

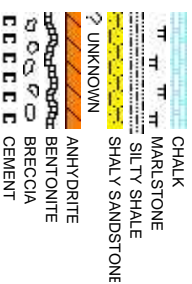
# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

Well Name	COUGAR B02-68-1HN HORZ		
Location	SEC 2 T5N R64W		
State	COLORADO	County	WELD
Country	USA		
API Number	05-123-36407	Rig Number	H&P 315
Region	DJ BASIN	A/E #	136840
Spud Date	1/16/2014	Field	WATTENBERG
		Drilling Completed	1/22/2014
Surface Coordinates	NMNW SEC2 T5N R64W 566' FNL; 725' FWL LAT/LON 40.43407000/-104.52420000		
Bottom Hole Coordinates	NENE SEC2 T5N R64W 990' FNL; 660' FEL		
Ground Elevation	4,640'	K.B. Elevation	4,664
Logged Interval	5,981'	To	10,318'
		Total Depth	10,318'
Formation	NIOBRARA B CHALK		
Type of Drilling Fluid	LSND		

Company Noble Energy Inc  
Address 1625 BROADWAY  
DENVER, CO 80202

Name MARK COLE, N  
Company COLUMBINE LOGGING  
Address 2385 S LIPAN ST  
DENVER, CO 80202



Operator

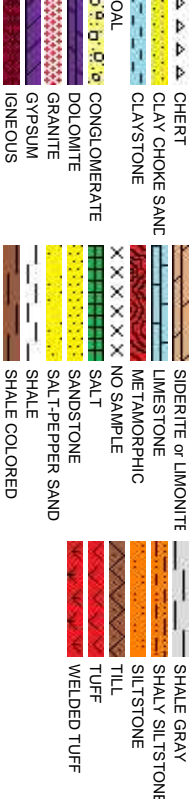
AY SUITE 2200  
0202

Geologist

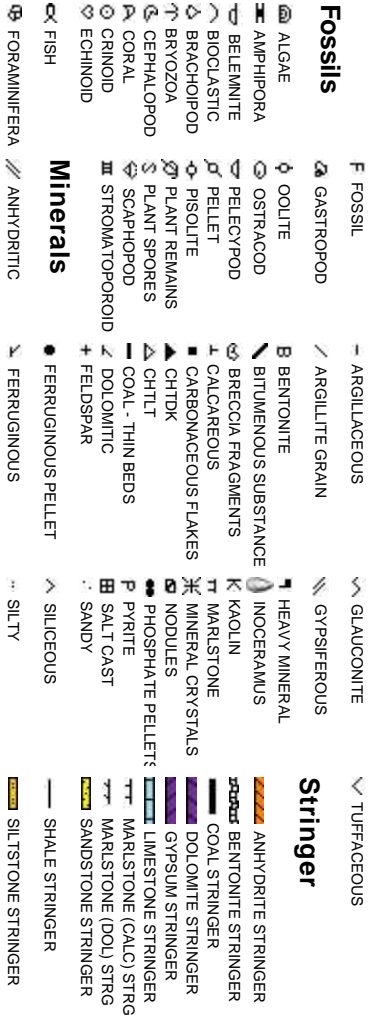
LATHAN MURPHY  
OGGING, INC

ST  
0223

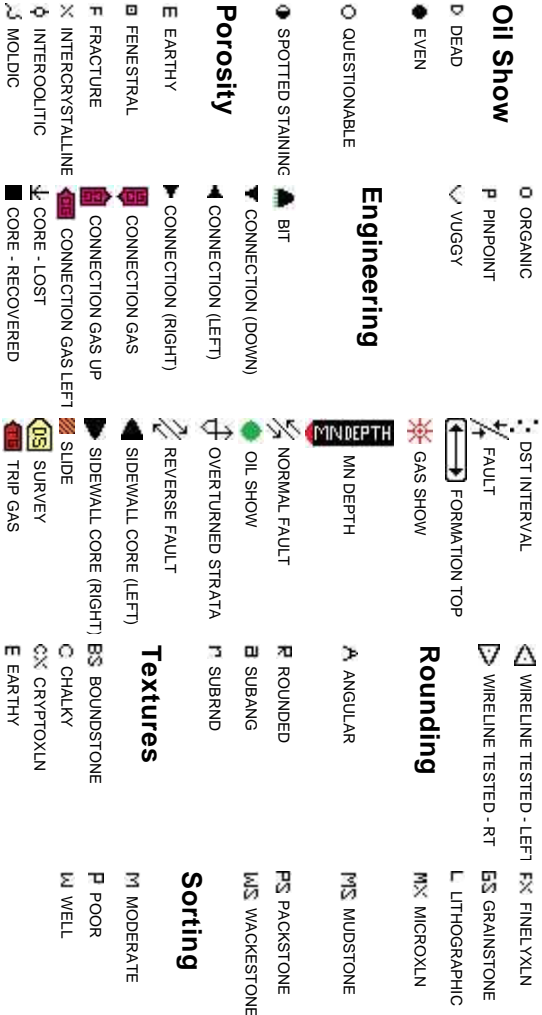
Rock Types



Accessories



Other Symbols



Slide/Rotate

ROP

ROP

ROP

Curves

GAMMA

Total Gas & Chromatograph

GAS

C1

C2

C3

C4

Depth Labels

% Lith

Well Bore

TVD

Oil Show

Images

ROP data from iBall

Gamma data from Sperry - Halliburton

Gas data from iBall

1/19/2014, Mud Wt: 9.95, FV/s: 37  
PV/s: 10, YP: 11, GELS: 4/8/14, API Filt: 10.0  
CAKE: 1/0, pH: 9.5, Cl: 1,600, Ca: 120

MUD WT: 10.30/10.  
VIS: 38/38 IN/OUT

138

2356u

GAS (units)  
C1-C4 (PPM)

Columbine Logging began logging with  
Bloodhound unit 624 on 01/19/2014

50' Sample Interval @ 6,000' MD

5900

Bit Data

Bit #: 2

Type: Smith

Model: SDI513

Size: 8.75"

Depth In: 5,981'

Jets: 5x13,3x12

SLTY SH: pred lt gy, occ med gy, hd, pty -  
sb pty, occ sb blk, silty - grty tex, v sl calc  
SHY SS: lt gy, s&p, vfg, mod hd wi brit clus,  
sb ang - sb rd, sl calc cnt

SLTY SH: pred lt gy, occ med gy, hd, pty -  
sb pty, occ sb blk, silty - grty tex, v sl calc  
SHY SS: lt gy, s&p, vfg, mod hd wi brit clus,  
sb ang - sb rd, sl calc cnt

SLTY SH: pred lt gy, occ med gy, h  
sb pty, occ sb blk, silty - grty tex,  
SHY SS: lt gy, s&p, vfg, mod hd wi  
sb ang - sb rd, sl calc cnt

MD: 6,011'

TVD: 5,977.15'

Inclination: 0.79 °

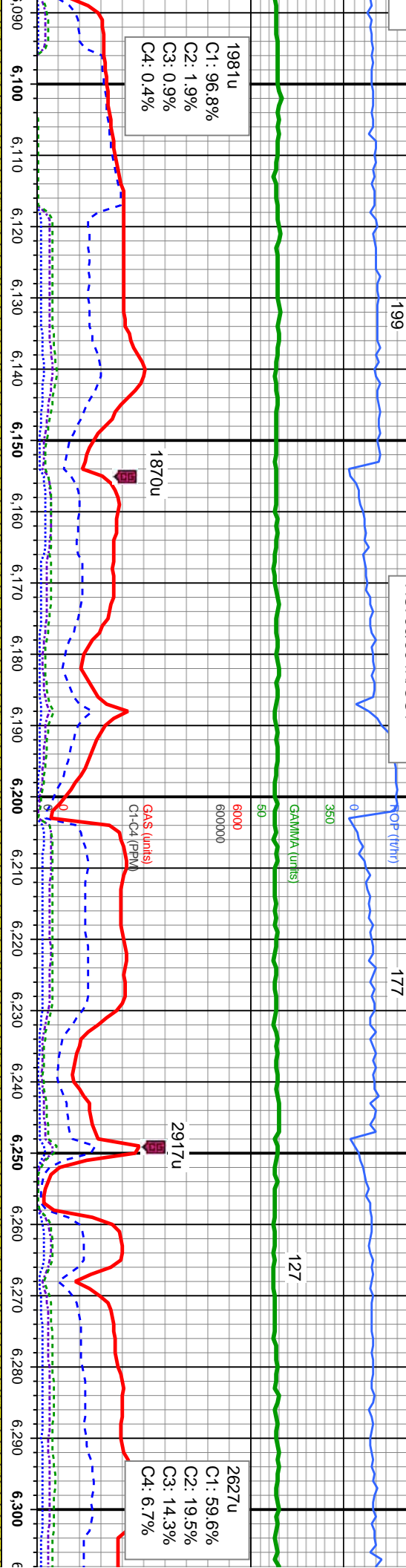
Azimuth: 196.88 °

VS: 56.93'



15

MUD WT: 10.40/10.25  
VIS: 36/36 IN/OUT



1981u  
C1: 96.8%  
C2: 1.9%  
C3: 0.9%  
C4: 0.4%

6000  
6000000  
6000000  
6000000

2627u  
C1: 59.6%  
C2: 19.5%  
C3: 14.3%  
C4: 6.7%

<<Scale Change>>

MD: 6,149'  
TVD: 6,114.71'  
Inclination: 8.05 °  
Azimuth: 80.17 °  
VS: 66.07'

MD: 6,196'  
TVD: 6,161.06'  
Inclination: 11.01 °  
Azimuth: 78.22 °  
VS: 73.54'

MD: 6,291'  
TVD: 6,253.06'  
Inclination: 17.6 °  
Azimuth: 84.14 °  
VS: 96.32'

SLTY SH: pred lt gy, occ med gy, hd, pily -  
sb pily, occ sb blkly, silty - grty tex, v sl calc  
SHY SS: lt gy, s&g, vfg, mod hd wi brit clus,  
sb ang - sb rd, sl calc cnt

SLTY SH: pred lt gy, occ med gy, hd, pily -  
sb pily, occ sb blkly, silty - grty tex, v sl calc  
SHY SS: lt gy, s&g, vfg, mod hd wi brit clus,  
sb ang - sb rd, sl calc cnt

SLTY SH: pred lt gy, occ med gy, hd, pily -  
sb pily, occ sb blkly, silty - grty tex, v sl calc  
SHY SS: lt gy, s&g, vfg, mod hd wi brit clus,  
sb ang - sb rd, sl calc cnt

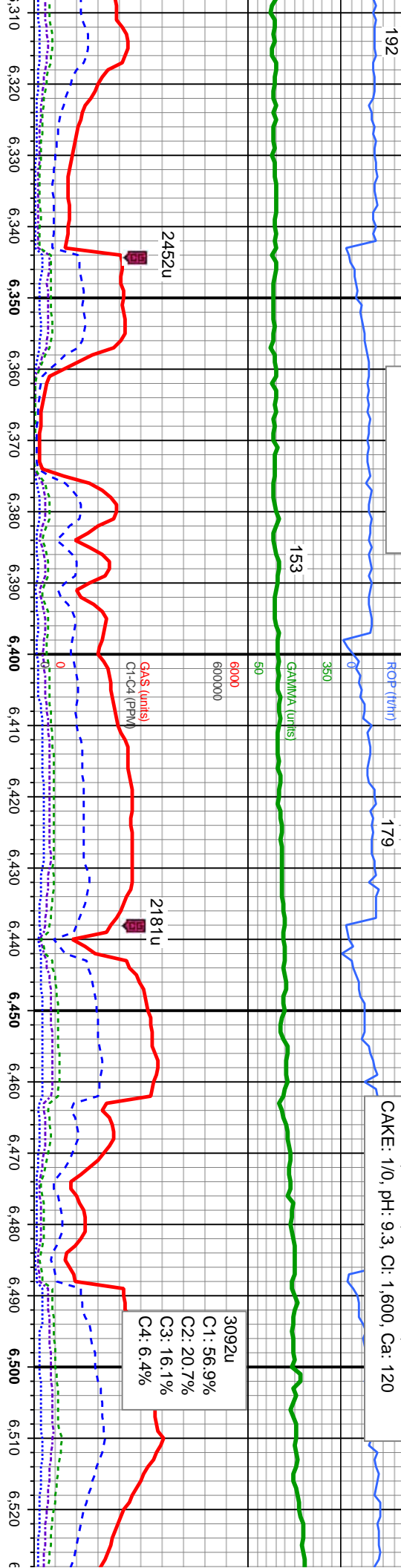
SLTY SH: pred lt gy, occ med gy, hd, pily -  
sb pily, occ sb blkly, silty - grty tex, v sl calc  
SHY SS: lt gy, s&g, vfg, mod hd wi brit clus,  
sb ang - sb rd, sl calc cnt

SLTY SH: pred lt gy, occ med gy, hd, pily -  
sb pily, occ sb blkly, silty - grty tex, v sl calc  
SHY SS: lt gy, s&g, vfg, mod hd wi brit clus,  
sb ang - sb rd, sl calc cnt



MUD WT: 10.90/10.45  
VIS: 38/38 IN/OUT

1/19/2014, Mud Wt: 10.85, FV/s: 38  
PV/s: 13, YP: 11, GELS: 5/9/17, API Filtr: 9.0  
CAKE: 1/0, pH: 9.3, CI: 1,600, Ca: 120



<<Scale Change>>

25' Sample Interval @ 6,500' MD

MD: 6,386'  
TVD: 6,341.61'  
Inclination: 24.7°  
Azimuth: 82.02°  
VS: 129.77'

MD: 6,434'  
TVD: 6,384.47'  
Inclination: 28.75°  
Azimuth: 80.57°  
VS: 150.69'

MD: 6,480'  
TVD: 6,423.95'  
Inclination: 32.97°  
Azimuth: 80.52°  
VS: 173.5'

MD: 6,5  
TVD: 6,  
Inclinati  
Azimuth  
VS: 200

SH: pred lt gy, occ med gy, hd, pily -  
, occ sb blkly, silty - grty tex, v sl calc  
SS: lt gy, s&p, vfg, mod hd wi brit clus,  
g - sb rd, sl calc cmt

SLTY SH: pred lt gy, occ med gy, hd, pily -  
sb pily, occ sb blkly, silty - grty tex, v sl calc  
SHY SS: lt gy, s&p, vfg, mod hd wi brit clus,  
sb ang - sb rd, sl calc cmt

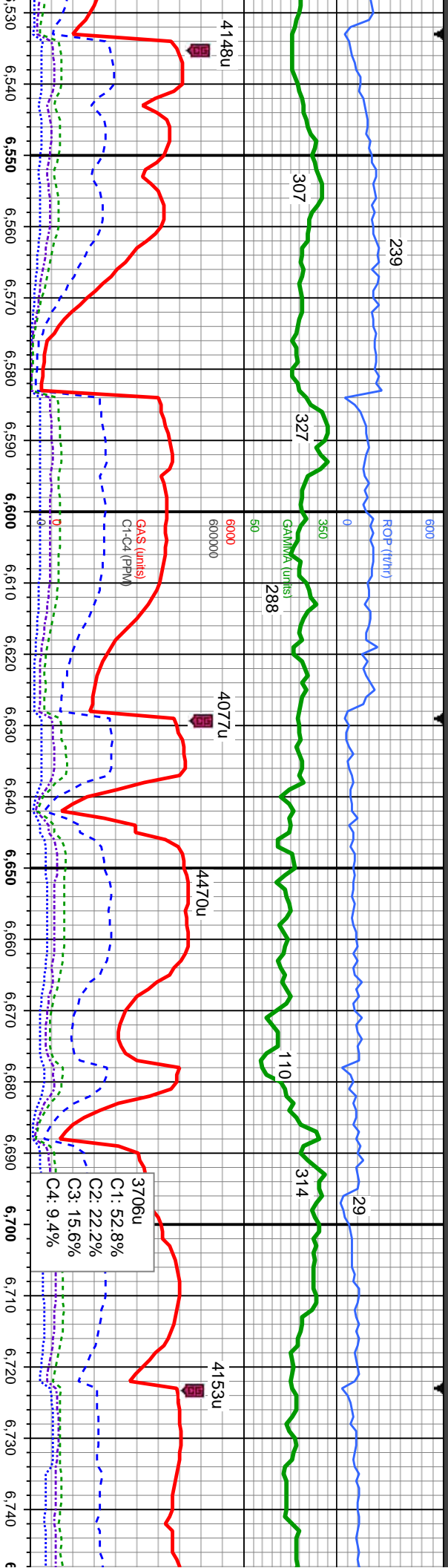
SLTY SH: pred lt gy, occ med gy, hd, pily -  
sb pily, occ sb blkly, silty - grty tex, v sl calc  
SHY SS: lt gy, s&p, vfg, mod hd wi brit clus,  
sb ang - sb rd, sl calc cmt

SLTY SH: pred lt gy, occ med gy, hd, pily -  
sb pily, occ sb blkly, silty - grty tex, v sl calc

SLTY SH: pred lt gy brn, -  
- sb pily, occ sb blkly, silty  
sme bent





Sharon Springs Marker  
6,585' MD; 6,506' TVD

6300	Niobrara Top @
	6,610' MD; 6,523' TVD

Nio A Chalk Top @  
6,639' MD; 6,542' TVD

Nio A Marl Top @  
6,680' MD; 6,566' TVD

## <<Scale Changes>>

**F**

## B Chalk

MD: 6,575'  
TVD: 6,498.73'  
Inclination: 43.13 °  
Azimuth: 81.58 °  
VS: 230.19'

MD: 6,623'  
TV D: 6,531.96'  
Inclination: 49.2°  
Azimuth: 80.79°  
VS: 263.73'

MD: 6,670'  
TVD: 6,560.72'  
Inclination: 55.31 °  
Azimuth: 81.28 °  
VS: 299.72'

463.03'      37.96 °  
: 82.08 °  
.5'

SLTY SH: pred lt gy brn, occ med gy, hd, plty - sb plty, occ sb blkly, slty - grty tex, v sl calic, sme bent

CHK: pried tan wi wñ, sme llyg, mot, lam, sft  
- frm, sb ply - sb blyk, rthy tex, v calc  
MRL: lt - med gy, occ blk, sft - mod hd, sb  
ply - ply, sily - grty tex, abnt bent  
6/00

CHK: pred tan wi wh, sme llyg, mot, lam, sft  
- frm, sb ply - sb blk, rthy tex, v calc  
MRL: lt - med gy, occ blk, sft - mod hd, sb  
ply - ply, silty - grty tex, abnt bent

MRL: lt - med gy, occ blk, sft - mod hd, sb  
ply - ply, stly - grry tex, tr bent  
CHK: pred tan wi wh, sme lgy, mot, lam, sft  
- frm, sb ply - sb blk, rthy tex, v calc







10/10/90  
N/OUT

01/19/2014

01/20/2014  
01/21/2014

01/22/2014

MUD WT: 9.40/9.55  
VIS: 31/34 IN/OUT

600  
ROP (ft/hr)

MINDEPTH

MINDEPTH

276

38

0

350

<<No Gamma Inside Casing>>

118

<<Scale Change>>

200

50

139

6000  
4168u

4774u

4240u

GA\$ (units)  
C1-C4 (PPM)

4349u  
C1: 44.8%  
C2: 23.5%  
C3: 19.1%  
C4: 12.6%

4300

6970 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 7,180

6500 TOOH @ 7,025' MD to run 7" casing

50' Sample Interval @ 7,050' MD

Bit Data

Bit #: 3  
Type: Ulterra  
Model: U513S

Size: 6.12"

Depth In: 7,025'  
Jets: 5x13

B Chalk

MD: 7,125'  
TVD: 6,658.73'  
Inclination: 89.23 °  
Azimuth: 92.58 °  
VS: 734.25'

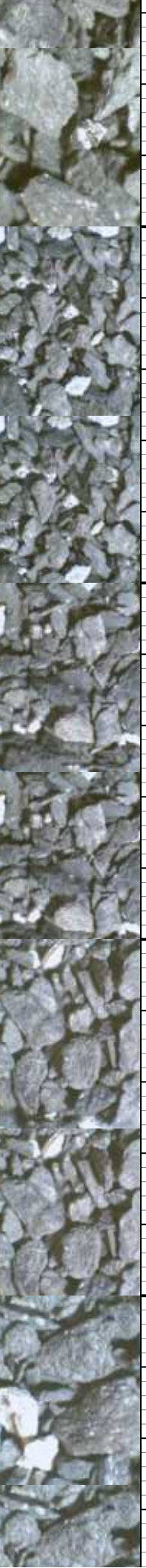
mot, lam, sft - frm, sb ply -  
v calc  
, occ blk, sft - mod hd, sb  
grty tex, tr bent, abnt fos frag

70% CHK: tan - ltgy, mot, lam, sft - frm, sb  
ply - sb blk, rthy tex, v calc  
30% MRL: lt - med gy, occ blk, sft - mod hd,  
sb ply - ply, slty - grty tex, tr bent, abnt fos  
frag

50% CHK: tan wi wh, ltgy, mot, lam, sft -  
frm, sb ply - sb blk, rthy tex, v calc  
50% MRL: lt - med gy, occ blk, sft - mod hd,  
sb ply - ply, slty - grty tex, tr bent, abnt fos  
frag

30% CHK: tan wi wh, ltgy, mot, lam, sft -  
frm, sb ply - sb blk, rthy tex, v calc  
70% MRL: lt - med gy, occ blk, sft - mod hd,  
sb ply - ply, slty - grty tex, abnt bent, abnt  
fos frag

30% CHK: tan wi wh, ltgy, mot, lam  
frm, sb ply - sb blk, rthy tex, v ca  
70% MRL: lt - med gy, occ blk, sft  
sb ply - ply, slty - grty tex, abnt be  
fos frag







[illegible]





--	--	--




1



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

**F**

620

 $\neq$ [illegible]

--	--

---

---

[illegible]

1

 $\neq$ 

---

[illegible]

wh

rthy

ad 9)

—

[illegible]




1

5

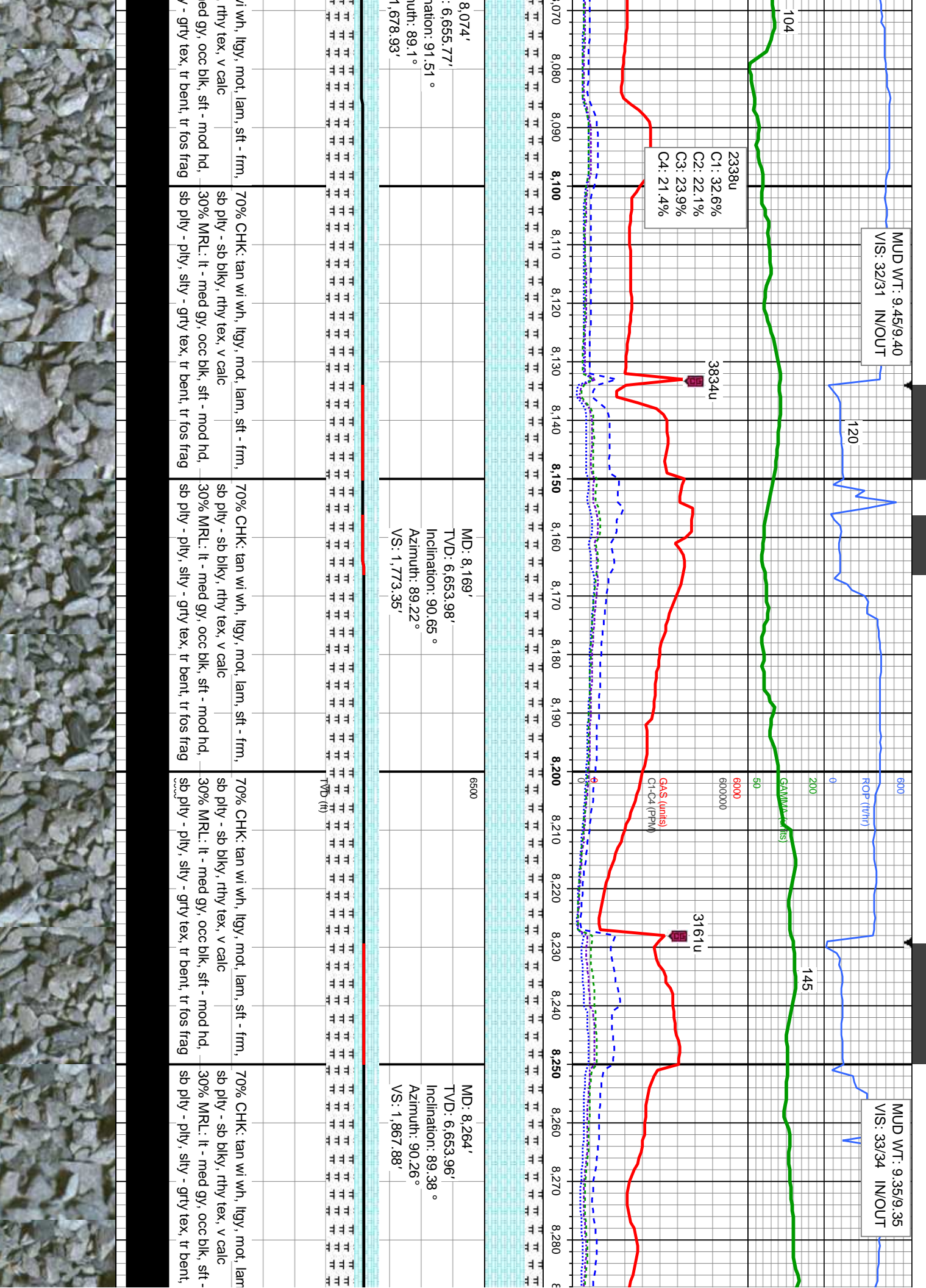
1





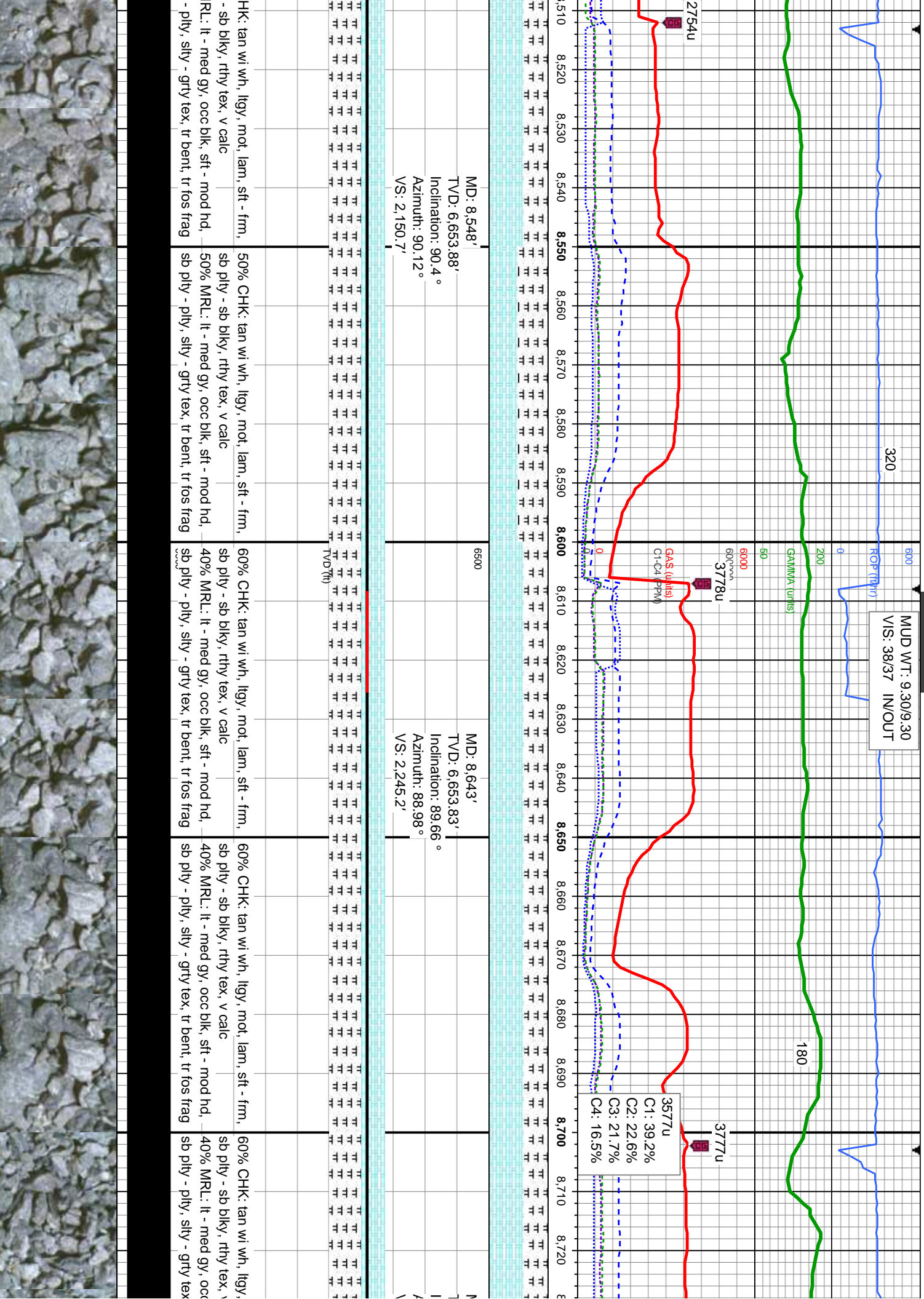


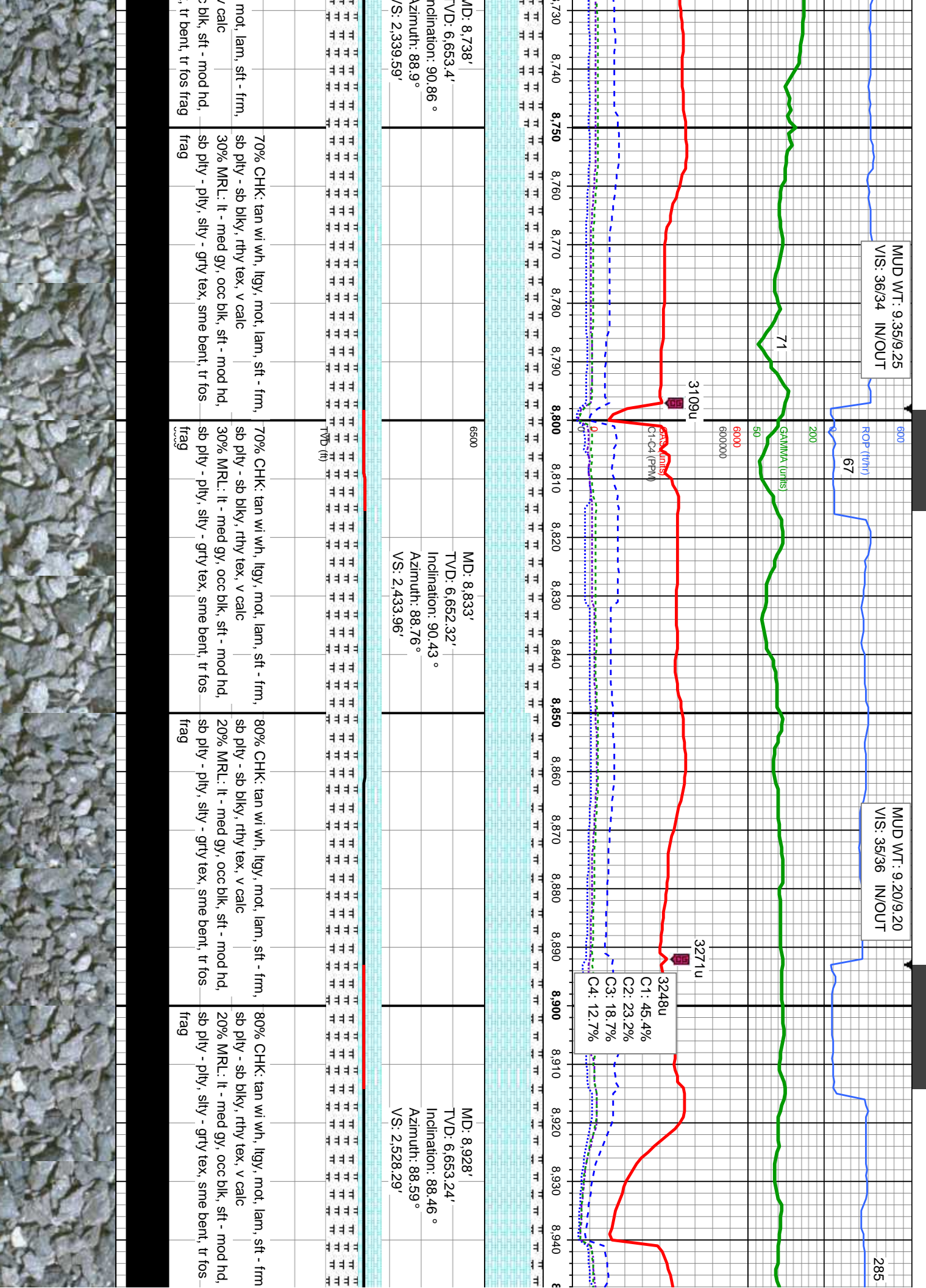




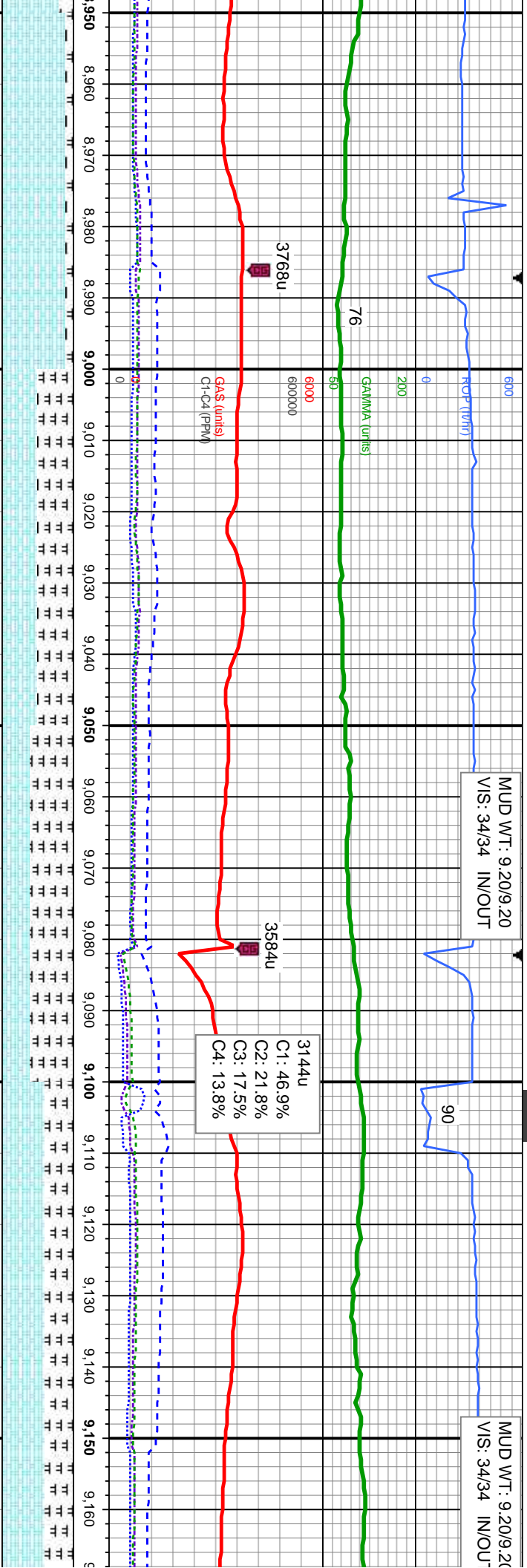






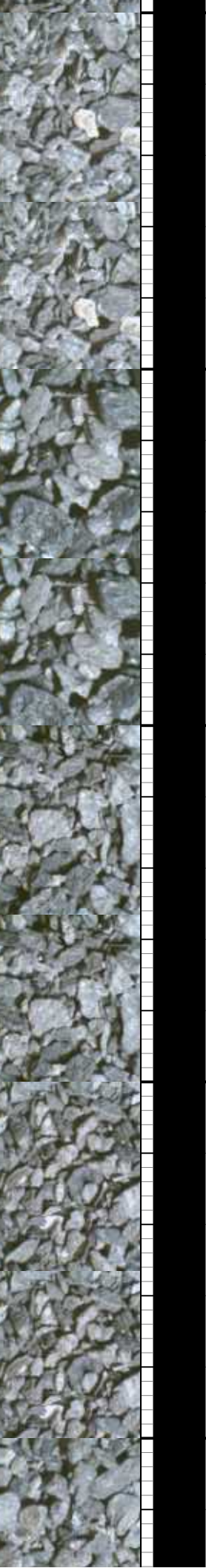




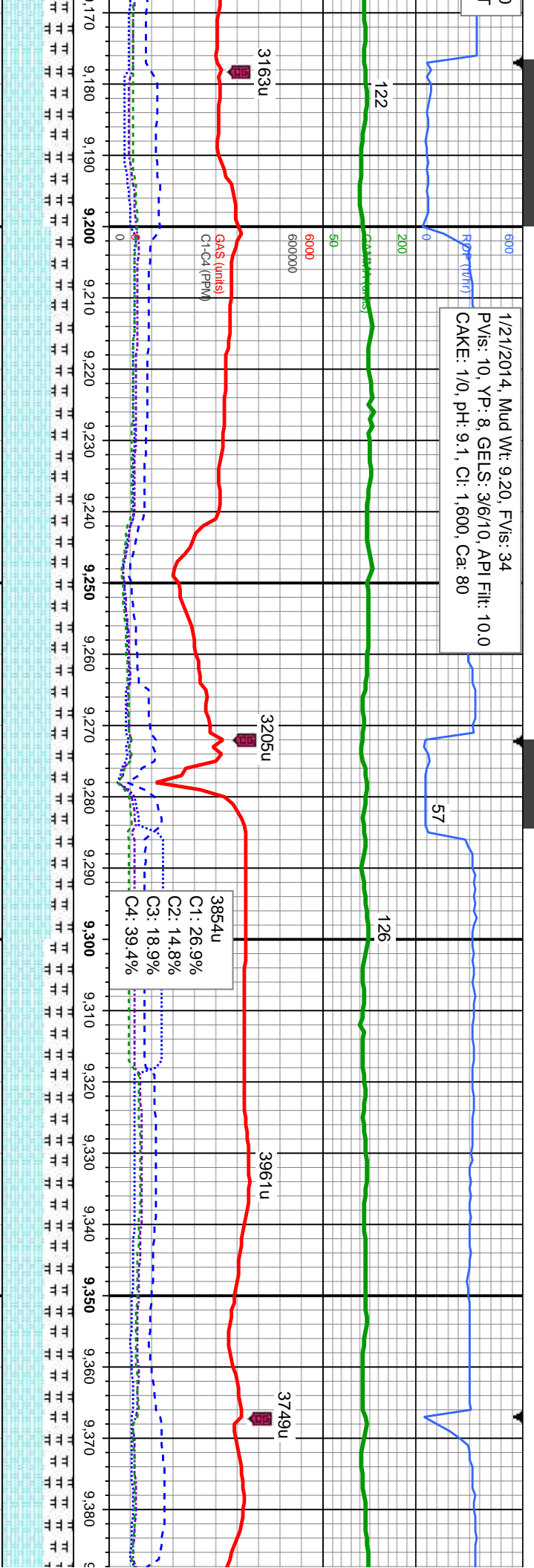


6500	MD: 9.022' TVD: 6,654.69' Inclination: 89.78 ° Azimuth: 88.8 ° VS: 2,621.64'	
	MD: 9.117' TVD: 6,654.12' Inclination: 90.89 ° Azimuth: 89.07 ° VS: 2,716.03'	

90% CHK: tan wi wh, ltgy, mod, lam, sft - frm, sb pily - sb blk, rthy tex, v calc 10% MRL: lt - med gy, occ blk, sft - mod hd, sb pily - pily, silty - grty tex, sme bent, tr fos frag	50% CHK: tan wi wh, ltgy, mod, lam, sft - frm, sb pily - sb blk, rthy tex, v calc 50% MRL: lt - med gy, occ blk, sft - mod hd, sb pily - pily, silty - grty tex, sme bent, tr fos frag	40% CHK: tan wi wh, ltgy, mod, lam, sft - frm, sb pily - sb blk, rthy tex, v calc 60% MRL: lt - med gy, occ blk, sft - mod hd, sb pily - pily, silty - grty tex, sme bent, tr fos frag	60% CHK: tan wi wh, ltgy, mod, lam, sft - frm, sb pily - sb blk, rthy tex, v calc 40% MRL: lt - med gy, occ blk, sft - mod hd, sb pily - pily, silty - grty tex, abnt bent, tr fos frag	60% CHK: tan wi wh, ltgy, mod, lam, sft - frm, sb pily - sb blk, rthy tex, v calc 40% MRL: lt - med gy, occ blk, sft - mod hd, sb pily - pily, silty - grty tex, abnt bent, tr fos frag
--	--	--	---	---



1/21/2014, Mud Wt: 9.20, FV/s: 34  
PV/s: 10, YP: 8, GELS: 36/10, API Filtr: 10.0  
CAKE: 1/0, pH: 9.1, Cl: 1,600, Ca: 80



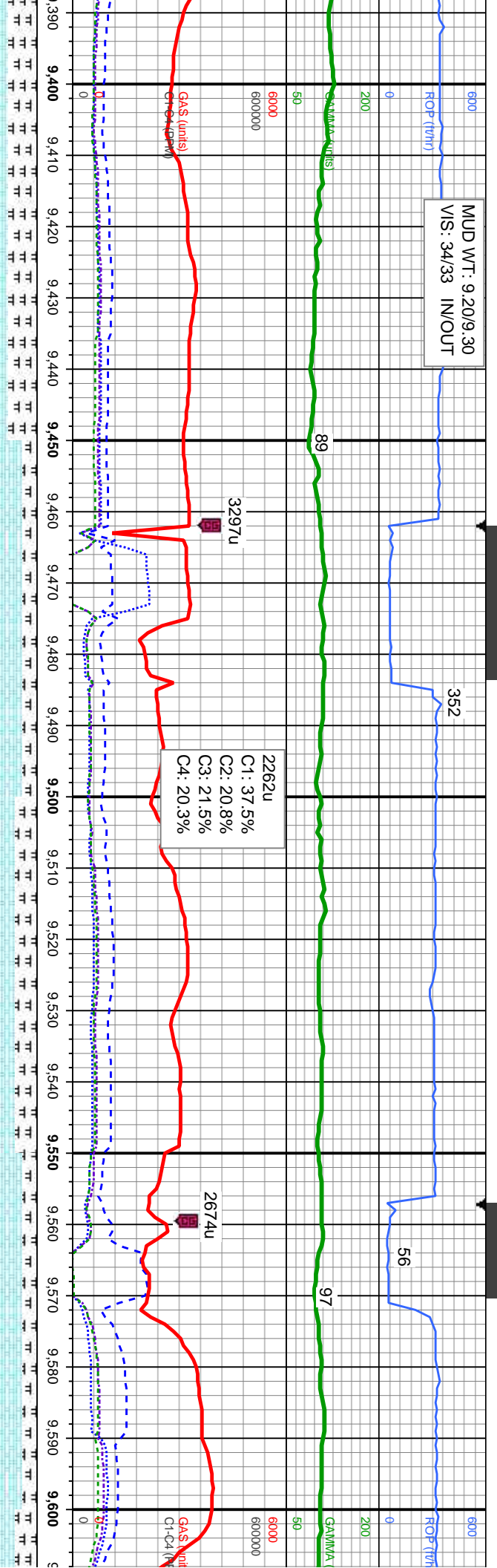
MD: 9,212'  
TVD: 6,653.56'  
Inclination: 89.78 °  
Azimuth: 89.76°  
VS: 2,810.5'

MD: 9,307'  
TVD: 6,654.2'  
Inclination: 89.45 °  
Azimuth: 90.24°  
VS: 2,905.08'

i wh, ltgy, mot, lam, sft - frm, rthy tex, v calc	70% CHK: tan wi wh, ltgy, mot, lam, sft - frm, sb pty - sb blk, rthy tex, v calc	70% CHK: tan wi wh, ltgy, mot, lam, sft - frm, sb pty - sb blk, rthy tex, v calc	60% CHK: tan wi wh, ltgy, mot, lam, sft - frm, sb pty - sb blk, rthy tex, v calc	60% CHK: tan wi wh, ltgy, mot, lam, sft - frm, sb pty - sb blk, rthy tex, v calc
ed gy, occ blk, sft - mod hd, - grty tex, sme bent, tr fos	30% MRL: lt - med gy, occ blk, sft - mod hd, sb pty - pty, silty - grty tex, sme bent, sme fos frag	30% MRL: lt - med gy, occ blk, sft - mod hd, sb pty - pty, silty - grty tex, sme bent, sme fos frag	40% MRL: lt - med gy, occ blk, sft - mod hd, sb pty - pty, silty - grty tex, tr bent, sme fos frag	40% MRL: lt - med gy, occ blk, sft - mod hd, sb pty - pty, silty - grty tex, tr bent, sme fos frag
6900	6900	6900	6900	6900



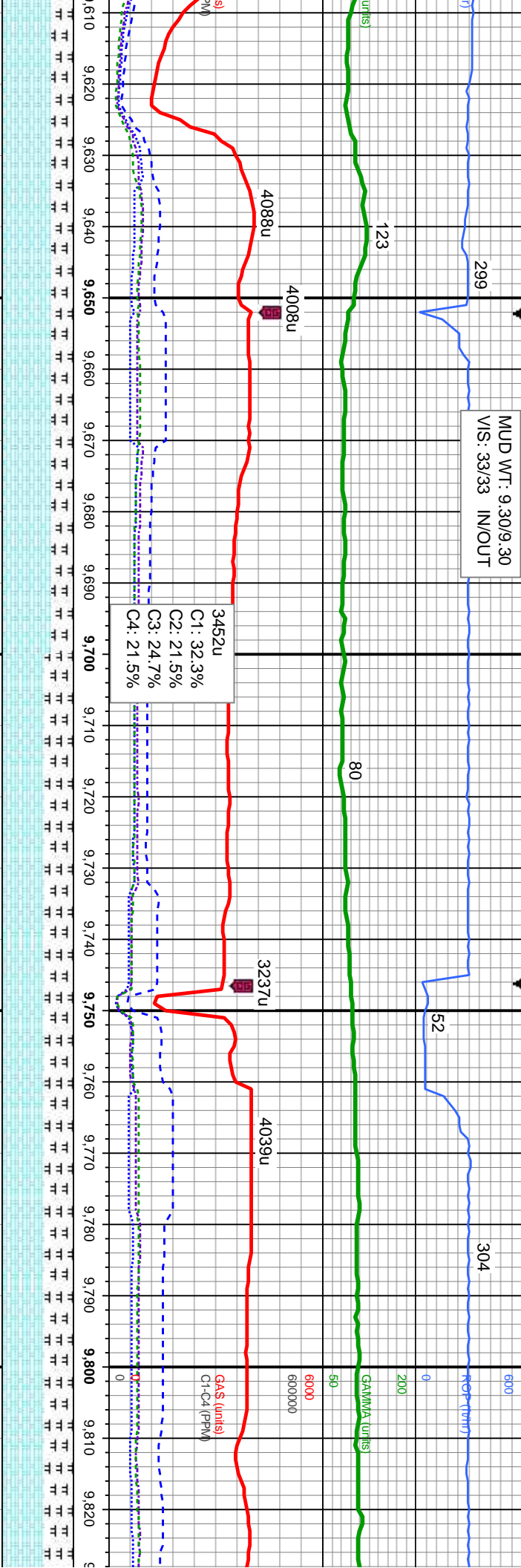




MD: 9.402'0	MD: 9.496'	MD: 9.591'
TVD: 6,653.59'	TVD: 6,652.22'	TVD: 6,652.26'
Inclination: 91.29 °	Inclination: 90.37 °	Inclination: 89.57 °
Azimuth: 92.03 °	Azimuth: 90.5 °	Azimuth: 89.65 °
VS: 2,999.8'	VS: 3,093.54'	VS: 3,188.13'

60% CHK: tan wi wh, ltgy, mot, lam, sft - frm, sb pily - sb blk, rthy tex, v calc	80% CHK: tan wi wh, ltgy, mot, lam, sft - frm, sb pily - sb blk, rthy tex, v calc	70% CHK: tan wi wh, ltgy, mot, lam, sft - frm, sb pily - sb blk, rthy tex, v calc	80% CHK: tan wi wh, ltgy, mot, lam, sft - frm, sb pily - sb blk, rthy tex, v calc
40% MRL: lt - med gy, occ blk, sft - mod hd, sb pily - pily, slty - grty tex, tr bent, sme fos frag	20% MRL: lt - med gy, occ blk, sft - mod hd, sb pily - pily, slty - grty tex, tr bent, sme fos frag	30% MRL: lt - med gy, occ blk, sft - mod hd, sb pily - pily, slty - grty tex, tr bent, sme fos frag	20% MRL: lt - med gy, occ blk, sft - mod hd, sb pily - pily, slty - grty tex, tr bent, sme fos frag
6900			6900





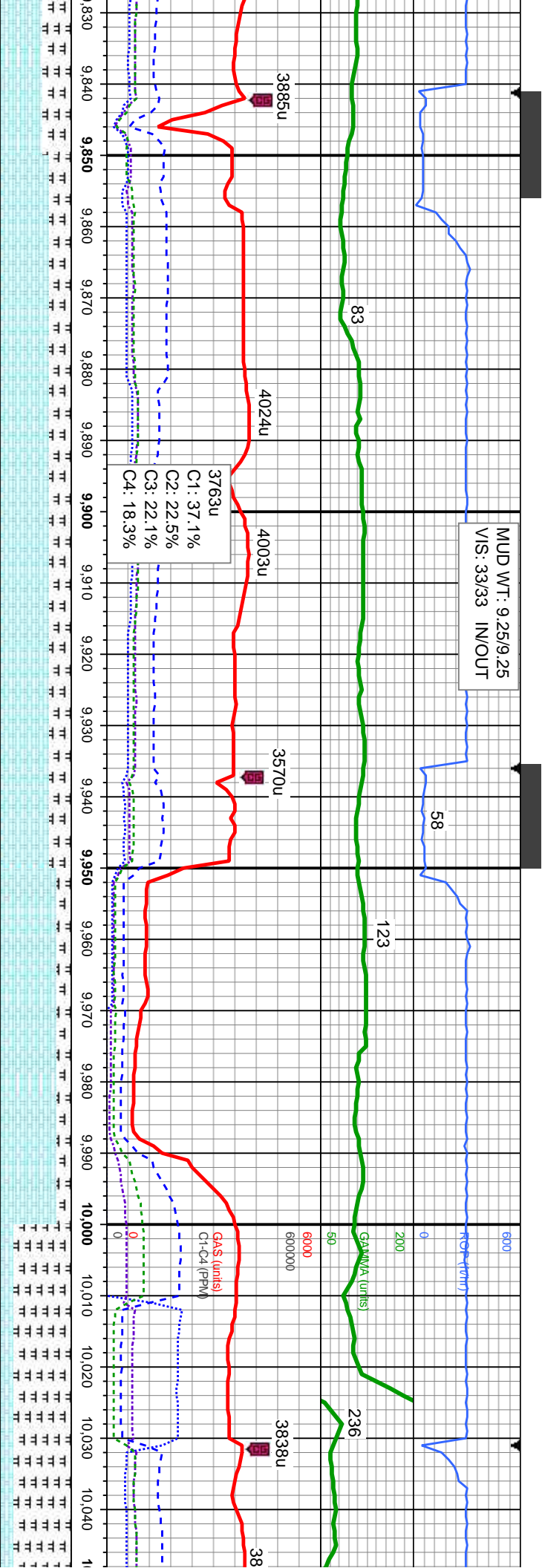
MD: 9.686'	TVD: 6.652.36'	Inclination: 90.31 °	Azinuth: 90.44 °	VS: 3.282.71'
MD: 9.781'	TVD: 6.651.46'	Inclination: 90.77 °	Azinuth: 89 °	VS: 3.377.24'

70% CHK: tan wi wh, llyg, mot, lam, sft - frm, sb pily - sb blk, rthy tex, v calc	60% CHK: tan wi wh, llyg, mot, lam, sft - frm, sb pily - sb blk, rthy tex, v calc	60% CHK: tan wi wh, llyg, mot, lam, sft - frm, sb pily - sb blk, rthy tex, v calc	40% MRL: It - med gy, occ blk, sft - mod hd, sb pily - pily, sily - gtry tex, tr bent, sme fos frag
30% MRL: It - med gy, occ blk, sft - mod hd, sb pily - pily, sily - gtry tex, tr bent, sme fos frag	40% MRL: It - med gy, occ blk, sft - mod hd, sb pily - pily, sily - gtry tex, tr bent, sme fos frag	40% MRL: It - med gy, occ blk, sft - mod hd, sb pily - pily, sily - gtry tex, tr bent, sme fos frag	40% MRL: It - med gy, occ blk, sft - mod hd, sb pily - pily, sily - gtry tex, tr bent, sme fos frag



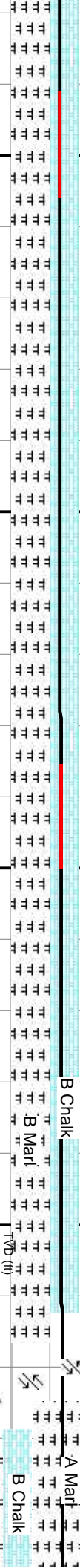


MUD WT: 9.25/9.25  
VIS: 33/33 IN/OUT



MD: 9,876'  
TVD: 6,650.24'  
Inclination: 90.71 °  
Azimuth: 88.98 °  
VS: 3,471.64'

MD: 9,971'  
TVD: 6,649.14'  
Inclination: 90.62 °  
Azimuth: 89.2 °  
VS: 3,566.05'

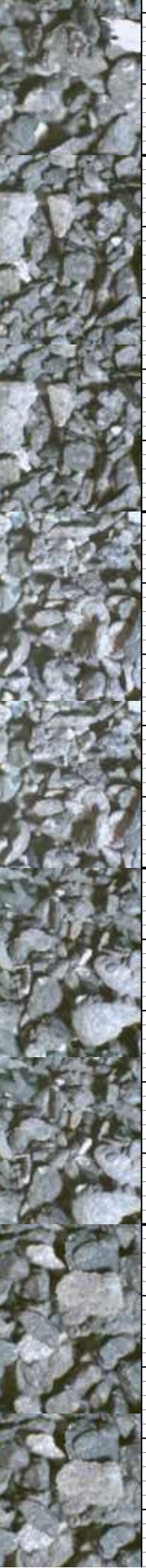


70% CHK: tan wi wh, ltgy, mot, lam, sft -  
frm, sb pty - sb blk, rthy tex, v calc  
30% MRL: lt - med gy, occ blk, sft - mod hd,  
sb pty - pty, slty - grty tex, tr bent, sme fos  
frag

70% CHK: tan wi wh, ltgy, mot, lam, sft -  
frm, sb pty - sb blk, rthy tex, v calc  
30% MRL: lt - med gy, occ blk, sft - mod hd,  
sb pty - pty, slty - grty tex, tr bent, sme fos  
frag

80% CHK: tan wi wh, ltgy, mot, lam, sft -  
frm, sb pty - sb blk, rthy tex, v calc  
20% MRL: lt - med gy, occ blk, sft - mod hd,  
sb pty - pty, slty - grty tex, tr bent, sme fos  
frag

20% CHK: tan wi wh, ltgy, mot, lam, sft -  
frm, sb pty - sb blk, rthy tex, v calc  
80% MRL: lt - med gy, occ blk, sft - mod hd,  
sb pty - pty, slty - grty tex, tr bent, sme fos  
frag







299



C4: 16.9%



Altitude: 88.9  
Azimuth: 88.9  
V.S. 3 911 02'

TD @ 10,318' MD @ 23:56 hrs MST  
on 01/22/2014

## Wellsite Geological Services Provided By Columbine Logging

frag