RESERVOIR GROUP

Scale: 5" / 100'
Measured Depth Log

Well Name	Critter Creek 16-6203B		
Location	SWSW Sec 16 T11N R63W		
State	Colorado	**County**	Weld
Country	U.S.	**Rig Number**	Cade 24
API Number	05-123-47297	**AFE #**	20208D
Geographic Region	Rockies	**Field**	Hereford
Spud Date	9/4/2018	**Drilling Completed**	11/12/2018
Surface Coordinates	Latitude: 40.916658, Longitude: -104.444614 SWSW Sec 16 T11N R63W 575 FSL 800 FWL		

Ground Elevation	5,267.40'			**K.B. Elevation**	5,283.90'
Logged Interval	3,000'	**To**	7,953'	**Total Depth**	7,953'
Formation	Niobrara B Marl				
Type of Drilling Fluid	Water Based Mud				

Operator

Company HighPoint Resources

Address 1099 18th Street, Suite 2300
Denver, CO 80202

Geologist

Name Aryn Rowe, Ben Burke, Emily Brehm

Company HighPoint Resources

Address 1099 18th Street, Suite 2300
Denver, CO 80202

Zone Color Coding

Oil	Condensate	Gas
Note	Core	Pressure
Error	Water	Seal

Other

Services Provided 2-Man Logging, ISO Tubes/Jars, Mass Spec, XRD, XRF, Pyrolysis

Loggers: Reed Pellicore / Jonathan Saltz

Equipment: ML-597

Address Reservoir Group - Empirica
6360 West Sam Houston Pkwy N
Houston, Texas 77041

Service Start Date: 11/08/2018

Service End Date: 11/12/2018

Job #: 1745RK1811

Hole Profile

Casing Records

Size	Wgt	From	To	Test
9.625	36	0	1557	-
7	23	1557	7953	-

Rock Types

UNKNOWN	CHERT	SILTY SHALE	BENTONITE
ANHYDRITE	COAL	SILTSTONE	TUFF
GYPSUM	MARLSTONE	SANDY SILTSTONE	IGNEOUS
SALT	CLAYSTONE	SANDSTONE	METAMORPHIC
CHALK	SHALE	CONGLOMERATE	CEMENT

CHALK
LIMESTONE
DOLOMITE
SHALE
SHALE GRAY
SHALE COLORED
CONGLOMERATE
BRECCIA
TILL
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

EARTHY
FENESTRAL
FRACTURE
INTERCRYSTALLINE
INTEROOLITIC
MOLDIC
ORGANIC
PINPOINT
VUGGY

Engineering

BIT
CASING
CONNECTION (LEFT)
CONNECTION (RIGHT)
CONNECTION GAS
CORE - LOST
CORE - RECOVERED
DST INTERVAL
FAULT
FORMATION TOP
GAS SHOW
MN DEPTH
NORMAL FAULT
OIL SHOW
OVERTURNED STRATA
REVERSE FAULT
SIDEWALL CORE (LEFT)
SIDEWALL CORE (RIGHT)
SLIDE
SURVEY
TRIP GAS
WIRELINE TESTED - LEFT
WIRELINE TESTED - RT

Rounding

ANGULAR
ROUNDED
SUBANG
SUBRND

Textures

BOUNDSTONE
CHALKY
CRYPTOXLN
EARTHY
FINELYXLN
GRAINSTONE
LITHOGRAPHIC
MICROXLN
MUDSTONE
PACKSTONE
WACKESTONE

Sorting

MODERATE
POOR
WELL

ROP	Slide/Rotate	Depth Labels	Notes	% Lith	Total Gas	Interp Lith	Lithology Descriptions	Images
ROP GAMMA WOBX					GAS C1 C2 C3 C4 C5			

HighPoint Resources
Critter Creek 16-6203B
Weld County, CO
Spud Date: 09/03/2018
Surface Casing: 9.625"
Set @1,557' MD
2 Man Logging
Began on 11/09/2018
23:08hrs MST
All Depths
Correspond to
Driller's Pipe Tally

Loggers Were Rigged Up and Ready on 11/08/2018

Bit #: 2
Type:
Sdi519-Smith
Size: 8.75"
Depth In: 1,557'
Depth Out: 5,116'
Hours: 9.8 hrs
Avg Ft/Hr: 363 '/hr
Jets: 7x14
S/N: JN8541

WOB: 14
RPM: 30
SPM: 218
SPP: 2,003

MD: 3,077'
INC: 18.83°
AZM: 133.1°
TVD: 3,014.63'
VS: -337.76'

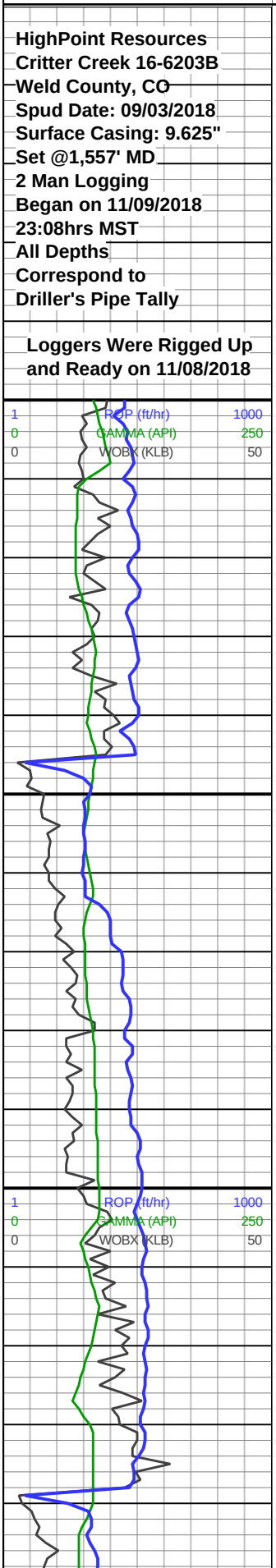
MW: 28
VIS: 8.5

Yellow Box: ML-597 for Gas

Pason for ROP & WOBX

SYSTEM CALIBRATED
1% Methane = 100 units
100% Methane = 10000 units

2800-3000 75% SS: pred lt gy off wh-v lt gy, vf gr, pred frm-fri, sb ang-v w rnd, v w srt, mod cal-tr dol cmt, p cmtd, pos tr intxl por; 25% SLTST: med gy, sft, blky-sb blky, no cmt, mud mtx sup, grdg to ss ip



1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

3,150
3,160
3,170
3,180
3,190
3,200
3,210
3,220
3,230
3,240
3,250
3,260
3,270
3,280
3,290
3,300
3,310
3,320
3,330
3,340
3,350
3,360

MD: 3,171'
INC: 18.79°
AZM: 132.68°
TVD: 3,103.62'
VS: -358.33'

WOB: 19
RPM: 30
SPM: 218
SPP: 2,527

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

5u

MD: 3,265'
INC: 18.84°
AZM: 132.34°
TVD: 3,192.59'
VS: -378.77'

MNDEPTH 11/11/18

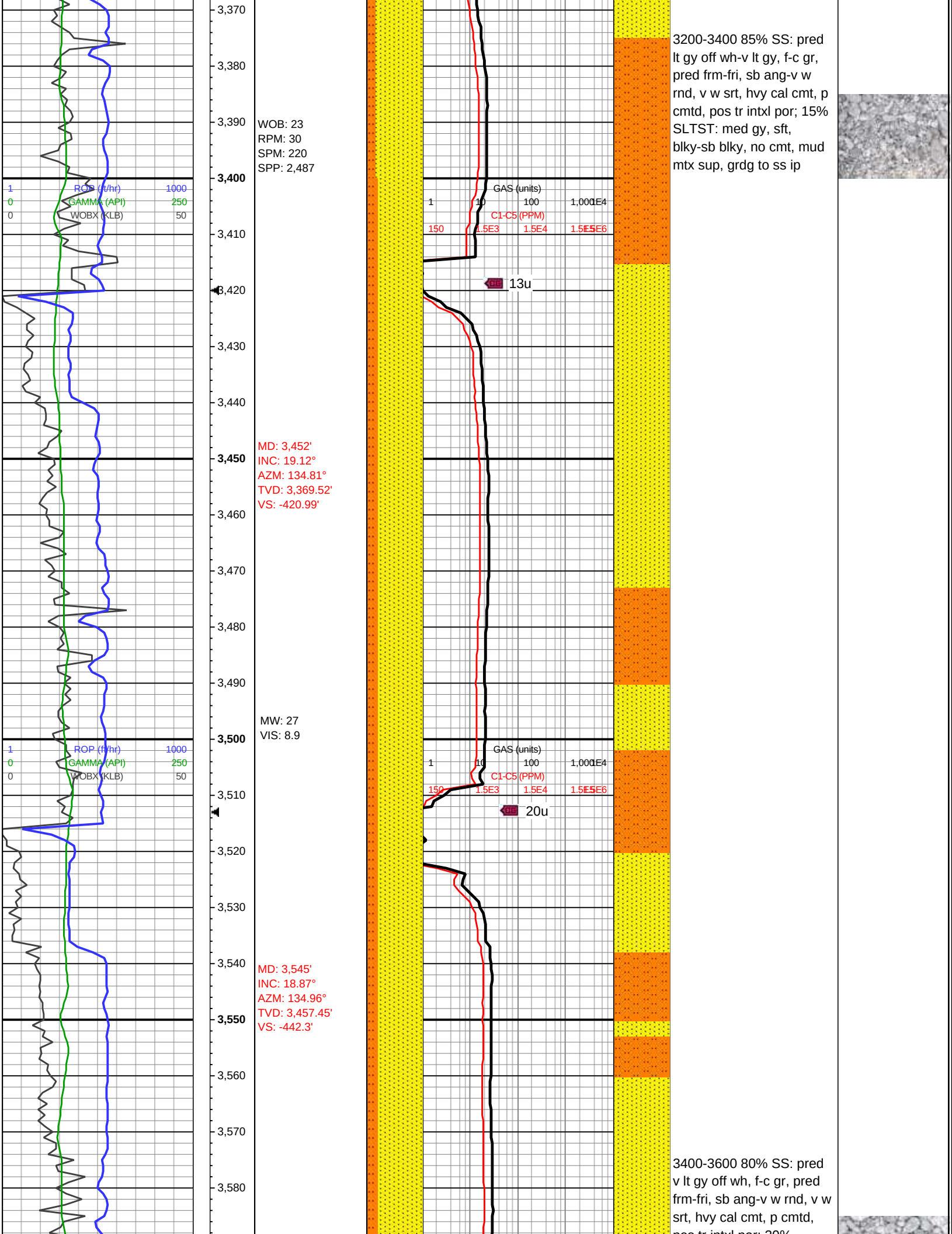
MW: 27
VIS: 8.9

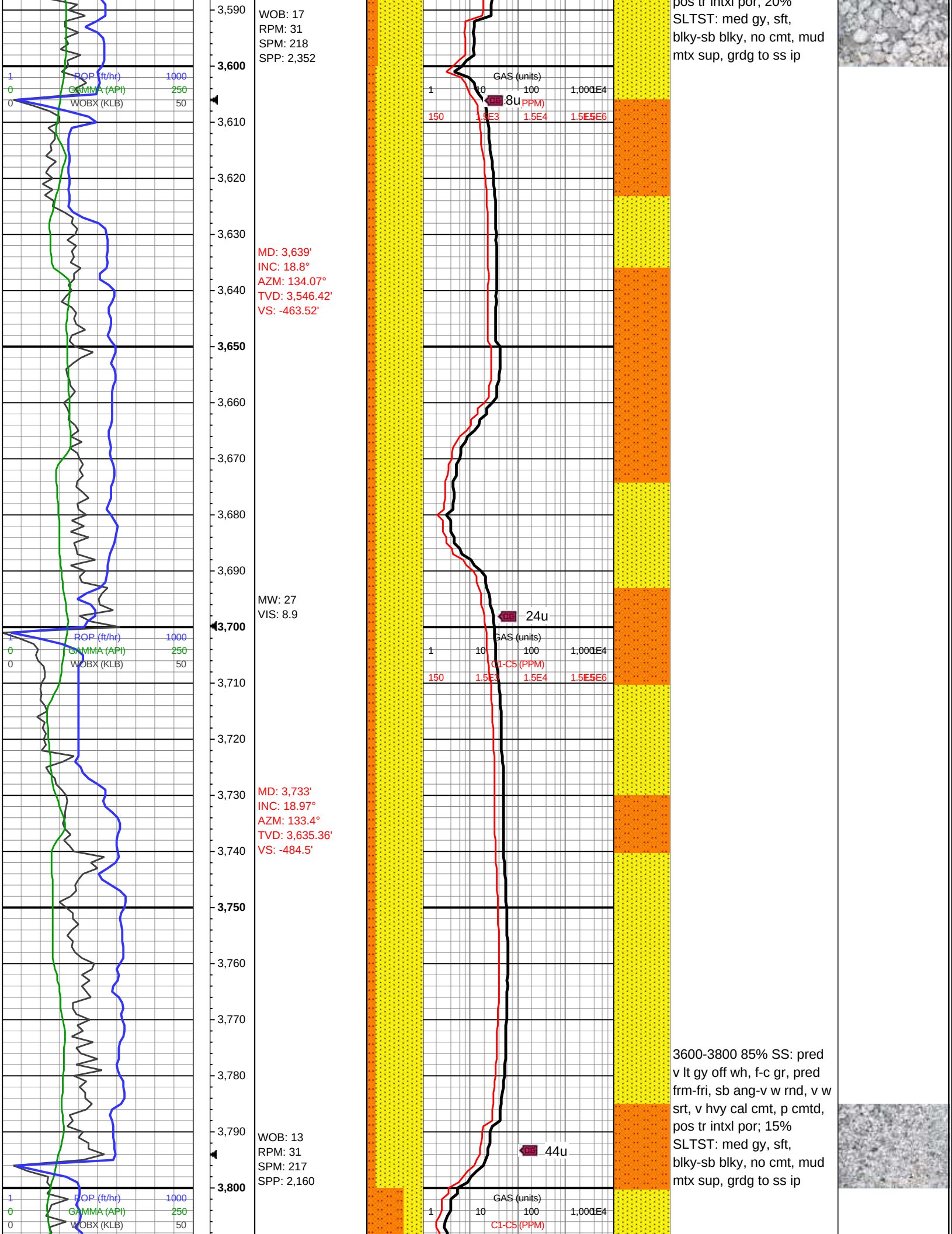
15u

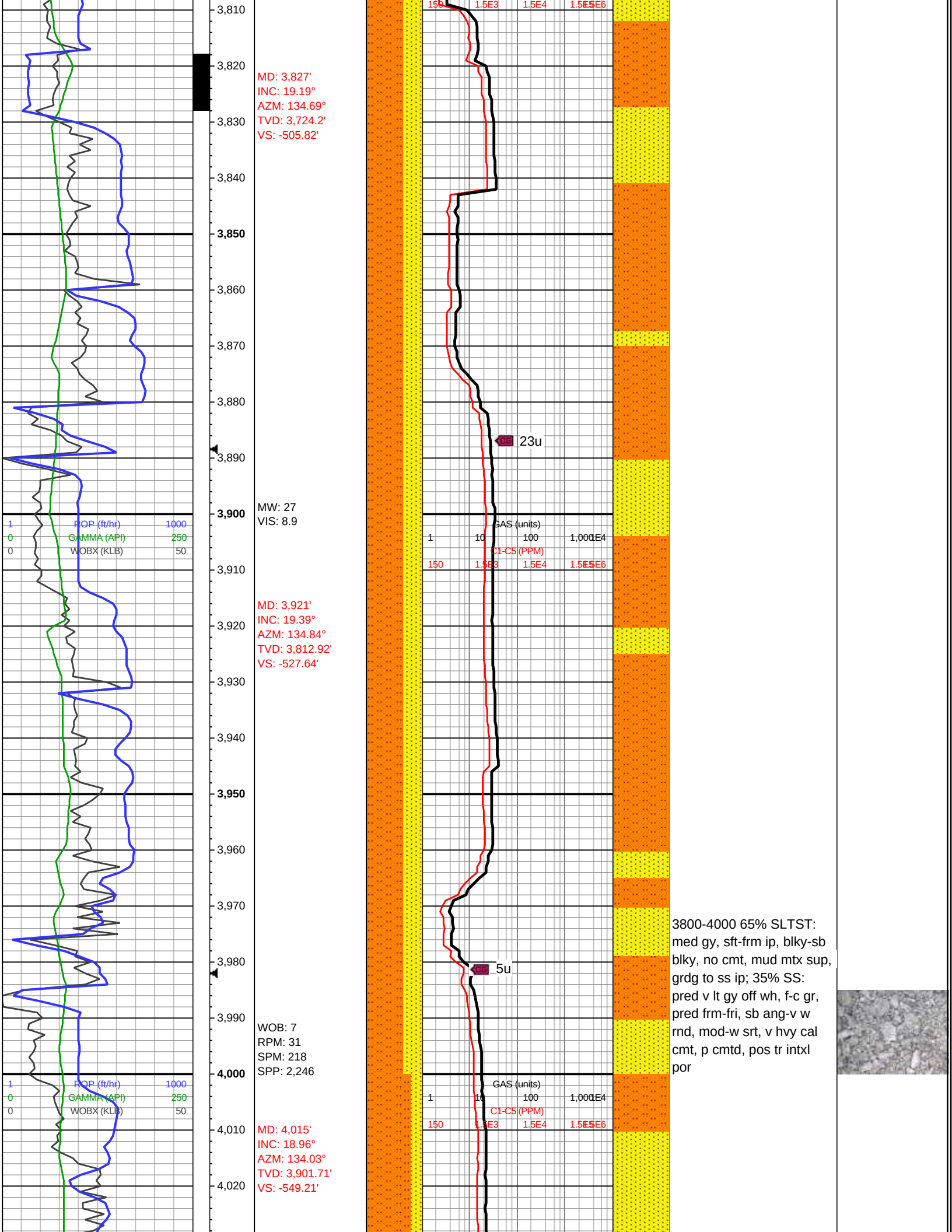
24hr Max Gas:
165u

MD: 3,359'
INC: 18.81°
AZM: 135.08°
TVD: 3,281.56'
VS: -399.68'

3000-3200 80% SS: pred lt gy off wh-v lt gy, vf gr, pred frm-fri, sb ang-v w rnd, v w srt, hvy cal cmt, p cmtd, pos tr intxl por; 20% SLTST: med gy, sft, blky-sb blky, no cmt, mud mtx sup, grdg to ss ip


3,370
3,380
3,390
3,400
3,410
3,420
3,430
3,440
3,450
3,460
3,470
3,480
3,490
3,500
3,510
3,520
3,530
3,540
3,550
3,560
3,570
3,580
1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
13u
20u
WOB: 23
RPM: 30
SPM: 220
SPP: 2,487
MD: 3,452'
INC: 19.12°
AZM: 134.81°
TVD: 3,369.52'
VS: -420.99'
MW: 27
VIS: 8.9
MD: 3,545'
INC: 18.87°
AZM: 134.96°
TVD: 3,457.45'
VS: -442.3'
3200-3400 85% SS: pred lt gy off wh-v lt gy, f-c gr, pred frm-fri, sb ang-v w rnd, v w srt, hvy cal cmt, p cmtd, pos tr intxl por; 15% SLTST: med gy, sft, blky-sb blky, no cmt, mud mtx sup, grdg to ss ip
3400-3600 80% SS: pred v lt gy off wh, f-c gr, pred frm-fri, sb ang-v w rnd, v w srt, hvy cal cmt, p cmtd,


1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50
3,590
3,600
3,610
3,620
3,630
3,640
3,650
3,660
3,670
3,680
3,690
3,700
3,710
3,720
3,730
3,740
3,750
3,760
3,770
3,780
3,790
3,800
WOB: 17
RPM: 31
SPM: 218
SPP: 2,352
MD: 3,639'
INC: 18.8°
AZM: 134.07°
TVD: 3,546.42'
VS: -463.52'
MW: 27
VIS: 8.9
MD: 3,733'
INC: 18.97°
AZM: 133.4°
TVD: 3,635.36'
VS: -484.5'
WOB: 13
RPM: 31
SPM: 217
SPP: 2,160
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
8u
24u
44u
pos tr intxl por; 20%
SLTST: med gy, sft,
blky-sb blky, no cmt, mud
mtx sup, grdg to ss ip
3600-3800 85% SS: pred
v lt gy off wh, f-c gr, pred
frm-fri, sb ang-v w rnd, v w
srt, v hvy cal cmt, p cmtd,
pos tr intxl por; 15%
SLTST: med gy, sft,
blky-sb blky, no cmt, mud
mtx sup, grdg to ss ip



3800-4000 65% SLTST: med gy, sft-frm ip, blky-sb blky, no cmt, mud mtx sup, grdg to ss ip; 35% SS: pred v lt gy off wh, f-c gr, pred frm-fri, sb ang-v w rnd, mod-w srt, v hvy cal cmt, p cmtd, pos tr intxl por

1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

4,030
4,040
4,050
4,060
4,070
4,080
4,090
4,100
4,110
4,120
4,130
4,140
4,150
4,160
4,170
4,180
4,190
4,200
4,210
4,220
4,230
4,240

MW: 28
VIS: 9.1

MD: 4,110'
INC: 18.66°
AZM: 133.65°
TVD: 3,991.63'
VS: -570.37'

WOB: 29
RPM: 31
SPM: 218
SPP: 2,802

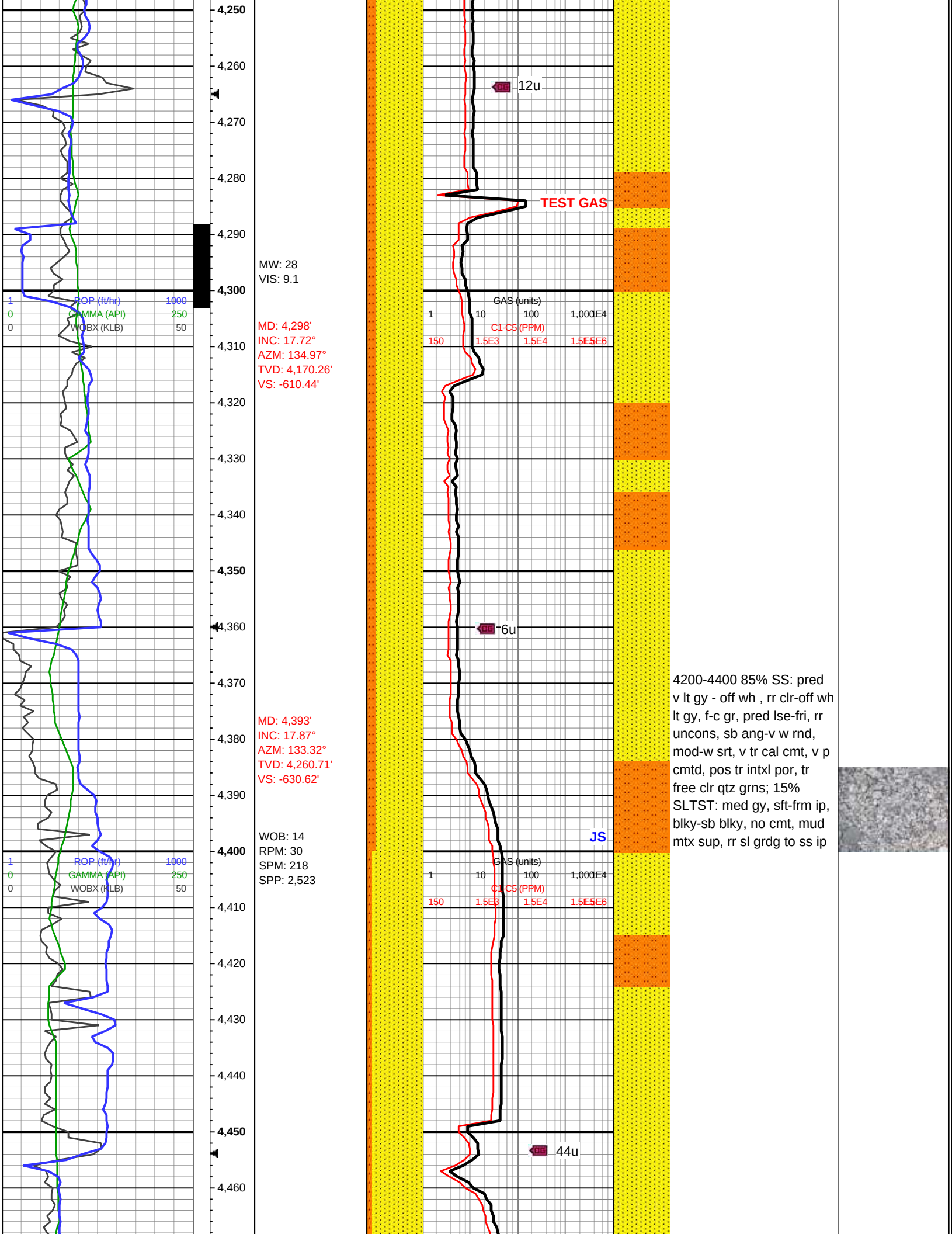
MD: 4,204'
INC: 18.15°
AZM: 132.18°
TVD: 4,080.83'
VS: -590.54'

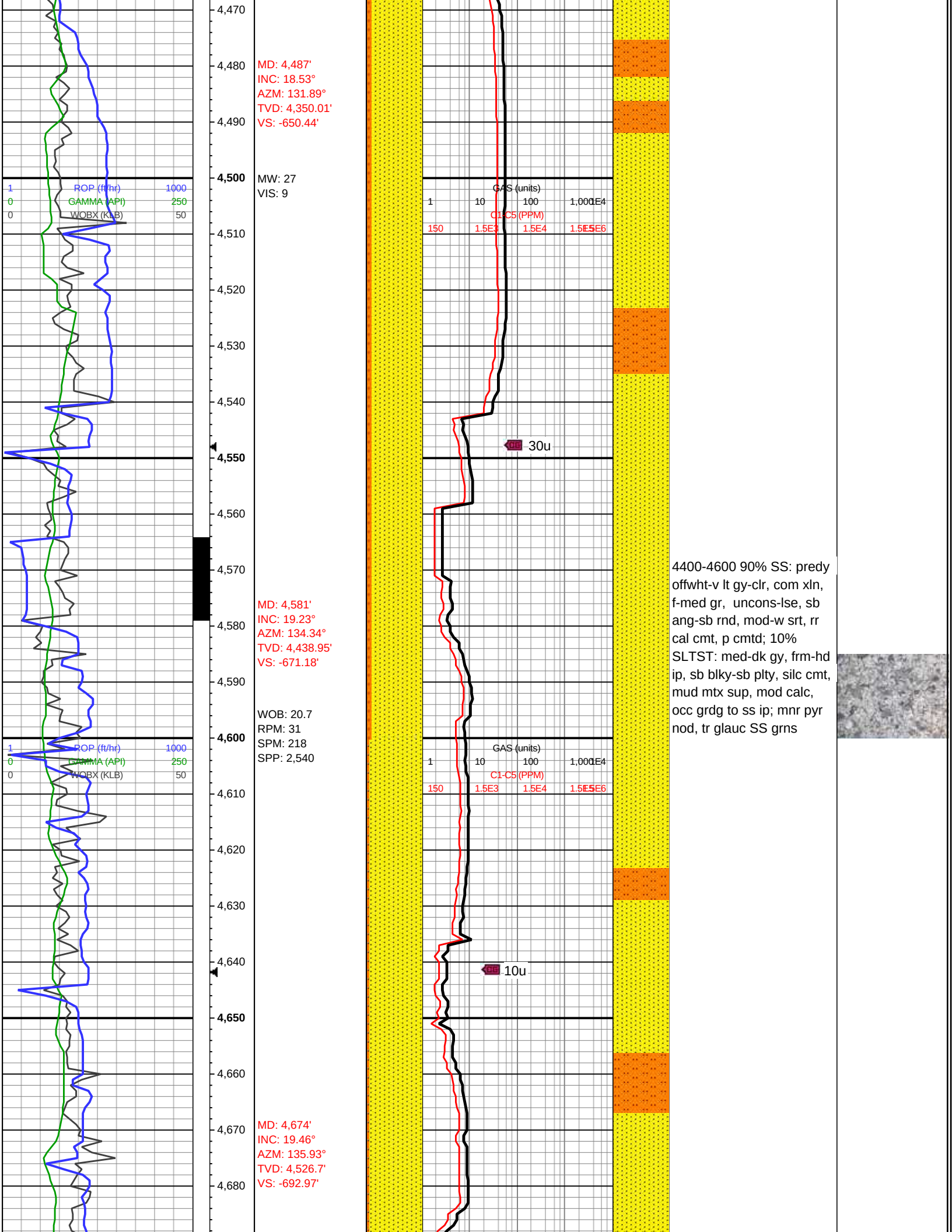
12u

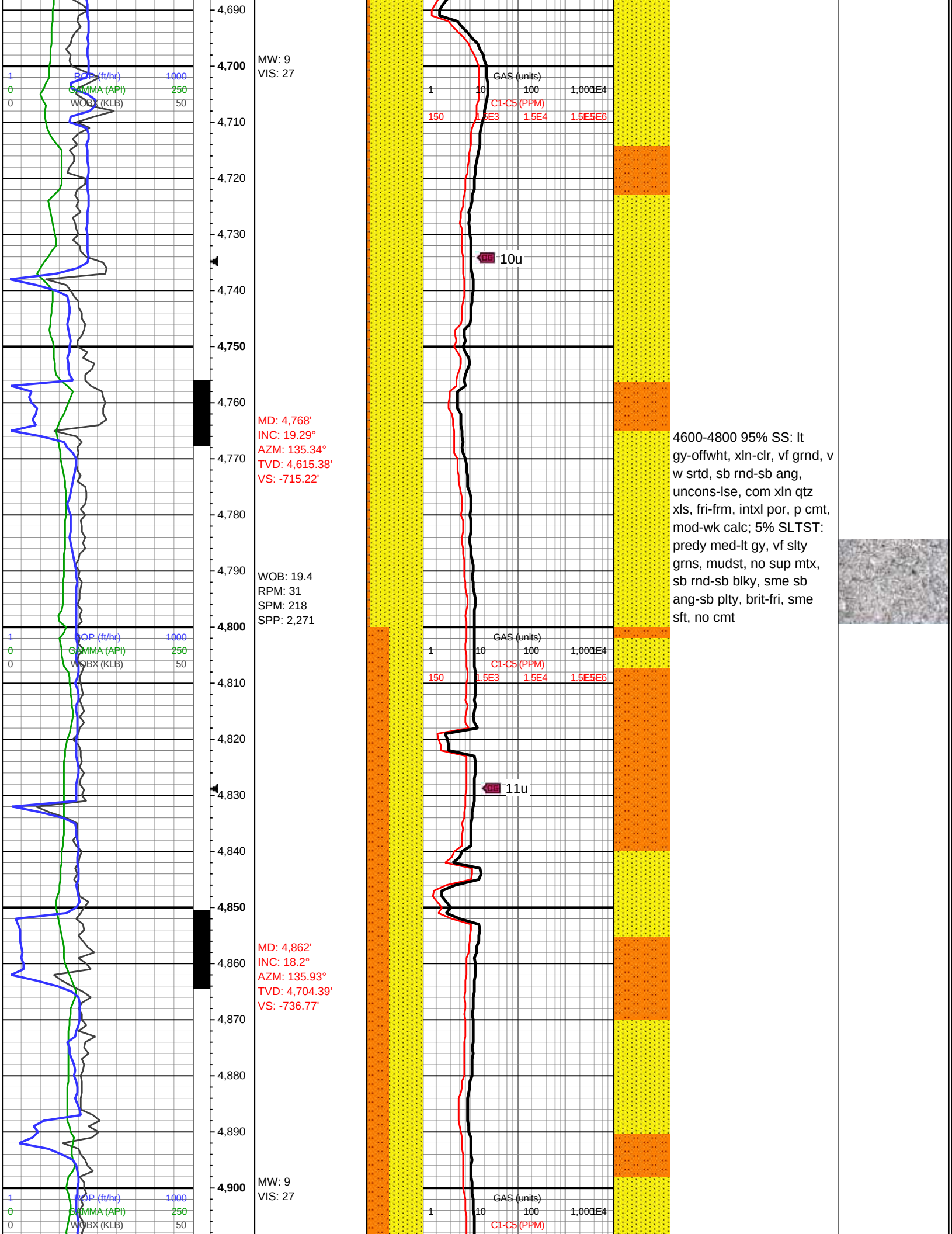
19u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

4000-4200 80% SLTST: med gy, sft-frm ip, blky-sb blky, no cmt, mud mtx sup, rr sl grdg to ss ip; 20% SS: pred v lt gy off wh, f-c gr, pred frm-fri, sb ang-v w rnd, mod-w srt, hvy cal cmt, p cmtd, pos tr intxl por


4,250
4,260
4,270
4,280
4,290
4,300
4,310
4,320
4,330
4,340
4,350
4,360
4,370
4,380
4,390
4,400
4,410
4,420
4,430
4,440
4,450
4,460
1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50
MW: 28
VIS: 9.1
MD: 4,298'
INC: 17.72°
AZM: 134.97°
TVD: 4,170.26'
VS: -610.44'
MD: 4,393'
INC: 17.87°
AZM: 133.32°
TVD: 4,260.71'
VS: -630.62'
WOB: 14
RPM: 30
SPM: 218
SPP: 2,523
12u
TEST GAS
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
6u
JS
44u
4200-4400 85% SS: pred v lt gy - off wh , rr clr-off wh lt gy, f-c gr, pred lse-fri, rr uncons, sb ang-v w rnd, mod-w srt, v tr cal cmt, v p cmtd, pos tr intxl por, tr free clr qtz grns; 15% SLTST: med gy, sft-frm ip, blky-sb blky, no cmt, mud mtx sup, rr sl grdg to ss ip


4,470
4,480
4,490
4,500
4,510
4,520
4,530
4,540
4,550
4,560
4,570
4,580
4,590
4,600
4,610
4,620
4,630
4,640
4,650
4,660
4,670
4,680
1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50
MD: 4,487'
INC: 18.53°
AZM: 131.89°
TVD: 4,350.01'
VS: -650.44'
MW: 27
VIS: 9
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
30u
MD: 4,581'
INC: 19.23°
AZM: 134.34°
TVD: 4,438.95'
VS: -671.18'
WOB: 20.7
RPM: 31
SPM: 218
SPP: 2,540
10u
MD: 4,674'
INC: 19.46°
AZM: 135.93°
TVD: 4,526.7'
VS: -692.97'
4400-4600 90% SS: predy offwht-v lt gy-clr, com xln, f-med gr, uncons-lse, sb ang-sb rnd, mod-w srt, rr cal cmt, p cmtd; 10% SLTST: med-dk gy, frm-hd ip, sb blky-sb plty, silc cmt, mud mtx sup, mod calc, occ grdg to ss ip; mnr pyr nod, tr glauc SS grns


1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50
4,690
4,700
4,710
4,720
4,730
4,740
4,750
4,760
4,770
4,780
4,790
4,800
4,810
4,820
4,830
4,840
4,850
4,860
4,870
4,880
4,890
4,900
MW: 9
VIS: 27
MD: 4,768'
INC: 19.29°
AZM: 135.34°
TVD: 4,615.38'
VS: -715.22'
WOB: 19.4
RPM: 31
SPM: 218
SPP: 2,271
MD: 4,862'
INC: 18.2°
AZM: 135.93°
TVD: 4,704.39'
VS: -736.77'
MW: 9
VIS: 27
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
10u
11u
4600-4800 95% SS: lt gy-offwht, xln-clr, vf grnd, v w srtd, sb rnd-sb ang, uncons-lse, com xln qtz xls, fri-frm, intxl por, p cmt, mod-wk calc; 5% SLTST: predy med-lt gy, vf slty grns, mudst, no sup mtx, sb rnd-sb blky, sme sb ang-sb plty, brit-fri, sme sft, no cmt

4,910
4,920
4,930
4,940
4,950
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

MD: 4,955'
INC: 16.9°
AZM: 136.47°
TVD: 4,793.06'
VS: -756.97'

WOB: 24.2
RPM: 30
SPM: 219
SPP: 2,669

MD: 5,050'
INC: 15.47°
AZM: 135.86°
TVD: 4,884.3'
VS: -776.03'

MW: 9
VIS: 27

Bit #: 3
Type: Ulterra-U611S
Size: 8 3/4
Depth In: 5,116'
Depth Out: 7,953'
Hours: 11.5 hrs
Avg Ft/Hr: 246 '/hr
Jets: 6x14
S/N: 29019

1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

-TOOH- @08:50hrs MST (Pressure Loss)

150 1.5E3 1.5E4 1.5E5 1.5E6

11u

RP

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

10u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

13u

4800-5000 60% SS: predy lt-med gy, sme gyshbn, com offwht grns, cons silc-arg cmt, p smt pred mtx sup, vf-f grnd, sb ang-sb rnd, grdg to slt; 40% SLTST: med-dk gy, sb blky-sb plty, frm-hrd ip, no-calc, grdg to ss ip, mod dol cmt, mud mtx sup

Change Bit/Motor

5,130
5,140
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

MD: 5,145'
INC: 12.26°
AZM: 132.8°
TVD: 4,976.52'
VS: -791.94'

WOB: 20
RPM: 30
SPM: 218
SPP: 2,855

1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

MD: 5,240'
INC: 11.95°
AZM: 130.78°
TVD: 5,069.41'
VS: -805.19'

MW: 9
VIS: 27

1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

MWDEPTH 11/12/18

MD: 5,334'
INC: 10.86°
AZM: 129.46°
TVD: 5,161.55'
VS: -817.14'

GAS (units)
1 10 100 1,000 1E4
18u
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

GAS (units)
1 10 100 1,000 1E4
29u
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

5000-5200 50% SLTST: med-dk gy, frm-hrd ip, blky-sb blky, mod cal cmt, mud mtx sup, sl grdg to ss ip; 45% SS: predy lt-med gy, rr v lt brn-off wh, com off wh grns, v f-c gr, fri-frm ip, v ang-w rnd, mod-w srt, rr cal cmt, p cmtd, v sl mud mtx sup, grdg to slt; 5% SLTY SH: blk-v dk gy, frm-bri, blky-plty, rthy tex

5,350
5,360
5,370
5,380
5,390
5,400
5,410
5,420
5,430
5,440
5,450
5,460
5,470
5,480
5,490
5,500
5,510
5,520
5,530
5,540
5,550
5,560

WOB: 17
RPM: 33
SPM: 216
SPP: 2,385

MD: 5,428'
INC: 9.61°
AZM: 140.54°
TVD: 5,254.06'
VS: -828.8'

MW: 9
VIS: 27

MD: 5,522'
INC: 9.39°
AZM: 138.74°
TVD: 5,346.77'
VS: -840.61'

1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

21u

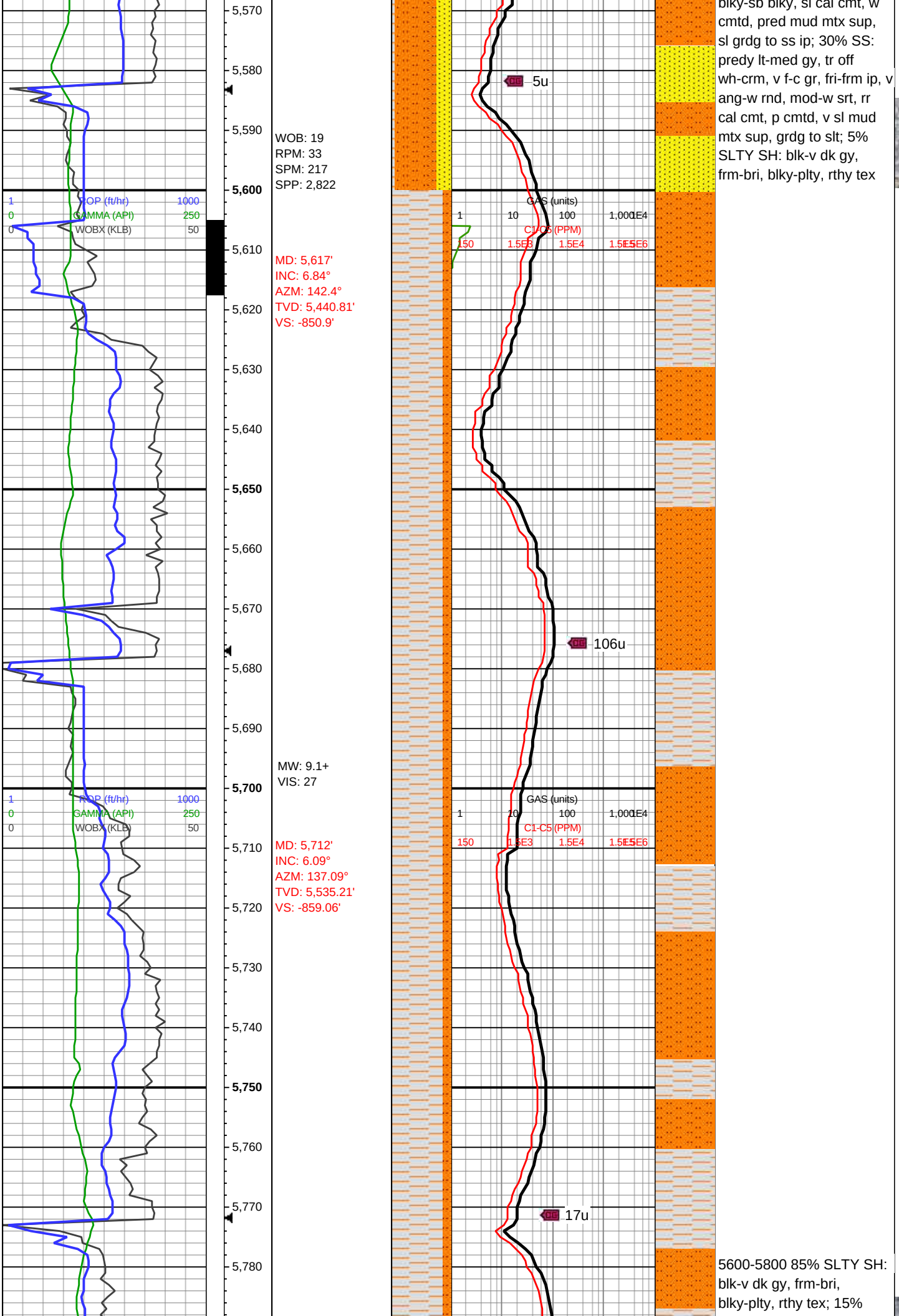
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

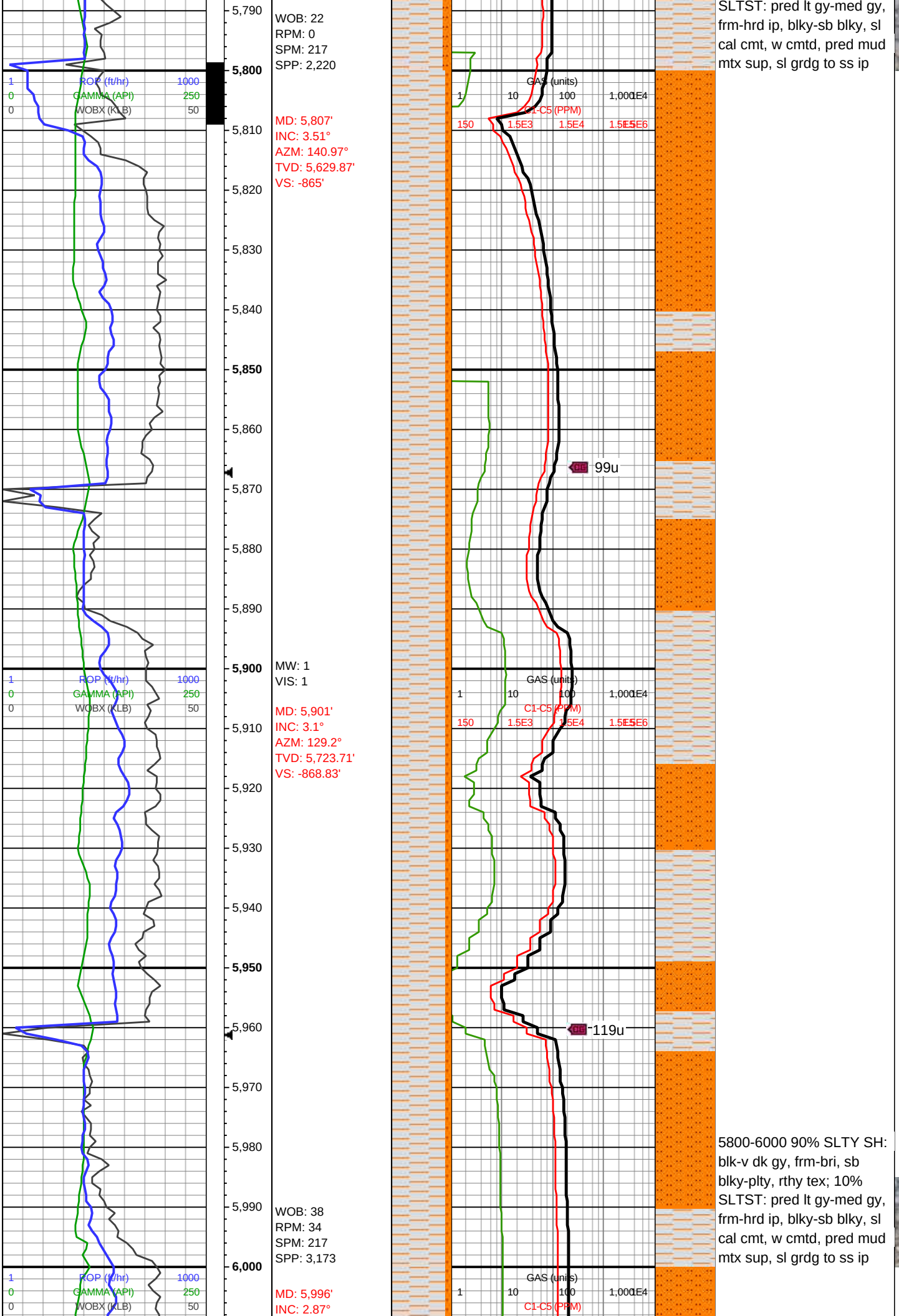
32u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

5200-5400 65% SLTST: pred med-dk gy, rr lt gy-med gy, frm-hrd ip, blky-sb blky, sl-mod cal cmt, mud mtx sup, sl grdg to ss ip; 30% SS: predy lt-med gy, tr off wh-crm, v f-c gr, fri-frm ip, v ang-w rnd, mod-w srt, rr cal cmt, p cmtd, v sl mud mtx sup, grdg to slt; 5% SLTY SH: blk-v dk gy, frm-bri, blky-plty, rthy tex

5400-5600 70% SLTST: pred med-dk gy, rr lt gy-med gy, frm-hrd ip,


1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50
5,570
5,580
5,590
5,600
5,610
5,620
5,630
5,640
5,650
5,660
5,670
5,680
5,690
5,700
5,710
5,720
5,730
5,740
5,750
5,760
5,770
5,780
WOB: 19
RPM: 33
SPM: 217
SPP: 2,822
MD: 5,617'
INC: 6.84°
AZM: 142.4°
TVD: 5,440.81'
VS: -850.9'
MW: 9.1+
VIS: 27
MD: 5,712'
INC: 6.09°
AZM: 137.09°
TVD: 5,535.21'
VS: -859.06'
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
5u
106u
17u
blky-sb blky, sl cal cmt, w cmtd, pred mud mtx sup, sl grdg to ss ip; 30% SS: predy lt-med gy, tr off wh-crm, v f-c gr, fri-frm ip, v ang-w rnd, mod-w srt, rr cal cmt, p cmtd, v sl mud mtx sup, grdg to slt; 5% SLTY SH: blk-v dk gy, frm-bri, blky-plty, rthy tex
5600-5800 85% SLTY SH: blk-v dk gy, frm-bri, blky-plty, rthy tex; 15%



SLTST: pred lt gy-med gy, frm-hrd ip, blky-sb blky, sl cal cmt, w cmtd, pred mud mtx sup, sl grdg to ss ip

5800-6000 90% SLTY SH: blk-v dk gy, frm-bri, sb blky-plty, rthy tex; 10% SLTST: pred lt gy-med gy, frm-hrd ip, blky-sb blky, sl cal cmt, w cmtd, pred mud mtx sup, sl grdg to ss ip

AZM: 110.32°
TVD: 5,818.59'
VS: -871.27'

6,010
6,020
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

MD: 6,091'
INC: 2.24°
AZM: 149.73°
TVD: 5,913.5'
VS: -873.69'

MW: 8.9+
VIS: 27

MD: 6,185'
INC: 2.06°
AZM: 150.54°
TVD: 6,007.43'
VS: -876.74'

WOB: 28
RPM: 33
SPM: 217
SPP: 3,180

1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

150 1.5E3 1.5E4 1.5E5 1.5E6

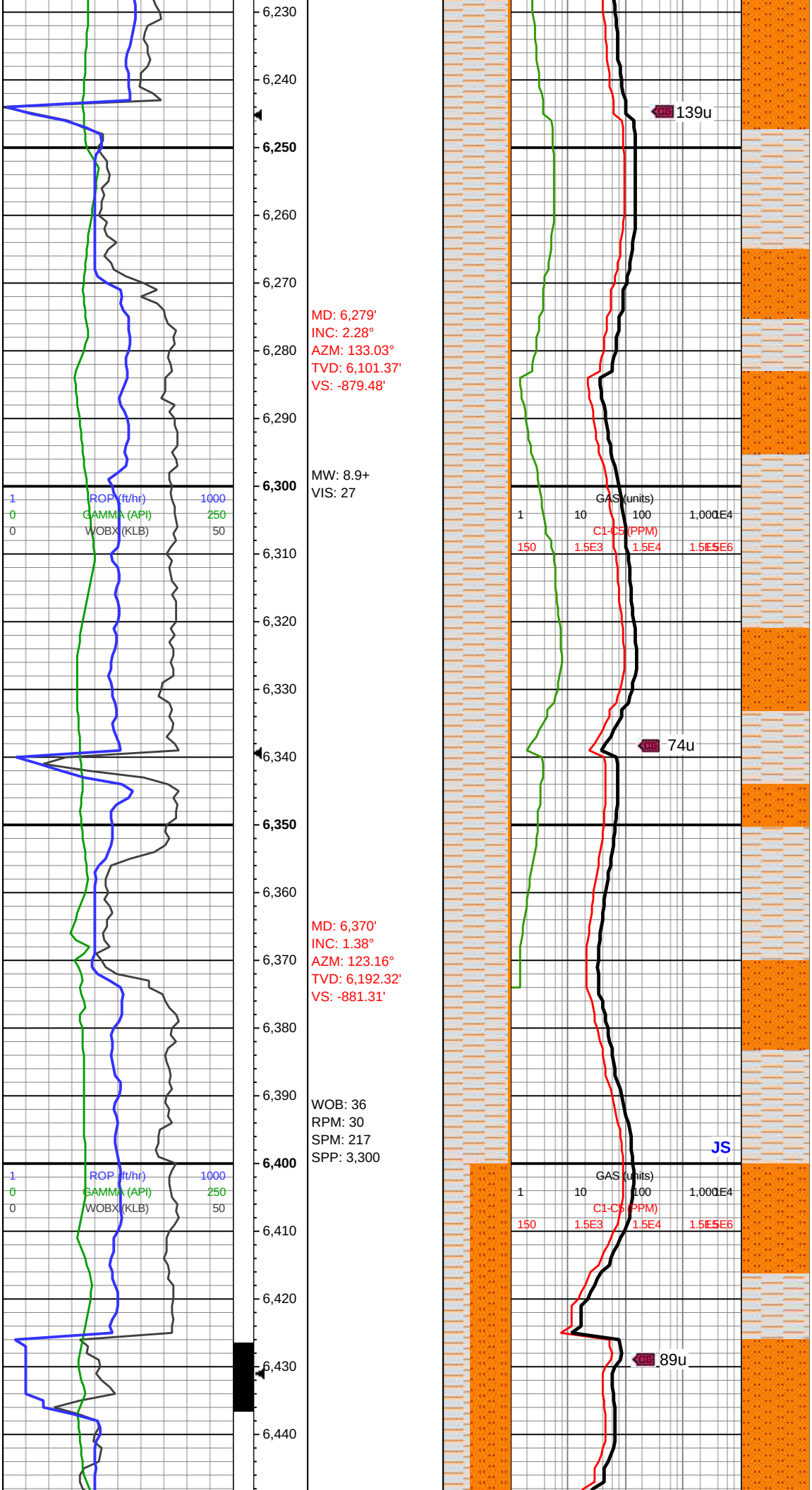
56u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

90u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

6000-6200 90% SLTY SH: blk-v dk gy, frm-bri, sb blky-plty, rthy tex; 10% SLTST: pred lt gy-med gy, frm-hrd ip, blky-sb blky, sl cal cmt, w cmtd, pred mud mtx sup, sl grdg to ss ip



6200-6400 95% SLTY SH: blk-v dk gy, frm-bri, sb blky-plty, rthy tex; 5% SLTST: pred lt gy-med gy, frm-hrd ip, blky-sb blky, sl cal cmt, w cmtd, pred mud mtx sup, sl grdg to ss ip

1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

6,450
6,460
6,470
6,480
6,490
6,500
6,510
6,520
6,530
6,540
6,550
6,560
6,570
6,580
6,590
6,600
6,610
6,620
6,630
6,640
6,650
6,660

MD: 6,465'
INC: 0.38°
AZM: 236.86°
TVD: 6,287.31'
VS: -882.11'

MW: 9.4
VIS: 32

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

177u

MD: 6,559'
INC: 0.43°
AZM: 231.02°
TVD: 6,381.31'
VS: -882.5'

WOB: 28
RPM: 35
SPM: 217
SPP: 3,366

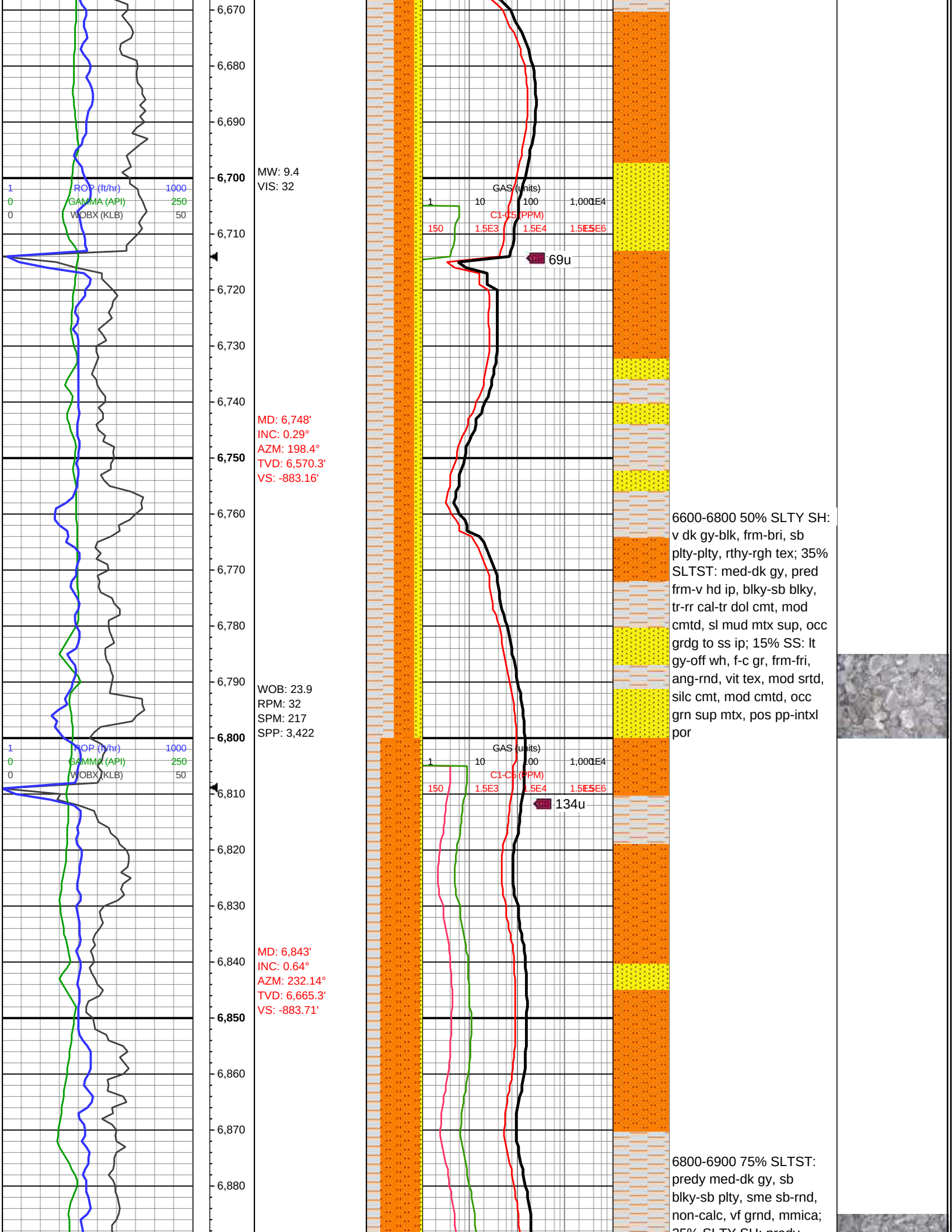
1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

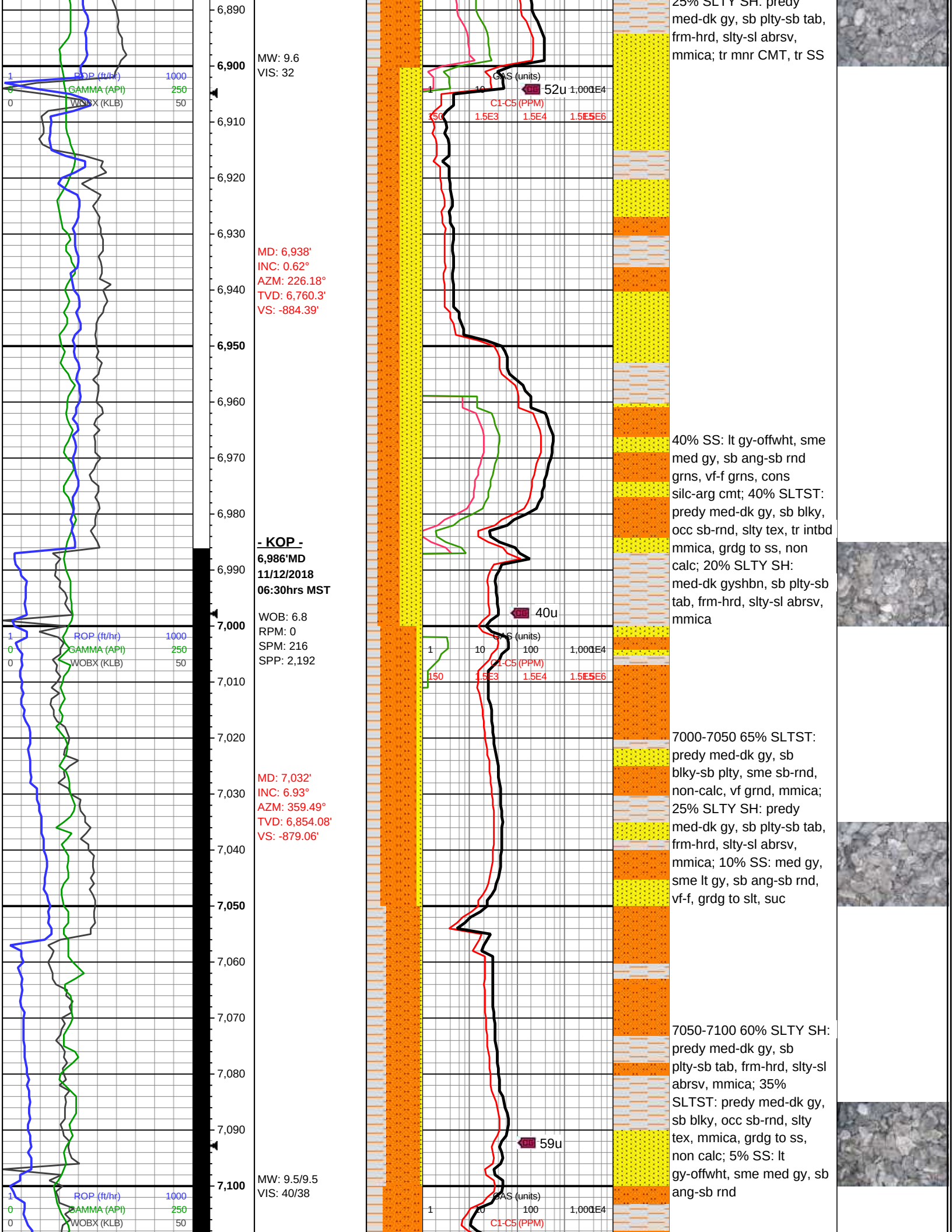
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

92u

MD: 6,654'
INC: 0.2°
AZM: 231.33°
TVD: 6,476.31'
VS: -882.83'

6400-6600 60% SLTST: med-dk gy, sme gyshbn, sb blky-sb plty, mnr lamn, non calc, tr cal frac fl, grdg to ss, micmica; 40% SLTY SH: med-dk gy, sb plty-sb tab, frm-hd, sb plty-sb tab, slty-sl abrsv, mmica; tr SS


1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50
6,670
6,680
6,690
6,700
6,710
6,720
6,730
6,740
6,750
6,760
6,770
6,780
6,790
6,800
6,810
6,820
6,830
6,840
6,850
6,860
6,870
6,880
MW: 9.4
VIS: 32
MD: 6,748'
INC: 0.29°
AZM: 198.4°
TVD: 6,570.3'
VS: -883.16'
WOB: 23.9
RPM: 32
SPM: 217
SPP: 3,422
MD: 6,843'
INC: 0.64°
AZM: 232.14°
TVD: 6,665.3'
VS: -883.71'
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
69u
134u
6600-6800 50% SLTY SH: v dk gy-blk, frm-bri, sb plty-plty, rthy-rgh tex; 35% SLTST: med-dk gy, pred frm-v hd ip, blky-sb blky, tr-rr cal-tr dol cmt, mod cmtd, sl mud mtx sup, occ grdg to ss ip; 15% SS: lt gy-off wh, f-c gr, frm-fri, ang-rnd, vit tex, mod srtd, silc cmt, mod cmtd, occ grn sup mtx, pos pp-intxl por
6800-6900 75% SLTST: predy med-dk gy, sb blky-sb plty, sme sb-rnd, non-calc, vf grnd, mmica;


ROP (ft/hr) 1 1000
GAMMA (API) 0 250
WOBX (KLB) 0 50
6,890
6,900
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
MW: 9.6
VIS: 32
MD: 6,938'
INC: 0.62°
AZM: 226.18°
TVD: 6,760.3'
VS: -884.39'
- KOP -
6,986'MD
11/12/2018
06:30hrs MST
WOB: 6.8
RPM: 0
SPM: 216
SPP: 2,192
MD: 7,032'
INC: 6.93°
AZM: 359.49°
TVD: 6,854.08'
VS: -879.06'
MW: 9.5/9.5
VIS: 40/38
GAS (units)
C1-C5 (PPM)
52u
40u
59u
25% SLTY SH: predy med-dk gy, sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica; tr mnr CMT, tr SS
40% SS: lt gy-offwht, sme med gy, sb ang-sb rnd grns, vf-f grns, cons silc-arg cmt; 40% SLTST: predy med-dk gy, sb blky, occ sb-rnd, slty tex, tr intbd mmica, grdg to ss, non calc; 20% SLTY SH: med-dk gyshbn, sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica
7000-7050 65% SLTST: predy med-dk gy, sb blky-sb plty, sme sb-rnd, non-calc, vf grnd, mmica; 25% SLTY SH: predy med-dk gy, sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica; 10% SS: med gy, sme lt gy, sb ang-sb rnd, vf-f, grdg to slt, suc
7050-7100 60% SLTY SH: predy med-dk gy, sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica; 35% SLTST: predy med-dk gy, sb blky, occ sb-rnd, slty tex, mmica, grdg to ss, non calc; 5% SS: lt gy-offwht, sme med gy, sb ang-sb rnd

7,110
7,120
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

MD: 7,127'
INC: 18.56°
AZM: 6.05°
TVD: 6,946.58'
VS: -858.22'

WOB: 3.8
RPM: 20
SPM: 217
SPP: 3,014

1 ROP (ft/hr) 1000
0 GAMMA (API) 250
0 WOBX (KLB) 50

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6

56u

MD: 7,221'
INC: 25.23°
AZM: 3.6°
TVD: 7,033.76'
VS: -823.31'

190u

MW: 9.6/9.6
VIS: 39/40

MD: 7,314'
INC: 32.35°
AZM: 1.39°
TVD: 7,115.21'
VS: -778.59'

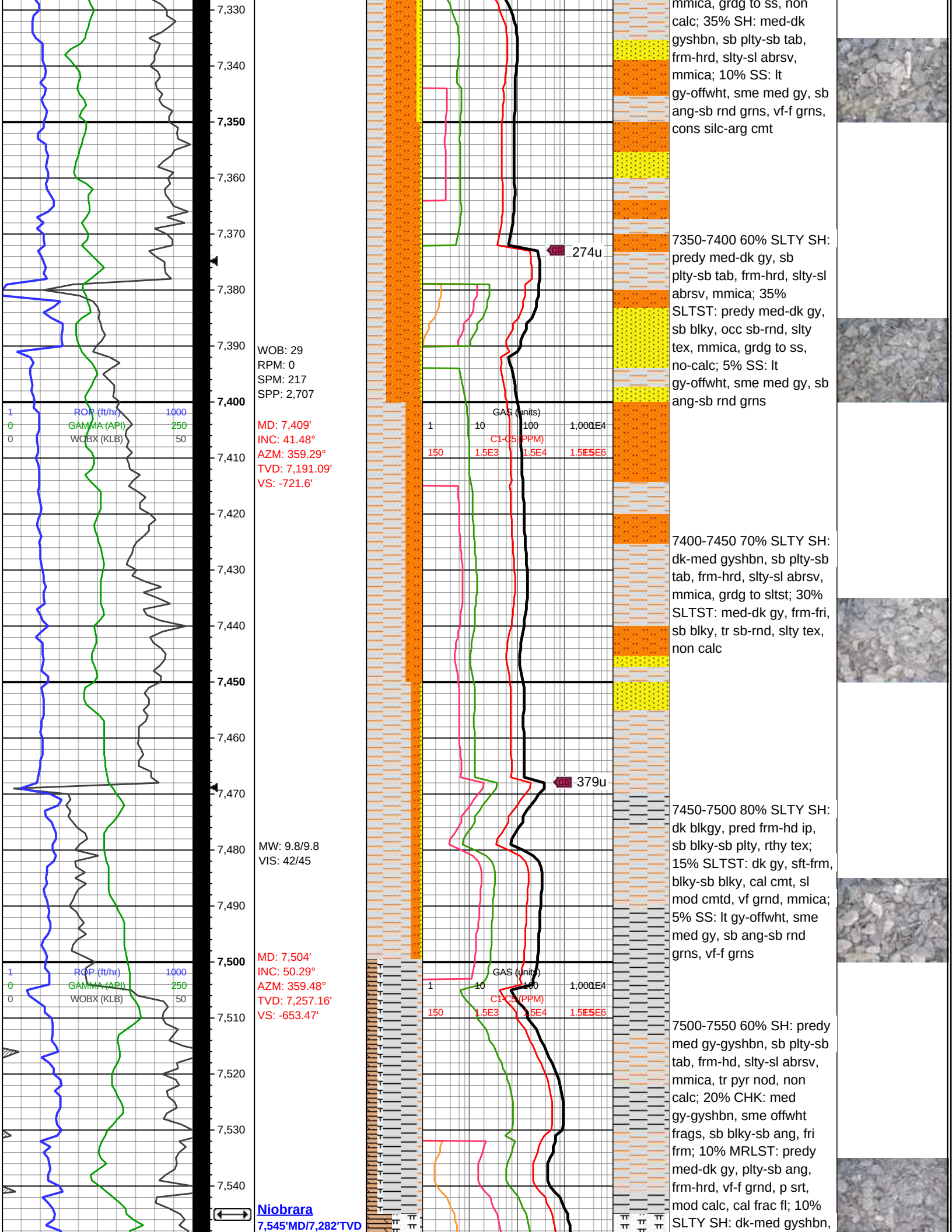
7100-7150 70% SLTY SH: dk-med gyshbn, sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica, grdg to sltst; 30% SLTST: med-dk gy, frm-fri, sb blky, tr sb-rnd, slty tex, non calc

7150-7200 65% SLTST: predy med-dk gy, sb blky-sb plty, sme sb-rnd, non-calc, vf grnd, mmica; 25% SLTY SH: predy med-dk gy, sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica; 10% SS: med gy, sme lt gy, sb ang-sb rnd, vf-f, grdg to slt, suc

7200-7250 55% SLTST: predy med-dk gy, sb blky, occ sb-rnd, slty tex, tr intbd mmica, grdg to ss, non calc; 30% SLTY SH: med-dk gyshbn, sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica; 15% SS: lt gy-offwht, sme med gy, sb ang-sb rnd grns, vf-f grns, cons silc-arg cmt

7250-7300 50% SLTY SH: predy med-dk gy, sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica; 45% SLTST: predy med-dk gy, sb blky-sb plty, sme sb-rnd, non-calc, vf grnd, mmica; 5%SS: med gy, sme lt gy, sb ang-sb rnd, vf-f, grdg to slt, suc, cons silc-arg cmt

7300-7350 55% SLTST: predy med-dk gy, sb blky, occ sb-rnd, slty tex, tr intbd



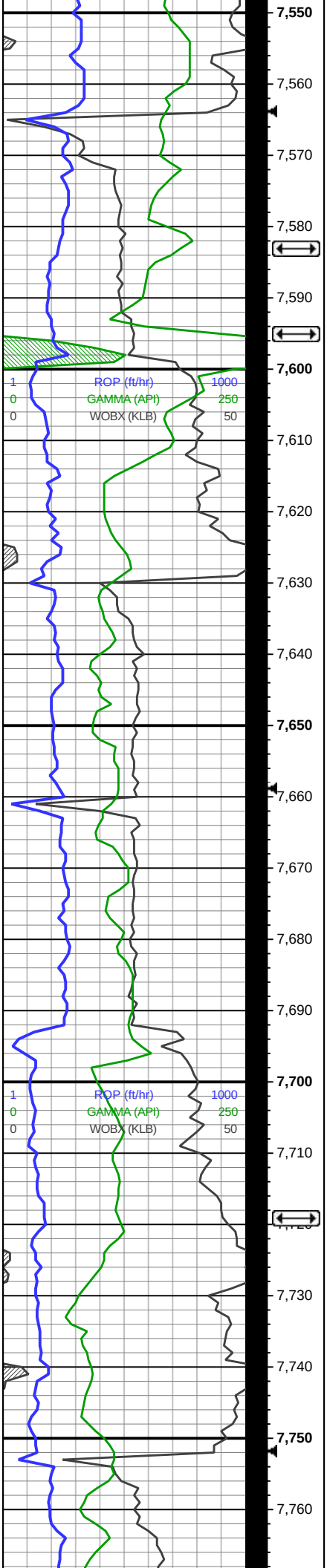
mmica, grdg to ss, non calc; 35% SH: med-dk gyshbn, sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica; 10% SS: lt gy-offwht, sme med gy, sb ang-sb rnd grns, vf-f grns, cons silc-arg cmt

7350-7400 60% SLTY SH: predy med-dk gy, sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica; 35% SLTST: predy med-dk gy, sb blky, occ sb-rnd, slty tex, mmica, grdg to ss, no-calc; 5% SS: lt gy-offwht, sme med gy, sb ang-sb rnd grns

7400-7450 70% SLTY SH: dk-med gyshbn, sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica, grdg to sltst; 30% SLTST: med-dk gy, frm-fri, sb blky, tr sb-rnd, slty tex, non calc

7450-7500 80% SLTY SH: dk blkgy, pred frm-hd ip, sb blky-sb plty, rthy tex; 15% SLTST: dk gy, sft-frm, blky-sb blky, cal cmt, sl mod cmtd, vf grnd, mmica; 5% SS: lt gy-offwht, sme med gy, sb ang-sb rnd grns, vf-f grns

7500-7550 60% SH: predy med gy-gyshbn, sb plty-sb tab, frm-hd, slty-sl abrsv, mmica, tr pyr nod, non calc; 20% CHK: med gy-gyshbn, sme offwht frags, sb blky-sb ang, fri frm; 10% MRLST: predy med-dk gy, plty-sb ang, frm-hrd, vf-f grnd, p srt, mod calc, cal frac fl; 10% SLTY SH: dk-med gyshbn,



Niobrara A Chalk
7,583'MD/7,302'TVD

Niobrara A Marl
7,595'MD/7,308'TVD

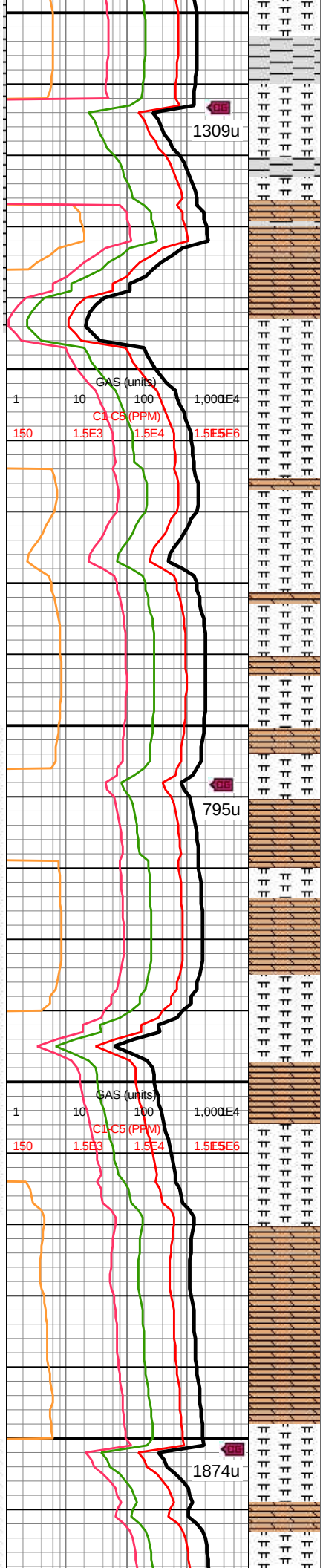
MD: 7,598'
INC: 61.02°
AZM: 2.96°
TVD: 7,310.13'
VS: -576.01'

WOB: 38.5
RPM: 0
SPM: 218
SPP: 2,889

MD: 7,692'
INC: 64.17°
AZM: 1.74°
TVD: 7,353.39'
VS: -492.64'

MW: 10/9.9
VIS: 39/44

Niobrara B Chalk
7,719'MD/7,364'TVD



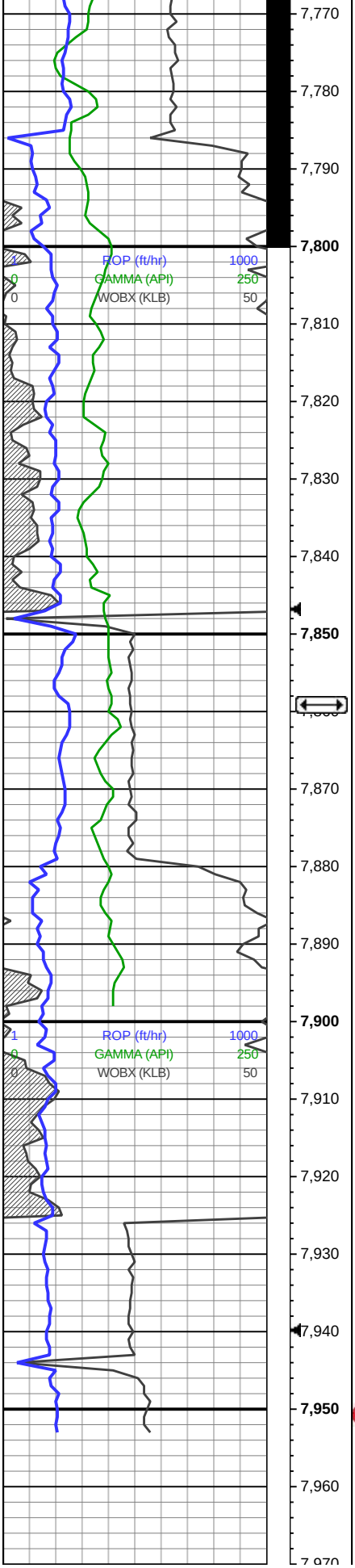
sb plty-sb tab, frm-hrd, slty-sl abrsv, mmica, grdg to sltst; tr SS

7550-7600 50% MRLST: predy med-dk gy, sb plty-sb ang, frm-hrd, mod calc, cal frac fl; 45% CHK: lt-med gy, sme gyshbn, sb blky-sb rnd, calc, fri-frm

7600-7650 90% MRLST: dk gyshbn-blk, sb plty-sb ang, mod calc, frm-hrd, cal frac fl, w srt; 10% CHK: med gy-gyshbn, sb blky-sb rnd, sme sb-ang, calc, fri-frm, cal frac fl; pp pyr nod

7650-7700 80% CHK: med gy-lt gy, com offwht intbds, blky-sb ang, fri, rthy tex, cal frac fill, com mrlst lam, calc; 20% MRLST: dk gy-med gy ip, sb ang-sb plty, frm-hrd, predy slky tex, f grnd, com chk lam, abnt scat cal frags, calc

7700-7750 90% CHK: predy lt-med gy-gyshbn, occ offwht frag, sb blky-sb-ang, fri frm, v calc, cal frac fl, intbd MRLST lamn; 10% MRLST: med-dk gyshbn, plty-sb ang, frm-hrd, mnr calc, cal frac fl, intbd CHK lamn



MD: 7,786'
INC: 72.8°
AZM: 358.51°
TVD: 7,387.84'
VS: -405.28'

WOB: 51.7
RPM: 0
SPM: 217
SPP: 2,960

Niobrara B Marl
7,859'MD/7,404'TVD

MD: 7,879'
INC: 83.59°
AZM: 355.33°
TVD: 7,406.84'
VS: -314.54'

MD: 7,893'
INC: 85.81°
AZM: 356.3°
TVD: 7,408.14'
VS: -300.64'

MW: 9.9/9.9
VIS: 40/46

-PTB-
INC: 89.84°
AZM: 358.62°
TVD: 7,409'

Land Curve
11/12/2018
15:25hrs MST
7,953'MD

MWD DEPTH **11/13/18**

Continued on Horizontal Log

7750-7800 80% CHK: predy med-dk gy-gyshbn, occ offwht frag, sb blky-sb-ang, fri frm, v calc, cal frac fl, intbd MRLST lamn; 20% MRLST: med-dk gyshbn, plty-sb ang, frm-hrd, mnr calc, cal frac fl, intbd CHK lamn

7800-7850 85% CHK: med gy-lt gy, com offwht intbds, blky-sb ang, fri, rthy tex, cal frac fill, com mrlst lam, calc; 15% MRLST: dk gy-med gy ip, sb ang-sb plty, frm-hrd, f grnd, com chk lam, predy slky tex

7850-7900 85% MRLST: med-dk gy brn, rr med brn, frm-hd ip, blky-sb plty, rthy-rgh tex, abnt cal cmt, mod-w cmtd, occ pp CHK incl with tr intbd chk lamn, tr cal frac fl; 15% CHK: offwht, micxln, v sft, mass, chky tex, tr intbd MRLST lamn

Bottom's-Up

7900-7953 90% MRLST: predy dk gyshbn-blk, incrg dk-blk, sb plty-sb ang, sme ang, mod calc, frm-hrd, cal frac fl, w srt; 10% CHK: med-lt gy-gyshbn, com offwht grns, sb blky-sb rnd, calc, fri-frm; tr pp pyr