



ThruBit
A Schlumberger Company

**ARRAY INDUCTION
DENSITY / NEUTRON
GAMMA RAY
MEMORY LOG**

Company	SHELL OIL E & P		
Well	NUNEMAKER 2509 32-1H		
Field	ARROWHEAD		
County	RENO	State	KANSAS
Location:	AP1 #: 15-155-21606-01-00		Other Services
Well	NUNEMAKER 2509 32-1H		PORTAL BIT
Field	ARROWHEAD		
County	RENO	State	KANSAS
Permanent Datum	SEC 32 TWP 25S RGE 9W	Elevation	1661'
Log Measured From	SHL: 330' FEL & 4960' FSL	D.F.	22.9' ABOVE PERM DATUM
Drilling Measured From	D.F.	Elevation	1661'
Date	21 JAN 2013		
Run Number	ONE		
Depth Driller	6744'		
Depth Logger	6608'		
Bottom Logged Interval	6597'		
Top Log Interval	4245'		
Casing Driller	7" @ 4246'		
Casing Logger	7" @ 4254'		
Bit Size	6.125"		
Type Fluid in Hole	WBM		
Density / Viscosity	8.5 / 30		
pH / Fluid Loss	7.5 / NA		
Source of Sample	ACTIVE PIT		
Rm @ Meas. Temp	0.40 OHM @ 80 DEGF		
Rmt @ Meas. Temp	0.30 OHM @ 80 DEGF		
Rmc @ Meas. Temp	0.50 OHM @ 80 DEGF		
Source of Rmt / Rmc	MEASURED		
Rm @ BHT	0.27 OHM @ 120 DEGF		
Time Circulation Stopped	0300 21 JAN 2013		
Time Logger on Bottom	0625 21 JAN 2013		
Maximum Recorded Temperature	120 DEGF		
Equipment Number	T011		
Location	OKC, OK		
Recorded By	R. BROOMFIELD		
Witnessed By	D.M. COOPER		

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All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.

Comments

SERVICE: LEVEL 4- HORIZONTAL MEMORY PUMPDOWN - BIT DEPTH 9552' LOG TO 4245'
ALL SCALES AND PRESENTATION PER CLIENT REQUEST
LIMESTONE POROSITY, 2.71 G/CC, USED FOR POROSITY CALCULATIONS
LOG RAN WITH SWIVEL, AND SMALL DECENTRALIZER
TBHV REPRESENTS TOTAL BOREHOLE VOLUME, FT3
ABHV REPRESENTS ANNULAR BOREHOLE VOLUME, FT3, CALCULATED FOR 4.50" CASING
RIGMINDER LITE AND PASON USED TO CREATE DEPTH LOG
LOG DEPTH CORRELATED TO MWD GAMMA RAY PROVIDED BY CUSTOMER
CI = 900 mg/l NaCl = 1236 mg/L NO BARITE
NaCl EQUIVALENT (ppm) = CI (mg/l) * 1.6488 * 0.833
CASING SIZE 7.00" 23.0 LB/FT ID = 6.36" CALI DIA 6.50" NO CORRECTION MADE
RIG: PATTERSON UTI 264
CREW: R. BROOMFIELD, J. HIRSCHLER, Z. HOWARD, J. BROWNAWELL

Service Ticket No.	1707	API No.	15-155-21606-01-00	PGM Ver	WARRIOR 7.0
The Well Name, Location, Borehole Description, and / or Cementing Data Furnished by Client					
EQUIPMENT DATA					
GAMMA RAY		NEUTRON		DENSITY	
				INDUCTION	

Run No.	ONE	Run No.	ONE	Run No.	ONE	Run No.	ONE
Serial No.	PS25T	Serial No.	PS35N	Serial No.	PS32D	Serial No.	PS13R
Model No.	PS	Model No.	PS	Model No.	PS	Model No.	PS
Diameter	2.125"	Diameter	2.125"	Diameter	2.125"	Diameter	2.125"
LOGGING DATA							
General Data							
Pass	Depths		Well Head	Speed	Logging Run Comments		
No.	From	To	Pressure	Ft/Min			
ONE	6608'	4245'	0	30			
	GAMMA RAY		NEUTRON		DENSITY		INDUCTION
Pass	Scale		Scale		Scale		Scale
No.	L	R	L	R	L	R	L
ONE	0 API	150 API	45%	-15%	1.95 g/cc	2.95 g/cc	0.2 OHM-M 2000 OHM-M
DIRECTIONAL INFORMATION							
Maximum Deviation	93.03	deg. @	6405'	KOP	3400'		

Job Times

Job # :1707

Operator :Shell Oil

Well name :Nunemaker 2509 32-1H

Job level :Level 4

Timeline of Bit Times

DateStart TimeElapsed Time (HH:MM)Time CodeNotes

Timeline of Crew / Logging Equipment Times

DateStart TimeElapsed Time (HH:MM)Time CodeNotes

20 Jan 201318:00L00 : Time stamp - activity start

20 Jan 201319:00L03 : Job preparation

21 Jan 201300:00L01 : Logging eqt travel time

21 Jan 201303:30L20 : Logging eqt standby time

21 Jan 201307:30L31 : Logging rig up / down time"rig up, deploy tools, rig do

21 Jan 201311:00L30 : Logging operating time

21 Jan 201312:00L31 : Logging rig up / down time"rig up, retrieve tools, rig

21 Jan 201317:00L80 : Data processing time

21 Jan 201322:00L01 : Logging eqt travel time

22 Jan 201300:00L90 : Job cleanup



ThruBit

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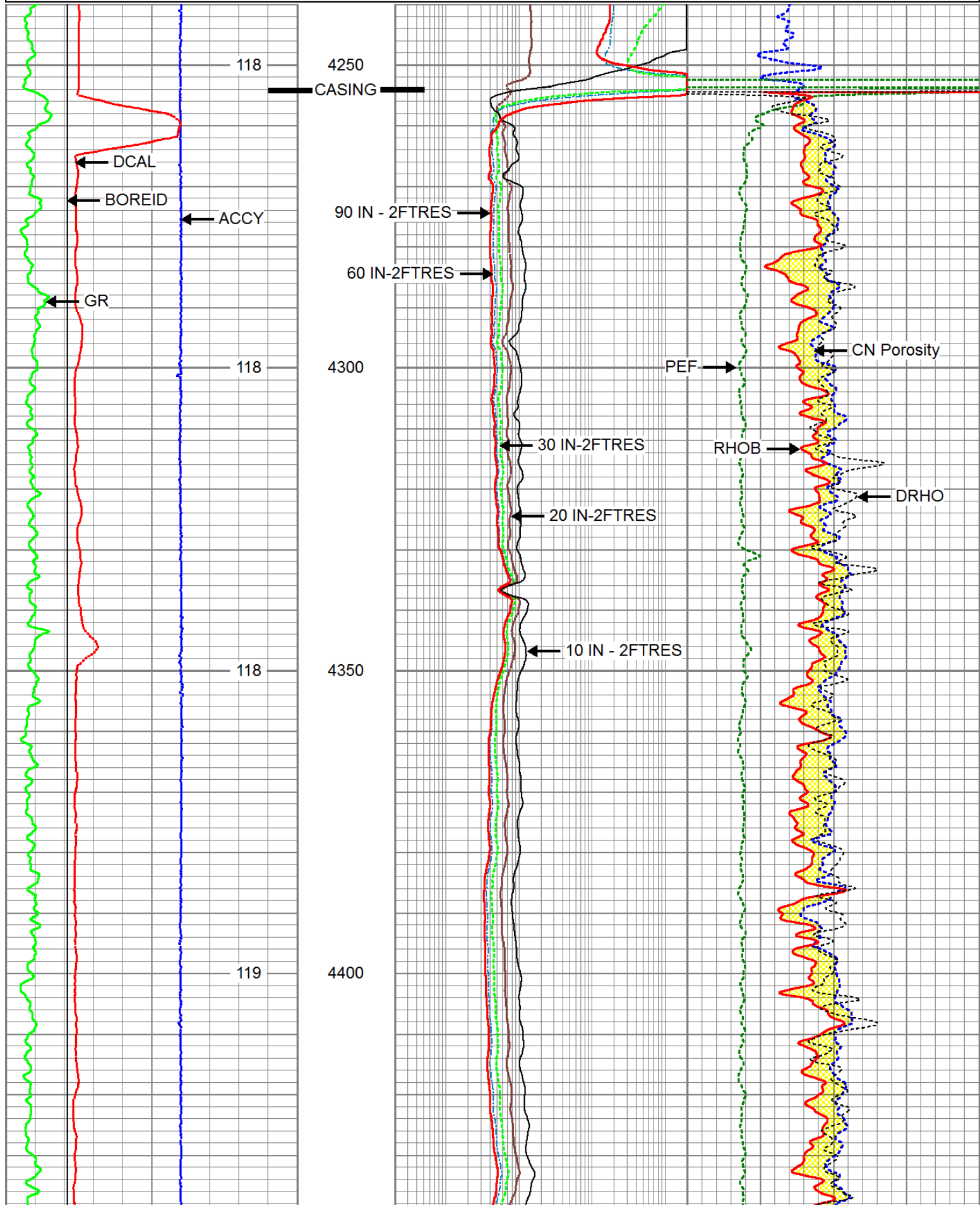
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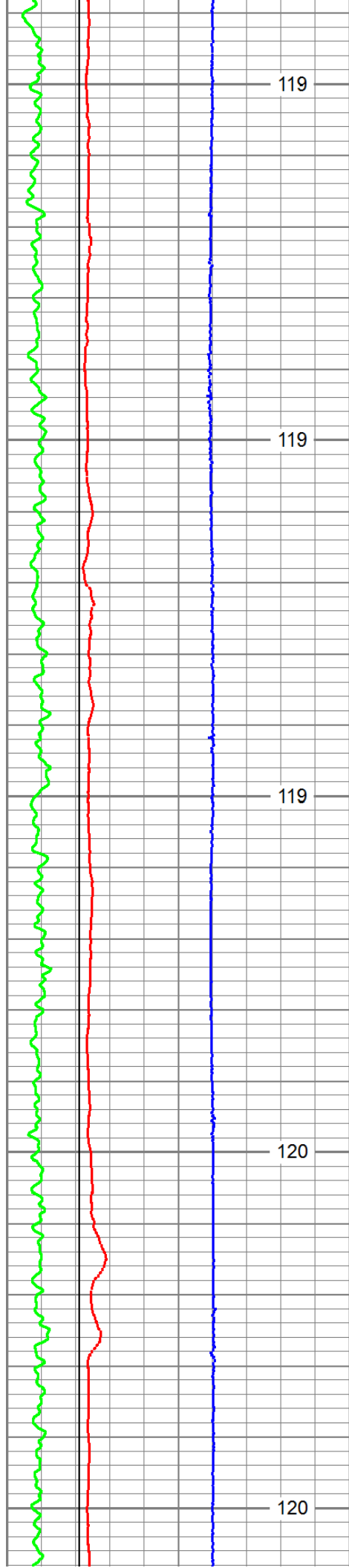
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Dataset Pathname: proc1/pass1.2
Presentation Format: 6_sh1_tc
Dataset Creation: Mon Jan 21 13:09:21 2013
Charted by: Depth in Feet scaled 1:240

0	GR (GAPI)	150	0.2	60 IN-2FTRES (Ohm-m)	2000	45	CN Porosity (pu)	-15
5	ACCV	5	0.2	30 IN-2FTRES (Ohm-m)	2000	0	RES (bars)	10

4	DCAL (in)	14
4	BOREID (in)	14
	GRTEMP (degF)	

0.2	30 IN-2FTRES (Ohm-m)	2000	1.95	RHOB (g/cc)	2.95
0.2	20 IN-2FTRES (Ohm-m)	2000	-0.25	DRHO (g/cc)	0.25
0.2	10 IN-2FTRES (Ohm-m)	2000			





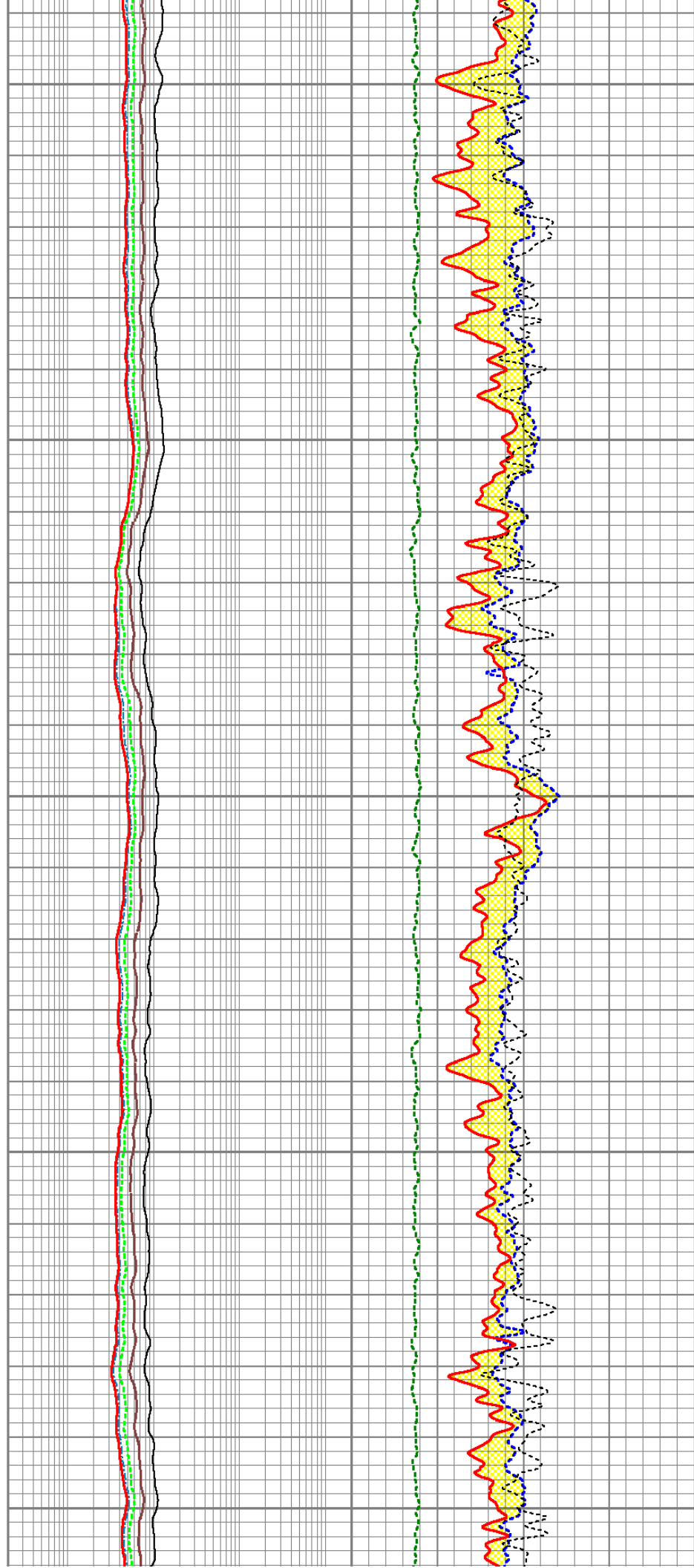
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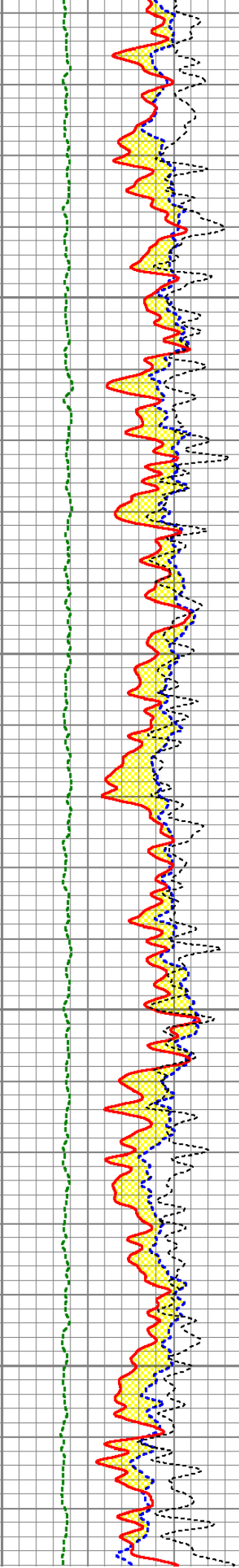
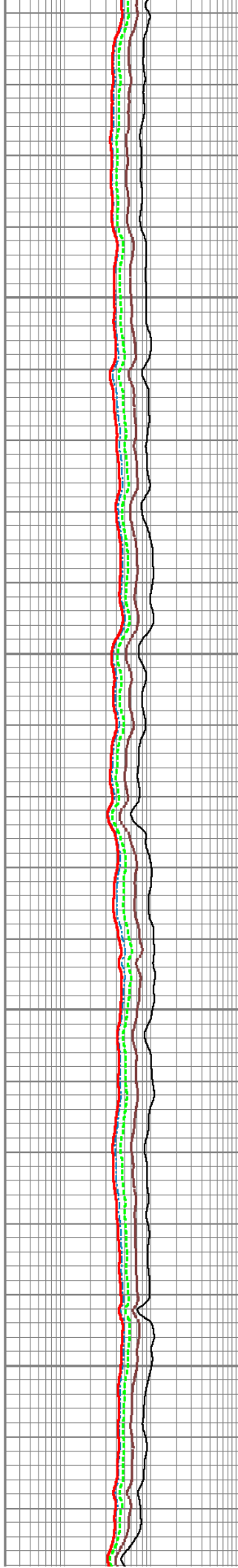
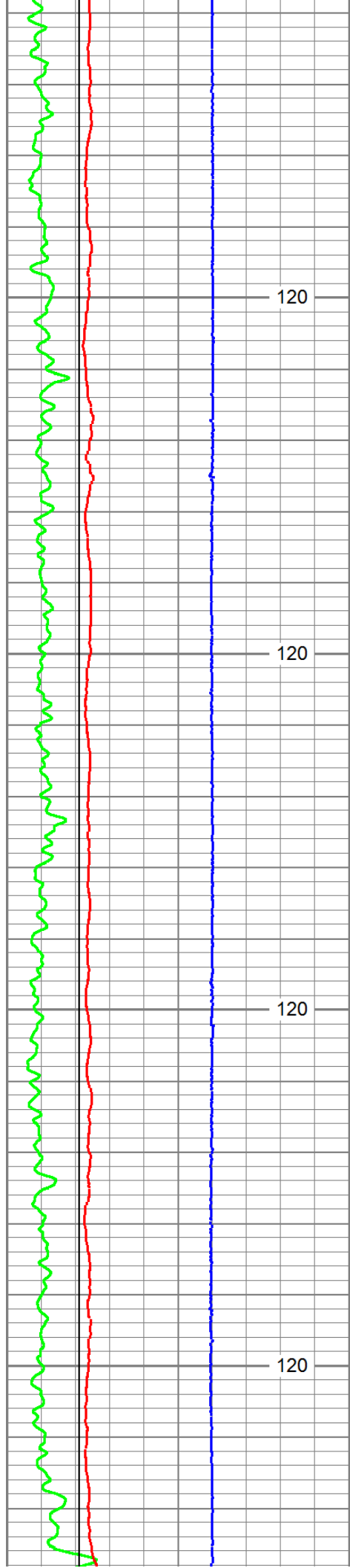
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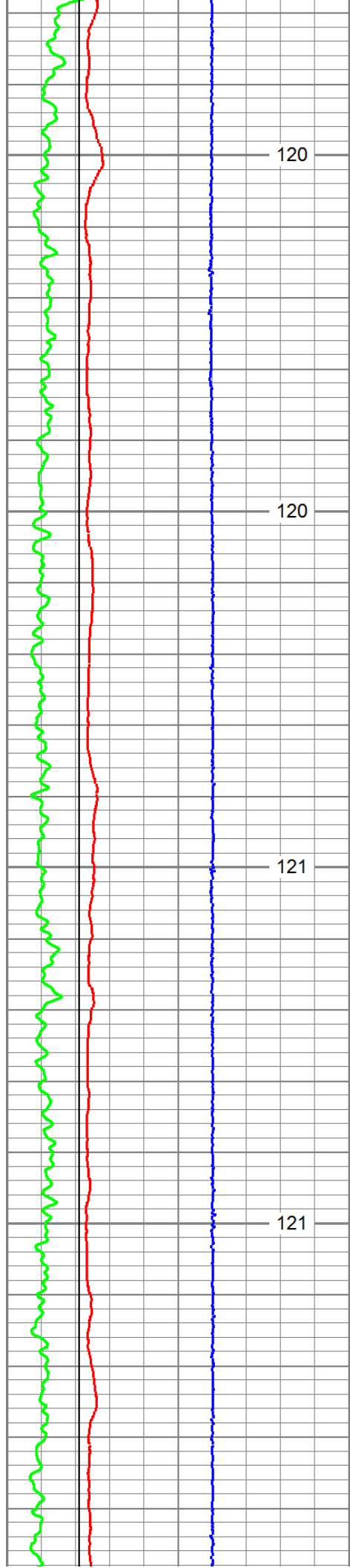
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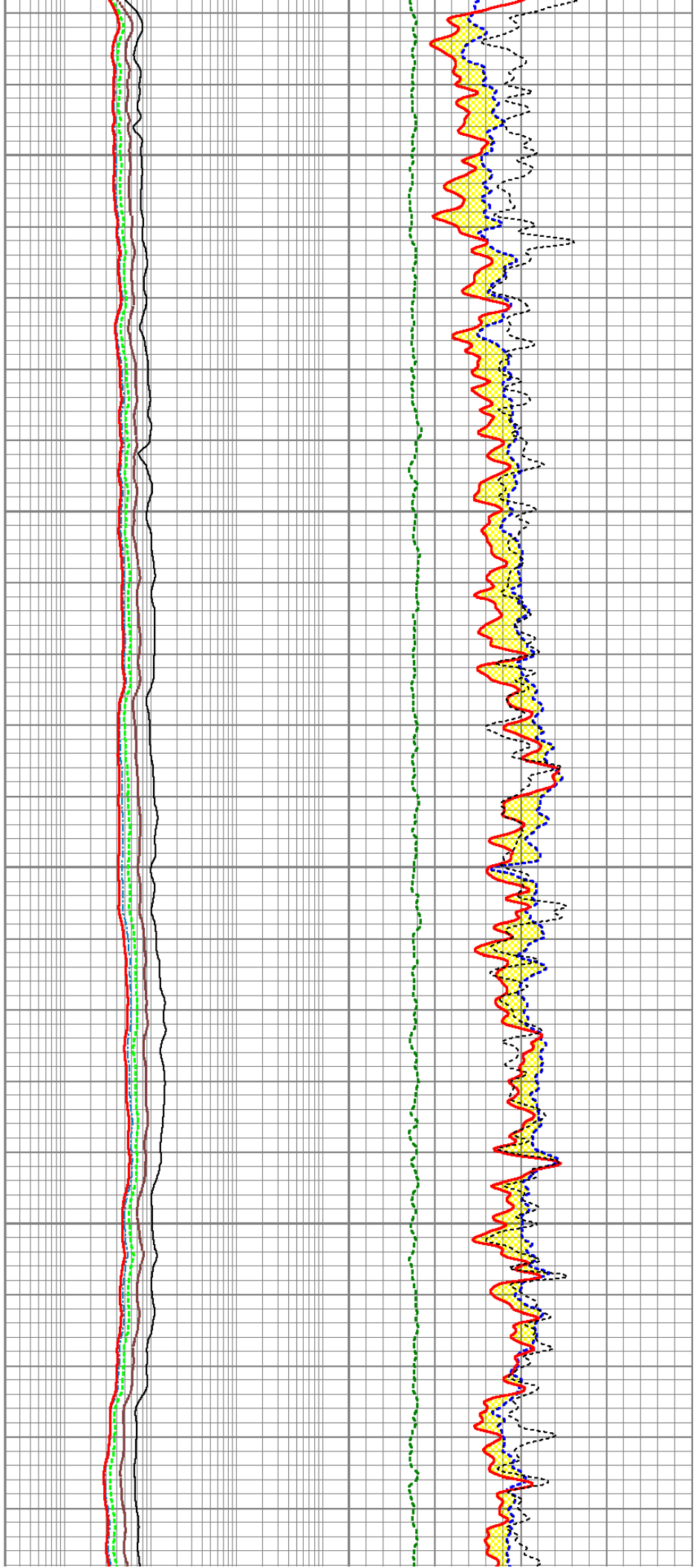


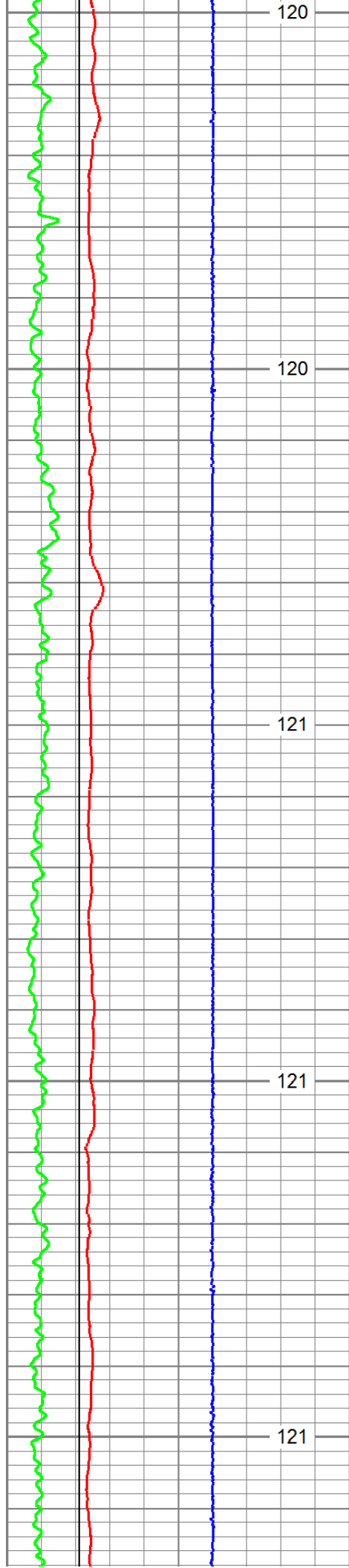
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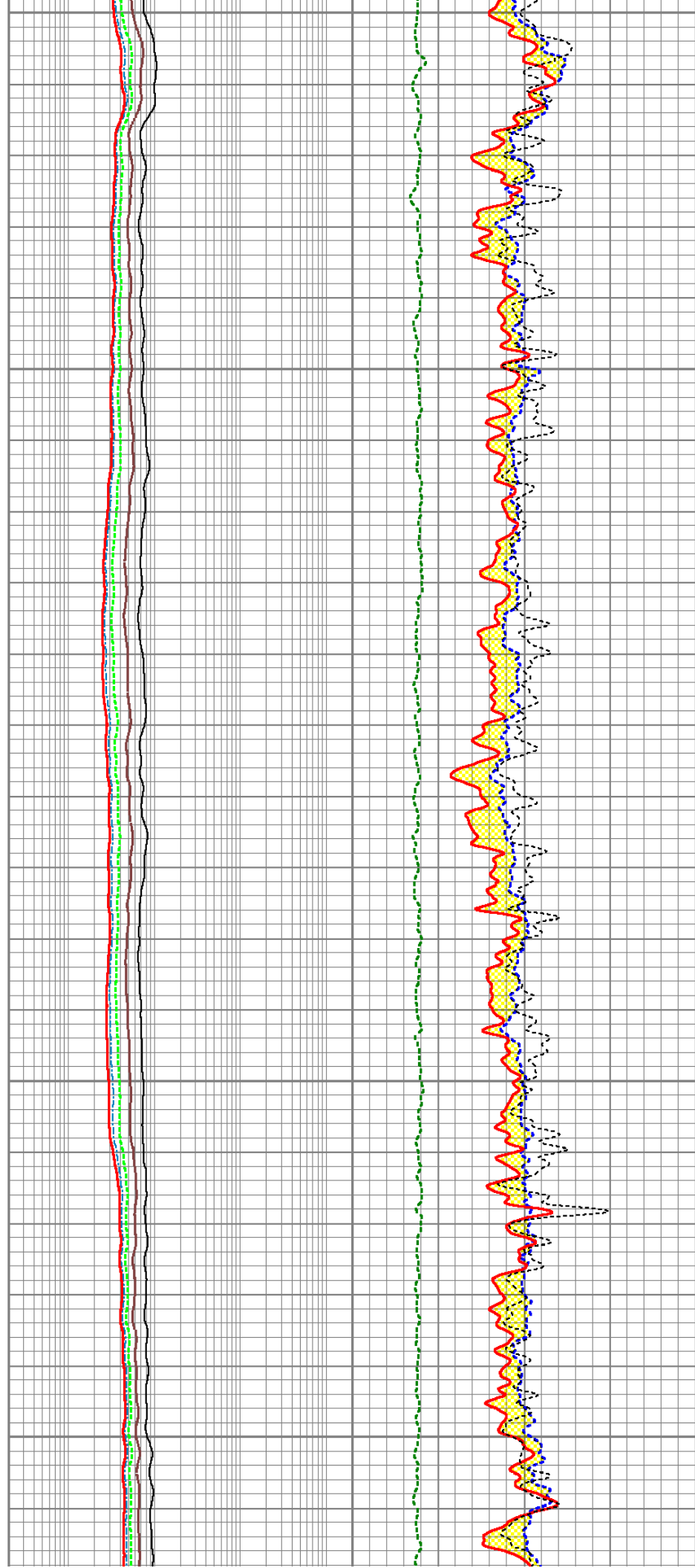
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5150
5200
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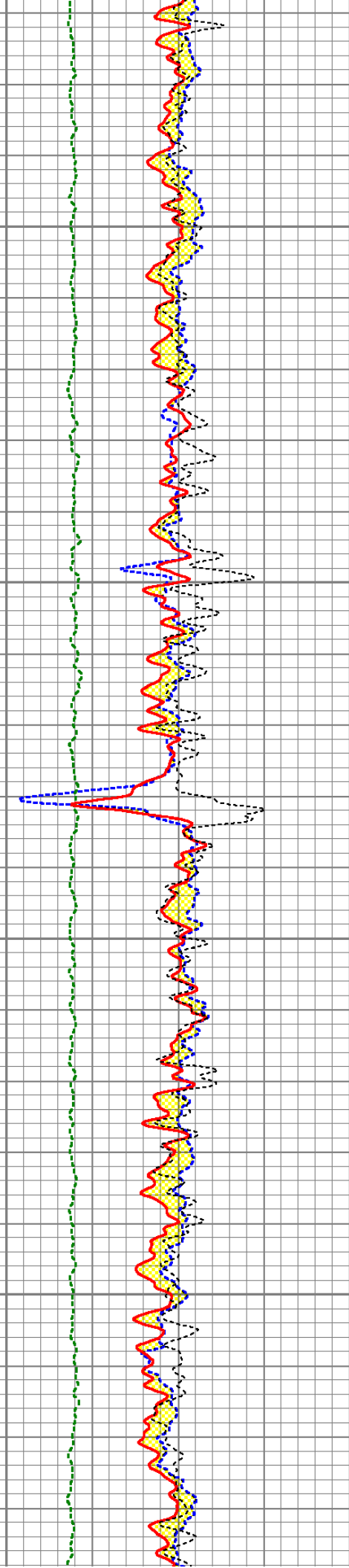
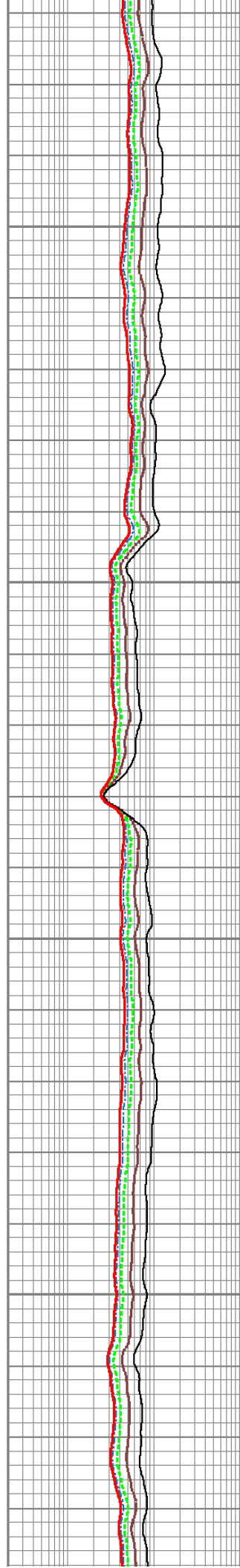


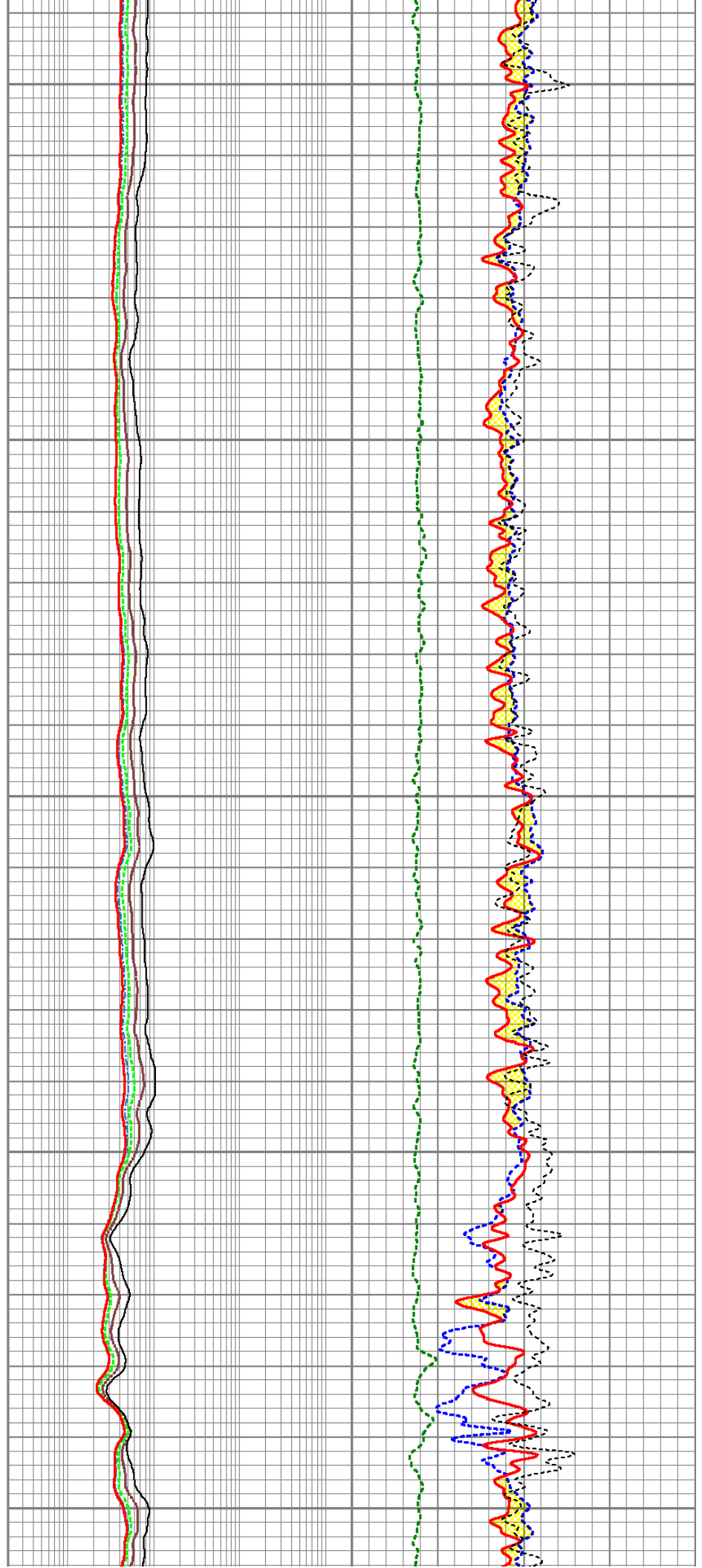
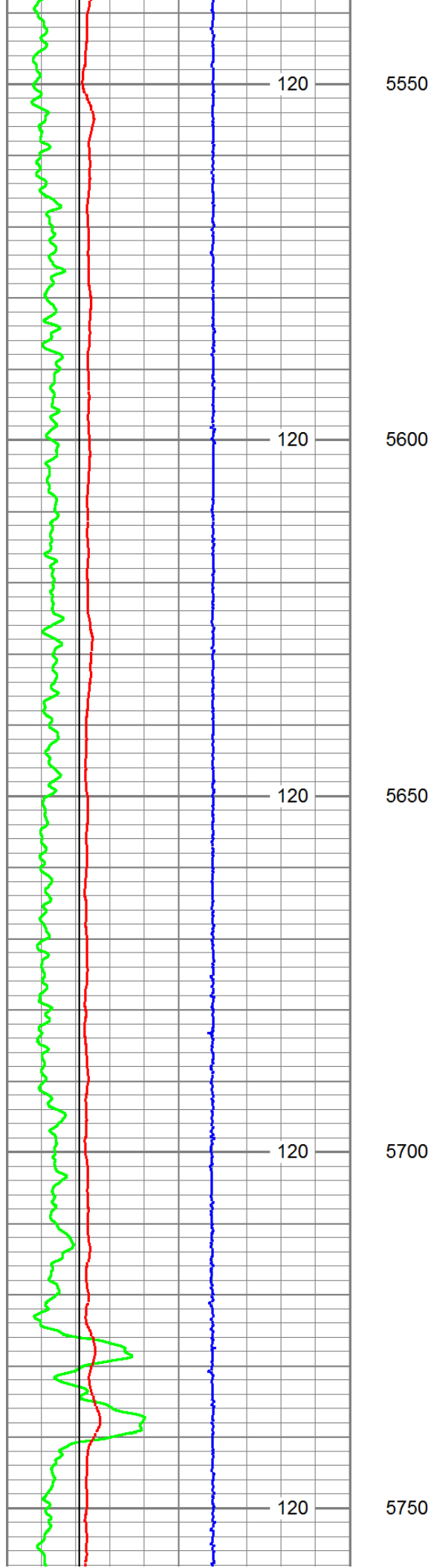
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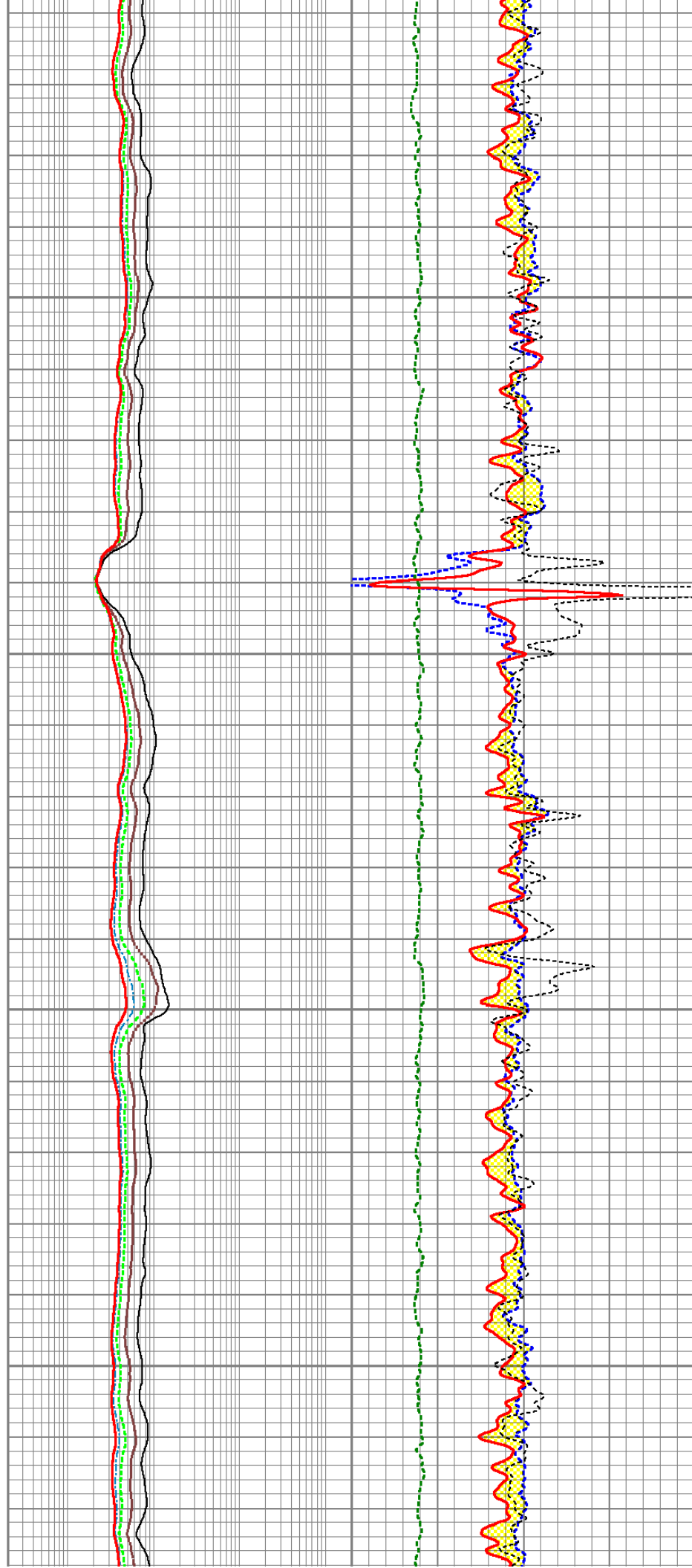


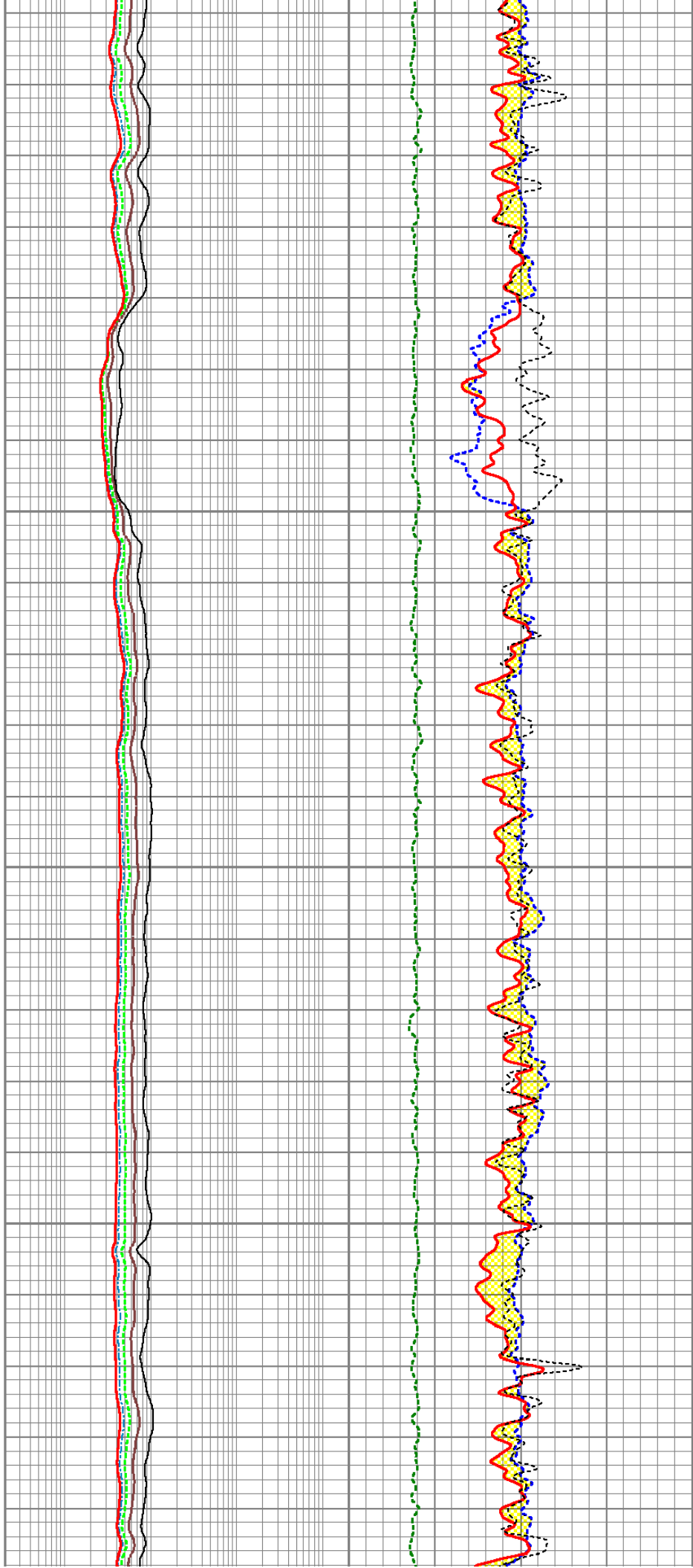
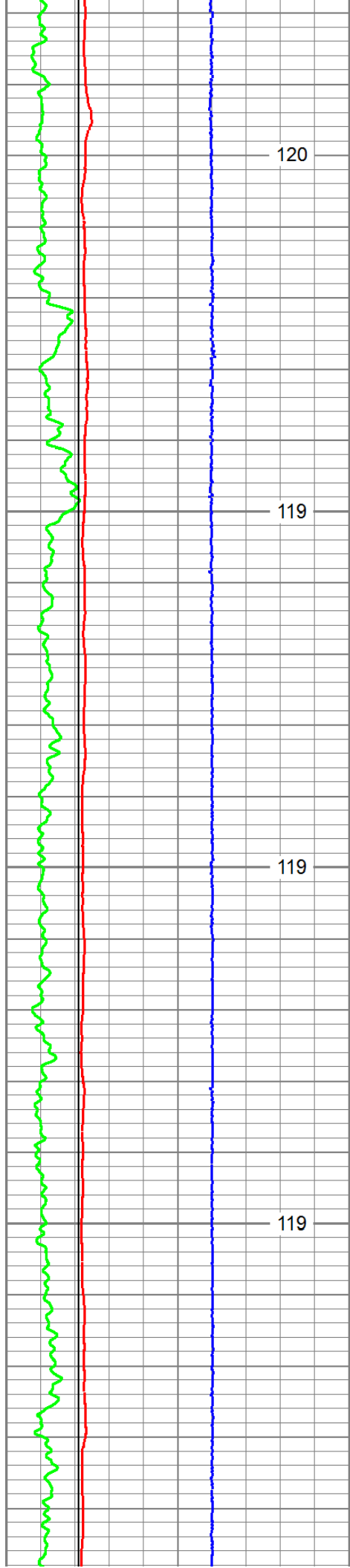
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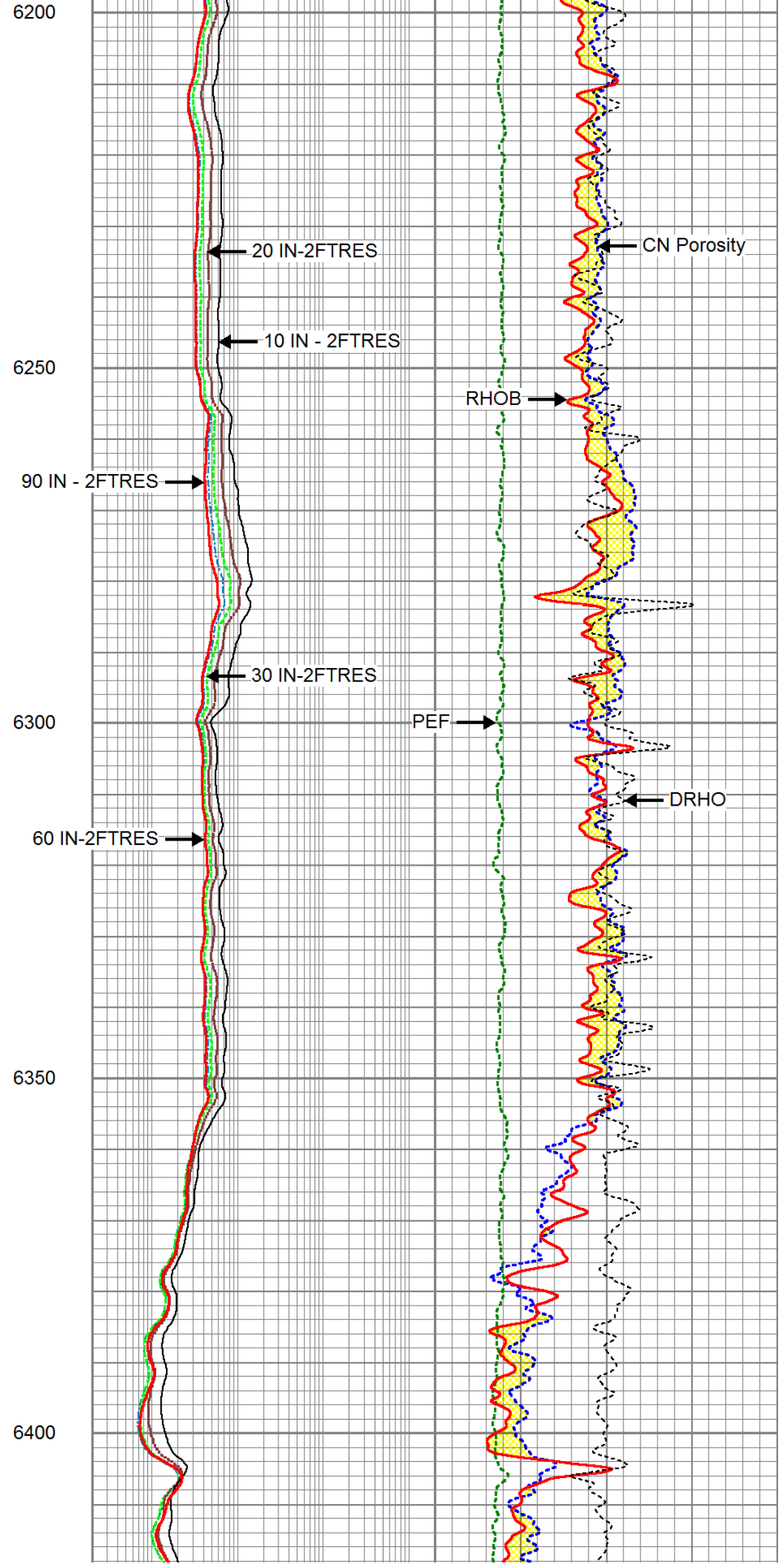
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Log Variables

Database: C:\Warrior\Data\shell_nunemaker_mem.db
Dataset: field/well/proc1/pass1.2

Top - Bottom

BHCOR On	BHFL_TYPE WBM	BHFLRES Ohm-m 1	BHFLRESSRC MUDCELL	BHIDSRC CURVE	BOREID in 6.125	BOTTEMP degF 120
CASED? No	CASEOD in 4.5	CASETHCK in 0	CEMWATERSA kppm 0	CMNTTHCK in 0	DNBHC? NO	DPORSEL RHOB
FLUIDDEN g/cc 1	FRMSALIN kppm 0	LATNOR Off	MATRXDEN g/cc 2.71	MUDSALIN kppm 0.8	MudWgt lb/gal 8.5	NPORSEL Limestone
PEBHC? YES	PERFS 0	RESTMP SRC INTERNAL	SO in 0.5	SRFTEMP degF 65	SZCOR On	TDEPTH ft 6744
TMPCOR On	TOOLPOS Free					

Calibration Report

Database File: shell_nunemaker_mem.db
Dataset Pathname: proc1/pass1.2
Dataset Creation: Mon Jan 21 13:09:21 2013

ThruBit Induction Calibration Report

Tool Model-Serial Number: PS-PS13R
Shop Calibration Performed: Tue Jan 08 11:00:21 2013

BASELINE

	R	Expected	X	Expected
Freq 1				
A1	-461.5880	[-500.00, -400.00]	159.4300	[-500.00, 500.00]
A2	-139.6990	[-180.00, -100.00]	138.6020	[-500.00, 500.00]
A3	-29.9497	[-50.00, -10.00]	110.0530	[-500.00, 500.00]
A4	-16.4197	[-30.00, -10.00]	208.3310	[-500.00, 500.00]
A5	-15.1327	[-30.00, -10.00]	101.4700	[-500.00, 500.00]
Freq 2				
A1	-241.6400	[-280.00, -180.00]	79.2268	[-500.00, 500.00]
A2	-90.0140	[-130.00, -50.00]	64.0773	[-500.00, 500.00]
A3	-21.8820	[-50.00, -10.00]	24.3411	[-500.00, 500.00]
A4	-19.8785	[-30.00, -10.00]	54.1275	[-500.00, 500.00]
A5	-19.9556	[-30.00, -10.00]	-26.1281	[-500.00, 500.00]
Freq 3				
A1	-152.4090	[-180.00, -80.00]	-6.2126	[-500.00, 500.00]
A2	-68.5593	[-130.00, -30.00]	7.6578	[-500.00, 500.00]
A3	-17.5465	[-50.00, -10.00]	-36.3951	[-500.00, 500.00]
A4	-21.4411	[-30.00, -10.00]	-50.1217	[-500.00, 500.00]
A5	-22.3458	[-30.00, -10.00]	-120.9040	[-500.00, 500.00]
Freq 4				
A1	-81.2236	[-120.00, -40.00]	-152.2610	[-500.00, 500.00]
A2	-49.2089	[-110.00, -10.00]	-75.3439	[-500.00, 500.00]

A3	-13.5149	[-50.00, -10.00]	-125.9080	[-500.00, 500.00]
A4	-24.2522	[-30.00, -10.00]	-205.8710	[-500.00, 500.00]
A5	-27.6952	[-30.00, -10.00]	-282.2210	[-500.00, 500.00]

CALIBRATION COEFFICIENTS				
	R	Expected	X	Expected
Freq 1				
A1	0.9853	[0.95, 1.05]	0.0016	[-0.05, 0.05]
A2	0.9865	[0.95, 1.05]	0.0017	[-0.05, 0.05]
A3	0.9869	[0.95, 1.05]	-0.0065	[-0.05, 0.05]
A4	0.9883	[0.95, 1.05]	0.0023	[-0.05, 0.05]
A5	0.9960	[0.95, 1.05]	0.0025	[-0.05, 0.05]
Freq 2				
A1	0.9806	[0.95, 1.05]	-0.0065	[-0.05, 0.05]
A2	0.9815	[0.95, 1.05]	-0.0062	[-0.05, 0.05]
A3	0.9763	[0.95, 1.05]	-0.0070	[-0.05, 0.05]
A4	0.9853	[0.95, 1.05]	-0.0063	[-0.05, 0.05]
A5	0.9928	[0.95, 1.05]	-0.0047	[-0.05, 0.05]
Freq 3				
A1	0.9868	[0.95, 1.05]	-0.0032	[-0.05, 0.05]
A2	0.9880	[0.95, 1.05]	-0.0026	[-0.05, 0.05]
A3	0.9826	[0.95, 1.05]	-0.0035	[-0.05, 0.05]
A4	0.9916	[0.95, 1.05]	-0.0035	[-0.05, 0.05]
A5	0.9997	[0.95, 1.05]	0.0005	[-0.05, 0.05]
Freq 4				
A1	0.9876	[0.95, 1.05]	-0.0138	[-0.05, 0.05]
A2	0.9884	[0.95, 1.05]	-0.0136	[-0.05, 0.05]
A3	0.9857	[0.95, 1.05]	-0.0162	[-0.05, 0.05]
A4	0.9958	[0.95, 1.05]	-0.0156	[-0.05, 0.05]
A5	1.0069	[0.95, 1.05]	-0.0106	[-0.05, 0.05]
Temperature	18.3864 degC			

ThruBit Density Calibration Report	
Tool Model-Serial Number:	PS-PS32D
Source Number:	
Shop Calibration Performed:	Thu Jan 17 12:04:35 2013

REFERENCE			
	Density	Units	
Aluminium	2.607	g/cc	
Magnesium	1.752	g/cc	
READINGS			
Outputs	Counts	Units	Expected
SS1 Background	142.77	cps	[130.00, 170.00]
LS1 Background	143.61	cps	[130.00, 170.00]
LS4 Background	30.03	cps	[27.00, 35.00]
SS1 Aluminium	5370.84	cps	[4500.00, 5500.00]
LS1 Aluminium	955.25	cps	[750.00, 950.00]
LS4 Aluminium	1169.85	cps	[843.00, 1068.00]
SS1 Magnesium	8549.35	cps	[7000.00, 9000.00]

LS1 Magnesium	6101.16	cps	[5250.00, 6250.00]
LS1 Al + Fe	789.25	cps	[650.00, 800.00]
LS4 Al + Fe	499.77	cps	[382.00, 471.00]
RESULTS			
SS Slope	1.80		[1.52, 1.77]
LS Slope	0.43		[0.38, 0.45]
PEF K Factor	5.531		[3.510, 6.170]
PEF B Factor	-0.564		[-0.700, -0.410]

RESULTS Caliper Shop Calibration performed: Thu Jan 17 12:04:35 2013			
Reference	Reading	Units	
12.00	1863.07	in	
9.00	2018.36	in	
6.00	2177.84	in	

DENSITY PRE-SURVEY CHECK Performed: Wed Dec 31 18:00:00 1969			
Outputs	Counts	Units	Expected
SS1 Background	0.00	cps	[138.48, 147.05]
LS1 Background	0.00	cps	[139.30, 147.91]
LS4 Background	0.00	cps	[28.22, 31.83]

CALIPER PRE-SURVEY CHECK Performed: Wed Dec 31 18:00:00 1969			
Reference	Readings	Units	Expected
0.00	0.00	in	[-0.20, 0.20]

Compensated Neutron Calibration Report
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Tool Model-Serial Number: Source Number:	PS-PS35N
Calibration Tank Temperature: Shop Calibration Performed:	61.0 degF Mon Dec 24 14:02:56 2012

BACKGROUND MEASUREMENT			
Outputs	Measured	Units	Expected
SS Counts	0.0	cps	<10
LS Counts	0.1	cps	<4

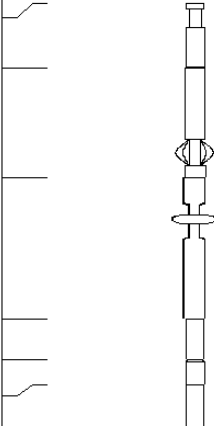
WATER TANK REFERENCE			
Outputs	Measured	Units	Expected
SS Counts	3038.1	cps	
LS Counts	100.4	cps	
Tank Ratio Ref	30.9580	SS/LS	
Tank Ratio	30.2612	SS/LS	
Tank Ratio Gain	1.0230		[0.85, 1.15]

ALUMINUM SLEEVE REFERENCE			
Outputs	Measured	Units	Expected
SS Counts	36200.5	cps	
LS Counts	3282.8	cps	
AI Ratio Ref	10.797	SS/LS	
AI Ratio	11.281	SS/LS	
AI Ratio Gain	0.96		[0.90, 1.10]
Sleeve Porosity	14.46	pu	

PRE-SURVEY BACKGROUND CHECK Performed: Wed Jan 16 19:09:39 2013			
Outputs	Measured	Units	Expected
SS Counts	0.1	cps	<10
LS Counts	0.1	cps	<4

Gamma Ray Calibration Report			
Tool Model-Serial Number:	PS-PS25T		
Performed:	Sun Jan 20 18:16:22 2013		
Calibrator Value:	162.7	GAPI	
Background Reading:	52.4	cps	
Calibrator Reading:	379.1	cps	
Sensitivity:	0.3750	GAPI/cps	

Inclinometer Calibration Report					
Performed:	Sun Jun 13 14:33:21 1993				
	Low Read.	High Read.	Low Ref.	High Ref.	
X Accelerometer	0.00	1.00	0.00	1.00	gee
Y Accelerometer	0.00	1.00	0.00	1.00	gee
Z Accelerometer	0.00	1.00	0.00	1.00	gee

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
Thrubit	66.92		Cablehead-S	2.31	2.13	5.00
Thrubit	64.61		Solid Weakpoint			
			PSBDOT	3.87	2.25	35.00
Thrubit	60.75		HangOff_Tool	5.00	2.38	60.00
Thrubit	55.75		Universal Joint	1.46	2.06	15.00
Thrubit	54.29		10-1	0.88	2.13	3.95
TBBAT	53.41					

TBBAT2	47.29		TBBAT-A (PS30B) ThruBit Battery	6.13	2.13	38.20
			TBBAT2-A (PS29B) ThruBit Battery	6.13	2.13	40.00
TMG GR GRTEMP	41.16 41.04 40.20		TMG-PS (PS25T) ThruBit Telemetry Gamma Ray	6.13	2.13	45.00
ThruBit	35.04					
			Decentralizer Decentralizer (Small)	4.50	2.13	70.00
CNLSC	28.60		TBN-PS (PS35N) ThruBit Neutron	4.77	2.13	63.00
			TBD-PS (PS32D) ThruBit Density	10.48	2.13	91.00
LSW1 DCAL	18.04 17.13					
A1_P A2_P A3_P A4_P A5_P	10.60 10.10 9.35 8.35 6.60		TBI-PS (PS13R) ThruBit Induction	15.29	2.13	94.00
Dataset: shell_nunemaker_mem.db: field/well/proc1/pass1.2 Total Length: 66.92 ft Total Weight: 560.15 lb O.D. 2.38 in						



ThruBit
A Schlumberger Company

Company SHELL OIL E & P
 Well NUNEMAKER 2509 32-1H
 Field ARROWHEAD
 County RENO
 State KANSAS