RESERVOIR GROUP

Scale: 5" / 100'
Measured Depth Log

Well Name	Flaschenriem 4		
Location	Section 3, Township 4N, Range 68W		
State	Colorado	**County**	Weld
Country	USA	**Rig Number**	Ensign 140
API Number	05-123-49818	**AFE #**	N/A
Geographic Region	Rockies	**Field**	Wattenberg
Spud Date	3/24/2019	**Drilling Completed**	5/9/2019
Surface Coordinates	1,893'FNL & 2,178'FWL, Sec:3 T:4N R:68W Latitude: 40.34401, Longitude: -104.99154		
Bottom Hole Coordinates	1,596'FSL & 460'FEL, Sec:35 T:5N R:68W Latitude: 40.35353 Longitude: -104.96611		
Ground Elevation	5,068'	**K.B. Elevation**	5,091'
Logged Interval	5,000' **To** 8,740'	**Total Depth**	15,741'
Formation	Codell		
Type of Drilling Fluid	Oil Based Mud		

Operator

Company Petro Operating Company, LLC

Address 9033 East Easter Place, Suite 112
Centennial, CO 80112-2105

Petro Operating Company, LLC

Geologist

Name Michael Domenick

Company Petro Operating Company, LLC

Address 9033 East Easter Place, Suite 112
Centennial, CO 80112-2105

Zone Color Coding

Oil	Condensate	Gas
Note	Core	Pressure
Error	Water	Seal

Petro Operating Company, LLC

Other

Loggers: Byron Pitulski/Greg Diefenbach

Services Provided: 2 Man Logging, Geosteering

Equipment: ML-585

Start Date 05/07/2019

Release Date: 05/09/2019

Job #: 2075RK1904

Rock Types

- UNKNOWN
- ANHYDRITE
- GYPSUM
- SALT
- SIDERITE or LIMONITE
- LIMESTONE
- DOLOMITE
- CHERT
- COAL
- MARLSTONE
- CHALK
- SHALE
- SHALE GRAY
- SHALE COLORED
- SILTSTONE
- SANDSTONE
- CONGLOMERATE
- BRECCIA
- TILL
- BENTONITE
- TUFF
- IGNEOUS
- METAMORPHIC
- CEMENT

Accessories

Fossils

- ALGAE
- AMPHIPORA
- BELEMNITE
- BIOCLASTIC
- BRACHOIPOD
- BRYOZOA
- CEPHALOPOD
- CORAL
- CRINOID
- ECHINOID
- FISH
- FORAMINIFERA
- FOSSIL
- GASTROPOD
- OOLITE
- OSTRACOD
- PELECYPOD
- PELLET
- PISOLITE
- PLANT REMAINS
- PLANT SPORES
- SCAPHOPOD
- STROMATOPOROID

Minerals

- ANHYDRITIC
- ARGILLACEOUS
- ARGILLITE GRAIN
- BENTONITE
- BITUMENOUS SUBSTANCE
- BRECCIA FRAGMENTS
- CALCAREOUS
- CARBONACEOUS FLAKES
- CHTDK
- CHTLT
- COAL - THIN BEDS
- DOLOMITIC
- FELDSPAR
- FERRUGINOUS PELLET
- FERRUGINOUS
- GLAUCONITE
- GYPSIFEROUS
- HEAVY MINERAL
- KAOLIN
- MARLSTONE
- MINERAL CRYSTALS
- NODULES
- PHOSPHATE PELLETS
- PYRITE
- SALT CAST
- SANDY
- SILICEOUS
- SILTY
- TUFFACEOUS

Stringer

- ANHYDRITE STRINGER
- BENTONITE STRINGER
- COAL STRINGER
- DOLOMITE STRINGER
- GYPSUM STRINGER
- LIMESTONE STRINGER
- MARLSTONE (CALC) STRG
- MARLSTONE (DOL) STRG
- SANDSTONE STRINGER
- SHALE STRINGER
- SILTSTONE STRINGER

Other Symbols

Oil Show

- DEAD
- EVEN
- QUESTIONABLE
- SPOTTED STAINING

Porosity

- ORGANIC
- PINPOINT
- VUGGY

Engineering

- BIT
- CASING
- CONNECTION (LEFT)

- FORMATION TOP
- GAS SHOW
- MN DEPTH
- NORMAL FAULT
- OIL SHOW
- OVERTURNED STRATA
- REVERSE FAULT
- SIDEWALL CORE (LEFT)

Rounding

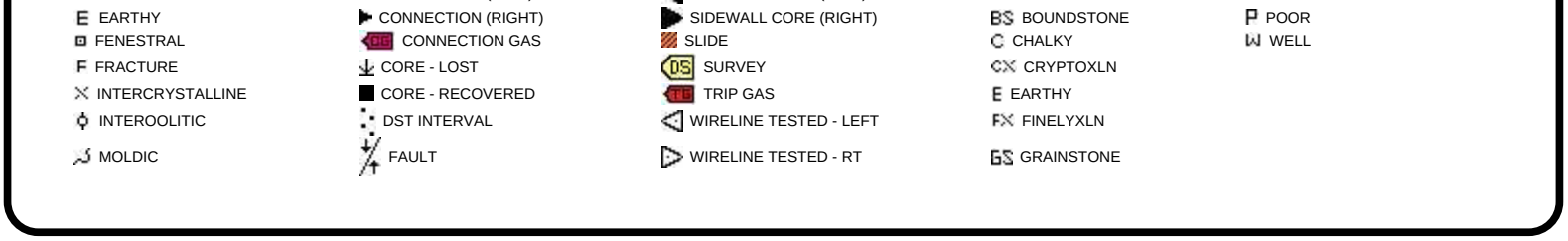
- ANGULAR
- ROUNDED
- SUBANG
- SUBRND

Textures

- LITHOGRAPHIC
- MICROXLN
- MUDSTONE
- PACKSTONE
- WACKESTONE

Sorting

- MODERATE


E EARTHY
FENESTRAL
F FRACTURE
INTERCRYSTALLINE
INTEROOLITIC
MOLDIC
CONNECTION (RIGHT)
CONNECTION GAS
CORE - LOST
CORE - RECOVERED
DST INTERVAL
FAULT
SIDEWALL CORE (RIGHT)
SLIDE
SURVEY
TRIP GAS
WIRELINE TESTED - LEFT
WIRELINE TESTED - RT
BS BOUNDSTONE
C CHALKY
CX CRYPTOXLN
E EARTHY
FX FINELYXLN
GS GRAINSTONE
P POOR
W WELL

Curves ROP GAMMA	Slide/Rotate	Depth Labels	Notes	% Lith	Total Gas GAS C1 C2 C3 C4 C5	Lithology Descriptions	Images
Petro Operating Co. **Flaschenriem 4** **9 5/8" Surface Casing @ 1,562'** **Spud Date: 03/24/2019** **Logging Began: 05/07/2019 02:35** **All Depths Correspond to Driller's Pipe Tally** 0 GROM (ft/API) 1000 0 ROP (ft/hr) 1000 0 GAMMA (API) 200		4,960 4,970 4,980 4,990 **5,000** 5,010 5,020 5,030 5,040 **5,050** 5,060 5,070 5,080 5,090 **5,100** 5,110 5,120 5,130 5,140	Bit #: 2 Type: ATD505T Size: 8.5 Depth In: 1,575' Depth Out: 15,741' Hours: 43.6 hrs Avg Ft/Hr: 324.9 '/hr Jets: 5x15 S/N: 5292246 **GD** MW IN: 9.3 VIS IN: 54 MW OUT: 9.4 VIS OUT: 53 MD: 5,079' INC: 32.36° AZM: 344.16° TVD: 4,563.25' VS: 341.59'		**Loggers** **BP - Byron Pitulski** **GD - Greg Diefenbach** **System Calibrated** **1% Methane = 100 units** **100% Methane = 10000 units** GAS (units) 1 10 100 1,000 1E4 C1-C5 (PPM) 200 2E3 2E4 2E5 2E6 **Troubleshoot PASON EDR** **No depth based data available 5,000' - 5,103' MD** GAS (units) 1 10 100 1,000 1E4 C1-C5 (PPM) 200 2E3 2E4 2E5 2E6	90% SS: v lt gy, occ wht or med gy, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, com free qtz; 10% SH: gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv, ply fiss, suc ip, wkly calc	

0 ROP (ft/hr) 1000
0 GAMMA (API) 200

5,150
5,160
5,170
5,180
5,190
5,200
5,210
5,220
5,230
5,240
5,250
5,260
5,270
5,280
5,290
5,300
5,310
5,320
5,330
5,340
5,350
5,360

MD: 5,173'
INC: 32.35°
AZM: 344.44°
TVD: 4,642.65'
VS: 350.73'

WOB: 22.6klbs
RPM: 100
SPM: 176
SPP: 2,819psi

MD: 5,268'
INC: 32.28°
AZM: 344.13°
TVD: 4,722.94'
VS: 359.93'

MW IN: 9.3
VIS IN: 55
MW OUT: 9.3
VIS OUT: 53

MD: 5,362'
INC: 32.3°
AZM: 343.62°
TVD: 4,802.4'
VS: 368.68'

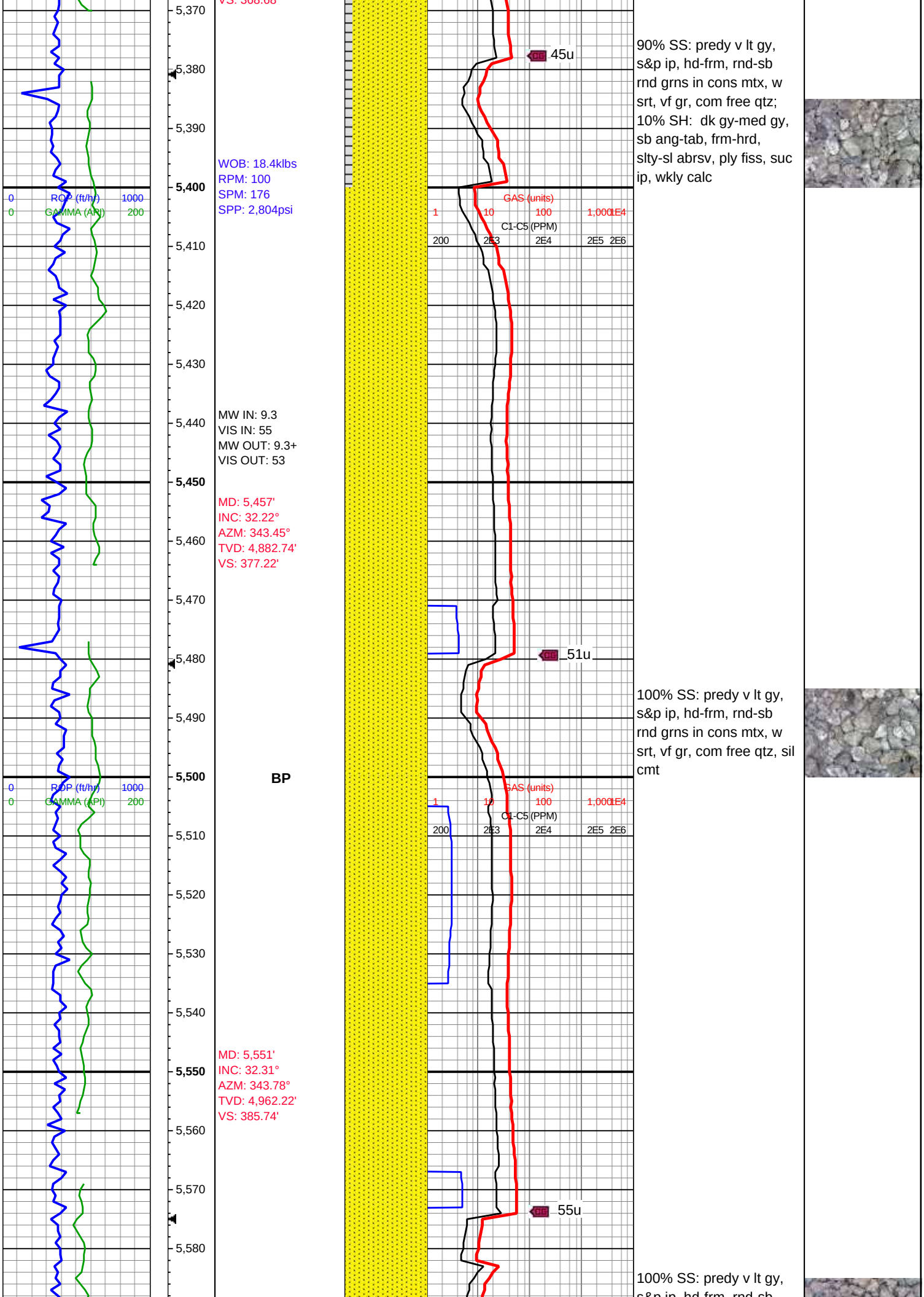
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6

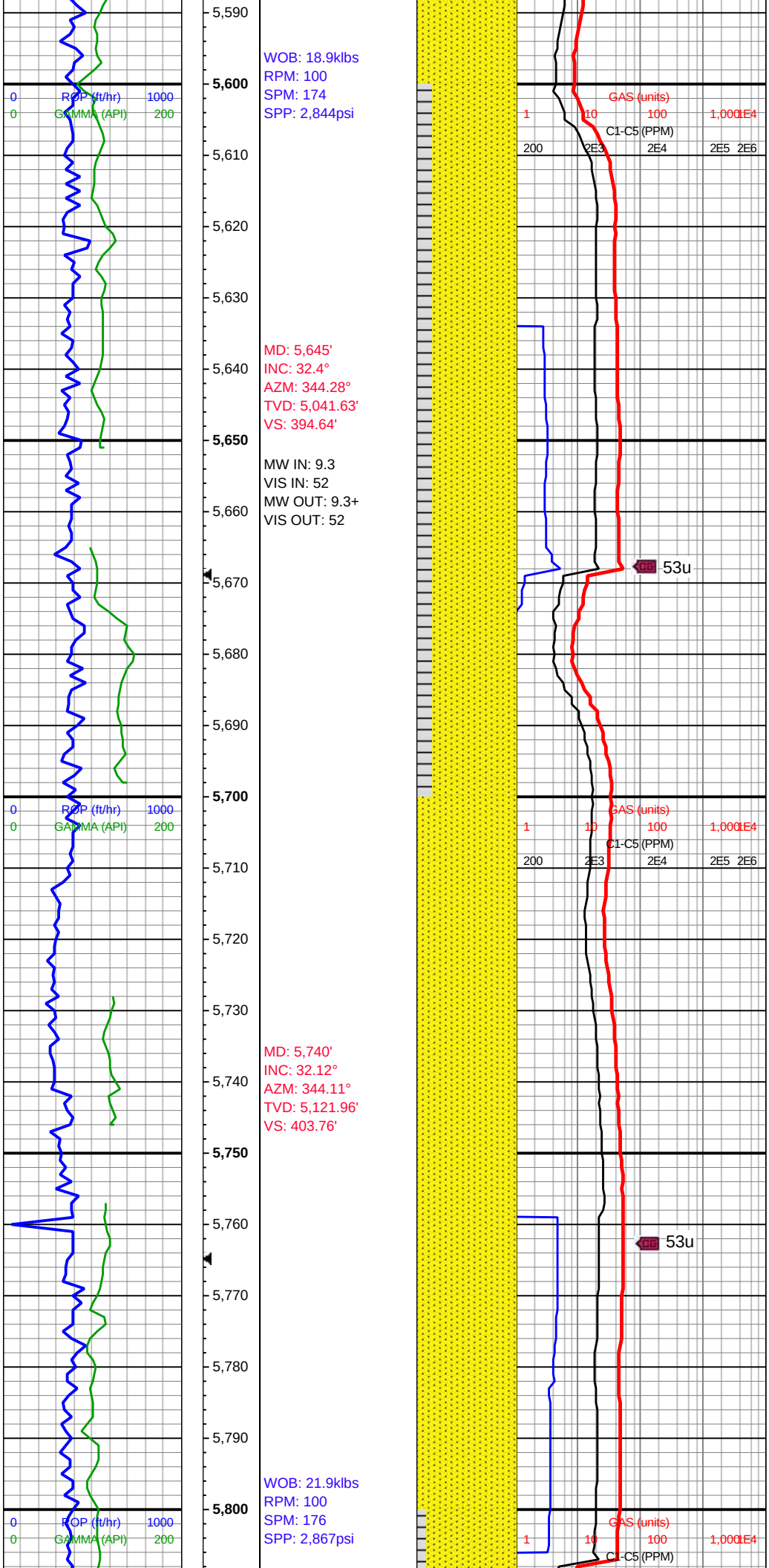
42u

50u

80% SS: v lt gy, occ wht or med gy, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, com free qtz; 20% SH: gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv, ply fiss, suc ip, wkly calc

85% SS: predy v lt gy, s&p ip, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, com free qtz; 15% SH: gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv, ply fiss, suc ip, wkly calc


VS: 368.68
5,370
5,380
5,390
WOB: 18.4klbs
RPM: 100
SPM: 176
SPP: 2,804psi
5,400
0 ROP (ft/hr) 1000
0 GAMMA (API) 200
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6
45u
90% SS: predy v lt gy, s&p ip, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, com free qtz; 10% SH: dk gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv, ply fiss, suc ip, wkly calc
5,410
5,420
5,430
MW IN: 9.3
VIS IN: 55
MW OUT: 9.3+
VIS OUT: 53
5,440
5,450
MD: 5,457'
INC: 32.22°
AZM: 343.45°
TVD: 4,882.74'
VS: 377.22'
5,460
5,470
5,480
51u
100% SS: predy v lt gy, s&p ip, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, com free qtz, sil cmt
5,490
5,500
BP
5,510
5,520
5,530
5,540
MD: 5,551'
INC: 32.31°
AZM: 343.78°
TVD: 4,962.22'
VS: 385.74'
5,550
5,560
5,570
55u
100% SS: predy v lt gy, s&p ip, hd-frm, rnd-sb
5,580



s&p ip, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, com free qtz, sil cmt

85% SS: v lt gy, wht-med gy, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, abnt intbd qtz; 15% SH: dk gy, sb ang-tab, frm-hrd, slty-sl abrsv, p-mod fiss, suc ip, grdg to SS, wk calc; com SLTST mtx

90% SS: v lt gy, wht-med gy, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, abnt intbd qtz; SLTST mtx

0 ROP (ft/hr) 1000
0 GAMMA (API) 200

5,810
5,820
5,830
5,840
5,850
5,860
5,870
5,880
5,890
5,900
5,910
5,920
5,930
5,940
5,950
5,960
5,970
5,980
5,990
6,000
6,010
6,020

MD: 5,834'
INC: 32.13°
AZM: 344.92°
TVD: 5,201.57'
VS: 413.02'

MW IN: 9.3
VIS IN: 53
MW OUT: 9.3
VIS OUT: 49

MD: 5,928'
INC: 31.75°
AZM: 346.19°
TVD: 5,281.34'
VS: 423.11'

WOB: 18klbs
RPM: 100
SPM: 174
SPP: 2,868psi

MD: 6,023'
INC: 31.8°
AZM: 348.55°

200 2E3 2E4 2E5 2E6

51u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6

34u

Start: Replace shaker screens

90% SS: v lt gy, gy-wht, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, abnt intbd qtz; 10% SH: gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv, p-mod fiss, suc, com grdg to SS, mod calc

75% SS: v lt gy, wht-gy, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, abnt intbd qtz; 25% SH: gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv, p-mod fiss, suc, SS intbds, wk-mod calc; com SLTST mtx

TVD: 5,362.11'
VS: 434.81'

6,030
6,040
6,050
6,060
6,070
6,080
6,090
6,100
6,110
6,120
6,130
6,140
6,150
6,160
6,170
6,180
6,190
6,200
6,210
6,220
6,230
6,240

0 ROP (ft/hr) 1000
0 GAMMA (API) 200

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6

End:
Replace shaker screens

90% SS: v lt gy, occ wht or med gy, hd-frm, rnd-sb rnd grns in cons mtx, tr slt mtx, w srt, vf gr, abnt intbd qtz; 10% SLTY SH: gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv, p-mod fiss, suc ip, grdg to SS, wk-mod calc

45u

MD: 6,117'
INC: 32.48°
AZM: 350.57°
TVD: 5,441.7'
VS: 448.37'

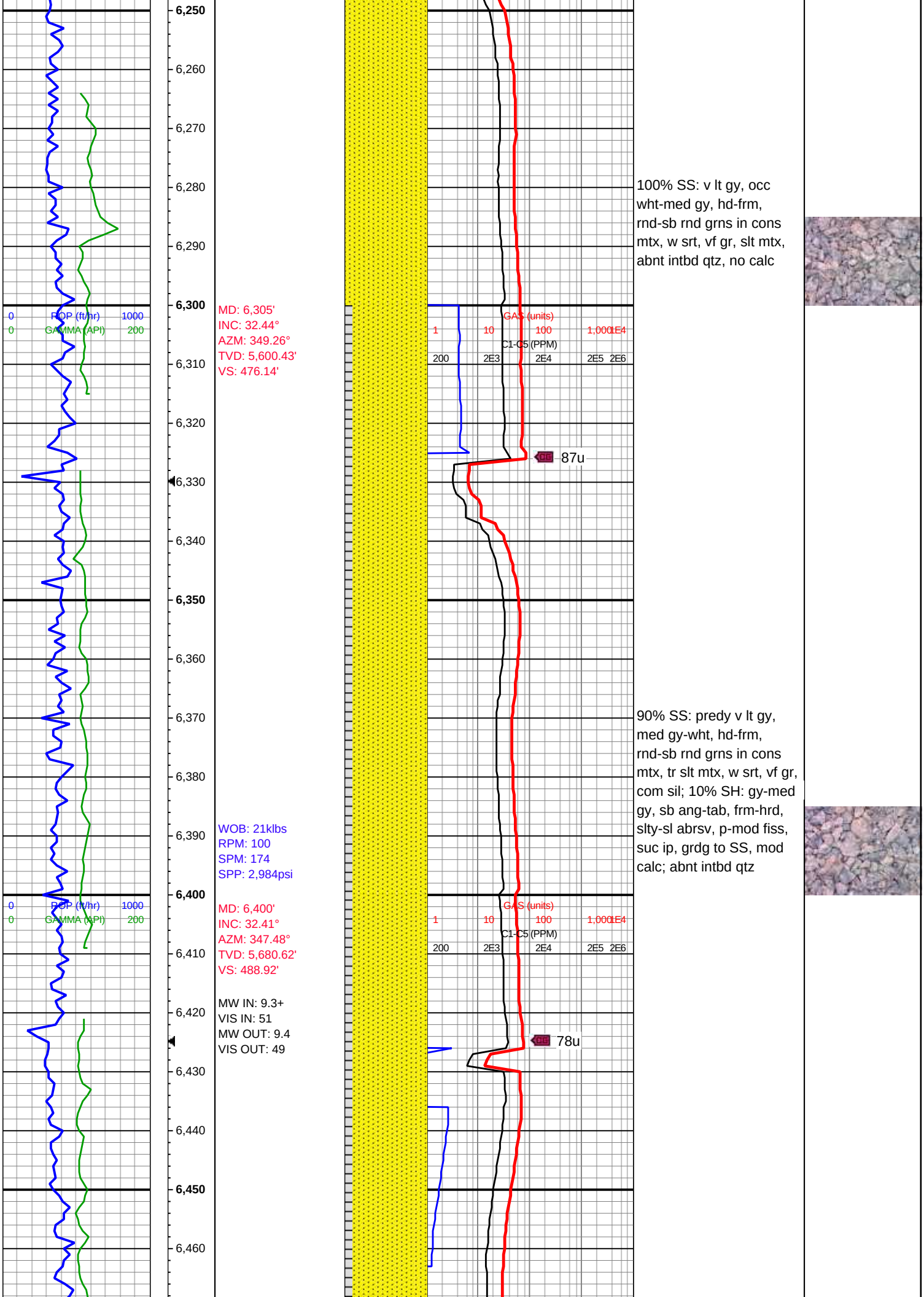
MW IN: 9.3+
VIS IN: 51
MW OUT: 9.4
VIS OUT: 49

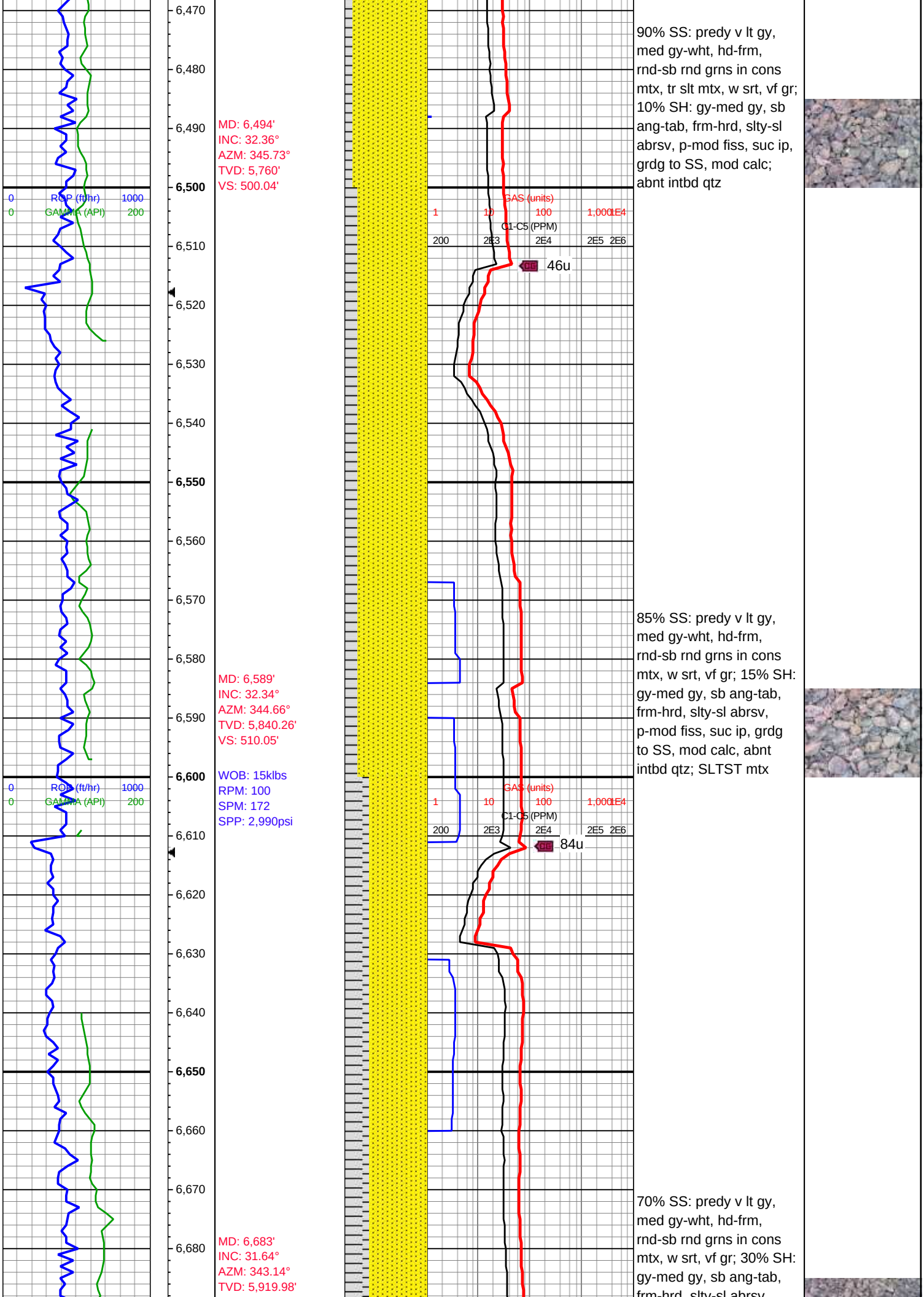
WOB: 14klbs
RPM: 100
SPM: 174
SPP: 2,781psi

MD: 6,211'
INC: 32.35°
AZM: 349.77°
TVD: 5,521.06'
VS: 462.54'

100% SLTY SS: v lt gy, occ wht-med gy, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, abnt intbd qtz

41u

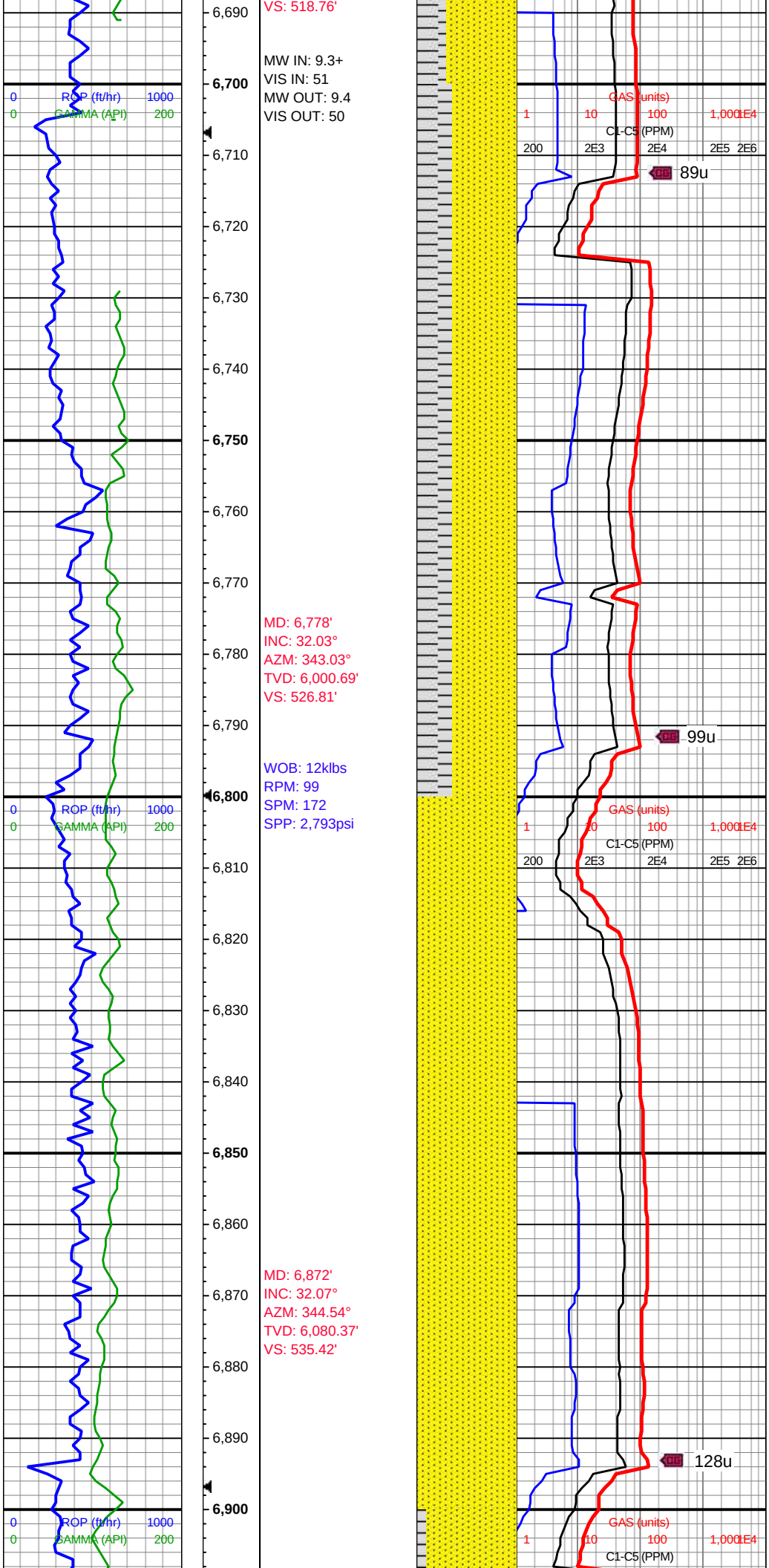

6,250
6,260
6,270
6,280
6,290
6,300
6,310
6,320
6,330
6,340
6,350
6,360
6,370
6,380
6,390
6,400
6,410
6,420
6,430
6,440
6,450
6,460
0 ROP (ft/hr) 1000
0 GAMMA (API) 200
MD: 6,305'
INC: 32.44°
AZM: 349.26°
TVD: 5,600.43'
VS: 476.14'
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6
87u
100% SS: v lt gy, occ wht-med gy, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr, slt mtx, abnt intbd qtz, no calc
WOB: 21klbs
RPM: 100
SPM: 174
SPP: 2,984psi
MD: 6,400'
INC: 32.41°
AZM: 347.48°
TVD: 5,680.62'
VS: 488.92'
MW IN: 9.3+
VIS IN: 51
MW OUT: 9.4
VIS OUT: 49
78u
90% SS: predy v lt gy, med gy-wht, hd-frm, rnd-sb rnd grns in cons mtx, tr slt mtx, w srt, vf gr, com sil; 10% SH: gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv, p-mod fiss, suc ip, grdg to SS, mod calc; abnt intbd qtz



90% SS: predy v lt gy, med gy-wht, hd-frm, rnd-sb rnd grns in cons mtx, tr slt mtx, w srt, vf gr; 10% SH: gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv, p-mod fiss, suc ip, grdg to SS, mod calc; abnt intbd qtz

85% SS: predy v lt gy, med gy-wht, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr; 15% SH: gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv, p-mod fiss, suc ip, grdg to SS, mod calc, abnt intbd qtz; SLTST mtx

70% SS: predy v lt gy, med gy-wht, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr; 30% SH: gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv,



VS: 518.76'

MW IN: 9.3+
VIS IN: 51
MW OUT: 9.4
VIS OUT: 50

MD: 6,778'
INC: 32.03°
AZM: 343.03°
TVD: 6,000.69'
VS: 526.81'

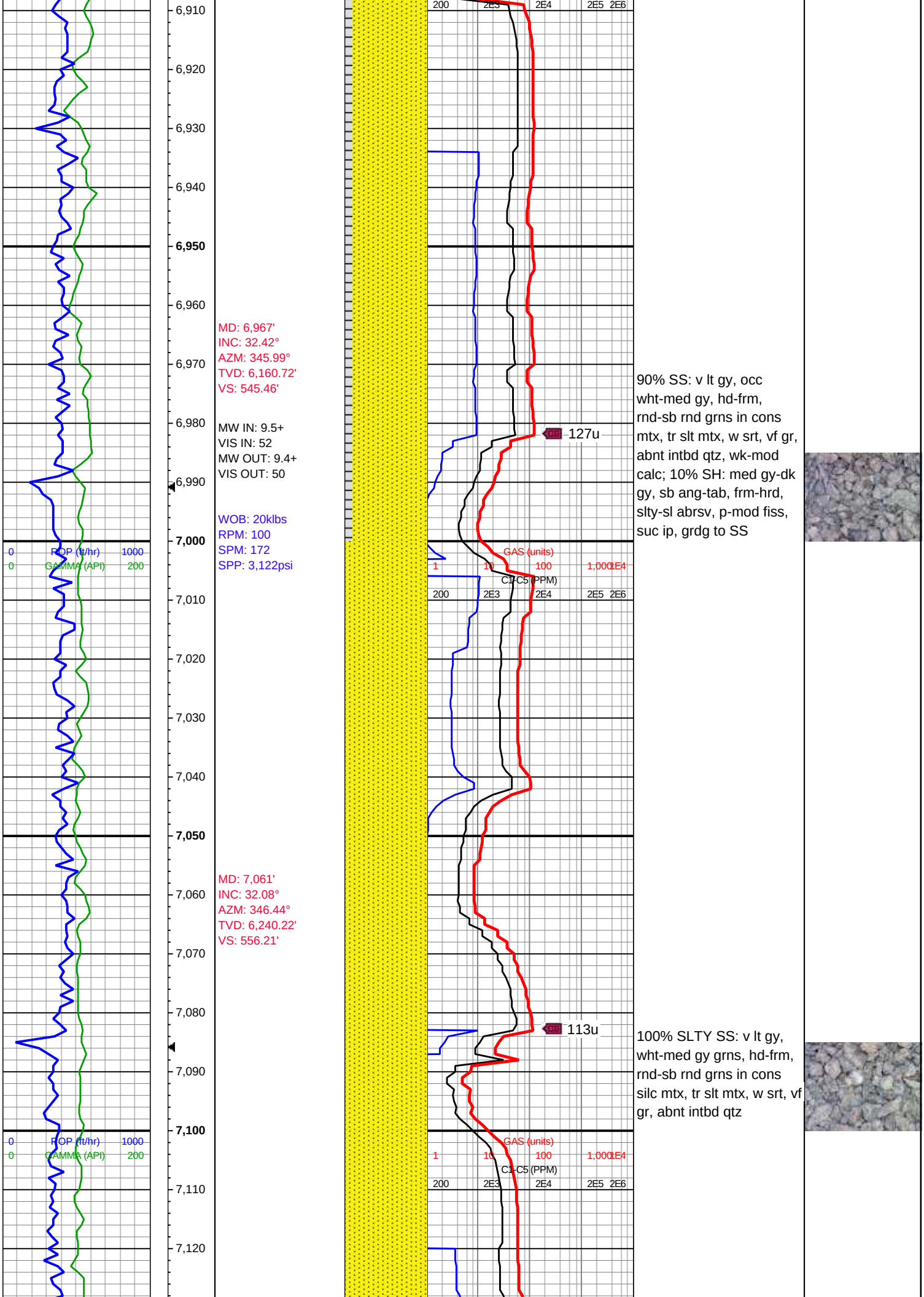
WOB: 12klbs
RPM: 99
SPM: 172
SPP: 2,793psi

MD: 6,872'
INC: 32.07°
AZM: 344.54°
TVD: 6,080.37'
VS: 535.42'

frm-hrd, slty-sl abrsv, p-mod fiss, suc ip, grdg to SS, mod calc; SLTST mtx

65% SS: predy v lt gy, med gy-wht, hd-frm, rnd-sb rnd grns in cons mtx, w srt, vf gr sil; 35% SH: gy-med gy, sb ang-tab, frm-hrd, slty-sl abrsv, p-mod fiss, suc ip, SS grdg, mod calc, abnt intbd qtz; SLTST mtx

100% SLTY SS: v lt gy, wht-med gy grns, hd-frm, rnd-sb rnd grns in cons silc mtx, tr slt mtx, w srt, vf gr, abnt intbd qtz


0 ROP (ft/hr) 1000
0 GAMMA (API) 200
6,910
6,920
6,930
6,940
6,950
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
MD: 6,967'
INC: 32.42°
AZM: 345.99°
TVD: 6,160.72'
VS: 545.46'
MW IN: 9.5+
VIS IN: 52
MW OUT: 9.4+
VIS OUT: 50
WOB: 20klbs
RPM: 100
SPM: 172
SPP: 3,122psi
MD: 7,061'
INC: 32.08°
AZM: 346.44°
TVD: 6,240.22'
VS: 556.21'
200 2E3 2E4 2E5 2E6
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
127u
113u
90% SS: v lt gy, occ wht-med gy, hd-frm, rnd-sb rnd grns in cons mtx, tr slt mtx, w srt, vf gr, abnt intbd qtz, wk-mod calc; 10% SH: med gy-dk gy, sb ang-tab, frm-hrd, slty-sl abrsv, p-mod fiss, suc ip, grdg to SS
100% SLTY SS: v lt gy, wht-med gy grns, hd-frm, rnd-sb rnd grns in cons silc mtx, tr slt mtx, w srt, vf gr, abnt intbd qtz

0 ROP (ft/hr) 1000
0 GAMMA (API) 200

7,130
7,140
7,150
7,160
7,170
7,180
7,190
7,200
7,210
7,220
7,230
7,240
7,250
7,260
7,270
7,280
7,290
7,300
7,310
7,320
7,330
7,340

MD: 7,155'
INC: 32.13°
AZM: 346.07°
TVD: 6,319.84'
VS: 566.95'

MW IN: 9.6
VIS IN: 51
MW OUT: 9.6+
VIS OUT: 49

WOB: 17klbs
RPM: 100
SPM: 174
SPP: 3,182psi

MD: 7,250'
INC: 31.53°
AZM: 345.3°
TVD: 6,400.55'
VS: 577.24'

KOP
7,320'MD / 6,460'TVD

MD: 7,344'
INC: 31.09°
AZM: 359.96°

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6

GB 114u

GB 109u

100% SS: v lt gy, occ wht-med gy, clr qtz, hd-frm, rnd-sb rnd grns in cons mtx, tr slt mtx, w srt, vf gr, wk-mod calc

85% SS: v lt gy, occ wht-med gy, hd-frm, rnd-sb rnd grns in cons mtx, tr slt mtx, w srt, vf gr, abnt intbd qtz, wk-mod calc; 15% SH: med gy-dk gy, sb ang-tab, frm-hrd, slty-sl abrsv, p-mod fiss, suc ip, grdg to slt

TVD: 6,480.98'
VS: 592.83'

MW IN: 9.6
VIS IN: 50
MW OUT: 9.6
VIS OUT: 49

WOB: 7klbs
RPM: 120
SPM: 201
SPP: 3,519psi

MD: 7,438'
INC: 30.57°
AZM: 21.48°
TVD: 6,561.95'
VS: 621.27'

MW IN: 9.5+
VIS IN: 52
MW OUT: 9.5+
VIS OUT: 53

MD: 7,533'
INC: 33.11°
AZM: 34.04°
TVD: 6,642.74'
VS: 661.69'

0 ROP (ft/hr) 1000
0 GAMMA (API) 200

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6

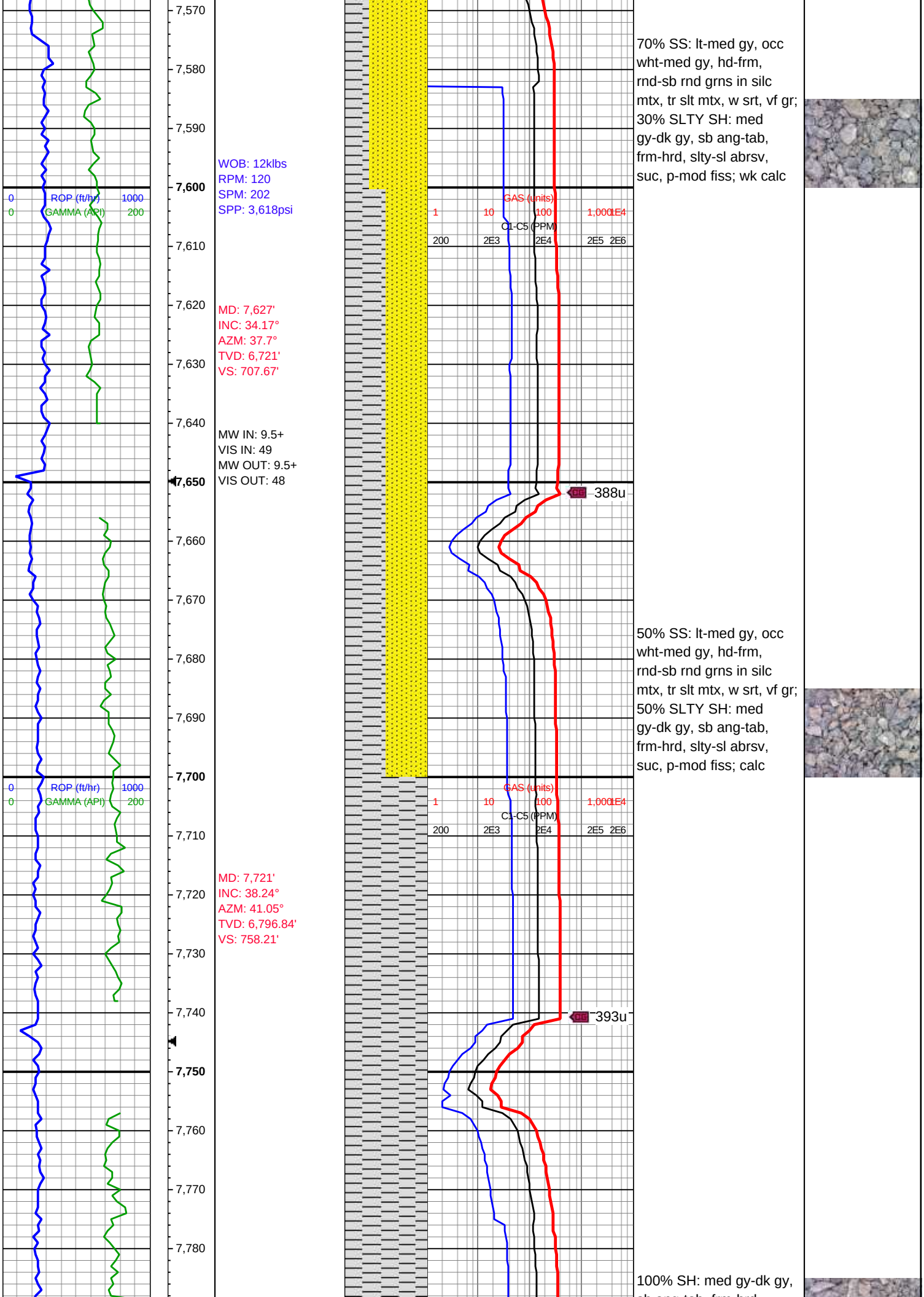
119u

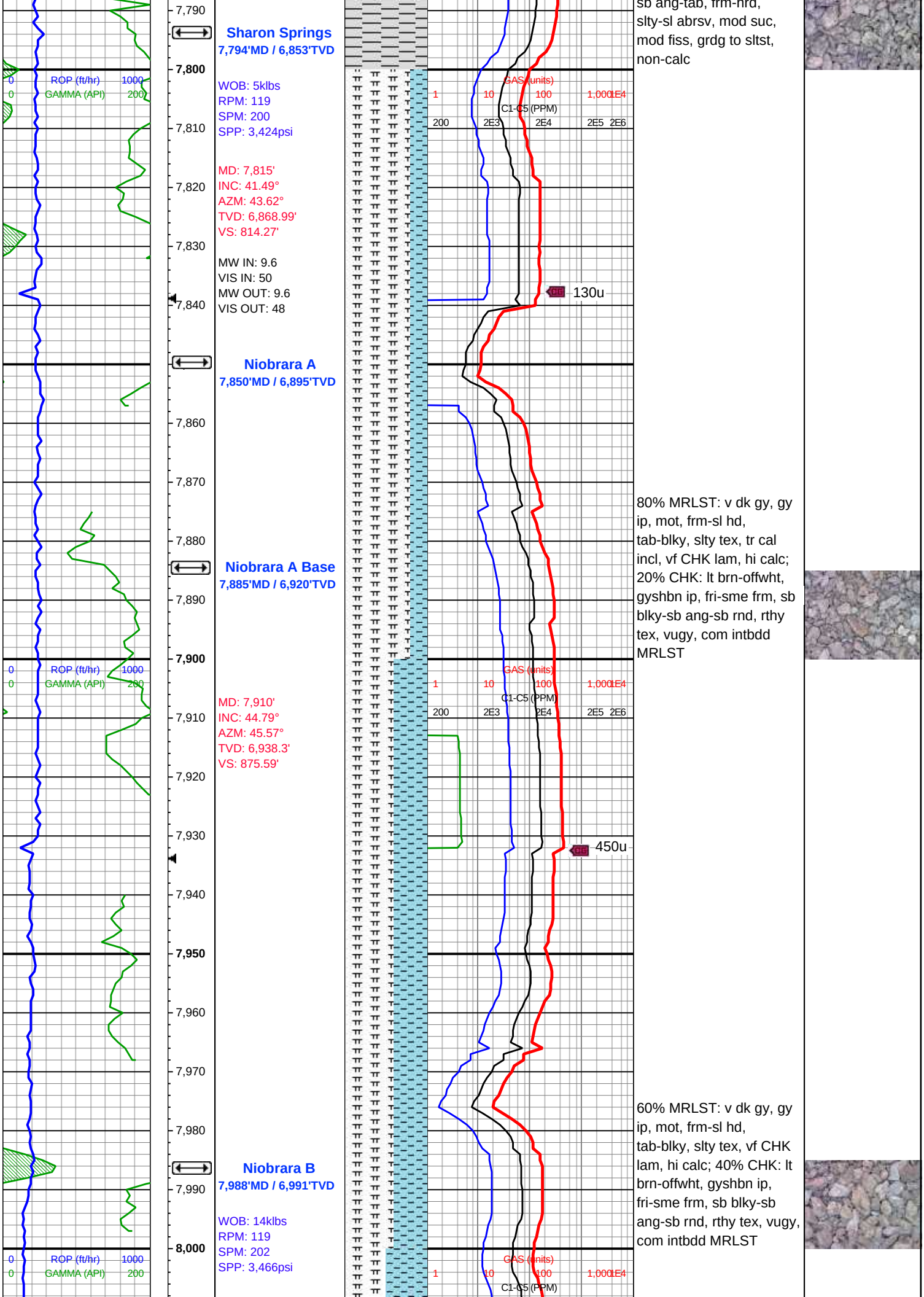
35u

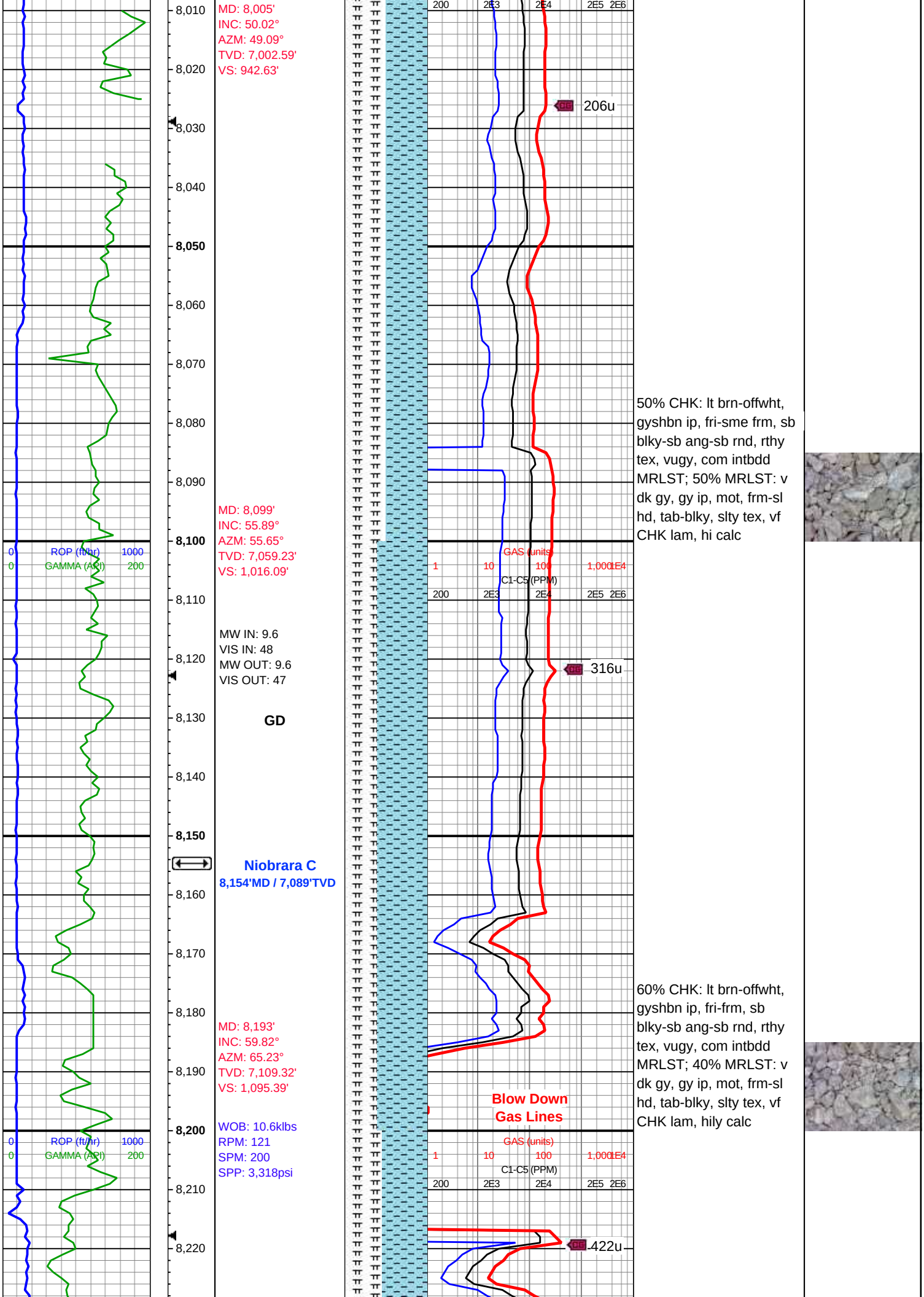
246u

90% SS: v lt gy, occ wht-med gy, hd-frm, rnd-sb rnd grns in cons mtx, tr slt mtx, w srt, vf gr, abnt intbd qtz, wk-mod calc; 10% SH: med gy-dk gy, sb ang-tab, frm-hrd, slty-sl abrsv, suc ip, grdg to slt, p-mod fiss

75% SS: lt-med gy, occ wht-med gy, hd-frm, rnd-sb rnd grns in silc mtx, tr slt mtx, w srt, vf gr, abnt intbd qtz, wk-mod calc; 25% SLTY SH: med gy-dk gy, sb ang-tab, frm-hrd, slty-sl abrsv, suc, p-mod fiss


0 ROP (ft/hr) 1000
0 GAMMA (API) 200
7,570
7,580
7,590
7,600
7,610
7,620
7,630
7,640
7,650
7,660
7,670
7,680
7,690
7,700
7,710
7,720
7,730
7,740
7,750
7,760
7,770
7,780
WOB: 12klbs
RPM: 120
SPM: 202
SPP: 3,618psi
MD: 7,627'
INC: 34.17°
AZM: 37.7°
TVD: 6,721'
VS: 707.67'
MW IN: 9.5+
VIS IN: 49
MW OUT: 9.5+
VIS OUT: 48
MD: 7,721'
INC: 38.24°
AZM: 41.05°
TVD: 6,796.84'
VS: 758.21'
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6
388u
393u
70% SS: lt-med gy, occ wht-med gy, hd-frm, rnd-sb rnd grns in silc mtx, tr slt mtx, w srt, vf gr; 30% SLTY SH: med gy-dk gy, sb ang-tab, frm-hrd, slty-sl abrsv, suc, p-mod fiss; wk calc
50% SS: lt-med gy, occ wht-med gy, hd-frm, rnd-sb rnd grns in silc mtx, tr slt mtx, w srt, vf gr; 50% SLTY SH: med gy-dk gy, sb ang-tab, frm-hrd, slty-sl abrsv, suc, p-mod fiss; calc
100% SH: med gy-dk gy,


7,790
Sharon Springs
7,794'MD / 6,853'TVD
7,800
0 ROP (ft/hr) 1000
0 GAMMA (API) 200
WOB: 5klbs
RPM: 119
SPM: 200
SPP: 3,424psi
7,810
MD: 7,815'
INC: 41.49°
AZM: 43.62°
TVD: 6,868.99'
VS: 814.27'
7,820
7,830
MW IN: 9.6
VIS IN: 50
MW OUT: 9.6
VIS OUT: 48
7,840
Niobrara A
7,850'MD / 6,895'TVD
7,860
7,870
7,880
Niobrara A Base
7,885'MD / 6,920'TVD
7,890
7,900
0 ROP (ft/hr) 1000
0 GAMMA (API) 200
MD: 7,910'
INC: 44.79°
AZM: 45.57°
TVD: 6,938.3'
VS: 875.59'
7,910
7,920
7,930
7,940
7,950
7,960
7,970
7,980
Niobrara B
7,988'MD / 6,991'TVD
7,990
WOB: 14klbs
RPM: 119
SPM: 202
SPP: 3,466psi
8,000
0 ROP (ft/hr) 1000
0 GAMMA (API) 200
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6
130u
450u
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
sb ang-tab, frm-hrd, slty-sl abrsv, mod suc, mod fiss, grdg to sltst, non-calc
80% MRLST: v dk gy, gy ip, mot, frm-sl hd, tab-blky, slty tex, tr cal incl, vf CHK lam, hi calc; 20% CHK: lt brn-offwht, gyshbn ip, fri-sme frm, sb blky-sb ang-sb rnd, rthy tex, vugy, com intbdd MRLST
60% MRLST: v dk gy, gy ip, mot, frm-sl hd, tab-blky, slty tex, vf CHK lam, hi calc; 40% CHK: lt brn-offwht, gyshbn ip, fri-sme frm, sb blky-sb ang-sb rnd, rthy tex, vugy, com intbdd MRLST


8,010
8,020
8,030
8,040
8,050
8,060
8,070
8,080
8,090
8,100
8,110
8,120
8,130
8,140
8,150
8,160
8,170
8,180
8,190
8,200
8,210
8,220
0 ROP (ft/hr) 1000
0 GAMMA (API) 200
MD: 8,005'
INC: 50.02°
AZM: 49.09°
TVD: 7,002.59'
VS: 942.63'
MD: 8,099'
INC: 55.89°
AZM: 55.65°
TVD: 7,059.23'
VS: 1,016.09'
MW IN: 9.6
VIS IN: 48
MW OUT: 9.6
VIS OUT: 47
GD
Niobrara C
8,154'MD / 7,089'TVD
MD: 8,193'
INC: 59.82°
AZM: 65.23°
TVD: 7,109.32'
VS: 1,095.39'
WOB: 10.6klbs
RPM: 121
SPM: 200
SPP: 3,318psi
200 2E3 2E4 2E5 2E6
206u
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
316u
Blow Down
Gas Lines
422u
50% CHK: lt brn-offwht, gyshbn ip, fri-sme frm, sb blky-sb ang-sb rnd, rthy tex, vugy, com intbdd MRLST; 50% MRLST: v dk gy, gy ip, mot, frm-sl hd, tab-blky, slty tex, vf CHK lam, hi calc
60% CHK: lt brn-offwht, gyshbn ip, fri-frm, sb blky-sb ang-sb rnd, rthy tex, vugy, com intbdd MRLST; 40% MRLST: v dk gy, gy ip, mot, frm-sl hd, tab-blky, slty tex, vf CHK lam, hily calc

MW IN: 9.6
VIS IN: 48
MW OUT: 9.6
VIS OUT: 47

MD: 8,286'
INC: 65.09°
AZM: 76.76°
TVD: 7,152.42'
VS: 1,176.95'

0 ROP (ft/hr) 1000
0 GAMMA (API) 200

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 5 2E6

480U

55% CHK: lt brn-offwht, gyshbn ip, fri-frm, sb blky-sb ang-sb rnd, rthy tex, vugy, com intbdd MRLST; 45% MRLST: v dk gy, gy ip, mot, frm-sl hd, tab-blky, slty tex, hily calc, vf CHK lam

Base Niobrara C
8,323'MD / 7,167'TVD

MW IN: 9.6
VIS IN: 47
MW OUT: 9.6
VIS OUT: 46

MD: 8,380'
INC: 69.76°
AZM: 82.3°
TVD: 7,188.52'
VS: 1,260.43'

WOB: 23klbs
RPM: 120
SPM: 202
SPP: 4,000psi

0 ROP (ft/hr) 1000
0 GAMMA (API) 200

GAS (units)
1 10 100 1,000
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6

328u

75% CHK: lt brn-offwht, gyshbn ip, fri-frm, sb blky-sb ang-sb rnd, rthy tex, vugy, com intbdd MRLST; 25% MRLST: v dk gy, gy ip, mot, frm-hd, tab-blky, slty tex, tr cal incl, vf CHK lam, hily calc

MW IN: 9.5+
VIS IN: 47

MW OUT: 9.5+
VIS OUT: 46

8,450
8,460
8,470
8,480
8,490
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

MD: 8,475'
INC: 75.06°
AZM: 85.32°
TVD: 7,217.23'
VS: 1,345.49'

0 ROP (ft/hr) 1000
0 GAMMA (API) 200

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6

600u

50% MRLST: v dk gy, gy ip, mot, frm-sl hd, tab-blky, slty tex, tr cal incl, vf CHK lam, hi calc; 50% LS: offwht to lt gry, dk gry ip, mas, occ slty-sdy, dolc ip

Ft Hayes
8,542'MD / 7,232'TVD

MD: 8,569'
INC: 79.92°
AZM: 88.49°
TVD: 7,237.59'
VS: 1,429.88'

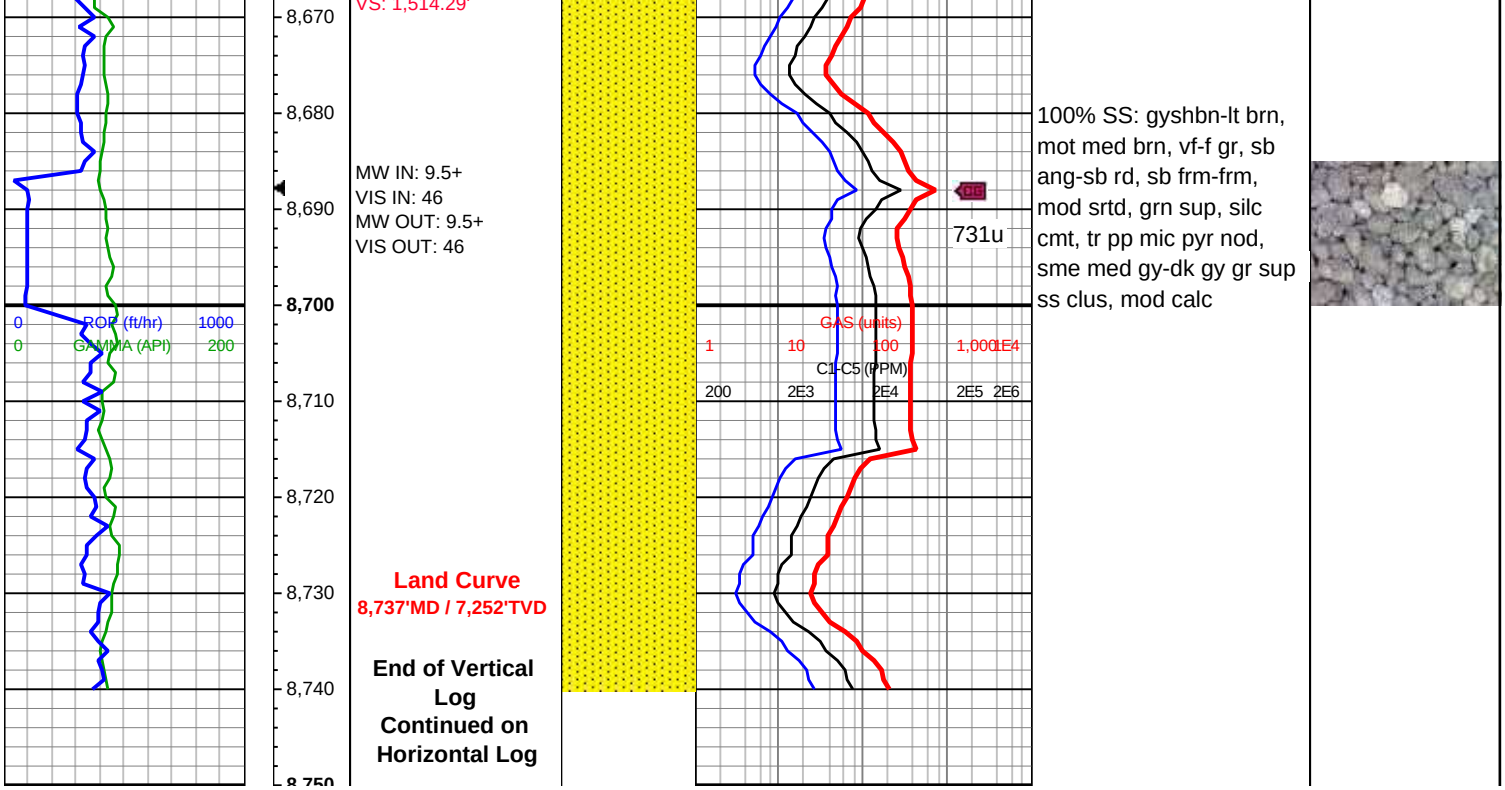
WOB: 28.9klbs
RPM: 120
SPM: 203
SPP: 3,330psi

459u

100% LS: offwht to lt gry, dk gry ip, mas, occ slty-sdy, dolc ip

Codell
8,624'MD / 7,244'TVD

MD: 8,663'
INC: 86.18°
AZM: 89.51°
TVD: 7,248.96'


VS: 1,514.29'
8,670
8,680
8,690
8,700
8,710
8,720
8,730
8,740
8,750
MW IN: 9.5+
VIS IN: 46
MW OUT: 9.5+
VIS OUT: 46
0 ROP (ft/hr) 1000
0 GAMMA (API) 200
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
200 2E3 2E4 2E5 2E6
731u
Land Curve
8,737'MD / 7,252'TVD
End of Vertical Log
Continued on Horizontal Log
100% SS: gyshbn-lt brn, mot med brn, vf-f gr, sb ang-sb rd, sb frm-frm, mod srtd, grn sup, silc cmt, tr pp mic pyr nod, sme med gy-dk gy gr sup ss clus, mod calc