

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Piceance Federal 28-21E

Location NE SW SEC 28 T9S R93W 1981 FSL 2484 FWL

State Colorado

County Mesa

Country United States

Rig Number Patterson 306

API Number 05-077-10250

Field Vega

Region Piceance Basin

Drilling Completed 10/13/2015

Spud Date 10/9/2015

Surface Coordinates N 39.246336 W 107.774994

Bottom Hole Coordinates N 39.241181 W 107.768206

Ground Elevation 7686'

K.B. Elevation 7701'

Logged Interval 1668' **To** 8574'

Total Depth 8574'

Formation Rollins

Type of Drilling Fluid Water Based

Operator

Company Piceance Energy, LLC.

Address 1512 Larimer Street, Suite 1000
Denver, CO 80202


Geologist

Name Andy McCarthy

Company Laramie Energy II, LLC.

Address 1512 Larimer Street, Suite 1000
Denver, CO 80202

Zone Color Coding

| | | |
|---|--|--|
|  Oil |  Condensate |  Gas |
|  Note |  Core |  Pressure |
|  Error |  Water |  Seal |

Other

Jordan Mccullugh Well Site Geologist

Columbine Logging Computer 14A

Rock Types

| | | | |
|-----------------|----------------------|-------------------|-----------------|
| UNKNOWN | COAL | MARLSTONE | SHALY SANDSTONE |
| ANHYDRITE | CONGLOMERATE | METAMORPHIC | SHALY SILTSTONE |
| BENTONITE | DOLOMITE | NO SAMPLE | SILTSTONE |
| BRECCIA | DOLOMITIC LIMESTONE | SALT | SILTY SHALE |
| CEMENT | GRANITE | SALT- PEPPER SAND | TILL |
| CHALK | GYPSUM | SANDSTONE | TUFF |
| CHERT | IGNEOUS | SHALE | WELDED TUFF |
| CLAY CHOKE SAND | LIMESTONE | SHALE COLORED | |
| CLAYSTONE | SIDERITE or LIMONITE | SHALE GRAY | |

Accessories

Fossils

| |
|--------------|
| ALGAE |
| AMPHIPORA |
| BELEMNITE |
| BIOCLASTIC |
| BRACHIOPOD |
| BRYOZOA |
| CEPHALOPOD |
| CORAL |
| CRINOID |
| ECHINOID |
| FISH |
| FORAMINIFERA |
| FOSSIL |

| |
|----------------|
| GASTROPOD |
| INOCERAMUS |
| 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 |
| MARCASITE |
| MARLSTONE |
| MICACEOUS |
| MINERAL CRYSTALS |
| NODULES |
| PHOSPHATE PELLETS |
| PYRITE |
| SALT CAST |
| SANDY |
| SIDERITE |
| 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

| |
|--------------------|
| E EARTHY |
| F FENESTRAL |
| F FRACTURE |
| X INTERCRYSTALLINE |
| O INTEROOLITIC |
| M MOLDIC |

| |
|------------|
| ORGANIC |
| P PINPOINT |
| V VUGGY |

Engineering

| |
|--------------------|
| BIT CHANGE |
| CONNECTION (LEFT) |
| CONNECTION (RIGHT) |
| CONNECTION GAS |
| TRIP GAS |
| DOWN TIME GAS |
| CORE - LOST |
| CORE - RECOVERED |
| DST INTERVAL |

| |
|-----------------------|
| FAULT |
| FORMATION TOP |
| GAS SHOW |
| OIL SHOW |
| MN DEPTH |
| MN DEPTH (RIGHT) |
| NORMAL FAULT |
| OVERTURNED STRATA |
| REVERSE FAULT |
| CASING |
| SIDEWALL CORE (LEFT) |
| SIDEWALL CORE (RIGHT) |
| SLIDE |
| SURVEY |

| |
|------------------------|
| DRILL STEM TEST |
| WIRELINE TESTED - LEFT |
| WIRELINE TESTED - RT |

Rounding

| |
|-----------|
| A ANGULAR |
| R ROUNDED |
| S SUBANG |
| SUBRND |

Textures

| |
|--------------|
| B BOUNDSTONE |
| C CHALKY |
| C CRYPTOXLN |

| |
|----------------|
| E EARTHY |
| F FINELYXLN |
| G GRAINSTONE |
| L LITHOGRAPHIC |
| M MICROXLN |
| MS MUDSTONE |
| PS PACKSTONE |
| WS WACKESTONE |

Sorting

| |
|------------|
| M MODERATE |
| P POOR |
| W WELL |

ROP
ROP

One-Man Strip Logging
Rigged Up 10/10/2015
Began Logging @ 1668' @
0900 hrs MST on 10/11/15

0.16 min/ft

0 ROP (min/ft) 2

WOB: 18.4 klbs
ROP: 337 ft/hr
SPP: 1286 psi
RPM: 42
Strokes: 48 spm

0.21 min/ft

0 ROP (min/ft) 2

Slide/Rotate

Depth Labels

Total Gas & Chromatograph

GAS
C1
C2
C3
C4
C5

Bit #: 2
Type: MM55
Size: 7.875"
Depth In: 1668'
Depth Out: 8574'
Hours: 62
Avg Ft/Hr: 111
Jets: 5x12
S/N: 12708751

1,640

1,650

1,660

1,670

1,680

1,690

1,700

1,710

1,720

1,730

1,740

1,750

1,760

1,770

1,780

1,790

1,800

1,810

1,820

43u

MD: 1,693'
TVD: 1,578'
Inclination: 33.71°
Azimuth: 132.51°

GAS (units) 250
C1-C5 (units) 250

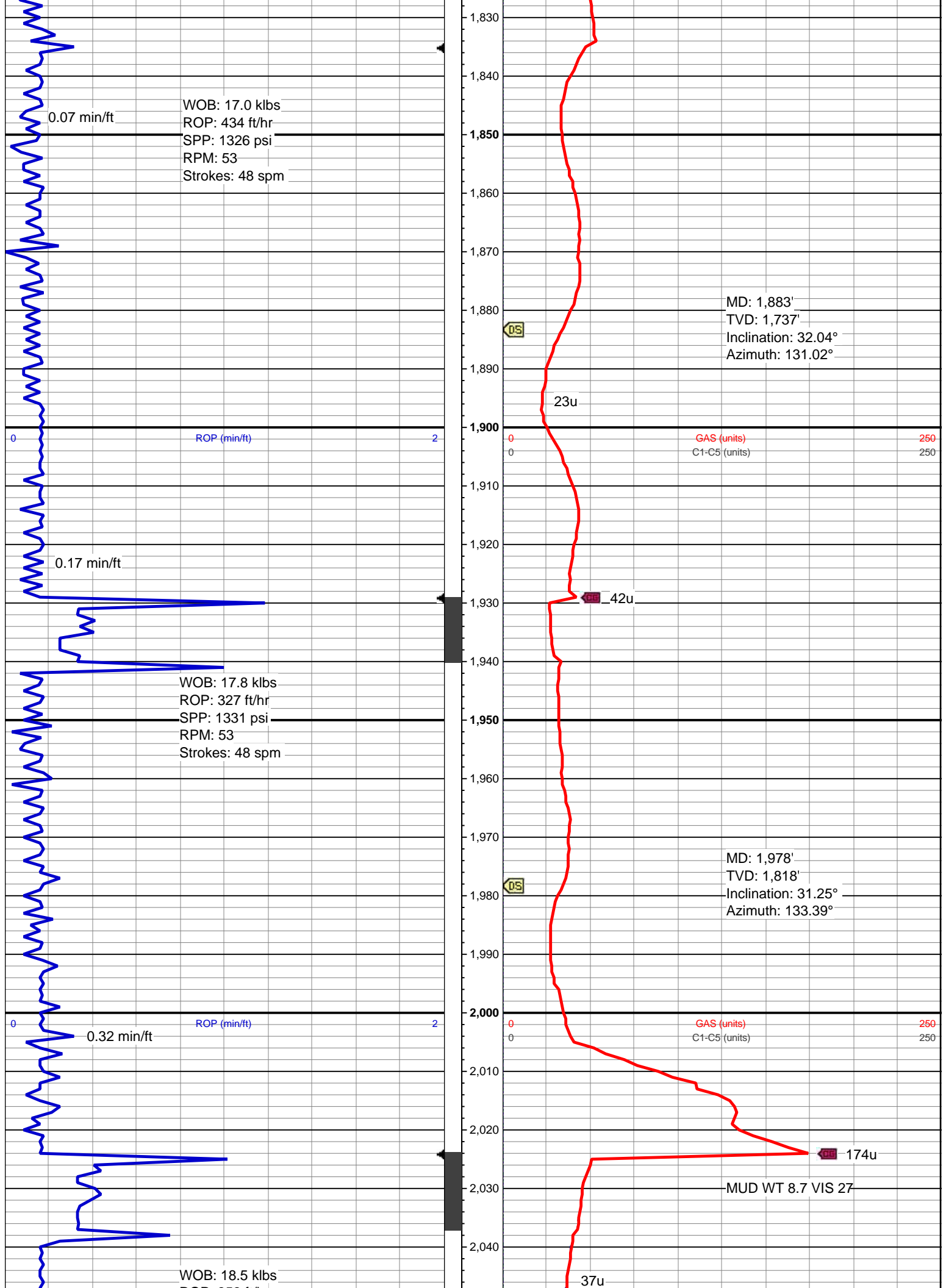
35u

MD: 1,788'
TVD: 1,657'
Inclination: 32.83°
Azimuth: 131.37°

GAS (units) 250
C1-C5 (units) 250

MUD WT 8.6 VIS 27

50u



Strokes: 49 spm

0.16 min/ft

ROP (min/ft)

Strokes: 49 spm

0.25 min/ft

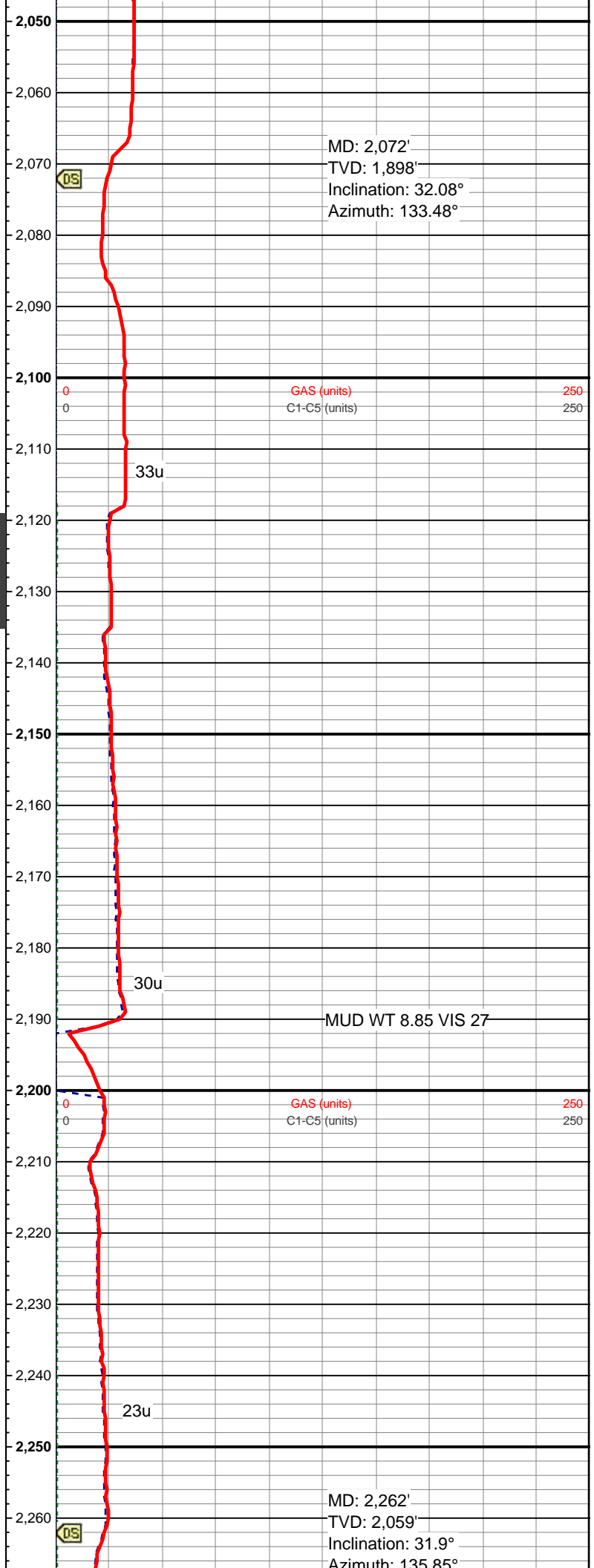
ROP (min/ft)

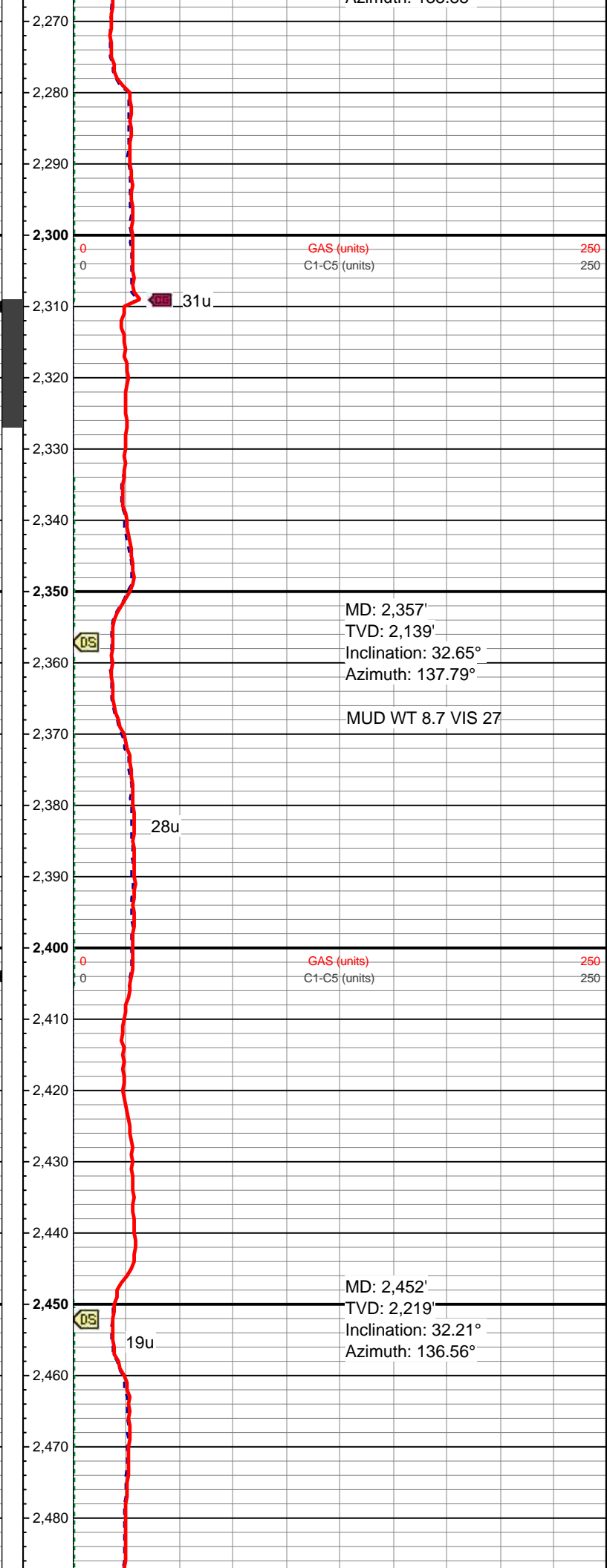
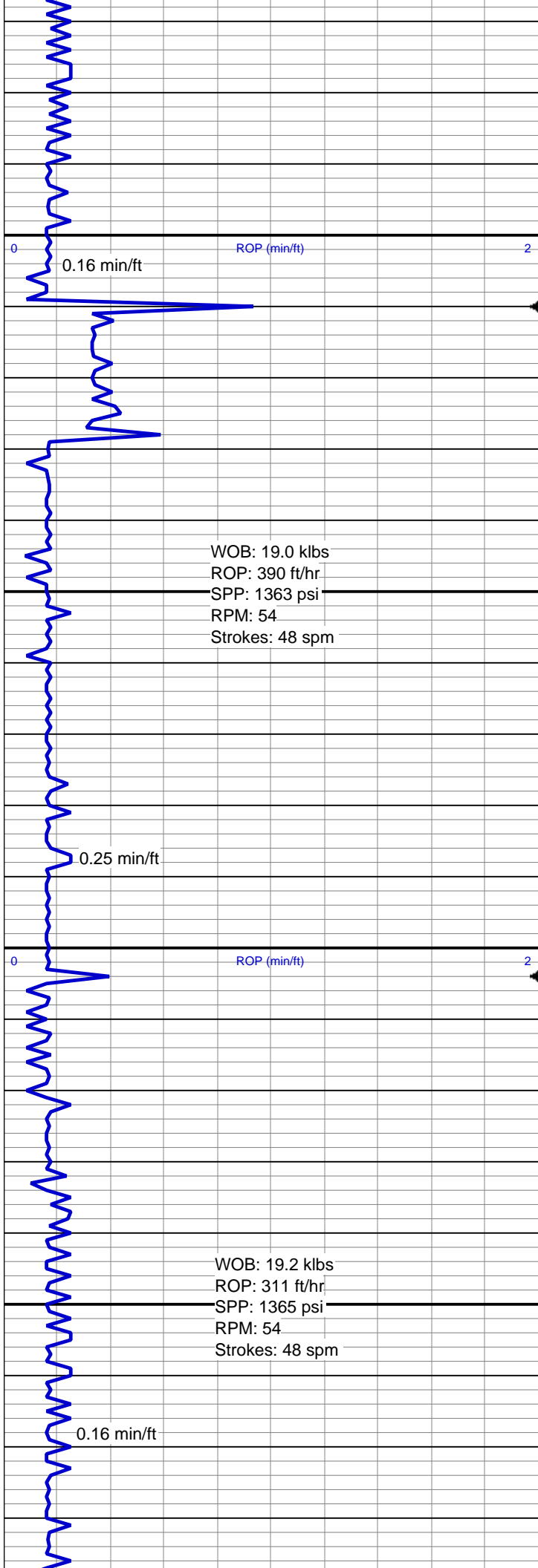
0.25 min/ft

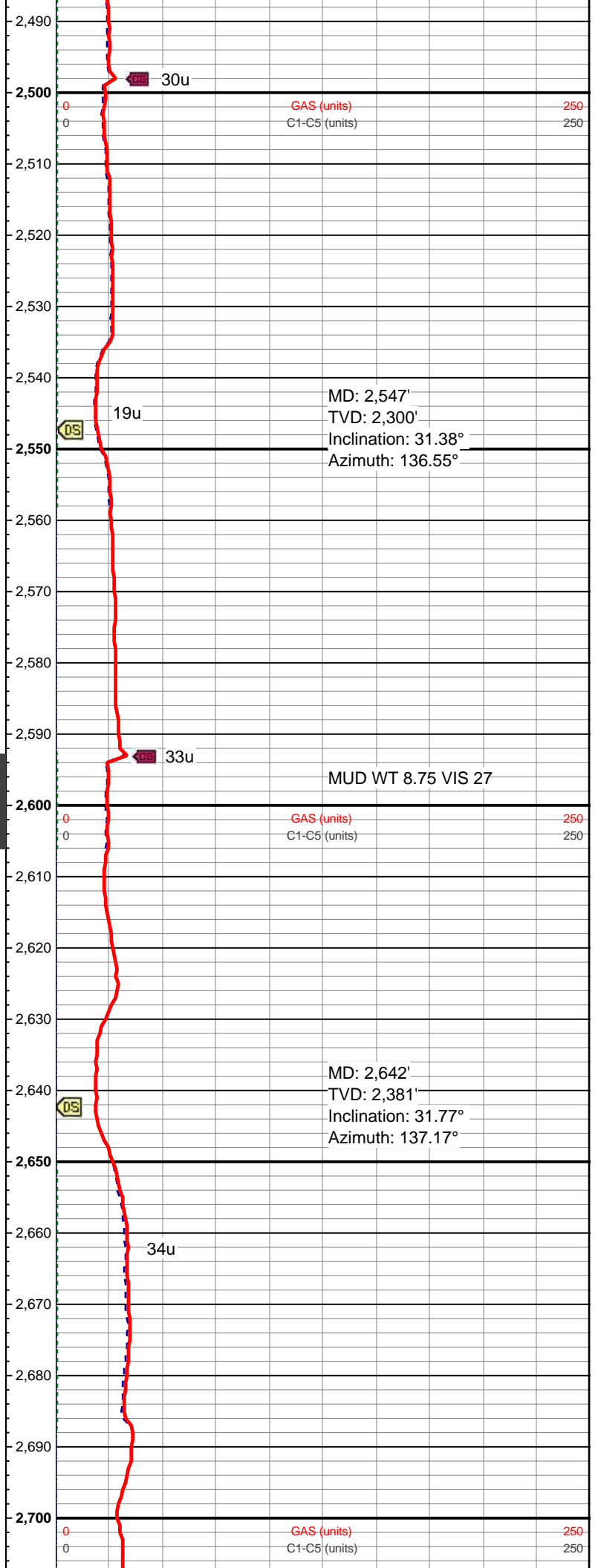
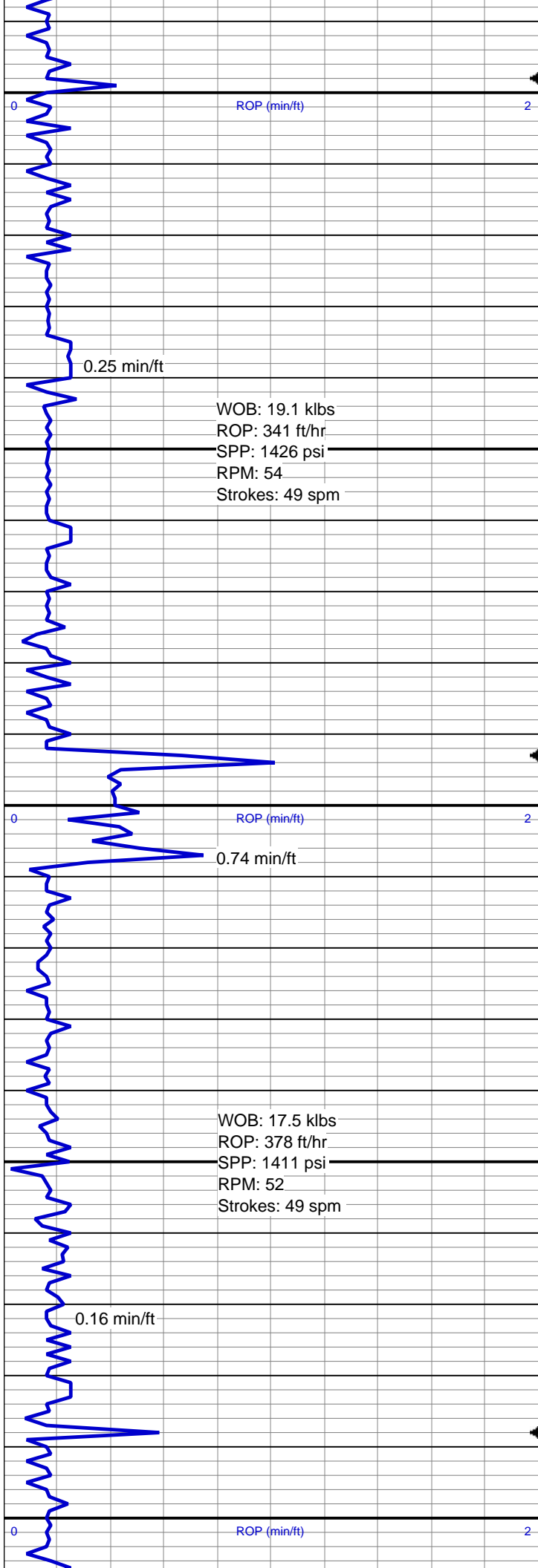
Strokes: 48 spm

Azimuth: 133.48°

—MUD WT 8.85 VIS 27—

Azimuth: 135.85° 





WOB: 18.7 klbs
ROP: 398 ft/hr
SPP: 1443 psi
RPM: 54
Strokes: 49 spm

0.25 min/ft

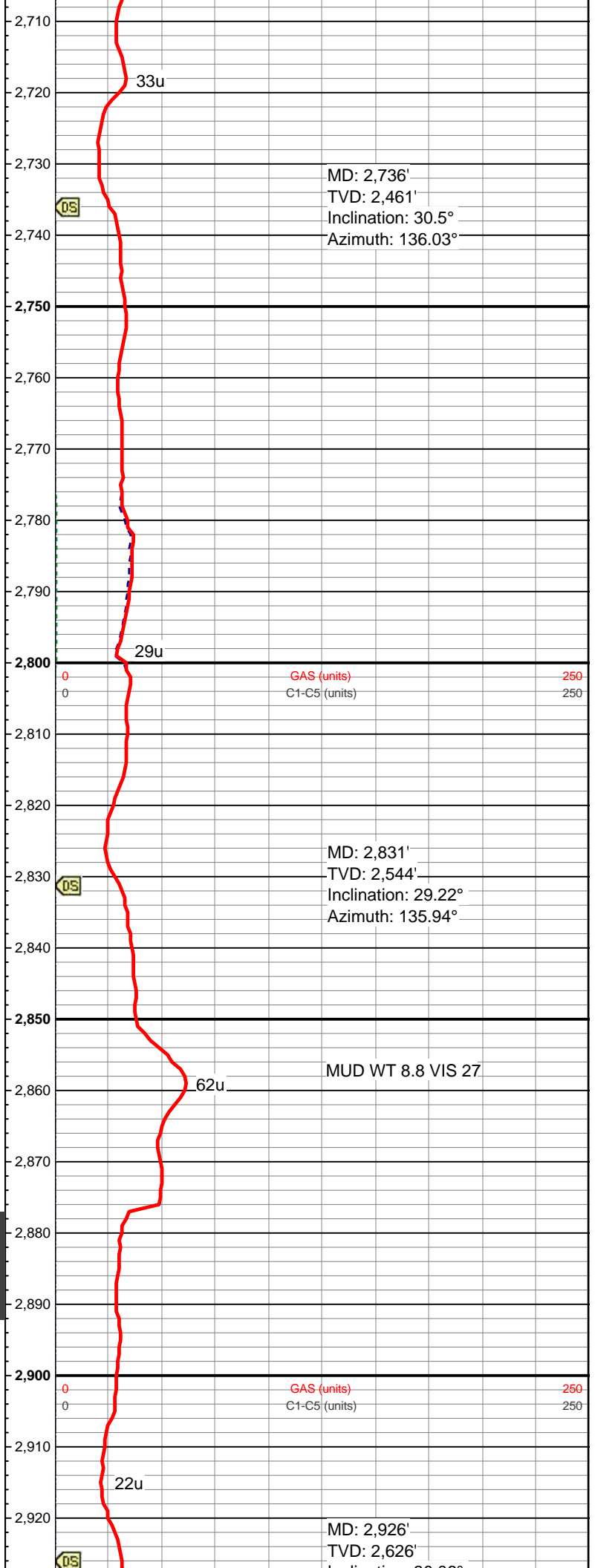
ROP (min/ft)

WOB: 18.5 klbs
ROP: 364 ft/hr
SPP: 1462 psi
RPM: 54
Strokes: 49 spm

0.33 min/ft

ROP (min/ft)

0.16 min/ft



WOB: 18.3 klbs
ROP: 390 ft/hr
SPP: 1433 psi
RPM: 55
Strokes: 49 spm

0.42 min/ft

ROP (min/ft)

WOB: 18.5 klbs
ROP: 256 ft/hr
SPP: 1477 psi
RPM: 53
Strokes: 50 spm

0.16 min/ft

ROP (min/ft)

WOB: 18.5 klbs
ROP: 201 ft/hr

Inclination: 30.06°
Azimuth: 134.89°

108u

GAS (units)
C1-C5 (units)

250
250

25u

MD: 3,021'
TVD: 2,708'
Inclination: 30.23°
Azimuth: 134.36°

116u

100u

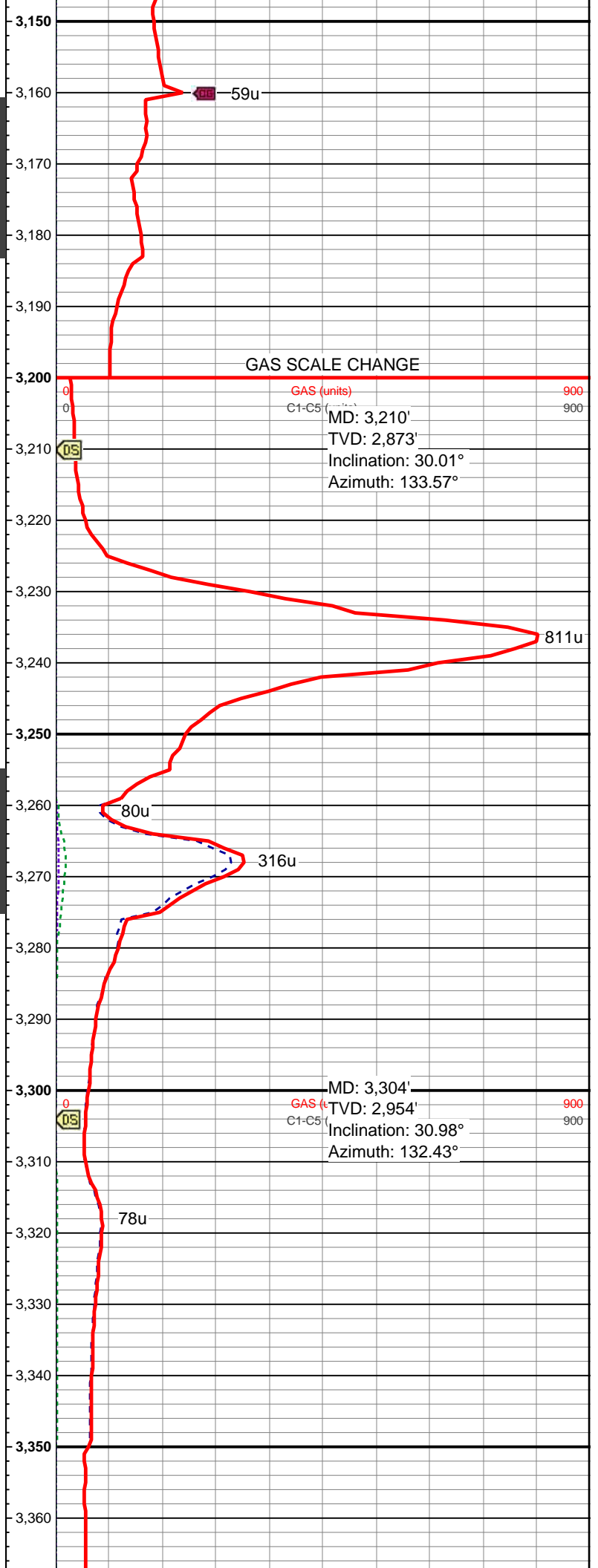
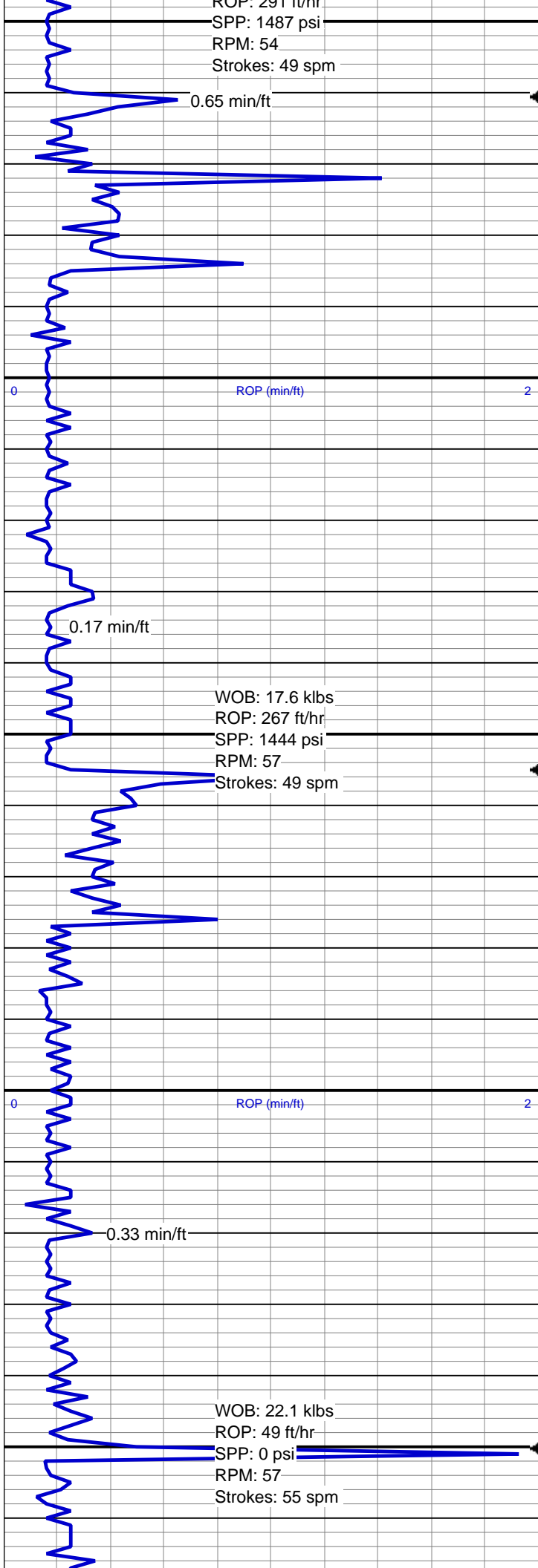
GAS (units)
C1-C5 (units)

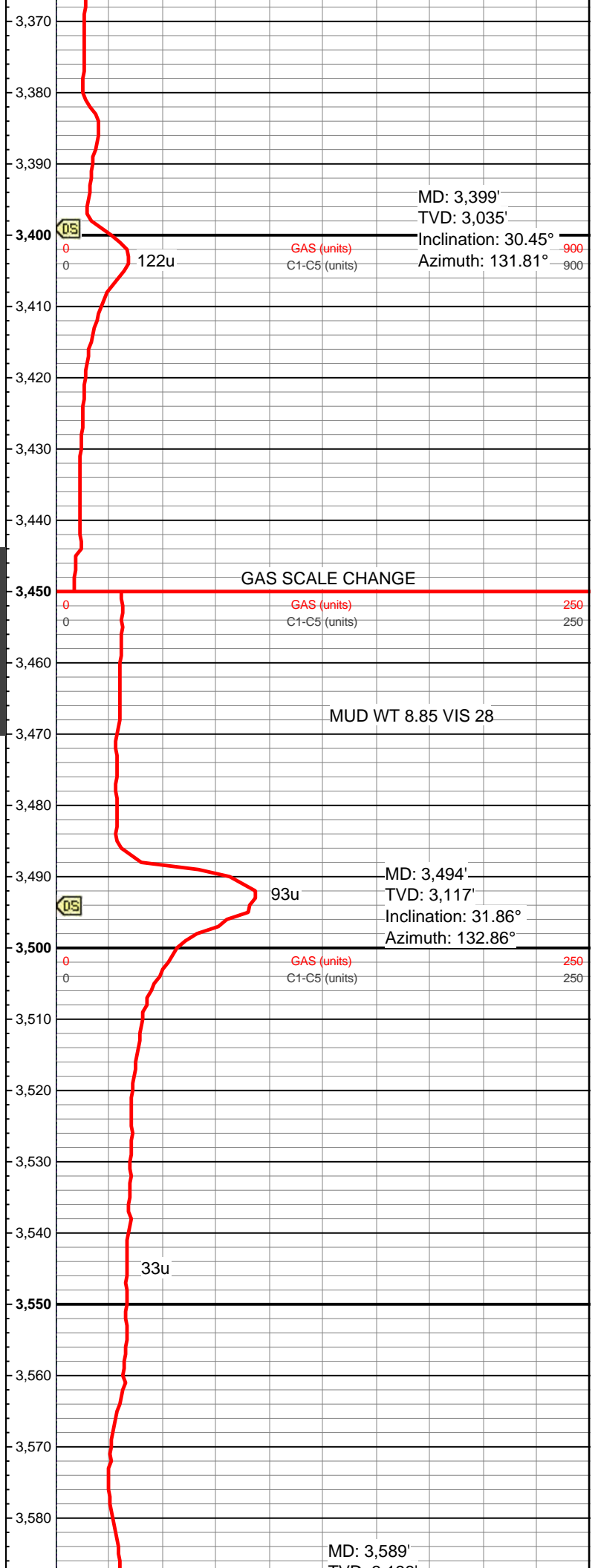
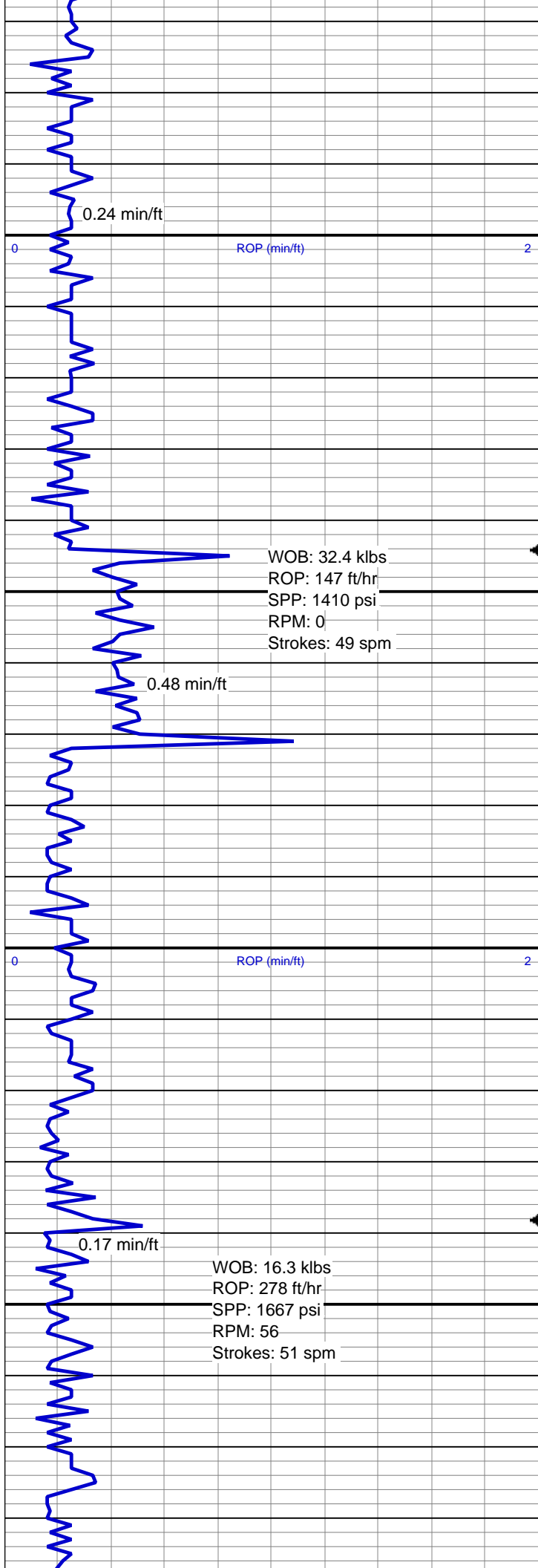
250
250

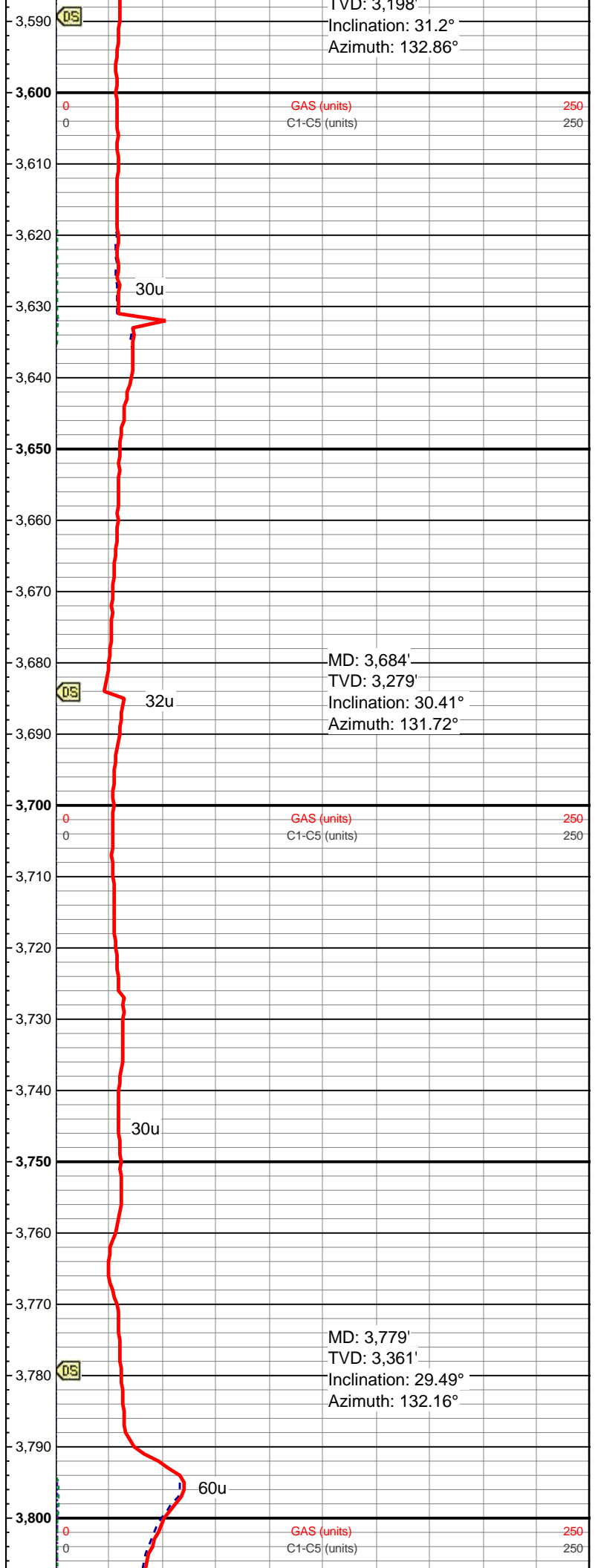
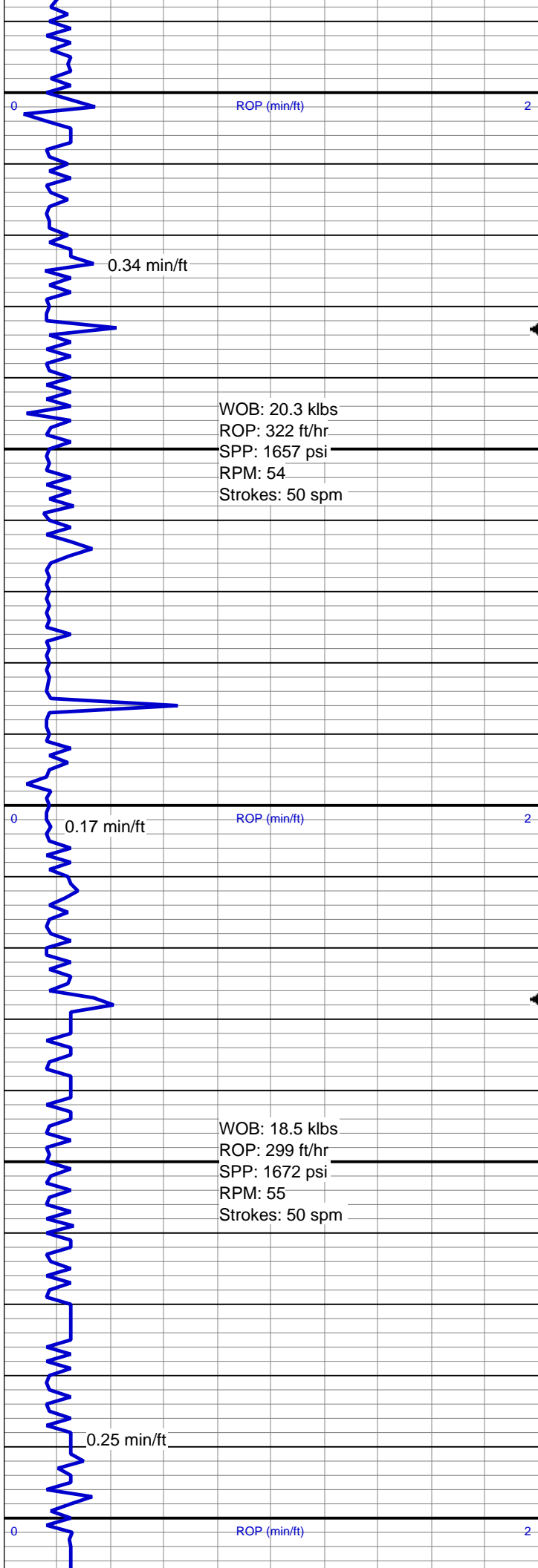
MD: 3,115'
TVD: 2,790'
Inclination: 29.31°
Azimuth: 133.66°

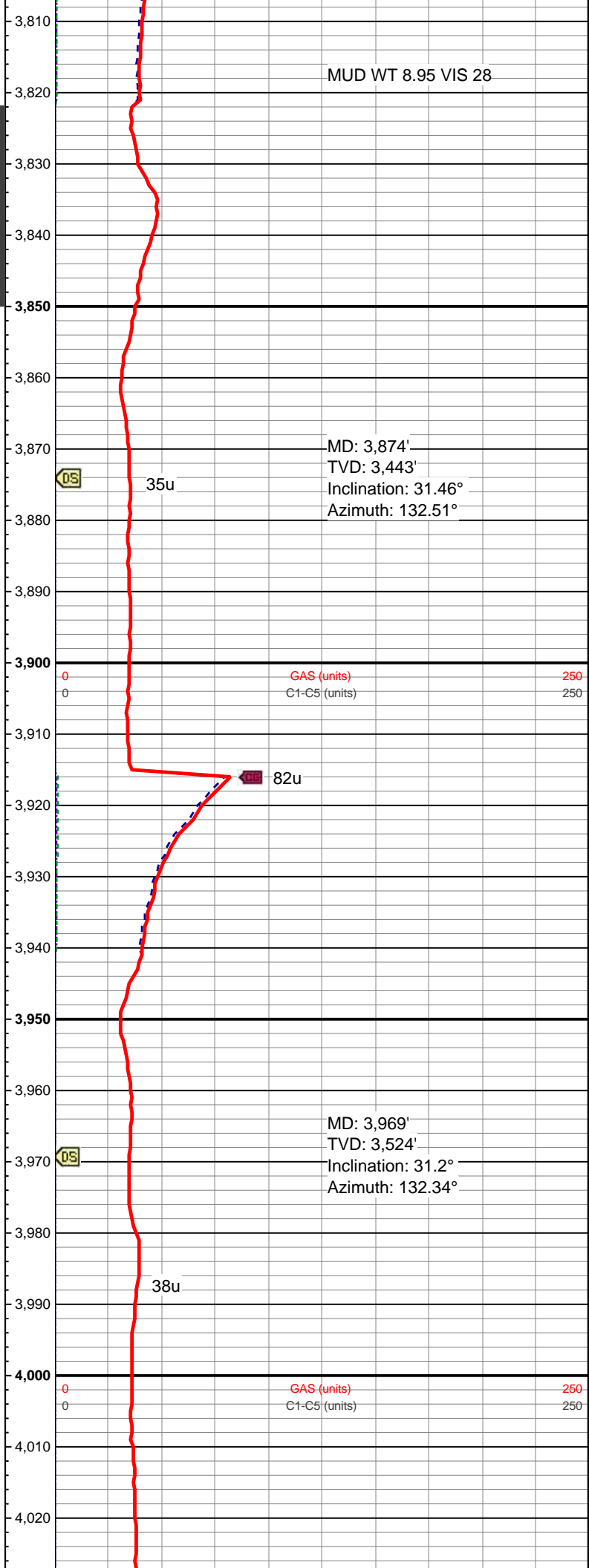
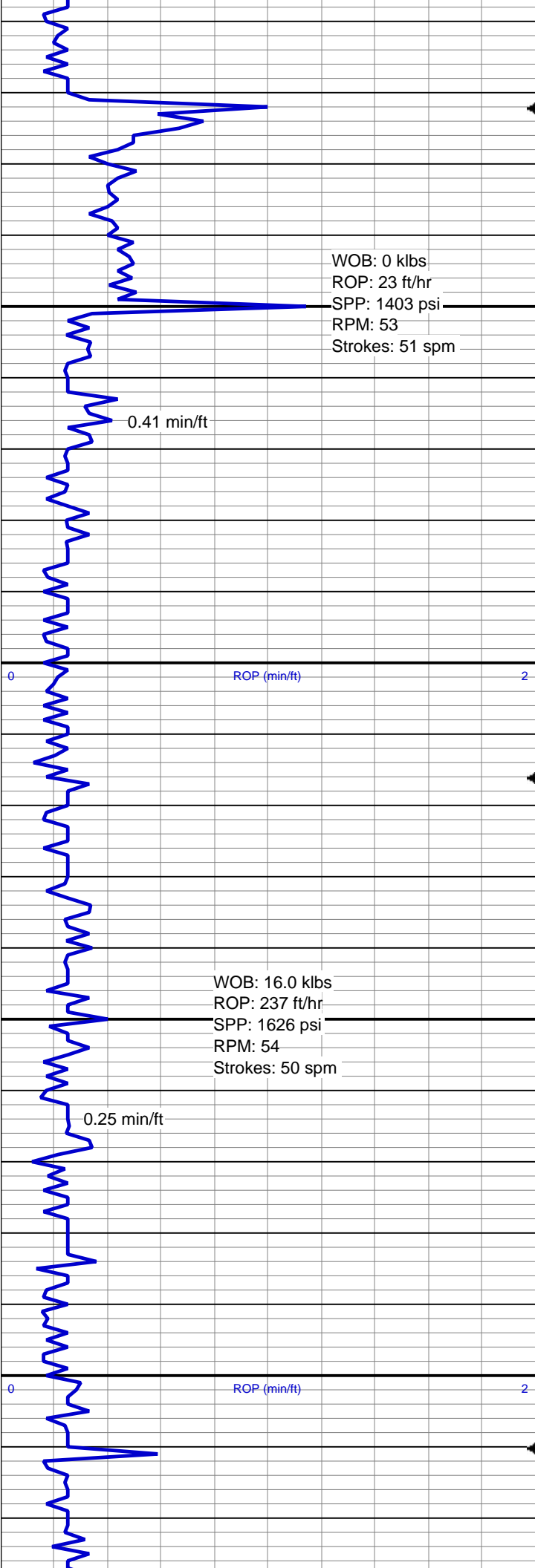
MUD WT 8.85 VIS 27

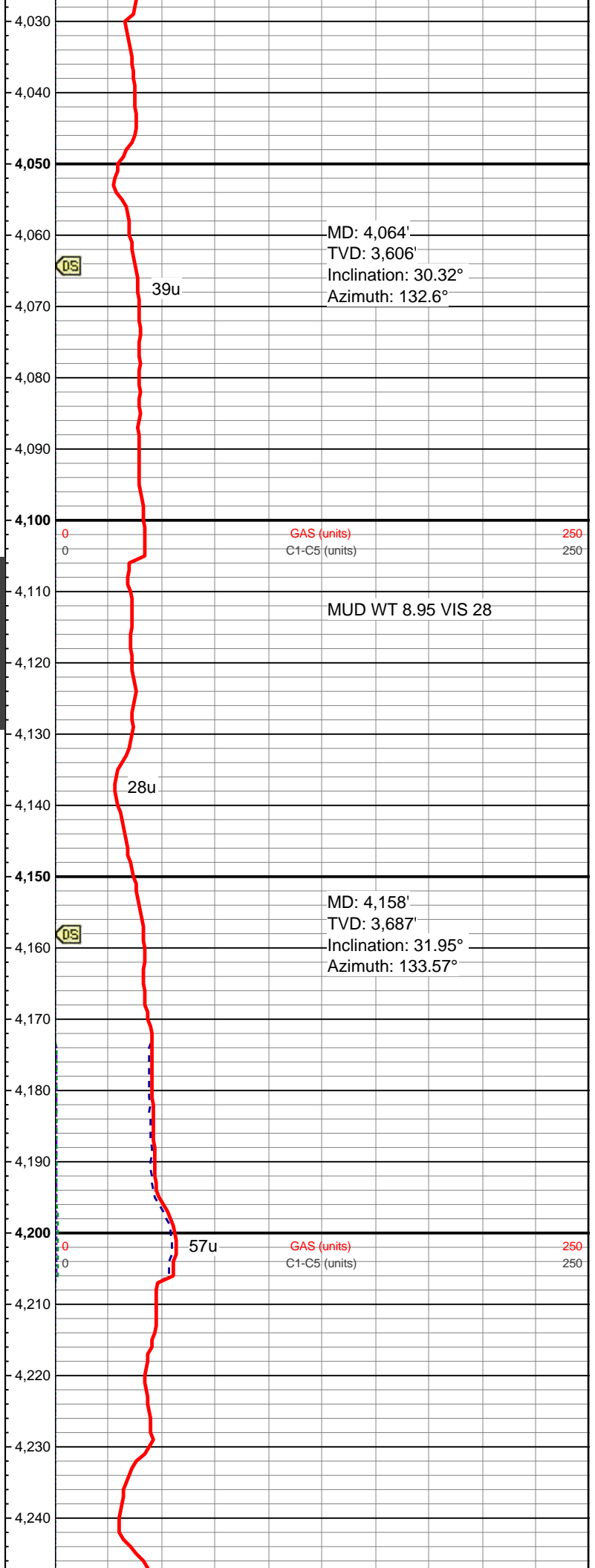
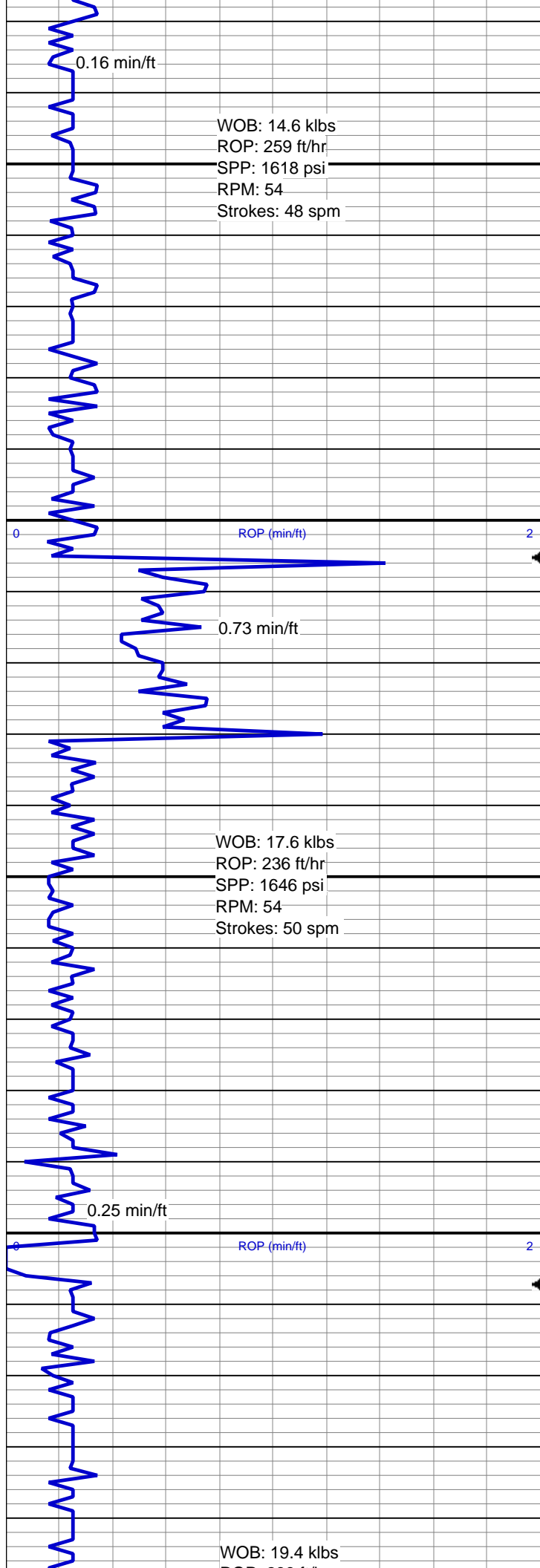
44u











ROP: 288 ft/hr
SPP: 1731 psi
RPM: 55
Strokes: 51 spm

0.34 min/ft

WOB: 17.5 klbs
ROP: 241 ft/hr
SPP: 1670 psi
RPM: 52
Strokes: 49 spm

0.25 min/ft

0.67 min/ft

WOB: 18.1 klbs
ROP: 278 ft/hr
SPP: 1730 psi
RPM: 54
Strokes: 50 spm

0.34 min/ft

10/11/15
MINDEPTH
10/12/15

MD: 4,253'
TVD: 3,768'
Inclination: 31.2°
Azimuth: 133.57°

51u

GAS (units)
C1-C5 (units)

250
250

33u

MD: 4,348'
TVD: 3,849'
Inclination: 30.23°
Azimuth: 133.3°

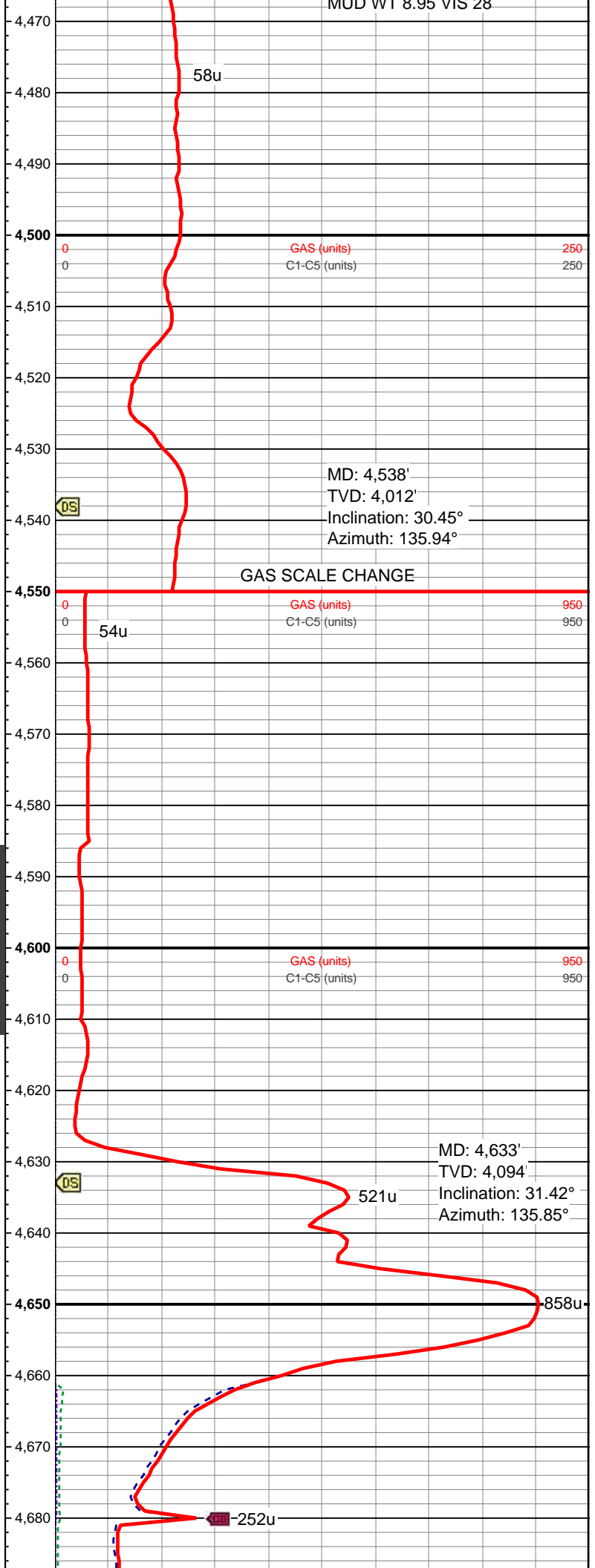
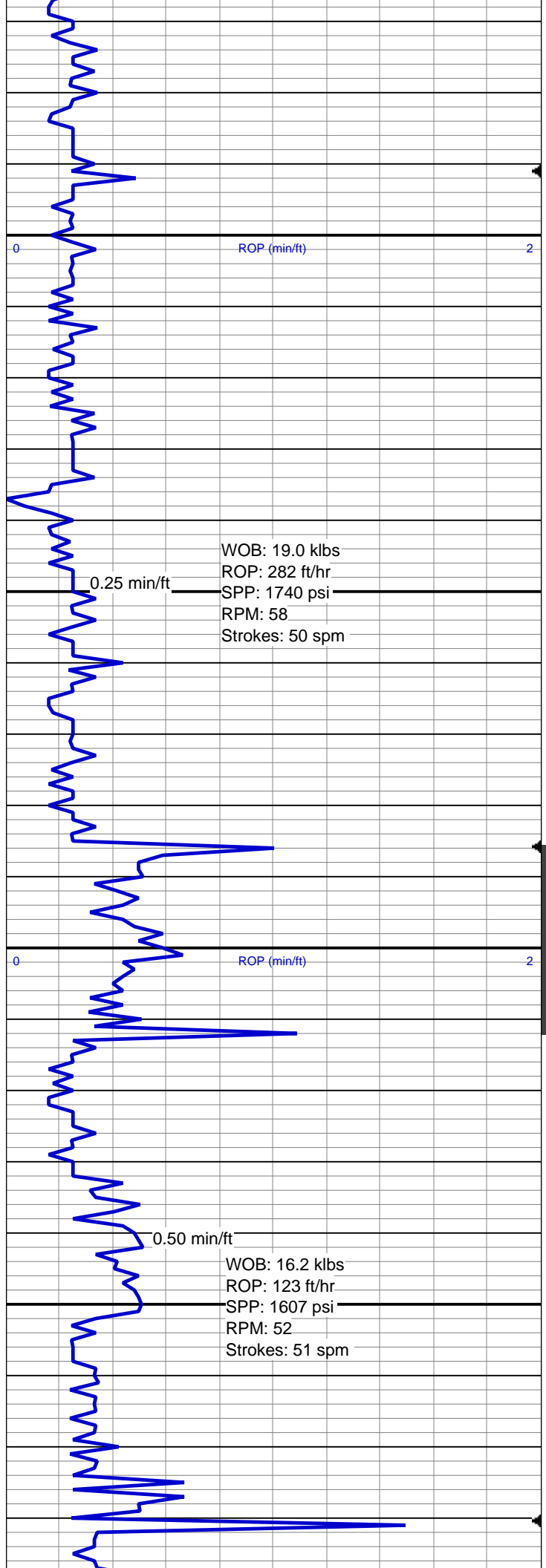
56u

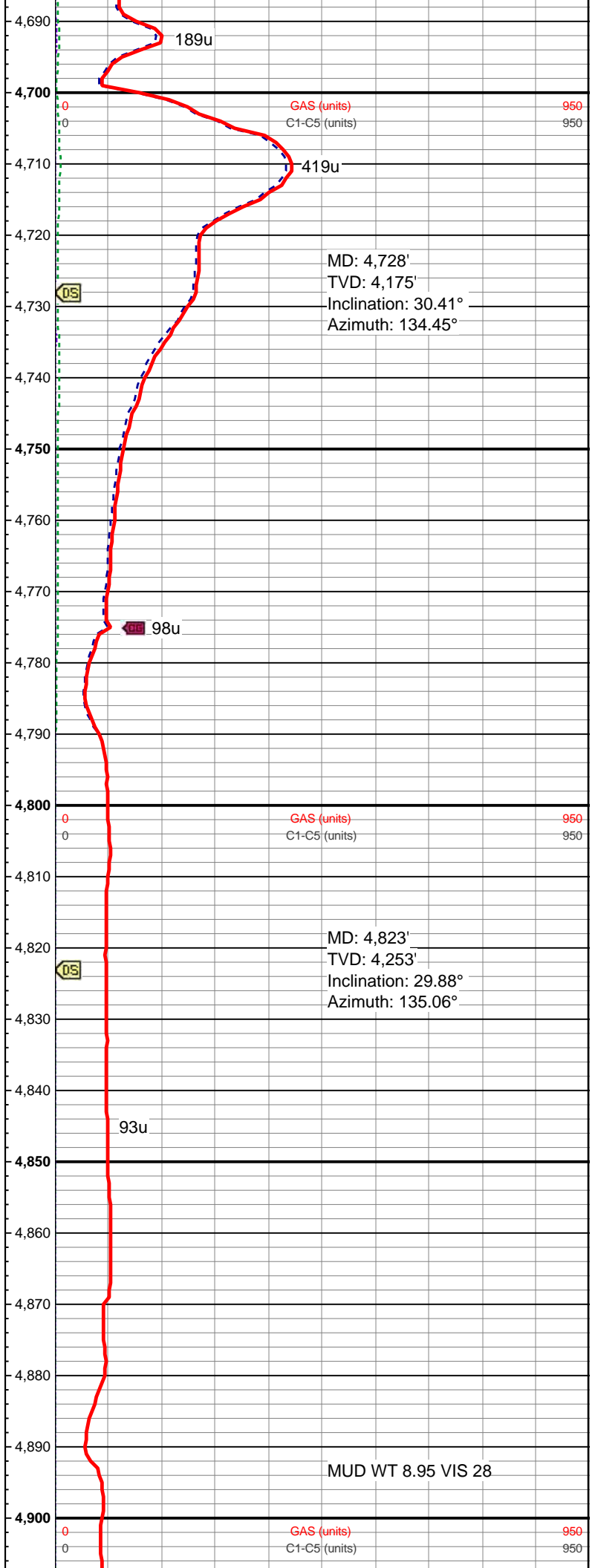
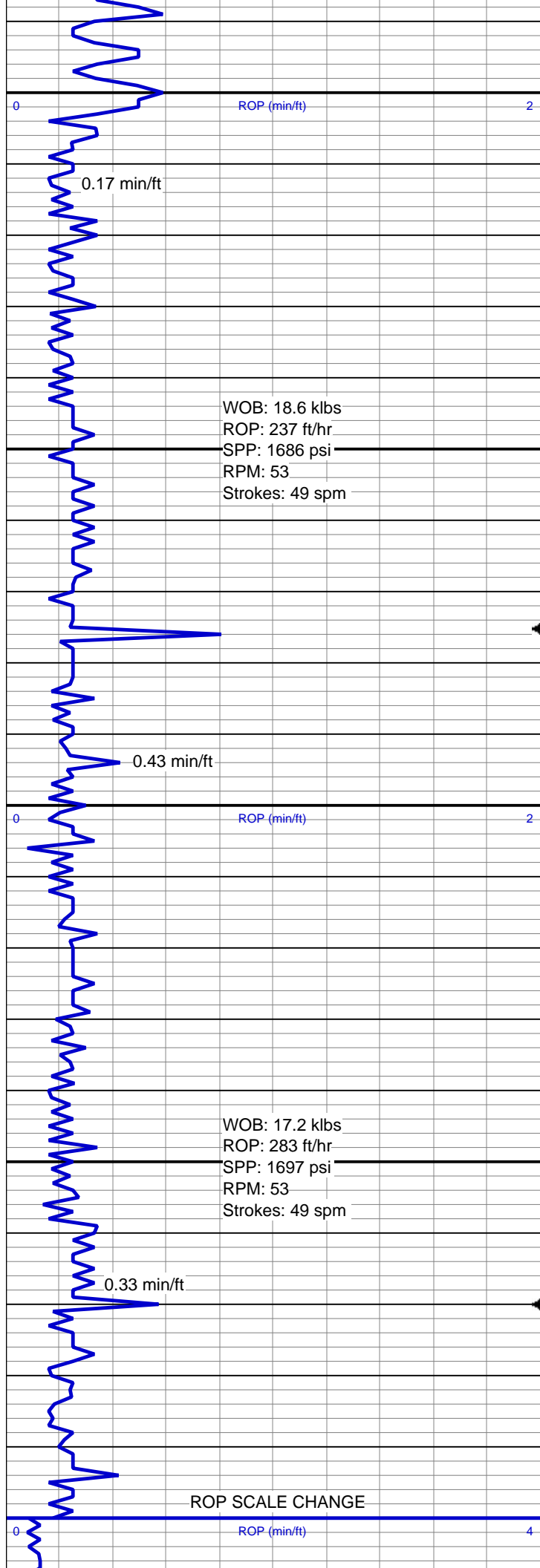
GAS (units)
C1-C5 (units)

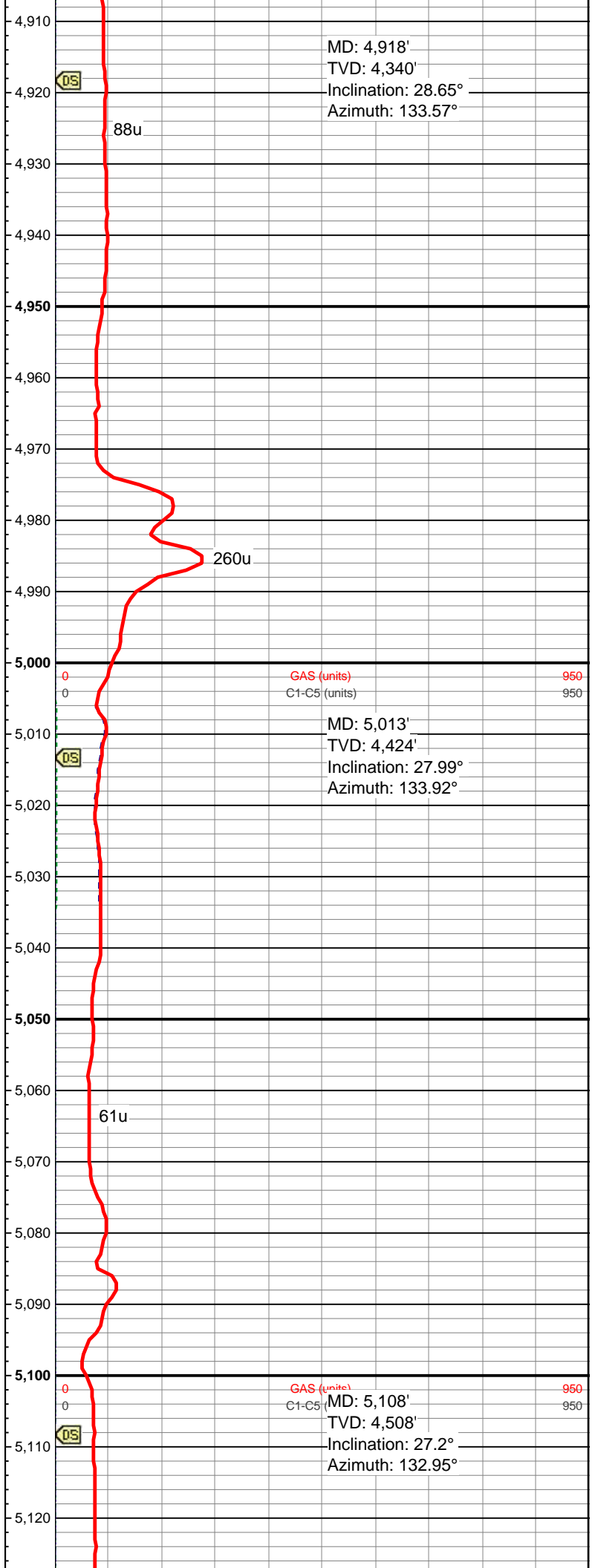
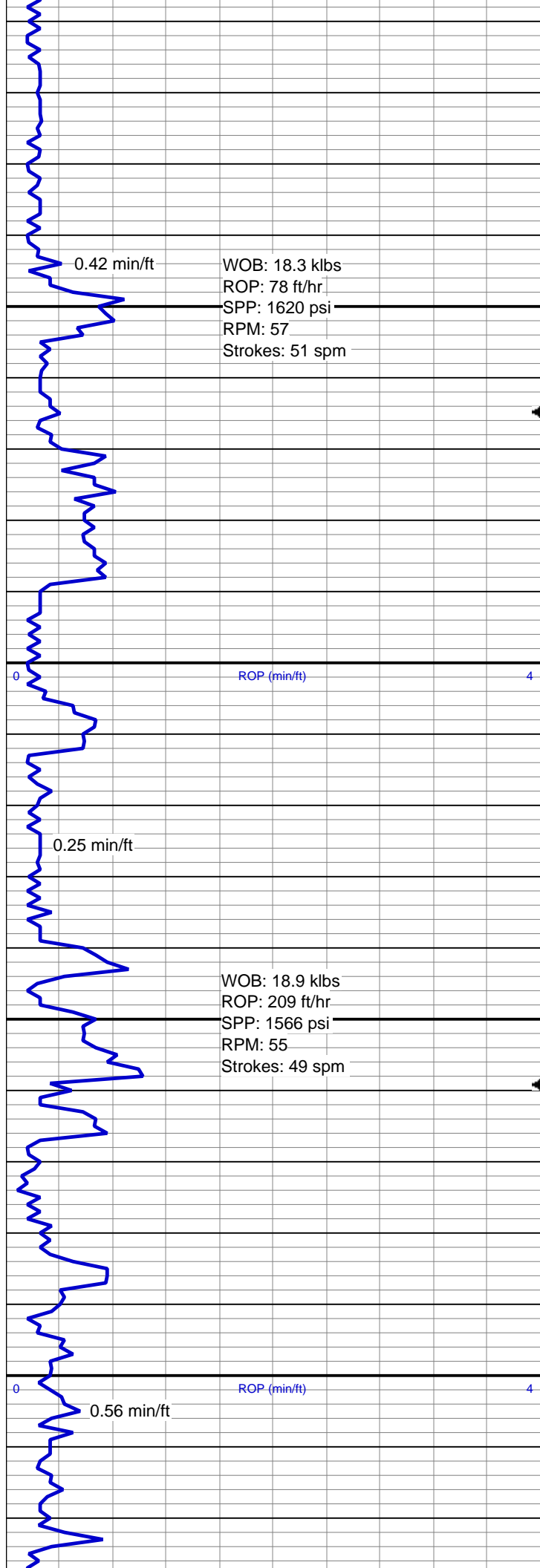
250
250

MD: 4,443'
TVD: 3,931'
Inclination: 31.51°
Azimuth: 135.68°

MUD WT: 9.25 V/G 20







WOB: 16.7 klbs
ROP: 75 ft/hr
SPP: 1599 psi
RPM: 59
Strokes: 51 spm

0.25 min/ft

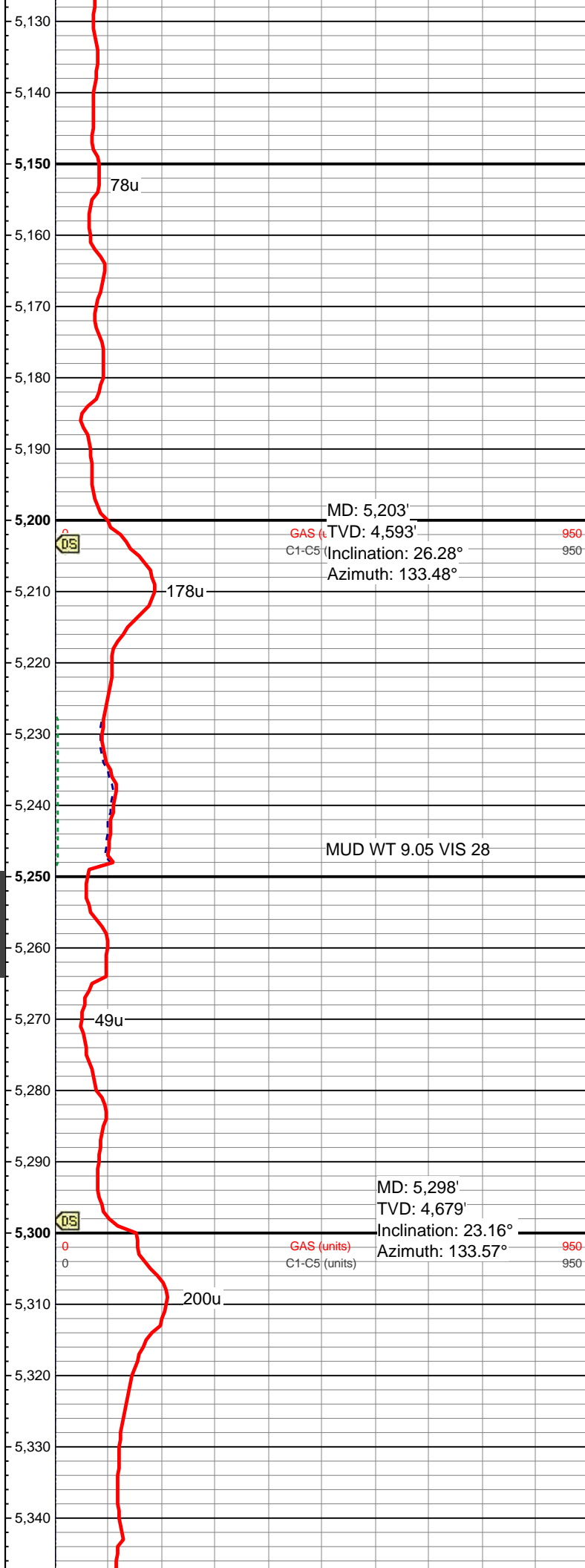
ROP (min/ft)

WOB: 38.0 klbs
ROP: 62.9 ft/hr
SPP: 1577 psi
RPM: 0
Strokes: 50 spm

0.65 min/ft

ROP (min/ft)

WOB: 18.5 klbs
ROP: 62.9 ft/hr
SPP: 1577 psi
RPM: 0
Strokes: 50 spm



ROP: 206 ft/hr
SPP: 1787 psi
RPM: 59
Strokes: 49 spm

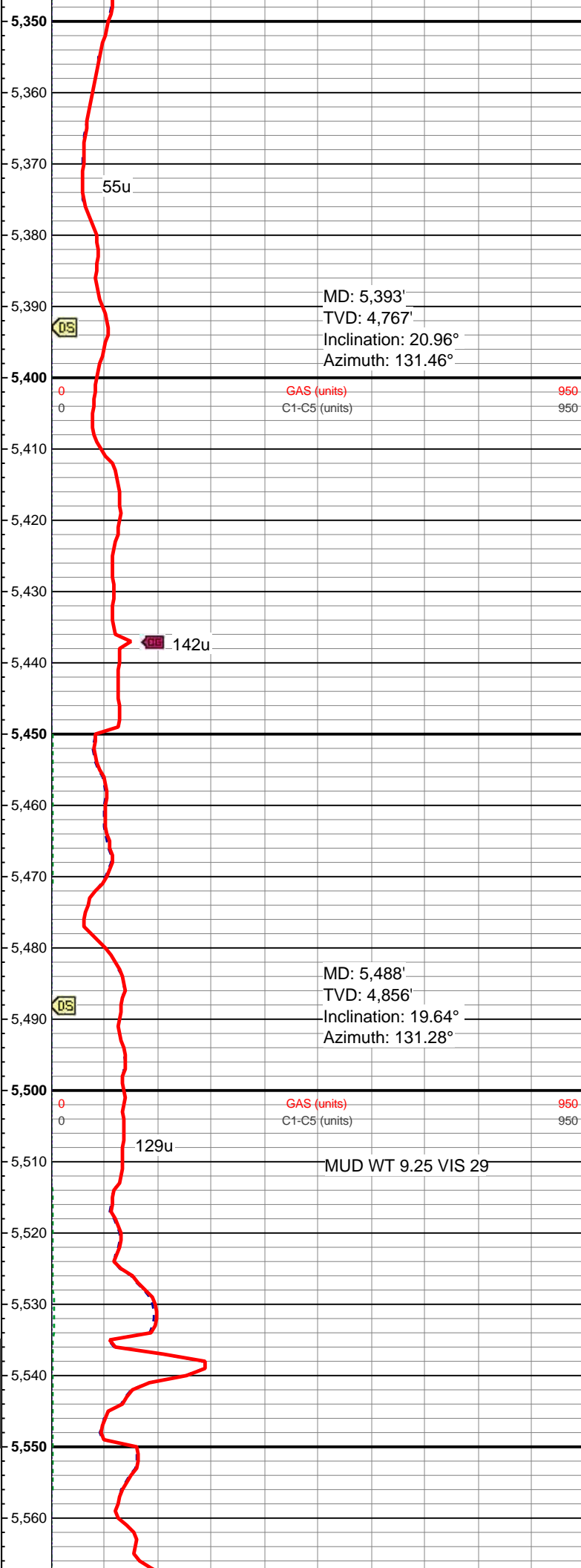
0.26 min/ft

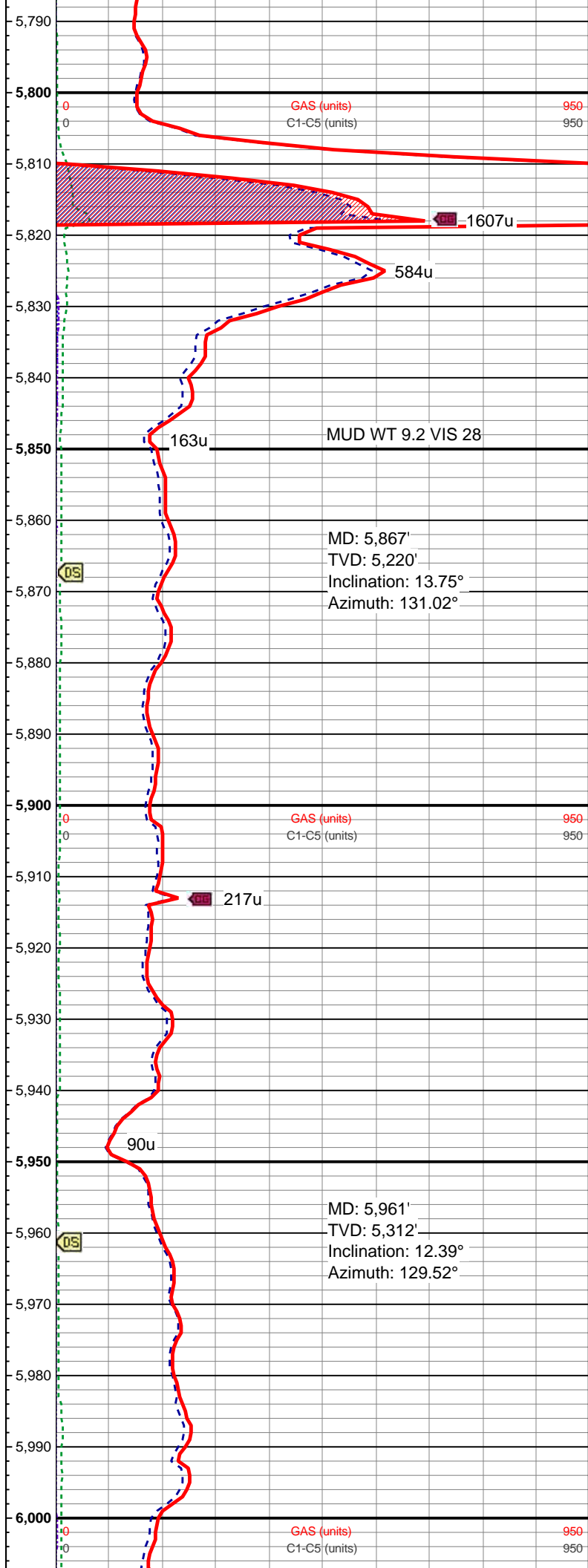
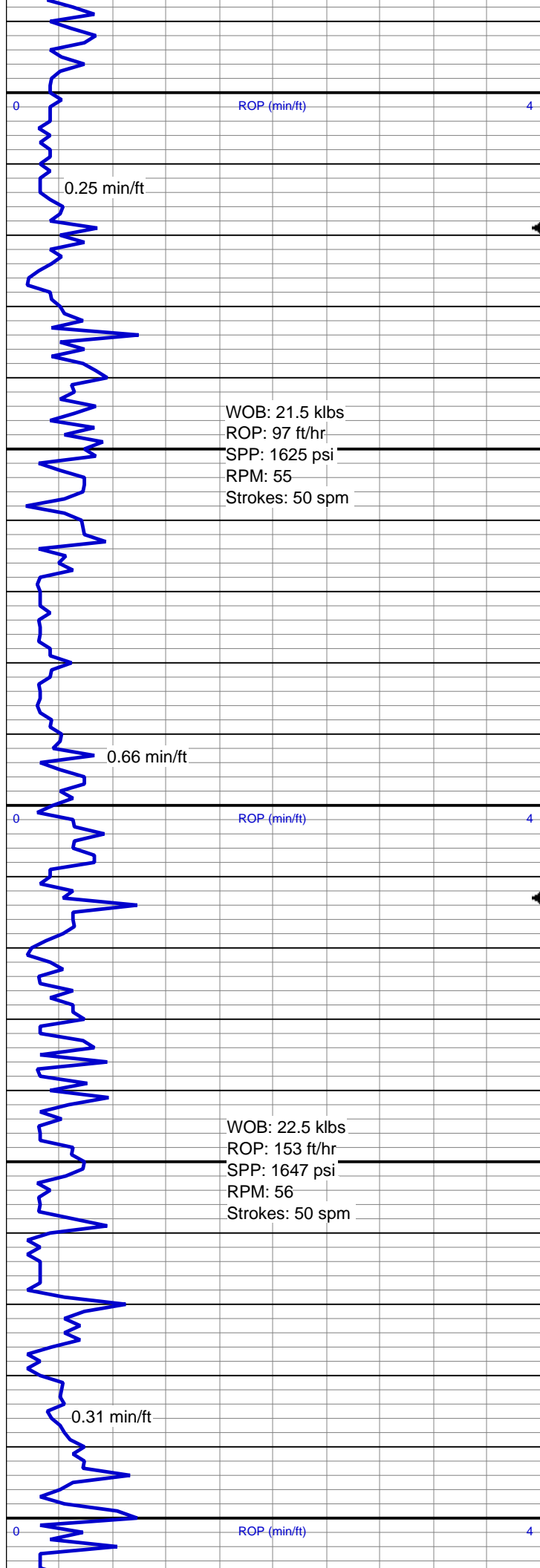
WOB: 20.8 klbs
ROP: 161 ft/hr
SPP: 1696 psi
RPM: 55
Strokes: 48 spm

0.34 min/ft

0.25 min/ft

WOB: 42.2 klbs
ROP: 79 ft/hr
SPP: 1546 psi
RPM: 0
Strokes: 49 spm





WOB: 22.3 klbs
ROP: 158 ft/hr
SPP: 1675 psi
RPM: 55
Strokes: 50 spm

0.89 min/ft

ROP SCALE CHANGE

ROP (min/ft)

WOB: 20.5 klbs
ROP: 115 ft/hr
SPP: 1696 psi
RPM: 58
Strokes: 49 spm

0.25 min/ft

ROP (min/ft)

2.16 min/ft

197u

MUD WT 9.25 VIS 28

MD: 6,056'
TVD: 5,405'
Inclination: 11.16°
Azimuth: 133.22°

373u

773u

GAS (units)
C1-C5 (units)

950
950

120u

MUD WT 9.15 VIS 28

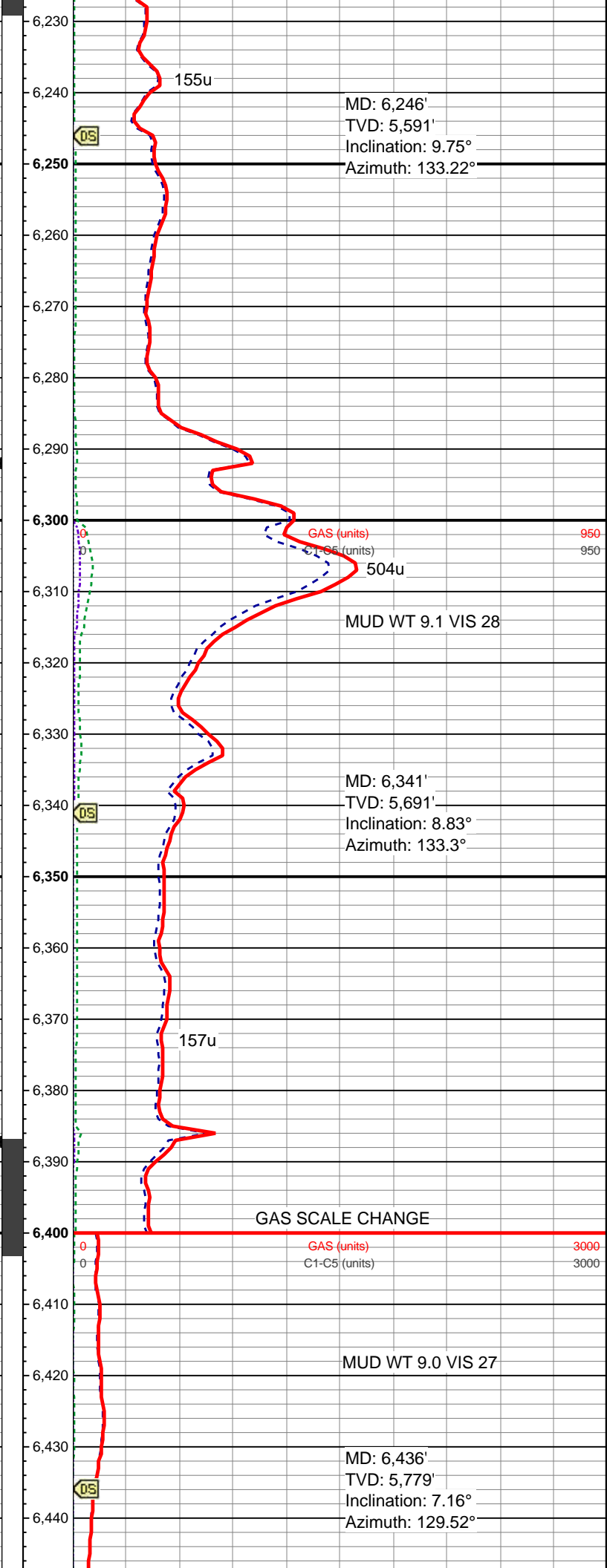
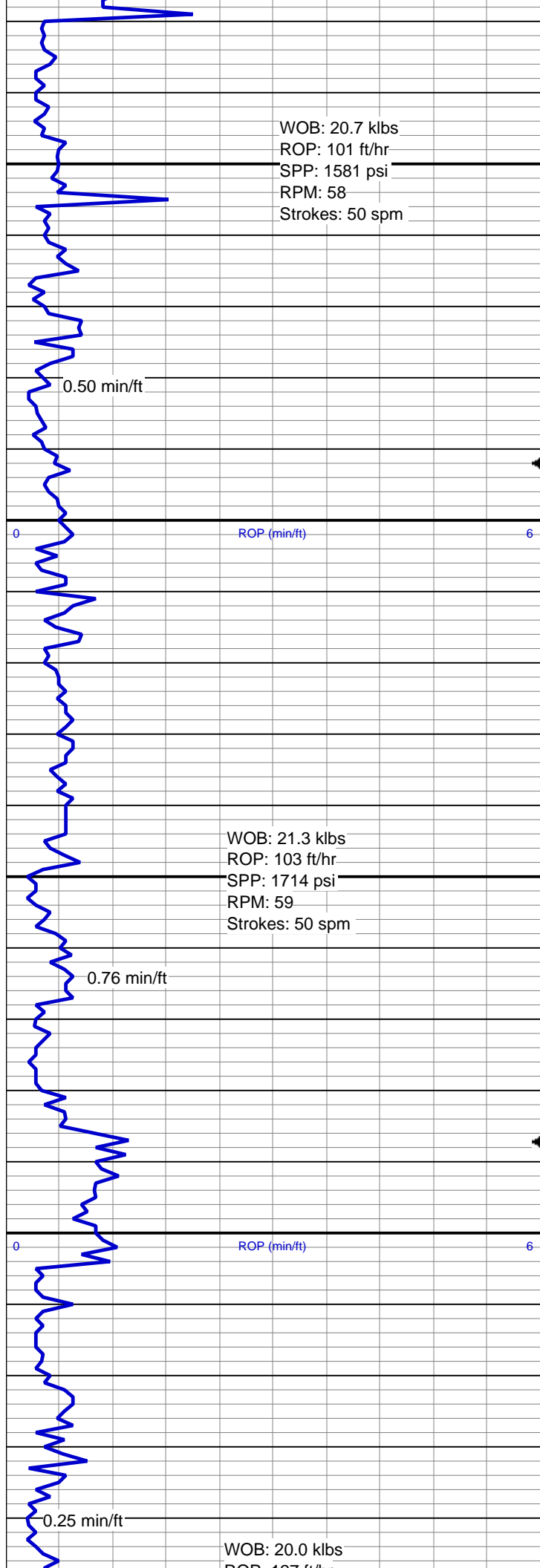
MD: 6,151'
TVD: 5,498'
Inclination: 10.68°
Azimuth: 133.66°

421u

GAS (units)
C1-C5 (units)

950
950

MUD WT 9.15 VIS 28

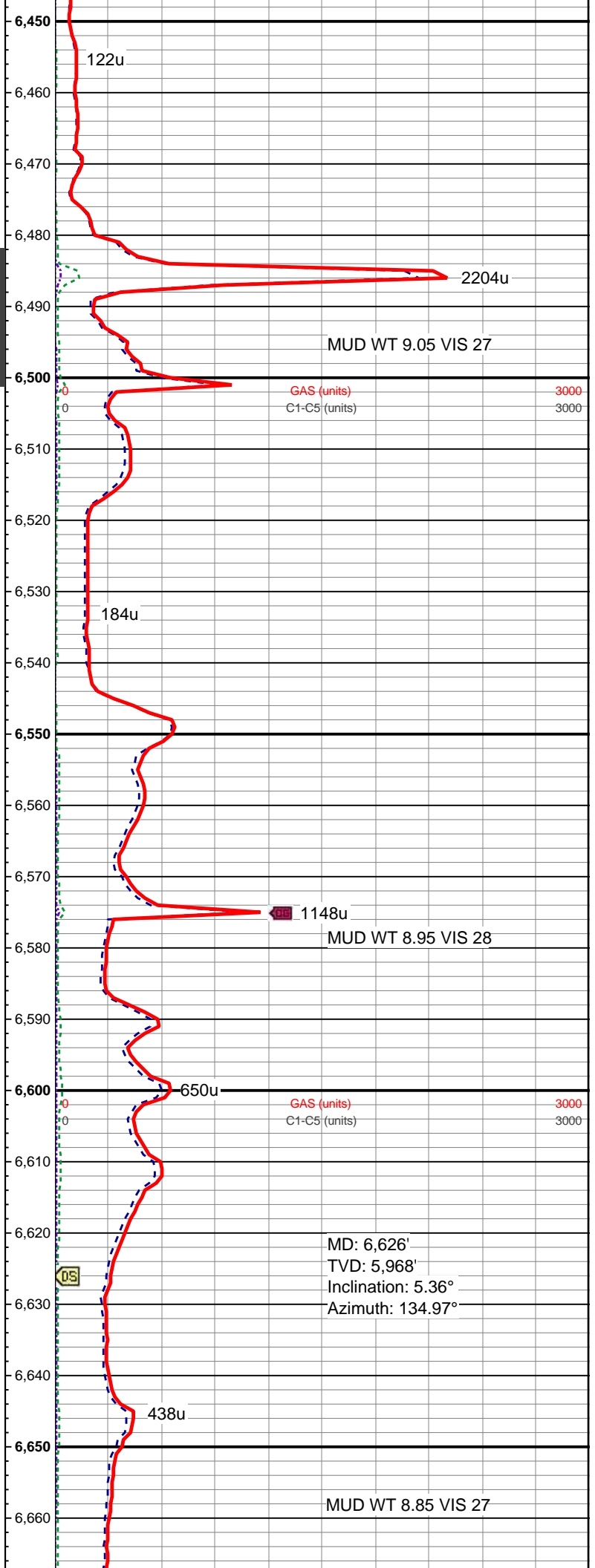


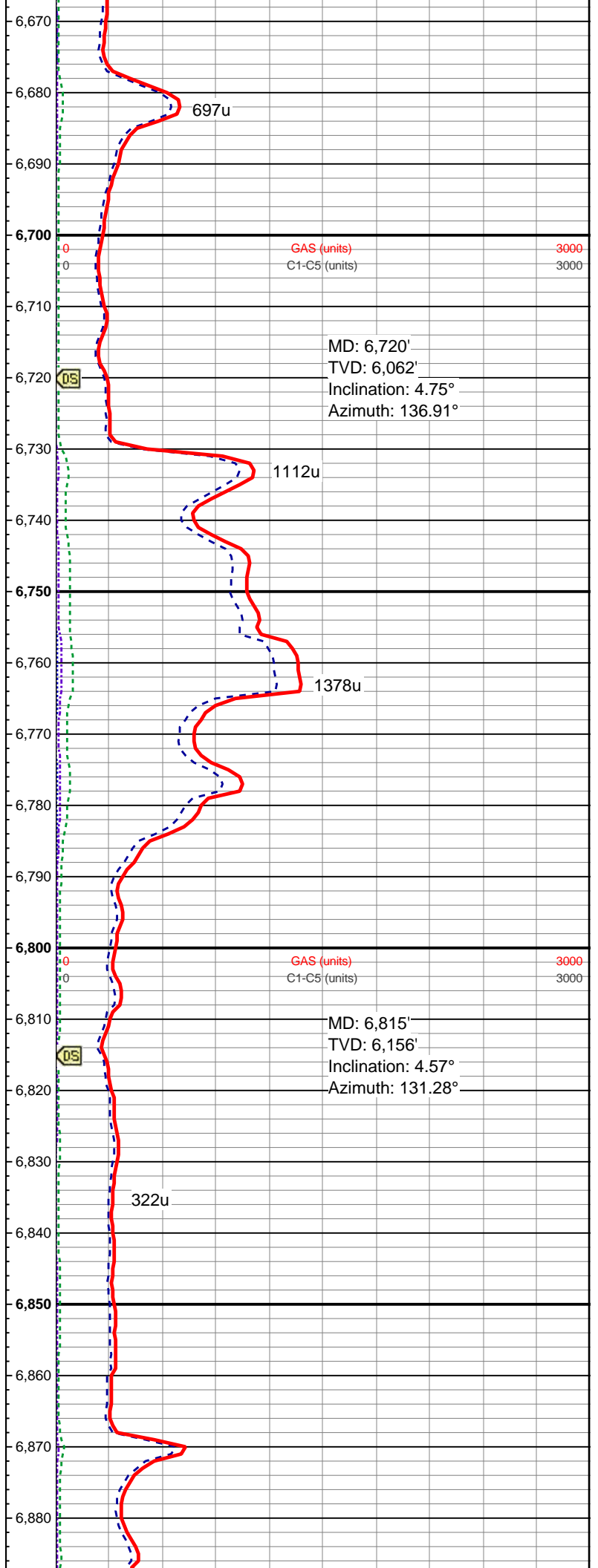
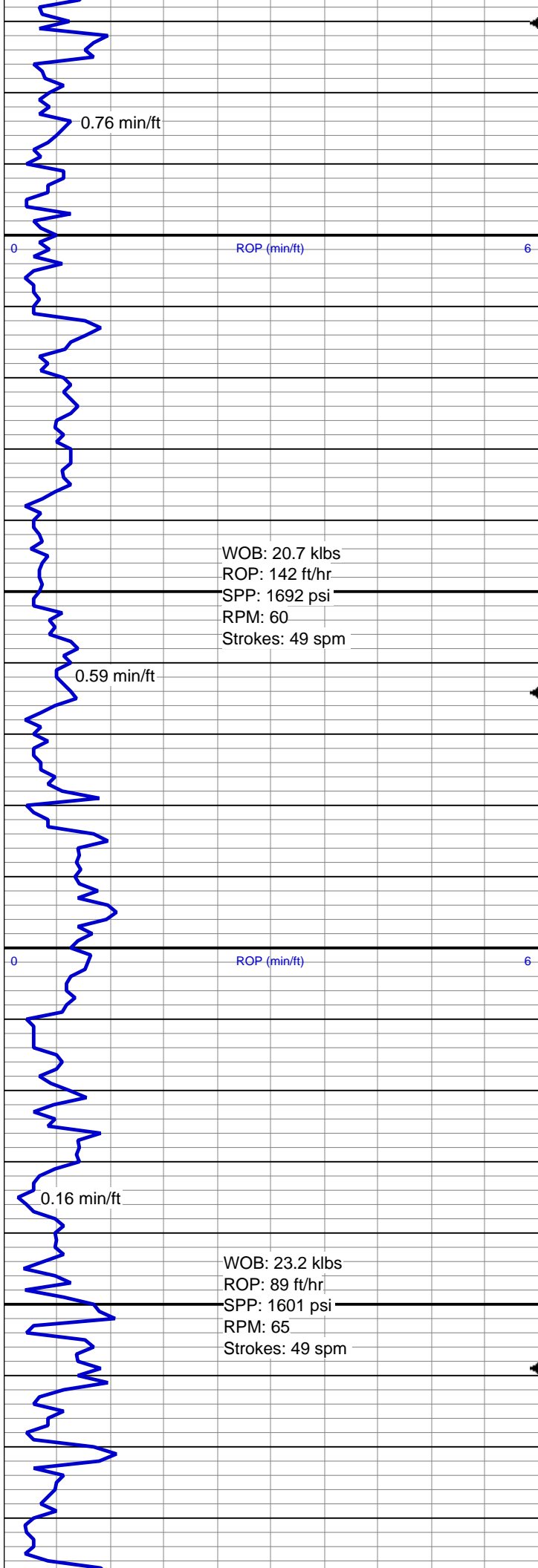
ROP: 127 ft/hr
SPP: 1732 psi
RPM: 60
Strokes: 50 spm

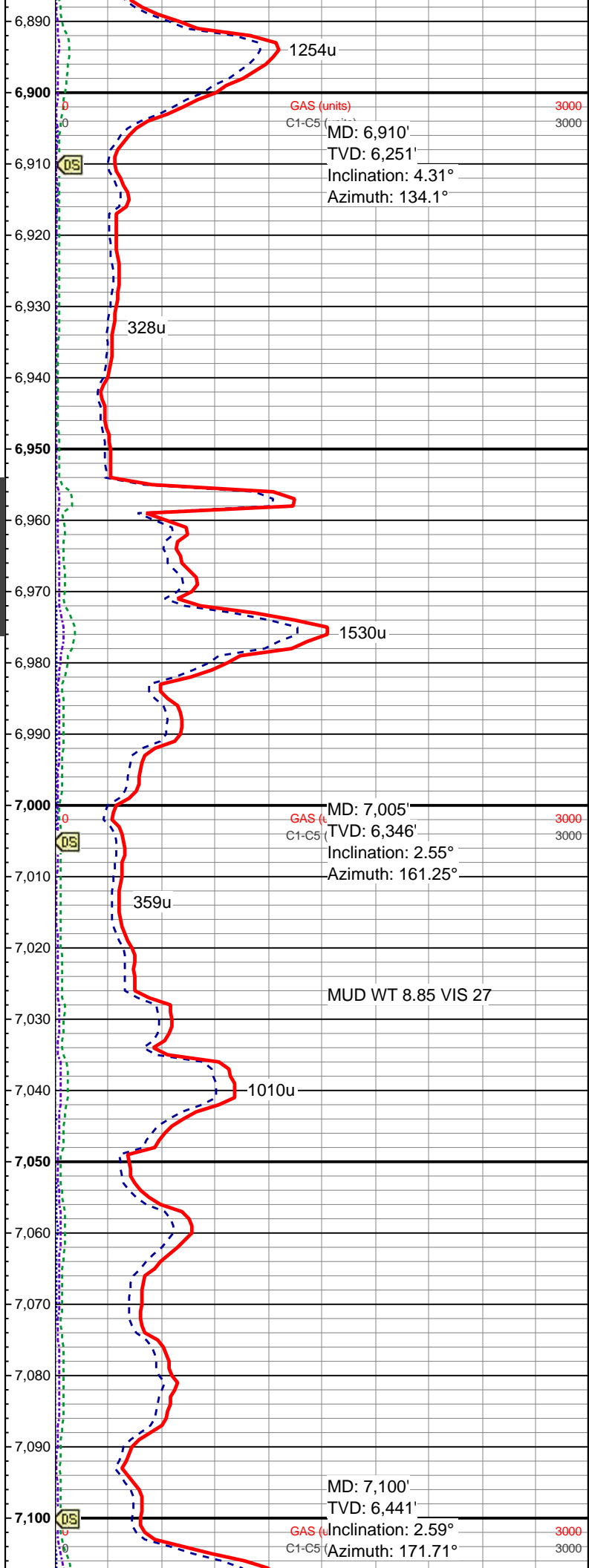
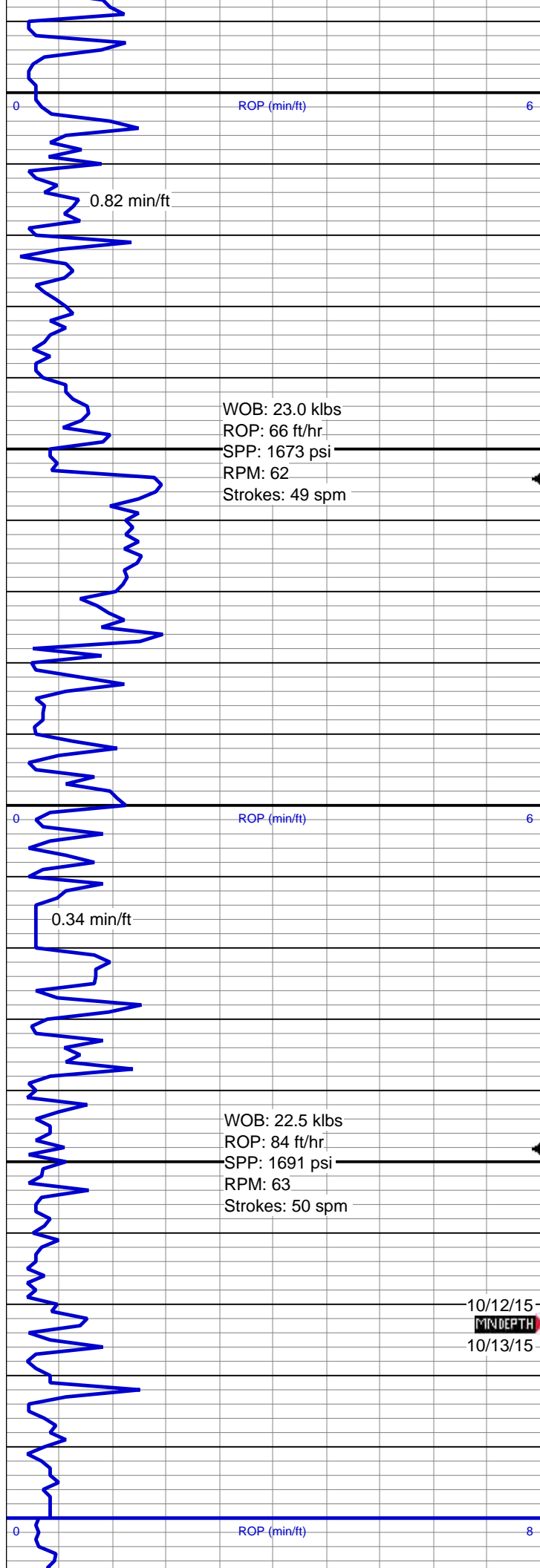
2.32 min/ft

WOB: 22.0 klbs
ROP: 100 ft/hr
SPP: 1663 psi
RPM: 61
Strokes: 50 spm

WOB: 21.8 klbs
ROP: 108 ft/hr
SPP: 1710 psi
RPM: 62
Strokes: 50 spm







WOB: 23.3 klbs
ROP: 136 ft/hr
SPP: 1699 psi
RPM: 60
Strokes: 49 spm

ROP (min/ft)

WOB: 63.1 klbs
ROP: 73 ft/hr
SPP: 1720 psi
RPM: 0
Strokes: 50 spm

ROP (min/ft)

1355u

1612u

MD: 7,195'
TVD: 6,536'
Inclination: 2.55°
Azimuth: 183.67°

GAS (units)
C1-C5 (units)

3000
3000

1706u

1473u

378u

MUD WT 8.85 VIS 27

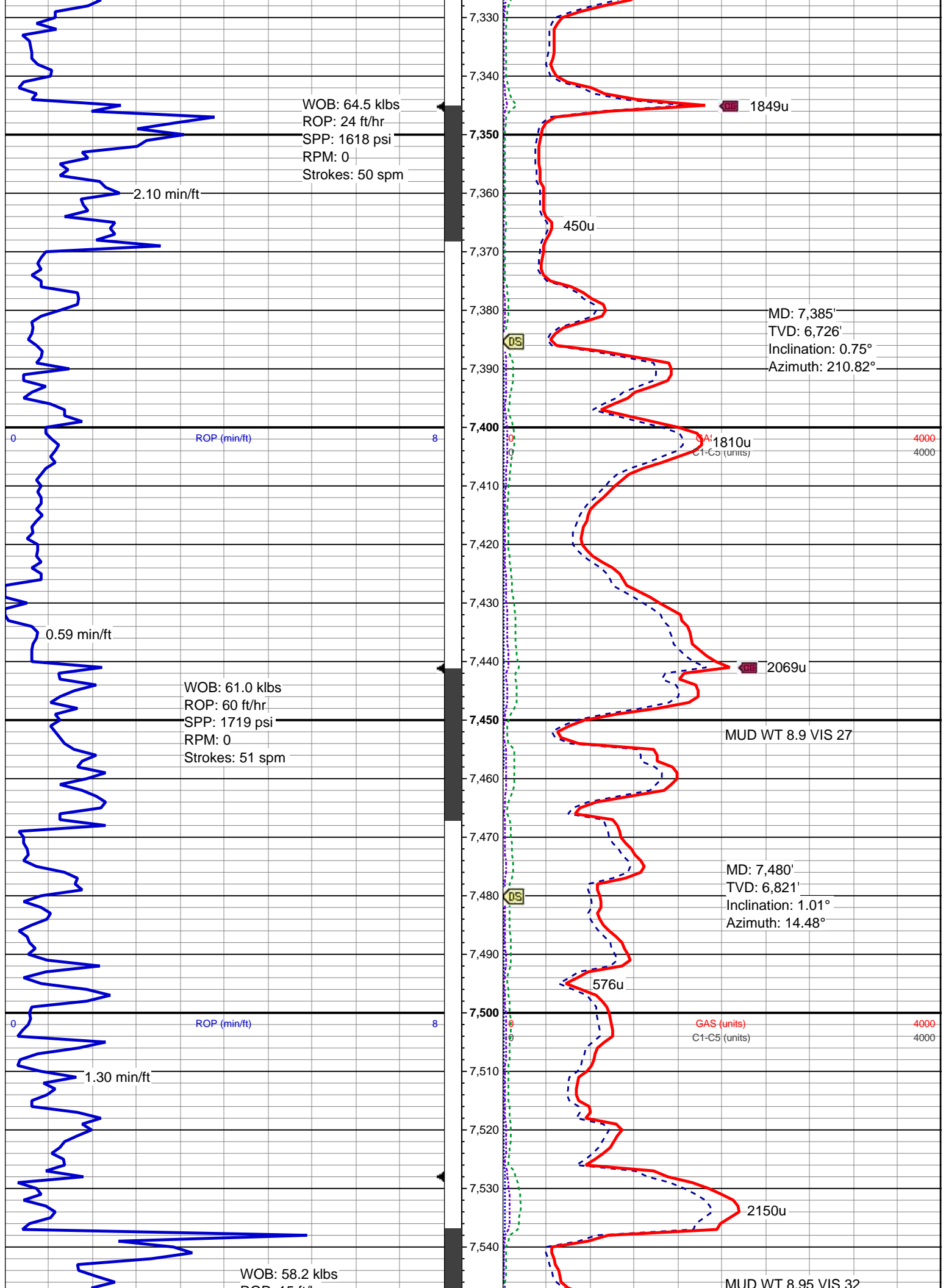
MD: 7,290'
TVD: 6,631'
Inclination: 2.33°
Azimuth: 152.82°

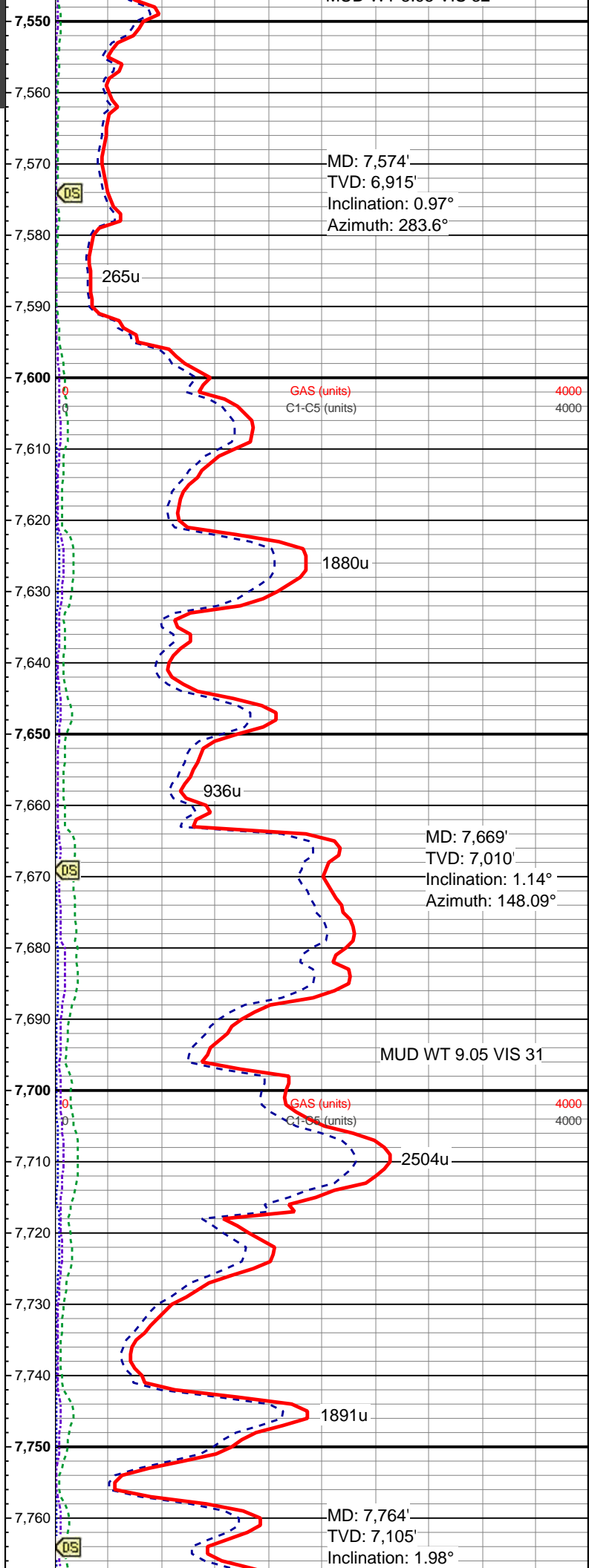
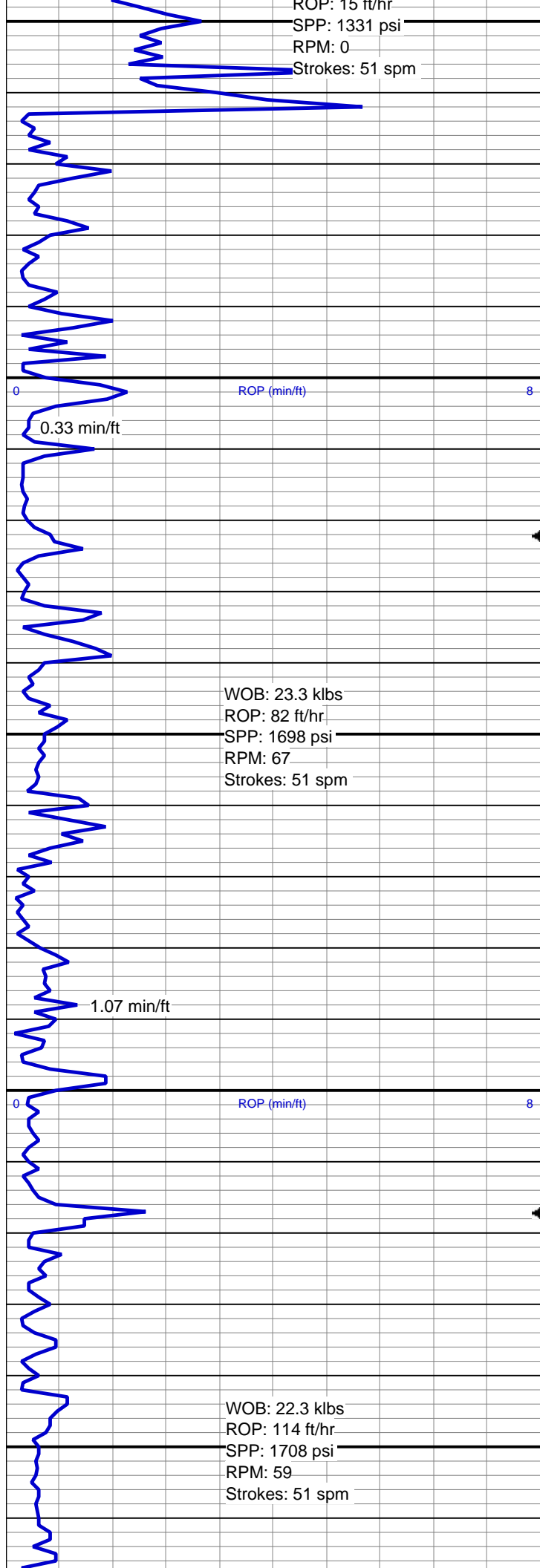
GAS SCALE CHANGE

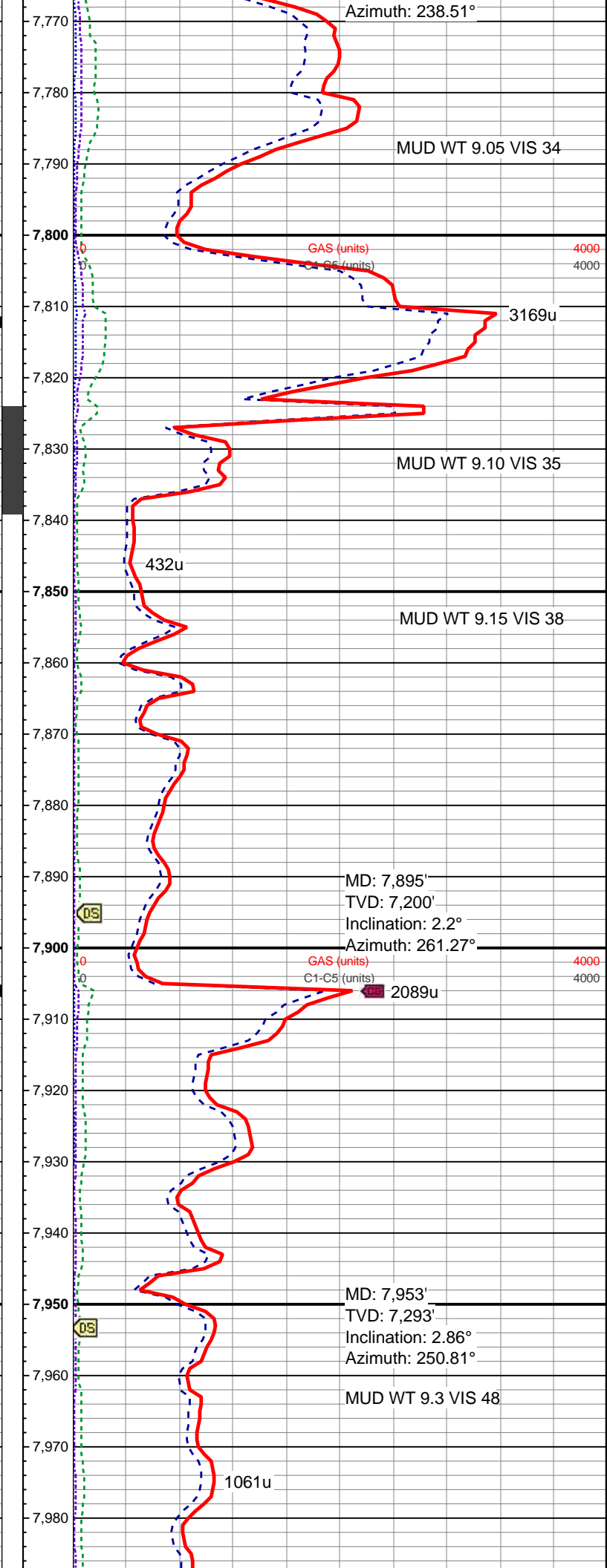
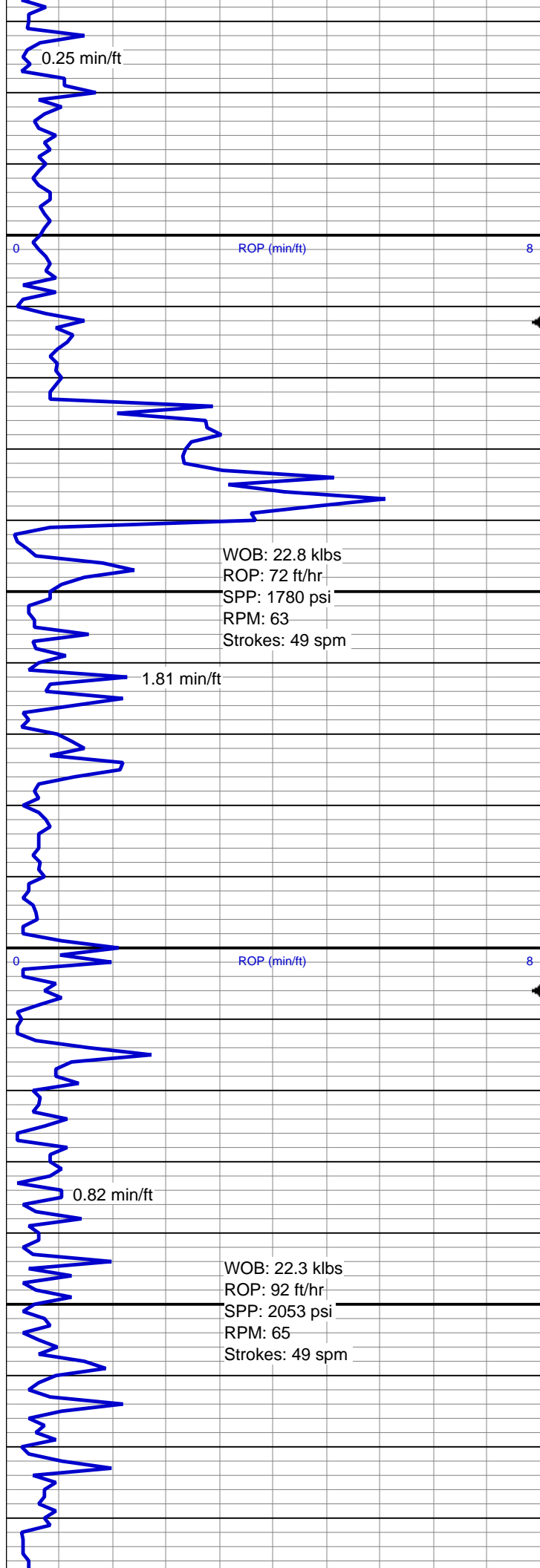
GAS (units)
C1-C5 (units)

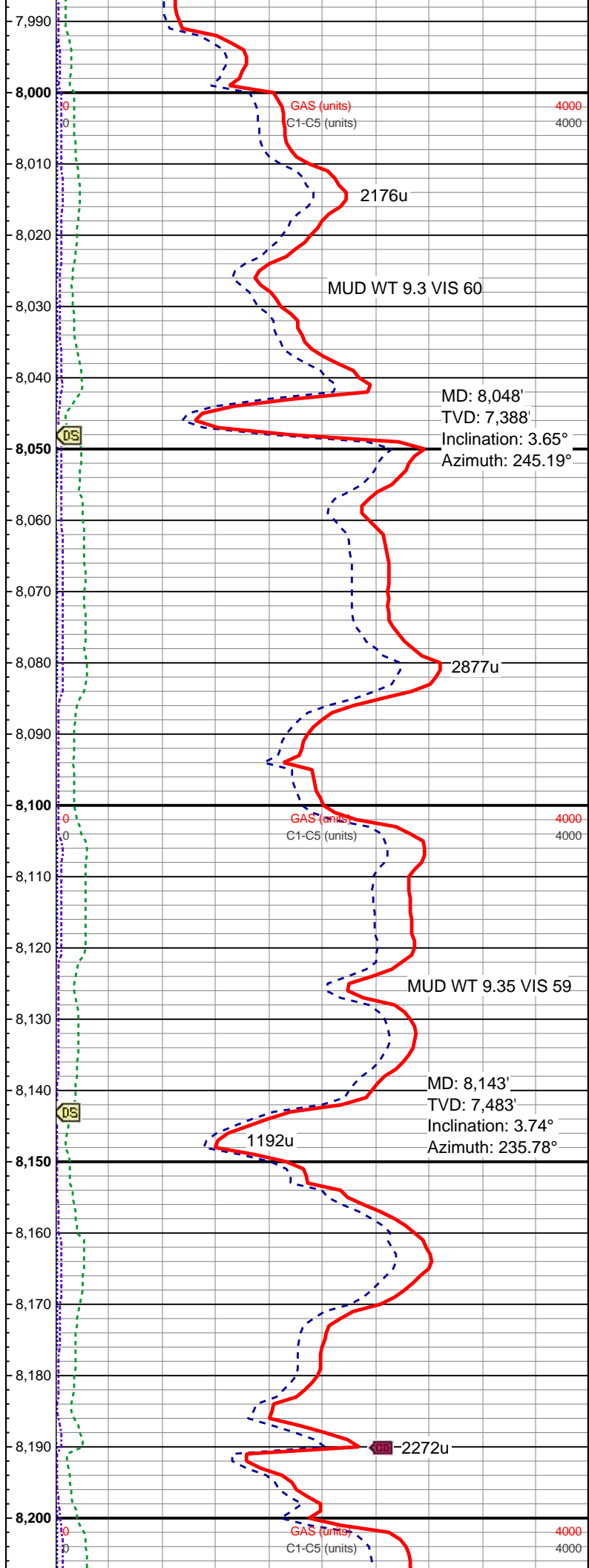
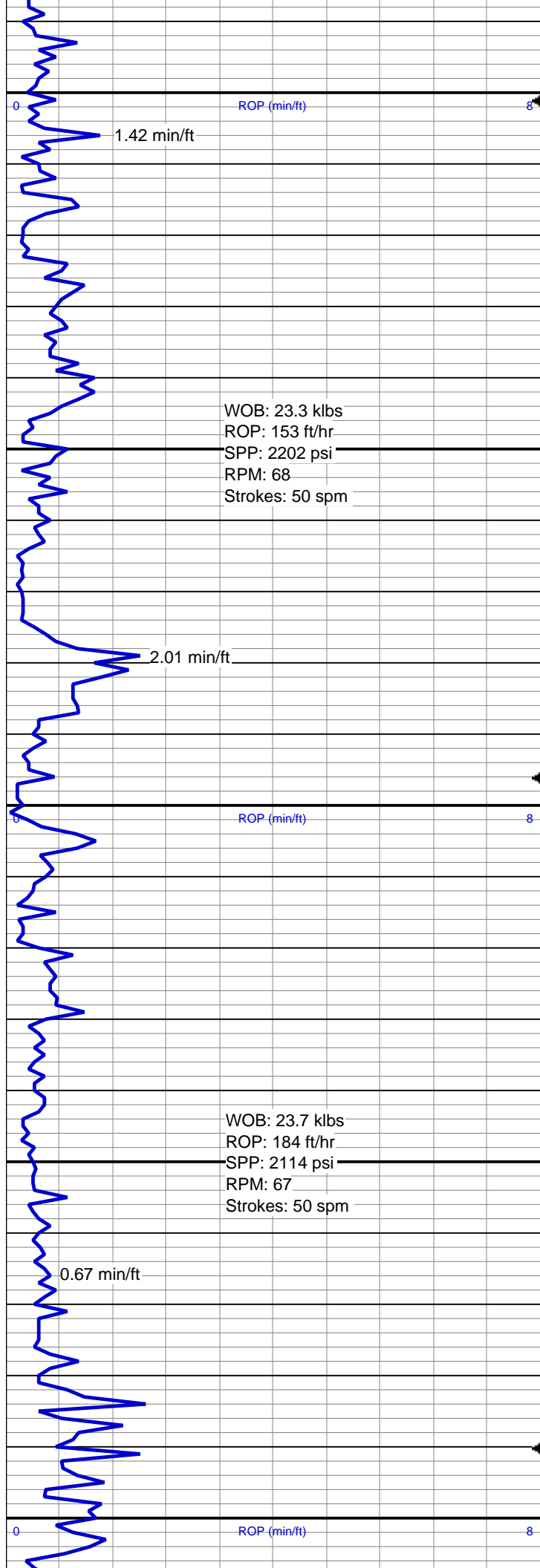
4000
4000

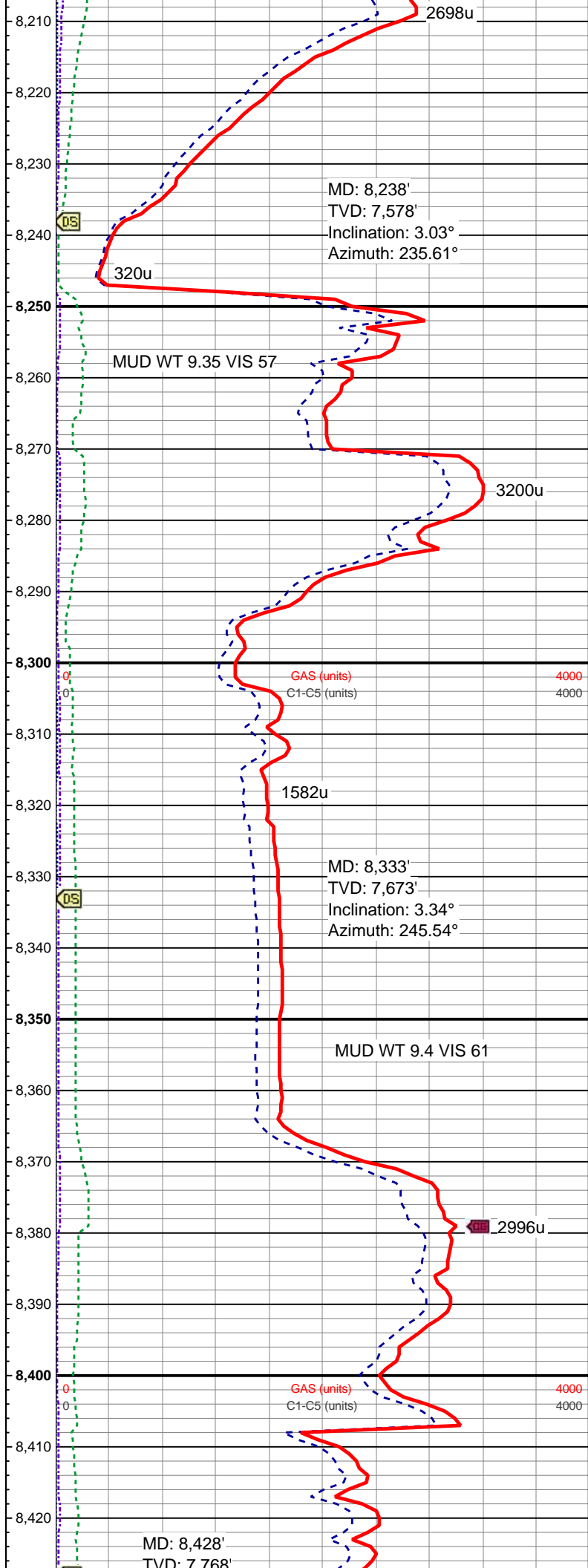
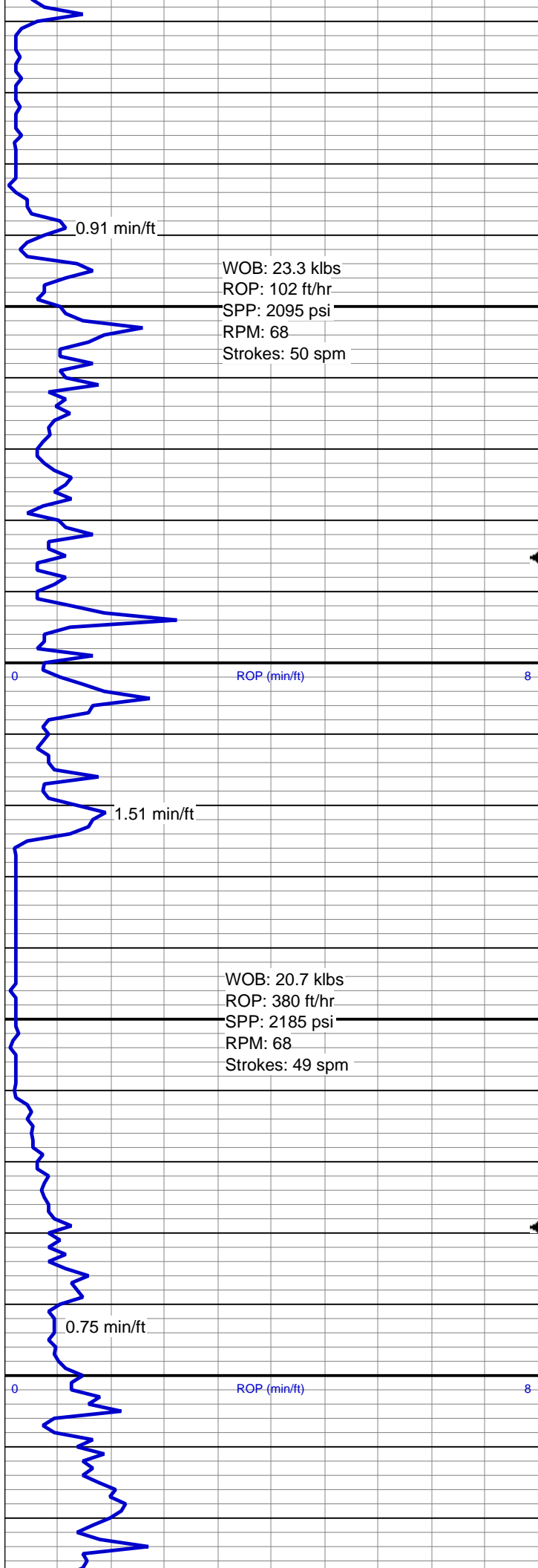
557u











WOB: 24.5 klbs
ROP: 70 ft/hr
SPP: 2271 psi
RPM: 64
Strokes: 51 spm

1.99 min/ft

0

ROP (min/ft)

8

1.25 min/ft

WOB: 21.9 klbs
ROP: 60 ft/hr
SPP: 2325 psi
RPM: 65
Strokes: 50 spm

TD @ 8574' MD @ 2300 hrs MST on 10/13/2015

TVD: 7,763'
Inclination: 3.91°
Azimuth: 242.29°

1963u

MUD WT 9.6 VIS 60

1970u

GAS (units)
C1-C5 (units)

4000
4000

MUD WT 9.7 VIS 62

MD: 8,523'
TVD: 7,862'
Inclination: 3.69°
Azimuth: 239.74°

2575u

Thank you for using Columbine Logging, Inc.