



Empirica

Scale: 5" / 100'
Measured Depth Log

Well Name Janssen #8 HZ

Location Sec.8-T06N-R65W

State Colorado

Country USA

API Number 05-123-42357-00

Geographic Region DJ Basin

Spud Date 11/19/2015

Surface Coordinates SHL: 2315' FNL, 2396' FWL Sec. 8 T6N R65W

Lat: 40 30' 10.289 N
Long: 104 42' 17.786 W

County Weld

Rig Number Patterson UTI 346

AFE # 14-798

Field Wattenberg

Drilling Completed 11/21/2015

Ground Elevation 4,777'

K.B. Elevation 4,801.5'

Logged Interval 7,380' To 11,410'

Total Depth 11,410'

Formation Codell

Type of Drilling Fluid Oil Based - invert

Operator

Company Extraction Oil & Gas

Address 1888 Sherman St., Suite 200
Denver, CO 80203

Geologist

Name Vivian Spiess / Jared Rouse

Company Extraction Oil & Gas

Address 1888 Sherman St., Suite 200
Denver, CO 80203



Other

Equipment ML-113

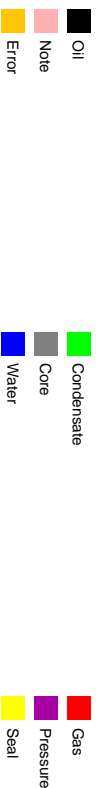
Comments Start: 11-19-15
TD: 11-21-15

Services Provided 2-man Logging
On Site Geosteering

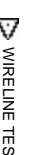
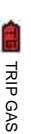
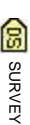
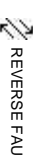
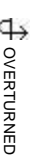
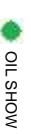
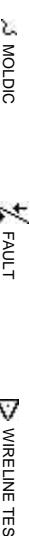
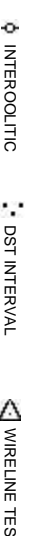
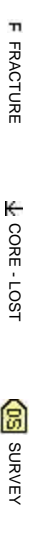
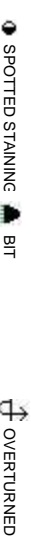
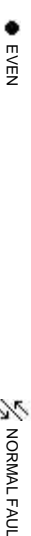
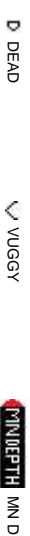
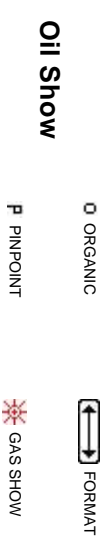
Logger Names Dominic Pitre / Nicholas Watk

Address Empirica, LLC.
6360 W Sam Houston Pkwy N
Suite 100
Houston, TX 77041

Zone Color Coding



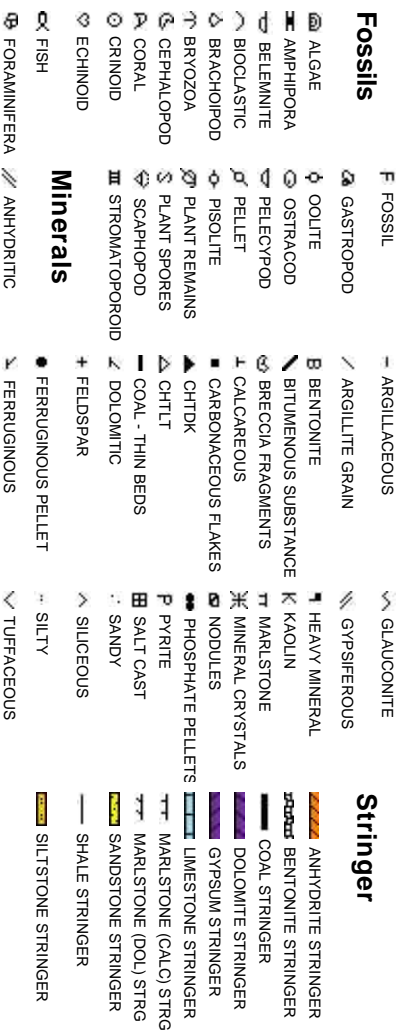
Other Symt



Rock Types



Accessories



Tools

ION TOP L LITHOGRAPHIC

Rounding

MX MICROXLN

DEPTH **A** ANGULAR **MS** MUDSTONE

T **R** ROUNDED **PS** PACKSTONE

B SUBANG **WS** WACKESTONE

STRATA **W** SUBRND

Sorting

LT

Textures

RE (LEFT) **M** MODERATE

RE (RIGHT) **BS** BOUNDSTONE **P** POOR

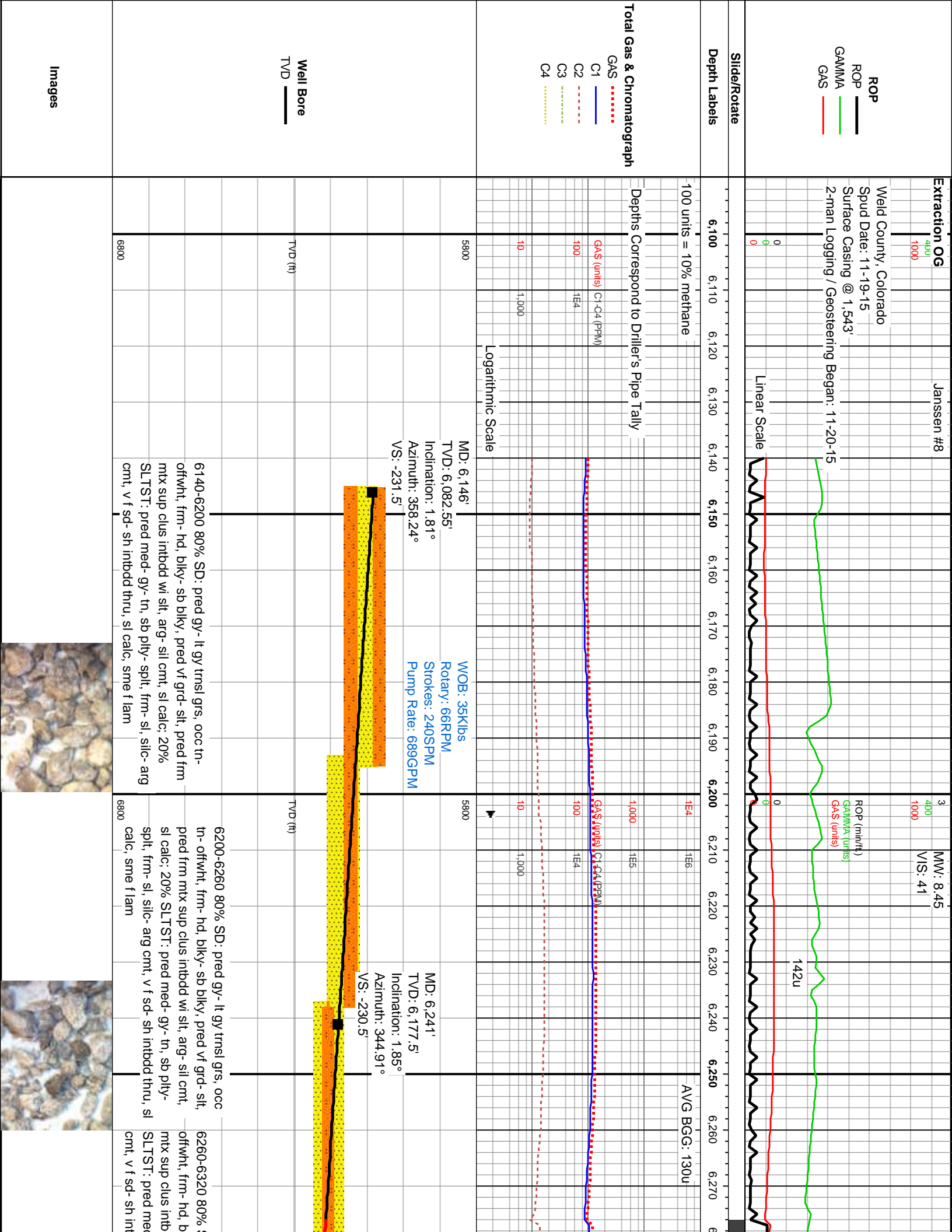
C CHALKY **W** WELL

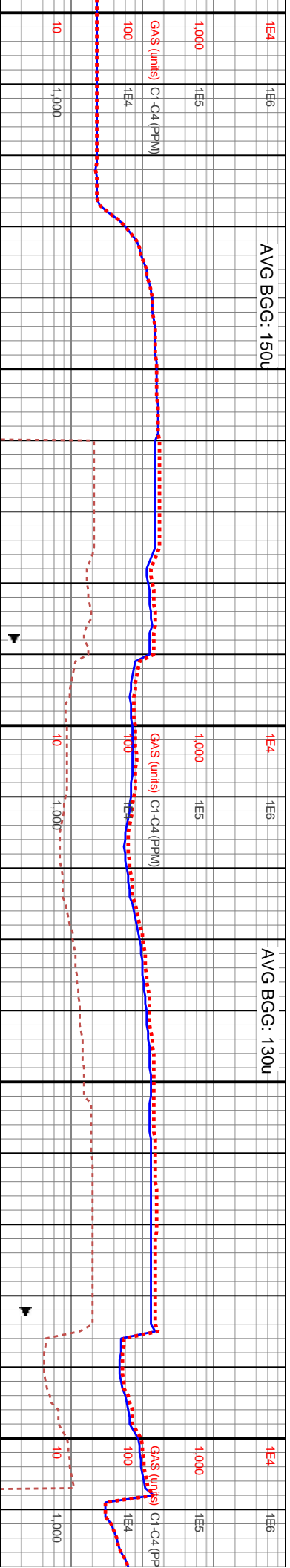
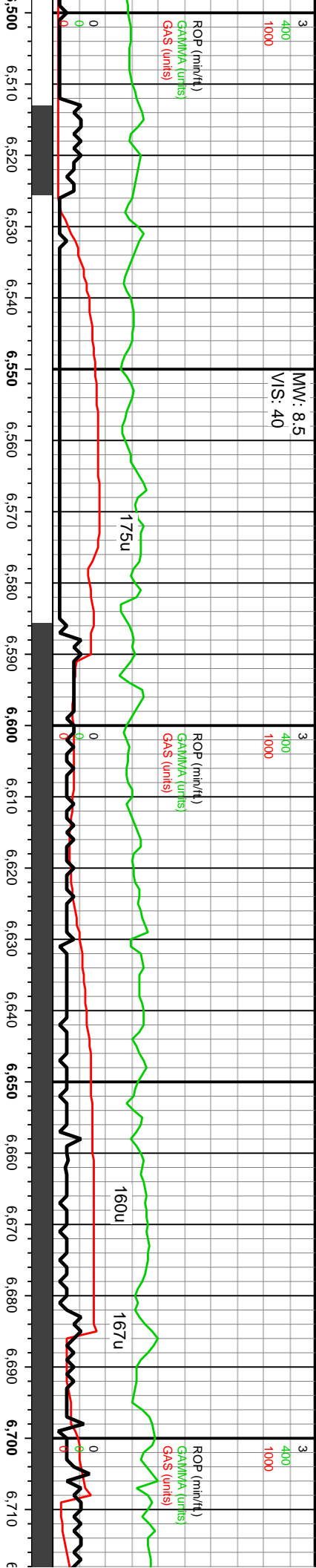
CK CRYPTOXLN

E EARTHY

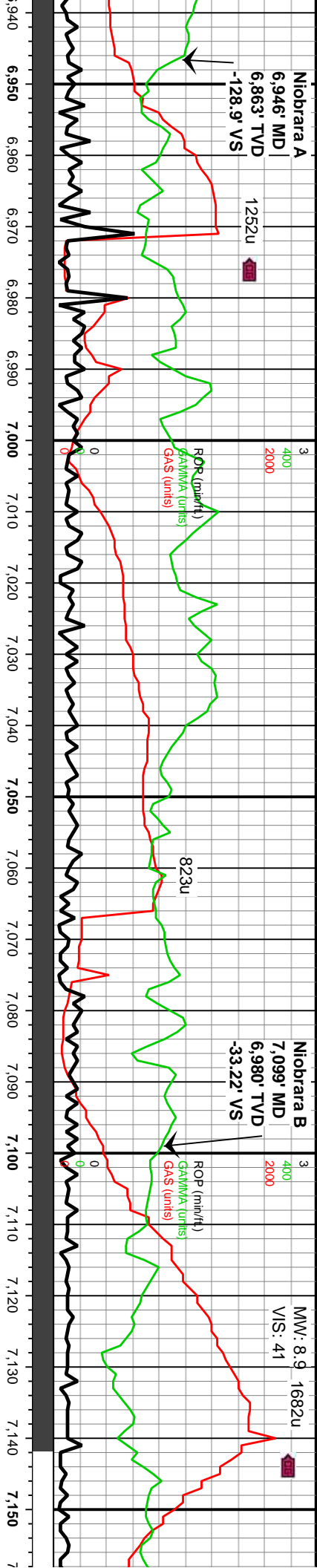
TED - LEFT **FX** FINELYXLN

TED - RT **GS** GRAINSTONE





MD: 6,528' TVD: 6,464.33' Inclination: 2.46° Azimuth: 9.23° VS: -227.81'		WOB: 21Klbs Rotary: 0RPM Strokes: 240SPM Pump Rate: 689GPM		MD: 6,623' TVD: 6,559.2' Inclination: 4.37° Azimuth: 282.63° VS: -224.12'		MD: 6,674 TVD: 6,579.2' Inclination: 4.37° Azimuth: 282.63° VS: -224.12'	
6500-6560 SD: pred gy- lt gy trnsl grs, ip med gy, occ tr- oftwht, pred frm- hd, blkly- sb blkly, occ splt, pred vf grd- slt, pred frm mx sup clus intbdd wi slt, mod slt intbds, arg thru, arg- sil cmt, sl calc		6560-6620 50% SLTST: pred med gy, occ brn- gy mot, sb blkly- spl, frm- sl frm, ip hd, silc- arg cmt, v f sd- sh intbdd thru, sl calc; 40% SLTY SH: ltgy- gy brn, sme med- dk gy, sl frm- sft, sme sm txt, mod fis- sb ply, v sl calc, ip f lam, intbdd wi slt; 10% SD: oftwht- lt gy trnsl grs, pred vf gr- slt, pred intbdd grs		6620-6680 50% SLTST: pred med gy, occ brn- gy mot, sb blkly- spl, frm- sl frm, ip hd, silc- arg cmt, v f sd- sh intbdd thru, sl calc; 40% SLTY SH: ltgy- gy brn, sme med- dk gy, sl frm- sft, sme sm txt, mod fis- sb ply, v sl calc, ip f lam, intbdd wi slt; 10% SD: oftwht- lt gy trnsl grs, pred vf gr- slt, pred intbdd grs		6680-6740 50% SLTST: pred med gy, occ brn- gy mot, sb blkly- spl, frm- sl frm, ip hd, silc- arg cmt, v f sd- sh intbdd thru, sl calc; 40% SLTY SH: ltgy- gy brn, sme med- dk gy, sl frm- sft, sme sm txt, mod fis- sb ply, v sl calc, ip f lam, intbdd wi slt; 10% SD: oftwht- lt gy trnsl grs, pred vf gr- slt, pred intbdd grs	
740C		740C		740C		740C	



WOB: 36Klbs
Rotary: 0RPM
Strokes: 240SPM
Pump Rate: 689GPM

MD: 7,005'
TVD: 6,911.67'
Inclination: 37.13°
Azimuth: 269.39°
VS: -95.34'

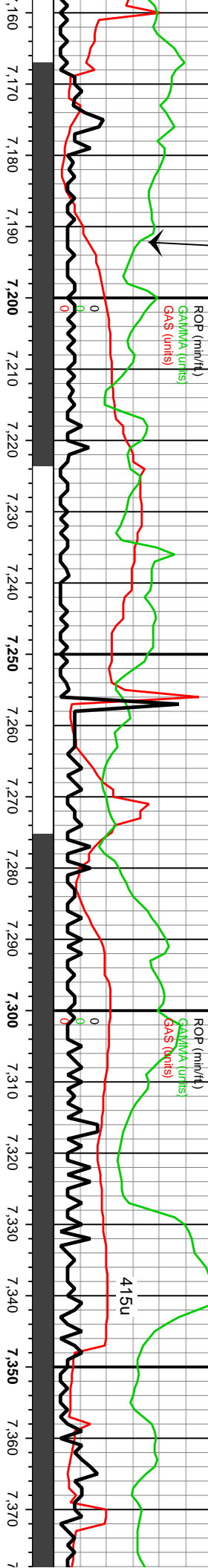
6980-80% CHK: pred gy- med gy, lt offwht mot, frm- hd, pred blk- sb blk, chky txt, arg thru, sme lse cal, tr pyr; intbdd MRLST: dk gy- blk, sb ply- fts, frm- sft, rthy- sm txt, intbdd wi chk

6980-7040 60% CHK: pred gy- med gy, lt gy- offwht mot, frm- hd, pred blk- sb blk, rthy- chky txt, arg thru, sme lse cal, tr pyr; 40% intbdd MRLST: dk gy- blk, sb ply- fts, pred frm- sft, rthy- sm txt, intbdd wi chk

7040-7100 80% CHK: pred gy- med gy, lt gy- offwht mot, frm- hd, pred blk- sb blk, rthy- chky txt, arg thru, sme lse cal, tr pyr; 20% intbdd MRLST: dk gy- blk, sb ply- fts, pred frm- sft, rthy- sm txt, intbdd wi chk

7100-7160 CHK: pred gy- med gy, lt gy- offwht mot, sme offwht- tn mot, pred frm- hd, pred blk- sb blk, rthy- chky txt, sme grnl tex, mod arg thru sme v cin chk, sme lse chk, sl intbdd w mlst, sme lse cal, sme pyr

Niobrara C
7,192 MD
7,037' TVD
38° VS



WOB: 44Klbs
Rotary: 0RPM
Strokes: 240SPM
Pump Rate: 689GPM

MD: 7,195'
TVD: 7,038.88'
Inclination: 56.37°
Azimuth: 268.54° (th)
VS: 40.79'

7160-7220 CHK: pred gy- med gy, lt gy-
offwht mot, sme offwht- tn mot, pred frm-
hd, pred blkly- sb blkly, rthy- chky txt, sme
gml tex, mod arg thru, sme v cin chk, sme
lse chk, incrg intbdd wi mlst, sme lse cal,
sme pyr

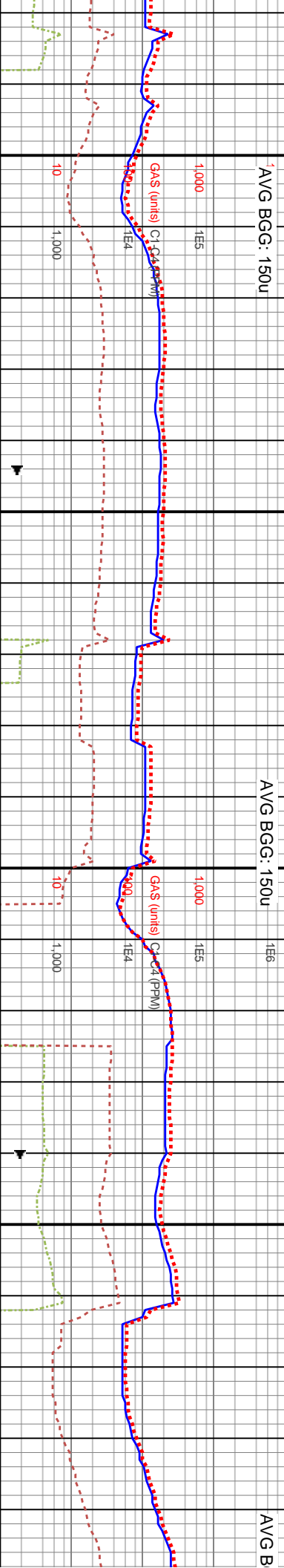
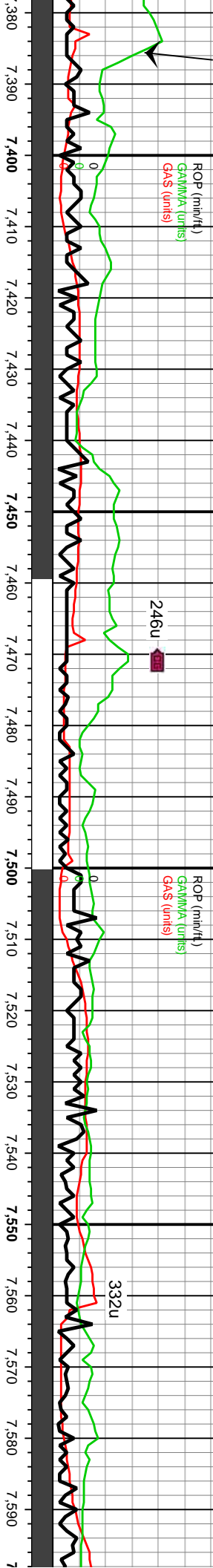
7220-7280 80% CHK: pred gy- med gy, tr lt gy-
offwht mot, occ dk gy, pred frm- hd, pred blkly-
sb blkly, rthy- chky txt, mod- v arg thru, sme lse
chk, ~5% pyr, 20% MRLST: dk gy- blk, sb plty-
fis, pred frm- sft, rthy- sm txt, intbdd wi chk

7280-7340 80% CHK: pred gy- med gy, tr lt gy-
offwht mot, occ dk gy, pred frm- hd, pred blkly- sb
blkly, rthy- chky txt, mod- v arg thru, sme lse chk,
~5% pyr, 20% MRLST: dk gy- blk, sb plty- fis,
pred frm- sft, rthy- sm txt, intbdd wi chk

7340-7400: 80% LS: offwht-
mot, occ wnt, pred blkly- sb b
pred mudst wi sme intbd carl
med gy, sb blkly, sl frm- hd, ca

Port Hayes
7,385' MD
7,122' TVD
7,009' VS

MW: 8.9
V/S: 41



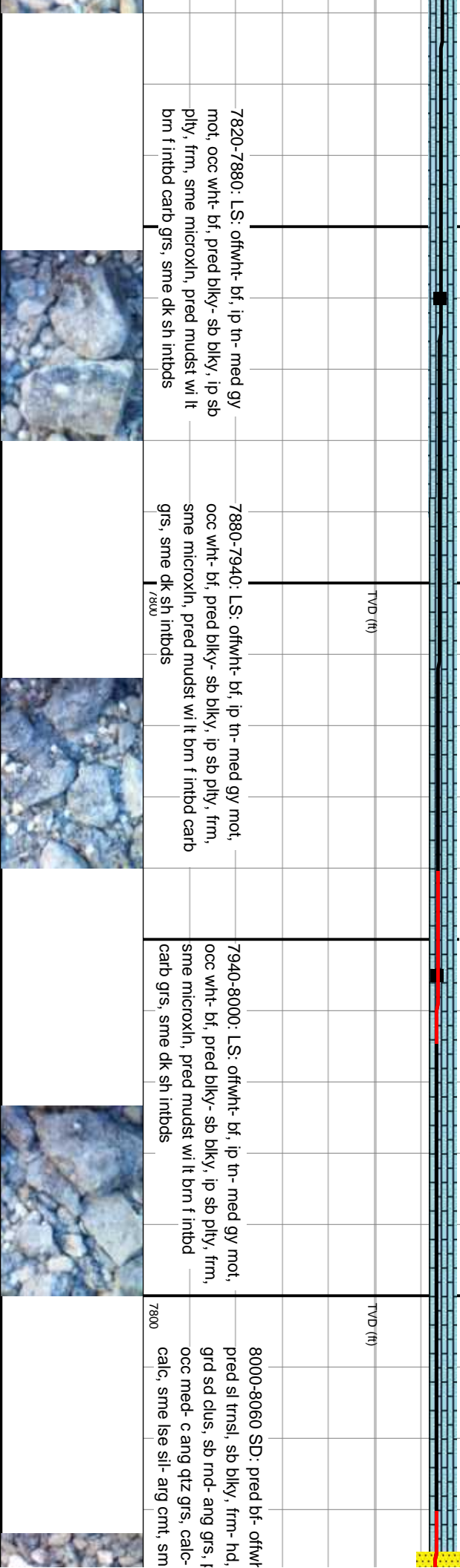
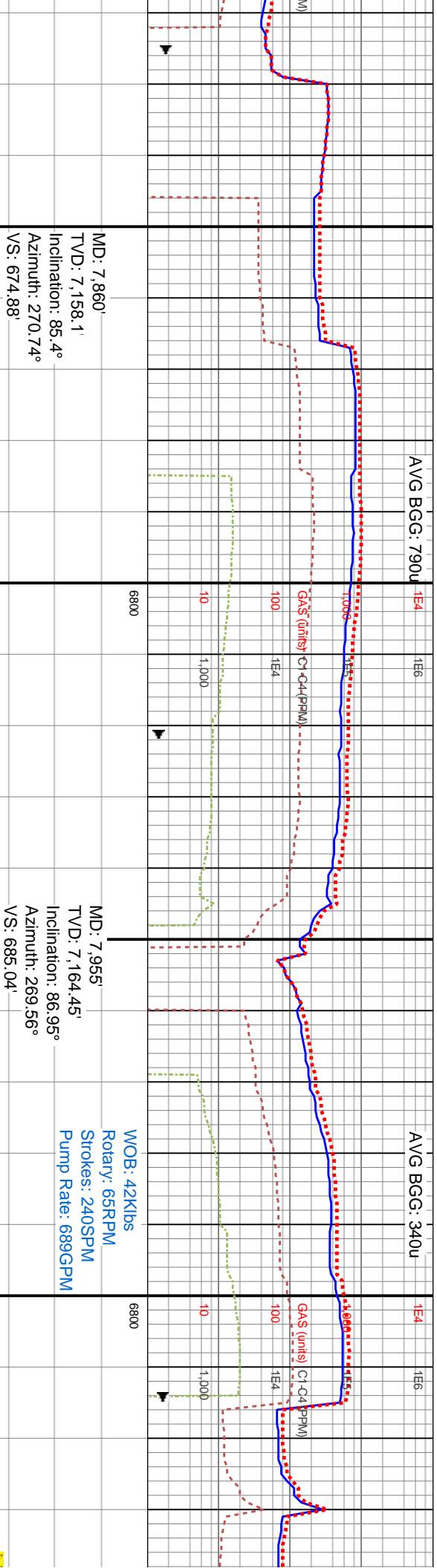
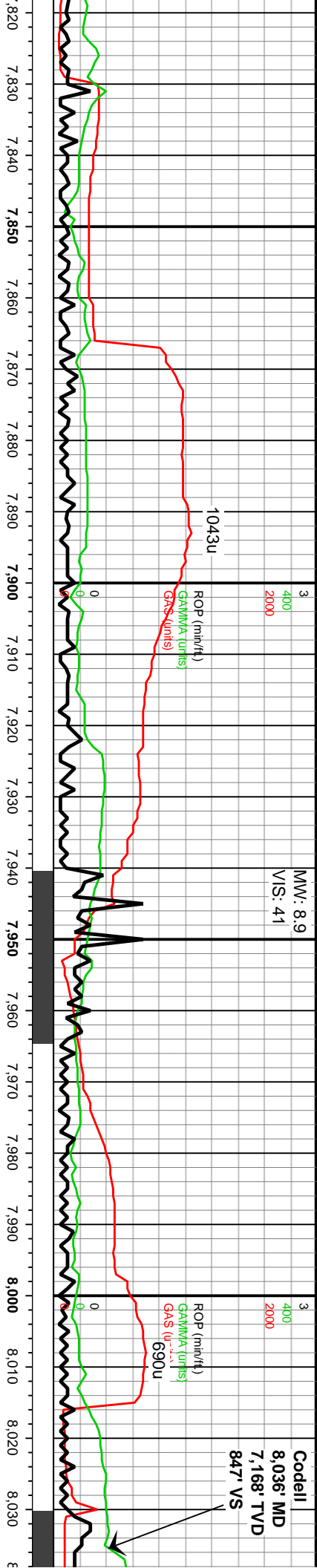
OB: 59Klbs
D: 7,386 PM
VD: 7,122.51 M
Inclination: 75.19° M
Azimuth: 275.54° M
S: 209.77'

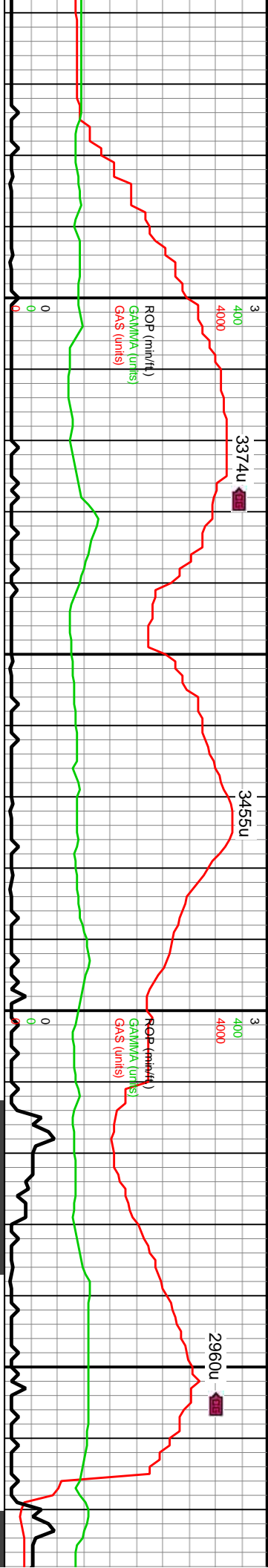
MD: 7,481'
TVD: 7,139.89'
Inclination: 83.71°
Azimuth: 271.77°
VS: 302.29'

WOB: 42Klbs
MD: 7,576' Rotary: 65RPM
TVD: 7,144.96' Res: 240SPM
Inclination: 90.17° Itc: 689GPI
Azimuth: 270.53°
VS: 395.71'

7400-7460: 80% LS: offwht- bf, ip sl tn- med gy mot, occ wht, pred blk- sb blk, ip sb pty, frm, pred mudst wi sme intbd carb grs: 20% SLTST: med gy, sb blk, sl frm- hd, calc, sme sh intbds	7460-7520: LS: offwht- bf, ip sl tn- med gy mot, occ wht, pred blk- sb blk, ip sb pty, frm, pred mudst wi sme intbd carb grs	7520-7580: LS: offwht- bf, ip sl tn- med gy mot, occ wht, pred blk- sb blk, ip sb pty, frm, pred mudst wi sme intbd carb grs	7580-7640 occ wht, pr mudst wi s
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8,260 8,270 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

GG: 1240u

1E4

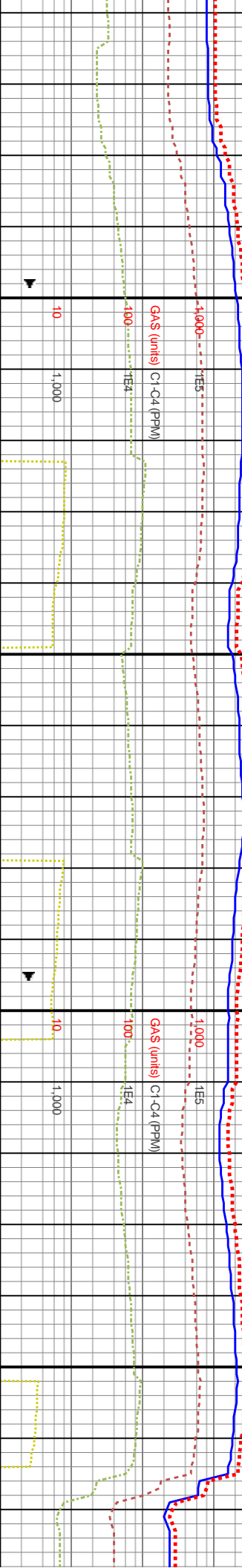
1E6

AVG BGG: 2980u

1E4

1E6

AVG BGG: 2160u



GA\$ (units)

C1-C4 (PPM)

GA\$ (units)

C1-C4 (PPM)

8300-8360 SD: pred gy- lt gy, sme gy- amb trnsi, v grs, sb blkly, frm- fri clus, pred v f- f grd sd, sb md- ang grs, pred grn sup grs, calc- sil cnt, sme lse sil- calc cnt, sme pyr

6800

MD: 8,334'
TVD: 7,173.57'
Inclination: 90.37°
Azimuth: 272.77°
VS: 1,063.72'

6800

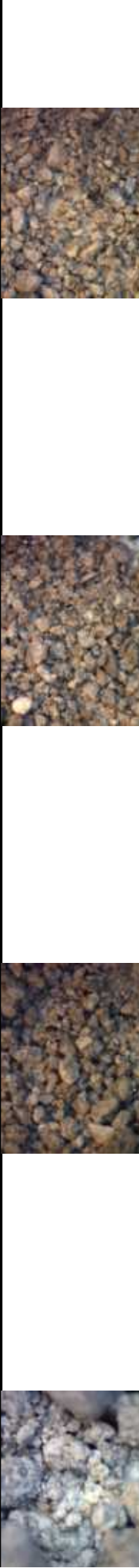
NW @ 8,420'
MD: 8,429'
TVD: 7,173.4'
Inclination: 89.83°
Azimuth: 273.82°
VS: 1,158.71'

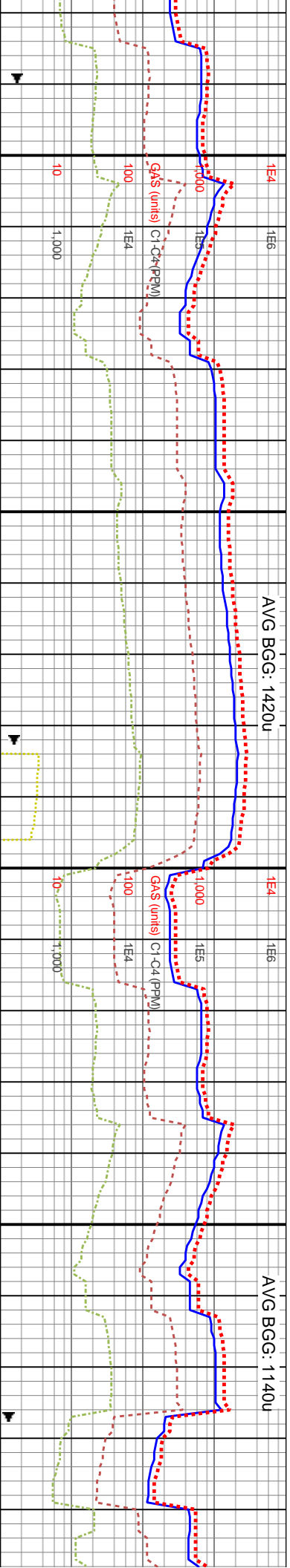
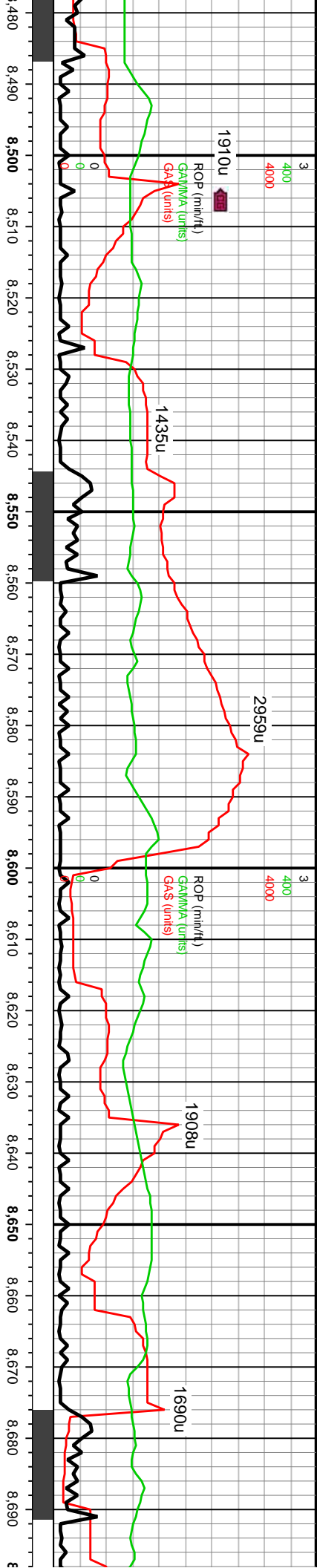
8360-8420 SD: pred gy- lt gy, sme gy- amb trnsi, pred si trnsi- v grs, sb blkly, frm- fri clus, pred v f- f grd, occ med grd sd, sb md- ang grs, pred grn sup clus, occ med- c ang qtz grs, calc- sil cnt, sme mod calc, sme lse sil- calc cnt, sme pyr

7800

7800

8420-8480 SS: off wh- v lt gy, com clr qtz grs & silic ip, occ lt br o stn, p-mod strd v f- f grs, frm pred gr sup clus cons wi calc- silic cnt, rr mx sup, arg ip, tr gn glau, non-si- mod calc





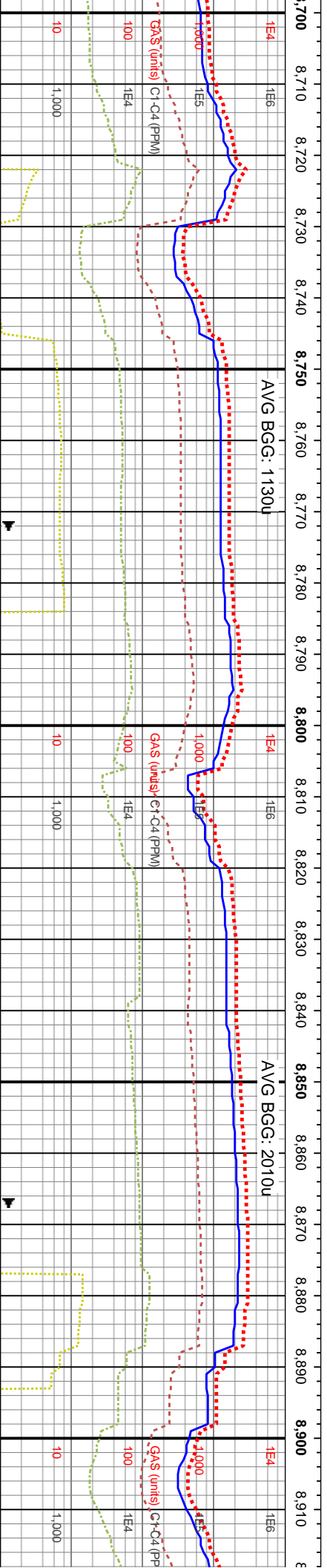
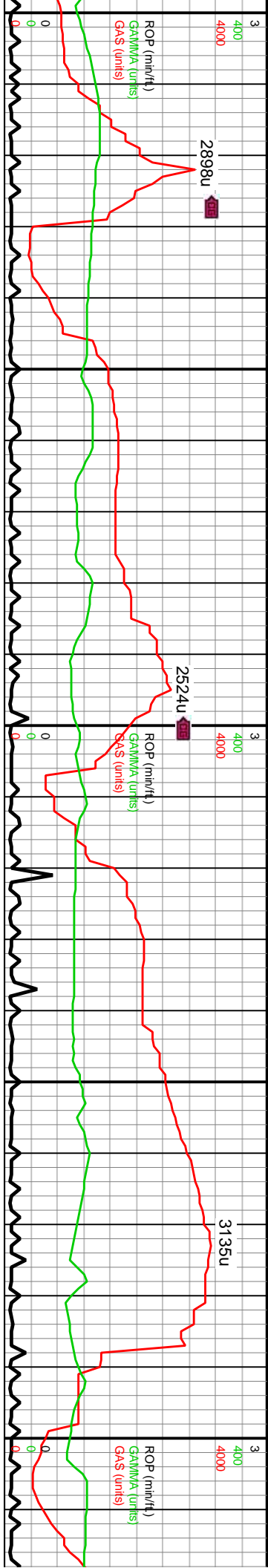
MD: 8,523'
TVD: 7,174.73'
Inclination: 88.56°
Azimuth: 273.22°
VS: 1,252.7'

WOB: 42Klbs
Rotary: 65RPM
Strokes: 240SPM
Pump Rate: 689GPM

MD: 8,617'
TVD: 7,177.01'
Inclination: 88.66°
Azimuth: 273.04°
VS: 1,346.67'

8480-8540 SS: off wh-v lt gy, com clr qtz grs & silic ip, occ lt br o stn, p-mod srtf vf-f grs, frm pred gr sup clus cons wi calc-silic cnt, rr mtx sup, arg ip, tr gn glau, non-sl-mod calc	8540-8600 SS: off wh-v lt gy, com clr qtz grs & silic ip, occ lt br o stn, p-mod srtf vf-f grs, frm pred gr sup clus cons wi calc-silic cnt, rr mtx sup, arg ip, tr gn glau, non-sl-mod calc	8600-8660 SS: off wh-v lt gy, com clr qtz grs & silic ip, occ lt br o stn, p-mod srtf vf-f grs, frm pred gr sup clus cons wi calc-silic cnt, rr mtx sup, arg ip, tr gn glau, non-sl-mod calc	8660-8720 SS: pred lt gy-gy cls, of ip, mod srtf lt-u f sb ang-sb rd-rd sc, pred hd-sli frn gr sup sb rd-rd clus c gn glau, tr vf pyr, non-sl calc
7800	7800	7800	7800





MD: 8,712'
TVD: 7,177.63'
Inclination: 90.6°
Azimuth: 274.23°
VS: 1,441.66'

WOB: 31Klbs
Rotary: 65RPM
Strokes: 240SPM
Pump Rate: 689GPM

MD: 8,807'
TVD: 7,175.99'
Inclination: 91.38°
Azimuth: 274.09°
VS: 1,536.63'

MD: 8,902'
TVD: 7,175.18'
Inclination: 89.6°
Azimuth: 273.62°
VS: 1,631.61'

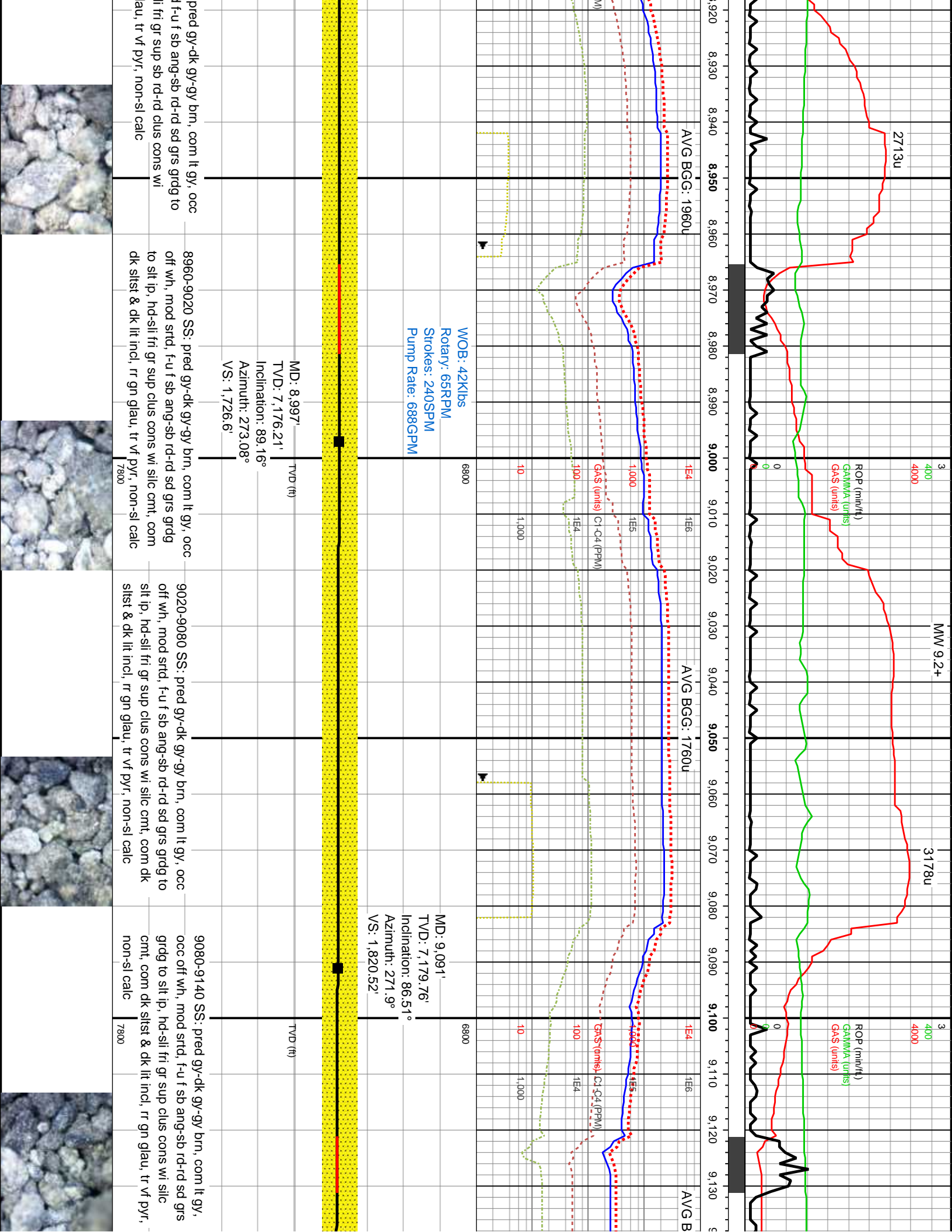
8720-8780 SS: off wh-it gy-gy cls, occ gy brn lamn & strg ip, mod srted, f-u f sb ang-sb rd-rd sd grs grdg down to silt ip, pred hd-sil fri gr sup sb rd-rd clus cons wi silc cnt, rr gn glau, tr vf pyr, non-sl calc

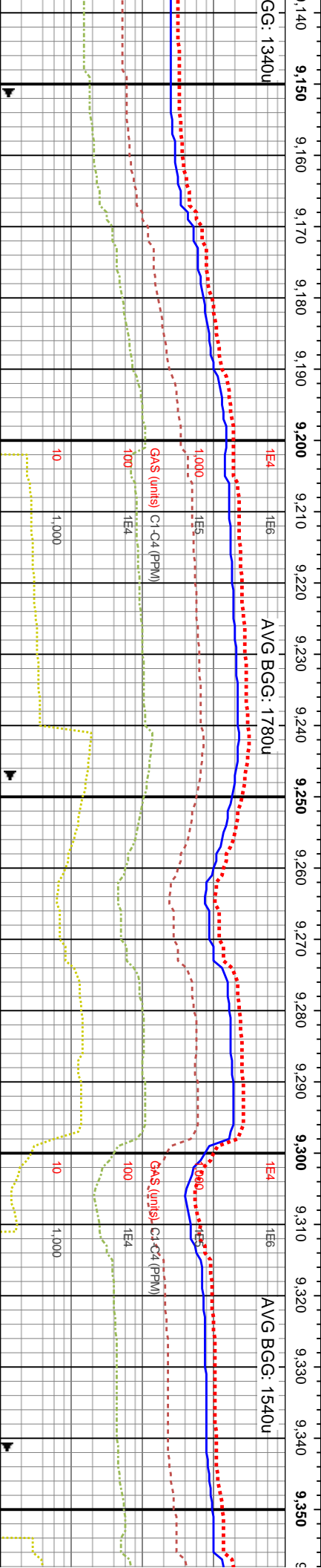
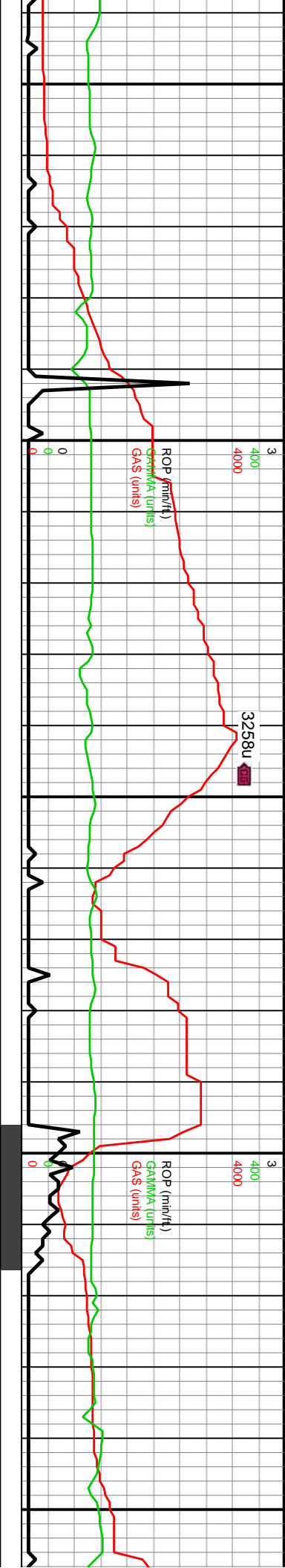
8780-8840 SS: pred lt gy-gy cls, off wh-gy brn lamn ip, mod srted f-u f sb ang-sb rd-rd sd grs grdg to silt ip, pred hd-sil fri gr sup sb rd-rd clus cons wi silc cnt, rr gn glau, tr vf pyr, non-sl calc

8840-8900 SS: pred lt gy-gy brn, occ off wh, occ gy brn lamn & strg, mod srted, f-u f sb ang-sb rd-rd sd grs grdg down to silt ip, pred hd-sil fri gr sup sb rd-rd clus cons wi silc cnt, rr gn glau, tr vf pyr, non-sl calc

8900-8960 SS: off wh, mod srted silt ip, pred hd-silic cnt, rr gn gl







WOB: 42Klbs
Rotary: 66RPM
Strokes: 240SPM
Pump Rate: 690GPM

MD: 9,281'
TVD: 7,192.81'
Inclination: 87.07°
Azimuth: 271.34°
VS: 2,009.97'

MD: 9,187'
TVD: 7,186.59'
Inclination: 85.33°
Azimuth: 270.89°
VS: 1,916.23'

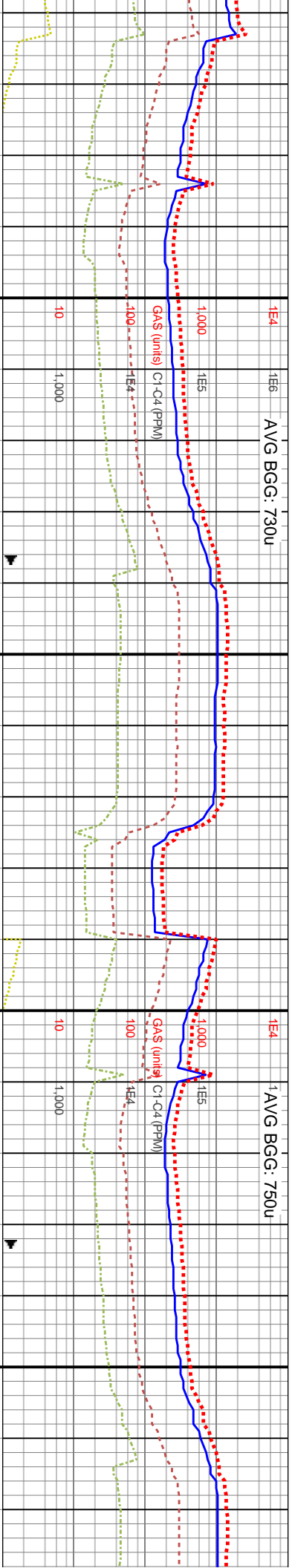
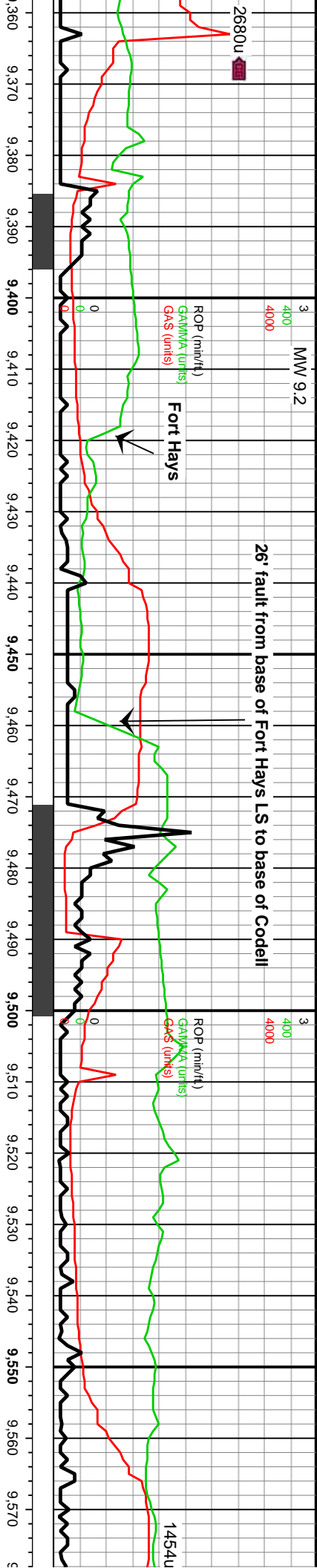
9140-9200 SS: pred gy-dk gy-gy brn, com lt gy, occ off wh, mod strd, f-u f sb ang-sb rd-rd sd grs grdg to slt ip, hd-slt fri gr sup clus cons wi silc cnt, incr uncons sd, com dk slst & dk lit incl, rr gn glau, tr vf pyr, non-sl calc

9200-9260 SS: gy-dk gy-gy brn, lt gy-off wh ip, mod strd, f-u f sb ang-sb rd-rd sd grs grdg to slt ip, hd-slt fri gr sup clus cons wi silc cnt, uncons sd ip, com dk slst & dk lit incl, rr gn glau, tr vf pyr, non-sl calc

9260-9320 SS: gy-dk gy-gy brn, lt gy-off wh ip, mod strd, f-u f sb ang-sb rd-rd sd grs grdg to slt ip, hd-slt fri gr sup clus cons wi silc cnt, uncons sd ip, com dk slst & dk lit incl, rr gn glau, tr vf pyr, non-sl calc

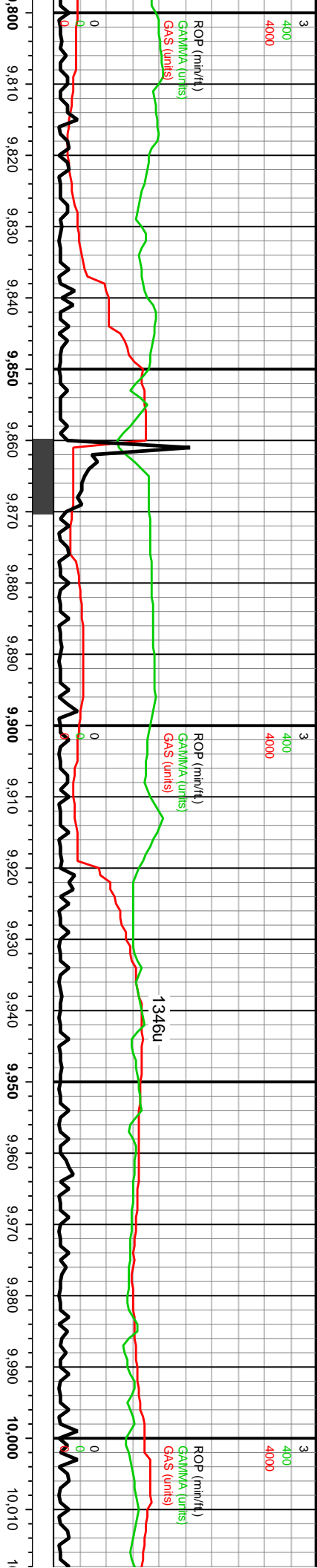
9320-9380 SS: gy-dk gy-gy brn, lt gy-off wh ip, mod strd, f-u f sb ang-sb rd-rd sd grs grdg to slt ip, hd-slt fri gr sup clus cons wi silc cnt, uncons sd ip, com dk slst & dk lit incl, rr gn glau, tr vf pyr, non-sl calc





WOB: 42Klbs Rotary: 65RPM Strokes: 240SPM Pump Rate: 689GPM		6800	MD: 9,473' TVD: 7,198.5' Inclination: 90.77° Azimuth: 272.64° VS: 2,201.8'		6800	MD: 9,568' TVD: 7,196.13' Inclination: 92.09° Azimuth: 271.51° VS: 2,296.76'	
MD: 9,377' TVD: 7,197.2' Inclination: 87.68° Azimuth: 271.81° VS: 2,105.84'		TVD (ft)	9440-9500 SLTST (80%): pred dk gy, occ tn-off wh-it gy, v frm ang-sb pily, brit cigs, silty tex, sl arg thru, mod arg ip, silc thru, mod calc, LS (20%): pred off wh-it gy, lt bl gy ip, pred micxn, occ crpxln, mudst-pkst, wkst-pkst, wxy lstr, mudst-pkst, wkst-pkst, wxy lstr, sm-chky tex rr f-uf pyr, mod hi calc		TVD (ft)	9500-9560 SLTST: pred dk gy, occ tn-off wh-it gy, v frm ang-sb pily, brit cigs, silty tex, sl arg thru, mod arg ip, silc thru, mod calc	
9380-9440 LS: pred off wh-it gy, lt bl gy ip, pred micxn, occ crpxln, mudst-pkst, wkst-pkst, wxy lstr, sm-chky tex rr f-uf pyr, mod hi calc		7800			7800	9560-9620 SLTST: pred dk gy, occ tn-off wh-it gy, v frm ang-sb pily, brit cigs, silty tex, sl arg thru, mod arg ip, silc thru, mod calc	

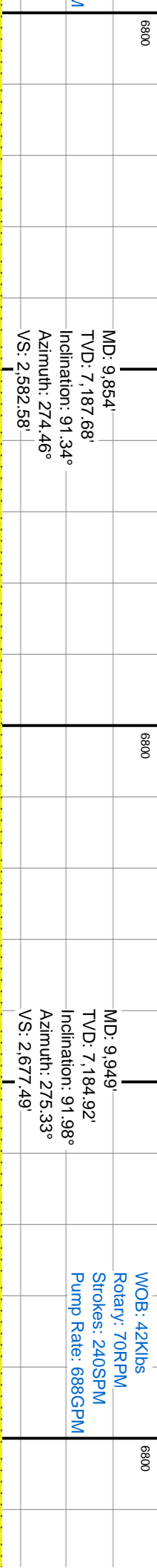
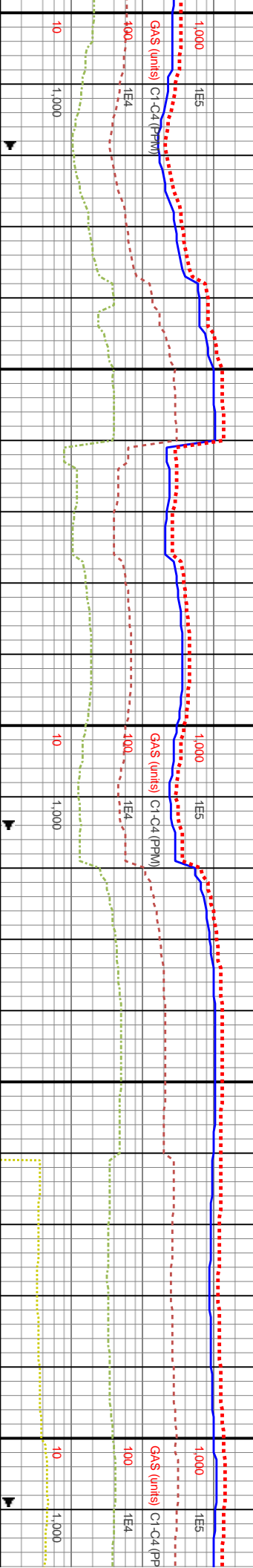




AVG BGG: 300u

AVG BGG: 550u

AVG BGG: 1210u



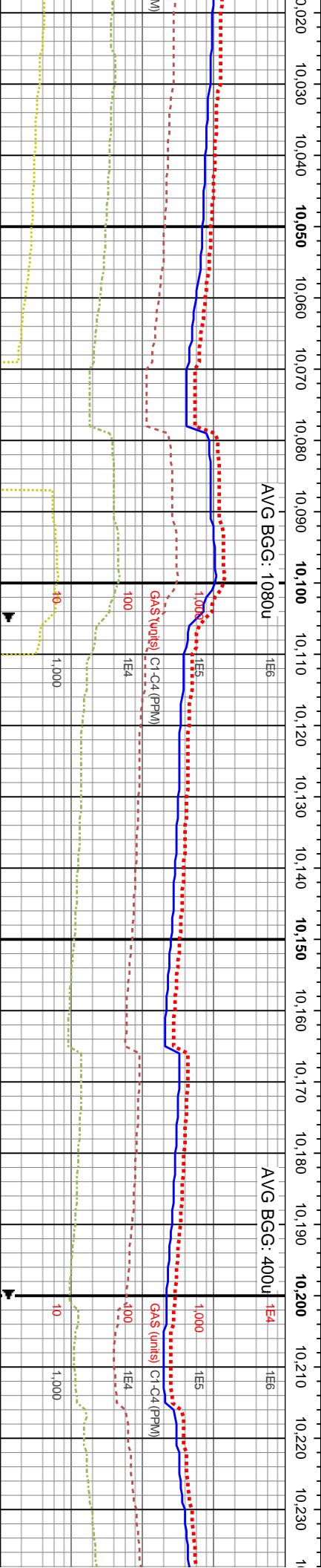
MD: 9,854'
TVD: 7,187.68'
Inclination: 91.34°
Azimuth: 274.46°
VS: 2,582.58'

MD: 9,949'
TVD: 7,184.92'
Inclination: 91.98°
Azimuth: 275.33°
VS: 2,677.49'

WOB: 42Klbs
Rotary: 70RPM
Strokes: 240SPM
Pump Rate: 688GPM

9800-9860 SS: off wh-v lt gy, rr dk gy-dk gy brn grdg to tr slst ip, p-mod strd vf-f grs, frm pred gr sup clus cons wi calc-silic cnt, rr mtz sup, arg ip, tr gn glau, non-sl-mod calc		9860-9920 SS: pred off wh-v lt gy, rr dk gy-dk gy brn, p-mod strd vf-f grs, frm pred gr sup cls cons wi silic cnt, com dolc & arg ip, rr mtz sup clus, tr gn glau, tr vf pyr, non-sl-mod calc		9920-9980 SS: pred off wh-v lt gy, rr dk gy-dk gy brn, p-mod strd vf-f grs, frm pred gr sup cls cons wi silic cnt, com dolc & arg ip, rr mtz sup clus, tr gn glau, tr vf pyr, non-sl-mod calc		9980-10040 SS: off wh-v lt gy, rr dk gy-dk gy brn, p-mod strd vf-f grs, frm pred gr sup clus cons wi calc-silic cnt, rr mtz sup, arg ip, tr gn glau, non-sl-mod calc	
TVD (ft)		TVD (ft)		TVD (ft)		TVD (ft)	
7800		7800		7800		7800	





MD: 10,045'
TVD: 7,182.7'
Inclination: 90.67°
Azimuth: 274.15°
VS: 2,773.42'

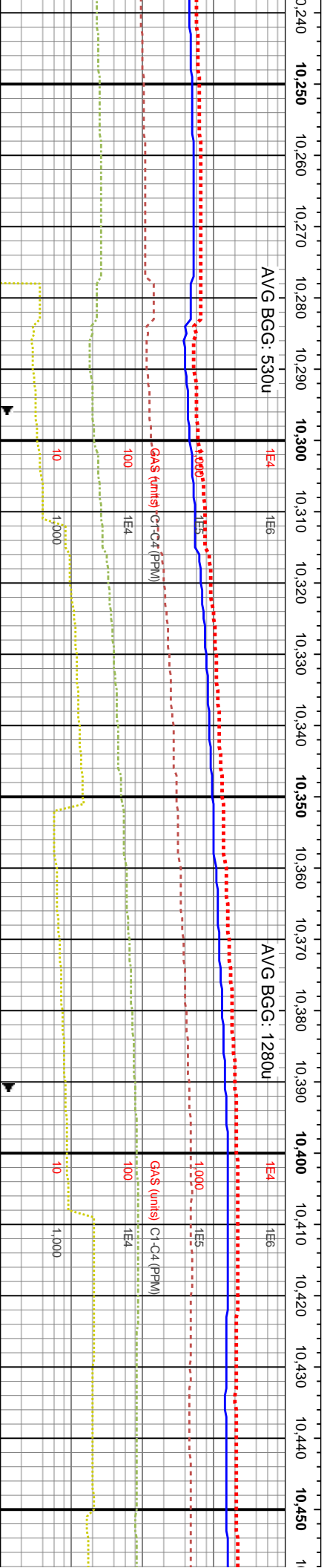
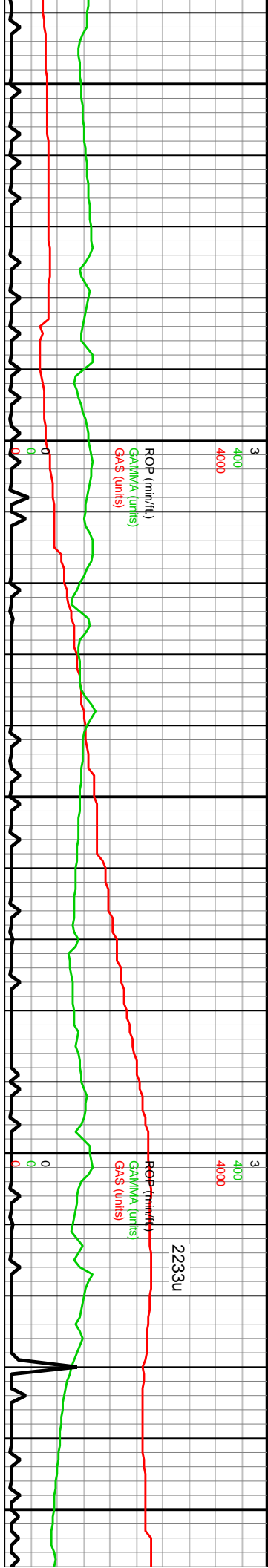
MD: 10,140'
TVD: 7,182.03'
Inclination: 90.13°
Azimuth: 274.2°
VS: 2,868.4'

WOB: 19Klbs
Rotary: 70RPM
Strokes: 240SPM
Pump Rate: 689GPM

MD: 10,230'
TVD: 7,182.03'
Inclination: 90.13°
Azimuth: 274.2°
VS: 2,868.4'

10040-10100 SS: pred lt gy brn-lt brn, com v lt gy, occ off wh, rr dk gy-dk gy brn, p-mod srtf vf-f grs, frm pred gr sup cls cons wi silic cnt, com dolc & arg ip, rr mtx sup clus, tr gn glau, tr vf pyr, non-sl-mod calc	10100-10160 SS: lt gy brn-lt brn, com v lt gy, occ off wh, rr dk gy-dk gy brn grdg to tr slst ip, p-mod srtf vf-f grs, frm pred gr sup cls cons wi calc-silic cnt, rr mtx sup, arg ip, tr gn glau, non-sl-mod calc	10160-10220 SS: lt gy brn-lt brn, com v lt gy, occ off wh, rr dk gy-dk gy brn grdg to tr slst ip, p-mod srtf vf-f grs, frm pred gr sup cls cons wi calc-silic cnt, rr mtx sup, arg ip, tr gn glau, non-sl-mod calc	10220-10280 S: occ off wh, rr dk slst, p-mod srtf silic cnt, com dc glau, tr vf pyr, n
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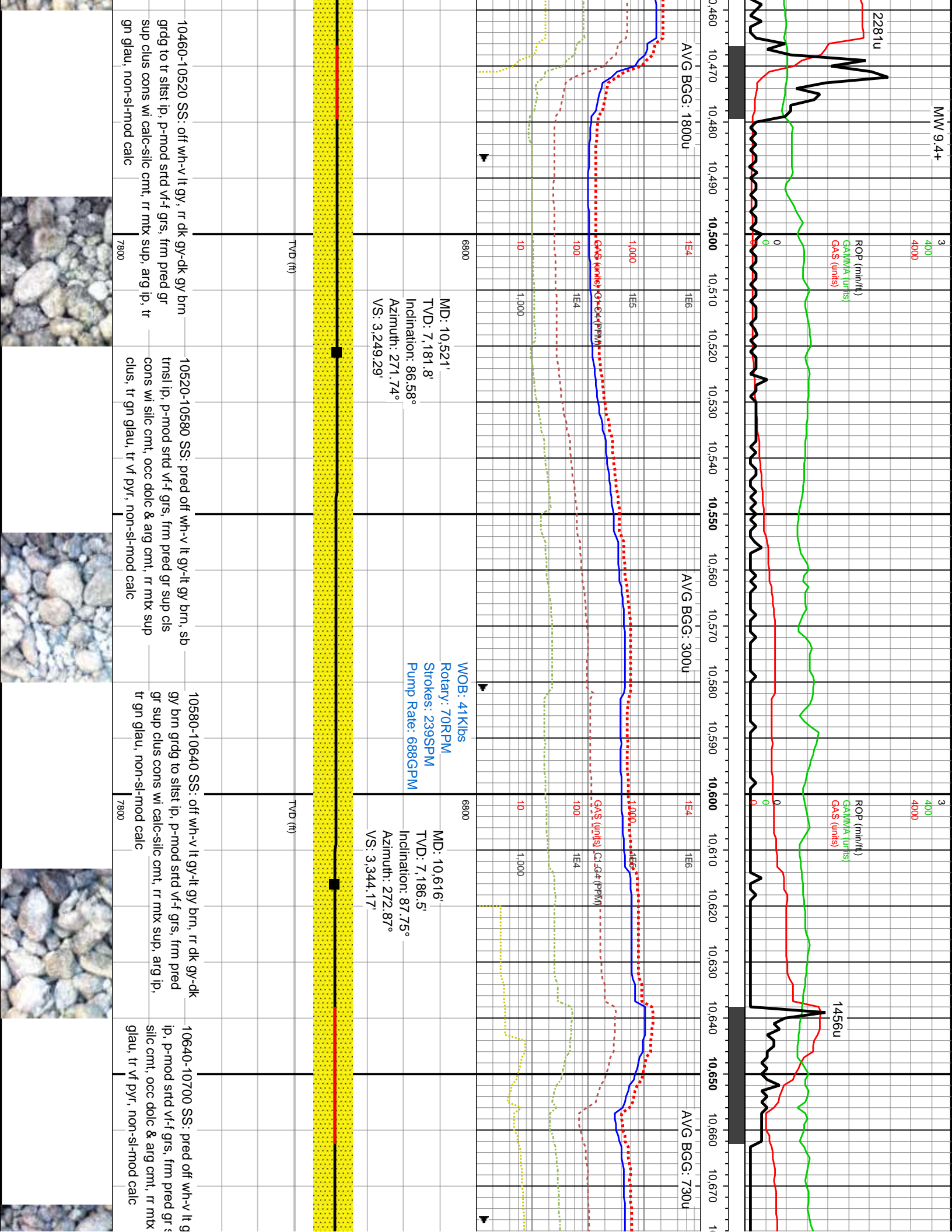


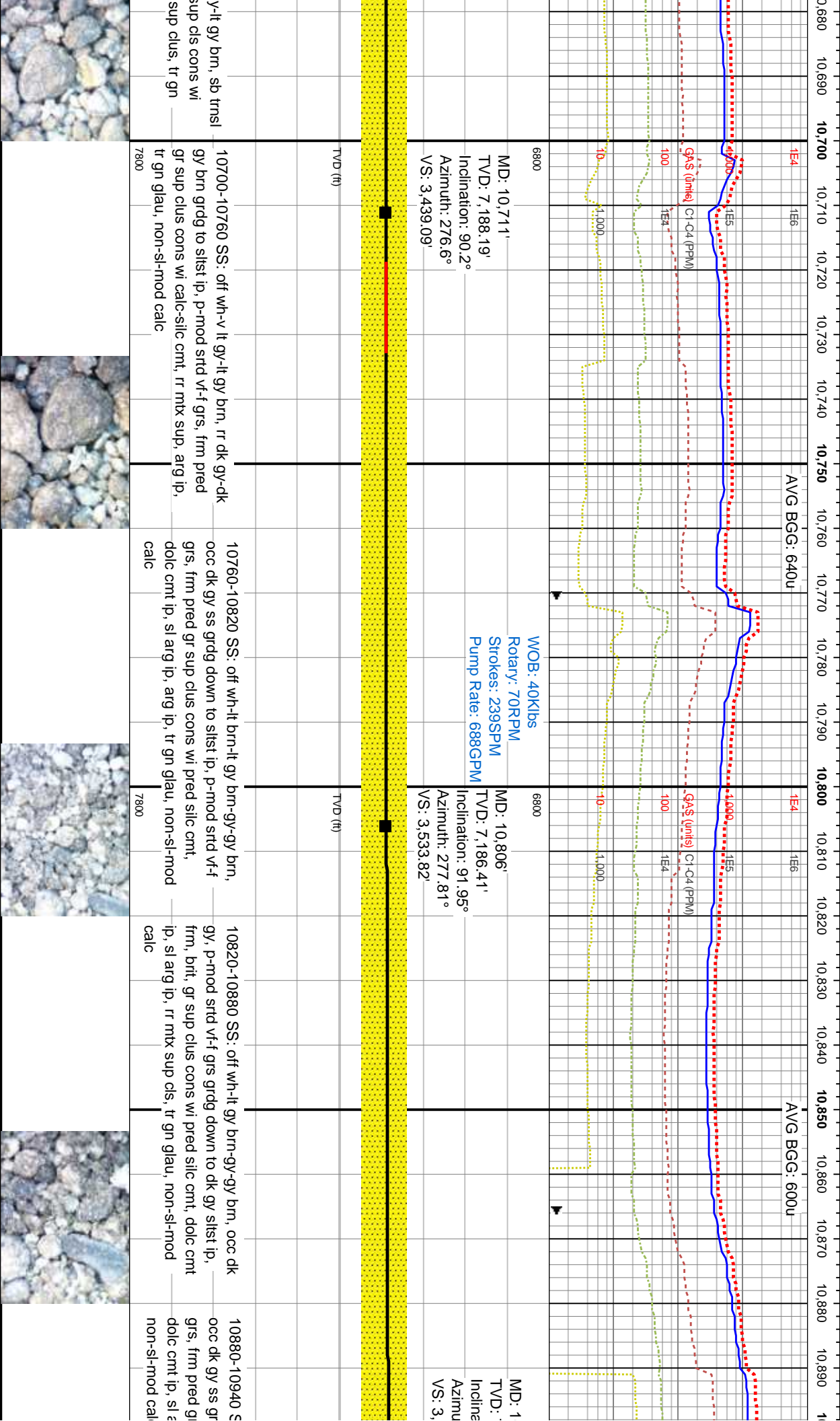


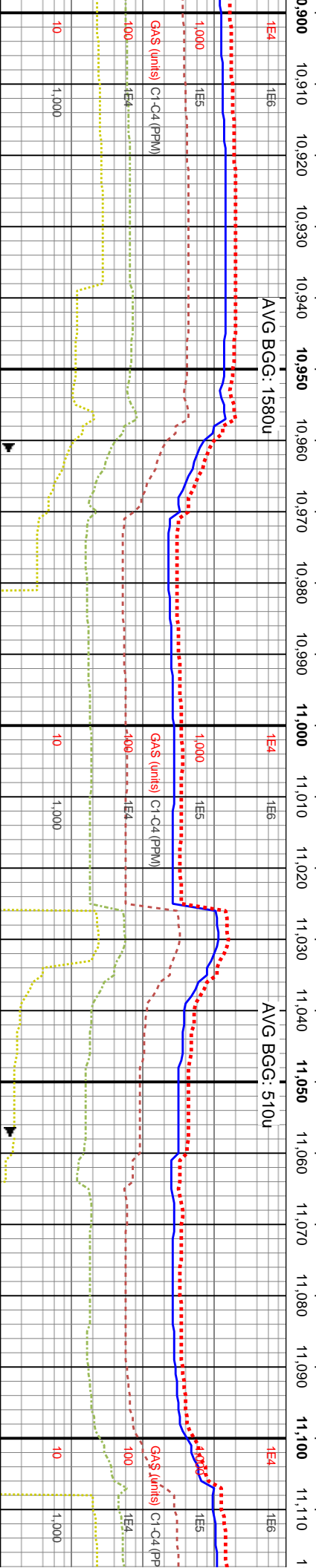
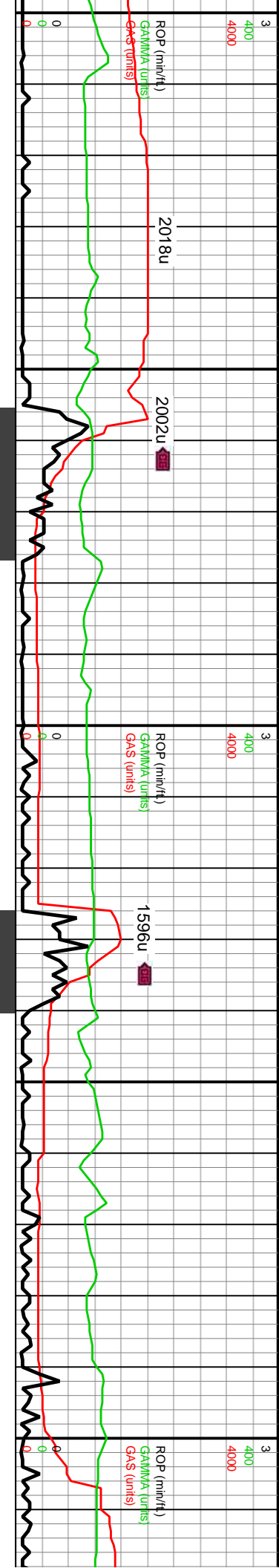
6'	6800	MD: 10,331'	VS: 3,059.37'
1.61'		TVD: 7,180.42'	
90.37°		Inclination: 91.08°	
74.02°		Azimuth: 273.75°	
39'			

10280-10340 SS: pred off wh-v lt gy, rr dk gy-dk gy brn, p-mod strd vf-f grs, frm pred gr sup cls cons wi silt cmt, com dolc & arg ip, rr mtx sup clus, tr gn glau, tr vf pyr, non-sl-mod calc	7800	10340-10400 SS: off wh-v lt gy, rr dk gy-dk gy brn, p-mod strd vf-f grs, frm pred gr sup cls cons wi calc-silt cmt, rr mtx sup, arg ip, tr gn glau, non-sl-mod calc	7800
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WOB: 39Klbs
Rotary: 71RPM
Strokes: 240SPM
Pump Rate: 689GPM

MD: 10.997'
TVD: 7,180.29'
Inclination: 90.03°
Azimuth: 273.69°
VS: 3,724.38'

MD: 11.092'
TVD: 7,180.71'
Inclination: 89.46°
Azimuth: 273.04°
VS: 3,819.38'

SS: off wh-it brn-it gy brn-gy brn, gr sup clus cons wi pred silic cnt, arg ip, arg ip, tr gn glau,	10940-11000 SS: off wh-it gy brn-dk gy brn, occ dk gy grdg down to sltst, p-mod strd vf-f grs, frm, brit, gr sup clus cons wi pred silic cnt, dolc cnt ip, sl arg ip, rr mtx sup cls, tr gn glau, non-sl-mod calc	11000-11060 SS: off wh-it gy brn-dk gy brn, occ dk gy grdg down to sltst, p-mod strd vf-f grs, frm, brit, gr sup clus cons wi pred silic cnt, dolc cnt ip, sl arg ip, rr mtx sup cls, tr gn glau, non-sl-mod calc	11060-11120 SS: off wh-it gy brn-dk gy brn, occ dk gy grdg down to sltst, p-mod strd vf-f grs, frm, brit, gr sup clus cons wi pred silic cnt, dolc cnt ip, sl arg ip, rr mtx sup cls, tr gn glau, non-sl-mod calc, wi rr-occ SLTST: dk gy, ang-sb ang sb pily clgs, silic, non calc, tr vf pyr
7800	7800	7800	7800

