MUD

County: Weld

Schlumberger

Company: **Kerr−McGee Oil and Gas Onshore LP**

Well: **Bella 19−8**
Field: **Wattenberg**
County: **Weld** State: **Colorado**

Platform Express
Micro Log

Company: Kerr−McGee Oil and Gas Onshor
Well: Bella 19−8
Location: Sec. 8, T3N, R66W
Field: Wattenberg
County: Weld

LOCATION

Sec. 8, T3N, R66W
Surf: 1719' FSL X 1703' FWL NESW
BHL: 1256' FSL X 1430' FWL SESW (est.)

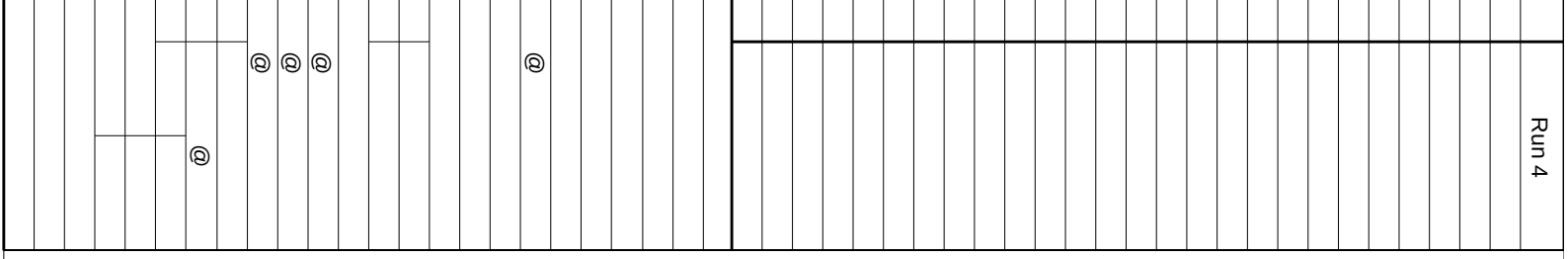
Elev.: K.B. 4877.00 ft
G.L. 4862.00 ft
D.F. 4876.00 ft

Permanent Datum: Ground Level — Elev.: 4862.00 ft
Log Measured From: Kelly Bushing — 15.00 ft above Perm. Datum
Drilling Measured From: Kelly Bushing

API Serial No.	Section	Township	Range
05−123−30696−0000	8	3N	66W

	Run 1	Run 2	Run 3
Logging Date	17−Feb−2010		
Run Number	1		
Depth Driller	8035 ft		
Schlumberger Depth	8027 ft		
Bottom Log Interval	8019 ft		
Top Log Interval	595 ft		
Casing Driller Size @ Depth	8.625 in @ 609 ft	@	
Casing Schlumberger	595 ft		
Bit Size	7.875 in		
Type Fluid In Hole	Water Based Mud		
MUD Density / Viscosity	8.4 lbm/gal / 26 s		
MUD Fluid Loss / PH	/		
MUD Source Of Sample	Mud Pit		
RM @ Measured Temperature	5.850 ohm.m @ 65 degF	@	
RMF @ Measured Temperature	4.387 ohm.m @ 65 degF	@	
RMC @ Measured Temperature	8.775 ohm.m @ 65 degF	@	
Source RMF / RMC	Calculated / Calculated	/	
RM @ MRT / RMF @ MRT	1.814 @ 225 / 1.361 @ 225	@ / @	
Maximum Recorded Temperatures	225 degF		
Circulation Stopped Time	17−Feb−2010 2:00		
Logger On Bottom Time	17−Feb−2010 8:15		
Unit Number / Location	3021 / Ft. Morgan, CO	/	
Recorded By	Tim Hoffman		
Witnessed By	Greg Hovivian and Tekabe Gedamu		

	Run 1	Run 2	Run 3
Logging Date			
Run Number			
Depth Driller			
Schlumberger Depth			
Bottom Log Interval			
Top Log Interval			
Casing Driller Size @ Depth	@		
Casing Schlumberger			
Bit Size			
Type Fluid In Hole			
MUD Density / Viscosity	/		
MUD Fluid Loss / PH	/		
MUD Source Of Sample			
RM @ Measured Temperature	@		
RMF @ Measured Temperature	@		
RMC @ Measured Temperature	@		
Source RMF / RMC	/		
RM @ MRT / RMF @ MRT	@ / @	@	
Maximum Recorded Temperatures			
Circulation Stopped Time			
Logger On Bottom Time			
Unit Number / Location	/		
Recorded By			
Witnessed By			



DEPTH SUMMARY LISTING

Date Created: 17−FEB−2010 8:19:35

Depth System Equipment

Depth Measuring Device		Tension Device		Logging Cable	
Type:	IDW−B	Type:	CMTD−B/A	Type:	7−39P LXS
Serial Number:		Serial Number:		Serial Number:	
Calibration Date:		Calibration Date:		Length:	13115 FT
Calibrator Serial Number:		Calibrator Serial Number:			
Calibration Cable Type:	7−46P	Number of Calibration Points:	0	Conveyance Method:	Wireline
Wheel Correction 1:				Rig Type:	LAND
Wheel Correction 2:					

Depth Control Parameters

Log Sequence:	First Log In the Well
Rig Up Length At Surface:	0.00 FT
Rig Up Length At Bottom:	0.00 FT
Rig Up Length Correction:	0.00 FT
Stretch Correction:	3.50 FT
Tool Zero Check At Surface:	

Depth Control Remarks

1.
2.
3.
4.
5.
6.

OTHER SERVICES1	OTHER SERVICES2
OS1: None	OS1:
OS2:	OS2:
OS3:	OS3:
OS4:	OS4:
OS5:	OS5:

REMARKS: RUN NUMBER 1	REMARKS: RUN NUMBER 2
This is the first run in hole.	
Toolstring run as per tool sketch.	
Toolstring run without bowspring or standoffs as per client request on deviated wells.	
Matrix changes are as noted on the porosity print.	

Rig: Xtreme 12

Crew: Mark Hoffman and Shane Walker

RUN 1		RUN 2	
SERVICE ORDER #:	BBE4−00016	SERVICE ORDER #:	
PROGRAM VERSION:	17C0−154	PROGRAM VERSION:	
FLUID LEVEL:	10 ft	FLUID LEVEL:	

LOGGED INTERVAL	START	STOP	LOGGED INTERVAL	START	STOP

EQUIPMENT DESCRIPTION

RUN 1 RUN 2

SURFACE EQUIPMENT

WITM (CTS)−A
GSR−U/Y
NCT−B
CNB−AB
NCS−VB

DOWNHOLE EQUIPMENT

LEH−QT
LEH−QT

40.6

HGNS HTEM
HMCA
TelStatus
CTEM

37.6

HILTB−CTS
HGNSC−B 940
HMCA
TCC−B
HGNH
NLS−KL
NSR−F 5168
HACCZ 419
HCNT
HGR
HRCC−B
HRMS−B
HRGD−B 898
GLS−VJ 5363
MCFL Device
HILT Nucl. LS 42767
HILT Nucl. SS 42767
HILT Nucl. BS 42767
AIT−H
AHIS−BA 397
AHRM−A
NPV−N

37.6

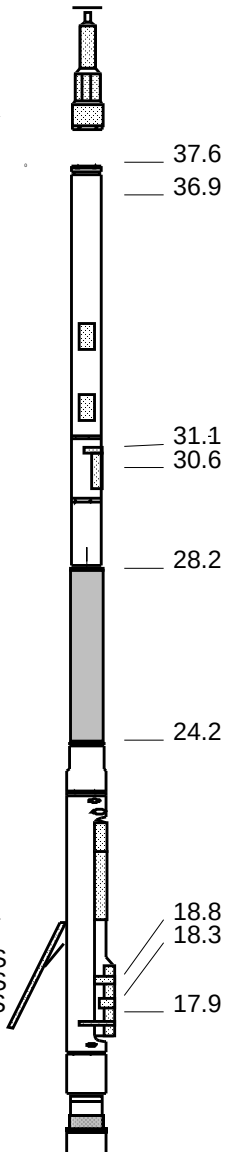
HGNS Gamm — 36.9

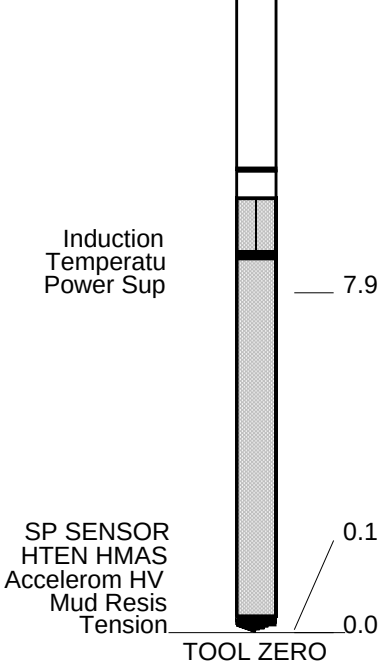
HGNS Neut — 31.1
HGNS Neut — 30.6

HGNS sens — 28.2

HRCC cart — 24.2

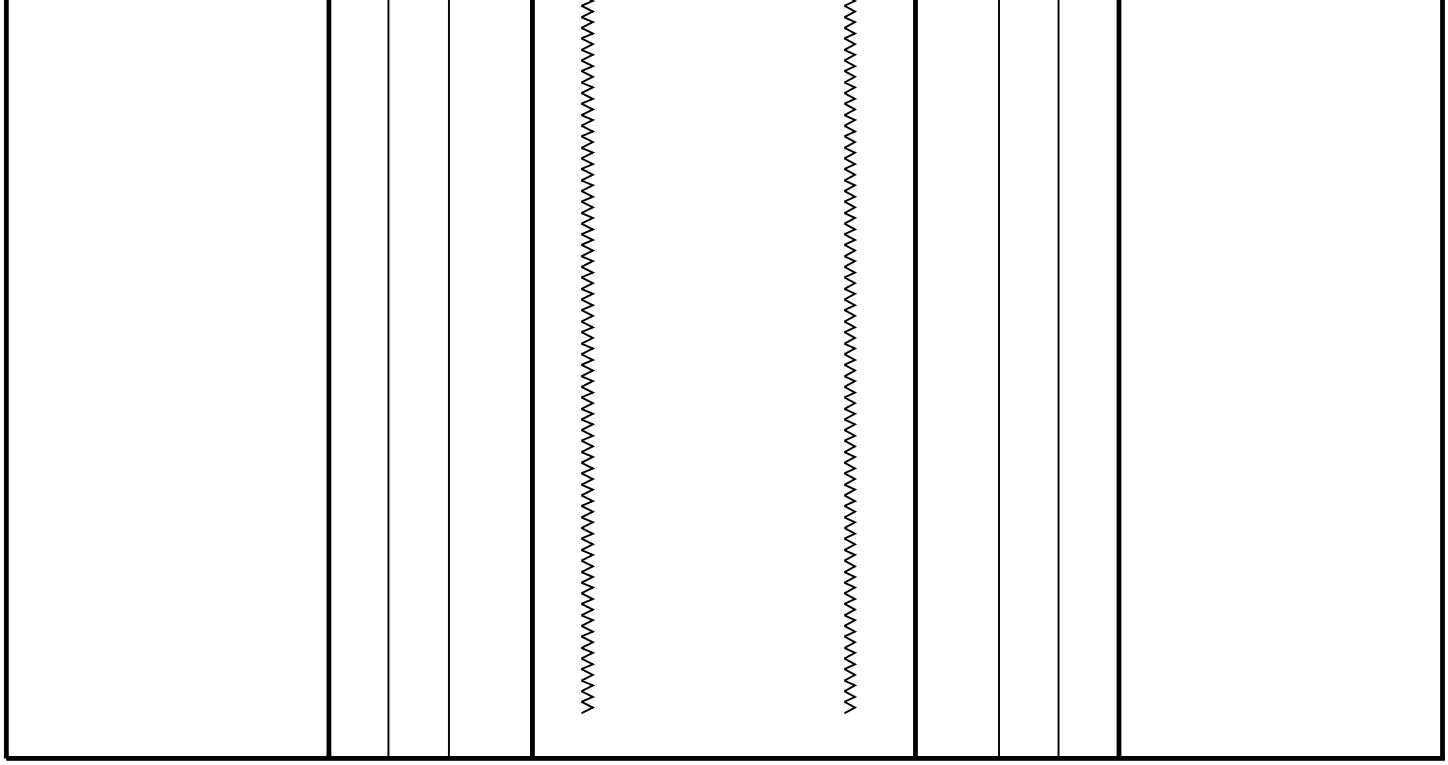
MCFL — 18.8
HILT cali — 18.3
HRDD−LS
HRDD−SS
HRDD−BS — 17.9





MAXIMUM STRING DIAMETER 4.63 IN
MEASUREMENTS RELATIVE TO TOOL ZERO
ALL LENGTHS IN FEET

Production String	(in) OD	(in) ID	(ft) MD	Well Schematic	(ft) MD	(in) OD	(in) ID	Casing String
					0.0	8.625		Casing String
					609.0	8.625		Casing Shoe
					609.0	7.875		Borehole Segment



All depths are driller’s depths

Schlumberger

UPPER MICROLOG 5" = 100’

MAXIS Field Log

Input DLIS Files

DEFAULT	AIT_TLD_MCFL_CNL_006LUP	FN:5	PRODUCER	17−Feb−2010 08:13	8040.0 FT	0.0 FT

Integrated Hole/Cement Volume Summary

Hole Volume = 417.84 ft3

Cement Volume = 284.82 ft3 (assuming 4.50 in casing O.D.)

Computed from 4999.5 ft to 3795.5 ft

OP System Version: 17C0−154

HILTC	17C0−154

PIP SUMMARY

- **Integrated Hole Volume Minor Pip Every 10 F3**
- **Integrated Hole Volume Major Pip Every 100 F3**

Integrated Cement Volume Minor Pip Every 10 F3
Integrated Cement Volume Major Pip Every 100 F3
Time Mark Every 60 S

Tension (TENS)
10000 (LBF) 0

Caliper (HCAL)
6 (IN) 16

PERM

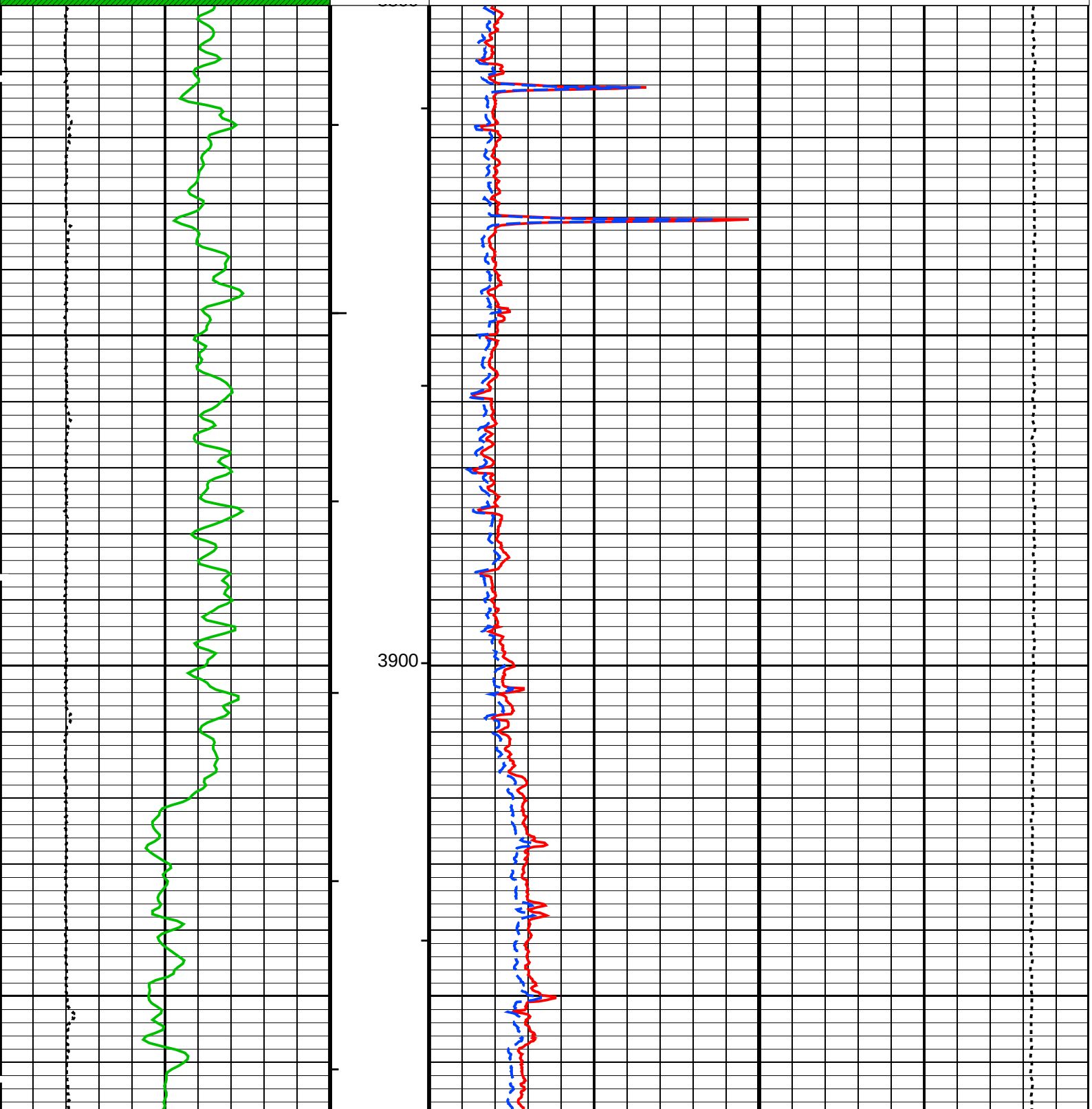
Gamma Ray (GR)
0 (GAPI) 200

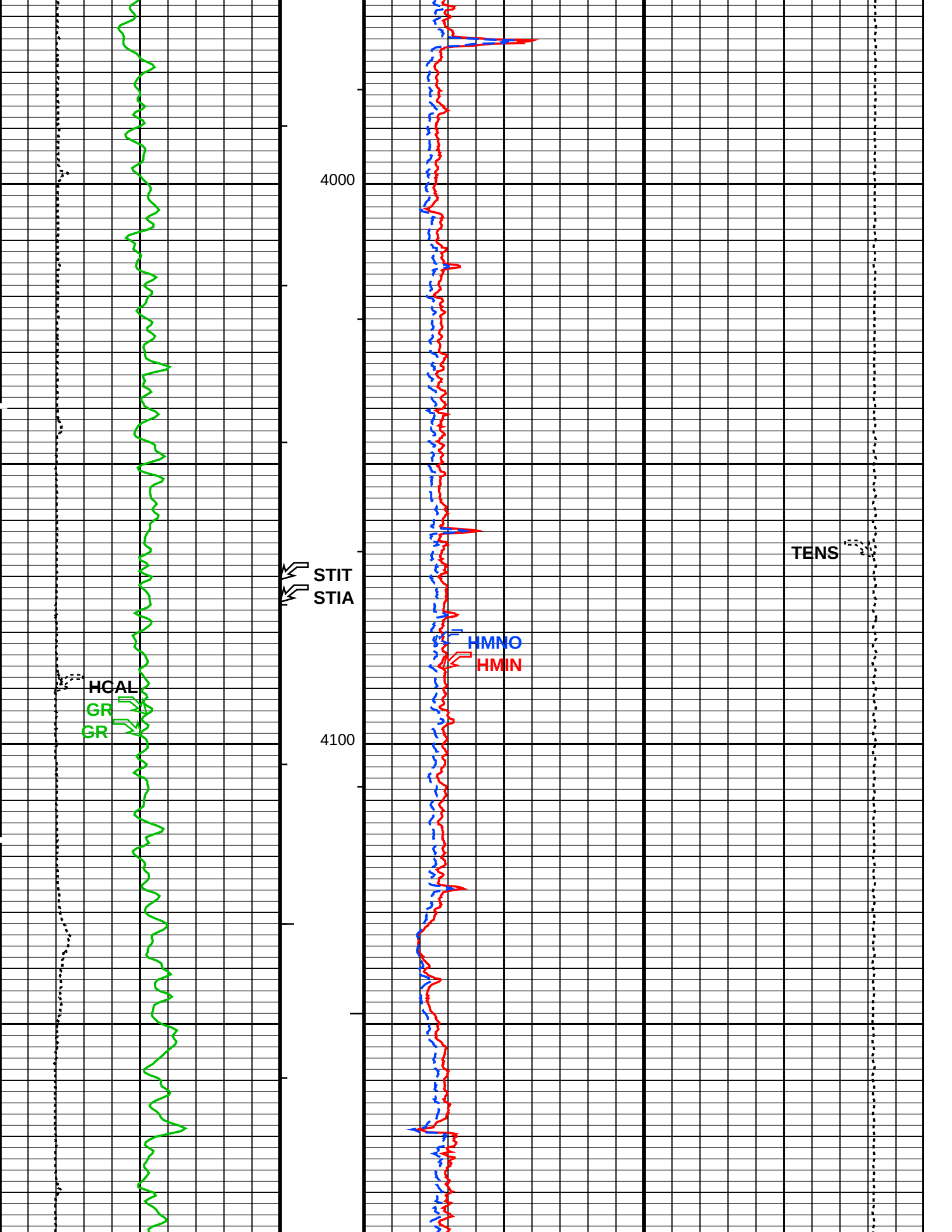
Computed Micro Normal (HMNO)
0 (OHMM) 40

GR BACKUP

Stuck Stretch (STIT)
0 (F) 50

Computed Micro Inverse (HMIN)
0 (OHMM) 40

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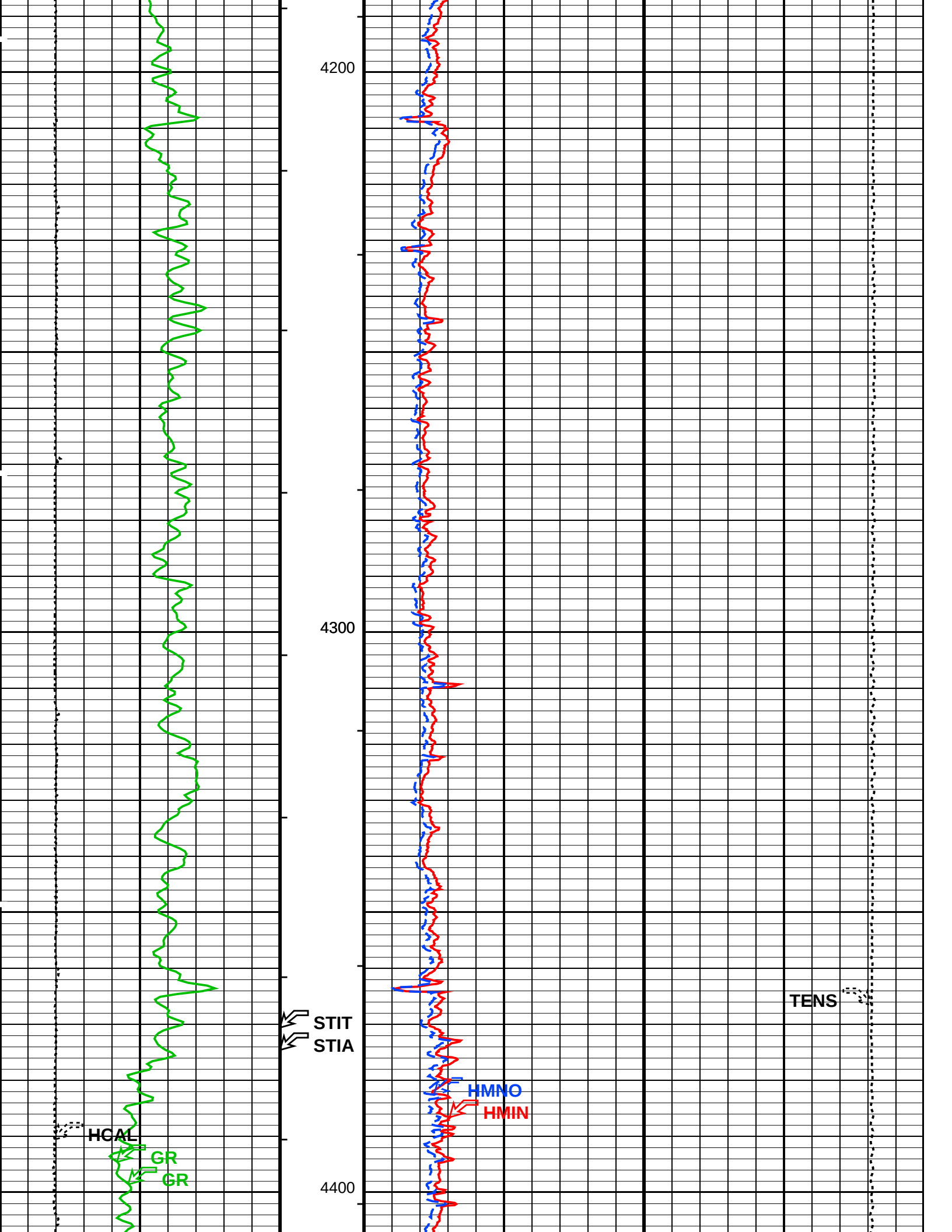
4100
STIT
STIA
HMNO
HMIN
TENS
HCAL
GR
GR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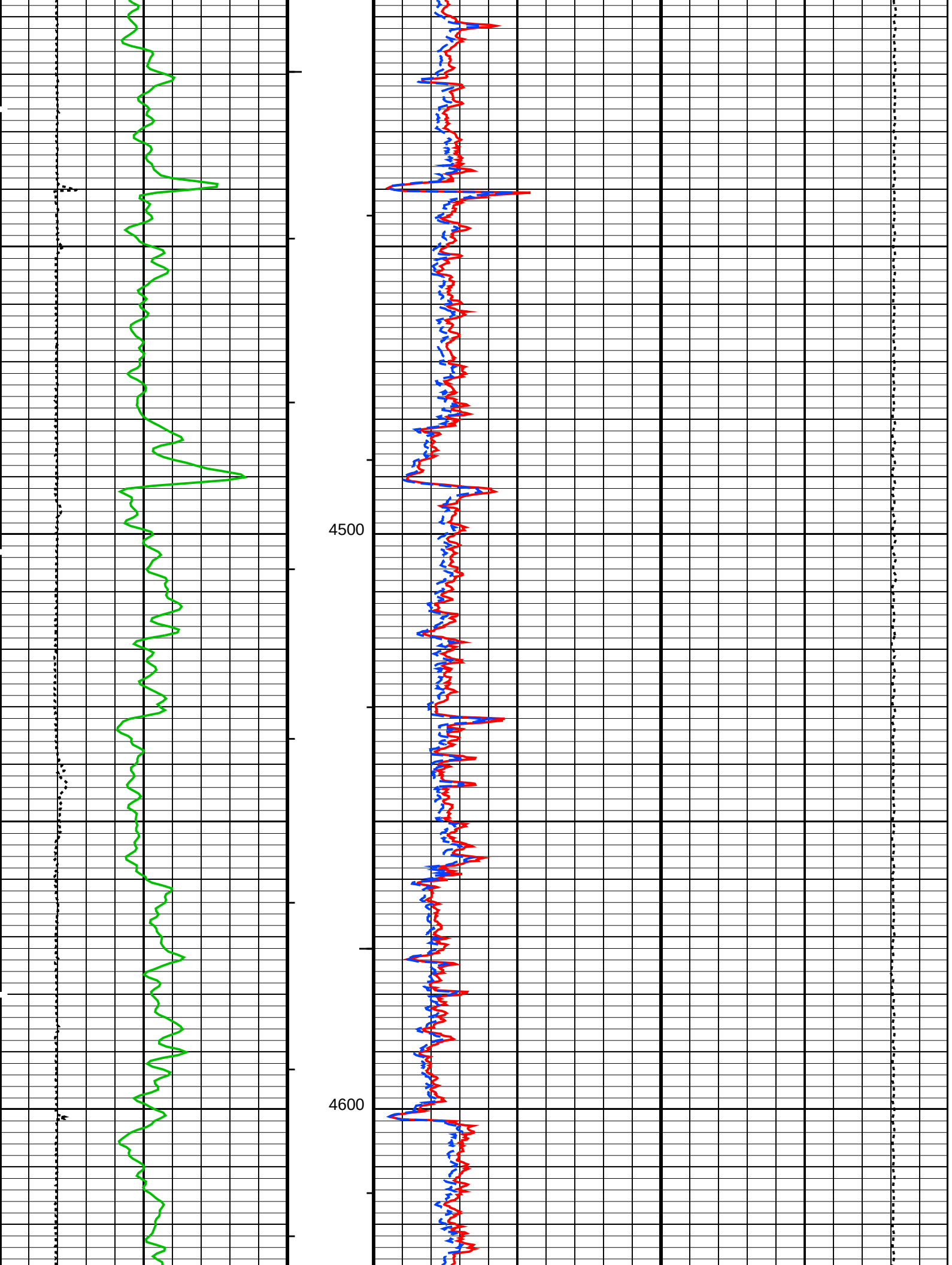
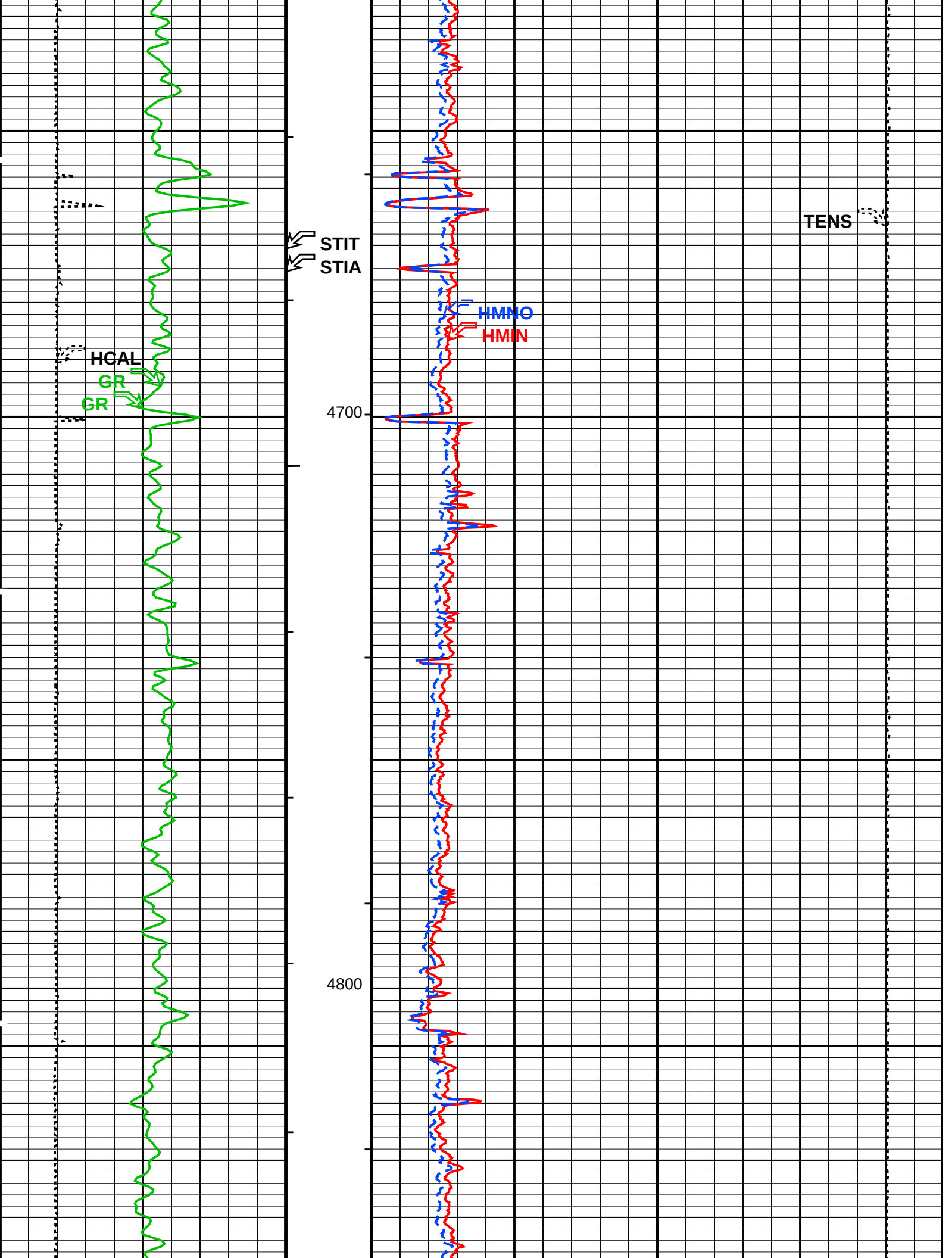
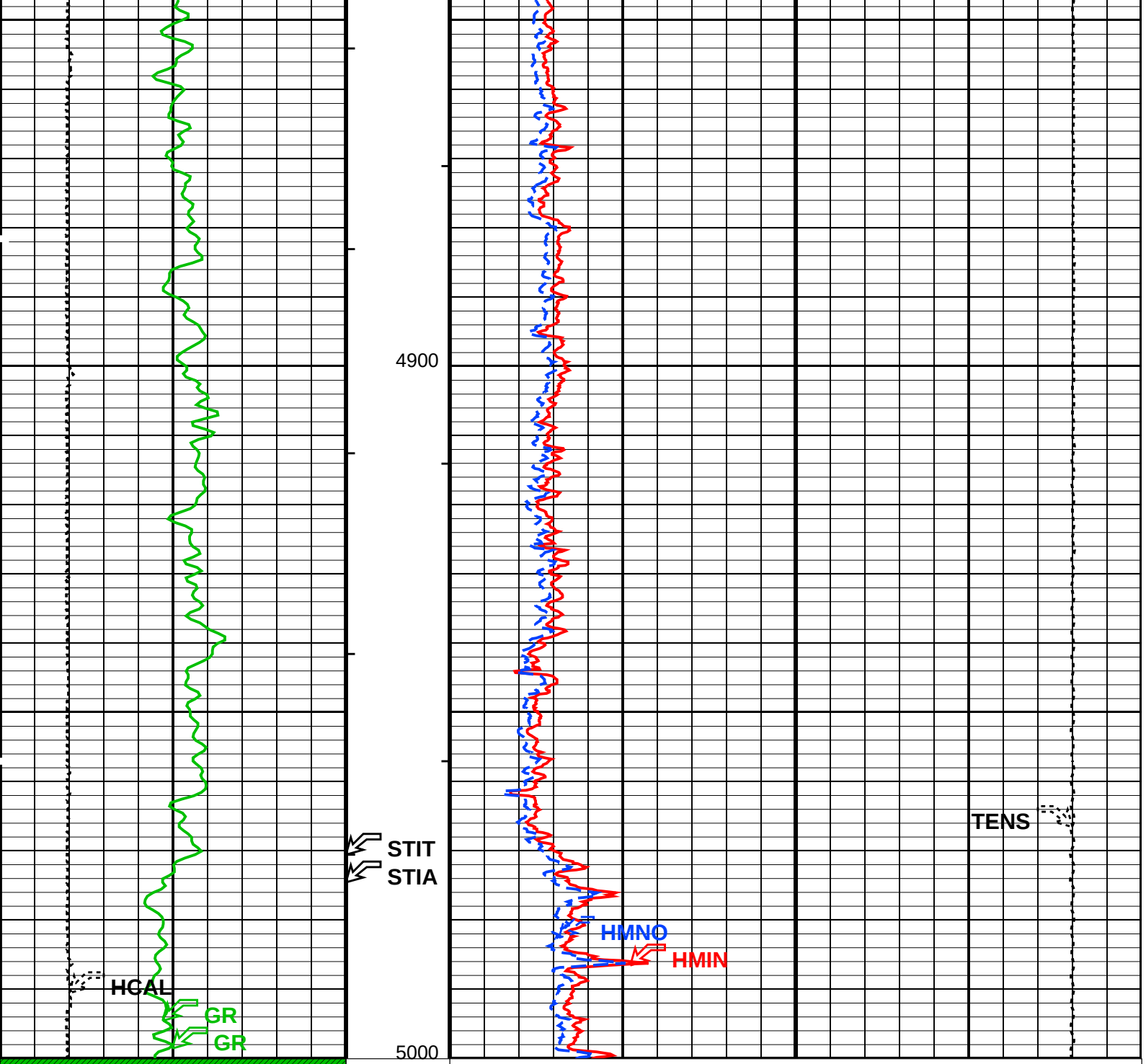
4300
4400
STIT
STIA
HMNO
HMIN
TENS
HCAL
GR
GR


4500
4600


TENS
STIT
STIA
HMNO
HMIN
HCAL
GR
GR
4700
4800



GR BACKUP

Stuck Stretch (STIT)
0 (F) 50

Computed Micro Inverse (HMIN)
0 (OHMM) 40

Gamma Ray (GR)
0 (GAPI) 200

Computed Micro Normal (HMNO)
0 (OHMM) 40

Caliper (HCAL)
6 (IN) 16

PERM

Tension (TENS)
10000 (LBF) 0

PIP SUMMARY

- Integrated Hole Volume Minor Pip Every 10 F3
- Integrated Hole Volume Major Pip Every 100 F3
- Integrated Cement Volume Minor Pip Every 10 F3
- Integrated Cement Volume Major Pip Every 100 F3

Time Mark Every 60 S

Parameters

DLIS Name	Description	Value	
	HILTB−CTS: High resolution Integrated Logging Tool−CTS		
MPOF	MCFL Processing Operation Mode	ON	
	STI: Stuck Tool Indicator		
STKT	STI Stuck Threshold	2.500	ft
TDD	Total Depth − Driller	8035.0	ft
TDL	Total Depth − Logger	8027.0	ft
	System and Miscellaneous		
BS	Bit Size	7.875	in

Format: UPPER_MLT Vertical Scale: 5" per 100’ Graphics File Created: 17−Feb−2010 09:02

OP System Version: 17C0−154

HILTC 17C0−154

Input DLIS Files

DEFAULT AIT_TLD_MCFL_CNL_006LUP FN:5 PRODUCER 17−Feb−2010 08:13 8040.0 FT 0.0 FT

Schlumberger

MAIN MICROLOG 5" = 100’

MAXIS Field Log

Output DLIS Files

DEFAULT AIT_TLD_MCFL_CNL_006LUP FN:5 PRODUCER 17−Feb−2010 08:13

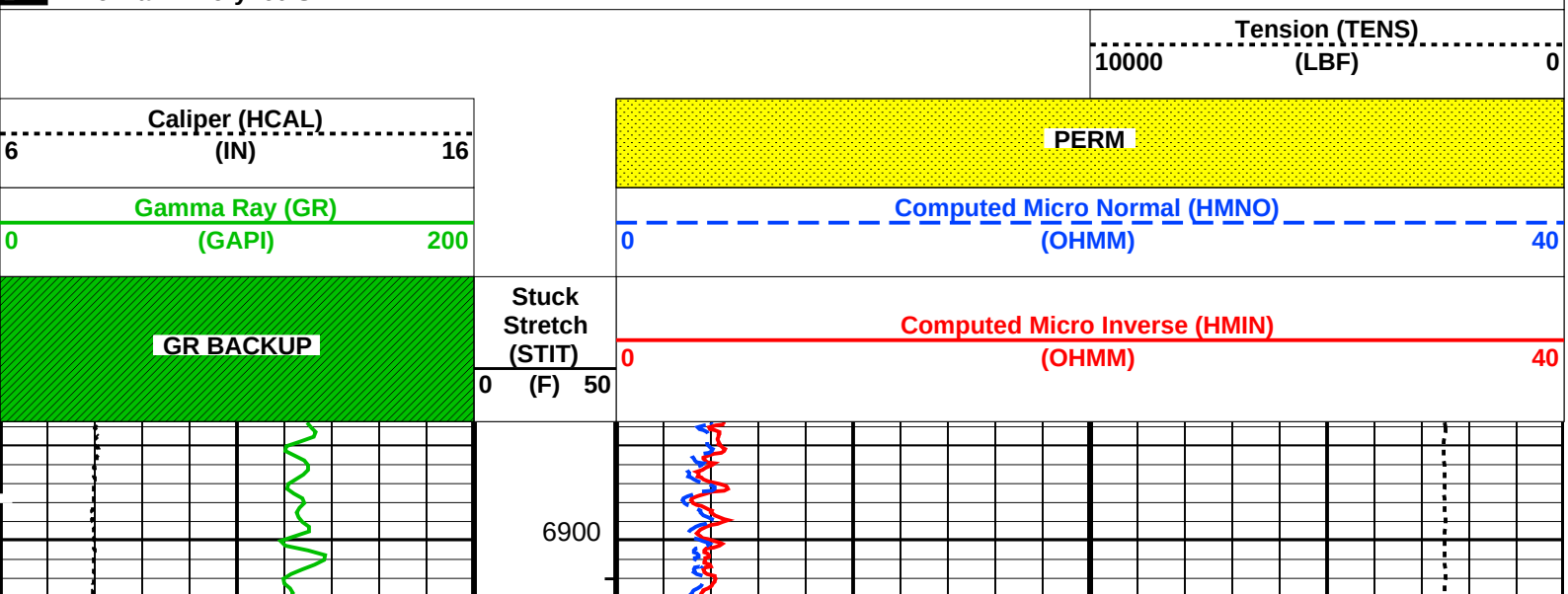
OP System Version: 17C0−154

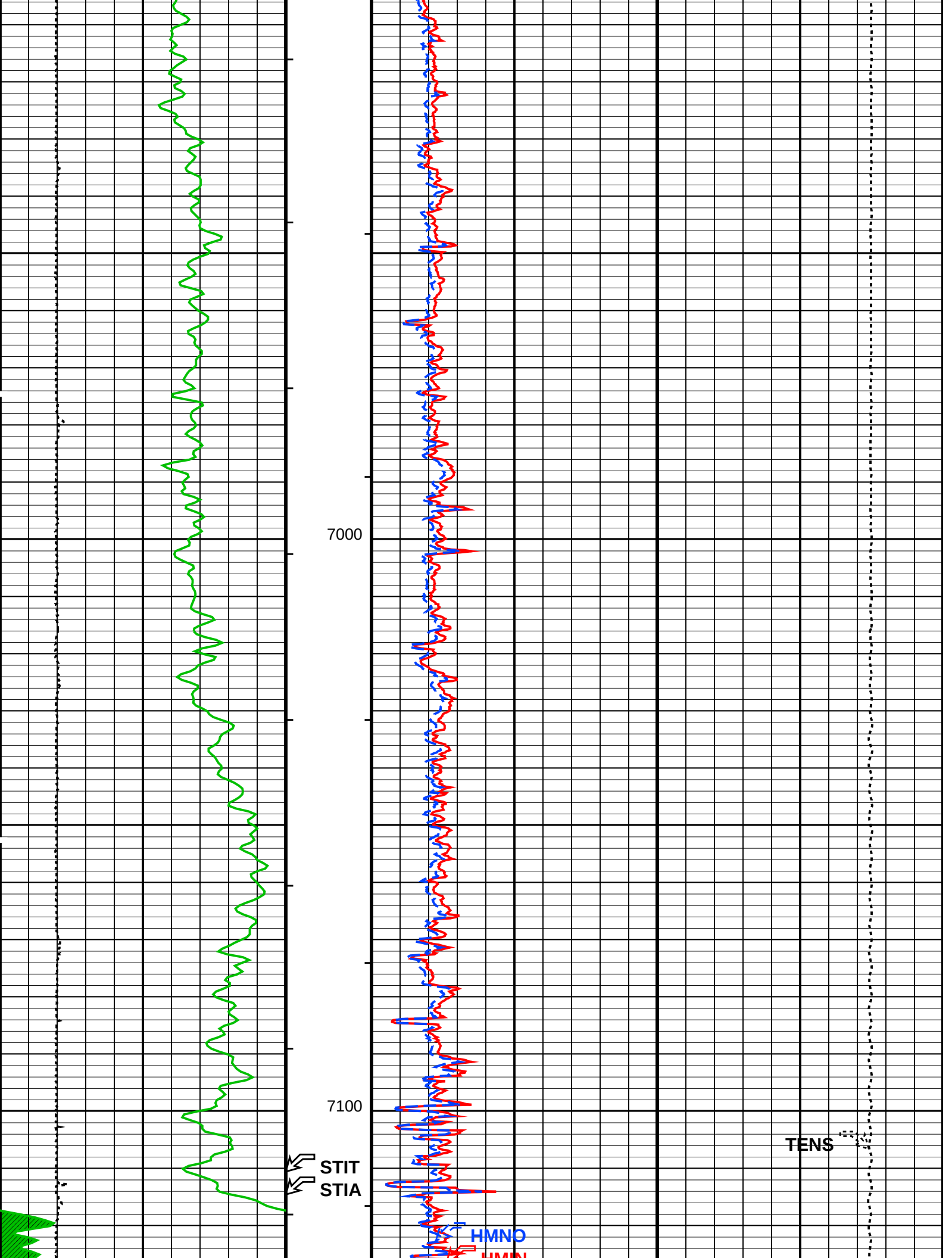
HILTB−CTS 17C0−154

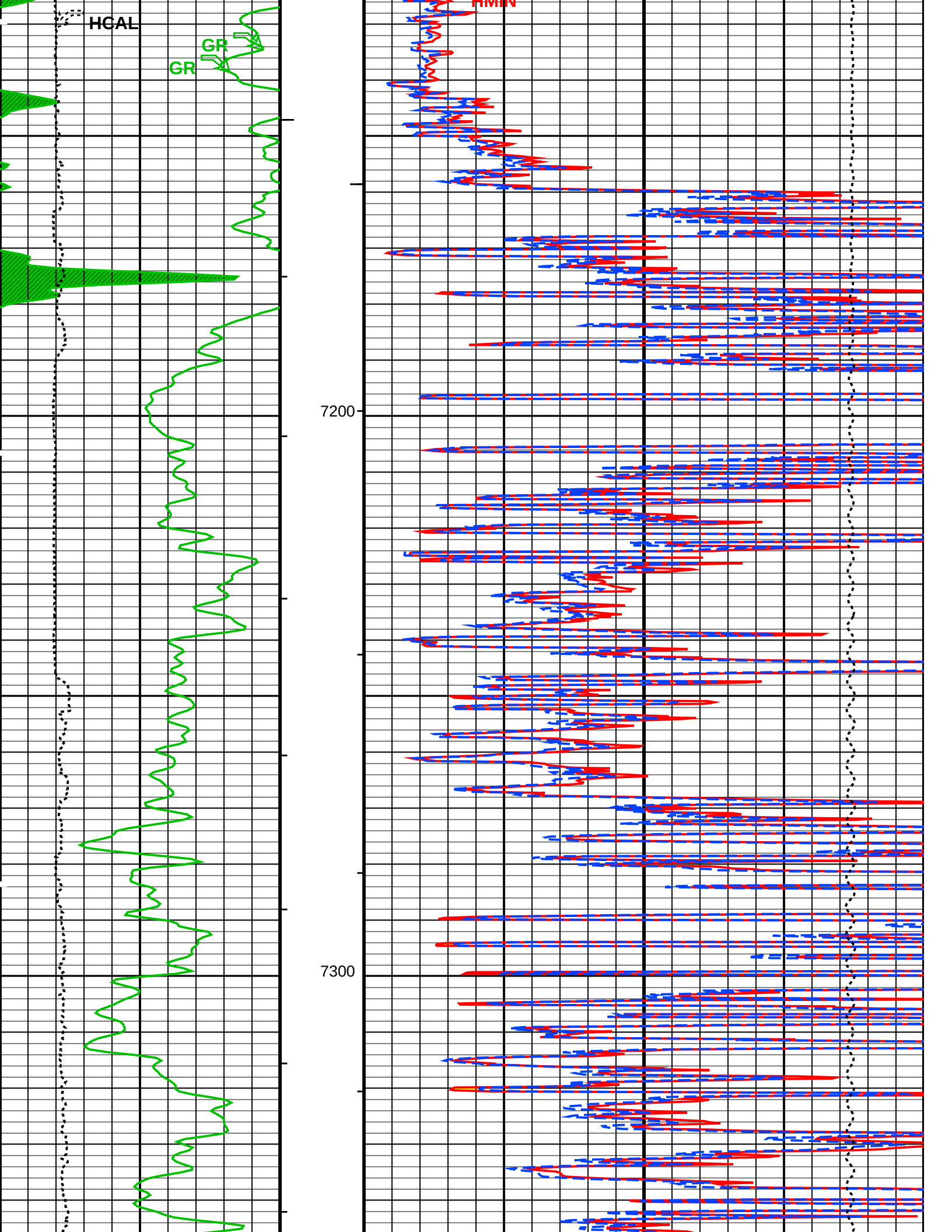
PIP SUMMARY

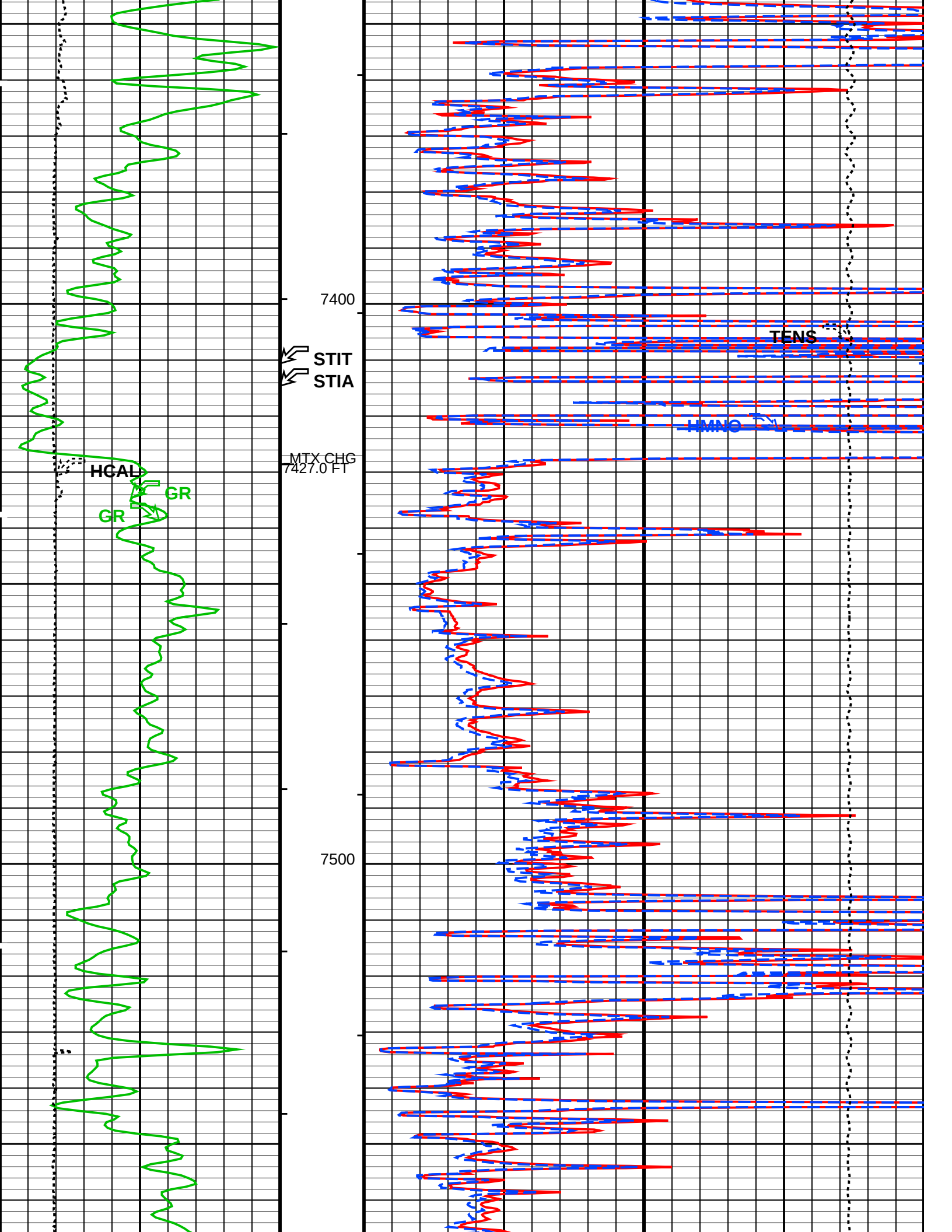
- Integrated Hole Volume Minor Pip Every 10 F3
- Integrated Hole Volume Major Pip Every 100 F3
- Integrated Cement Volume Minor Pip Every 10 F3
- Integrated Cement Volume Major Pip Every 100 F3

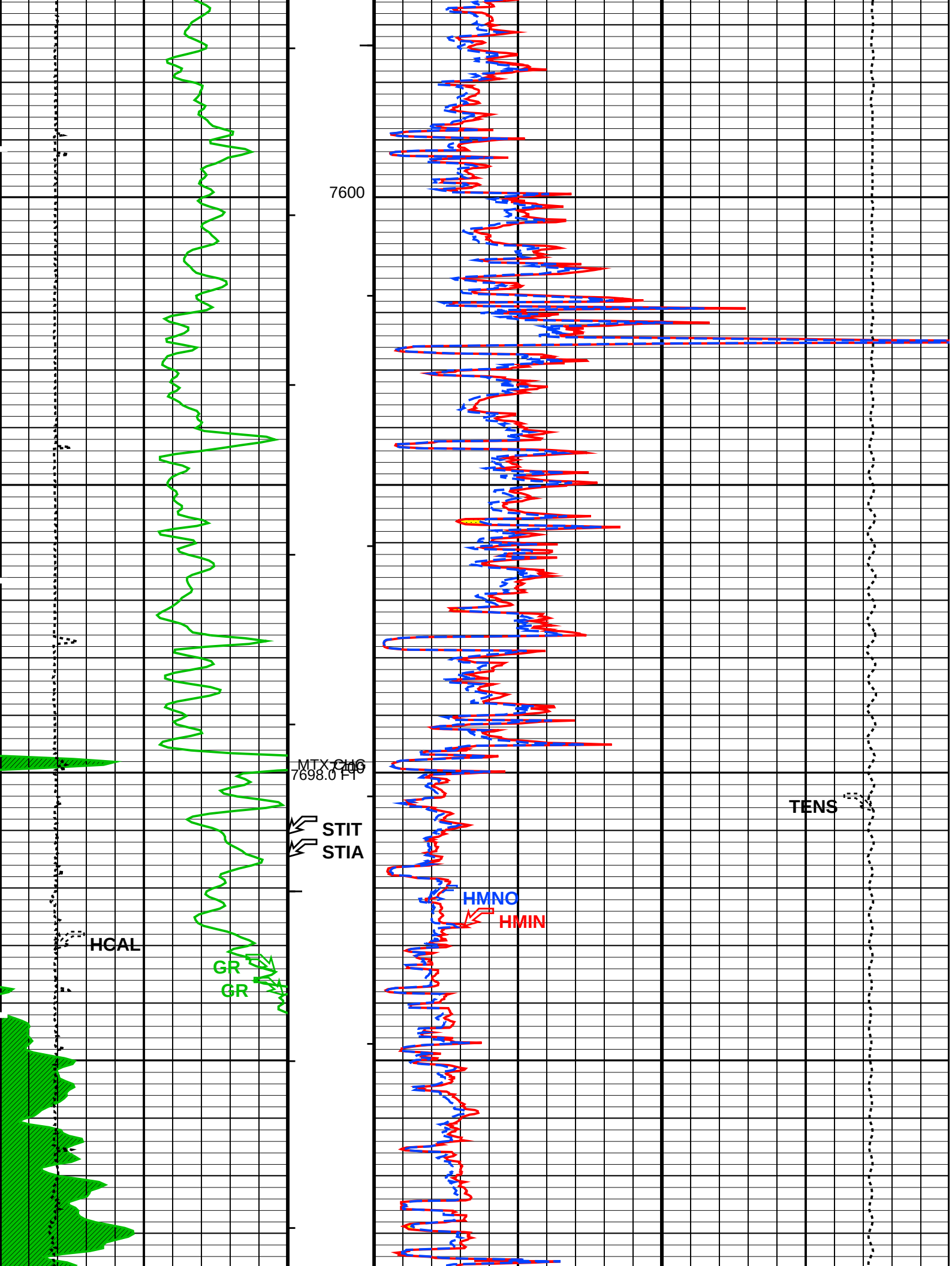
Time Mark Every 60 S

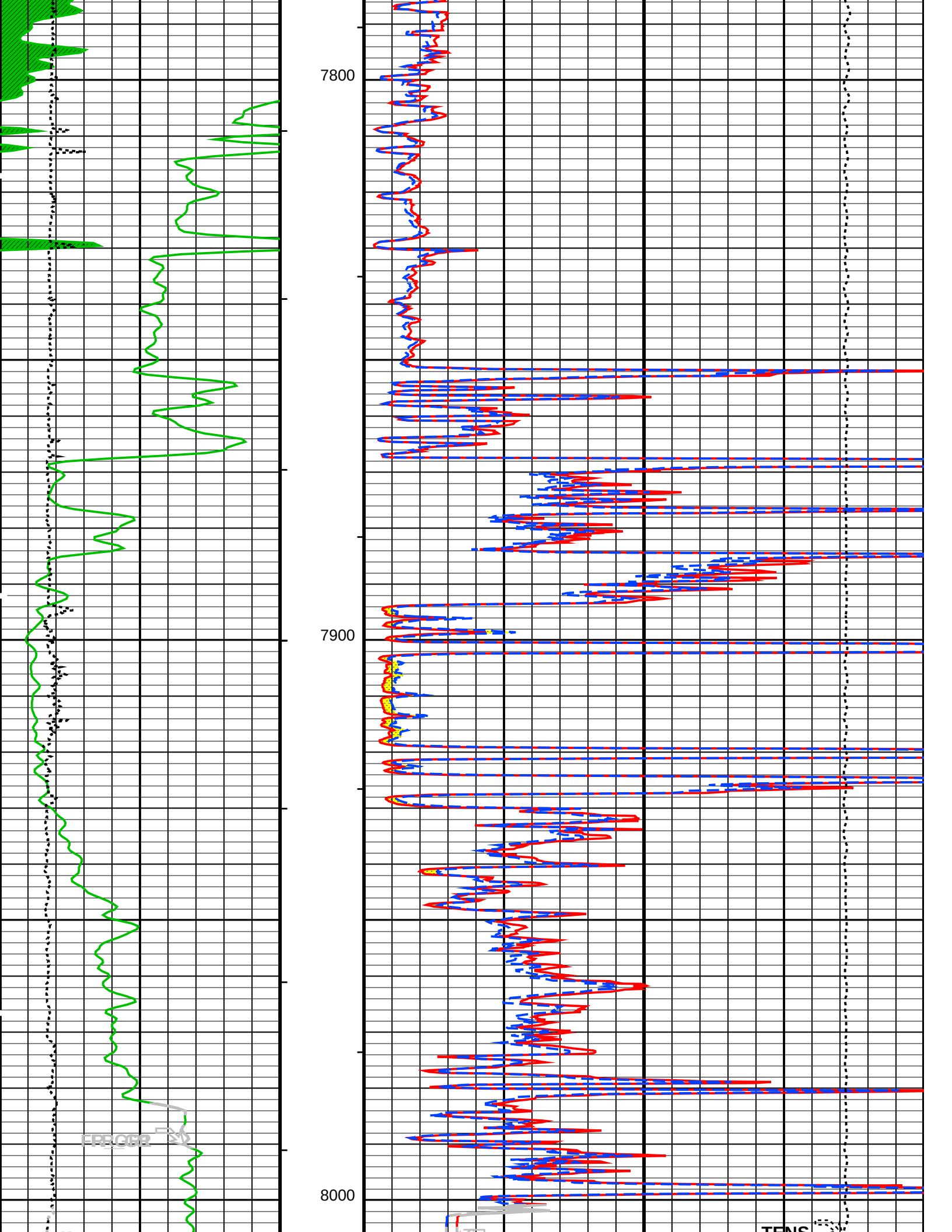



7000
7100
STIT
STIA
HMNO
TENS


HCAL
GR
GR
HMIN
7200
7300


7400
7500
STIT
STIA
TENS
HMNO
MTX CHG
7427.0 FT
HCAL
GR
GR


7600
MTX Cable
7698.0 FT
STIT
STIA
HMNO
HMIN
TENS
HCAL
GR
GR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7900
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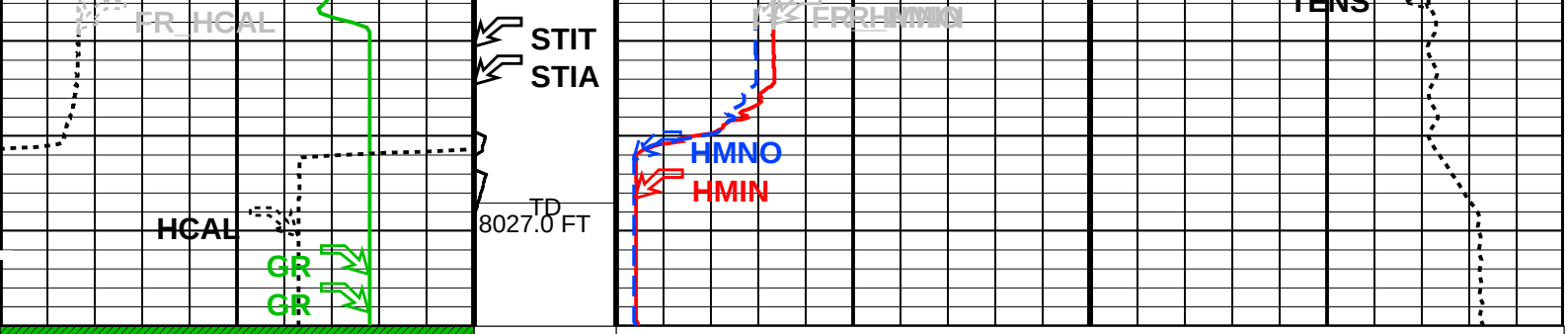


GR BACKUP

Stuck Stretch (STIT)
0 (F) 50

Computed Micro Inverse (HMIN)
0 (OHMM) 40

Gamma Ray (GR)
0 (GAPI) 200

Computed Micro Normal (HMNO)
0 (OHMM) 40

Caliper (HCAL)
6 (IN) 16

PERM

Tension (TENS)
10000 (LBF) 0

PIP SUMMARY

- Integrated Hole Volume Minor Pip Every 10 F3
- Integrated Hole Volume Major Pip Every 100 F3
- Integrated Cement Volume Minor Pip Every 10 F3
- Integrated Cement Volume Major Pip Every 100 F3

Time Mark Every 60 S

Parameters

DLIS Name	Description	Value	
	HILTB−CTS: High resolution Integrated Logging Tool−CTS		
MPOF	MCFL Processing Operation Mode	ON	
	HOLEV: Integrated Hole/Cement Volume		
FCD	Future Casing (Outer) Diameter	4.5	IN
HVCS	Integrated Hole Volume Caliper Selection	HCAL	
	STI: Stuck Tool Indicator		
LBFR	Trigger for MAXIS First Reading Label	TDL	
STKT	STI Stuck Threshold	2.5	FT
TDD	Total Depth − Driller	8035.00	FT
TDL	Total Depth − Logger	8027.00	FT
	System and Miscellaneous		
BS	Bit Size	7.875	IN
DORL	Depth Offset for Repeat Analysis	0.0	FT
TD	Total Depth	8027	FT

Format: LOWER_MLT Vertical Scale: 5" per 100’ Graphics File Created: 17−Feb−2010 08:13

OP System Version: 17C0−154

HILTB−CTS 17C0−154

Output DLIS Files

DEFAULT AIT_TLD_MCFL_CNL_006LUP FN:5 PRODUCER 17−Feb−2010 08:13

Schlumberger

REPEAT ANALYSIS

MAXIS Field Log

Input DLIS Files

DEFAULT	AIT_TLD_MCFL_CNL_005PUP	FN:4	PRODUCER	17−Feb−2010 08:12	8049.0 FT	7607.0 FT

Output DLIS Files

DEFAULT	AIT_TLD_MCFL_CNL_006LUP	FN:5	PRODUCER	17−Feb−2010 08:13		

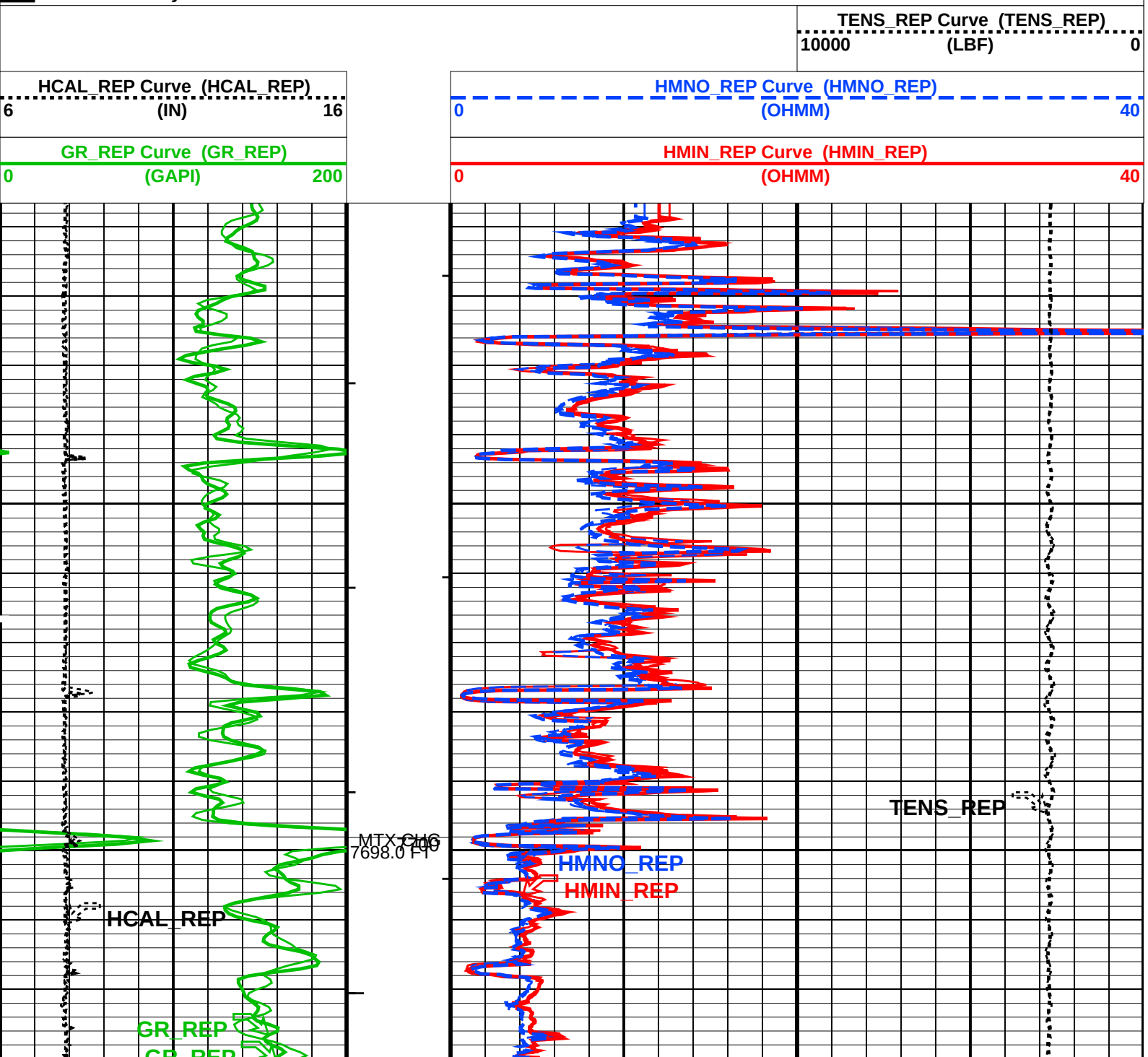
OP System Version: 17C0−154

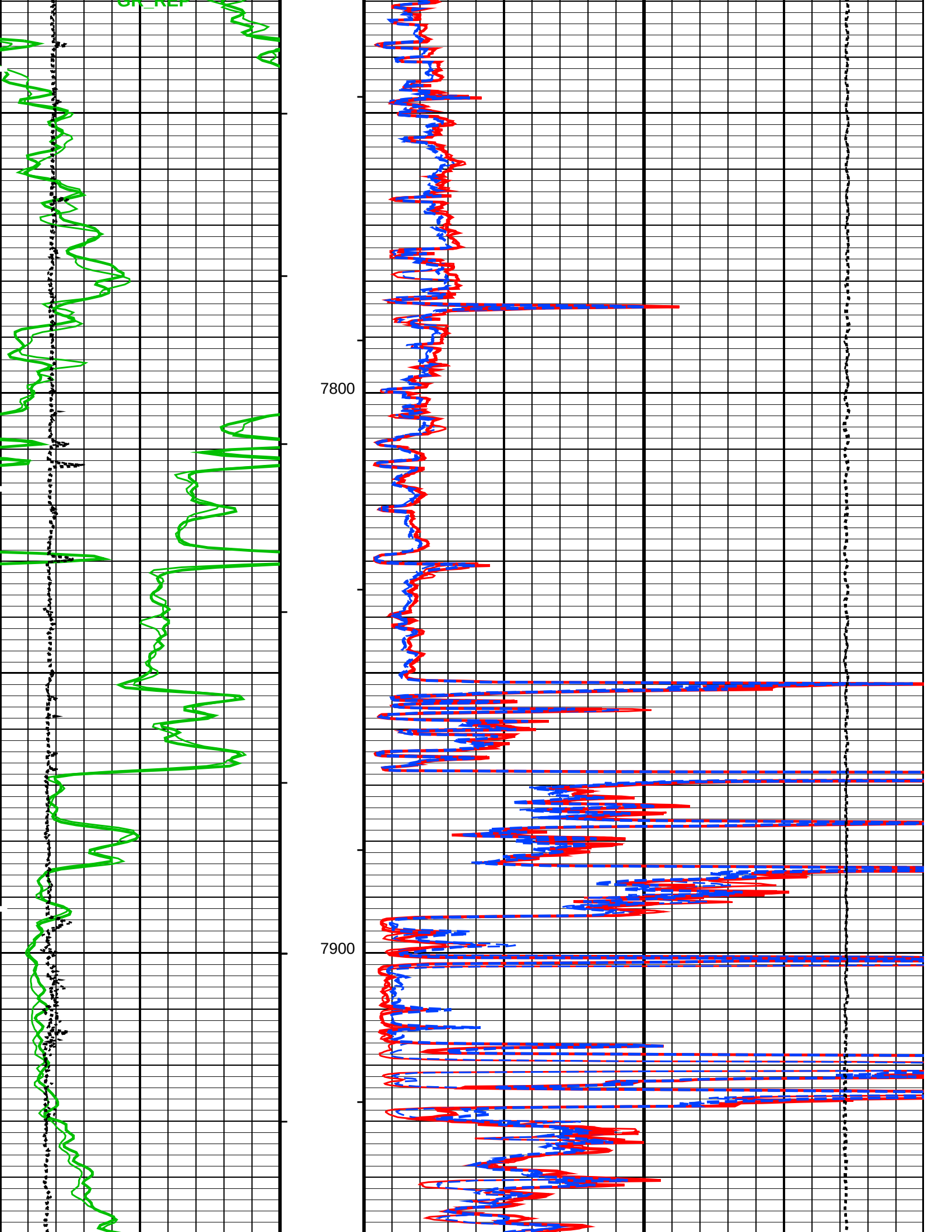
HILTB−CTS	17C0−154

PIP SUMMARY

- Integrated Hole Volume Minor Pip Every 10 F3
- Integrated Hole Volume Major Pip Every 100 F3
- Integrated Cement Volume Minor Pip Every 10 F3
- Integrated Cement Volume Major Pip Every 100 F3

Time Mark Every 60 S

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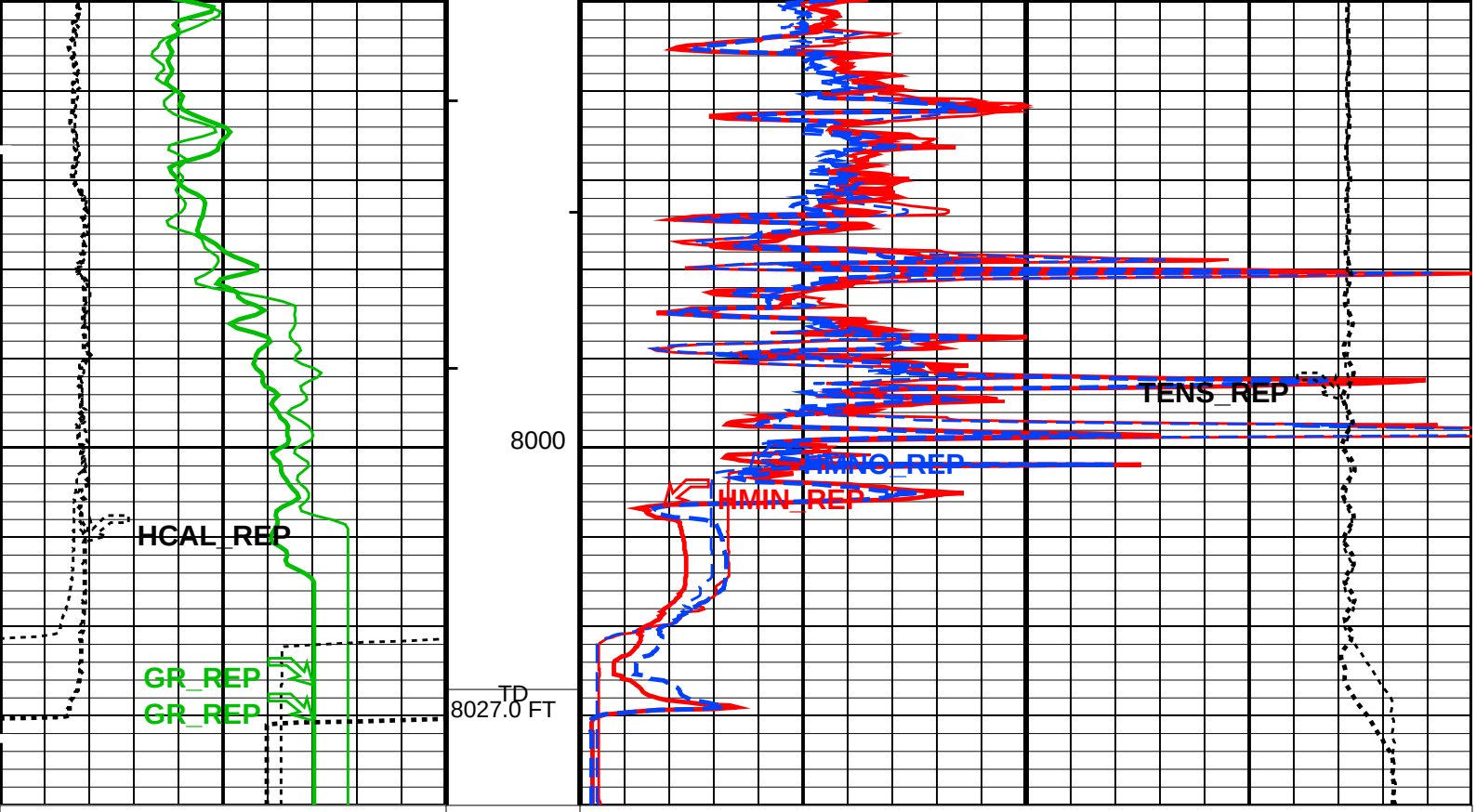

GR_REP Curve (GR_REP)
0 (GAPI) 200

HCAL_REP Curve (HCAL_REP)
6 (IN) 16

HMIN_REP Curve (HMIN_REP)
0 (OHMM) 40

HMNO_REP Curve (HMNO_REP)
0 (OHMM) 40

TENS_REP Curve (TENS_REP)
10000 (LBF) 0

PIP SUMMARY

- Integrated Hole Volume Minor Pip Every 10 F3
- Integrated Hole Volume Major Pip Every 100 F3
- Integrated Cement Volume Minor Pip Every 10 F3
- Integrated Cement Volume Major Pip Every 100 F3

Time Mark Every 60 S

Parameters

DLIS Name	Description	Value	
	HILTB−CTS: High resolution Integrated Logging Tool−CTS		
MPOF	MCFL Processing Operation Mode	ON	
	HOLEV: Integrated Hole/Cement Volume		
FCD	Future Casing (Outer) Diameter	4.5	IN
HVCS	Integrated Hole Volume Caliper Selection	HCAL	
	System and Miscellaneous		
BS	Bit Size	7.875	IN
DORL	Depth Offset for Repeat Analysis	0.0	FT
TD	Total Depth	8027	FT

Format: MLT_REP Vertical Scale: 5" per 100' Graphics File Created: 17−Feb−2010 08:13

OP System Version: 17C0−154

HILTB−CTS	17C0−154

Input DLIS Files

DEFAULT	AIT_TLD_MCFL_CNL_005PUP	FN:4	PRODUCER	17−Feb−2010 08:12	8049.0 FT	7607.0 FT

Output DLIS Files

DEFAULT	AIT_TLD_MCFL_CNL_006LUP	FN:5	PRODUCER	17−Feb−2010 08:13		

Schlumberger

BEFORE CALIBRATIONS

MAXIS Field Log

Calibration and Check Summary

Measurement	Nominal	Master	Before	After	Change	Limit	Units
High resolution Integrated Logging Tool−CTS Wellsite Calibration − Electronics Calibration Check − Thru Cal Mag. & Phase							
Master: 30−Nov−2009 14:59 Before: 16−Feb−2010 10:51							
Thru Cal Magnitude − 0	0	0.6193	0.6195	N/A	N/A	N/A	V
Thru Cal Magnitude − 1	0	1.271	1.272	N/A	N/A	N/A	V
Thru Cal Magnitude − 2	0	0.6293	0.6292	N/A	N/A	N/A	V
Thru Cal Magnitude − 3	0	0.7116	0.7120	N/A	N/A	N/A	V
Thru Cal Magnitude − 4	0	1.330	1.331	N/A	N/A	N/A	V
Thru Cal Magnitude − 5	0	1.924	1.926	N/A	N/A	N/A	V
Thru Cal Magnitude − 6	0	1.927	1.929	N/A	N/A	N/A	V
Thru Cal Magnitude − 7	0	1.353	1.357	N/A	N/A	N/A	V
Phase − 0	0	68.36	69.52	N/A	N/A	N/A	DEG
Phase − 1	0	67.36	68.53	N/A	N/A	N/A	DEG
Phase − 2	0	63.29	64.50	N/A	N/A	N/A	DEG
Phase − 3	0	62.43	63.64	N/A	N/A	N/A	DEG
Phase − 4	0	55.68	56.94	N/A	N/A	N/A	DEG
Phase − 5	0	53.53	54.84	N/A	N/A	N/A	DEG
Phase − 6	0	53.50	54.81	N/A	N/A	N/A	DEG
Phase − 7	0	48.00	49.69	N/A	N/A	N/A	DEG
High resolution Integrated Logging Tool−CTS Wellsite Calibration − Electronics Calibration Check − Auxilliary							
Master: 30−Nov−2009 14:59 Before: 16−Feb−2010 10:51							
Array Induction SPA Plus	990.5	992.6	991.7	N/A	N/A	N/A	MV
Array Induction SPA Zero	0	−0.2184	−0.2105	N/A	N/A	N/A	MV
Array Induction Temperature Pl	0.9150	0.9194	0.9185	N/A	N/A	N/A	V
Array Induction Temperature Ze	0	−0.0002118	−0.0002015	N/A	N/A	N/A	V
High resolution Integrated Logging Tool−CTS Wellsite Calibration − Test Loop Gain Correction							
Master: 30−Nov−2009 14:59							
Test Loop Gain Magnitude − 0	0	1.013	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude − 1	0	1.015	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude − 2	0	1.016	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude − 3	0	1.012	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude − 4	0	0.9923	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude − 5	0	0.9870	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude − 6	0	0.9920	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude − 7	0	1.003	N/A	N/A	N/A	N/A	V
Phase − 0	0	−2.469	N/A	N/A	N/A	N/A	DEG
Phase − 1	0	−0.1516	N/A	N/A	N/A	N/A	DEG
Phase − 2	0	0.9347	N/A	N/A	N/A	N/A	DEG
Phase − 3	0	0.1802	N/A	N/A	N/A	N/A	DEG
Phase − 4	0	0.1003	N/A	N/A	N/A	N/A	DEG
Phase − 5	0	−0.09392	N/A	N/A	N/A	N/A	DEG
Phase − 6	0	0.2377	N/A	N/A	N/A	N/A	DEG
Phase − 7	0	−0.1620	N/A	N/A	N/A	N/A	DEG
High resolution Integrated Logging Tool−CTS Wellsite Calibration − Sonde Error Correction							
Master: 30−Nov−2009 14:59							
R Sonde Error Correction − 0	0	−76.56	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 1	0	170.5	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 2	0	110.7	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 3	0	61.12	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 4	0	24.14	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 5	0	14.16	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 6	0	9.674	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 7	0	−1.714	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 0	0	−228.6	N/A	N/A	N/A	N/A	MM/M

X Sonde Error Correction − 1	0	141.0	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 2	0	−31.72	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 3	0	−44.12	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 4	0	2.293	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 5	0	17.99	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 6	0	−4.867	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 7	0	−0.3559	N/A	N/A	N/A	N/A	MM/M

High resolution Integrated Logging Tool−CTS Wellsite Calibration − Mud Gain Correction
Master: 30−Nov−2009 14:59

Coarse − Mag, Real, Imag − 0	0	1.073	N/A	N/A	N/A	N/A	
Coarse − Mag, Real, Imag − 1	0	1.073	N/A	N/A	N/A	N/A	
Coarse − Mag, Real, Imag − 2	0	1.073	N/A	N/A	N/A	N/A	
Fine − Mag, Real, Imag − 0	0	1.072	N/A	N/A	N/A	N/A	
Fine − Mag, Real, Imag − 1	0	1.072	N/A	N/A	N/A	N/A	
Fine − Mag, Real, Imag − 2	0	1.072	N/A	N/A	N/A	N/A	

High resolution Integrated Logging Tool−CTS Wellsite Calibration − Stab Measurement Summary
Before: 16−Feb−2010 15:10

BS Window Ratio	0.7600	N/A	0.7582	N/A	N/A	N/A	
BS Window Sum	10410	N/A	10390	N/A	N/A	N/A	CPS
SS Window Ratio	0.4998	N/A	0.4982	N/A	N/A	N/A	
SS Window Sum	9832	N/A	9831	N/A	N/A	N/A	CPS
LS Window Ratio	0.2927	N/A	0.2906	N/A	N/A	N/A	
LS Window Sum	1029	N/A	1031	N/A	N/A	N/A	CPS

High resolution Integrated Logging Tool−CTS Wellsite Calibration − Photo−multiplier High Voltages Calibrations
Before: 16−Feb−2010 15:10

BS PM High Voltage (Command)	1363	N/A	1408	N/A	N/A	N/A	V
SS PM High Voltage (Command)	1401	N/A	1427	N/A	N/A	N/A	V
LS PM High Voltage (Command)	1517	N/A	1540	N/A	N/A	N/A	V

High resolution Integrated Logging Tool−CTS Wellsite Calibration − Crystal Quality Resolutions Calibration
Before: 16−Feb−2010 15:10

BS Crystal Resolution	10.64	N/A	10.65	N/A	N/A	N/A	%
SS Crystal Resolution	9.215	N/A	9.156	N/A	N/A	N/A	%
LS Crystal Resolution	10.18	N/A	9.978	N/A	N/A	N/A	%

High resolution Integrated Logging Tool−CTS Wellsite Calibration − MCFL Calibration
Before: 16−Feb−2010 15:06

Raw B0 Resistivity	3875	N/A	3876	N/A	N/A	N/A	OHMM
Raw B1 Resistivity	3830	N/A	3823	N/A	N/A	N/A	OHMM
Raw B2 Resistivity	3830	N/A	3825	N/A	N/A	N/A	OHMM

High resolution Integrated Logging Tool−CTS Wellsite Calibration − HILT Caliper Calibration
Before: 16−Feb−2010 10:49

HILT Caliper Zero Measurement	8.000	N/A	9.852	N/A	N/A	N/A	IN
HILT Caliper Plus Measurement	12.00	N/A	13.98	N/A	N/A	N/A	IN

High resolution Integrated Logging Tool−CTS Wellsite Calibration − Detector Calibration
Before: 16−Feb−2010 10:49

Gamma Ray Background	30.00	N/A	74.73	N/A	N/A	N/A	GAPI
Gamma Ray (Jig − Bkg)	176.8	N/A	176.8	N/A	N/A	16.07	GAPI
Gamma Ray (Calibrated)	165.0	N/A	165.0	N/A	N/A	15.00	GAPI

High resolution Integrated Logging Tool−CTS Wellsite Calibration − Zero Measurement
Master: 10−Jan−2010 18:39 Before: 16−Feb−2010 10:58

CNTC Background	26.69	26.69	27.56	N/A	N/A	4.004	CPS
CFTC Background	33.46	33.46	29.01	N/A	N/A	5.019	CPS

High resolution Integrated Logging Tool−CTS Wellsite Calibration − Ratio Measurement
Master: 10−Jan−2010 18:39

Thermal Near Corr. (Tank)	5800	5102	N/A	N/A	N/A	N/A	CPS
Thermal Far Corr. (Tank)	2400	2170	N/A	N/A	N/A	N/A	CPS
CNTC/CFTC (Tank)	2.159	2.351	N/A	N/A	N/A	N/A	

High resolution Integrated Logging Tool−CTS Wellsite Calibration − Accelerometer Calibration
Before: 17−Feb−2010 7:29

Z−Axis Acceleration	32.19	N/A	32.21	N/A	N/A	N/A	F/S2

High resolution Integrated Logging Tool−CTS Master Calibration − Inversion results
Master: 16−Feb−2010 14:22

Rho Aluminum	2.596	2.600	−−	−−	−−	−−	G/C3
Rho Magnesium	1.686	1.686	−−	−−	−−	−−	G/C3
Pe Aluminum	2.570	2.554	−−	−−	−−	−−	
Pe Magnesium	2.650	2.639	−−	−−	−−	−−	

High resolution Integrated Logging Tool−CTS Master Calibration − Deviation Summary
Master: 16−Feb−2010 14:22

BS Average Deviation	0	0.3068	−−	−−	−−	−−	%
BS Max Deviation	0	0.7997	−−	−−	−−	−−	%
SS Average Deviation	0	0.2497					%

SS Average Deviation	0	0.2497	−−	−−	−−	−−	%
SS Max Deviation	0	1.017	−−	−−	−−	−−	%
LS Average Deviation	0	0.5285	−−	−−	−−	−−	%
LS Max Deviation	0	1.602	−−	−−	−−	−−	%

The GLS−VJ source activity is acceptable.

The HGNS Neutron Master Calibration was done with the following parameters :

NCT−B Water Temperature 57.6 DEGF.
Thermal Housing Size 3.357 IN.
NSR−F serial number 5168

High resolution Integrated Logging Tool−CTS / Equipment Identification

Primary Equipment:

Array Induction Tool − H	AIT − H	
Rm/SP Bottom Nose	AHRM − A	
Array Induction Sonde	AHIS − BA	397
HILT high−Resolution Mechanical Sonde	HRMS − B	
HILT Rxo Gamma−ray Device	HRGD − B	898
HILT Micro Cylindrically Focused Log Dev	MCFL −	
GR Logging Source	GLS − VJ	5363
HILT High Res. Control Cartridge	HRCC − B	

Auxiliary Equipment:

High resolution Integrated Logging Tool−CTS Wellsite Calibration

Electronics Calibration Check − Thru Cal Mag. & Phase

Idx	Phase	Value	Thru Cal Magnitude V	Nominal	Value	Phase DEG	Nominal
0	Master	0.6193		0.6050	68.36		71.00
	Before	0.6195			69.52		
1	Master	1.271		1.270	67.36		70.00
	Before	1.272			68.53		
2	Master	0.6293		0.6230	63.29		66.00
	Before	0.6292			64.50		
3	Master	0.7116		0.7040	62.43		65.00
	Before	0.7120			63.64		
4	Master	1.330		1.337	55.68		59.00
	Before	1.331			56.94		
5	Master	1.924		1.955	53.53		57.00
	Before	1.926			54.84		
6	Master	1.927		1.955	53.50		57.00
	Before	1.929			54.81		
7	Master	1.353		1.415	48.00		53.00
	Before	1.357			49.69		
		60.00 % (Minimum)	(Nominal)	140.0 % (Maximum)	Nom −60.00 (Minimum)	(Nominal)	Nom + 60.00 (Maximum)

Master: 30−Nov−2009 14:59 Before: 16−Feb−2010 10:51

High resolution Integrated Logging Tool−CTS Wellsite Calibration

Electronics Calibration Check − Auxilliary

Phase	Array Induction SPA Plus MV	Value	Phase	Array Induction SPA Zero MV	Value
Master		992.6	Master		−0.2184
Before		991.7	Before		−0.2105
941.0	990.5 1040		−50.00	0 50.00	

(Minimum)	(Nominal)	(Maximum)	(Minimum)	(Nominal)	(Maximum)

Phase Array Induction Temperature Plus V			Value
Master			0.9194
Before			0.9185
0.8700 (Minimum)	0.9150 (Nominal)	0.9600 (Maximum)	

Phase Array Induction Temperature Zero V			Value
Master			−0.0002118
Before			−0.0002015
−0.05000 (Minimum)	0 (Nominal)	0.05000 (Maximum)	

Master: 30−Nov−2009 14:59 Before: 16−Feb−2010 10:51

High resolution Integrated Logging Tool−CTS Wellsite Calibration

Test Loop Gain Correction

Idx	Value	Test Loop Gain Magnitude V			Value	Phase DEG		
0	1.013				−2.469			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
1	1.015				−0.1516			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
2	1.016				0.9347			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
3	1.012				0.1802			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
4	0.9923				0.1003			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
5	0.9870				−0.09392			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
6	0.9920				0.2377			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
7	1.003				−0.1620			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)

Master: 30−Nov−2009 14:59

High resolution Integrated Logging Tool−CTS Wellsite Calibration

Sonde Error Correction

Idx	Value	R Sonde Error Correction MM/M			Value	X Sonde Error Correction MM/M		
0	−76.56				−228.6			
		−231.0 (Minimum)	−56.00 (Nominal)	119.0 (Maximum)		−2250 (Minimum)	0 (Nominal)	2250 (Maximum)
1	170.5				141.0			
		114.0 (Minimum)	159.0 (Nominal)	204.0 (Maximum)		−625.0 (Minimum)	0 (Nominal)	625.0 (Maximum)
2	110.7				−31.72			
		66.00 (Minimum)	111.0 (Nominal)	156.0 (Maximum)		−350.0 (Minimum)	0 (Nominal)	350.0 (Maximum)
3	61.12				−44.12			
		39.00 (Minimum)	64.00 (Nominal)	89.00 (Maximum)		−250.0 (Minimum)	0 (Nominal)	250.0 (Maximum)
4	24.14				2.293			
		15.00 (Minimum)	25.00 (Nominal)	35.00 (Maximum)		−63.00 (Minimum)	0 (Nominal)	63.00 (Maximum)
5	14.16				17.99			
		4.000 (Minimum)	14.00 (Nominal)	24.00 (Maximum)		−50.00 (Minimum)	0 (Nominal)	50.00 (Maximum)
6	9.674				−4.867			
		5.000 (Minimum)	10.00 (Nominal)	15.00 (Maximum)		−30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)
7	−1.714				−0.3559			
		−5.000 (Minimum)	0 (Nominal)	5.000 (Maximum)		−30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)

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High resolution Integrated Logging Tool−CTS Wellsite Calibration

Mud Gain Correction

Idx	Value	Coarse − Mag, Real, Imag	Value	Fine − Mag, Real, Imag
0	1.073	0.8000 (Minimum) 1.000 (Nominal) 1.200 (Maximum)	1.072	0.8000 (Minimum) 1.000 (Nominal) 1.200 (Maximum)
1	1.073	0.8000 (Minimum) 1.000 (Nominal) 1.200 (Maximum)	1.072	0.8000 (Minimum) 1.000 (Nominal) 1.200 (Maximum)
2	1.073	0.8000 (Minimum) 1.000 (Nominal) 1.200 (Maximum)	1.072	0.8000 (Minimum) 1.000 (Nominal) 1.200 (Maximum)

Master: 30−Nov−2009 14:59

High resolution Integrated Logging Tool−CTS Wellsite Calibration

Stab Measurement Summary

Phase	BS Window Ratio	Value	Phase	SS Window Ratio	Value	Phase	LS Window Ratio	Value
Before	0.7220 (Minimum) 0.7600 (Nominal) 0.7980 (Maximum)	0.7582	Before	0.4748 (Minimum) 0.4998 (Nominal) 0.5248 (Maximum)	0.4982	Before	0.2780 (Minimum) 0.2927 (Nominal) 0.3073 (Maximum)	0.2906
Phase	BS Window Sum CPS	Value	Phase	SS Window Sum CPS	Value	Phase	LS Window Sum CPS	Value
Before	9887 (Minimum) 10410 (Nominal) 10930 (Maximum)	10390	Before	9341 (Minimum) 9832 (Nominal) 10320 (Maximum)	9831	Before	977.6 (Minimum) 1029 (Nominal) 1081 (Maximum)	1031

Before: 16−Feb−2010 15:10

High resolution Integrated Logging Tool−CTS Wellsite Calibration

Photo−multiplier High Voltages Calibrations

Phase	BS PM High Voltage (Command) V	Value	Phase	SS PM High Voltage (Command) V	Value	Phase	LS PM High Voltage (Command) V	Value
Before	1263 (Minimum) 1363 (Nominal) 1463 (Maximum)	1408	Before	1301 (Minimum) 1401 (Nominal) 1501 (Maximum)	1427	Before	1417 (Minimum) 1517 (Nominal) 1617 (Maximum)	1540

Before: 16−Feb−2010 15:10

High resolution Integrated Logging Tool−CTS Wellsite Calibration

Crystal Quality Resolutions Calibration

Phase	BS Crystal Resolution %	Value	Phase	SS Crystal Resolution %	Value	Phase	LS Crystal Resolution %	Value
Before	9.637 (Minimum) 10.64 (Nominal) 11.64 (Maximum)	10.65	Before	8.215 (Minimum) 9.215 (Nominal) 10.21 (Maximum)	9.156	Before	9.176 (Minimum) 10.18 (Nominal) 11.18 (Maximum)	9.978

Before: 16−Feb−2010 15:10

High resolution Integrated Logging Tool−CTS Wellsite Calibration

MCFL Calibration

Phase	Raw B0 Resistivity OHMM	Value	Phase	Raw B1 Resistivity OHMM	Value	Phase	Raw B2 Resistivity OHMM	Value
Before	3565 (Minimum) 3875 (Nominal) 4185 (Maximum)	3876	Before	3524 (Minimum) 3830 (Nominal) 4136 (Maximum)	3823	Before	3524 (Minimum) 3830 (Nominal) 4136 (Maximum)	3825

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High resolution Integrated Logging Tool−CTS Wellsite Calibration

HILT Caliper Calibration

Phase	HILT Caliper Zero Measurement IN	Value	Phase	HILT Caliper Plus Measurement IN	Value
Before	6.000 (Minimum) 8.000 (Nominal) 10.00 (Maximum)	9.852	Before	9.000 (Minimum) 12.00 (Nominal) 15.00 (Maximum)	13.98

Before: 16−Feb−2010 10:49

High resolution Integrated Logging Tool−CTS Wellsite Calibration

Detector Calibration

Phase	Gamma Ray Background GAPI	Value	Phase	Gamma Ray (Jig − Bkg) GAPI	Value	Phase	Gamma Ray (Calibrated) GAPI	Value
Before	0 (Minimum) 30.00 (Nominal) 120.0 (Maximum)	74.73	Before	160.7 (Minimum) 176.8 (Nominal) 192.8 (Maximum)	176.8	Before	150.0 (Minimum) 165.0 (Nominal) 180.0 (Maximum)	165.0

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Before: 16−Feb−2010 10:49

High resolution Integrated Logging Tool−CTS Wellsite Calibration

Zero Measurement

Phase	CNTC Background CPS	Value
Master		26.69
Before		27.56
	5.000 (Minimum) 26.69 (Nominal) 40.00 (Maximum)	

Phase	CFTC Background CPS	Value
Master		33.46
Before		29.01
	5.000 (Minimum) 33.46 (Nominal) 40.00 (Maximum)	

Master: 10−Jan−2010 18:39 Before: 16−Feb−2010 10:58

High resolution Integrated Logging Tool−CTS Wellsite Calibration

Ratio Measurement

Phase	Thermal Near Corr. (Tank) CPS	Value
Master		5102
	4700 (Minimum) 5800 (Nominal) 6900 (Maximum)	

Phase	Thermal Far Corr. (Tank) CPS	Value
Master		2170
	1900 (Minimum) 2400 (Nominal) 2900 (Maximum)	

Phase	CNTC/CFTC (Tank)	Value
Master		2.351
	2.120 (Minimum) 2.159 (Nominal) 2.540 (Maximum)	

Master: 10−Jan−2010 18:39

High resolution Integrated Logging Tool−CTS Wellsite Calibration

Accelerometer Calibration

Phase	Z−Axis Acceleration F/S2	Value
Before		32.21
	31.53 (Minimum) 32.19 (Nominal) 32.84 (Maximum)	

Before: 17−Feb−2010 7:29

High resolution Integrated Logging Tool−CTS Master Calibration

Electronics Calibration Check − Thru Cal Mag. & Phase

Idx	Phase	Value	Thru Cal Magnitude V	Nominal	Value	Phase DEG	Nominal
0	Master	0.6193		0.6050	68.36		71.00
1	**Master**	**1.271**		**1.270**	**67.36**		**70.00**
2	Master	0.6293		0.6230	63.29		66.00
3	Master	0.7116		0.7040	62.43		65.00
4	Master	1.330		1.337	55.68		59.00
5	Master	1.924		1.955	53.53		57.00
6	Master	1.927		1.955	53.50		57.00
7	Master	1.353		1.415	48.00		53.00
		60.00 % (Minimum) (Nominal)		140.0 % (Maximum)	Nom −60.00 (Minimum)	(Nominal)	Nom + 60.00 (Maximum)

Master: 30−Nov−2009 14:59

High resolution Integrated Logging Tool−CTS Master Calibration

Electronics Calibration Check − Auxilliary

Phase	Array Induction SPA Plus MV	Value
Master		992.6
	941.0 (Minimum) 990.5 (Nominal) 1040 (Maximum)	

Phase	Array Induction SPA Zero MV	Value
Master		−0.2184
	−50.00 (Minimum) 0 (Nominal) 50.00 (Maximum)	

Phase	Array Induction Temperature Plus V	Value
Master		0.9194
	0.8700 (Minimum) 0.9150 (Nominal) 0.9600 (Maximum)	

Phase	Array Induction Temperature Zero V	Value
Master		−0.0002118
	−0.05000 (Minimum) 0 (Nominal) 0.05000 (Maximum)	

Master: 30−Nov−2009 14:59

High resolution Integrated Logging Tool−CTS Master Calibration

Test Loop Gain Correction

Idx	Value	Test Loop Gain Magnitude V	Value	Phase DEG
0	1.013		−2.469	
	0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)		−3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)	
1	1.015		−0.1516	

		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
2	1.016				0.9347			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
3	1.012				0.1802			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
4	0.9923				0.1003			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
5	0.9870				−0.09392			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
6	0.9920				0.2377			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
7	1.003				−0.1620			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)

Master: 30−Nov−2009 14:59

High resolution Integrated Logging Tool−CTS Master Calibration

Sonde Error Correction

Idx	Value	R Sonde Error Correction MM/M			Value	X Sonde Error Correction MM/M		
0	−76.56				−228.6			
		−231.0 (Minimum)	−56.00 (Nominal)	119.0 (Maximum)		−2250 (Minimum)	0 (Nominal)	2250 (Maximum)
1	170.5				141.0			
		114.0 (Minimum)	159.0 (Nominal)	204.0 (Maximum)		−625.0 (Minimum)	0 (Nominal)	625.0 (Maximum)
2	110.7				−31.72			
		66.00 (Minimum)	**111.0** (Nominal)	**156.0** (Maximum)		**−350.0** (Minimum)	**0** (Nominal)	**350.0** (Maximum)
3	61.12				−44.12			
		39.00 (Minimum)	64.00 (Nominal)	89.00 (Maximum)		−250.0 (Minimum)	0 (Nominal)	250.0 (Maximum)
4	24.14				2.293			
		15.00 (Minimum)	25.00 (Nominal)	35.00 (Maximum)		−63.00 (Minimum)	0 (Nominal)	63.00 (Maximum)
5	14.16				17.99			
		4.000 (Minimum)	14.00 (Nominal)	24.00 (Maximum)		−50.00 (Minimum)	0 (Nominal)	50.00 (Maximum)
6	9.674				−4.867			
		5.000 (Minimum)	10.00 (Nominal)	15.00 (Maximum)		−30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)
7	−1.714				−0.3559			
		−5.000 (Minimum)	0 (Nominal)	5.000 (Maximum)		−30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)

Master: 30−Nov−2009 14:59

High resolution Integrated Logging Tool−CTS Master Calibration

Mud Gain Correction

Idx	Value	Coarse − Mag, Real, Imag			Value	Fine − Mag, Real, Imag		
0	1.073				1.072			
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)
1	1.073				1.072			
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)
2	1.073				1.072			
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)

Master: 30−Nov−2009 14:59

High resolution Integrated Logging Tool−CTS Master Calibration

High resolution Integrated Logging Tool−CTS Master Calibration

Inversion results

Phase	Rho Aluminum G/C3	Value	Phase	Rho Magnesium G/C3	Value
Master		2.600	Master		1.686
	2.586 (Minimum) 2.596 (Nominal) 2.606 (Maximum)			1.676 (Minimum) 1.686 (Nominal) 1.696 (Maximum)	

Phase	Pe Aluminum	Value	Phase	Pe Magnesium	Value
Master		2.554	Master		2.639
	2.470 (Minimum) 2.570 (Nominal) 2.670 (Maximum)			2.550 (Minimum) 2.650 (Nominal) 2.750 (Maximum)	

Master: 16−Feb−2010 14:22

High resolution Integrated Logging Tool−CTS Master Calibration

Deviation Summary

Phase	BS Average Deviation %	Value	Phase	SS Average Deviation %	Value	Phase	LS Average Deviation %	Value
Master		0.3068	Master		0.2497	Master		0.5285
	−0.6000 (Minimum) 0 (Nominal) 0.6000 (Maximum)			−1.000 (Minimum) 0 (Nominal) 1.000 (Maximum)			−1.500 (Minimum) 0 (Nominal) 1.500 (Maximum)	

Phase	BS Max Deviation %	Value	Phase	SS Max Deviation %	Value	Phase	LS Max Deviation %	Value
Master		0.7997	Master		1.017	Master		1.602
	−1.600 (Minimum) 0 (Nominal) 1.600 (Maximum)			−2.500 (Minimum) 0 (Nominal) 2.500 (Maximum)			−3.500 (Minimum) 0 (Nominal) 3.500 (Maximum)	

Master: 16−Feb−2010 14:22

High resolution Integrated Logging Tool−CTS Master Calibration

Zero Measurement

Phase	CNTC Background CPS	Value	Phase	CFTC Background CPS	Value
Master		26.69	Master		33.46
	5.000 (Minimum) 26.69 (Nominal) 40.00 (Maximum)			5.000 (Minimum) 33.46 (Nominal) 40.00 (Maximum)	

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High resolution Integrated Logging Tool−CTS Master Calibration

Tank Measurement

Phase	Thermal Near Corr. (Tank) CPS	Value	Phase	Thermal Far Corr. (Tank) CPS	Value	Phase	CNTC/CFTC (Tank)	Value
Master		5102	Master		2170	Master		2.351
	4700 (Minimum) 5800 (Nominal) 6900 (Maximum)			1900 (Minimum) 2400 (Nominal) 2900 (Maximum)			2.120 (Minimum) 2.159 (Nominal) 2.540 (Maximum)	

Master: 10−Jan−2010 18:39

Company: **Kerr−McGee Oil and Gas Onshore LP**

Schlumberger

Well: **Bella 19−8**
Field: **Wattenberg**
County: **Weld**
State: **Colorado**

Platform Express
Micro Log