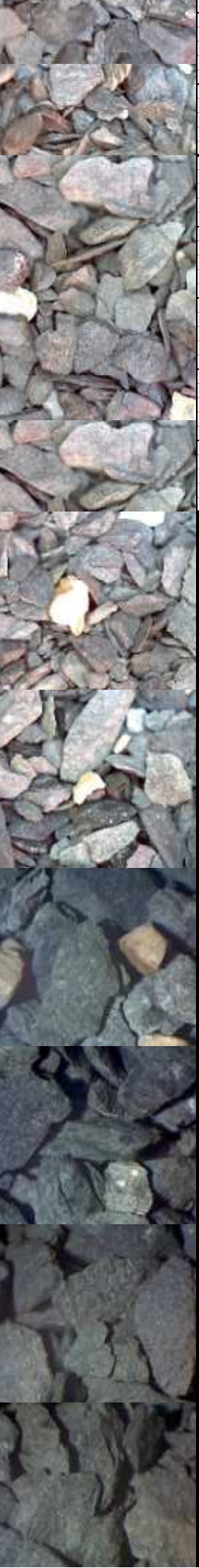
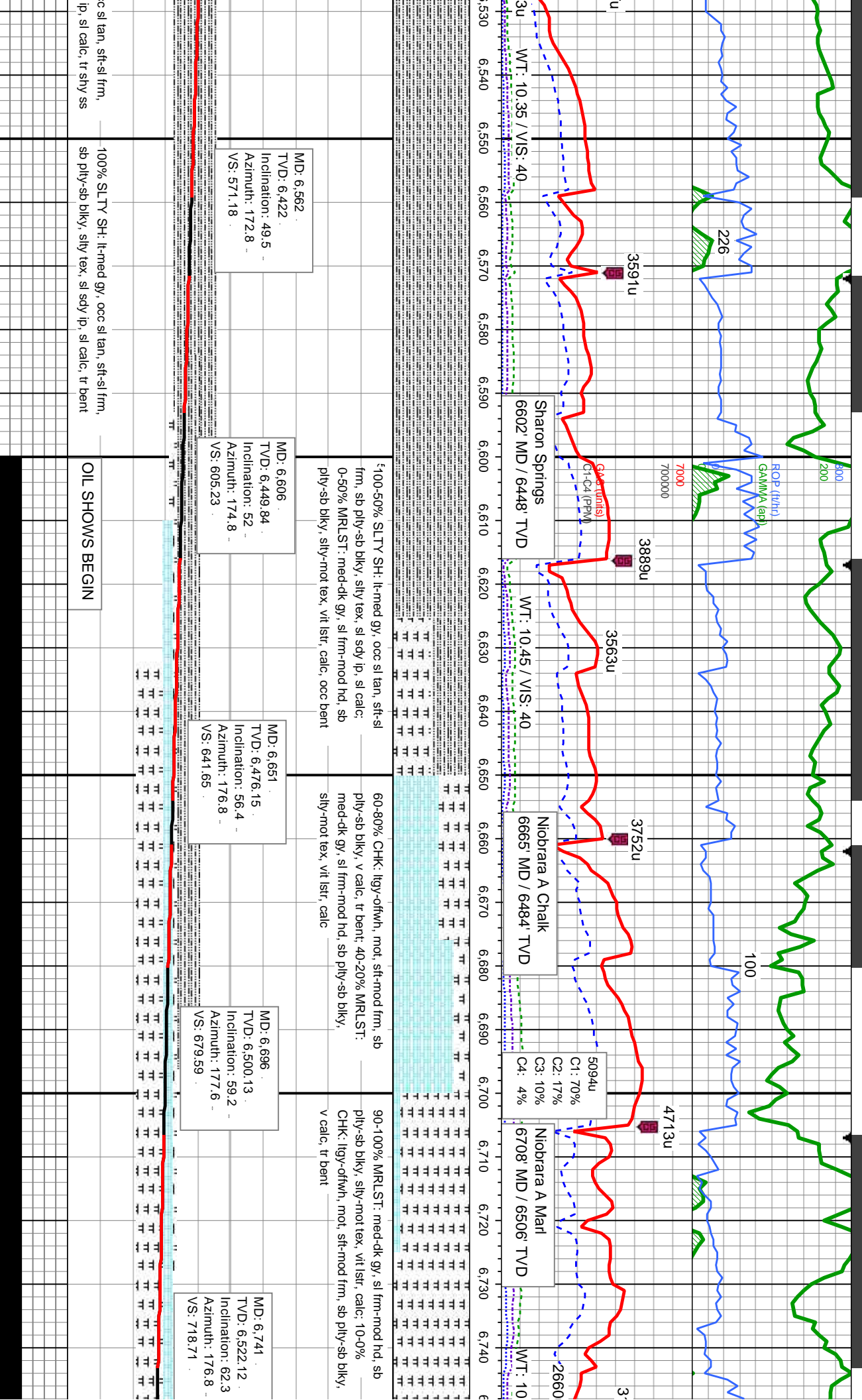






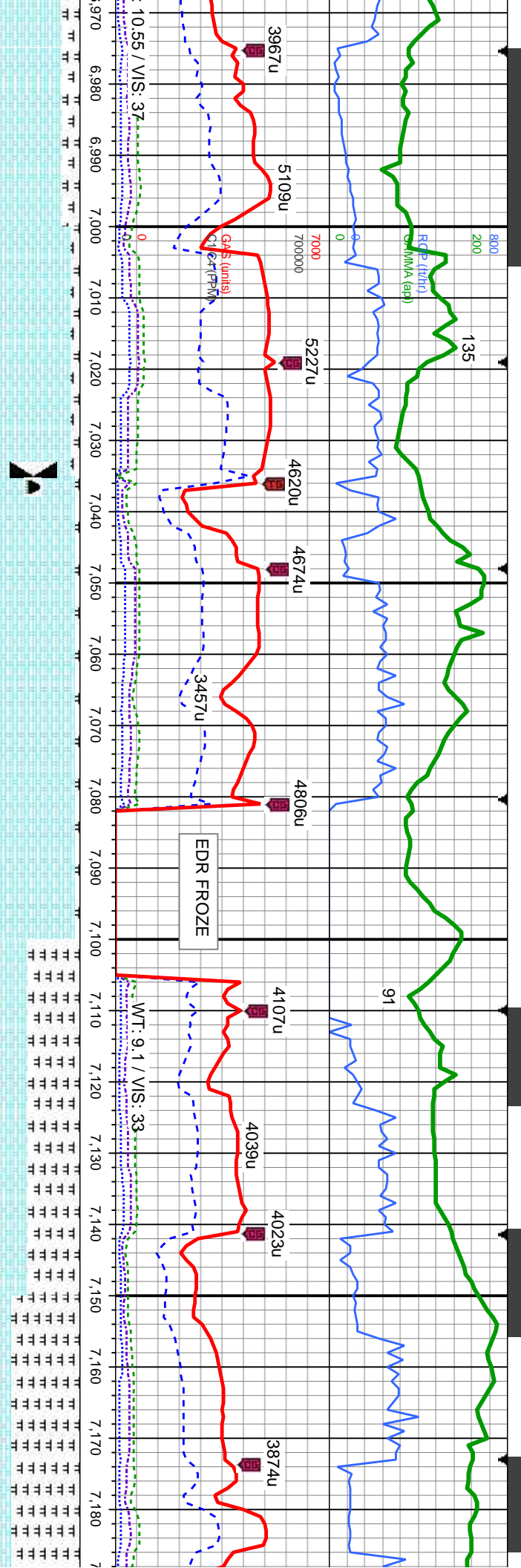












offwh, mot, sft-mod frm, sb  
20-20% MRLST: med-dk gy,  
ply-sb blk, sily-mot tex, vit

90% CHK: lly-offwh, mot, sft-mod  
frm, sb ply-sb blk, v calc: 10%  
MRLST: med-dk gy, sl frm-mod hd,  
sb ply-sb blk, sily-mot tex, vit lstr,  
calc, tr sec cal, v tr inoc

95% CHK: lly-offwh, mot, sft-mod frm, sb ply-sb blk, v calc: 5%  
MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blk, sily-mot tex, vit  
lstr, calc, tr sec cal

60% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb  
blk, sily-mot tex, vit lstr, calc: 40% CHK:  
lly-offwh, mot, sft-mod frm, sb ply-sb blk, v calc,  
abt sec cal

80% MRLST: med-dk gy, sl frm-mod hd, s  
blk, sily-mot tex, vit lstr, calc: 20% CHK:  
lly-offwh, mot, sft-mod frm, sb ply-sb blk  
calc, abt sec cal

MD: 6.980  
TVD: 6.592.52  
Inclination: 81.4  
Azimuth: 178.2  
VS: 945.31

MD: 7.081  
TVD: 6.605.18  
Inclination: 84.2  
Azimuth: 179.9  
VS: 1,044.81

MD: 7.113  
TVD: 6.608.17  
Inclination: 85.1  
Azimuth: 179.4  
VS: 1,076.42

MD: 7.143  
TVD: 6.610.39  
Inclination: 86.4  
Azimuth: 180.9  
VS: 1,106.05

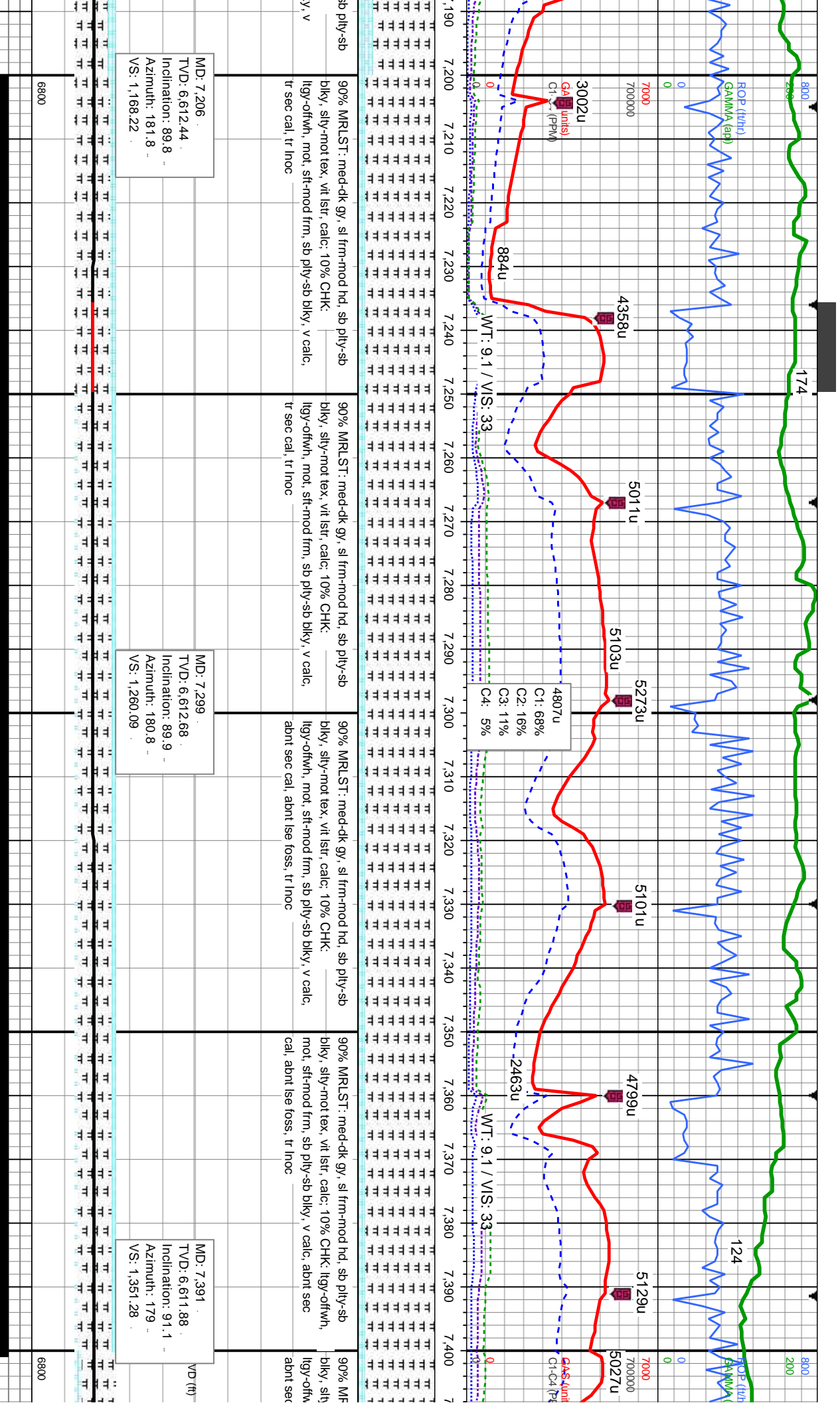
MD: 7.175  
TVD: 6.611.9  
Inclination: 88.2  
Azimuth: 181.5  
VS: 1,137.64

Bit Data  
Type: SDI 516  
Size: 6.12  
Depth In: 7,035 '  
Jets: 5x16  
S/N: J08186

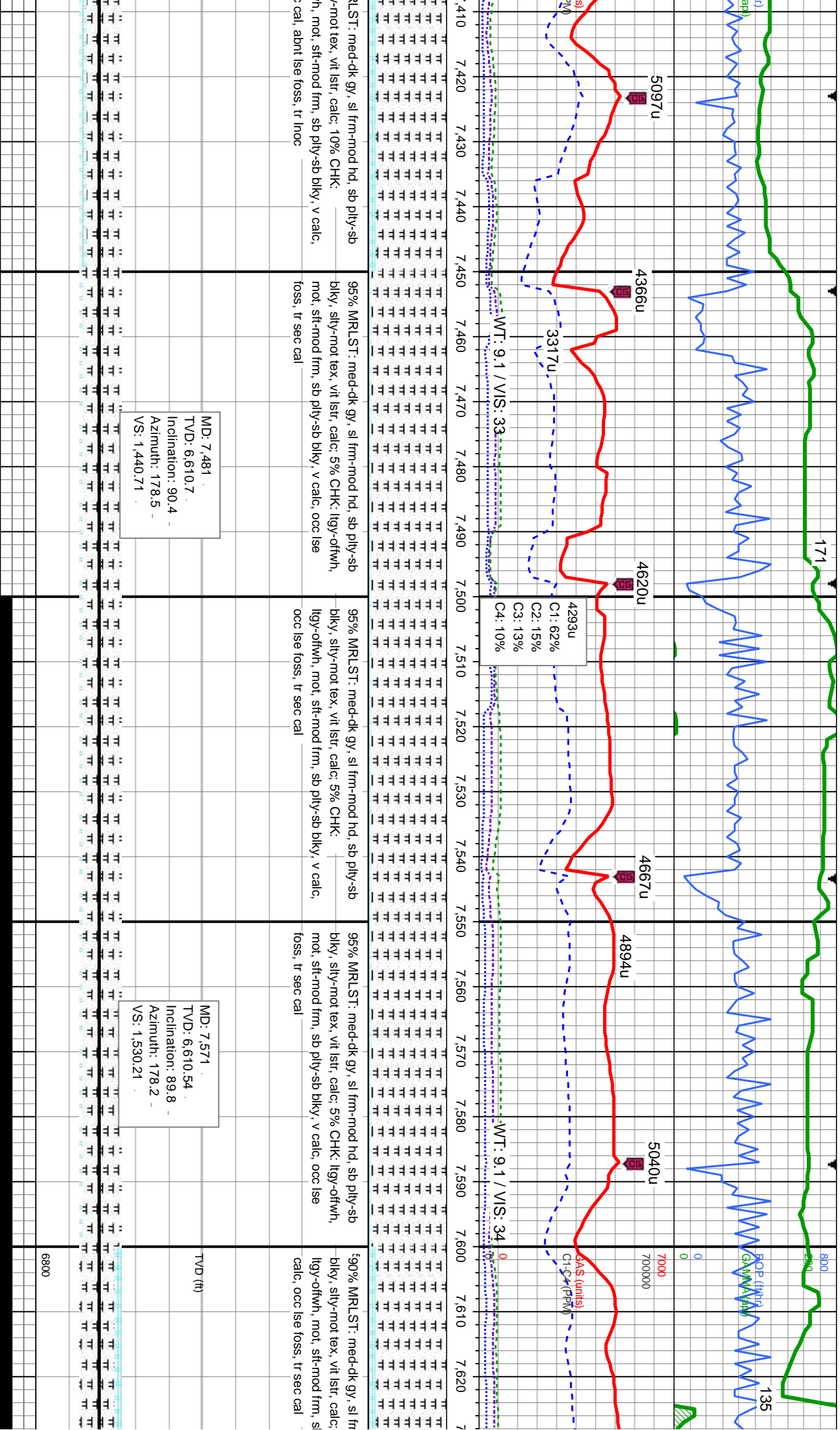
TVD (ft)

6800

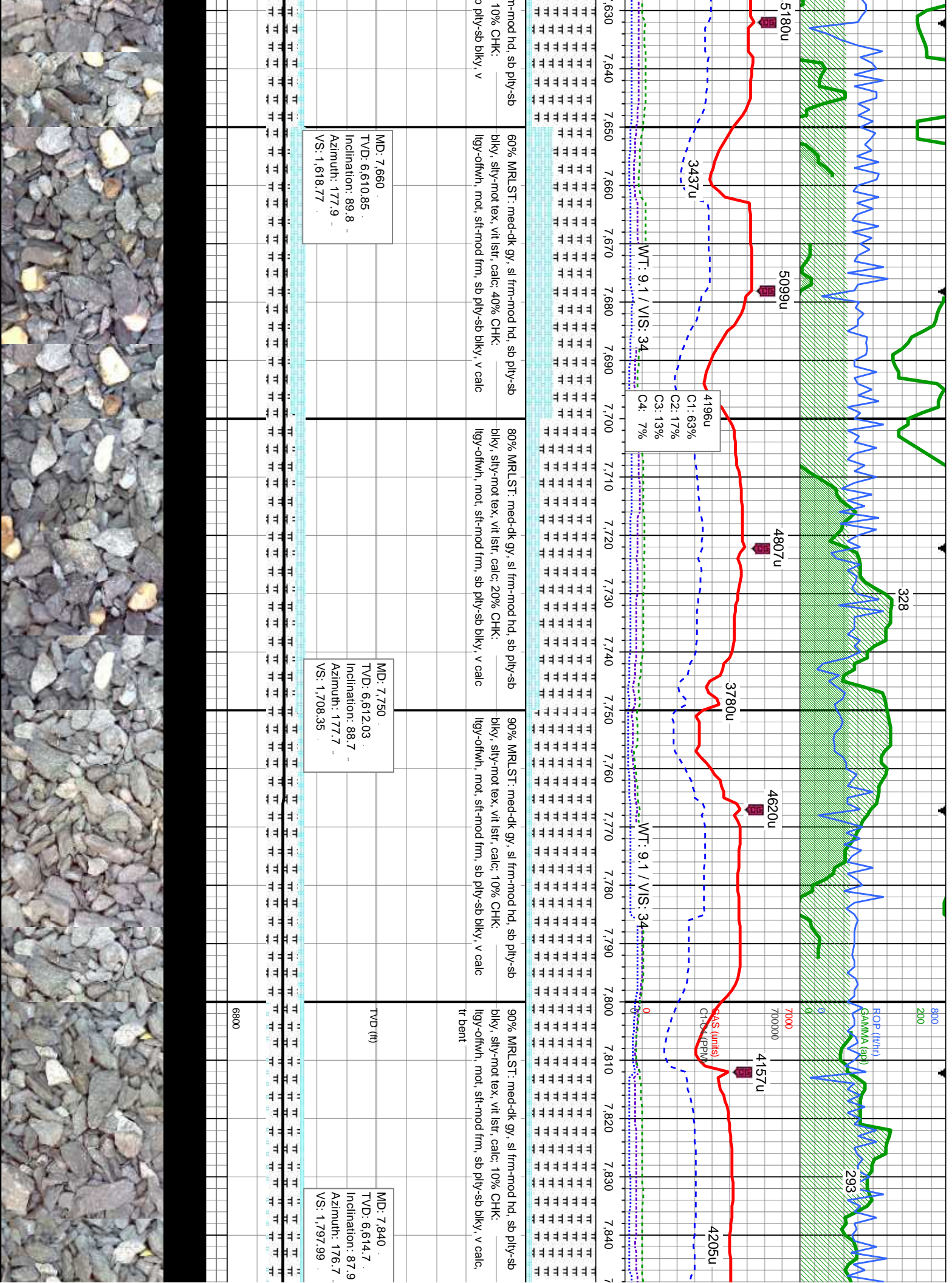






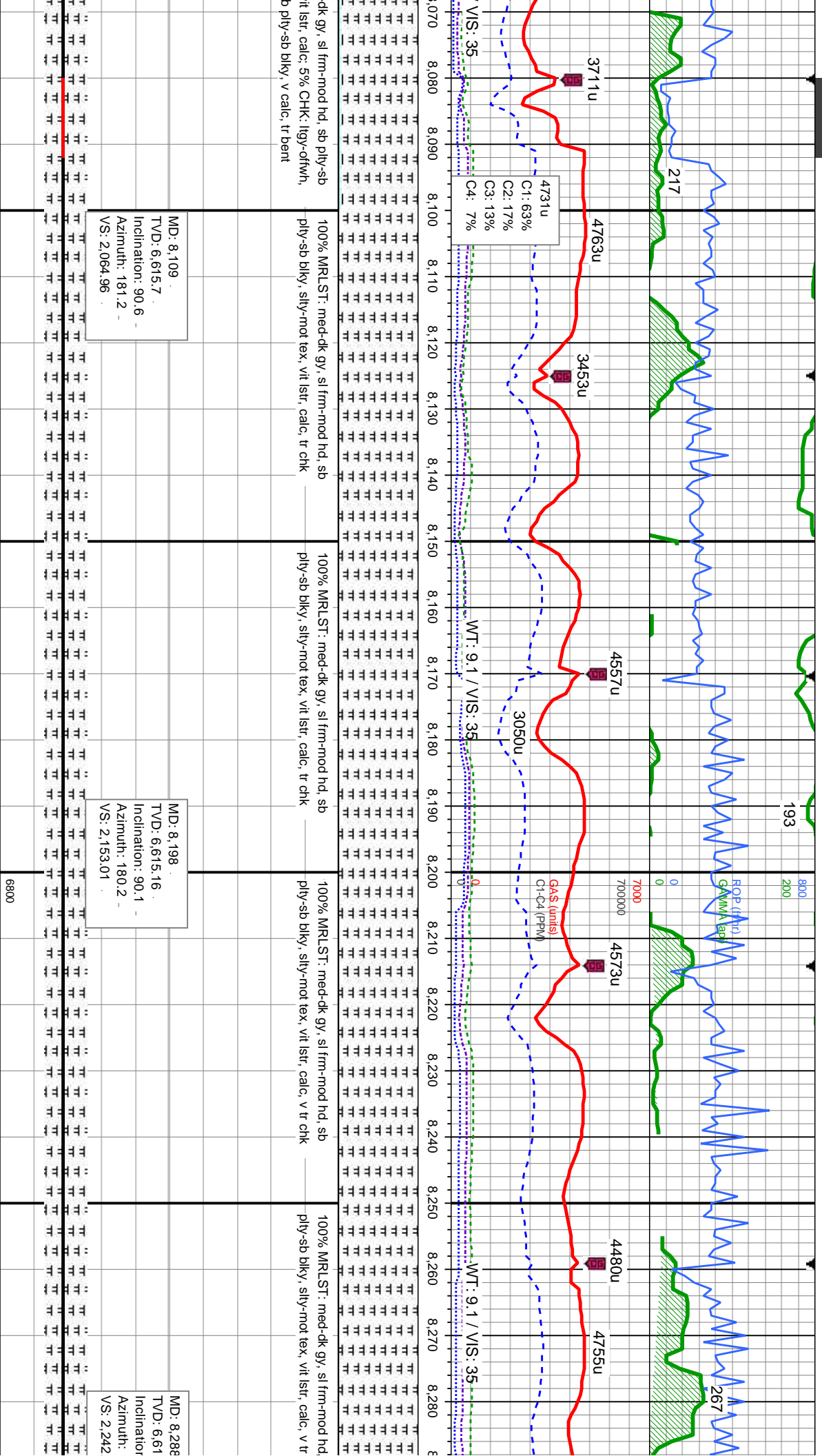




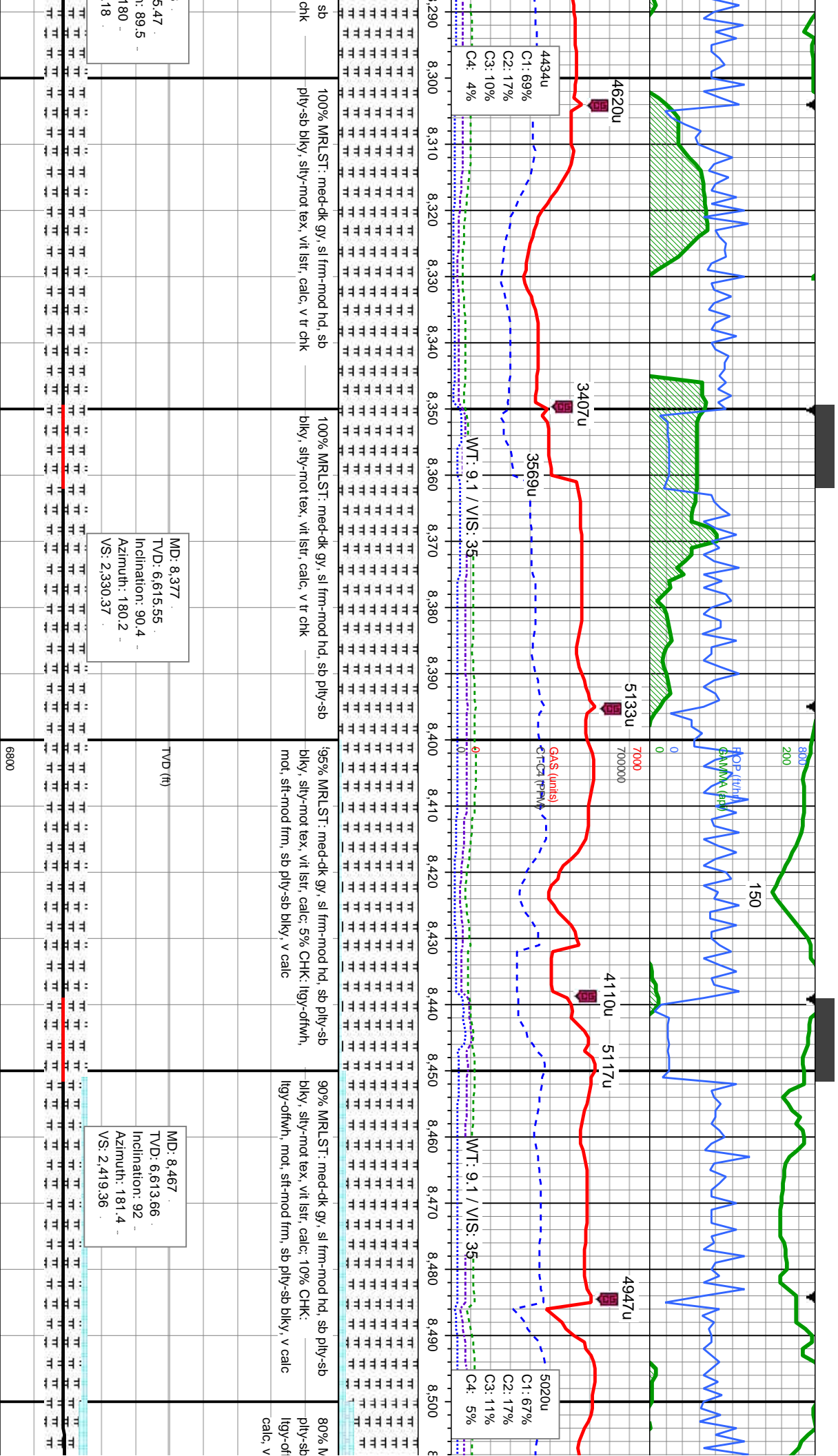


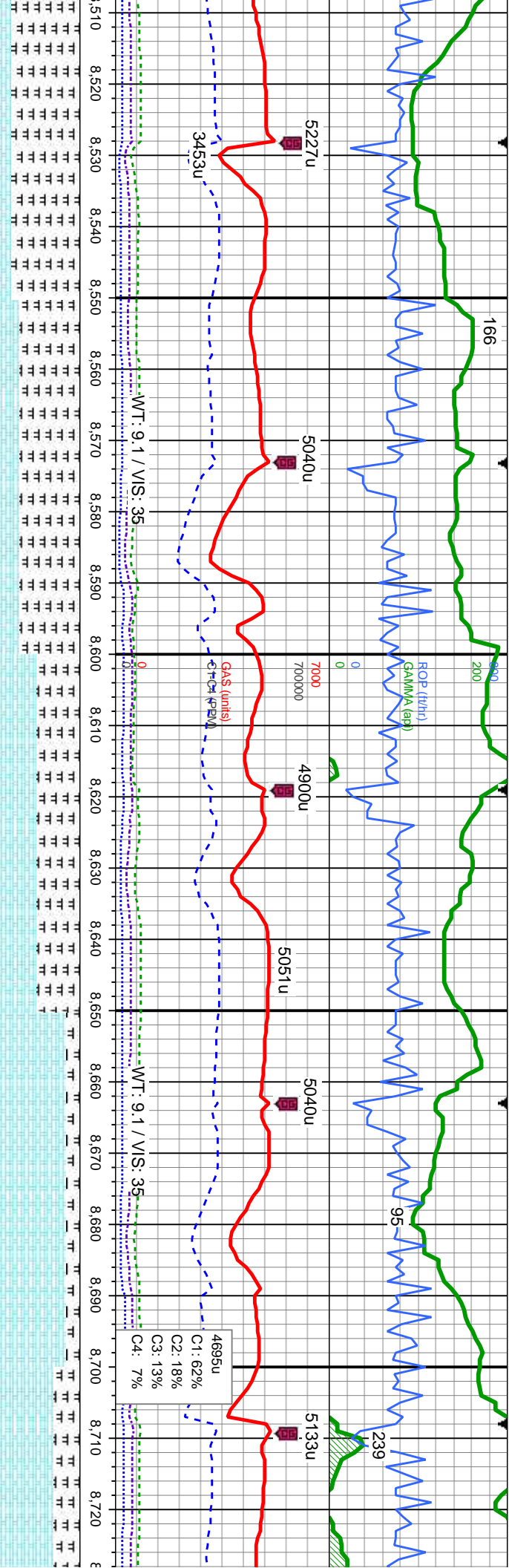












MR.LST: med-dk gy, sl frm-mod hd, sb  
biky, sily-mot tex, vit lstr, calc: 20% CHK:  
wh, mot, sft-mod frm, sb ply-sb biky, v  
tr bent

70% MR.LST: med-dk gy, sl frm-mod hd, sb  
ply-sb biky, sily-mot tex, vit lstr, calc: 30% CHK:  
lgy-ofwh, mot, sft-mod frm, sb ply-sb biky, v  
calc, v tr bent

50% MR.LST: med-dk gy, sl frm-mod hd, sb ply-sb  
biky, sily-mot tex, vit lstr, calc: 50% CHK:  
lgy-ofwh, mot, sft-mod frm, sb ply-sb biky, v calc

85% CHK: lgy-ofwh, mot, sft-mod frm, sb ply-sb  
biky, v calc: 15% MR.LST: med-dk gy, sl frm-mod  
hd, sb ply-sb biky, sily-mot tex, vit lstr, calc

70% CHK: lgy-ofwh, mot, sft  
biky, v calc: 30% MR.LST: med-dk gy, sl frm-mod  
hd, sb ply-sb biky, sily-mot tex

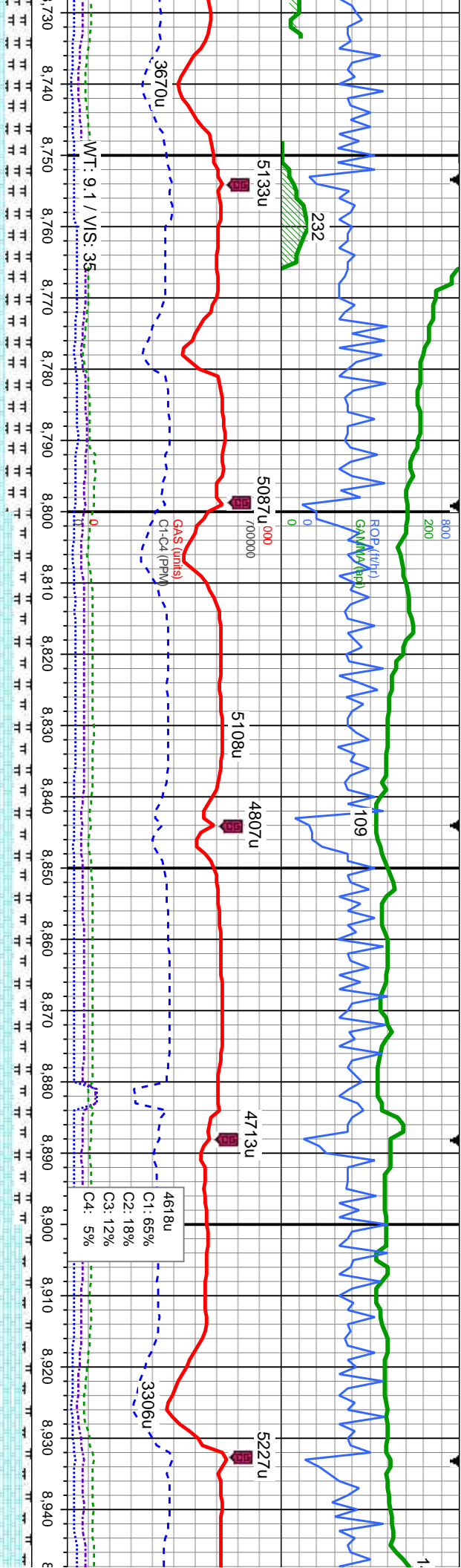
MD: 8.557  
TVD: 6.610.84  
Inclination: 91.6  
Azimuth: 180.7  
VS: 2.508.28

MD: 8.646  
TVD: 6.608.58  
Inclination: 91.3  
Azimuth: 180.4  
VS: 2.596.34

6800







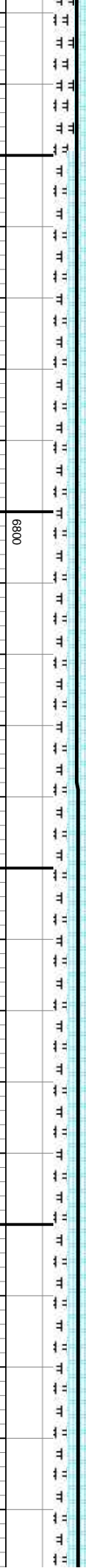
mod frm, sb ply-sb -d-dk gy, sl frm-mod x, vit lstr, calc	70% CHK: lgy-ofwh, mot, sft-mod frm, sb ply-sb -dky, v calc: 30% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb dkly, silty-mot tex, vit lstr, calc	580% CHK: lgy-ofwh, mot, sft-mod frm, sb ply-sb -dky, v calc: 20% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb dkly, silty-mot tex, vit lstr, calc, tr pyr, tr fos frag	80% CHK: lgy-ofwh, mot, sft-mod frm, sb ply-sb -dky, v calc: 20% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb dkly, silty-mot tex, vit lstr, calc, tr pyr, tr fos frag	90% CHK: lgy-ofwh, mot, sft-mod frm, sb ply-sb -dky, v calc: 10% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb dkly, silty-mot tex, vit lstr, calc, tr pyr, tr fos frag
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ID: 8,736  
VD: 6,606.7  
Inclination: 91.1  
Azimuth: 179.5  
VS: 2,685.53

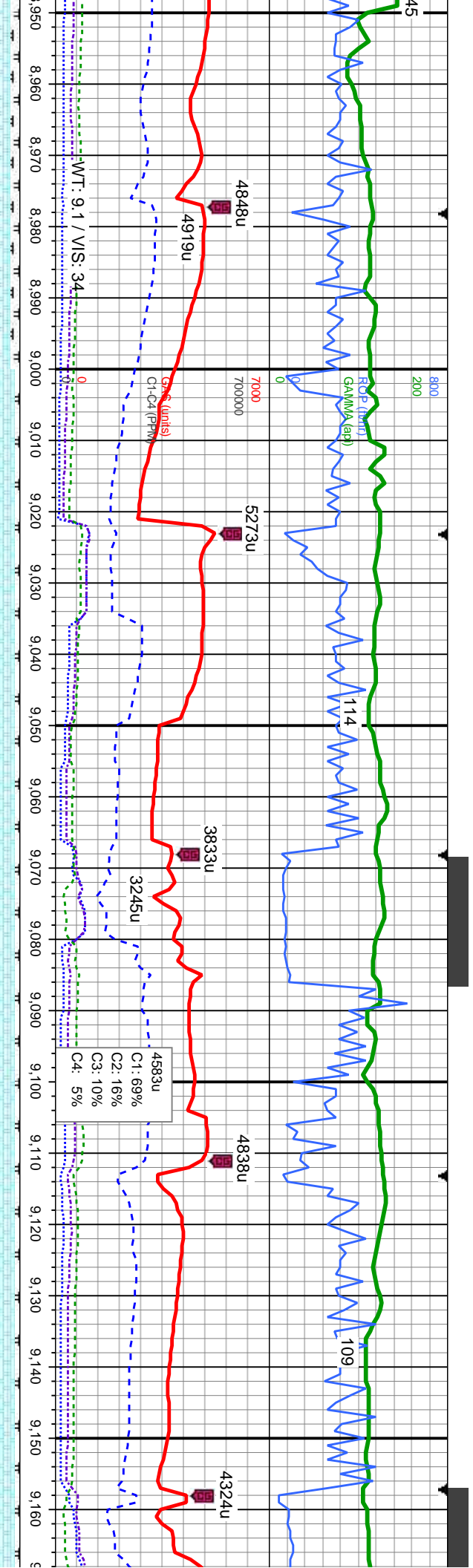
TVD (ft)

MD: 8,826  
TVD: 6,604.97  
Inclination: 91.1  
Azimuth: 179.5  
VS: 2,774.81

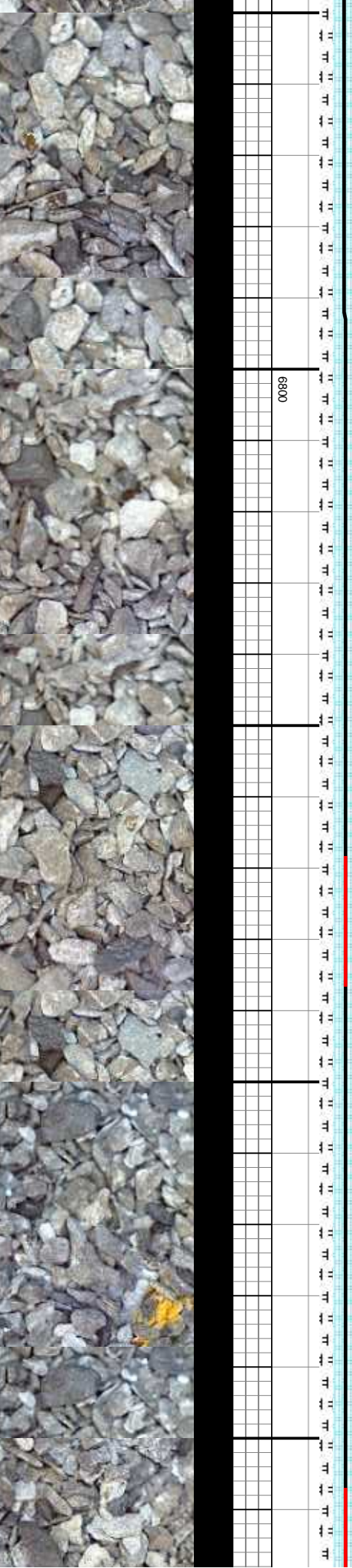
MD: 8,916  
TVD: 6,602.85  
Inclination: 91.6  
Azimuth: 180.5  
VS: 2,863.98

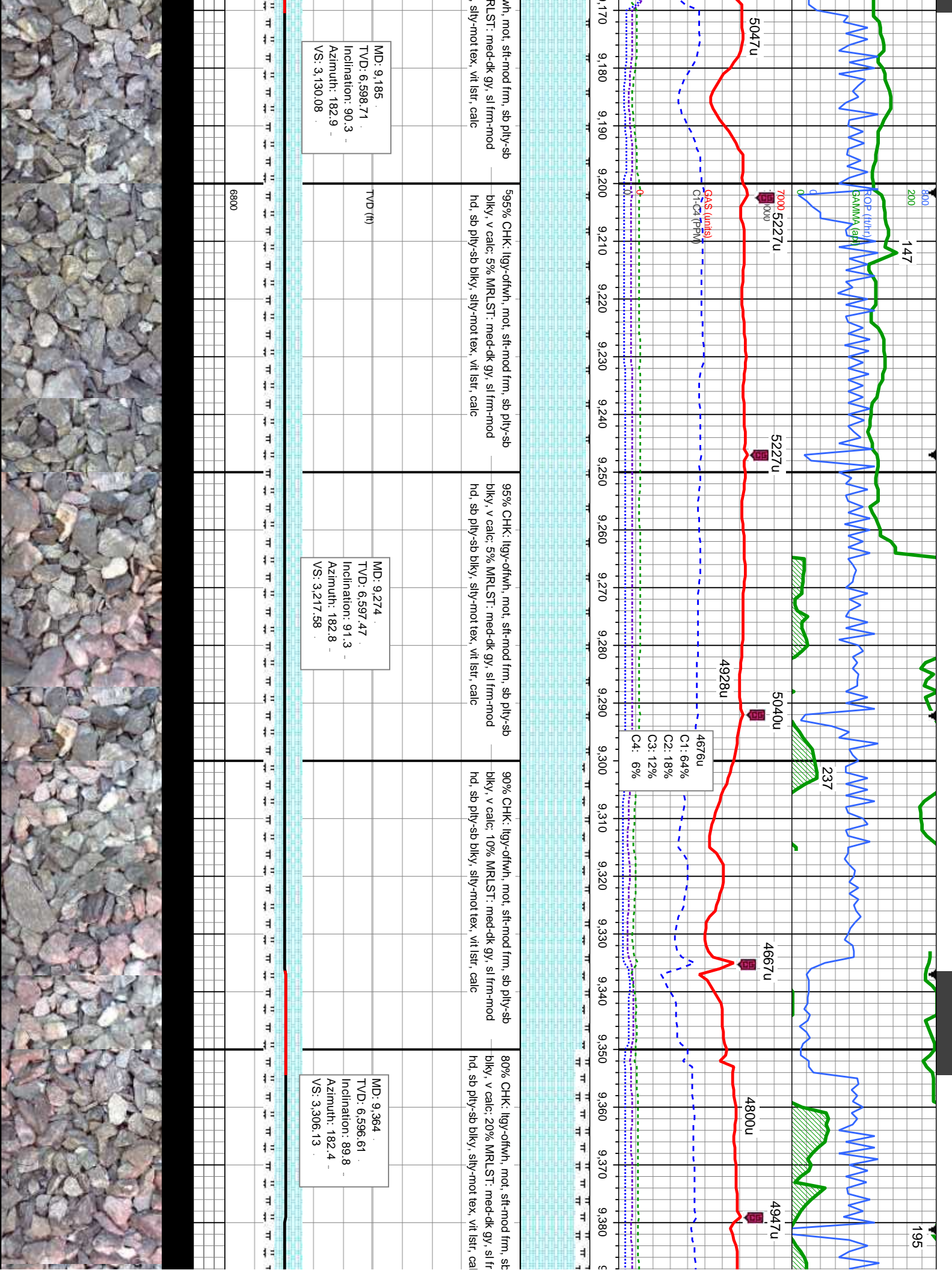




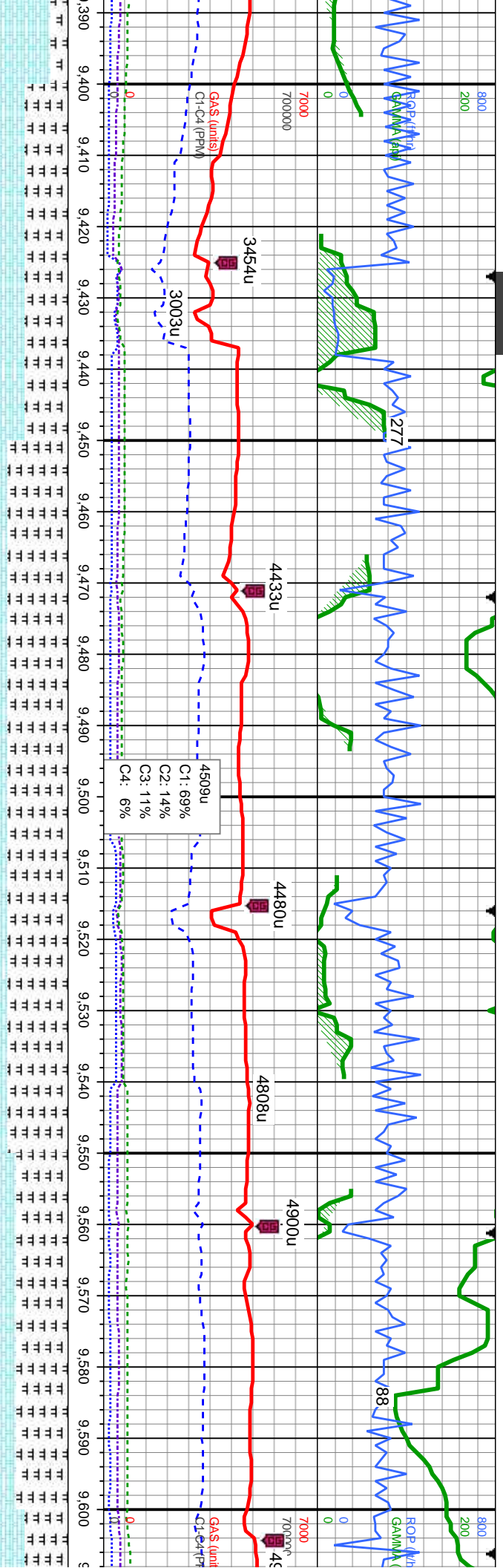


90% CHK: lgy-ofw/h, mot, sft-mod frm, sb ply-sb biky, v calc: 10% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb biky, silv-mot tex, vit lstr, calc, tr pyr, tr fos frag	5895% CHK: lgy-ofw/h, mot, sft-mod frm, sb ply-sb biky, v calc: 5% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb biky, silv-mot tex, vit lstr, calc	95% CHK: lgy-ofw/h, mot, sft-mod frm, sb ply-sb biky, v calc: 5% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb biky, silv-mot tex, vit lstr, calc	95% CHK: lgy-ofw/h, mot, sft-mod frm, sb ply-sb biky, v calc: 5% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb biky, silv-mot tex, vit lstr, calc	95% CHK: lgy-ofw/h, mot, sft-mod frm, sb ply-sb biky, v calc: 5% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb biky
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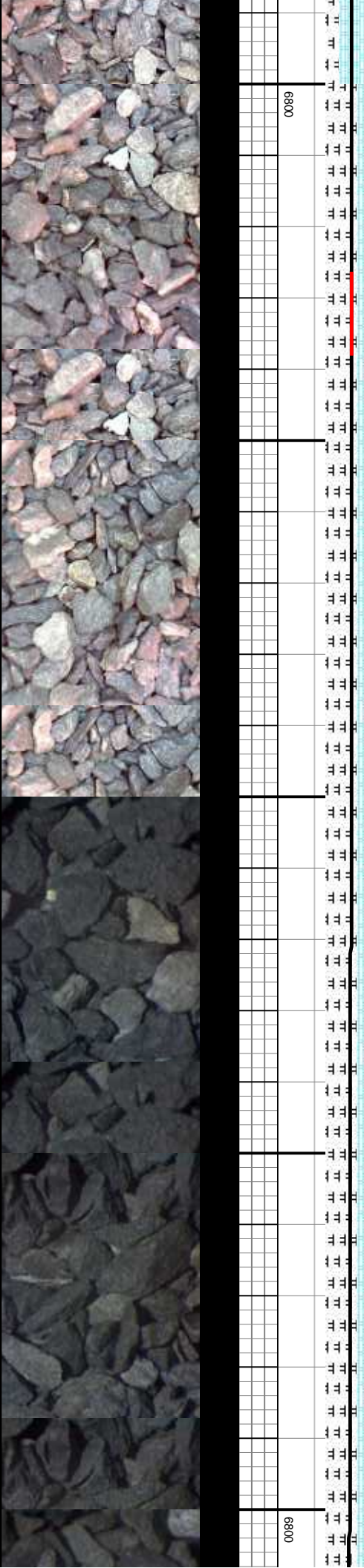






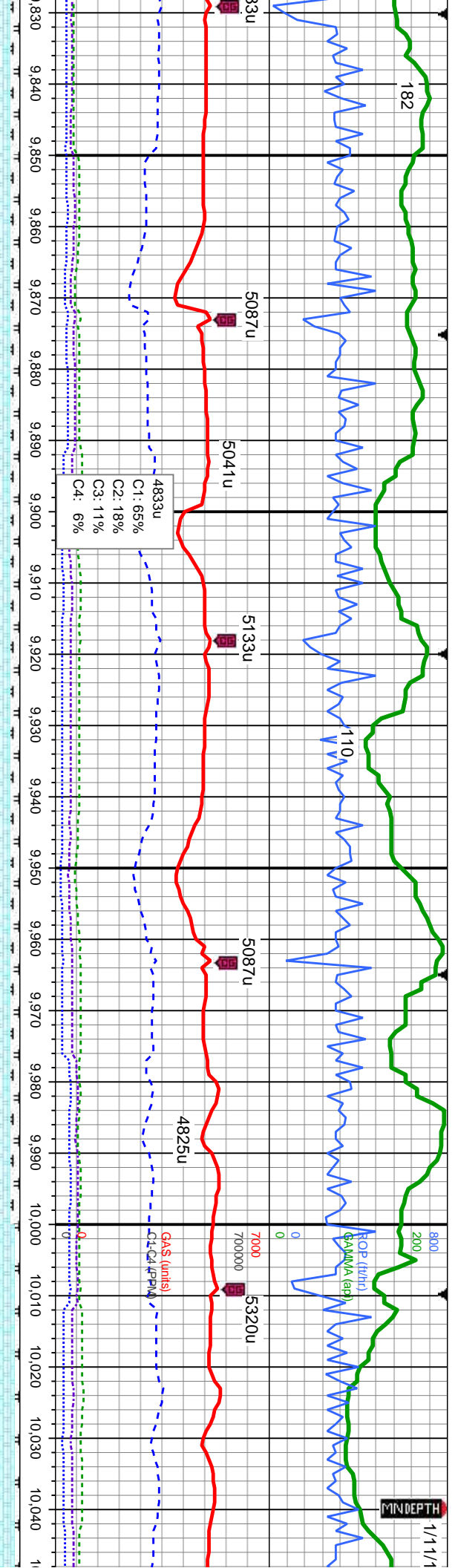


MD: 9.454 TVD: 6,598.18 Inclination: 88.2 Azimuth: 181 VS: 3,394.91	MD: 9.543 TVD: 6,601.6 Inclination: 87.4 Azimuth: 181.1 VS: 3,482.82
TVD (ft)	TVD (ft)









mod frm, sb ply-sb	90% CHK: lgy-offwh, mot, sft-mod frm, sb ply-sb	90% CHK: lgy-offwh, mot, sft-mod frm, sb ply-sb	90% CHK: lgy-offwh, mot, sft-mod frm, sb ply-sb	565% CHK: lgy-offwh, mot, sft-mod frm, sb ply-sb
-dkk-gy, sl frm-mod	blky, v calc: 10% MRLST: med-dk gy, sl frm-mod	blky, v calc: 10% MRLST: med-dk gy, sl frm-mod	blky, v calc: 10% MRLST: med-dk gy, sl frm-mod	blky, v calc: 5% MRLST: med-dk gy, sl frm-mod
x, vit lstr, calc, tr	hd, sb ply-sb blky, silv-mot tex, vit lstr, calc, tr	hd, sb ply-sb blky, silv-mot tex, vit lstr, calc	hd, sb ply-sb blky, silv-mot tex, vit lstr, calc	hd, sb ply-sb blky, silv-mot tex, vit lstr, calc
bent				

MD: 9.902  
TVD: 6,610.22  
Inclination: 90.2  
Azimuth: 180.1  
VS: 3.837.93

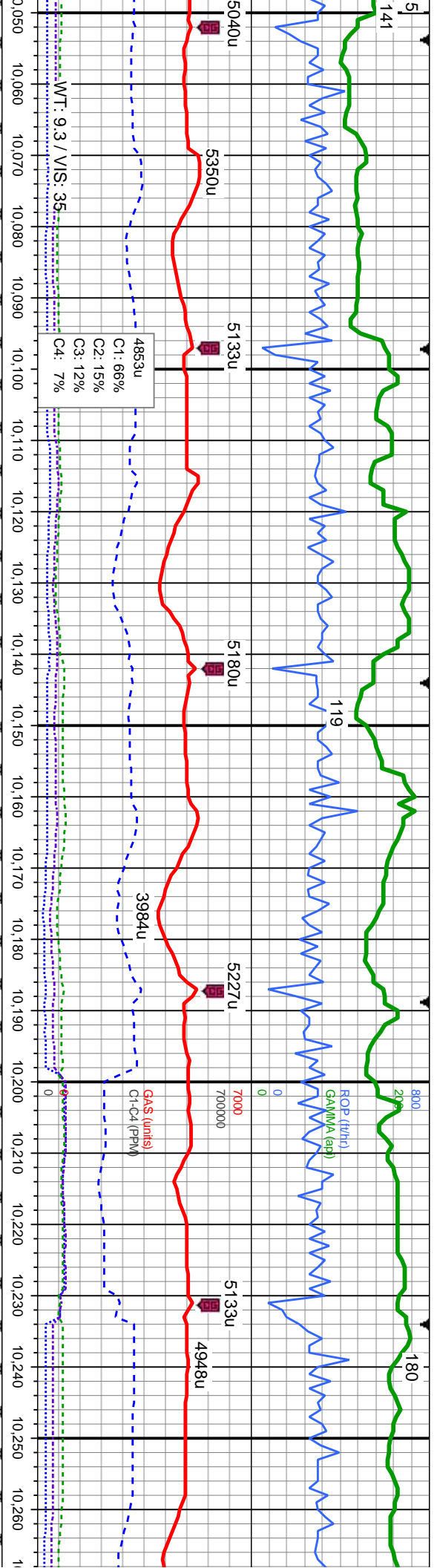
MD: 9.992  
TVD: 6,610.07  
Inclination: 90  
Azimuth: 180.1  
VS: 3.927.1

TVD (ft)

6800







95% CHK: lgy-ofwh, mot, sft-mod frm, sb ply-sb biky, v calc: 5% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb biky, silty-mot tex, vit lstr, calc

95% CHK: lgy-ofwh, mot, sft-mod frm, sb ply-sb biky, v calc: 5% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb biky, silty-mot tex, vit lstr, calc, tr fos frag

95% CHK: lgy-ofwh, mot, sft-mod frm, sb ply-sb biky, v calc: 5% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb biky, silty-mot tex, vit lstr, calc, tr fos frag

95% CHK: lgy-ofwh, mot, sft-mod frm, sb ply-sb biky, v calc: 5% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb biky, silty-mot tex, vit lstr, calc, tr fos frag

95% CHK: lgy-ofwh, mot, sft-mod frm, sb ply-sb biky, v calc: 5% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb biky, silty-mot tex, vit lstr, calc, tr fos frag

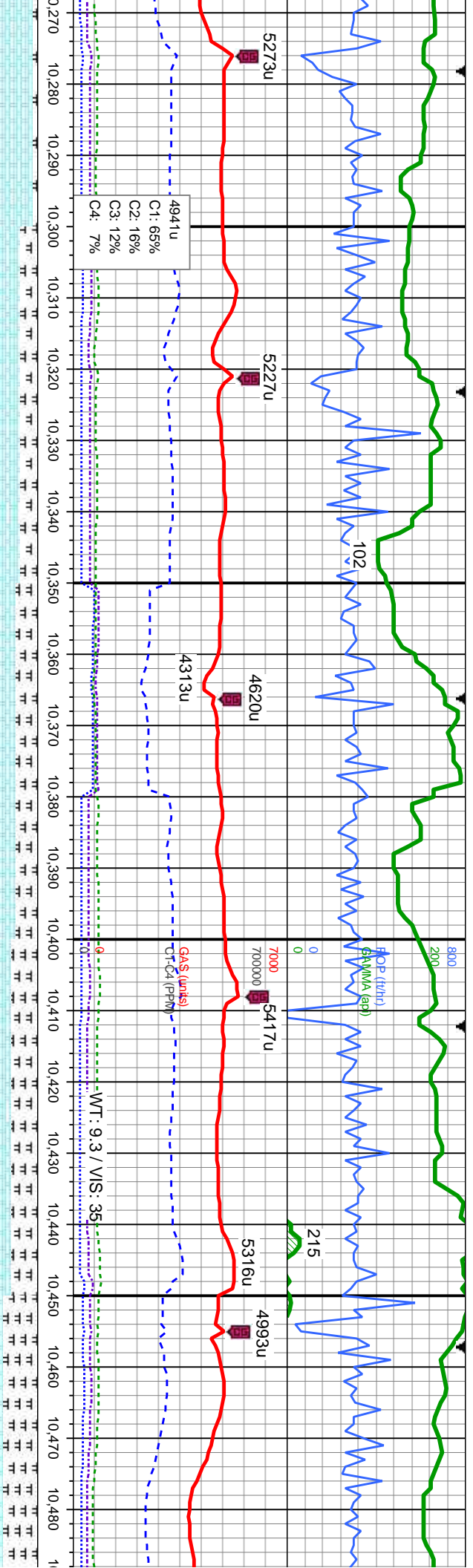
MD: 10,081  
TVD: 6,609.99  
Inclination: 90.1  
Azimuth: 179.7  
VS: 4,015.33

MD: 10,171  
TVD: 6,609.99  
Inclination: 89.9  
Azimuth: 179.4  
VS: 4,104.62

MD: 10,261  
TVD: 6,610.46  
Inclination: 89.5  
Azimuth: 179.4  
VS: 4,193.93

6800





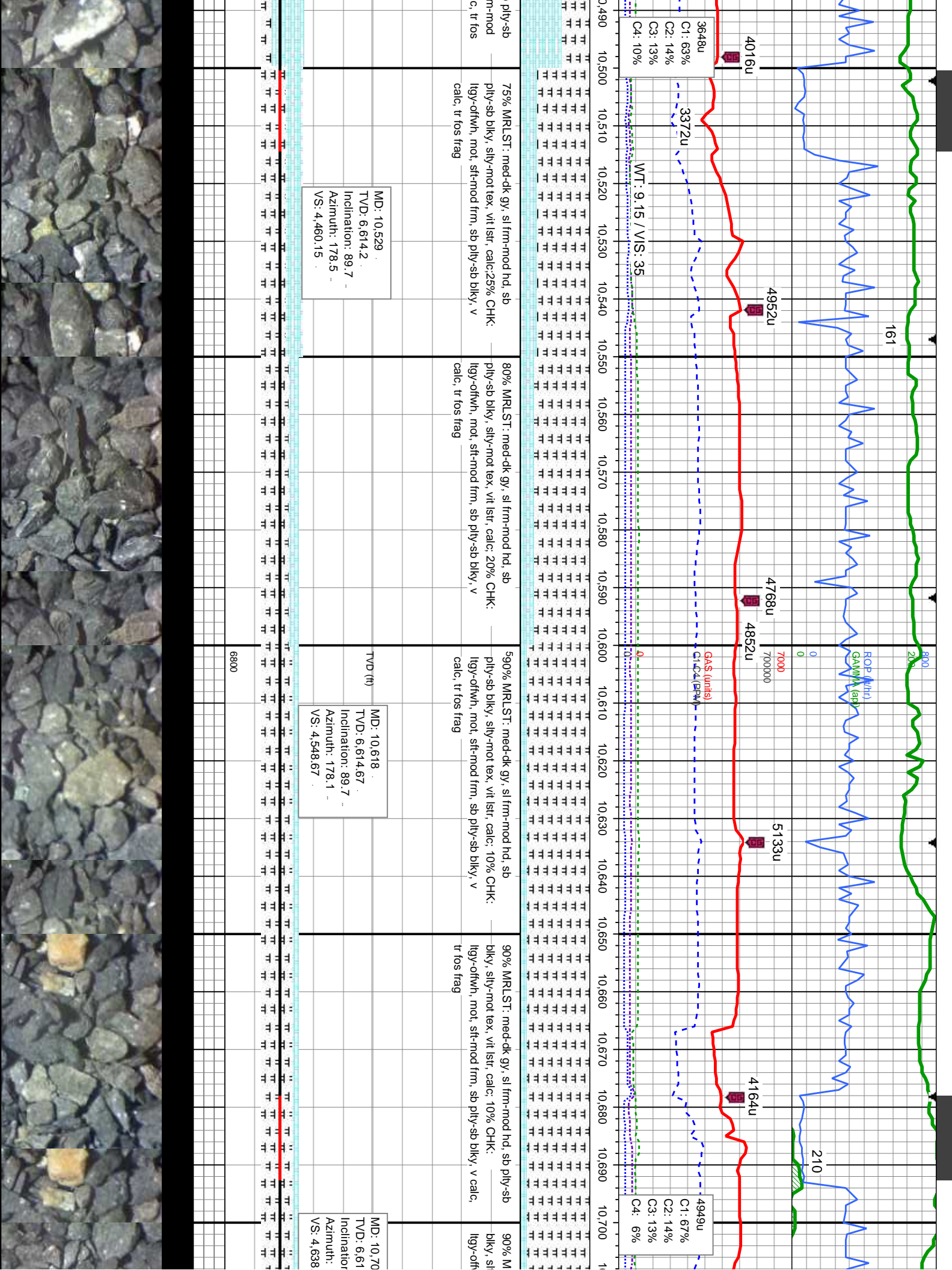
10,270	10,280	10,290	10,300	10,310	10,320	10,330	10,340	10,350	10,360	10,370	10,380	10,390	10,400	10,410	10,420	10,430	10,440	10,450	10,460	10,470	10,480
10,270 10,280 10,290 10,300 10,310 10,320 10,330 10,340 10,350 10,360 10,370 10,380 10,390 10,400 10,410 10,420 10,430 10,440 10,450 10,460 10,470 10,480																					

10,270	10,280	10,290	10,300	10,310	10,320	10,330	10,340	10,350	10,360	10,370	10,380	10,390	10,400	10,410	10,420	10,430	10,440	10,450	10,460	10,470	10,480
10,270 10,280 10,290 10,300 10,310 10,320 10,330 10,340 10,350 10,360 10,370 10,380 10,390 10,400 10,410 10,420 10,430 10,440 10,450 10,460 10,470 10,480																					

10,270	10,280	10,290	10,300	10,310	10,320	10,330	10,340	10,350	10,360	10,370	10,380	10,390	10,400	10,410	10,420	10,430	10,440	10,450	10,460	10,470	10,480
10,270 10,280 10,290 10,300 10,310 10,320 10,330 10,340 10,350 10,360 10,370 10,380 10,390 10,400 10,410 10,420 10,430 10,440 10,450 10,460 10,470 10,480																					







161

210

4952u

4768u

5133u

4164u

3648u  
C1: 63%  
C2: 14%  
C3: 13%  
C4: 10%

4949u  
C1: 67%  
C2: 14%  
C3: 13%  
C4: 6%

WT: 9.15 / VS: 35

75% MRLST: med-dk gy, sl frm-mod hd, sb pty-sb blkly, silty-mot tex, vit lstr, calc:25% CHK: llyg-offwh, mot, sft-mod frm, sb pty-sb blkly, v calc, tr fos frag

80% MRLST: med-dk gy, sl frm-mod hd, sb pty-sb blkly, silty-mot tex, vit lstr, calc: 20% CHK: llyg-offwh, mot, sft-mod frm, sb pty-sb blkly, v calc, tr fos frag

590% MRLST: med-dk gy, sl frm-mod hd, sb pty-sb blkly, silty-mot tex, vit lstr, calc: 10% CHK: llyg-offwh, mot, sft-mod frm, sb pty-sb blkly, v calc, tr fos frag

90% MRLST: med-dk gy, sl frm-mod hd, sb blkly, silty-mot tex, vit lstr, calc: 10% CHK: llyg-offwh, mot, sft-mod frm, sb pty-sb blkly, v calc, tr fos frag

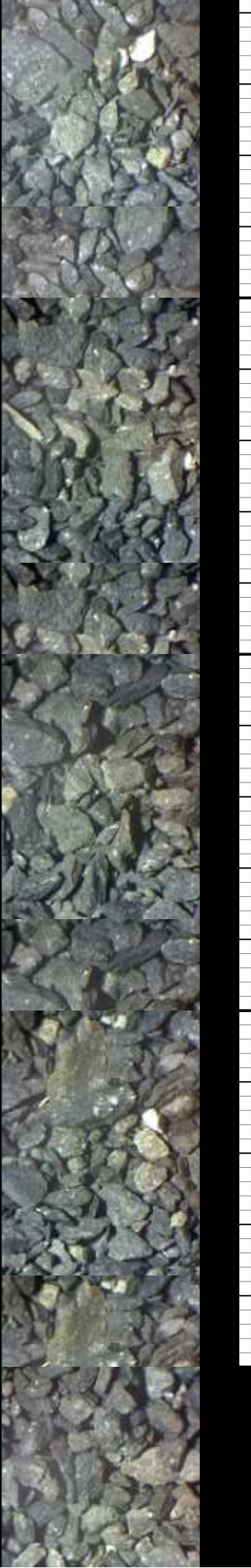
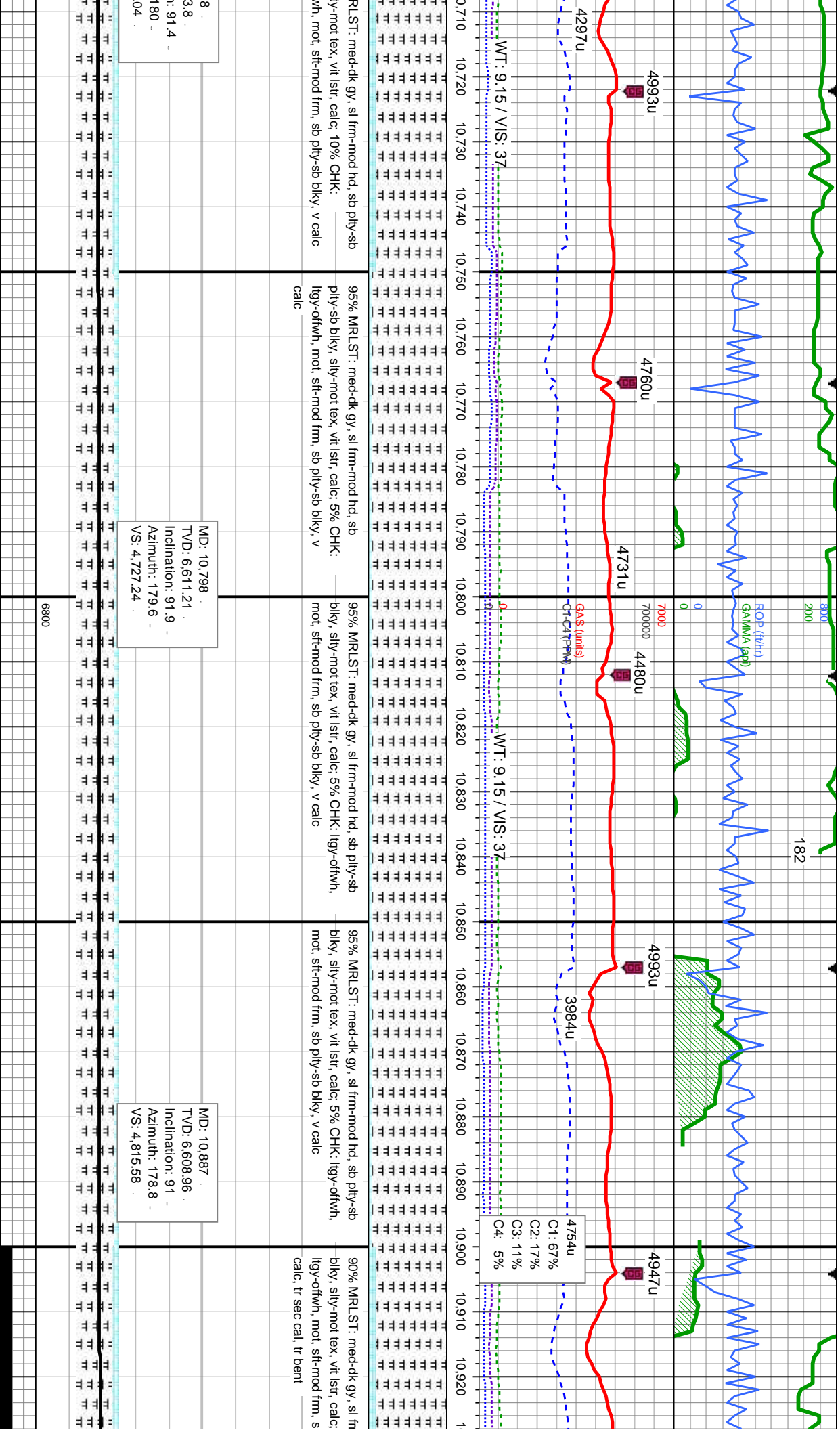
90% MRLST: med-dk gy, sl frm-mod hd, sb blkly, silty-mot tex, vit lstr, calc: 10% CHK: llyg-offwh, mot, sft-mod frm, sb pty-sb blkly, v calc, tr fos frag

MD: 10.529  
TVD: 6.614.2  
Inclination: 89.7  
Azimuth: 178.5  
VS: 4.460.15

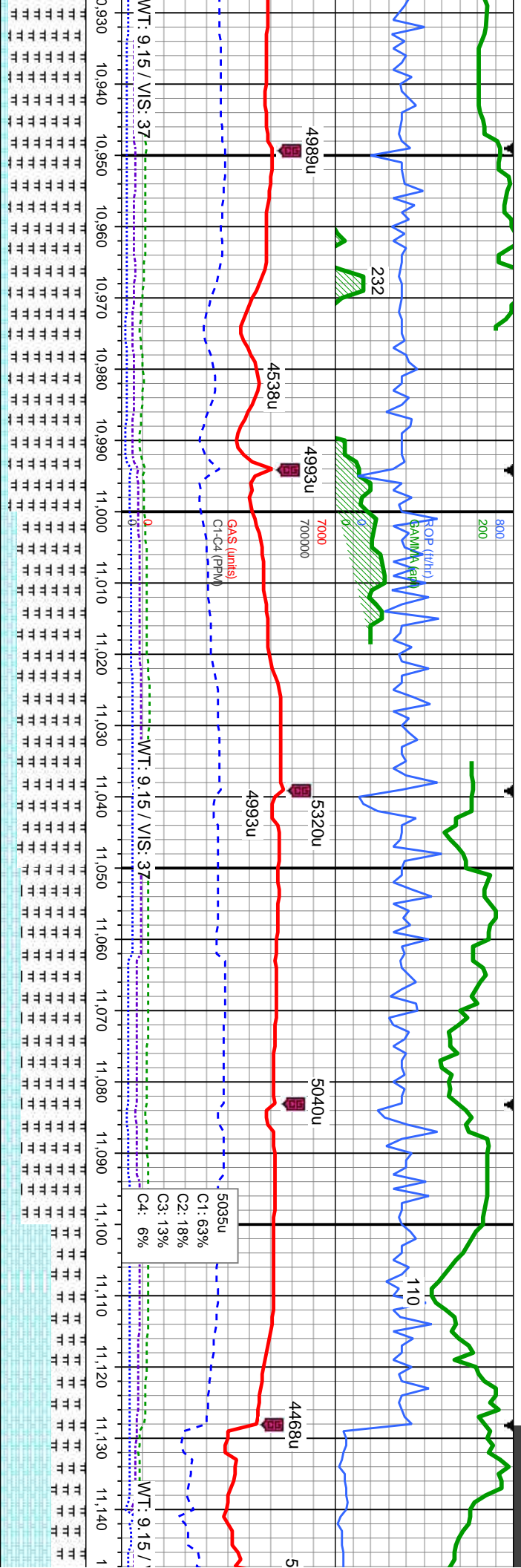
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TVD: 6.614.67  
Inclination: 89.7  
Azimuth: 178.1  
VS: 4.548.67

MD: 10.70  
TVD: 6.61  
Inclination: 89.7  
Azimuth: 178.5  
VS: 4.638

6800







mod hd, sb ply-sb  
10% CHK: —  
ply-sb blk, v

90% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb  
blk, silty-mot tex, vit lstr, calc; 10% CHK: —  
lgy-offwh, mot, sft-mod frm, sb ply-sb blk, v calc,  
tr sec cal, tr bent

80% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb  
blk, silty-mot tex, vit lstr, calc; 20% CHK: —  
lgy-offwh, mot, sft-mod frm, sb ply-sb blk, v calc,  
tr sec cal, tr bent

75% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb  
blk, silty-mot tex, vit lstr, calc; 25% CHK: —  
lgy-offwh, mot, sft-mod frm, sb ply-sb blk, v calc,  
tr sec cal, tr bent

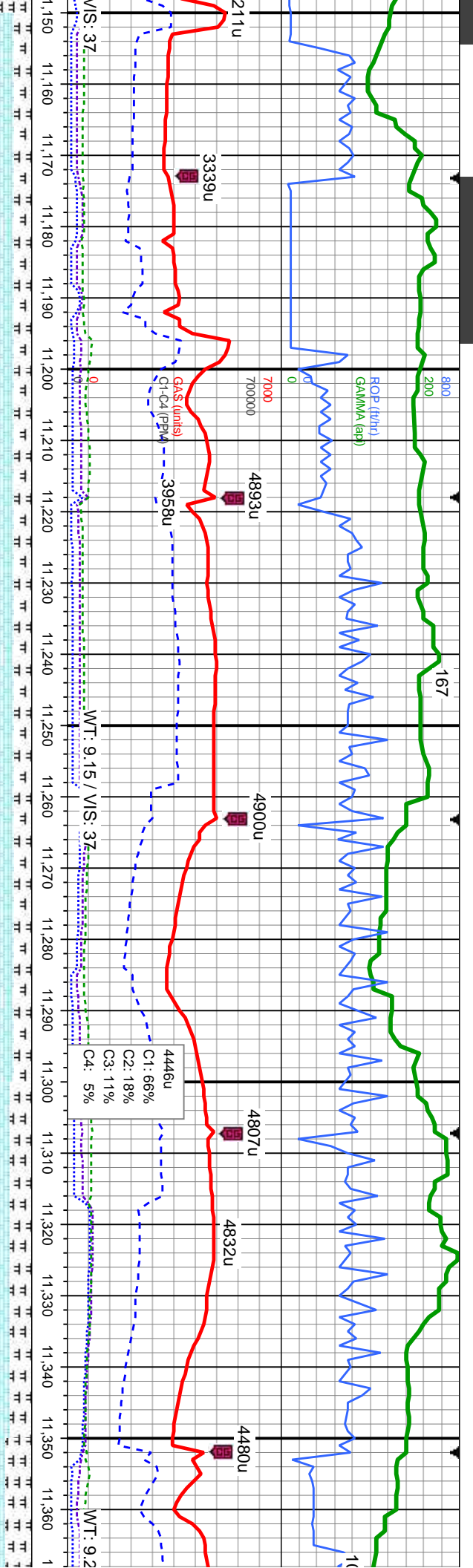
60% CHK: lgy-offwh, occ brn, mot, sft-mod frm,  
sb ply-sb blk, v calc; 40% MRLST: med-dk gy, sl  
frm-mod hd, sb ply-sb blk, silty-mot tex, vit lstr,  
calc, tr sec cal, tr inoc

MD: 10.977  
TVD: 6,607.86  
Inclination: 90.4  
Azimuth: 178.8  
VS: 4.905

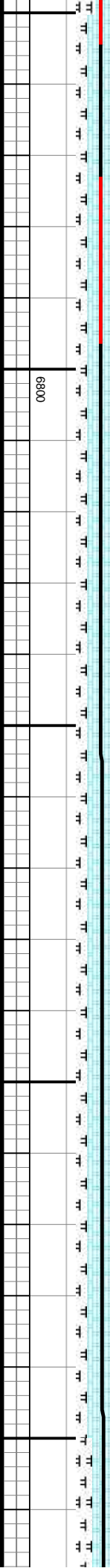
MD: 11.067  
TVD: 6,607.7  
Inclination: 89.8  
Azimuth: 178.4  
VS: 4.994.46

6800

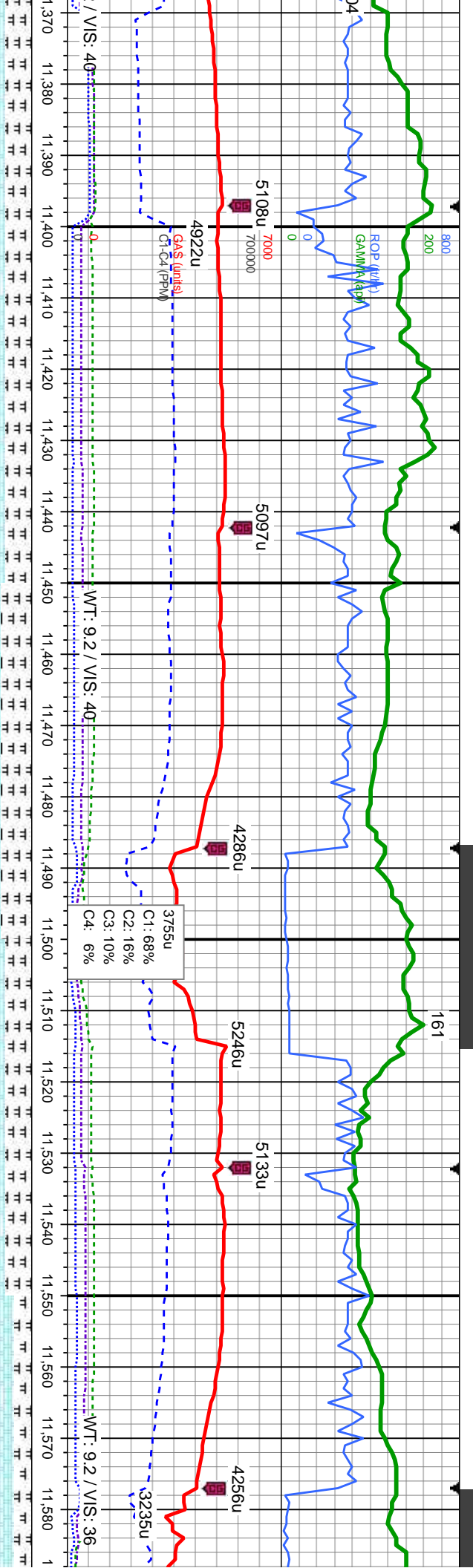




80% CHK: lgy-offwh, occ brn, mot, sft-mod frm, sb ply-sb blkly, v calc: 20% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, silty-mot tex, vit lstr, calc, tr sec cal, tr inoc	80% CHK: lgy-offwh, occ brn, mot, sft-mod frm, sb ply-sb blkly, v calc: 20% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, silty-mot tex, vit lstr, calc, occ lse foss, tr sec cal, tr inoc	80% CHK: lgy-offwh, occ brn, mot, sft-mod frm, sb ply-sb blkly, v calc: 20% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, silty-mot tex, vit lstr, calc, occ lse foss, tr sec cal, tr inoc	75% CHK: lgy-offwh, occ brn, mot, sft-mod frm, sb ply-sb blkly, v calc: 25% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, silty-mot tex, vit lstr, calc, occ lse foss, tr sec cal, tr inoc	70% CHK: lgy-offwh, occ brn, mot, sft-mod frm, sb ply-sb blkly, v calc: 25% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, silty-mot tex, vit lstr, calc, occ lse foss, tr sec cal, tr inoc
ID: 11,156 VD: 6,607.39 inclination: 90.6 azimuth: 180.6 S: 5,082.76	MD: 11,246 TVD: 6,605.04 inclination: 92.4 Azimuth: 183.2 VS: 5,171.47	MD: 11,335 TVD: 6,601.31 inclination: 92.4 Azimuth: 183 VS: 5,258.83		







h, occ brn, mot, sft-mot frm, sb  
30% MRLST: med-dk gy, sl  
sb blkly, sily-mot tex, vit lstr,  
sec cal, tr inoc

70% CHK: ligy-offwh, occ brn, mot, sft-mot frm, sb  
ply-sb blkly, v calc: 30% MRLST: med-dk gy, sl  
frm-mot hd, sb ply-sb blkly, sily-mot tex, vit lstr,  
calc, occ lse foss, tr sec cal, tr inoc

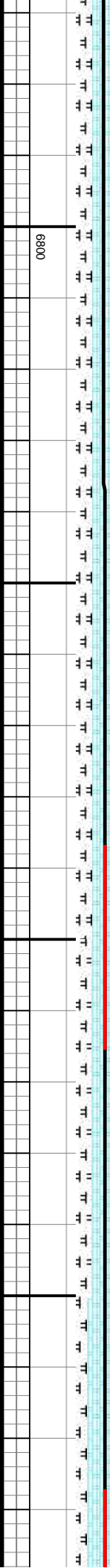
65% CHK: ligy-offwh, occ brn, mot, sft-mot frm,  
sb ply-sb blkly, v calc: 35% MRLST: med-dk gy, sl  
frm-mot hd, sb ply-sb blkly, sily-mot tex, vit lstr,  
calc, occ lse foss, tr sec cal, tr inoc

70% CHK: ligy-offwh, occ brn, mot, sft-mot frm, sb  
ply-sb blkly, v calc: 30% MRLST: med-dk gy, sl  
frm-mot hd, sb ply-sb blkly, sily-mot tex, vit lstr,  
calc, tr lse foss, tr sec cal, tr inoc

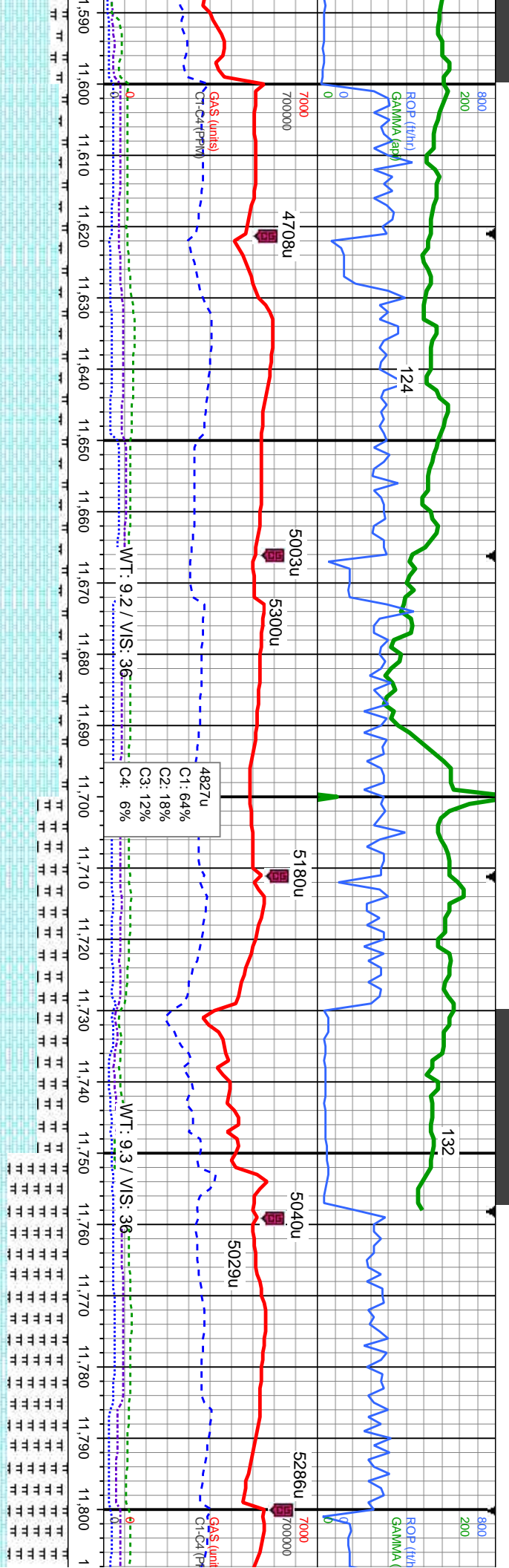
80% CHK: ligy-offwh, occ brn, mot, sft-mo  
ply-sb blkly, v calc: 20% MRLST: med-dk  
frm-mot hd, sb ply-sb blkly, sily-mot tex, v  
calc, tr lse foss, tr sec cal, tr inoc

MD: 11,425  
TVD: 6,597.23  
Inclination: 92.8  
Azimuth: 183  
VS: 5,347.18

MD: 11,514  
TVD: 6,594.51  
Inclination: 90.7  
Azimuth: 182  
VS: 5,434.83







590% CHK: lgy-offwh, occ brn, mot, sft-mod frm, sb ply-sb blk, v calc: 10% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blk, silty-mot tex, vit lstr, calc, tr lse foss, tr sec cal, tr inoc	90% CHK: lgy-offwh, occ brn, mot, sft-mod frm, sb ply-sb blk, v calc: 10% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blk, silty-mot tex, vit lstr, calc, tr lse foss, tr sec cal, tr inoc	65% CHK: lgy-offwh, occ brn, mot, sft-mod frm, sb ply-sb blk, v calc: 35% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blk, silty-mot tex, vit lstr, calc, tr lse foss, tr sec cal, tr inoc	70% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blk, silty-m lstr, calc: 30% CHK: lgy-offwh, occ brn, mot, sft-mod frm, sb v calc, tr inoc
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MD: 11,604  
TVD: 6,594.51  
Inclination: 89.3  
Azimuth: 182.2  
VS: 5,523.52

MD: 11,693  
TVD: 6,594.35  
Inclination: 90.9  
Azimuth: 183.6  
VS: 5,611.01

MD: 11,762  
TVD: 6,594.65  
Inclination: 88.6  
Azimuth: 184.9  
VS: 5,678.52

6800  
6800





