

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

Well Name Wells Ranch AA11-657

Location SENE 11 6N 63W

State COLORADO County WELD

Country USA Rig Number H&P #273

API Number 05-123-41255 Field WATTENBERG

Region DJ BASIN Drilling Completed 6/10/2015

Spud Date 6/4/2015

Surface Coordinates LAT: 40.50302  
LONG: -104.3952

500' FSL  
552' FEL

Bottom Hole Coordinates PROJECTED:  
2150' FNL  
2085' FEL

Ground Elevation 4869' K.B. Elevation 4893'

Logged Interval 800' To 13791' Total Depth 13791'

Formation NIOBRARA C CHALK

Type of Drilling Fluid H2O, LSND

## Operator

Company Noble Energy Inc.  
Address 1625 BROADWAY  
DENVER, CO 80202  
(303) 228-4000

## Geologists

Name MICHAEL ANDERSON, ANDREW MARTEN  
Company COLUMBINE LOGGING, INC.  
Address 602 S. LIPAN ST  
DENVER, COLORADO 80223  
(303) 289-7764

## Zone Color C



## Rock Type



Accessories

Fossils		Stringer	
	GASTROPOD		ARGILLITE GRAIN
	INOCERAMUS		HEAVY MINERAL
	OOLITE		KAOLIN
	OSTRACOD		MARCASITE
	BELEMNITE		MARLSTONE
	BIOCLASTIC		MICACEOUS
	BRACHIOPOD		MINERAL CRYSTALS
	BRYOZOA		NODULES
	CEPHALOPOD		PHOSPHATE PELLETS
	CORAL		PYRITE
	CRINOID		SALT CAST
	ECHINOID		SANDY
	FISH		SIDERITE
	FORAMINIFERA		SILICEOUS
	F. FOSSIL		SILTY
			TUFFACEOUS
			SHALE STRINGER
			SILTSTONE STRINGER
			ANHYDRITE STRINGER
			BENTONITE STRINGER
			COAL STRINGER
			DOLOMITE STRINGER
			GYPSUM STRINGER
			LIMESTONE STRINGER
			MARLSTONE (CALC) STRG
			MARLSTONE (DOL) STRG
			SANDSTONE STRINGER

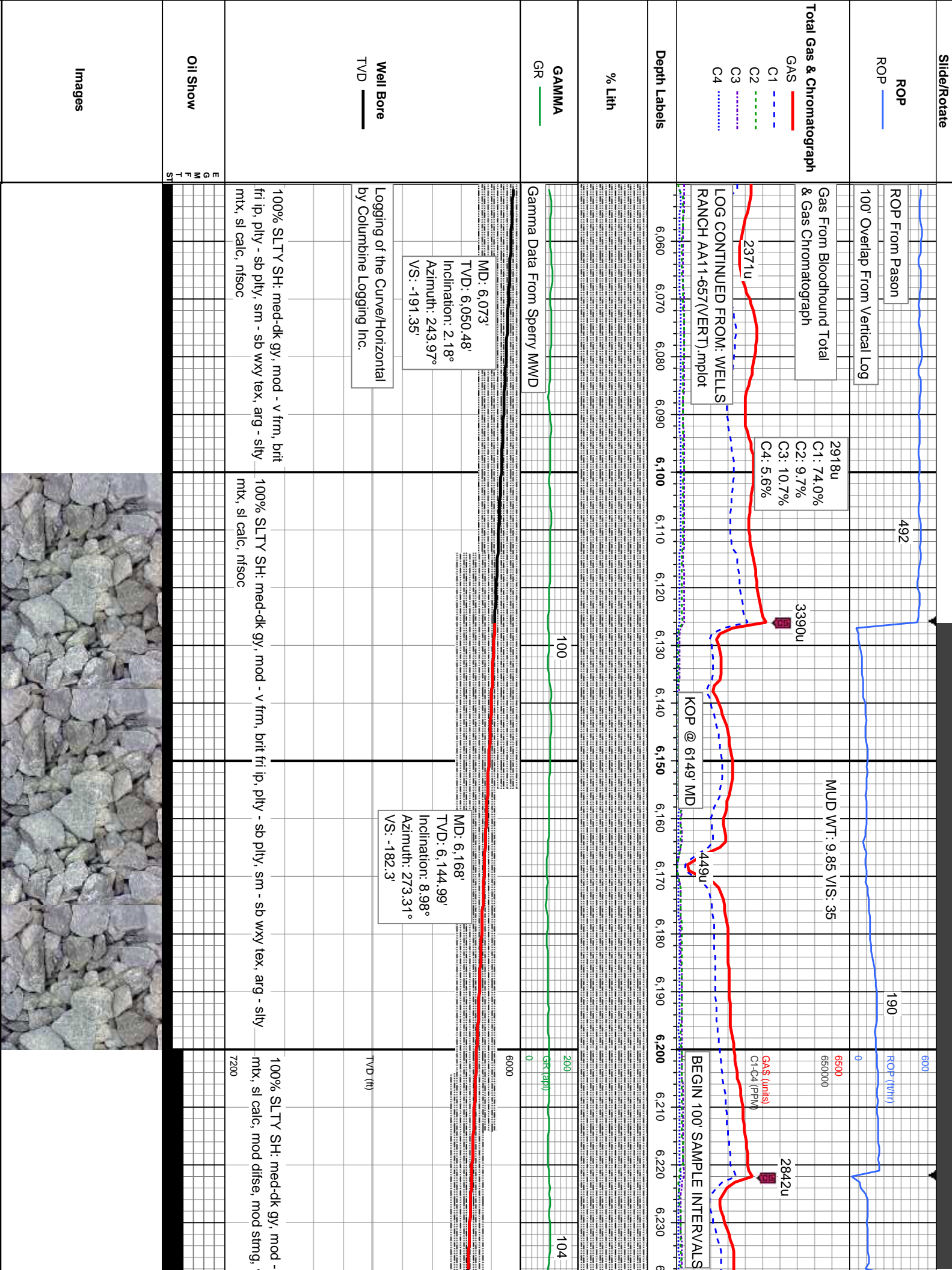
Other Symbols

Oil Show		Engineering	
	P PINPOINT		FAULT
	V VUGGY		FORMATION TOP
	D DEAD		GAS SHOW
	E EVEN		OIL SHOW
	Q QUESTIONABLE		BIT
	SPOTTED STAIN...		CONNECTION (UP)
			CONNECTION (DOWN)
			NORMAL FAULT
			OVERTURNED STRATA
			REVERSE FAULT
			CASING
			SIDEWALL CORE (LEFT)
			SIDEWALL CORE (RIGH...
			SLIDE
			SURVEY
			WIRELINE TESTED - LE...
			WIRELINE TESTED - RT
			DRILL STEM TEST
			MN DEPTH
			L LITHOGRAPHIC
			MX MICROXLN
			M MUDSTONE
			A ANGULAR
			P PACKSTONE
			W WACKESTO...
			R ROUNDED
			S SUBANG
			S SUBRND
			M MODERATE
			P POOR
			W WELL

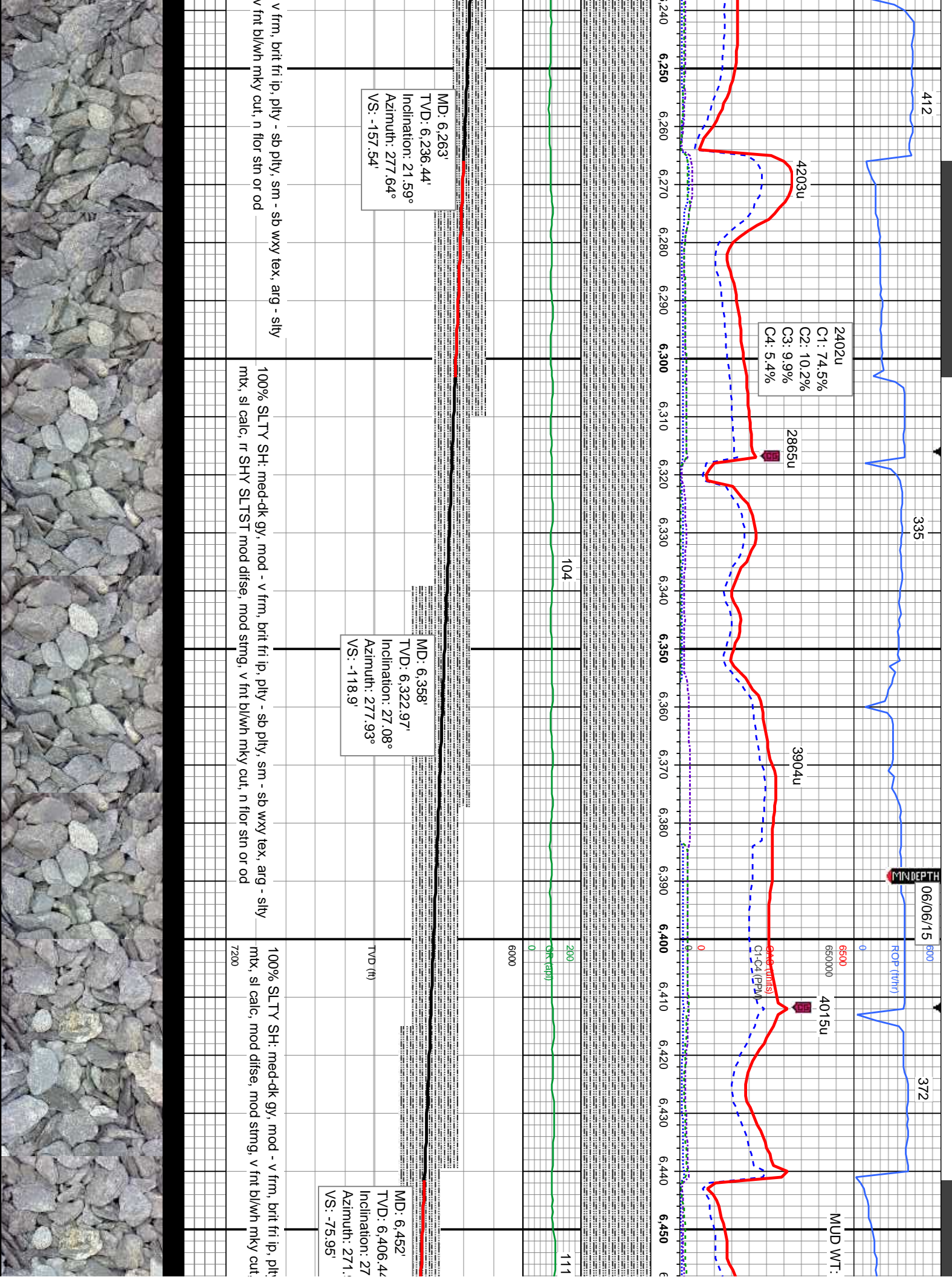
Logging



	MARLSTONE		SHALY SANDSTO...
	METAMORPHIC		SHALY SILTSTONE
	NO SAMPLE		SILTY SHALE
	SALT		SILTSTONE
	SANDSTONE		TILL
	SALT-PEPPER SA...		TUFF
	SHALE		WELDED TUFF
	SHALE COLORED		
	SHALE GRAY		

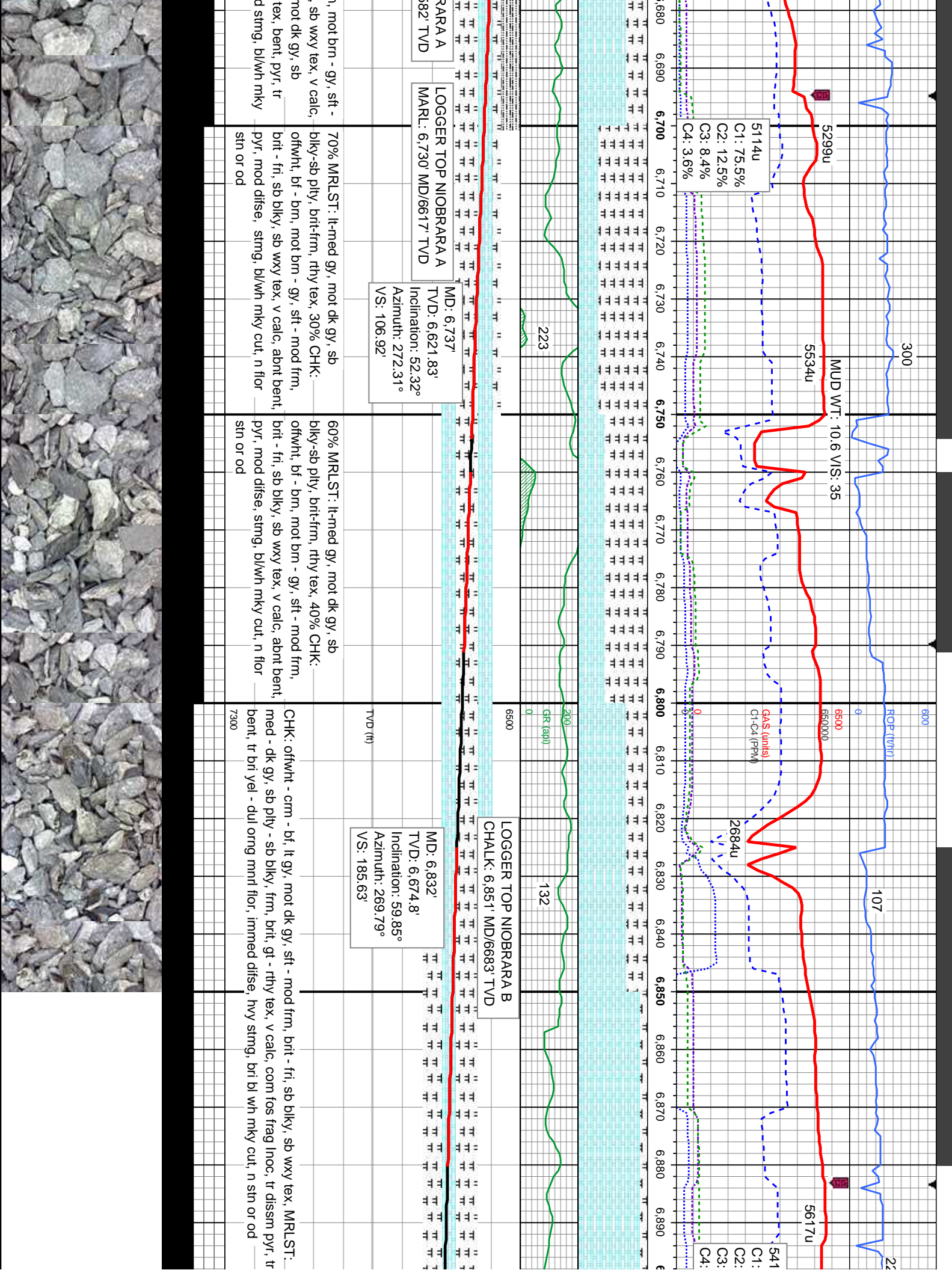




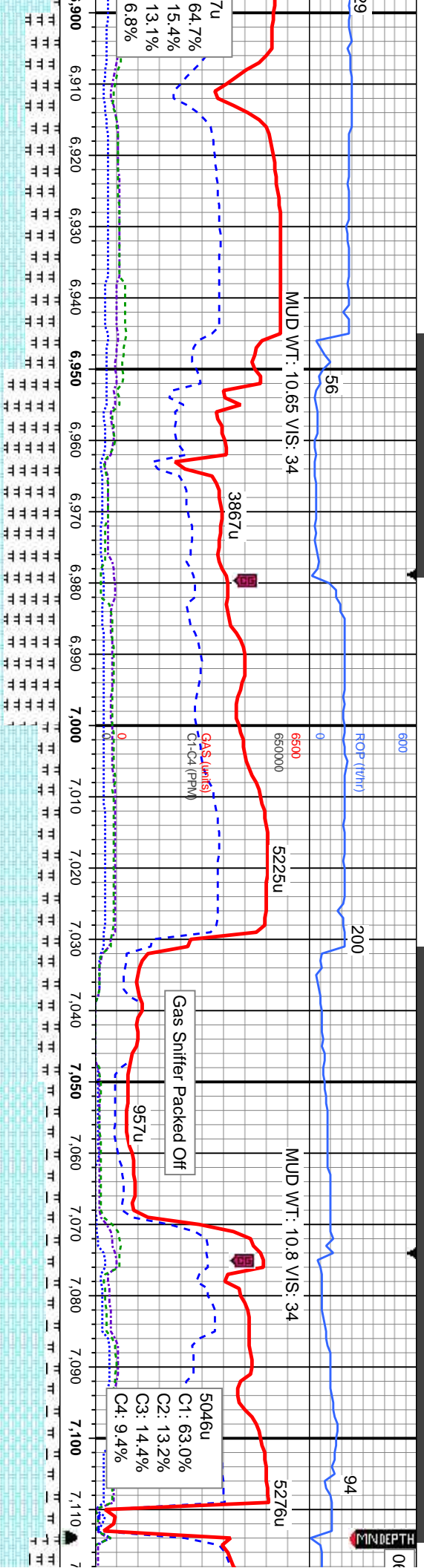












LOGGER TOP NIOBRARA B  
MARL: 6,926' MD/6715' TVD

MD: 6,926'  
TVD: 6,715.77'  
Inclination: 68.42°  
Azimuth: 268.34°  
VS: 270.14'

LOGGER TOP NIOBRARA C  
CHALK: 7,041' MD/6747' TVD

MD: 7,061'  
TVD: 6,753.09'  
Inclination: 79.44°  
Azimuth: 269.99°  
VS: 399.65'

TID Intermediate @  
@ 07:55 hrs on 04/11/2011

MD: 7,114'  
TVD: 6,760.00'  
Inclination: 80.00°  
Azimuth: 270.00°  
VS: 452.13'

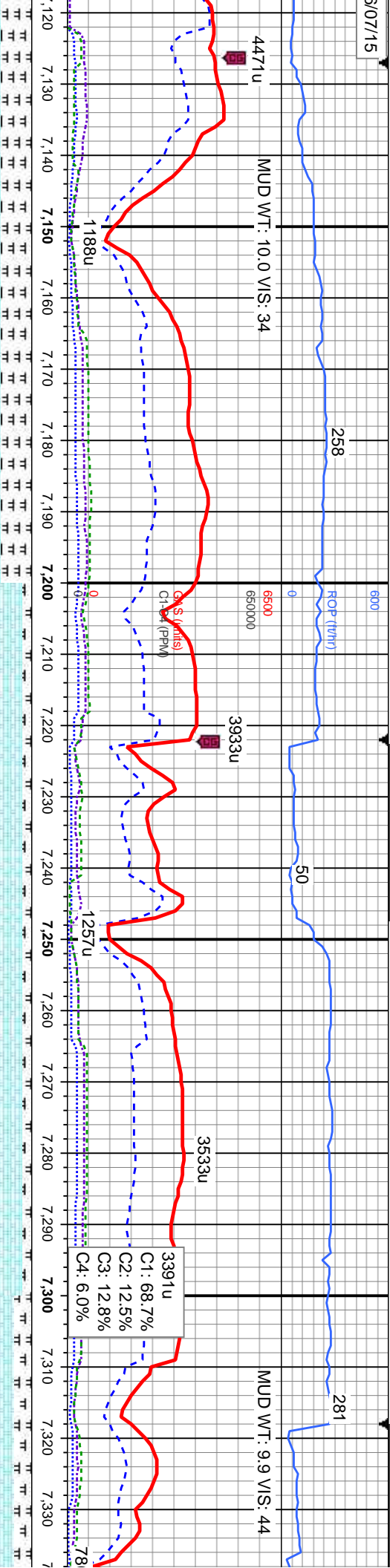
MRLST: med - dk gy, sb ply - sb blk, frm, brit, gt tex, CHK: offwht - crm, bf - brn, med - dk gy brn, mot brn - dk gy, sft - pied frm, brit - fri ip, sb blk, sb wxy - rthy tex, v calc, abnt fos frag lnoc, com bent wi dissim pyr, com bri yel - orng mnrl flr, mod disse, stmg, bri bl wh mky cut, n sin or od

CHK: offwht - crm, bf - brn, mot brn - gy, frm, brit, sb ply - sb blk, v wxy tex, MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, tr fos frag lnoc, rr bent wi dissim pyr, rr bri yel - orng mnrl flr, mod disse, sl stmg, bl wh mky cut, n sin or od

65% CHK: crm, med - dk gy, blk stmg, mod bri b



5/07/15



Resume Drilling @  
5/06/15 10:09 hrs on 06/07/15

**Bit Data**  
Bit #: 3  
Type: HDBS Security SFD55  
Size: 6.12  
Depth In: 7,114'  
Jets: 5x13  
S/N: 12671464

MD: 7,156'  
TVD: 6,763.91'  
Inclination: 84.97°  
Azimuth: 270.74°  
VS: 493.94'

MD: 7,251'  
TVD: 6,770.93'  
Inclination: 86.55°  
Azimuth: 270.41°  
VS: 588.63'

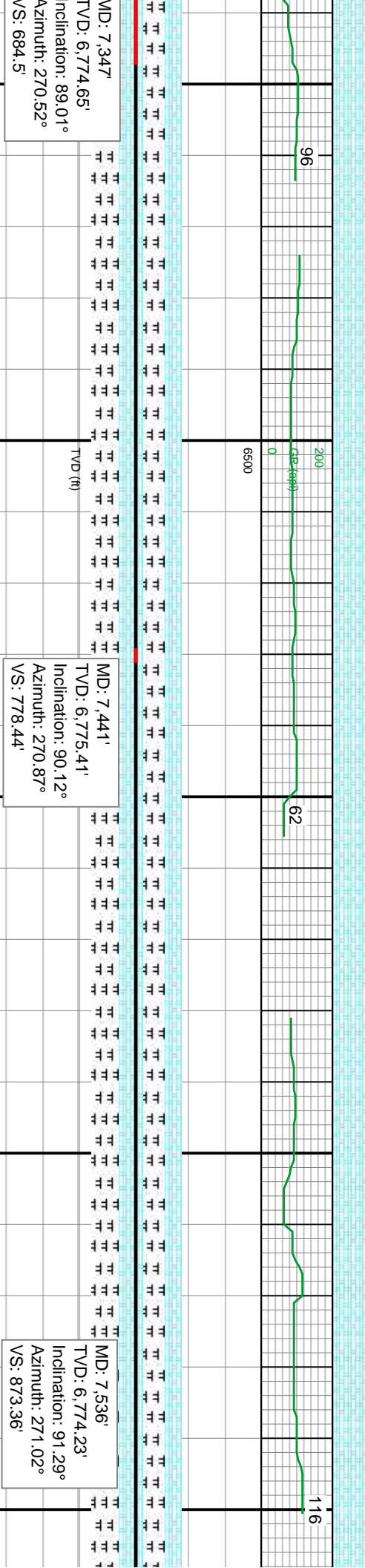
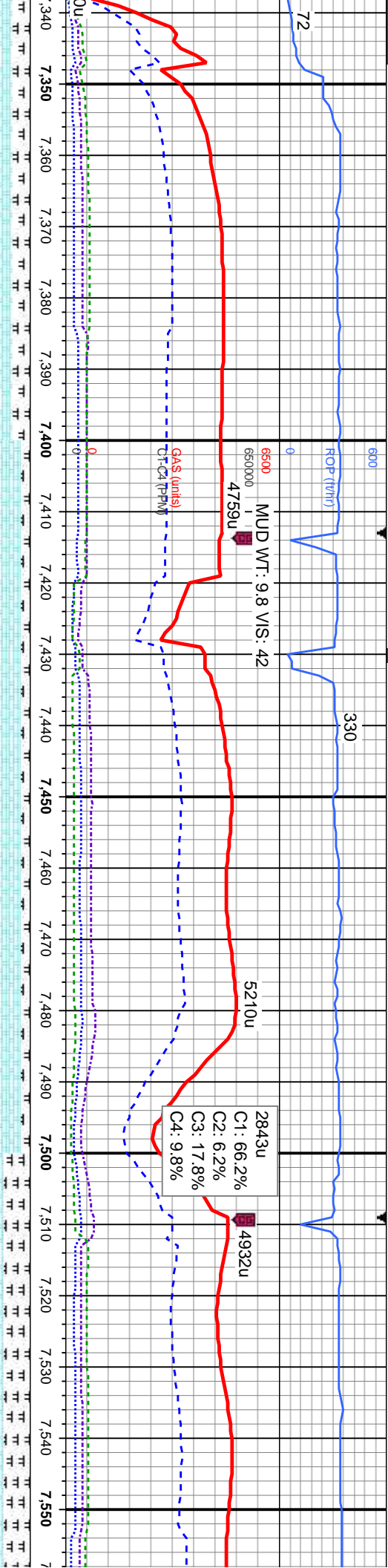
bf - brn, dk gy brn, mot gy ip, frm, brit, sb blkly, wxy - rthy tex, 35% MRLST:  
s, sb blkly, frm, brit, gt tex, v calc, occ fos frag Inoc, tr calcite, mod difse, mod  
wh mky cut, n flor sln or od

90% CHK: oftwht - crm, bf - brn, dk gy brn, mot dk gy ip, mod - v frm, brit, sb blkly, v wxy tex,  
calc, occ (10%) mrlst, tr fos frag Inoc, mod difse, mod sting, mod bri bl wh mky cut, n flor  
sln or od

80% CHK: oftwht - crm, bf - brn, oc  
tex, 20% MRLST: med - dk gy, blk  
Inoc, mod difse, mod sting, mod bri







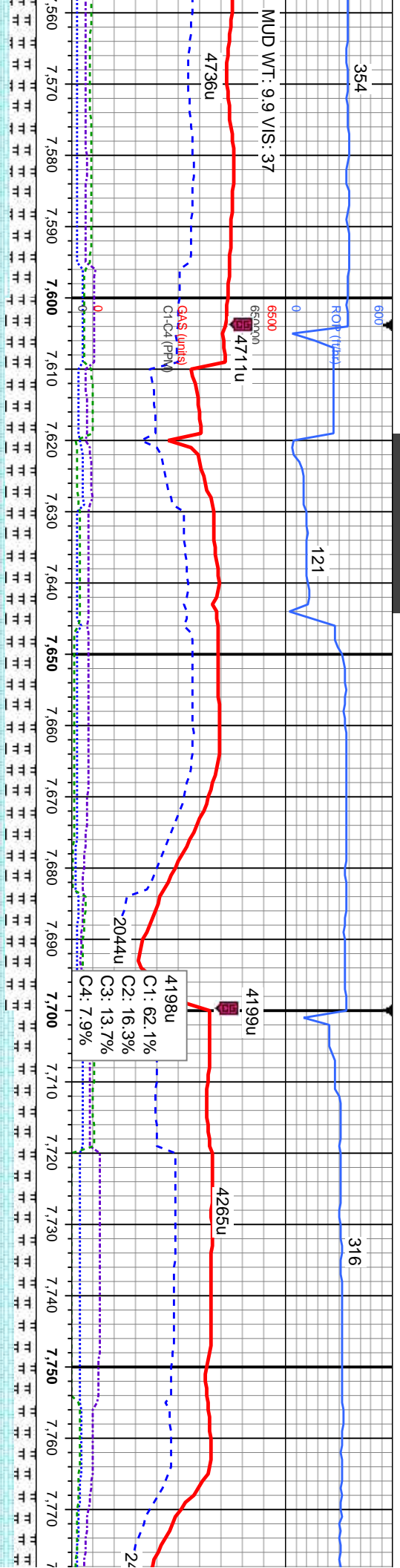
occ dk gy brn, mot dk gy ip, mod - v frm, brit, sb blk, v wxy  
sb ply - sb blk, frm, brit, gt tex, v calc, com fos frag  
1 bl wh mky cut, n flr stn or od

90% CHK: offwht - crm, bf - brn, mot gy ip, mod - v frm, brit, sb blk, v wxy tex, v calc, occ  
(10%) mrlst, occ fos frag lnc, mod difse, mod sting, mod bri bl wh mky cut, n flr stn or od

70% CHK: bf - brn, med - dk gy brn, occ crm, mot dk gy  
30% MRLST: med - dk gy, blk, sb ply - sb blk, frm, b  
mod difse, mod sting, bl wh mky cut, n flr stn or od





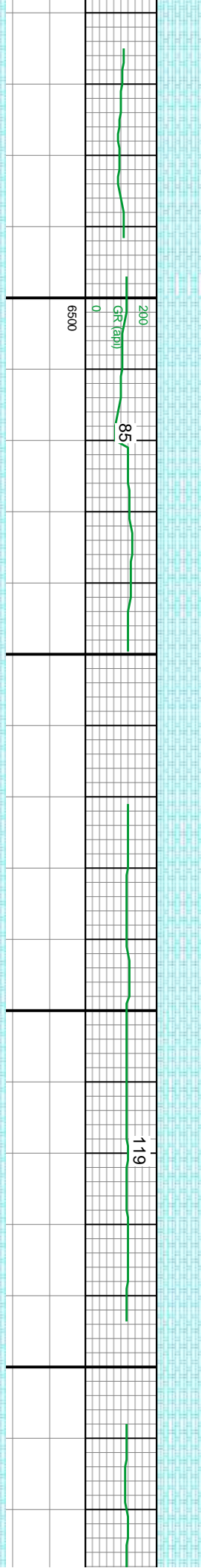


MUD WT: 9.9 VIS: 37

6500  
6500.00  
4711u

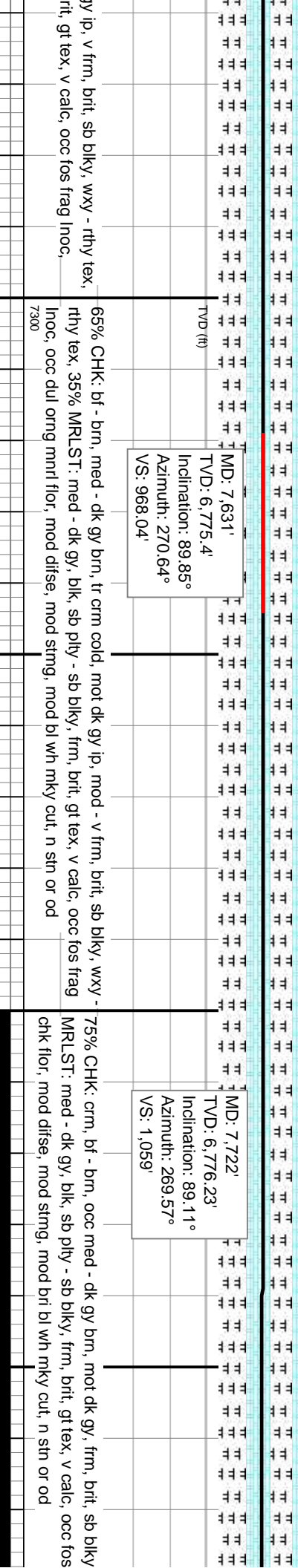
G4S (units)  
C1-C4 (PPM)

4198u  
C1: 62.1%  
C2: 16.3%  
C3: 13.7%  
C4: 7.9%



200  
GR (app)

119



TVD (ft)

MD: 7,631'  
TVD: 6,775.4'  
Inclination: 89.85°  
Azimuth: 270.64°  
VS: 968.04'

MD: 7,722'  
TVD: 6,776.23'  
Inclination: 89.11°  
Azimuth: 269.57°  
VS: 1,059'

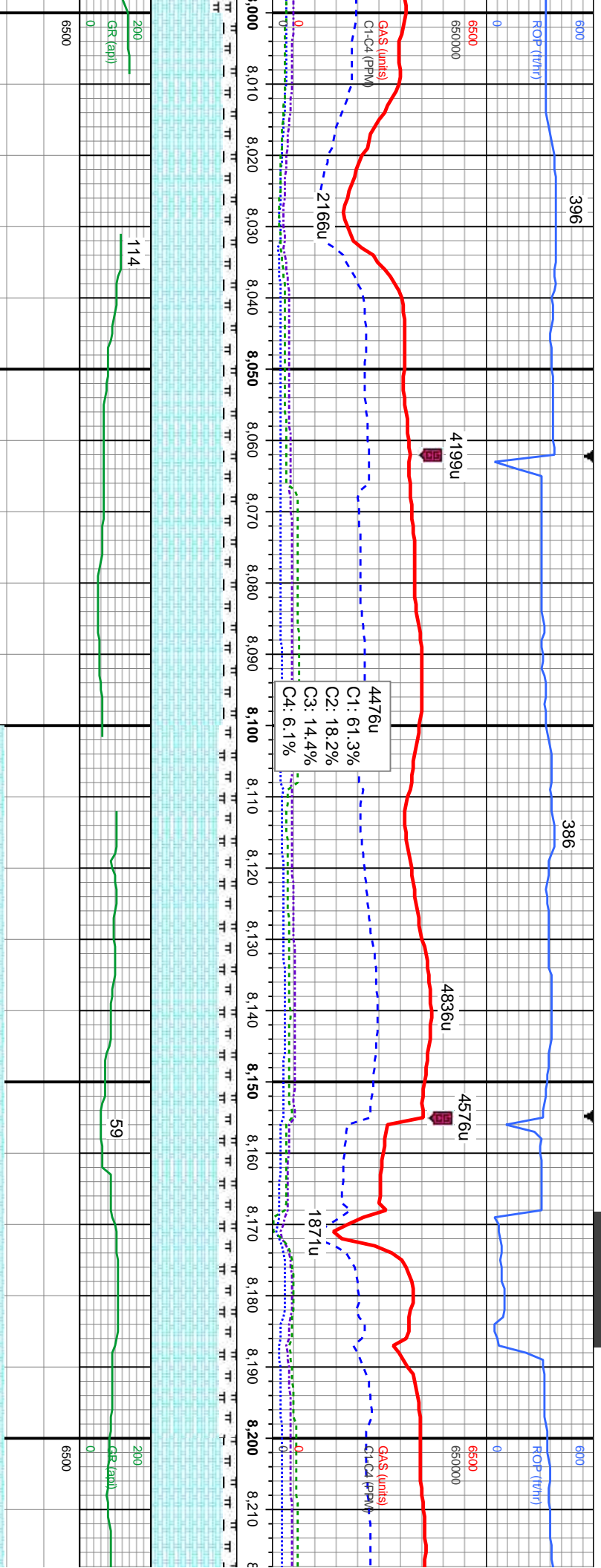
65% CHK: bf - brn, med - dk gy brn, tr crm cold, mot dk gy ip, mod - v frm, brit, sb blk, wxy - rthy tex, 35% MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, occ fos frag Inoc, occ dul org mnt flr, mod dfse, mod sting, mod bl wh mky cut, n stn or od

75% CHK: crm, bf - brn, occ med - dk gy brn, mot dk gy, frm, brit, sb blk, MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, occ fos chk flr, mod dfse, mod sting, mod bri bl wh mky cut, n stn or od









777.07'

1: 91.02°

269.64°

3.93'

MD: 8,088'

TVD: 6,775.35'

Inclination: 91.14°

Azimuth: 268.98°

VS: 1,424.91'

85% CHK: bf - brn, occ med - dk gy brn, mot dk gy, frm, brit, sb blk, wxy tex, 15% MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, r fos frag Inoc, mod difse, v mod string, mod bri bl wh mky cut, n sin or od

7300

MD: 8,180'

TVD: 6,773.57'

Inclination: 91.08°

Azimuth: 269.45°

VS: 1,516.89'

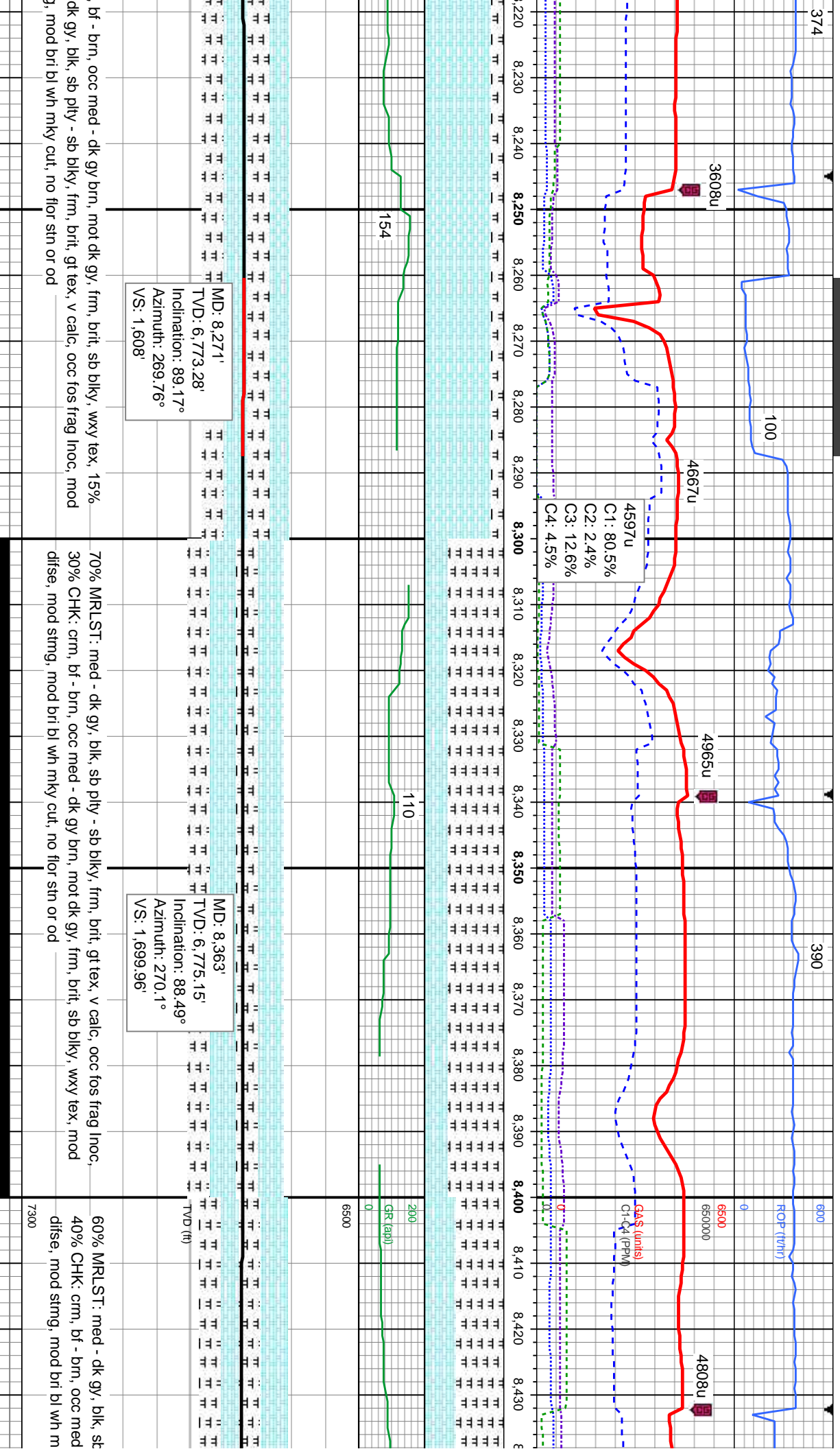
TVD (ft)

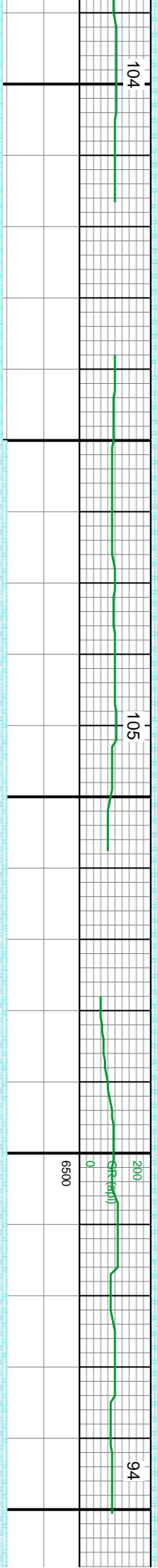
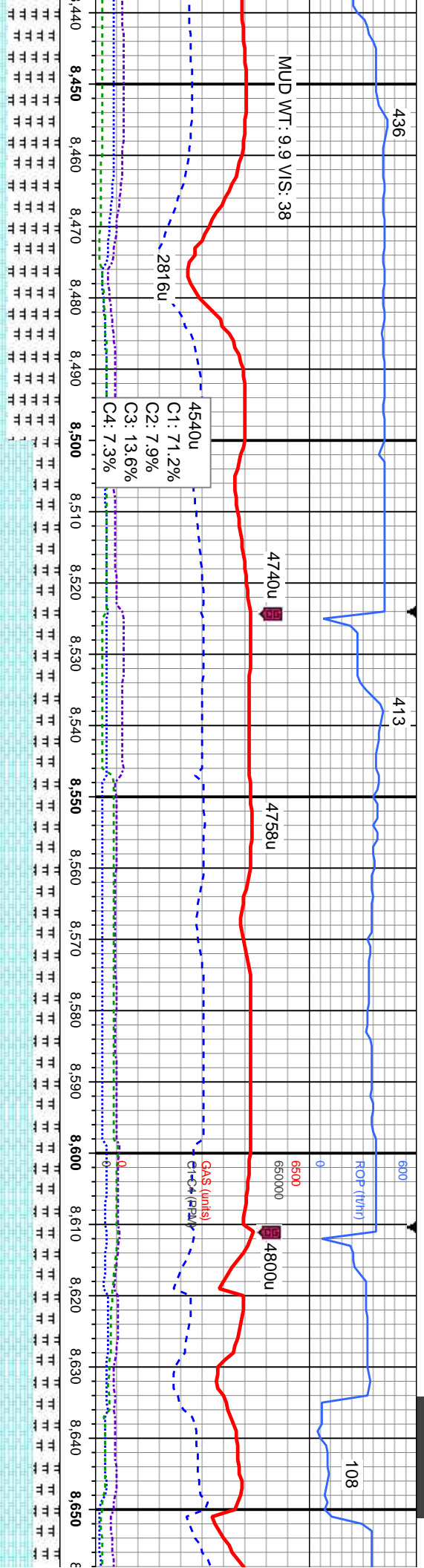
80% CHK: crm, bf - brn, occ med - dk gy brn, mot dk gy, frm, brit, sb blk, wxy tex, 20% MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, occ fos frag Inoc, mod difse, mod string, mod bri bl wh mky cut, no flr sin or od

7300









MD: 8,454'  
TVD: 6,777.94'  
Inclination: 88°  
Azimuth: 269.58°  
VS: 1,790.9'

MD: 8,546'  
TVD: 6,778.9'  
Inclination: 90.8°  
Azimuth: 271.92°  
VS: 1,882.82'

MD: 8,637'  
TVD: 6,777.66'  
Inclination: 90.77°  
Azimuth: 271.94°  
VS: 1,973.66'

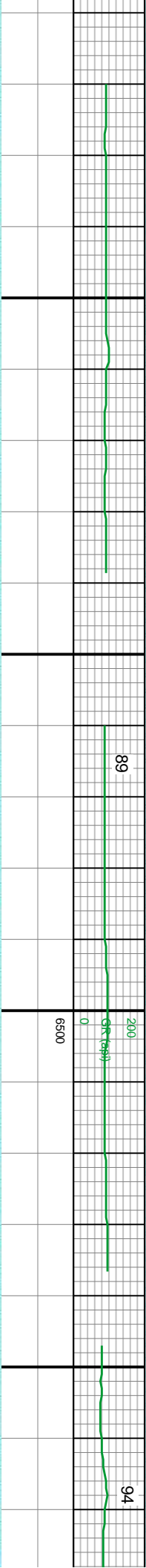
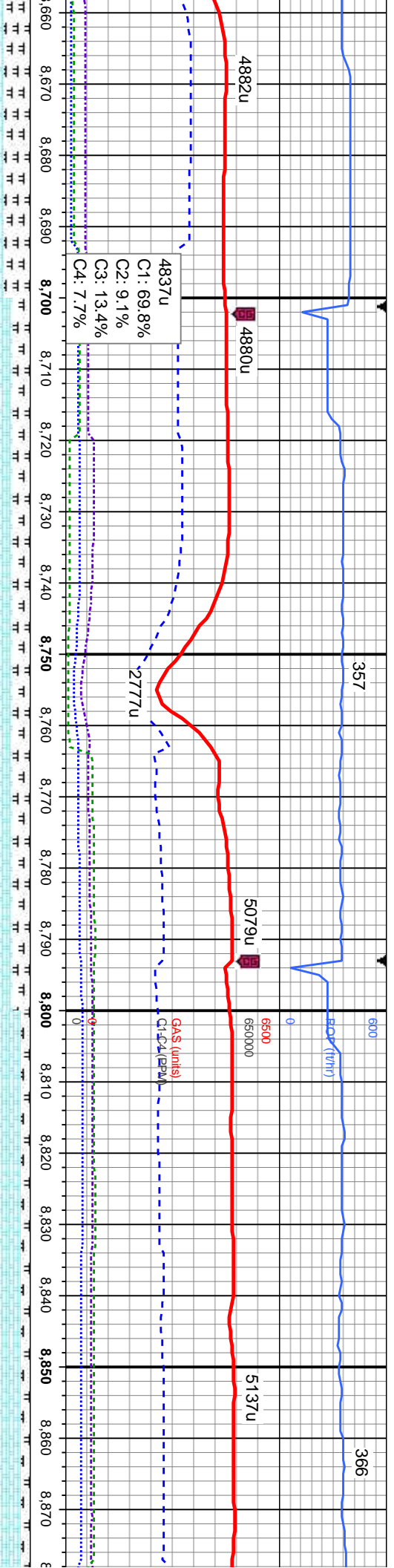
ply - sb blk, frm, brit, gt tex, v calc, occ fos frag Inoc.  
- dk gy brn, mot dk gy, frm, brit, sb blk, wxy tex, fast  
ky cut, no flr sln or od

70% CHK: crm, bf - brn, occ med - dk gy brn, mot dk gy, frm, brit, sb blk, wxy tex, 30%  
MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, com fos frag Inoc, fast  
dise, mod sting, bri bl wh mky cut, no flr sln or od

70% CHK: crm, bf - brn, occ med - dk gy brn, mo  
30% MRLST: med - dk gy, blk, sb ply - sb blk, fr  
Inoc, fast dise, mod sting, bri bl wh mky cut, no f







dk gy, frm, brit, sb blk, wxy tex, m, brit, gt tex, v calc, com fos frag	80% CHK: crm, bf - brn, occ med - dk gy brn, mot dk gy, frm, brit, sb blk, wxy tex, 20% MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, com fos frag	90% CHK: crm, bf - brn, occ med - dk gy brn, mot dk gy, frm, brit, sb blk, MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, fos fr
or sin or od	Inc, mod fast difse, mod stimg, bri bl wh mky cut, no flor sin or od	difse, mod stimg, mod bri bl wh mky cut, no flor sin or od
	MD: 8,729' TVD: 6,777.11' Inclination: 89.91° Azimuth: 271.67° VS: 2,065.53	MD: 8,820' TVD: 6,776.69' Inclination: 90.62° Azimuth: 272.72° VS: 2,156.36'





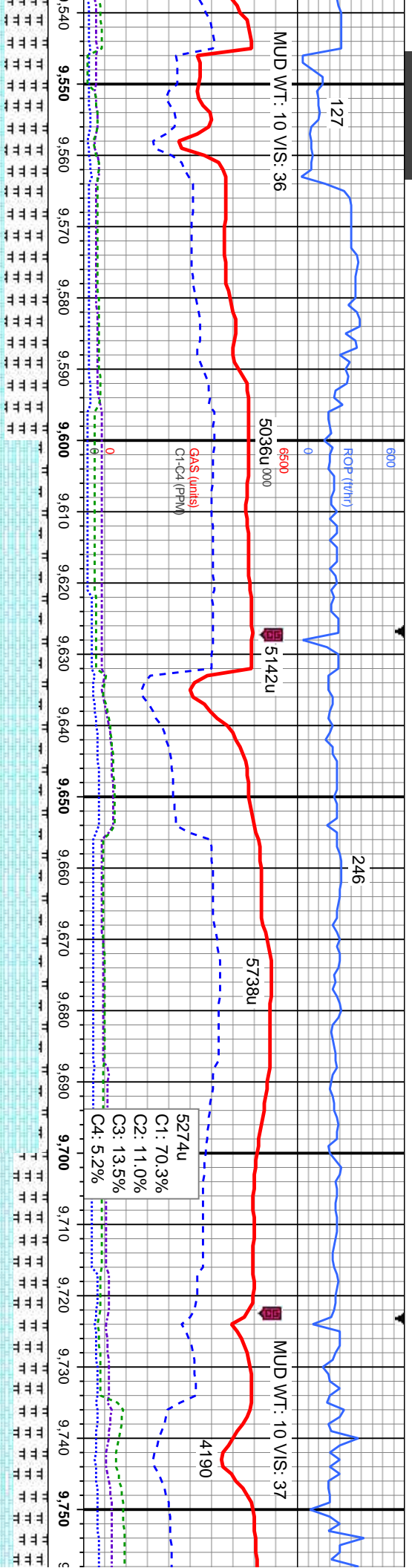












MD: 9.563'  
TVD: 6,797.15'  
Inclination: 90.09°  
Azimuth: 268.21°  
VS: 2,898.46'

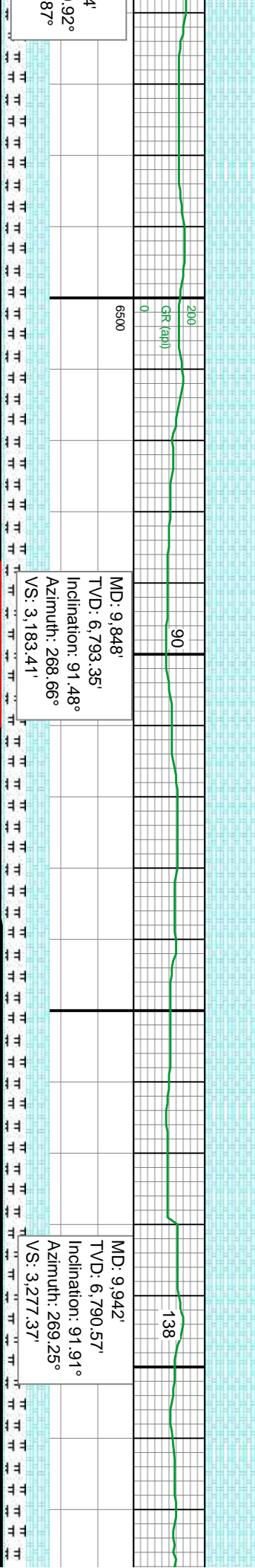
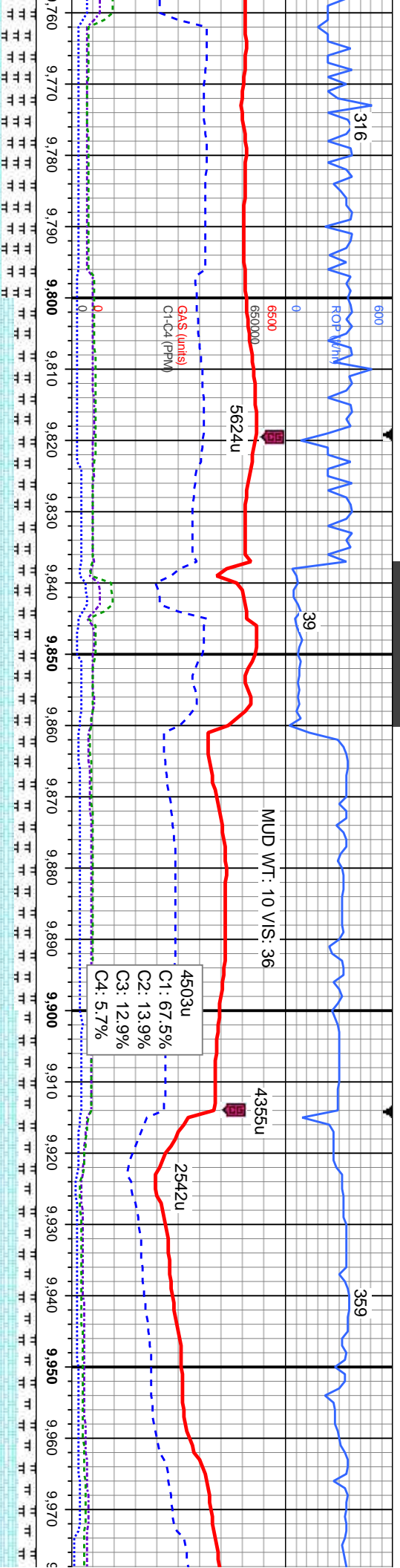
MD: 9.658'  
TVD: 6,796.59'  
Inclination: 90.59°  
Azimuth: 268.16°  
VS: 2,993.45'

MD: 9.753'  
TVD: 6,795.3'  
Inclination: 90°  
Azimuth: 267°  
VS: 3,088.44'

need - dk gy brn, mot dk gy, frm, brit, sb blk, wxy tex, 20% MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, fos frag Inoc, occ	80% CHK: occ crm, bf - brn, occ med - dk gy brn, mot dk gy, frm, brit, sb blk, wxy tex, 20% MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, rr fos frag Inoc, occ pyr, bent, fast difse, mod stmg, bri bl wh mky cut, no flr stn or od	60% CHK: occ crm, bf - brn, occ med - dk gy brn, mot dk gy, frm, brit, sb blk, wxy tex, 20% MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, rr fos frag Inoc, occ pyr, bent, fast difse, mod stmg, bri bl wh mky cut, no flr stn or od
g, bri bl wh mky cut, no flr stn or od	g, bri bl wh mky cut, no flr stn or od	g, bri bl wh mky cut, no flr stn or od



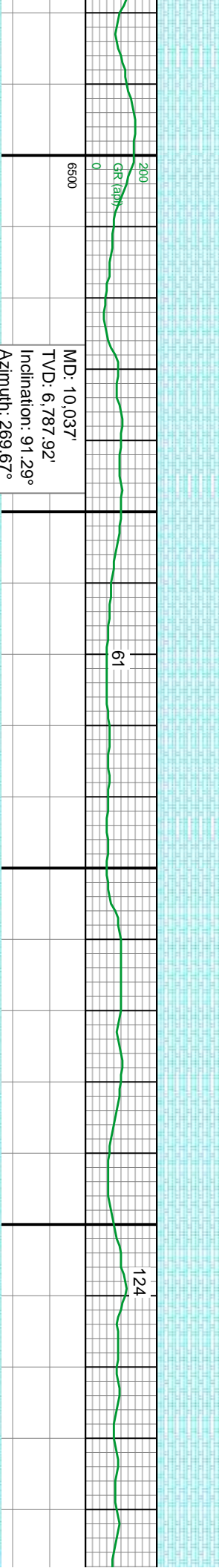
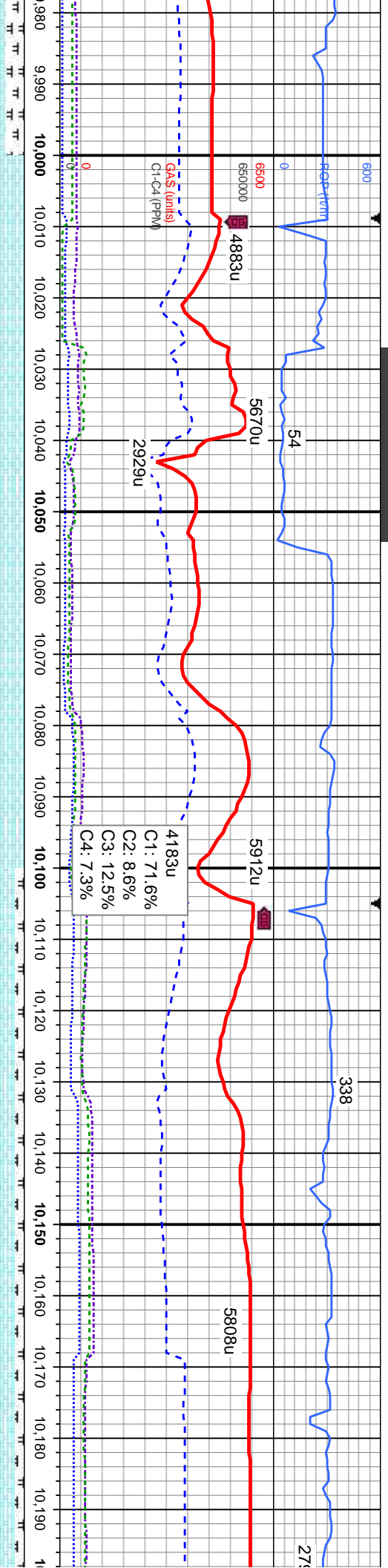




dk gy, frm, brit, sb blk, wxy tex, 40% tex, v calc, r r fos frag Inoc, occ pyr, n or od	75% CHK: bf - brn, tr crm cold, med - dk gy brn, mot dk gy, mod - v frm, brit, sb blk, wxy - thy tex, 25% MRLST: med - dk gy, blk, sb pily - sb blk, frm, brit, gt tex, v calc, occ fos frag Inoc, occ bent wi diss pyr, occ bri yel gn mnrl flr, fast difse, mod stmg, mod bri bl wh mky cut, no stn or od	7300
---	--	------



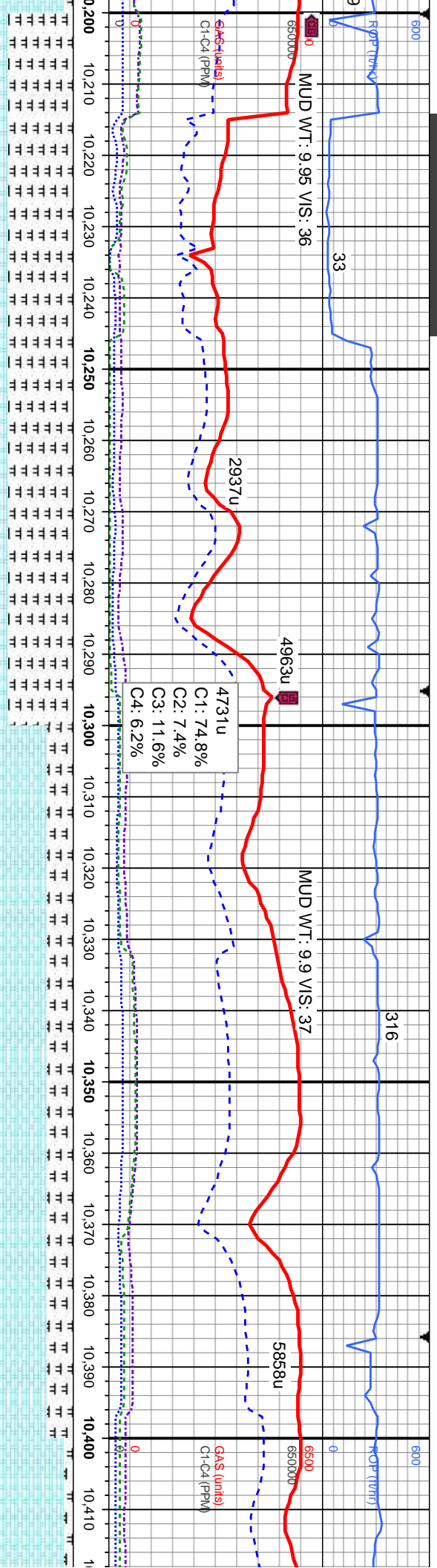




MD: 10,037' TVD: 6,787.92' Inclination: 91.29° Azimuth: 269.67° VS: 3,372.32'		TVD (ft)	
ssb blkly, wxy tex, flos frag Inoc, tr bent y cut, no stn or	100% CHK: offwht - crm, bf - brn, mot gy lp, frm, brit, sb blkly, v wxy tex, v calc, rr flos frag Inoc, tr bent wí dissn pyr, mod difse, mod stng, mod bri bl wh mky cut, no stn or od	7300	







MD: 10,227'  
TVD: 6,786.08'  
Inclination: 89.82°  
Azimuth: 269.77°  
VS: 3,562.28'

4731u  
C1: 74.8%  
C2: 7.4%  
C3: 11.6%  
C4: 6.2%

MD: 10,321'  
TVD: 6,787.84'  
Inclination: 88.03°  
Azimuth: 269.07°  
VS: 3,656.25'

MD: 10,411'  
TVD: 6,798.00'  
Inclination: 88.03°  
Azimuth: 269.07°  
VS: 3,751.00'

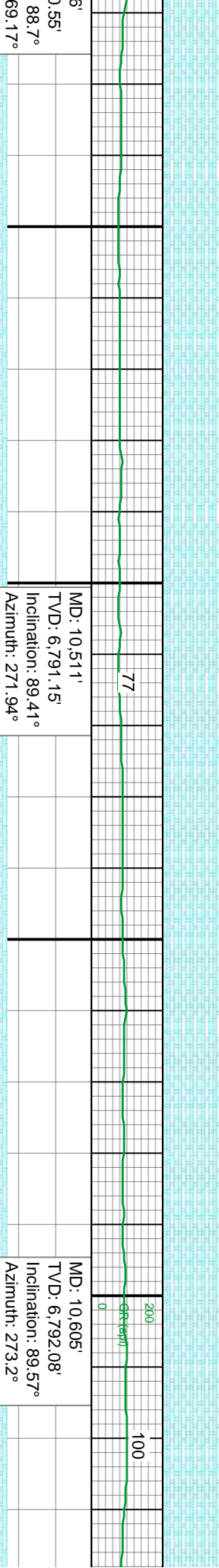
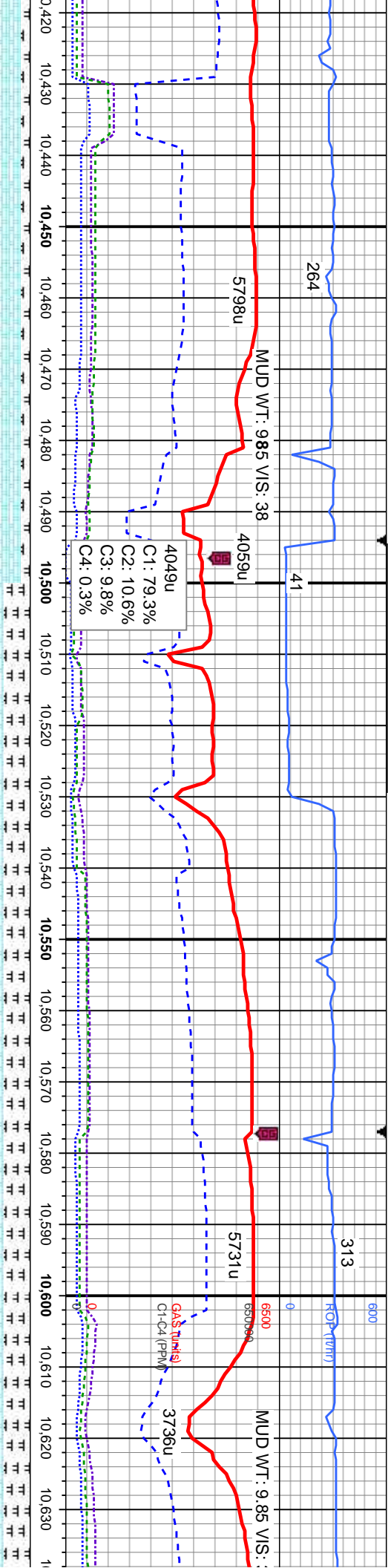
75% MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, 25% CHK: bf - brn, mot gy, v frm, brit, sb blk, rthy tex, v calc, occ fos frag lnc, occ bent wi dissm pyr, occ bri yel - dul orng mnrl flr, slow difse, v sl stmg, v dul bl wh mky cut, no stn or od

70% CHK: offwht - cm, bf - brn, mot gy, v frm, brit, sb ply - sb blk, frm, brit, gt tex, v calc, tr fos frag lnc, occ bent wi dissm pyr, occ bri yel - dul orng mnrl flr, mod difse, mod stmg, bl wh mky cut, no stn or od

90% CHK: offwht (10%) mrlst, rr fr bl wh mky cut, n





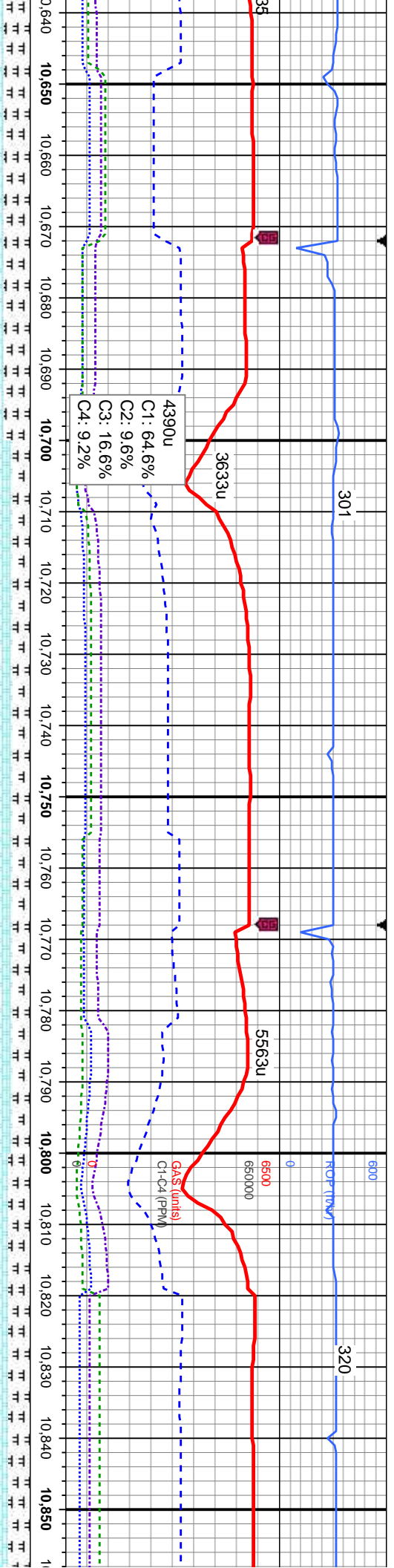


6'	0.55'	MD: 10,511'	TVD: 6,791.15'	Inclination: 89.41°	Azimuth: 271.94°	VS: 3,846.13'
69.17°						
221'						
6'	0.55'	MD: 10,605'	TVD: 6,792.08'	Inclination: 89.57°	Azimuth: 273.2°	VS: 3,939.91'
69.17°						
221'						
6'	0.55'	MD: 10,605'	TVD: 6,792.08'	Inclination: 89.57°	Azimuth: 273.2°	VS: 3,939.91'
69.17°						
221'						

70% CHK: crm - bf - brn, mot gy, v frm, brit, sb blk, v wxy - rthy tex, v calc, occ sb ply - sb blk, frm, brit, gt tex, v calc, tr fos frag lnc, tr bent wi diss pyr, tr bri yel mnl flr, mod difse, mod stmg, bl wh mky cut, no sin or od

70% CHK: crm - bf - brn, mot gy, v sb ply - sb blk, frm, brit, gt tex, v flr, mod difse, mod stmg, bl wh m





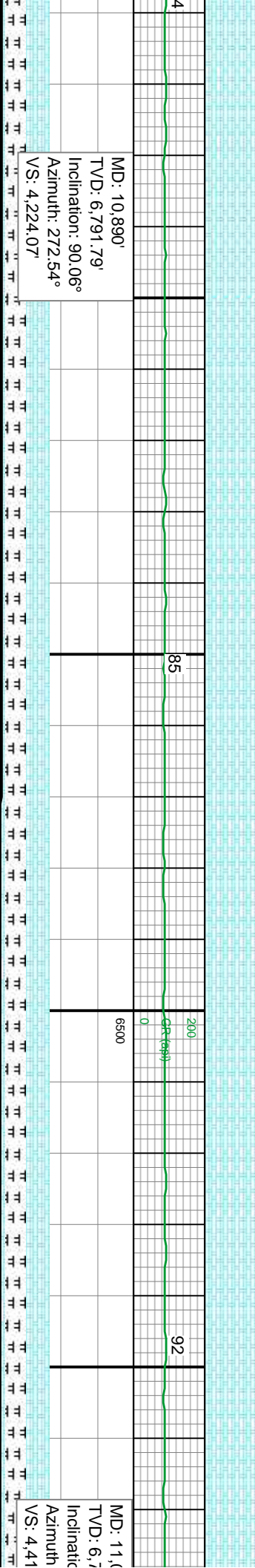
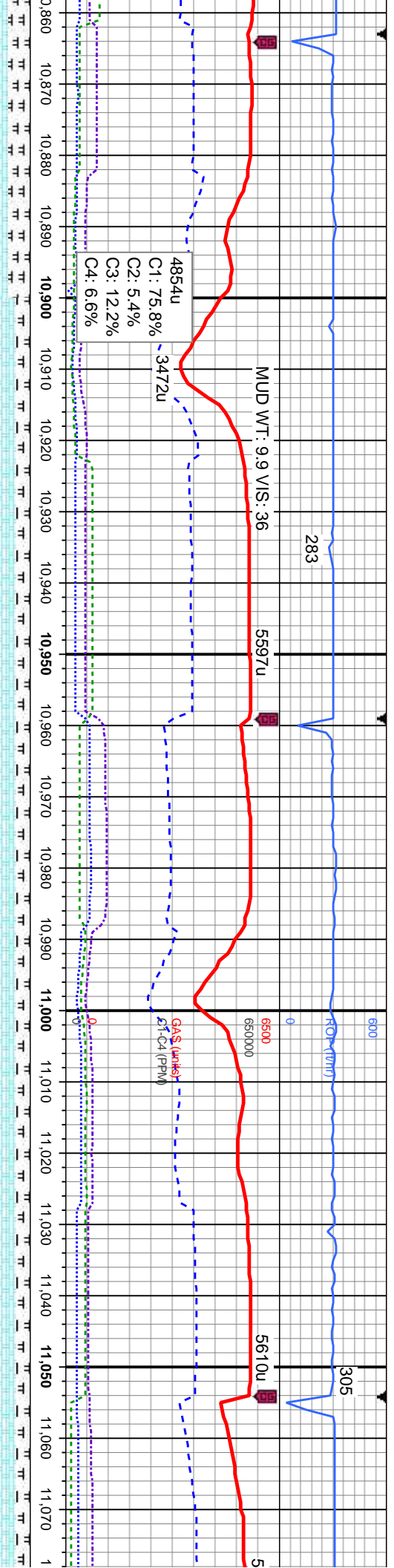
MD: 10,700'  
TVD: 6,792.29'  
Inclination: 90.18°  
Azimuth: 273.29°  
VS: 4,034.61'

MD: 10,795'  
TVD: 6,791.99'  
Inclination: 90.18°  
Azimuth: 273.15°  
VS: 4,129.32'

fr, fm, brit, sb blk, v wxy tex, 30% MRLST: med - dk gy, blk	80% CHK: offwht - crm, bf - brn, lt gy, mot dk gy, v frm, brit, sb ply-sb blk, v wxy tex, 20% MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt calc, tr fos frag inoc, tr bent wi dissm pyr, tr bri yel mnrl	80% CHK: offwht - crm, bf - brn, lt gy, mot dk gy, v frm, brit, sb ply-sb blk, v wxy tex, 20% MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, tr fos frag inoc, mod difse, mod stimg, bl wh mky cut, no flor sin or od	80% CHK: offwht - crm, bf - brn, lt gy, mot dk gy, frm, t MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt dissm pyr, rr bri yel mnrl flor, mod difse, mod stimg, bl v
gy cut, no sin or od			







crit, sb ply-sb blk, v wxy tex, 20% tex, v calc, tr fos frag Inoc, tr bent wi wh mky cut, no stn or od	85% CHK: offwht - crm, bf - brn, lt gy, mot dk gy, frm, brit, sb ply-sb blk, v wxy tex, 15% MRLST: med - dk gy, blk, sb ply - sb blk, frm, brit, gt tex, v calc, occ fos frag Inoc, mod dise, mod stmg, bl wh mky cut, no flor stn or od
--	--

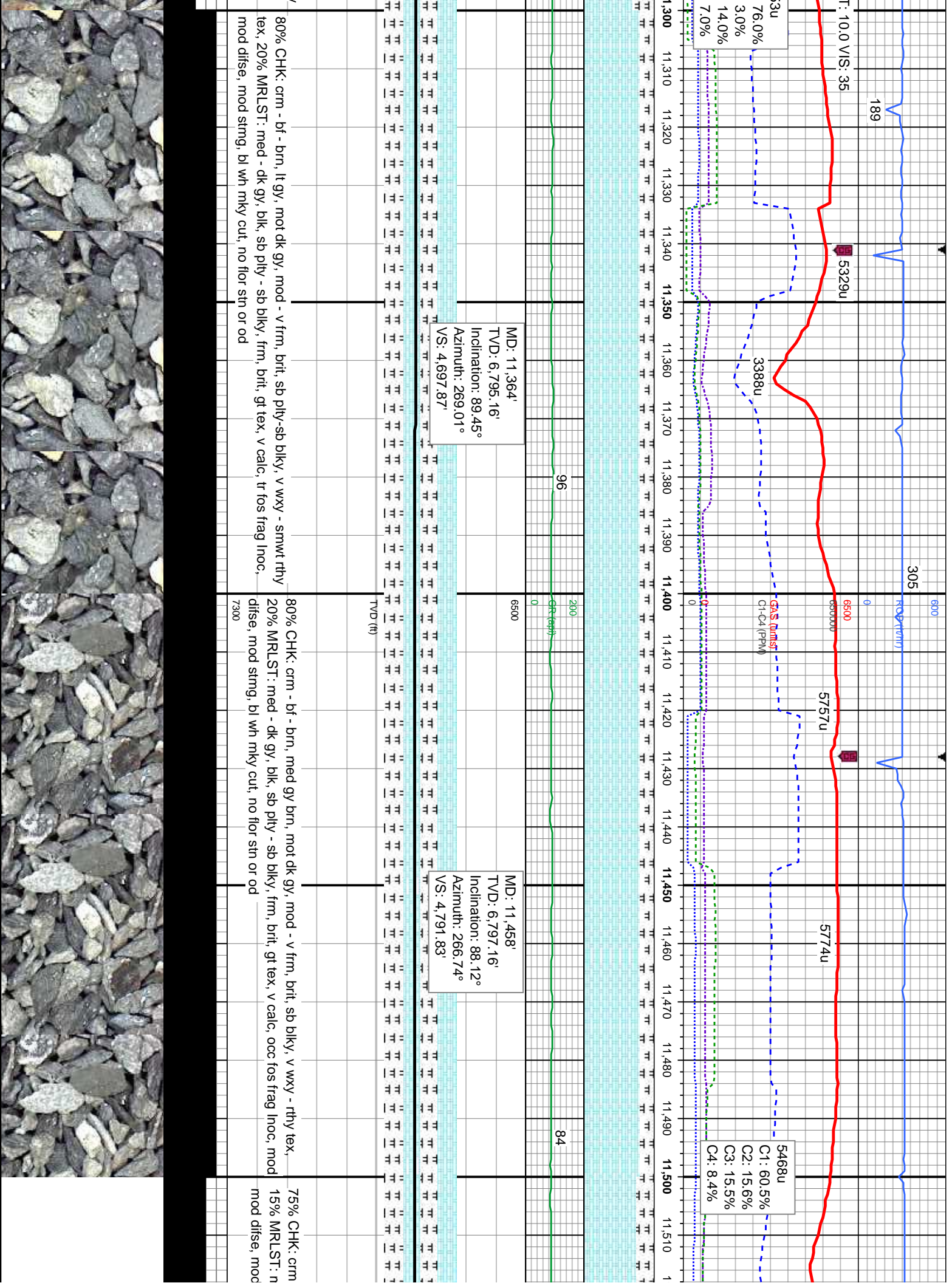
MD: 11,100'	MD: 11,100'
TVD: 6,791.79'	TVD: 6,791.79'
Inclination: 90.06°	Inclination: 90.06°
Azimuth: 272.54°	Azimuth: 272.54°
VS: 4,224.07'	VS: 4,224.07'

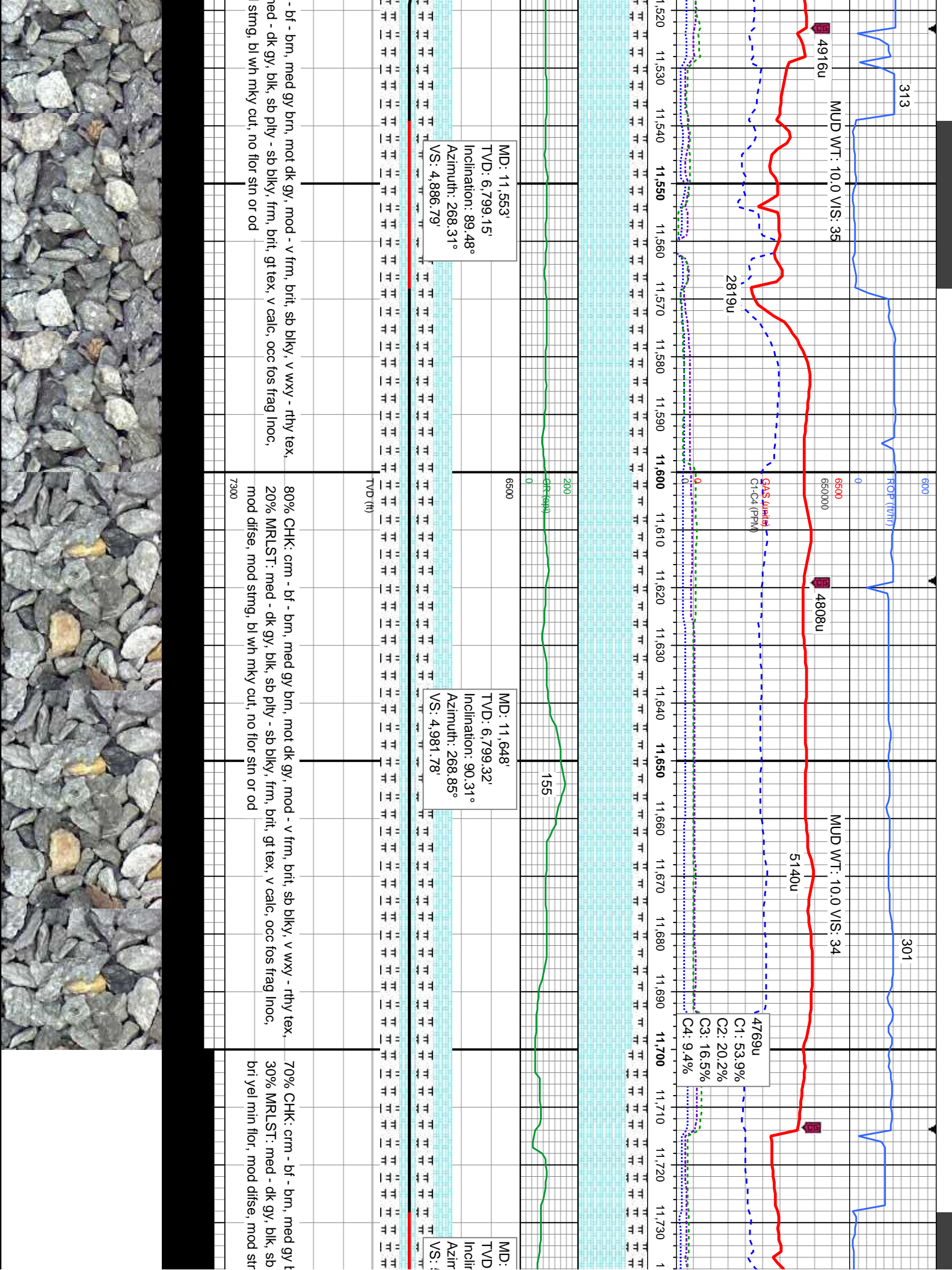




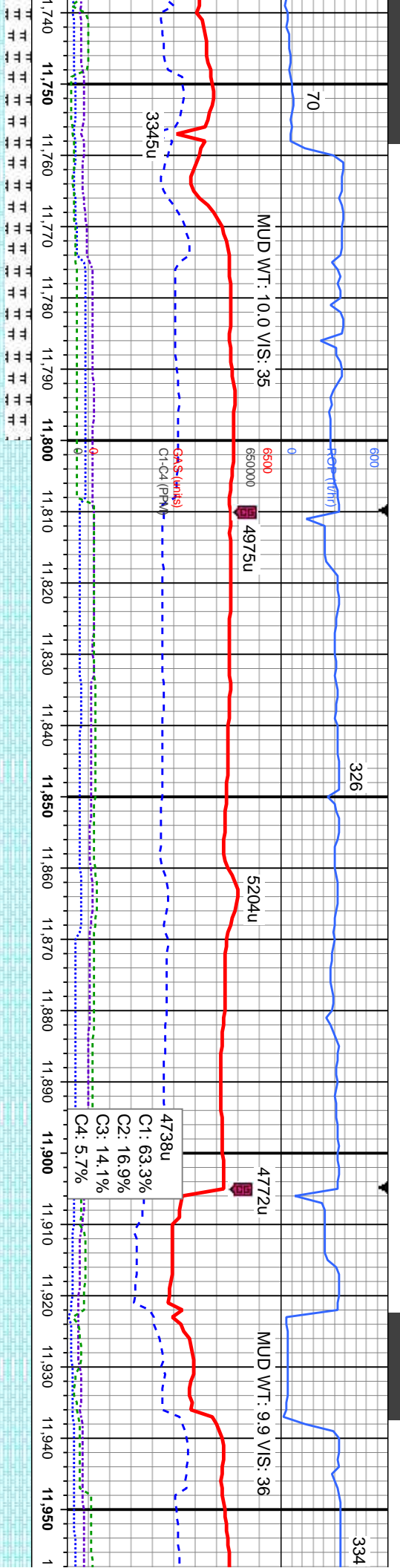












11,743'  
6,798.83'  
ation: 90.28°  
uth: 270.27°  
5,076.77'

MD: 11,838'  
TVD: 6,797.58'  
Inclination: 91.23°  
Azimuth: 271.04°  
VS: 5,171.71'

MD: 11,932'  
TVD: 6,795.89'  
Inclination: 90.83°  
Azimuth: 271.33°  
VS: 5,265.6'

mot dk gy, mod - v frm, brit, sb blk, v wxy - rthy tex,  
ply - sb blk, frm, brit, gt tex, v calc, occ fos frag Inoc, tr  
ng, bl wh mky cut, no stn or od

100% CHK: crm - bf - brn, med gy brn, mot dk gy, mod - v frm, brit, sb blk, v wxy - rthy  
tex, occ fos frag Inoc, rr yel min flr, mod disse, mod stmg, bl wh mky cut, no stn or od

100% CHK: crm - bf - brn, med gy brn, mot dk gy, mo  
occ fos frag Inoc, rr yel min flr, mod disse, mod stmg



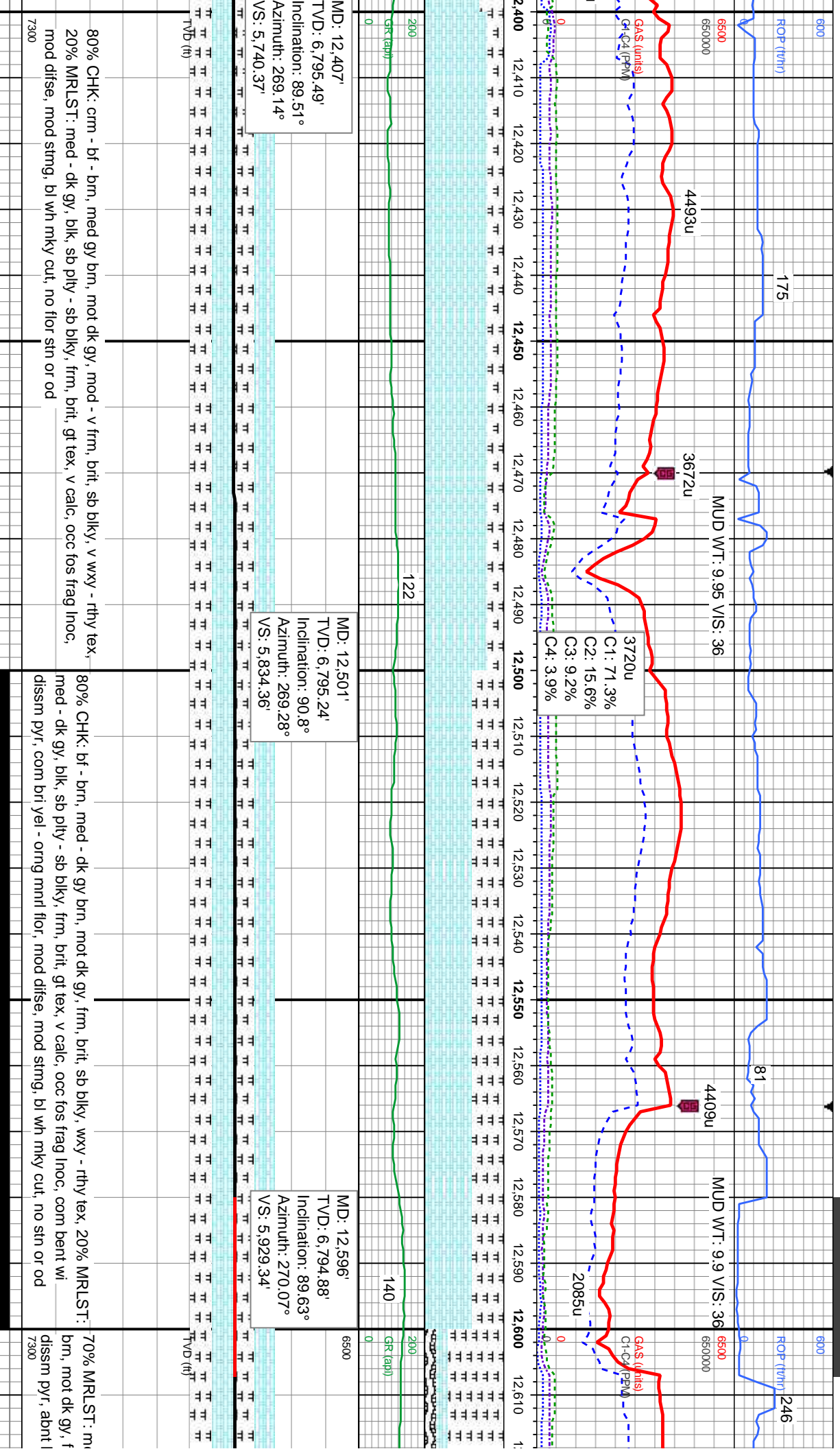






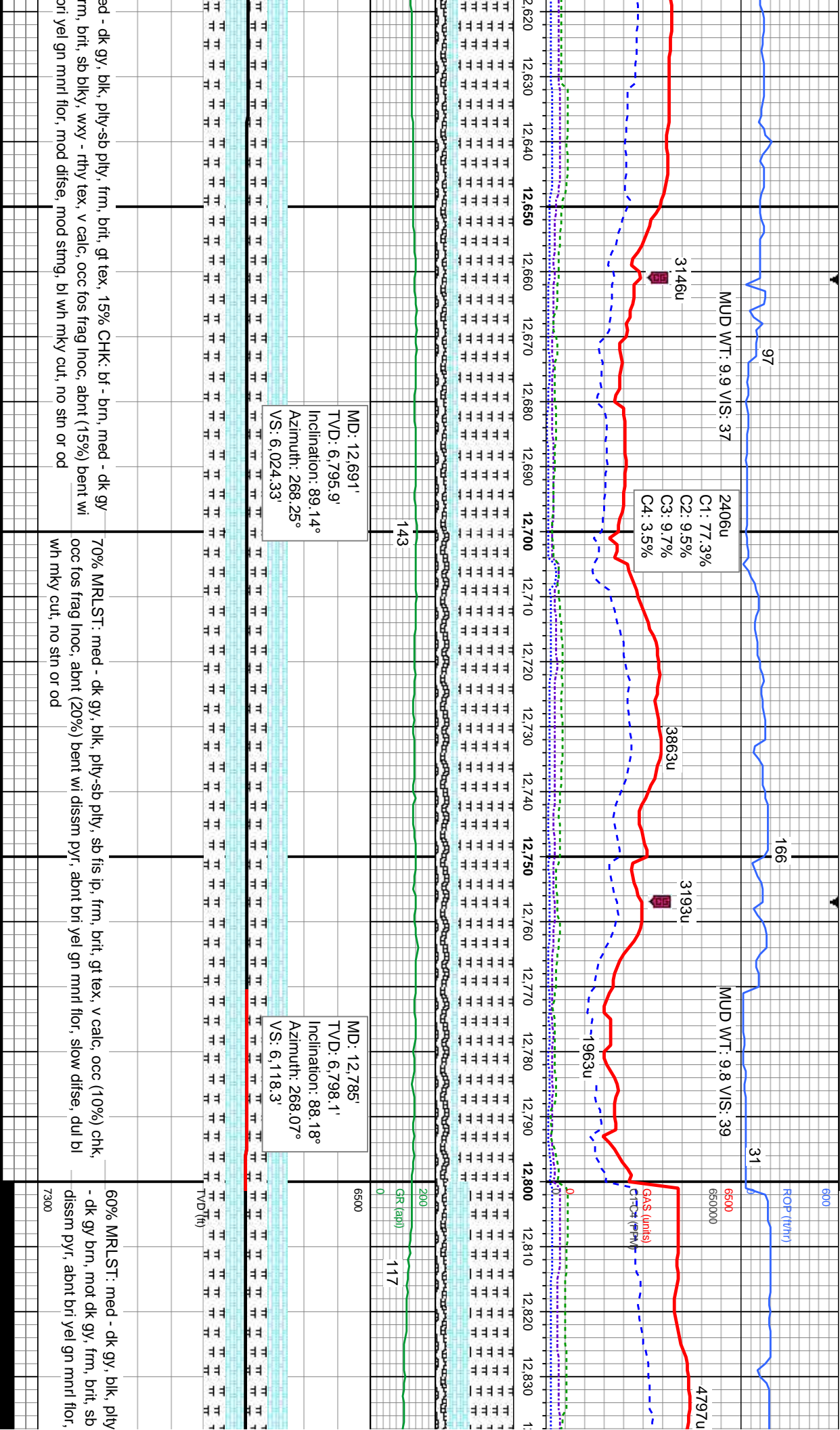






70% MRLST: m  
brn, mot dk gy, f  
dissm pyr, abnt  
7300

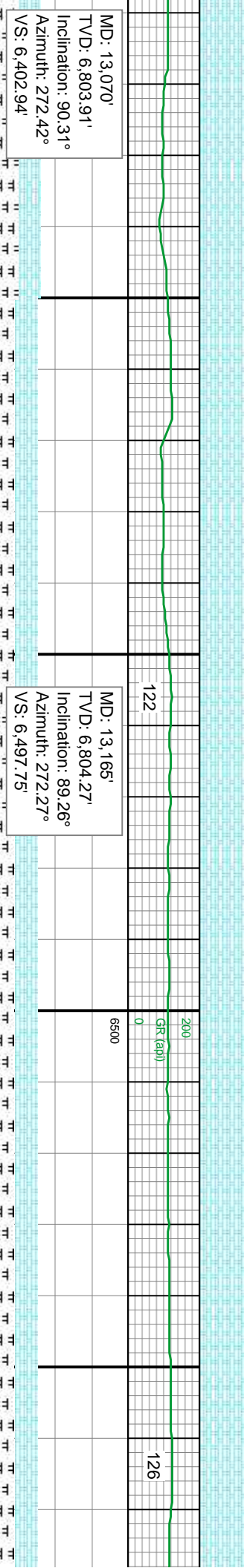
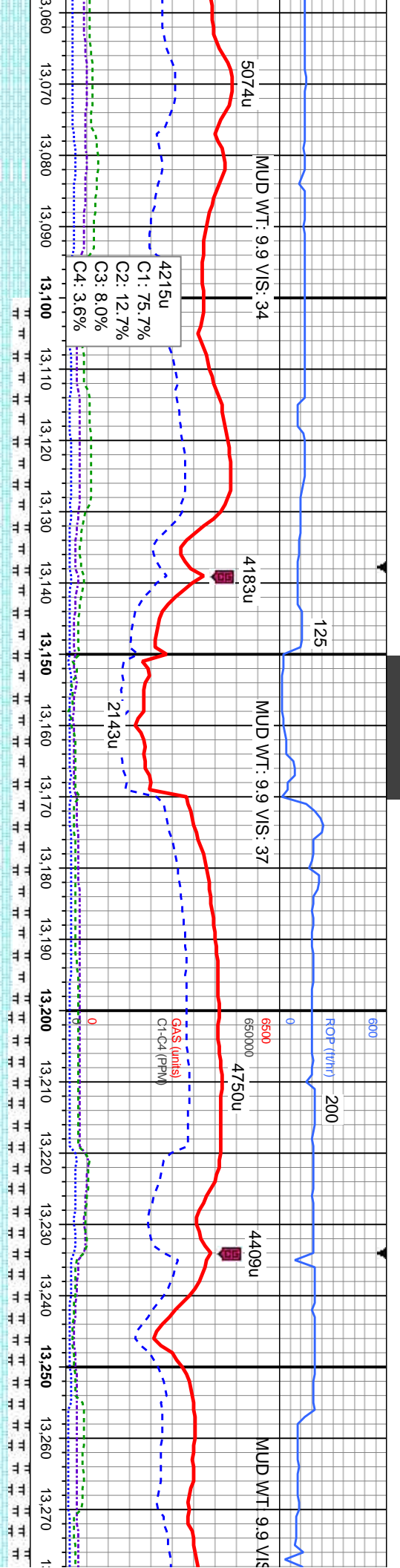




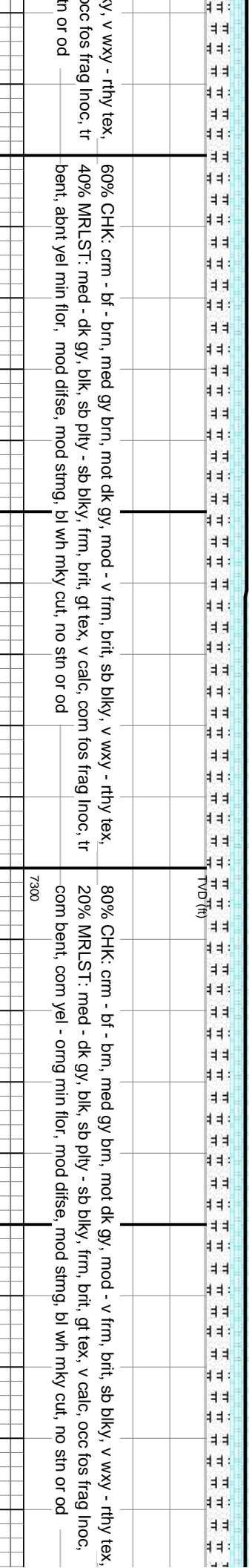
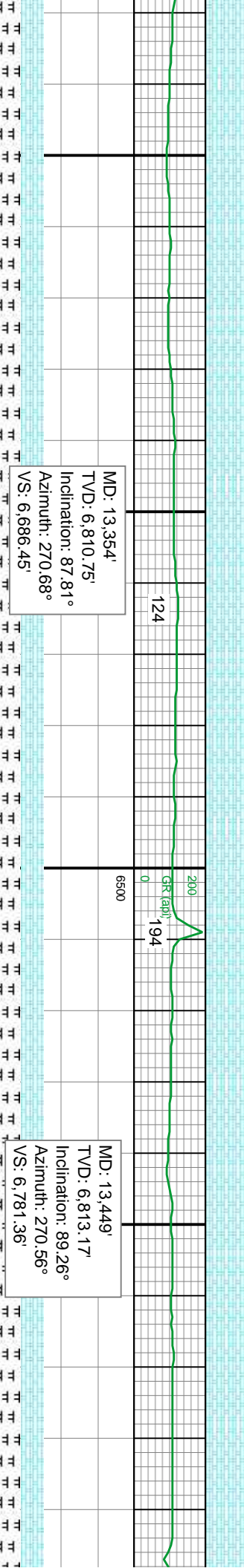
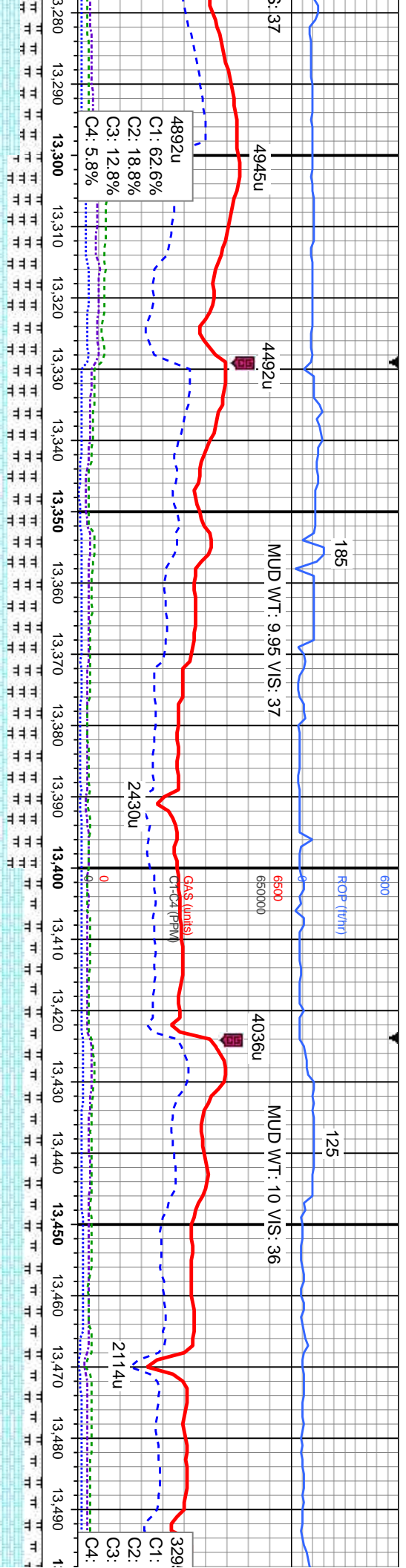














06/10/15

MINDEPTH

MUD WT: 9.95 VIS: 37

3360u

4186u

4068u

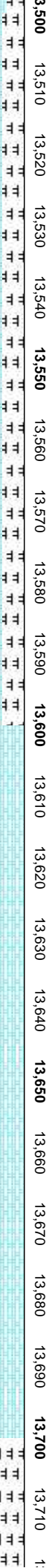
4900u

4789u

5u  
77.1%  
9.2%  
9.4%  
4.3%

Gas (units)  
Gr-C (ppm)

478u  
C1: 73.5%  
C2: 11.3%  
C3: 10.3%  
C4: 4.9%



114

200

99

MD: 13,638'

TVD: 6,816.52'

Inclination: 88.71°

Azimuth: 269.1°

VS: 6,970.29'

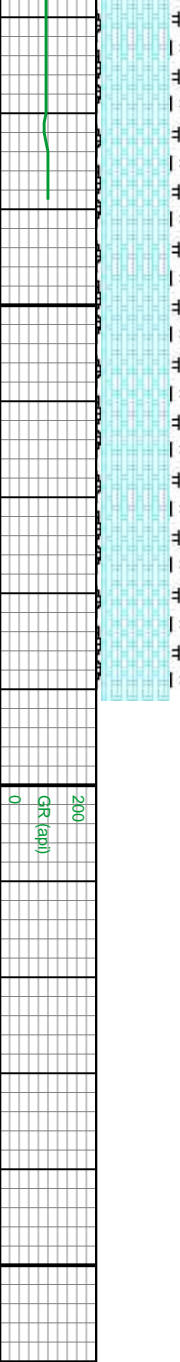
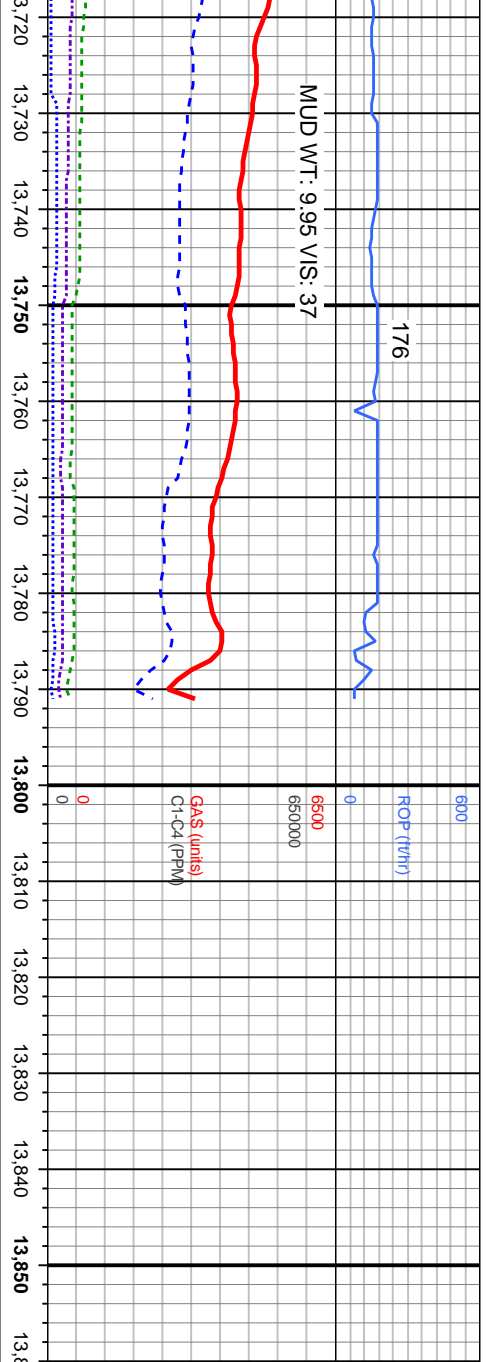
TVD (ft)

75% CHK: crm - bf - brn, med gy brn, mot dk gy, mod - v frm, brit, sb blk, v wxy - rthy tex,  
25% MRLST: med - dk gy, blk, sb pily - sb blk, frm, brit, gt tex, v calc, occ fos frag Inoc,  
com bent, com yel - orng min flor, mod difse, mod strng, bl wh mky cut, no stn or od

100% CHK: bf - brn, med - dk gy brn, mot dk gy, frm, brit, sb blk, rthy tex, v calc, tr fos frag  
Inoc, tr bri yel orng mnrl flor, tr MRLST, mod difse, bl wh mky cut, no sin or od

60% CHK: crm  
35% MRLST: m  
abt bent (5%),





MD: 13,726'  
VD: 6,818.13'  
Inclination: 89.2°  
Azimuth: 268.4°  
S: 7,058.27'

MD: 13,791'  
TVD: 6,819.03'  
Inclination: 89.2°  
Azimuth: 268.4°  
VS: 7,123.27'

Wells Ranch AA 11-657 Wellbore TD @ 13791' MD @ 02:30 hrs on 06/10/15

Thank you for using  
Columbine Logging Inc.

PROJECTION TO BIT

bf - brn, med gy brn, mot dk gy, mod - v frm, brit, sb blk, v wxy - rthy tex,  
ed - dk gy, blk, sb blk, frm, brit, gt tex, v calc, com fos frag Inoc,  
abt yel min flr, mod difse, mod sting, bl wh mky cut, no sh or od

