Schlumberger

Company: Cascade Petroleum

Well: Gaede 9S-55W-08-12

Field: Wildcat

County: Lincoln State: Colorado

# Combinable Magnetic Resonance Tool CMR

County: Lincoln
Field: Wildcat
Location: NENW Sec.8, T9S, R55W
Well: Gaede 9S-55W-08-12
Company: Cascade Petroleum

| Location: | | | | |
|---|---|---|---|---|
| NENW Sec.8, T9S, R55W | | Elev.: | K.B. | 5566.00 ft |
| SHL: 660' FNL & 1980' FWL | | | G.L. | 5551.00 ft |
| Lat/Long: 39.285870/-103.577820 | | | D.F. | 5565.00 ft |
| Permanent Datum: | Ground Level | Elev.: | 5551.00 f | |
| Log Measured From: | Kelly Bushing | 15.00 ft | above Perm.Datum | |
| Drilling Measured From: | Kelly Bushing | | | |

| API Serial No. | Section: | Township: | Range: |
|---|---|---|---|
| 05-073-06604-0000 | 8 | 9S | 55W |

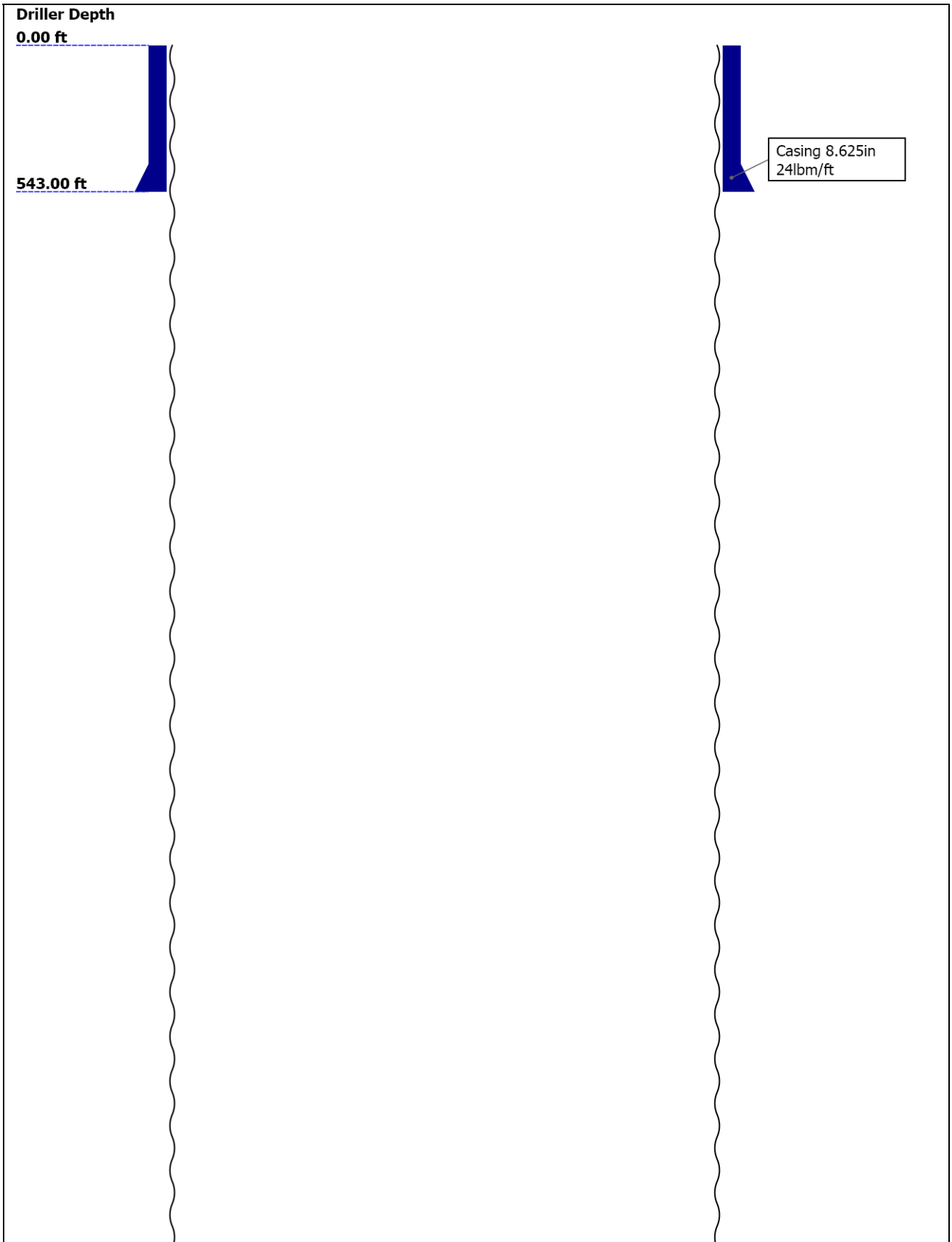
| | | | | | | |
|---|---|---|---|---|---|---|
| Logging Date | | | 07-Dec-2014 | | | |
| Run Number | | | ONE | | | |
| Depth Driller | | | 7990.00 ft | | | |
| Schlumberger Depth | | | 7998.00 ft | | | |
| Bottom Log Interval | | | 7998.00 ft | | | |
| Top Log Interval | | | 3000.00 ft | | | |
| Casing Driller Size @ Depth | | | 8.625 in @ 543.00 ft | | | |
| Casing Schlumberger | | | 544.75 ft | | | |
| Bit Size | | | 7.875 in | | | |
| Type Fluid In Hole | | | WBM | | | |
| MUD | Density | Viscosity | 9 lbm/gal | 63 s | | |
| | Fluid Loss | PH | 4 cm3 | 9 | | |
| | Source of Sample | | Active Tank | | | |
| RM @ Meas Temp | | | 0.81 ohm.m @ 86.16 degF | | | |
| RMF @ Meas Temp | | | 0.69 ohm.m @ 75 degF | | | |
| RMC @ Meas Temp | | | 1.38 ohm.m @ 75 degF | | | |
| Source RMF | RMC | | Calculated | Calculated | | |
| RM @ BHT | RMF @ BHT | | 0.42 @ 174.4 | 0.31 @ 174.4 | | |
| Max Recorded Temperatures | | | 178.27 degF | | | |
| Circulation Stopped | Time | | 08-Dec-2014 | 06:00:00 | | |
| Logger on Bottom | Time | | 08-Dec-2014 | 23:52:16 | | |
| Unit Number | Location: | | 9108 | Fort Morgan | | |
| Recorded By | | | Nolan Welsh | | | |
| Witnessed By | | | Jim Weir | | | |

## Disclaimer



## Contents

## Well Sketch




## Borehole Size/Casing/Tubing Record

| | | | | | | |
|---|---|---|---|---|---|---|
| Bit | | | | | | |
| Bit Size ( in ) | 7.875 | | | | | |
| Top Driller ( ft ) | 0 | | | | | |
| Top Logger ( ft ) | 0 | | | | | |
| Bottom Driller ( ft ) | 7990 | | | | | |
| Bottom Logger ( ft ) | 7998 | | | | | |
| Casing | | | | | | |
| Size ( in ) | 8.625 | | | | | |
| Weight ( lbm/ft ) | 24 | | | | | |
| Inner Diameter ( in ) | 8.097 | | | | | |
| Grade | J55 | | | | | |
| Top Driller ( ft ) | 0 | | | | | |
| Top Logger ( ft ) | 0 | | | | | |
| Bottom Driller ( ft ) | 543 | | | | | |
| Bottom Logger ( ft ) | 544.75 | | | | | |

## Borehole Fluids

| Parameter( unit ) | ONE | | | | | |
|---|---|---|---|---|---|---|
| Fluid Type | Water | | | | | |
| Fluid Name | WBM | | | | | |
| Max Recorded Temperatures ( degF ) | 178.27 | | | | | |
| Source of Sample | Active Tank | | | | | |
| Salinity ( ppm ) | 1700 | | | | | |
| Density ( lbm/gal ) | 9 | | | | | |
| Funnel Viscosity ( s ) | 63 | | | | | |
| Fluid Loss ( cm3 ) | 4 | | | | | |
| PH | 9 | | | | | |
| Date/Time Circulation Stopped | 08-Dec-2014 06:00:00 | | | | | |
| Date Logger on Bottom | 08-Dec-2014 | | | | | |
| Time Logger on Bottom | 23:52:16 | | | | | |
| Source RMF | Calculated | | | | | |
| RMC | Calculated | | | | | |
| RM @ Meas Temp ( ohm.m@degF ) | 0.81 @ 86.16 | | | | | |
| RMF @ Meas Temp ( ohm.m@degF ) | 0.69 @ 75 | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| RMC @ Meas Temp ( ohm.m@degF ) | 1.38 @ 75 | | | | | |
| RM @ BHT ( ohm.m@degF ) | 0.42 @ 174.4 | | | | | |
| RMF @ BHT ( ohm.m@degF ) | 0.31 @ 174.4 | | | | | |
| RMC @ BHT ( ohm.m@degF ) | 0.62 @ 174.4 | | | | | |
| Total Solid ( % ) | | | | | | |
| High Gravity Solids ( % ) | | | | | | |

# Remarks and Equipment Summary

## ONE: Toolstring

| Equip name | Length | MP name | Offset |
|---|---|---|---|
| **LEH-QT** | **69.67** | | |
| LEH-QT | | | |
| **DTC-H** | **66.75** | | |
| ECH-KC | | **CTEM** | **65.85** |
| DTC-H | | **HV** | **0.00** |
| | | **ToolStatus** | **63.75** |
| | | **TelStatus** | **63.75** |
| **PPC-B:8352** | **63.75** | | |
| PPC-B:8352 | | | |
| | | **PPC-B Calipers** | **62.61** |
| **CMRT-B:2** | **57.24** | | |
| CMRC:156 | | | |
| CMRH:156 | | | |
| CMRS:2 | | | |
| | | **CMRT** | **43.59** |
| **AH-184[2]** | **41.65** | | |
| **AH-184[1]** | **39.65** | | |

## ONE: Remarks

This is the first run in the well

Toolstring run withould bowspring and AIT top standoff as per client request.

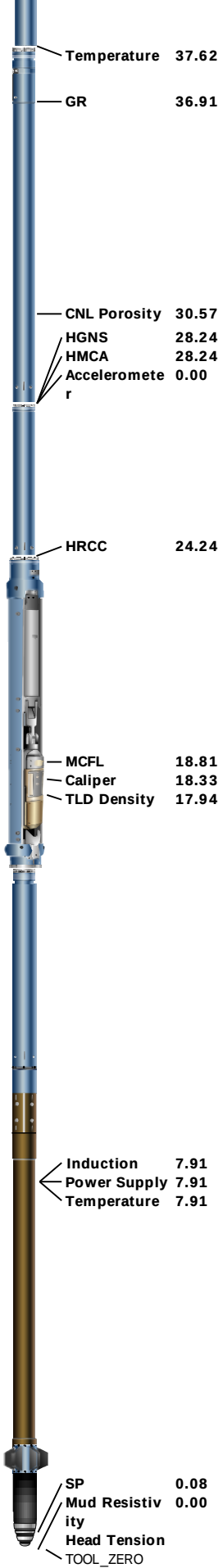
Matrix: Limestone MDEN:2.71 g/cm3

Logging interval from TD to 3000' , GR logged to surface.

Tool stuck for 2.5 hours at 3950', cailper closed from 3950 to top of logging interval due to client request.

Crew: Troy Ocanus, Jeffery Schossow

Rig: Extreme #11




**HGNS-H** 37.65
HGNH
NPV-N
NSR-F:5068
HMCA-H
HACCZ-H:3616
HGNS-H

**HDRS-H** 28.24
ECH-MEB
HRCC-H
HRMS-H
Backscatter:26961
Long Spacing:26961
HRGD-H:5788
GPV-Q
GSR-J:5416
Short Spacing:26961

**AIT-M:181** 16.00
AMIS:181
AMRM:181

Lengths are in ft
Maximum Outer Diameter = 9.000 in
Line: Sensor Location, Value: Gating Offset
All measurements are relative to TOOL_ZERO

## Depth Summary

| | ONE | | |
|---|---|---|---|

## Depth Measuring Device

| | | | |
|---|---|---|---|
| Type | IDW-B | | |
| Serial Number | | | |
| Calibration Date | | | |
| Calibrator Serial Number | | | |
| Calibration Cable Type | | | |
| Wheel Correction 1 | 0 | | |
| Wheel Correction 2 | 0 | | |

## Tension Device

| | | | |
|---|---|---|---|
| Type | CMTD-B/A | | |
| Serial Number | | | |
| Calibration Date | | | |
| Calibrator Serial Number | | | |
| Number of Calibration Points | 0 | | |

## Logging Cable

| | | | |
|---|---|---|---|
| Type | 7-46A-XS | | |
| Serial Number | | | |
| Length | 18000.00 ft | | |
| Conveyance Type | Wireline | | |
| Rig Type | Land | | |

| ONE:Depth Control Parameters | | Depth Control Remarks |
|---|---|---|
| Log Sequence | First Log In the Well | All Schlumberger depth procedures followed. |
| Rig Up Length At Surface | | IDW used as primary depth control. |
| Rig Up Length At Bottom | | Z-Chart used as secondary depth control. |
| Rig Up Length Correction | | |
| Stretch Correction | | |
| Tool Zero Check At Surface | | |

# ONE

# CMR Depth Log LQC

## Software Version

| Acquisition System | Version |
|---|---|
| MaxWell | 4.0.9163.3000 |
| Application Patch | Patch-SP-10767_26570-4.0.9163.3001 |

| Tool Elements | Description | Software Version | Firmware Version |
|---|---|---|---|
| CMRS | CMRT sonde consists of magnets to create a permanent magnetic field as well as an antenna and necessary circuitry to generate an oscillating magnetic field | 4.0.9502.3000 | |

## Pass Summary

| Run Name | Pass Objective | Direction | Top | Bottom | Start | Stop | DSC Mode | Depth Shift | Include Parallel Data |
|---|---|---|---|---|---|---|---|---|---|
| ONE | Main[4]:Up | Up | 66.10 ft | 8019.08 ft | 09-Dec-2014 12:26:30 AM | 09-Dec-2014 6:56:36 AM | ON | 0.97 ft | No |

All depths are referenced to toolstring zero

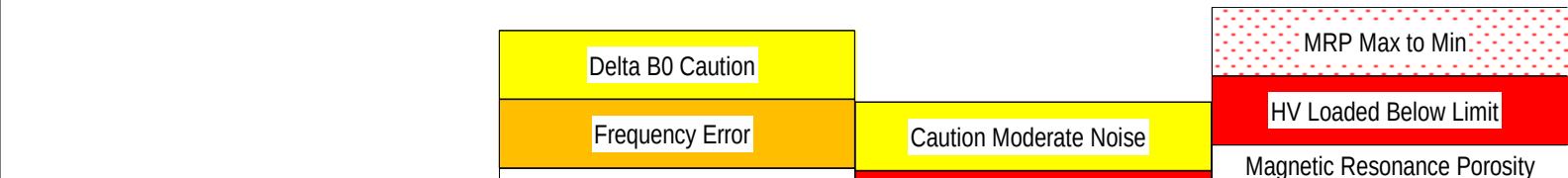
## Log

Company:Cascade Petroleum Well:Gaede 9S-55W-08-12

ONE: Main[4]:Up:S006

Description: CMRT Depth Log LQC Format Format: Log ( CMRT Depth Log LQC ) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth
Creation Date: 09-Dec-2014 07:54:25

TIME_1900 - Time Marked every 60.00 (s)



Insufficient Wait Time

Bad Hole Flag

Repeated Data Frame Flag (REPEAT_FLAG) CMRT-B
0 10

Tuning Mode (TUNING_MODE) CMRT-B
-7 3

Window Porosity 2 to 3

Window Porosity (WPHI[0]) CMRT-B
0.4 ft3/ft3 0

Window Porosity (WPHI[1]) CMRT-B
0.4 ft3/ft3 0

Window Porosity (WPHI[2]) CMRT-B
0.4 ft3/ft3 0

Sonde Temperature (SONDE_TEMP) CMRT-B
60 degF 160

System Gain (SYS_GAIN) CMRT-B
0 1

Operating Frequency (FREQ_OP) CMRT-B
2100 kHz 2300

Difference between Operating Frequency and Temperature-Corrected LFST Frequency (DIF_ALF_LFST) CMRT-B
0 kHz 200

Signal Phase (SPHASE[0]) CMRT-B
-180 deg 180

Static Magnetic Field Difference (DELTA_B0) CMRT-B
-0.5 mT 0.5

Tune Word Set for Tuning Relay (TUNE_WORD) CMRT-B
0.5 10.5

Noise Out of Tolerance

Standard Deviation of Bound Fluid Volume (BFV_SIG) CMRT-B
0.1 ft3/ft3 0

Standard Deviation of Free Fluid Volume (FFV_SIG) CMRT-B
0.1 ft3/ft3 0

Standard Deviation of Magnetic Resonance Porosity (MRP_SIG) CMRT-B
0.1 ft3/ft3 0

Tool Hardware Noise per Echo from Sub-Measurements (TNOISE_SM[0]) CMRT-B
0.1 ft3/ft3 0

Enviromental Noise per Echo from Sub-Measurements (ENOISE_SM[0]) CMRT-B
0.1 ft3/ft3 0

Tool Noise Computed from Early Echoes for Sub-Measurements (TNOISE_EE_SM[0]) CMRT-B
0.1 ft3/ft3 0

(MRP) CMRT-B
0.4 ft3/ft3 0

Magnetic Resonance Porosity using Minimum T1/T2 Ratio (MRP_T1T2R_MIN) CMRT-B
0.4 ft3/ft3 0

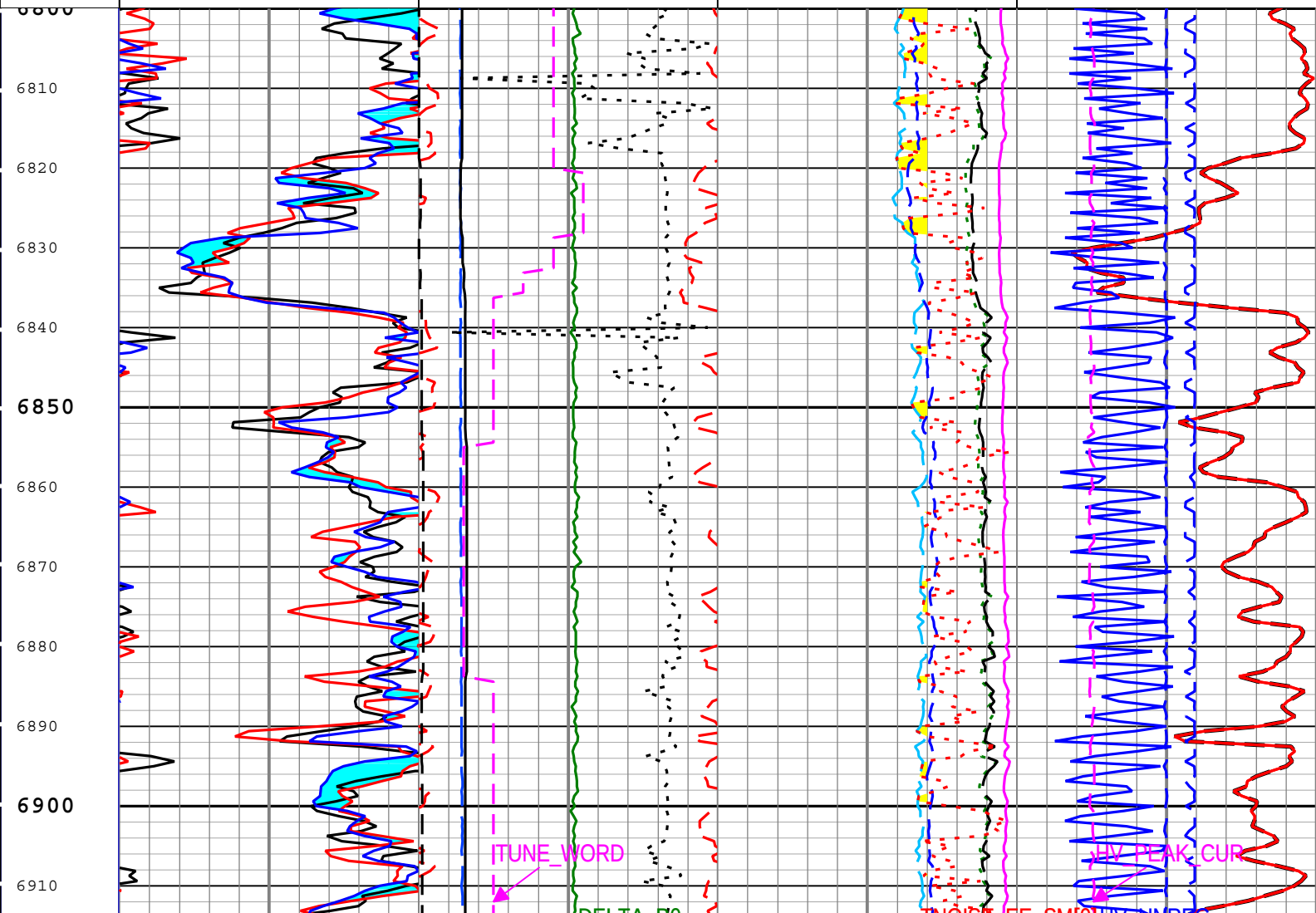
Magnetic Resonance Porosity using Maximum T1/T2 Ratio (MRP_T1T2R_MAX) CMRT-B
0.4 ft3/ft3 0

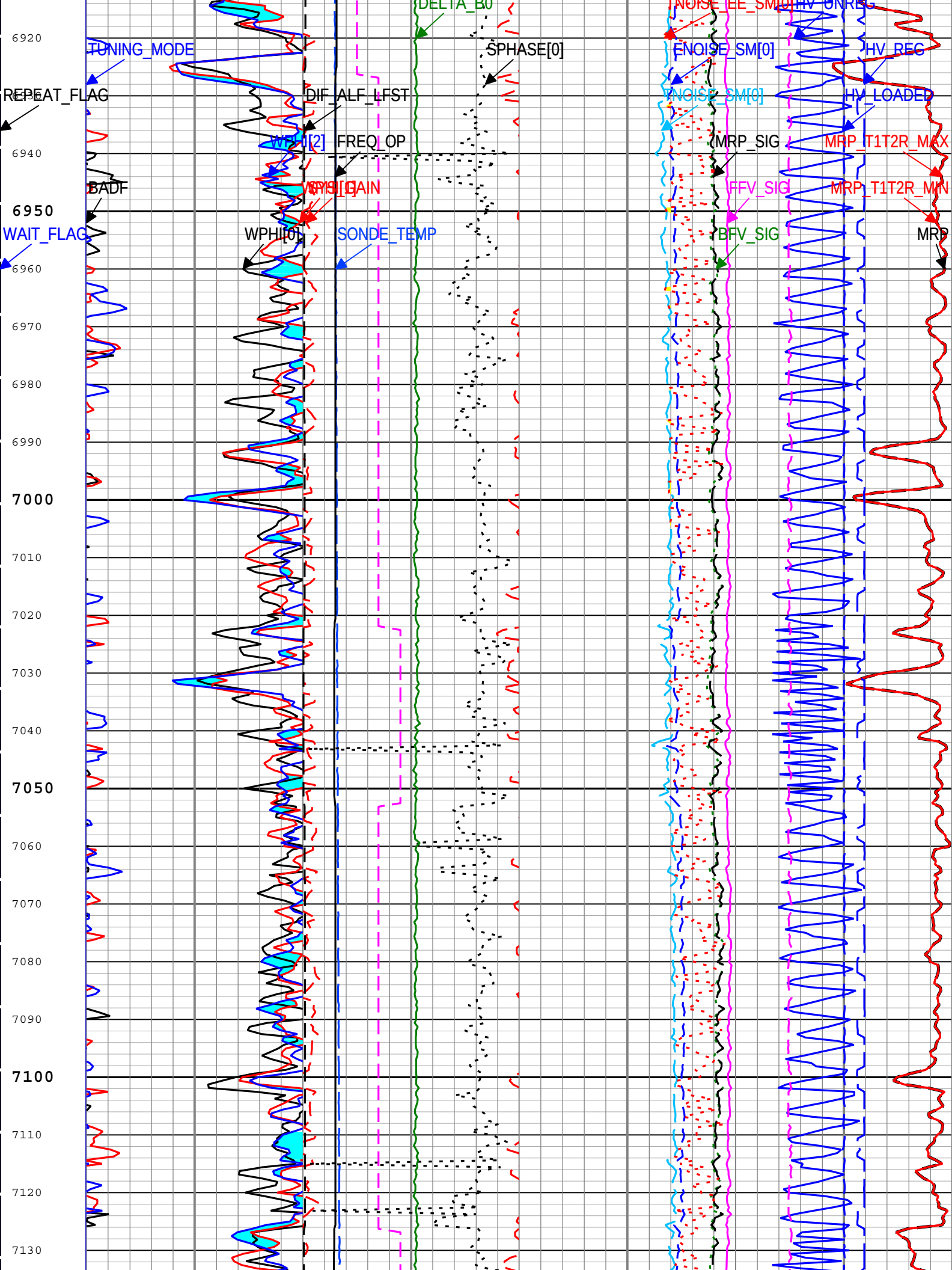
High Voltage When Loaded (HV_LOADED) CMRT-B
220 V 270

High Voltage Regulated (HV_REG) CMRT-B
220 V 270

High Voltage Unregulated (HV_UNREG) CMRT-B
270 V 320

High Voltage Peak Current (HV_PEAK_CUR) CMRT-B
0 mA 10000

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7120
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TUNING_MODE
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DIF_ALF_LFST
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WAIT_FLAG
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MRP_T1T2R_MIN
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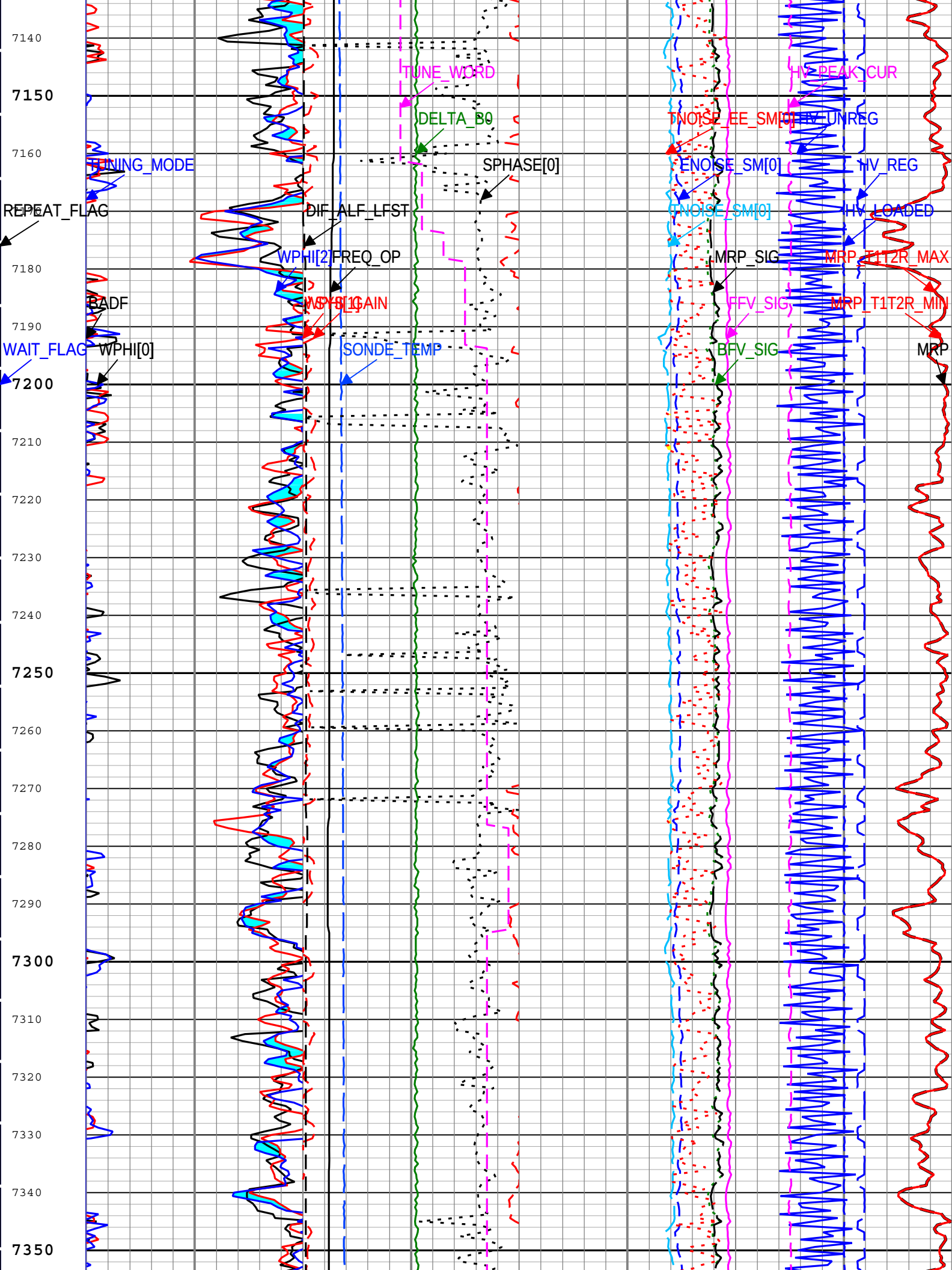
BFV_SIG
MRP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HV_REG
HV_LOADED
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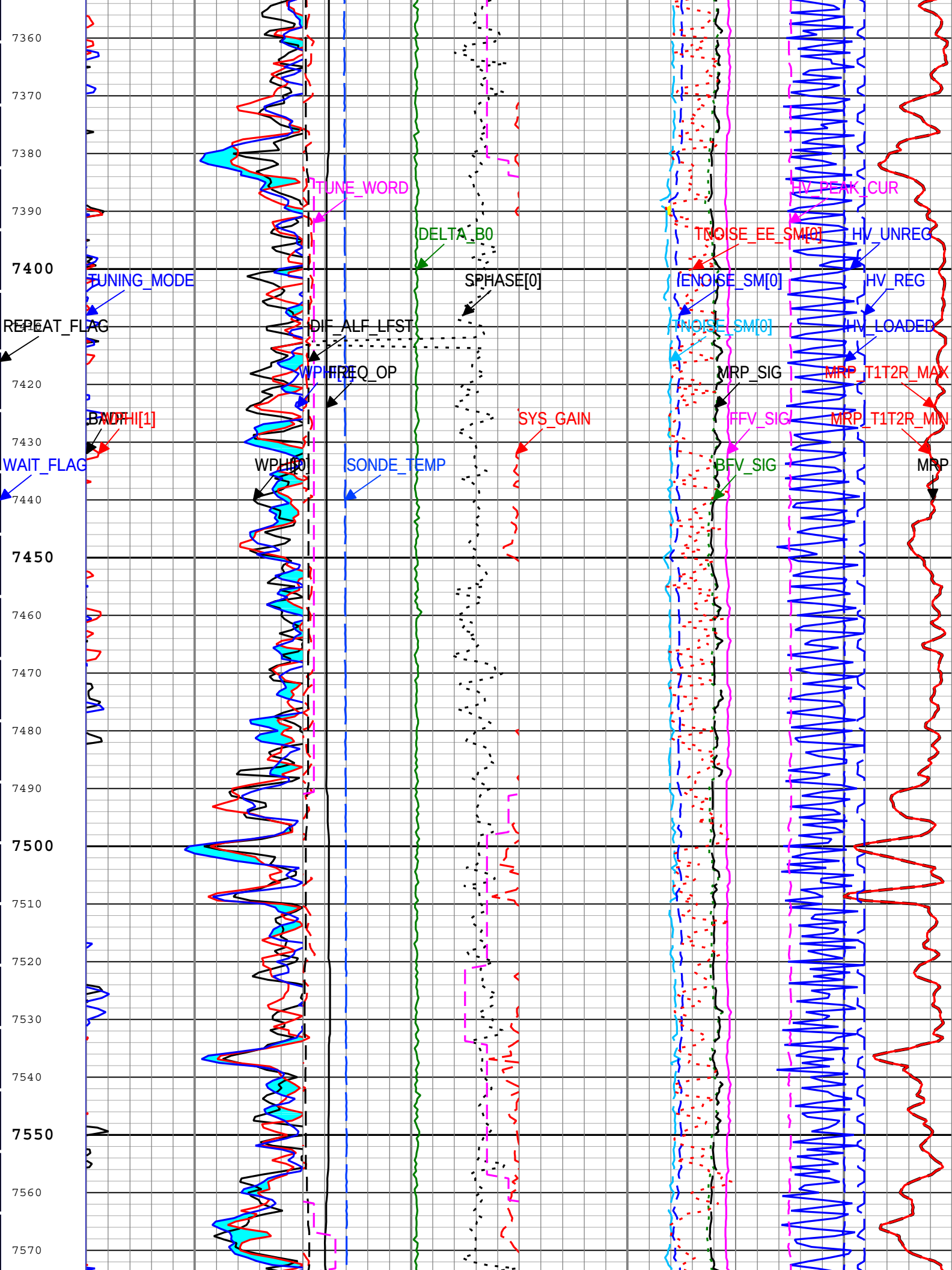
MRP_T1T2R_MIN
MRP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DELTA_B0
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WPHI_FREQ_OP
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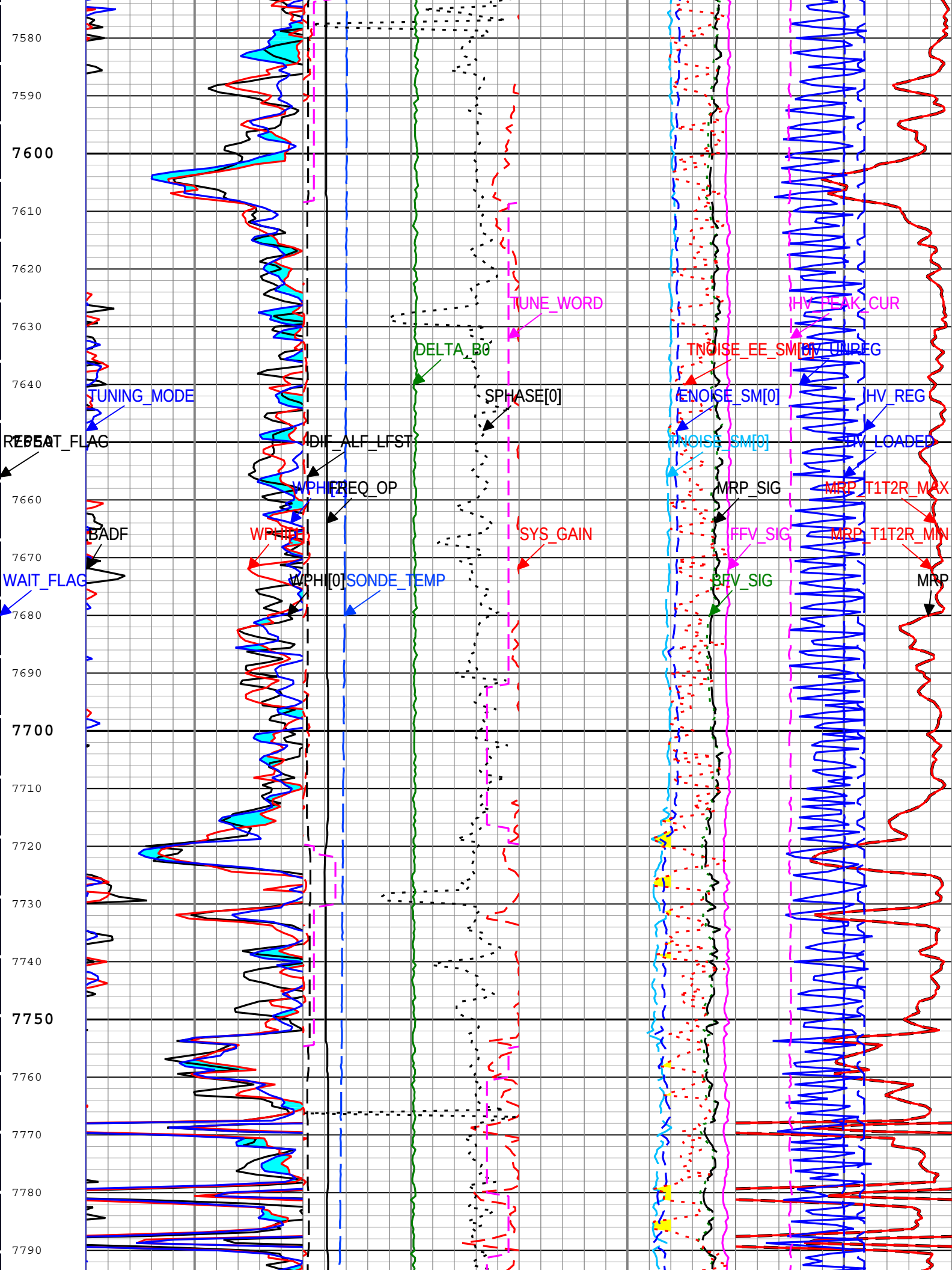
BFV_SIG
MRP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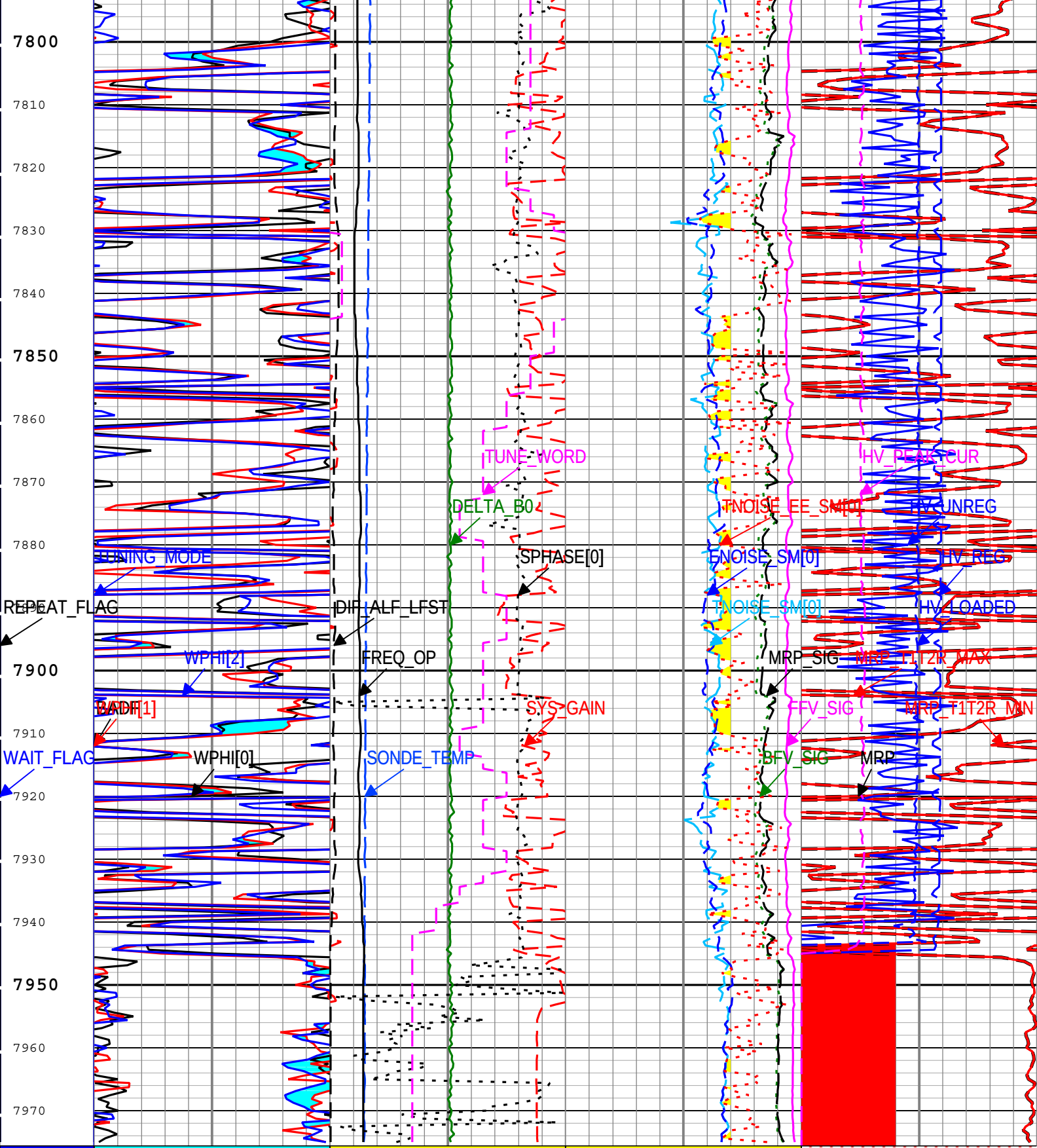
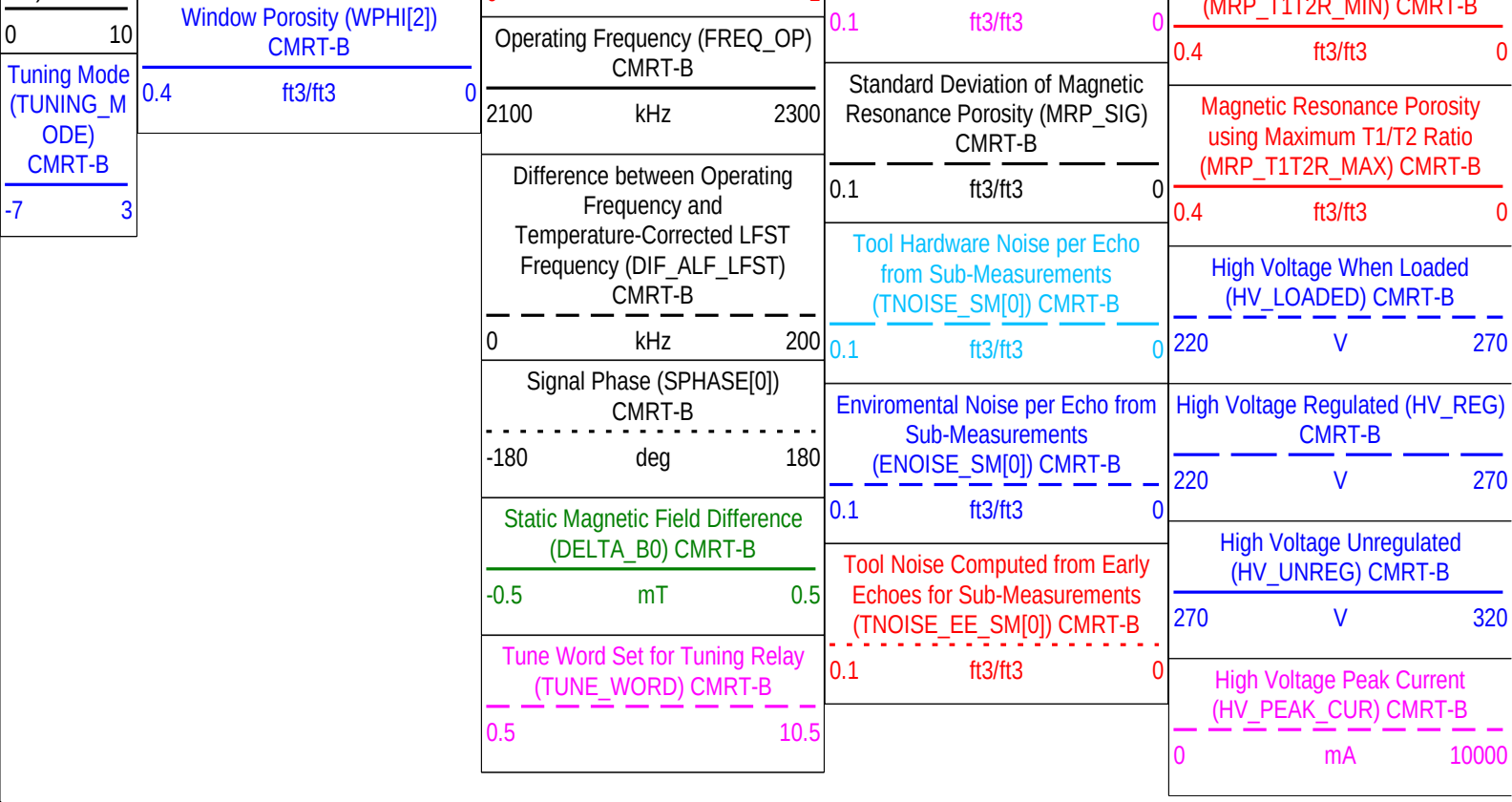
SFV_SIG
MRP




| | | | | |
|---|---|---|---|---|
| Insufficient Wait Time | Window Porosity 2 to 3 | Delta B0 Caution | Caution Moderate Noise | MRP Max to Min |
| Bad Hole Flag | Window Porosity (WPHI[0]) CMRT-B<br>0.4 ft3/ft3 0 | Frequency Error | Noise Out of Tolerance | HV Loaded Below Limit |
| Repeated Data Frame Flag (REPEAT_FLAG) CMRT-B | Window Porosity (WPHI[1]) CMRT-B<br>0.4 ft3/ft3 0 | Sonde Temperature (SONDE_TEMP) CMRT-B<br>60 degF 160<br>System Gain (SYS_GAIN) CMRT-B<br>0 1 | Standard Deviation of Bound Fluid Volume (BFV_SIG) CMRT-B<br>0.1 ft3/ft3 0<br>Standard Deviation of Free Fluid Volume (FFV_SIG) CMRT-B | Magnetic Resonance Porosity (MRP) CMRT-B<br>0.4 ft3/ft3 0<br>Magnetic Resonance Porosity using Minimum T1/T2 Ratio |




TIME_1900 - Time Marked every 60.00 (s)

Description: CMRT Depth Log LQC Format  Format: Log ( CMRT Depth Log LQC )  Index Scale: 5 in per 100 ft  Index Unit: ft  Index Type: Measured Depth
Creation Date: 09-Dec-2014 07:54:25

## Channel Processing Parameters

| Parameter | Description | Tool | Value | Unit |
|---|---|---|---|---|
| DC_MODE | Depth Correction Mode | DepthCorrection | Real-time | |
| GAMMA_REG | Regularization Factors | CMRT-B | [1.5, 1.5, 0, 0, 0, 0] | |
| JOBID | Job Identification | WLSESSION | CXRX-00068 | |
| NSTACK | Number of Stacking Levels | CMRT-B | 3 | |
| POLC_SW | Polarization Correction Switch | CMRT-B | No | |
| T1CUT | T1 Cutoff between BFV and FFV | CMRT-B | 50 | ms |
| T1T2R_IN | T1/T2 Ratio Input | CMRT-B | 2 | |
| T1T2R_MAX | T1/T2 Ratio Maximum | CMRT-B | 3 | |
| T1T2R_MIN | T1/T2 Ratio Minimum | CMRT-B | 1 | |
| T2CUT | T2 Cutoff between BFV and FFV | CMRT-B | 100 | ms |
| T2CUT_TAPER | Start of Tapered T2 Cutoff | CMRT-B | 25 | ms |

## Tool Control Parameters

| Parameter | Description | Tool | Value | Unit |
|---|---|---|---|---|
| ACQ_METHOD_OPT | Acquisition Method Option | CMRT-B | SEQ | |
| ALF_PHDIF_AVE | Average of Auto-Larmor-Frequency Phase Difference during LFST | CMRT-B | -2.61 | deg |
| ALF_PHDIF_STD | Standard Deviation of Auto-Larmor-Frequency Phase Difference during LFST | CMRT-B | 0.12 | deg |
| DLSR | Depth Log Sample Rate | CMRT-B | 7.5 | in |
| DSP_VERS | DH Signal Processing Code Version | CMRT-B | 13 | |
| EPM_OPT | Enhanced Precision Mode Option | CMRT-B | On | |
| FREQ_OP_PREV | Operating Frequency, prior to new LFST, at LFST Temperature | CMRT-B | 2113 | kHz |
| LFST_CFREQ | LFST Central Frequency | CMRT-B | 2132 | kHz |
| LFST_FREQ | LFST Frequency | CMRT-B | 2129 | kHz |
| LFST_TEMP | LFST Temperature | CMRT-B | 174.4 | degF |
| LFST_TEMP_DEL | LFST Temperature Variation | CMRT-B | 32.27 | degF |

| | | | | |
|---|---|---|---|---|
| LFST_TT_OFFSET | LFST Tune Table Offset | CMRT-B | -2.7 | kHz |
| LOG_DIRECTION | Logging Direction | CMRT-B | Up | |
| LOG_MODE_CMR | Logging Mode for CMR | CMRT-B | DEPTH_B_MODE_EXPERT | |
| LOG_SPEED | Optimal Logging Speed | CMRT-B | 700 | ft/h |
| MAX_LOG_SPEED | Toolstring Maximum Logging Speed | WLSESSION | 840 | ft/h |
| MAX_TOOL_SPEED | Maximum service speed allowed for, or attained by, a logging tool. | CMRT-B | 840 | ft/h |
| NECH_V | Number of Echo Amplitudes Vector | CMRT-B | [5000, 30, 0, 0, 0, 0] | |
| NWT | Number of Wait Times | CMRT-B | 2 | |
| PT_V | Polarization Times Vector | CMRT-B | [6.49, 0.02, 0, 0, 0, 0] | s |
| RPTN_V | Number of Repetitions Vector | CMRT-B | [1, 10, 0, 0, 0, 0] | |
| SLSR | Station Log Sample Rate | CMRT-B | 0 | s |
| TE_V | Echo Spacings Vector | CMRT-B | [200, 200, 0, 0, 0, 0] | us |
| WT_V | Wait Times Vector | CMRT-B | [1.95, 0.02, 0, 0, 0, 0] | s |

# ONE

# 5"CMR Depth Log Main

## Software Version

| Acquisition System | Version |
|---|---|
| MaxWell | 4.0.9163.3000 |
| Application Patch | Patch-SP-10767_26570-4.0.9163.3001 |

| Computation | Description | Version |
|---|---|---|
| HENVIR | Computation Ensemble for the HGNS Neutron environmental corrections | 4.0.9469.3000 |

| Tool Elements | Description | Software Version | Firmware Version |
|---|---|---|---|
| CMRS | CMRT sonde consists of magnets to create a permanent magnetic field as well as an antenna and necessary circuitry to generate an oscillating magnetic field | 4.0.9502.3000 | |
| HRGD-H | HILT Resistivity Gamma-Ray Density Device, 150 degC | 4.0.9575.3000 | 3.0 |
| HGNS-H | HILT Gamma-Ray and Neutron Sonde, 150 degC | 4.0.9575.3000 | 2.0 |

## Pass Summary

| Run Name | Pass Objective | Direction | Top | Bottom | Start | Stop | DSC Mode | Depth Shift | Include Parallel Data |
|---|---|---|---|---|---|---|---|---|---|
| ONE | Main[4]:Up | Up | 66.10 ft | 8019.08 ft | 09-Dec-2014 12:26:30 AM | 09-Dec-2014 6:56:36 AM | ON | 0.97 ft | No |

All depths are referenced to toolstring zero

## Log

Company:Cascade Petroleum Well:Gaede 9S-55W-08-12

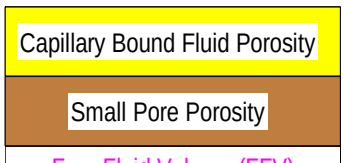
ONE: Main[4]:Up:S006

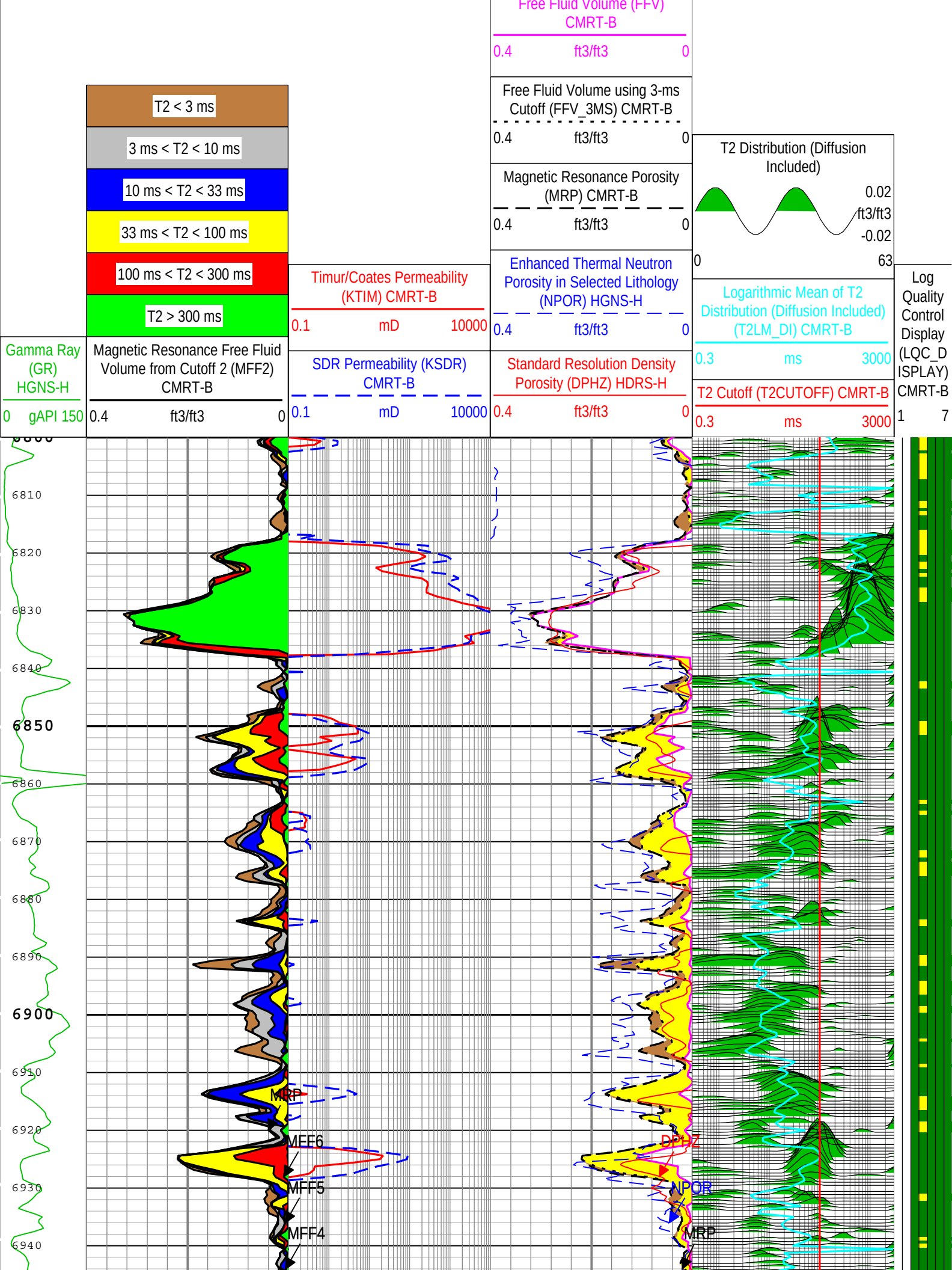
Description: CMRT Depth Log Main Format Format: Log ( CMRT Depth Log Main ) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 09-Dec-2014 07:54:29

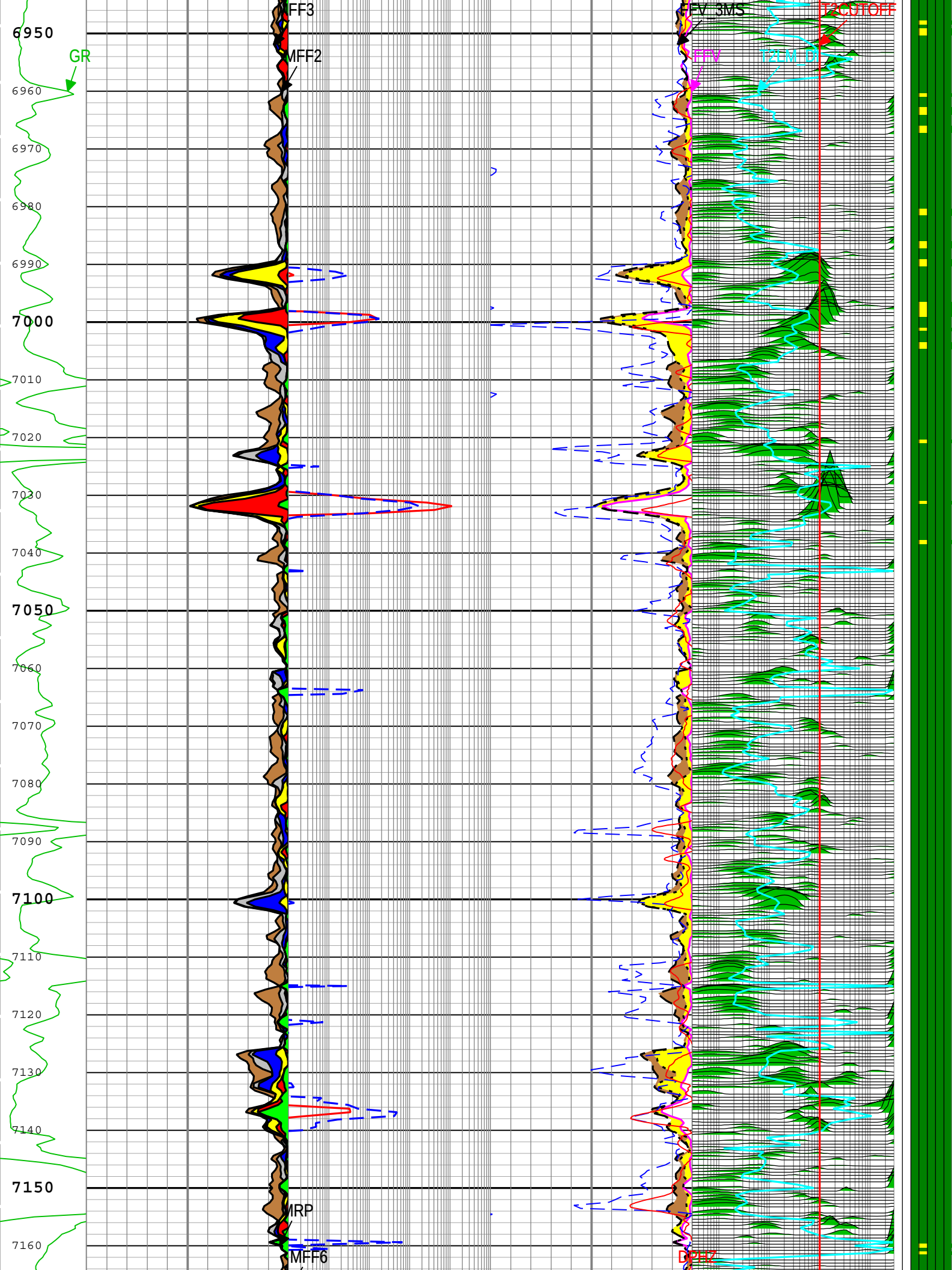
Log Quality Control Display (LQC_DISPLAY) CMRT-B

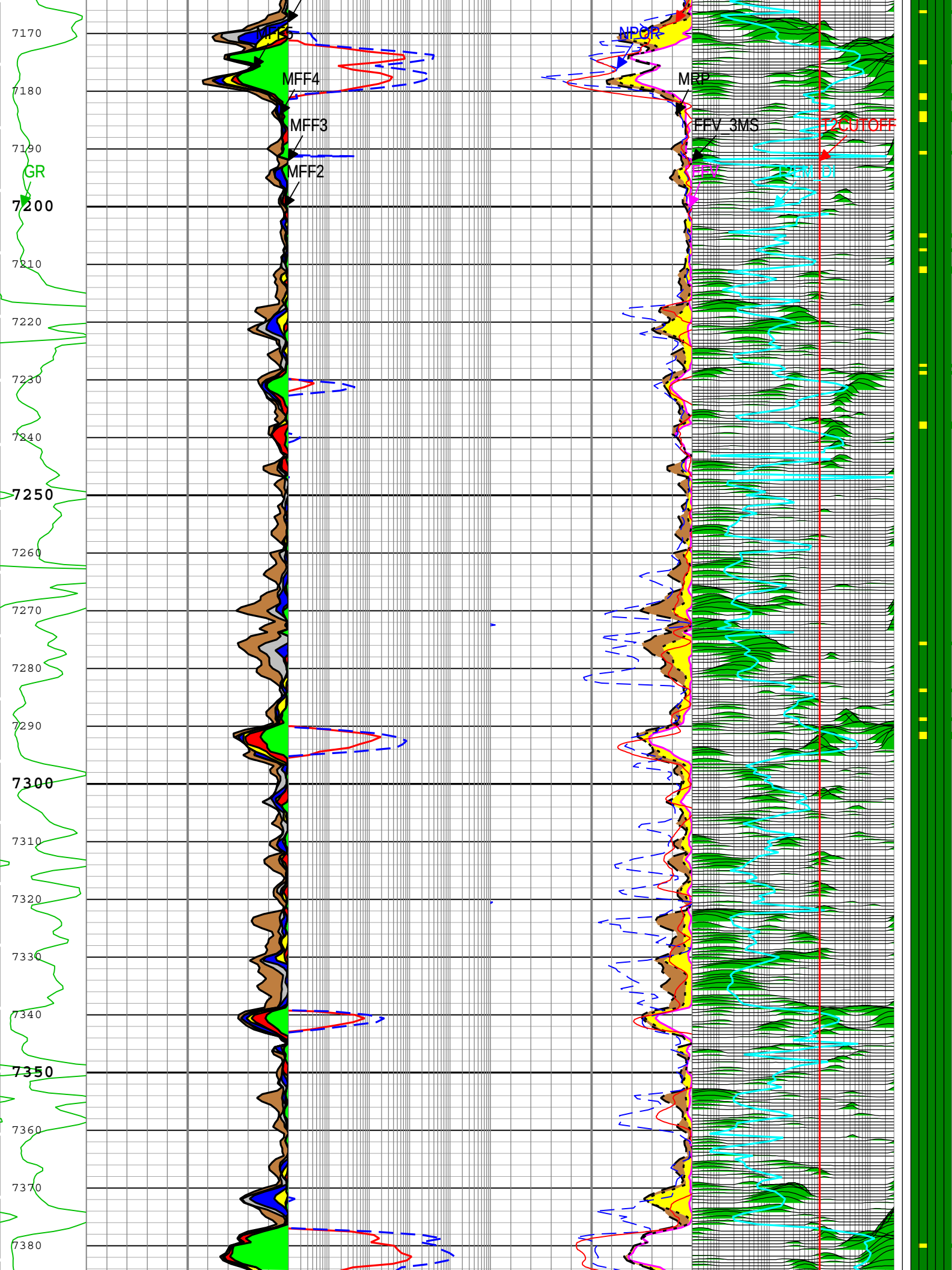
| | | | | |
|---|---|---|---|---|
| 1 - BHS - Bad Hole Flag : | Good | Bad | | |
| 2 - IWT - Wait Time : | OK | Insufficient | | |
| 3 - DB0 - Delta B0 : | OK | Warning | Error | |
| 4 - EEN - Early Echo Noise : | OK | Warning | Error | |
| 5 - HVL - High Voltage : | Normal | Too Low | | |
| 6 - ATS - Auto Tuning : | ALF | Ant | Temp | Off |
| 7 - ATTS - AT Tracking : | OK | Warning | | |

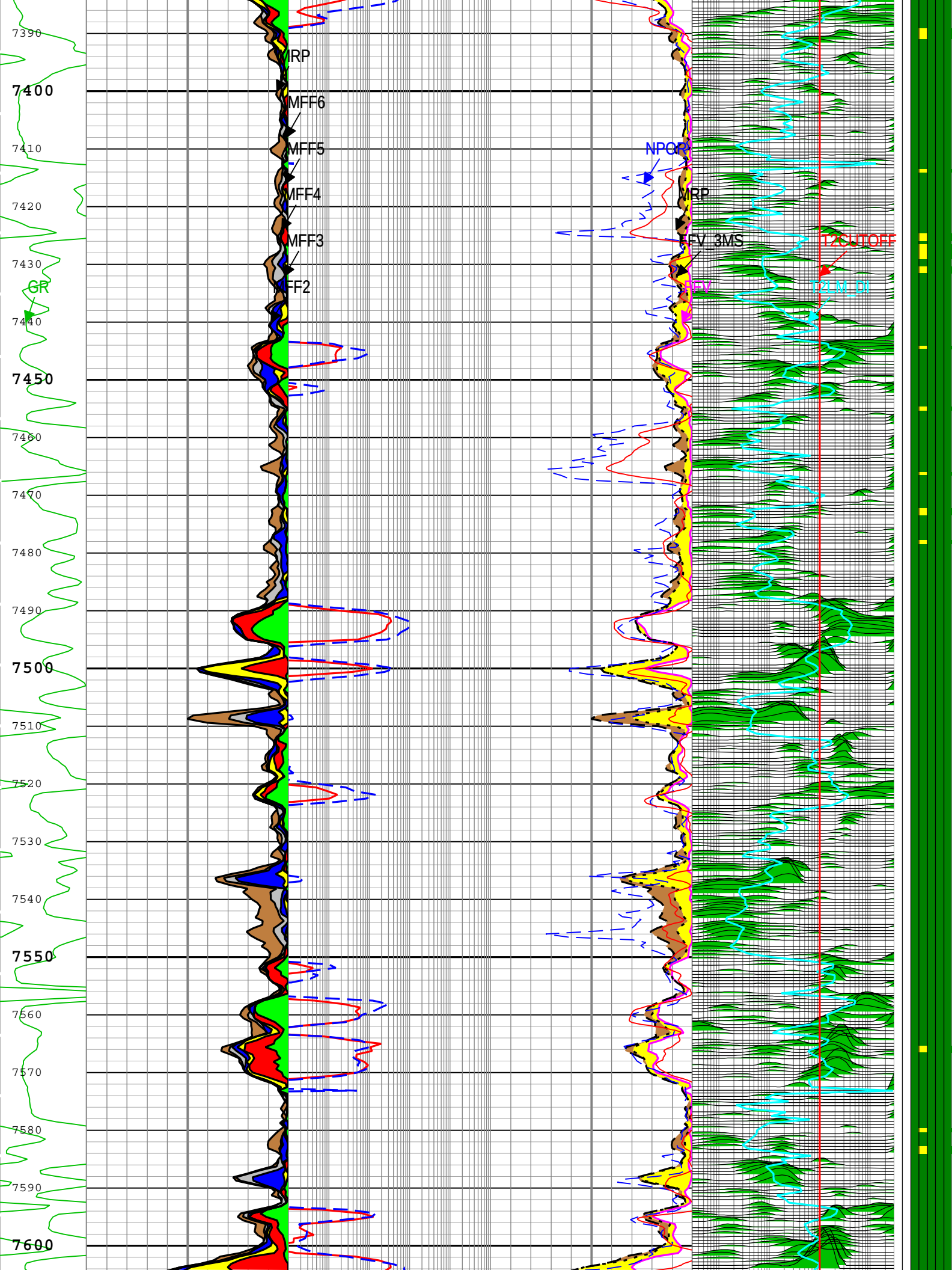
TIME_1900 - Time Marked every 60.00 (s)

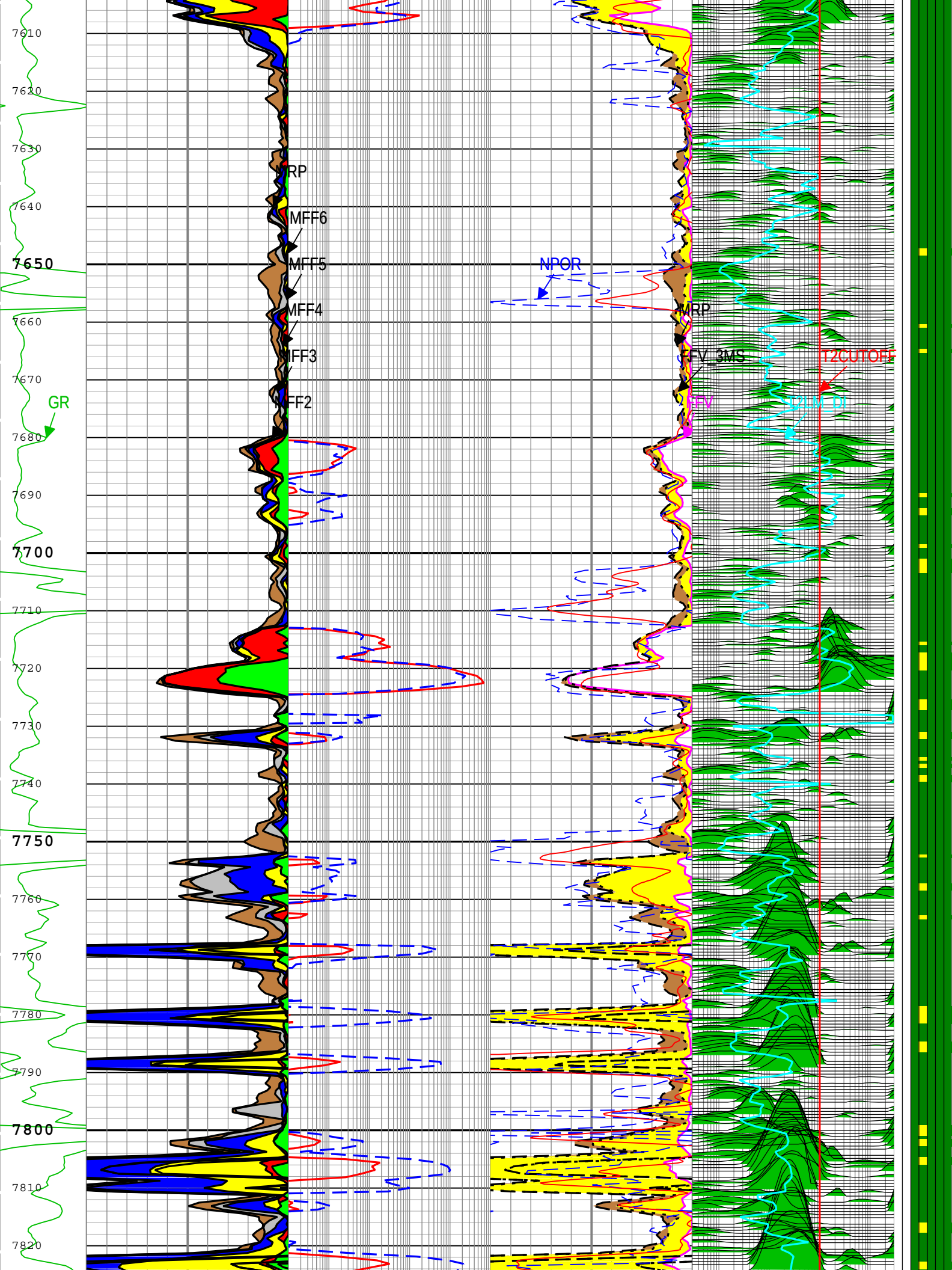


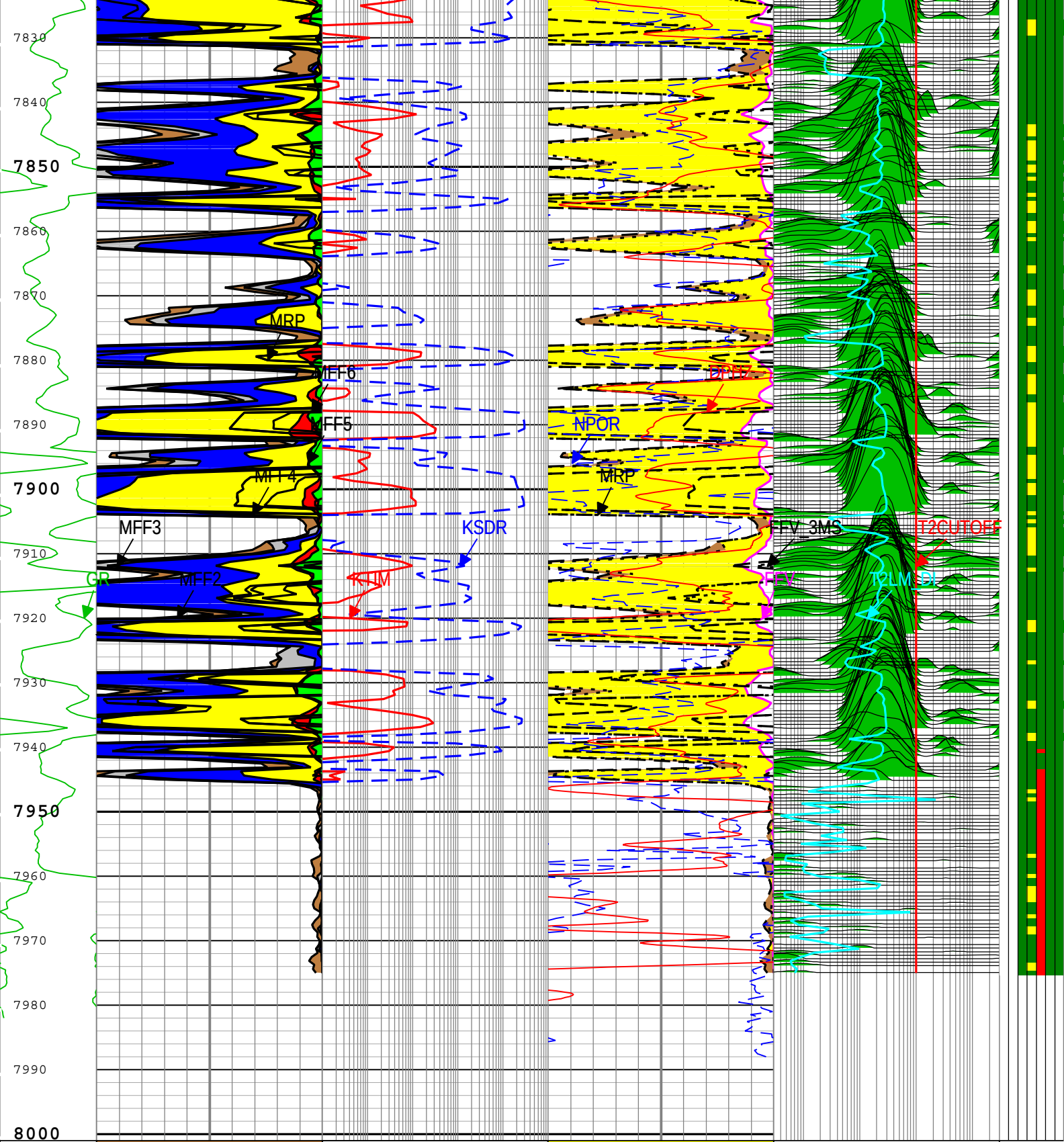

Free Fluid Volume (FFV) CMRT-B
0.4 ft3/ft3 0
Free Fluid Volume using 3-ms Cutoff (FFV_3MS) CMRT-B
0.4 ft3/ft3 0
Magnetic Resonance Porosity (MRP) CMRT-B
0.4 ft3/ft3 0
T2 Distribution (Diffusion Included)
0.02
ft3/ft3
-0.02
0 63
T2 < 3 ms
3 ms < T2 < 10 ms
10 ms < T2 < 33 ms
33 ms < T2 < 100 ms
100 ms < T2 < 300 ms
T2 > 300 ms
Timur/Coates Permeability (KTIM) CMRT-B
0.1 mD 10000
Enhanced Thermal Neutron Porosity in Selected Lithology (NPOR) HGNS-H
0.4 ft3/ft3 0
Logarithmic Mean of T2 Distribution (Diffusion Included) (T2LM_DI) CMRT-B
0.3 ms 3000
Log Quality Control Display (LQC_DISPLAY) CMRT-B
1 7
Gamma Ray (GR) HGNS-H
0 gAPI 150
Magnetic Resonance Free Fluid Volume from Cutoff 2 (MFF2) CMRT-B
0.4 ft3/ft3 0
SDR Permeability (KSDR) CMRT-B
0.1 mD 10000
Standard Resolution Density Porosity (DPHZ) HDRS-H
0.4 ft3/ft3 0
T2 Cutoff (T2CUTOFF) CMRT-B
0.3 ms 3000
6810
6820
6830
6840
6850
6860
6870
6880
6890
6900
6910
6920
6930
6940
MRP
MFF6
MFF5
MFF4
DPHZ
NPOR
MRP


FF3
FFV_3MS
FACUTOFF
6950
GR
MFF2
FFV
FZLM_CF
6960
6970
6980
6990
7000
7010
7020
7030
7040
7050
7060
7070
7080
7090
7100
7110
7120
7130
7140
7150
MRP
7160
MFF6
DPHZ


7170
7180
7190
7200
7210
7220
7230
7240
7250
7260
7270
7280
7290
7300
7310
7320
7330
7340
7350
7360
7370
7380
GR
MFF5
MFF4
MFF3
MFF2
NPOR
MRP
FFV_3MS
F2CUTOFF


7390
7400
7410
7420
7430
7440
7450
7460
7470
7480
7490
7500
7510
7520
7530
7540
7550
7560
7570
7580
7590
7600
MRP
MFF6
MFF5
MFF4
MFF3
MFF2
GR
NPOR
MRP
FFV_3MS
MFV
T2CUTOFF
CLM_DI


7610
7620
7630
RP
7640
MFF6
7650
MFF5
NPOR
MFF4
MRP
7660
MFF3
FFV_3MS
T2CUTOFF
7670
GR
FF2
FFV
7680
7690
7700
7710
7720
7730
7740
7750
7760
7770
7780
7790
7800
7810
7820




Gamma Ray (GR) HGNS-H

0 gAPI 150

T2 < 3 ms

3 ms < T2 < 10 ms

10 ms < T2 < 33 ms

33 ms < T2 < 100 ms

100 ms < T2 < 300 ms

T2 > 300 ms

Timur/Coates Permeability (KTIM) CMRT-B

0.1 mD 10000

SDR Permeability (KSDR) CMRT-B

0.1 mD 10000

Capillary Bound Fluid Porosity

Small Pore Porosity

Free Fluid Volume (FFV) CMRT-B

0.4 ft3/ft3 0

Free Fluid Volume using 3-ms Cutoff (FFV_3MS) CMRT-B

0.4 ft3/ft3 0

T2 Distribution (Diffusion Included)

0.02 ft3/ft3 -0.02

0 63

Logarithmic Mean of T2 Distribution (Diffusion Included) (T2LM_DI) CMRT-B

0.3 ms 3000

Log Quality Control Display (LQC_DISPLAY) CMRT-B

1 7

Magnetic Resonance Free Fluid Volume from Cutoff 2 (MFF2) CMRT-B

0.4 ft3/ft3 0

Magnetic Resonance Porosity (MRP) CMRT-B

0.4 ft3/ft3 0

Enhanced Thermal Neutron Porosity in Selected Lithology (NPOR) HGNS-H

0.4 ft3/ft3 0

Standard Resolution Density Porosity (DPHZ) HDRS-H

0.4 ft3/ft3 0

T2 Cutoff (T2CUTOFF) CMRT-B

0.3 ms 3000

TIME_1900 - Time Marked every 60.00 (s)

Log Quality Control Display (LQC_DISPLAY) CMRT-B

| | | | | |
|---|---|---|---|---|
| 1 - BHS - Bad Hole Flag : | Good | Bad | | |
| 2 - IWT - Wait Time : | OK | Insufficient | | |
| 3 - DB0 - Delta B0 : | OK | Warning | Error | |
| 4 - EEN - Early Echo Noise : | OK | Warning | Error | |
| 5 - HVL - High Voltage : | Normal | Too Low | | |
| 6 - ATS - Auto Tuning : | ALF | Ant | Temp | Off |
| 7 - ATTS - AT Tracking : | OK | Warning | | |

Description: CMRT Depth Log Main Format Format: Log ( CMRT Depth Log Main ) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 09-Dec-2014 07:54:29

## Channel Processing Parameters

| Parameter | Description | Tool | Value | Unit |
|---|---|---|---|---|
| BARI | Barite Mud Presence Flag | Borehole | No | |
| BHS | Borehole Status (Open or Cased Hole) | Borehole | Open | |
| BHT | Bottom Hole Temperature | Borehole | 174.4 | degF |
| BS | Bit Size | WLSESSION | 7.875 | in |
| BSAL | Borehole Salinity | Borehole | 1700 | ppm |
| CALI_SHIFT | CALI Supplementary Offset | HDRS-H | 0 | in |
| CBLO | Casing Bottom (Logger) | WLSESSION | 544.75 | ft |
| CDEN | Cement Density | HGNS-H | 2 | g/cm3 |
| DC_MODE | Depth Correction Mode | DepthCorrection | Real-time | |
| DFD | Drilling Fluid Density | Borehole | 9 | lbm/gal |
| DFT | Drilling Fluid Type | Borehole | Water | |
| DFT_WATER | Drilling Fluid Water Type | Borehole | WBM | |
| DHC | Density Hole Correction | HDRS-H | Bit Size | |
| FD | Fluid Density | Borehole | 1 | g/cm3 |
| FSAL | Formation Salinity | Borehole | 0 | ppm |
| GAMMA_REG | Regularization Factors | CMRT-B | [1.5, 1.5, 0, 0, 0, 0] | |
| GCSE_DOWN_PASS | Generalized Caliper Selection for WL Log Down Passes | Borehole | BS | |
| GCSE_UP_PASS | Generalized Caliper Selection for WL Log Up Passes | Borehole | CALI | |
| GRSE | Generalized Mud Resistivity Selection, from Measured or Computed Mud Resistivity | Borehole | AMF | |
| GTSE | Generalized Temperature Selection, from Measured or Computed Temperature | Borehole | CTEM | |
| HSCO | Hole Size Correction Option | HGNS-H | Yes | |
| JOBID | Job Identification | WLSESSION | CXRX-00068 | |
| MATR | Rock Matrix for Neutron Porosity Corrections | Borehole | LIMESTONE | |
| MDEN | Matrix Density for Density Porosity | Borehole | 2.71 | g/cm3 |
| MFST | Mud Filtrate Sample Temperature | Borehole | 75 | degF |
| NSTACK | Number of Stacking Levels | CMRT-B | 3 | |

| | | | | |
|---|---|---|---|---|
| NSTACK | Number of Stacking Levels | CMRT-B | 3 | |
| POLC_SW | Polarization Correction Switch | CMRT-B | No | |
| RMFS | Resistivity of Mud Filtrate Sample | Borehole | 0.69 | ohm.m |
| T1CUT | T1 Cutoff between BFV and FFV | CMRT-B | 50 | ms |
| T1T2R_IN | T1/T2 Ratio Input | CMRT-B | 2 | |
| T1T2R_MAX | T1/T2 Ratio Maximum | CMRT-B | 3 | |
| T1T2R_MIN | T1/T2 Ratio Minimum | CMRT-B | 1 | |
| T2CUT | T2 Cutoff between BFV and FFV | CMRT-B | 100 | ms |
| T2CUT_TAPER | Start of Tapered T2 Cutoff | CMRT-B | 25 | ms |

# Tool Control Parameters

| Parameter | Description | Tool | Value | Unit |
|---|---|---|---|---|
| ACQ_METHOD_OPT | Acquisition Method Option | CMRT-B | SEQ | |
| ALF_PHDIF_AVE | Average of Auto-Larmor-Frequency Phase Difference during LFST | CMRT-B | -2.61 | deg |
| ALF_PHDIF_STD | Standard Deviation of Auto-Larmor-Frequency Phase Difference during LFST | CMRT-B | 0.12 | deg |
| DLSR | Depth Log Sample Rate | CMRT-B | 7.5 | in |
| DSP_VERS | DH Signal Processing Code Version | CMRT-B | 13 | |
| EPM_OPT | Enhanced Precision Mode Option | CMRT-B | On | |
| FREQ_OP_PREV | Operating Frequency, prior to new LFST, at LFST Temperature | CMRT-B | 2113 | kHz |
| HMCA_BRD_TYPE | HMCA Board Type | HGNS-H | 1 | |
| HRGD_BRD_TYPE | HRGD Board Type | HDRS-H | WITH_HET | |
| LFST_CFREQ | LFST Central Frequency | CMRT-B | 2132 | kHz |
| LFST_FREQ | LFST Frequency | CMRT-B | 2129 | kHz |
| LFST_TEMP | LFST Temperature | CMRT-B | 174.4 | degF |
| LFST_TEMP_DEL | LFST Temperature Variation | CMRT-B | 32.27 | degF |
| LFST_TT_OFFSET | LFST Tune Table Offset | CMRT-B | -2.7 | kHz |
| LOG_DIRECTION | Logging Direction | CMRT-B | Up | |
| LOG_MODE_CMR | Logging Mode for CMR | CMRT-B | DEPTH_B_MODE_EXPERT | |
| LOG_SPEED | Optimal Logging Speed | CMRT-B | 700 | ft/h |
| MAX_LOG_SPEED | Toolstring Maximum Logging Speed | WLSESSION | 840 | ft/h |
| MAX_TOOL_SPEED | Maximum service speed allowed for, or attained by, a logging tool. | CMRT-B | 840 | ft/h |
| NECH_V | Number of Echo Amplitudes Vector | CMRT-B | [5000, 30, 0, 0, 0, 0] | |
| NWT | Number of Wait Times | CMRT-B | 2 | |
| PT_V | Polarization Times Vector | CMRT-B | [6.49, 0.02, 0, 0, 0, 0] | s |
| RPTN_V | Number of Repetitions Vector | CMRT-B | [1, 10, 0, 0, 0, 0] | |
| SLSR | Station Log Sample Rate | CMRT-B | 0 | s |
| TE_V | Echo Spacings Vector | CMRT-B | [200, 200, 0, 0, 0, 0] | us |
| WT_V | Wait Times Vector | CMRT-B | [1.95, 0.02, 0, 0, 0, 0] | s |

# Calibration Report

## CMRT-B (Combinable Magnetic Resonance Tool - BA/BB/VA/BAH) Calibration - Run ONE

Primary Equipment :

| | | |
|---|---|---|
| CMRT Normal Pressure Sonde | CMRS | 2 |

Auxiliary Equipment :

| | | |
|---|---|---|
| CMRT Cartridge Element 30kpsi | CMRC | 156 |

## CMRT Water Bottle Calibration - Water Bottle Calibration

Master (EEPROM): 12:30:00 07-Dec-2014 Before (Measured): 21:29:48 02-Dec-2014

| Measurement | Unit | Phase | Nominal | Low Limit | Actual | High Limit |
|---|---|---|---|---|---|---|
| Reciprocal of the MC Amplitude Corrected to 25 degC | | Master | 0.030 | 0.020 | 0.032 | 0.040 |
| | | Before | 0.030 | 0.020 | 0.031 | 0.040 |
| | | Before-Master | ----- | ----- | -0.001 | ----- |
| Test Loop Amplitude During MC | | Master | 2350.000 | 1500.000 | 2529.760 | 3200.000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Loop Amplitude During MC | | Master | 2350.000 | 1500.000 | 2529.760 | 3200.000 | |
| | | Before | 2350.000 | 1500.000 | 2520.324 | 3200.000 | |
| | | Before-Master | ----- | ----- | -9.436 | ----- | |
| Oper Freq During MC | kHz | Master | 2240.000 | 2130.000 | 2163.000 | 2350.000 | |
| | | Before | 2240.000 | 2130.000 | 2173.241 | 2350.000 | |
| | | Before-Master | ----- | ----- | 10.241 | ----- | |
| Sonde Temp During MC | degF | Master | 80.600 | 50.000 | 60.940 | 111.200 | |
| | | Before | 80.600 | 50.000 | 65.100 | 111.200 | |
| | | Before-Master | ----- | ----- | 4.160 | ----- | |
| Noise Per Echo - 0 | ft3/ft3 | Master | ----- | ----- | ----- | ----- | |
| | | Before | 0.100 | 0 | 0.045 | 0.200 | |
| | | Before-Master | ----- | ----- | ----- | ----- | |
| Signal-to-Noise Ratio for MC - 0 | | Master | ----- | ----- | ----- | ----- | |
| | | Before | 675.000 | 350.000 | 709.566 | 1000.000 | |
| | | Before-Master | ----- | ----- | ----- | ----- | |
| Log Mean of the T2 Dist - 0 | ms | Master | ----- | ----- | ----- | ----- | |
| | | Before | 52.500 | 45.000 | 59.925 | 60.000 | |
| | | Before-Master | ----- | ----- | ----- | ----- | |

Company: Cascade Petroleum

Schlumberger

Well: Gaede 9S-55W-08-12

Field: Wildcat

County: Lincoln

State: Colorado

# Combinable Magnetic Resonance Tool

# CMR