

Company: Noble Energy Inc

Well: Romero PC G10-79HN

Field: Wattenberg

County: Weld State: Colorado

County: Weld	
Field: Wattenberg	
Location: SWNW, Sec. 3, T4N, R65W	
Well: Romero PC G10-79HN	
Company: Noble Energy Inc	
Array Induction with Linear Correlation	
Location:	
SWNW, Sec. 3, T4N, R65W	
SHL: 2235' FNL x 273' FWL	
Elev.: K.B. 4700.00 ft	
G.L. 4670.00 ft	
D.F. 4699.00 ft	
Permanent Datum: Ground Level	
Log Measured From: Kelly Bushing	
Drilling Measured From: Kelly Bushing	
Elev.: 30.00 ft	
above Perm.Datum	
API Serial No. Section: 3 Township: 4N Range: 65W	
05-123-34018-0000	

Logging Date	23-Mar-2014
Run Number	Run 1
Depth Driller	6115.00 ft
Schlumberger Depth	6123.00 ft
Bottom Log Interval	6123.00 ft
Top Log Interval	729.00 ft
Casing Driller Size @ Depth	9.625 in @ 729.00 ft
Casing Schlumberger	729 ft
Bit Size	8.75 in
Type Fluid In Hole	WBM LSND
Density	9 lbm/gal
Viscosity	38 s
Fluid Loss	PH 9.6
Source of Sample	Active Tank
RM @ Meas Temp	0.71 ohm.m @ 79.98 degF
RMF @ Meas Temp	0.53 ohm.m @ 79.98 degF
RMC @ Meas Temp	0.89 ohm.m @ 79.98 degF
Source RMF	Calculated
RM @ BHT	0.33 @ 180 0.25 @ 180
Max Recorded Temperatures	
Circulation Stopped	22-Mar-2014 18:25:00
Logger on Bottom	23-Mar-2014 02:50:00
Unit Number	3022
Recorded By	Aleksei Bekhterev/ Heather Hoffman
Witnessed By	John Drahota

Disclaimer

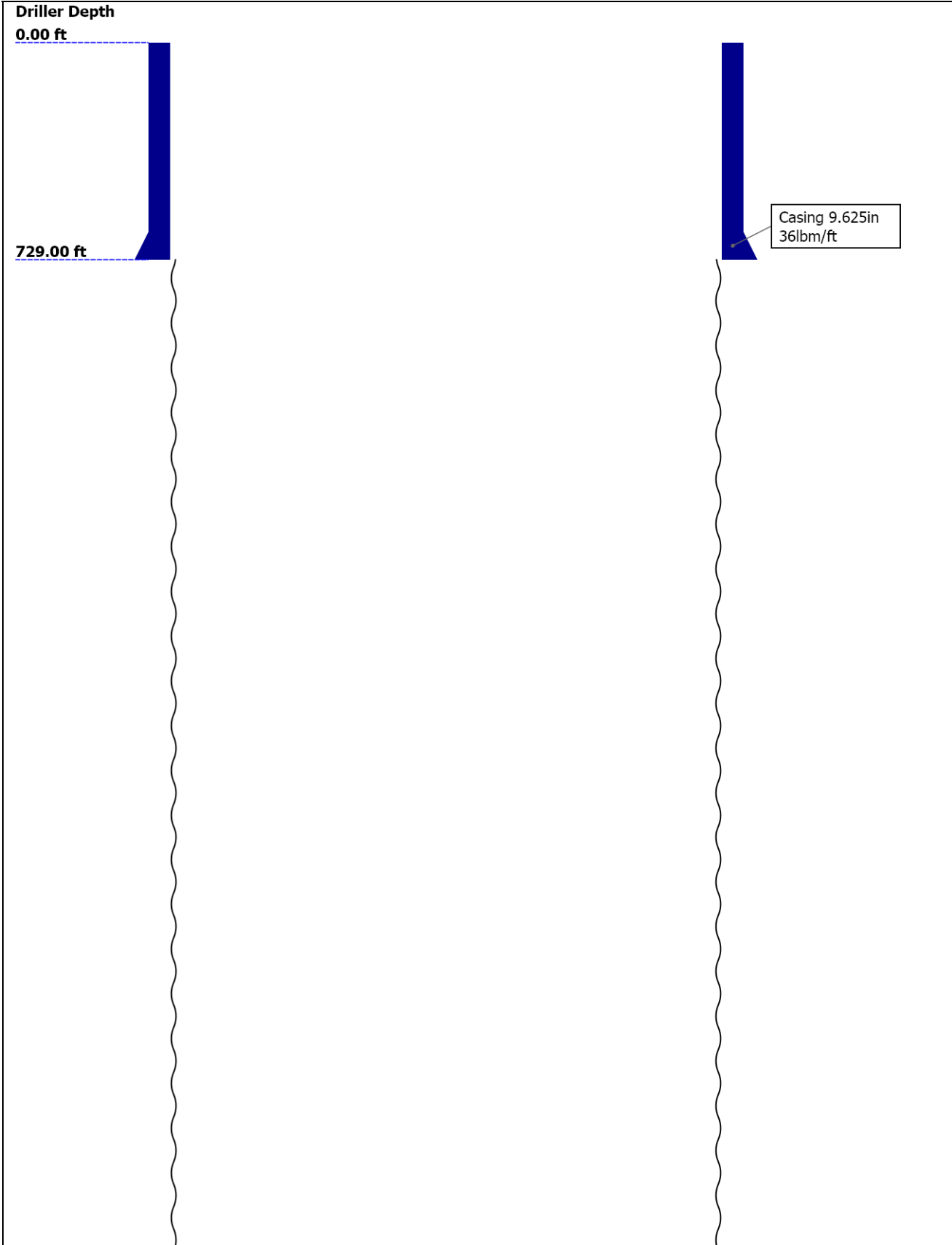
THE USE OF AND RELIANCE UPON THIS RECORDED-DATA BY THE HEREIN NAMED COMPANY (AND ANY OF ITS AFFILIATES, PARTNERS, REPRESENTATIVES, AGENTS, CONSULTANTS AND EMPLOYEES) IS SUBJECT TO THE TERMS AND CONDITIONS AGREED UPON BETWEEN SCHLUMBERGER AND THE COMPANY, INCLUDING: (a) RESTRICTIONS ON USE OF THE RECORDED-DATA; (b) DISCLAIMERS AND WAIVERS OF WARRANTIES AND REPRESENTATIONS REGARDING COMPANY'S USE AND RELIANCE UPON THE RECORDED-DATA; AND (c) CUSTOMER'S FULL AND SOLE RESPONSIBILITY FOR ANY INFERENCE DRAWN OR DECISION MADE IN CONNECTION WITH THE USE OF THIS RECORDED-DATA.

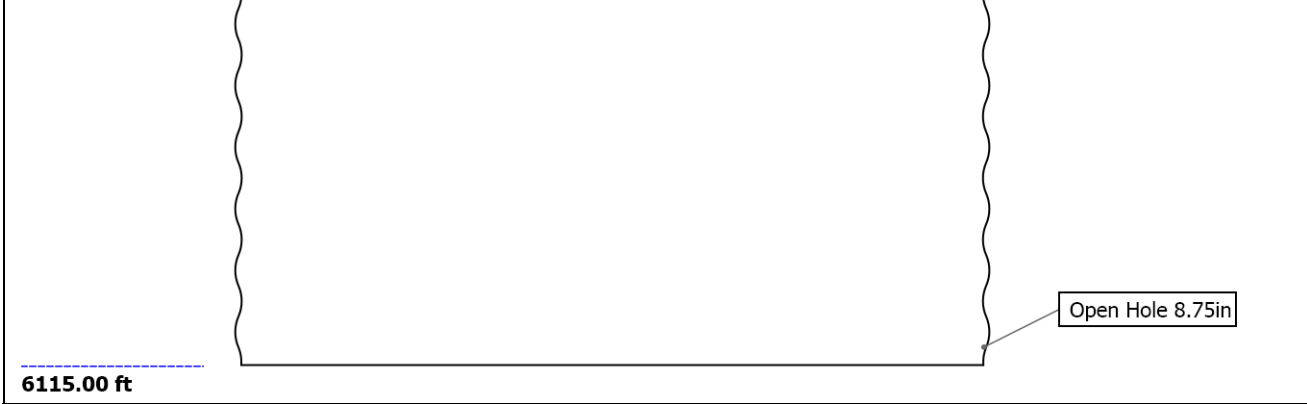
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Well Sketch



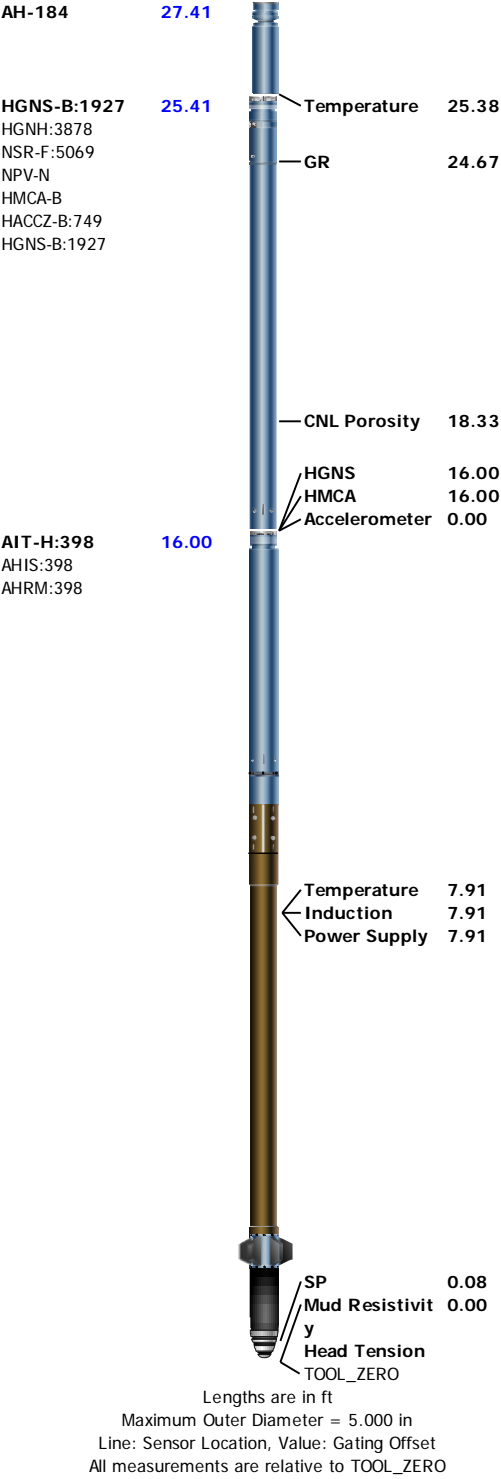


Borehole Size/Casing/Tubing Record

Bit						
Bit Size (in)	8.75					
Top Driller (ft)	729					
Top Logger (ft)	729					
Bottom Driller (ft)	6115					
Bottom Logger (ft)	6123					
Casing						
Size (in)	9.625					
Weight (lbm/ft)	36					
Inner Diameter (in)	8.921					
Grade	N/A					
Top Driller (ft)	0					
Top Logger (ft)	0					
Bottom Driller (ft)	729					
Bottom Logger (ft)	729					

Remarks and Equipment Summary

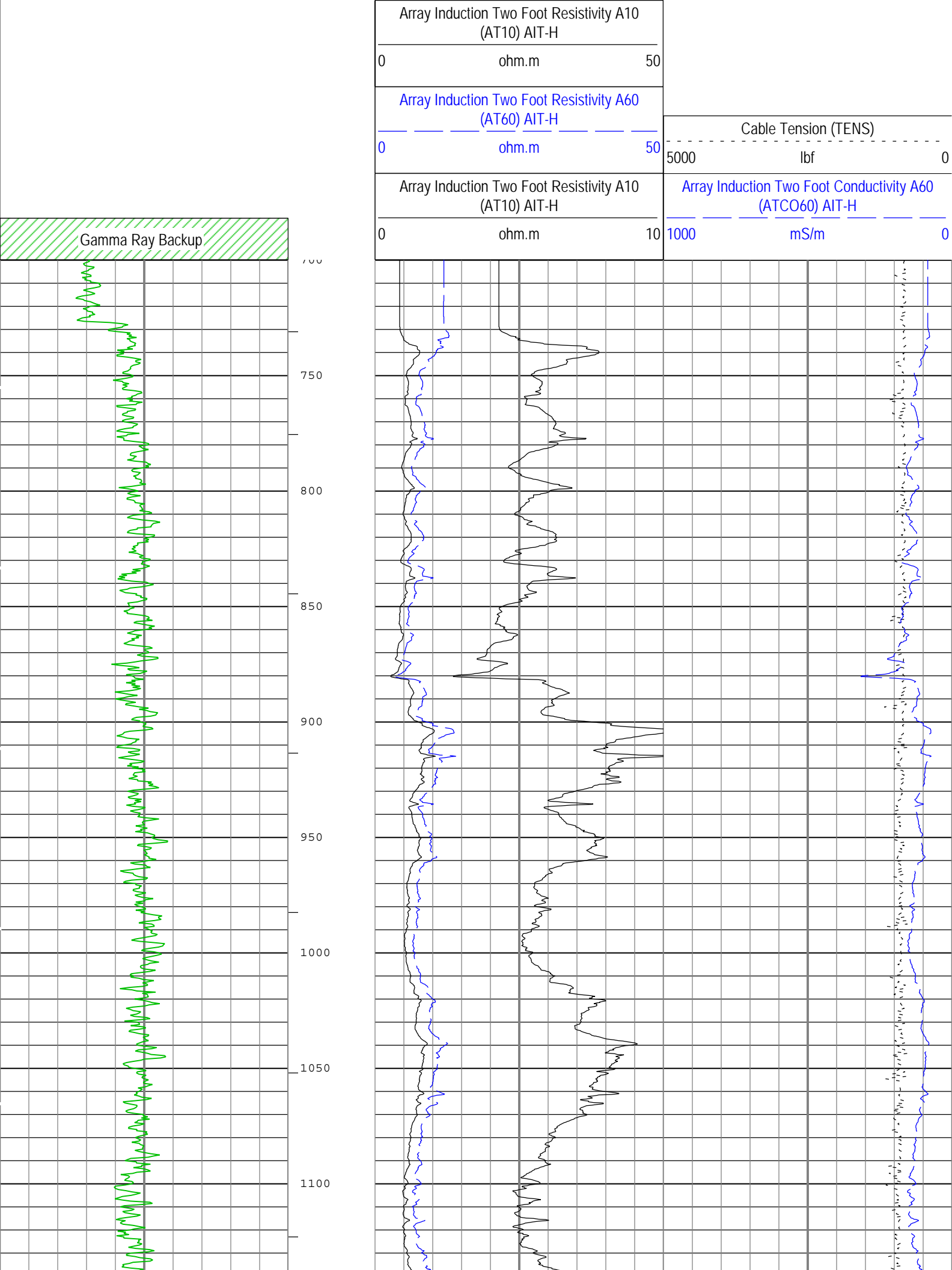
Run 1: Toolstring				Run 1: Remarks	
<div>Equip name</div> <div>LEH-QT</div> <div>LEH-QT</div>	<div>Length</div> <div>39.84</div>	<div>MP name</div> <div></div>	<div>Offset</div> <div></div>	This is the first run in hole	
				Toolstring run as per toolsketch	
				Survey data provided by client	
<div>DTC-H</div> <div>ECH-KC</div> <div>DTC-H</div>	<div>36.92</div>	<div>CTEM</div> <div>HV</div>	<div>36.03</div> <div>0.00</div>	Rig: H&P326	
				Crew: Jay Musgrave	
<div>PPC-B:8352</div> <div>PPC-B:8352</div>	<div>33.92</div>	<div>ToolStatus</div> <div>TelStatus</div>	<div>33.92</div> <div>33.92</div>		
		<div>PPC-B Calipers</div>	<div>32.78</div>		

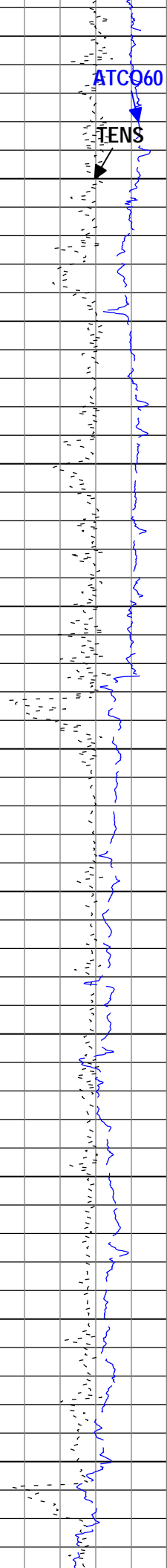
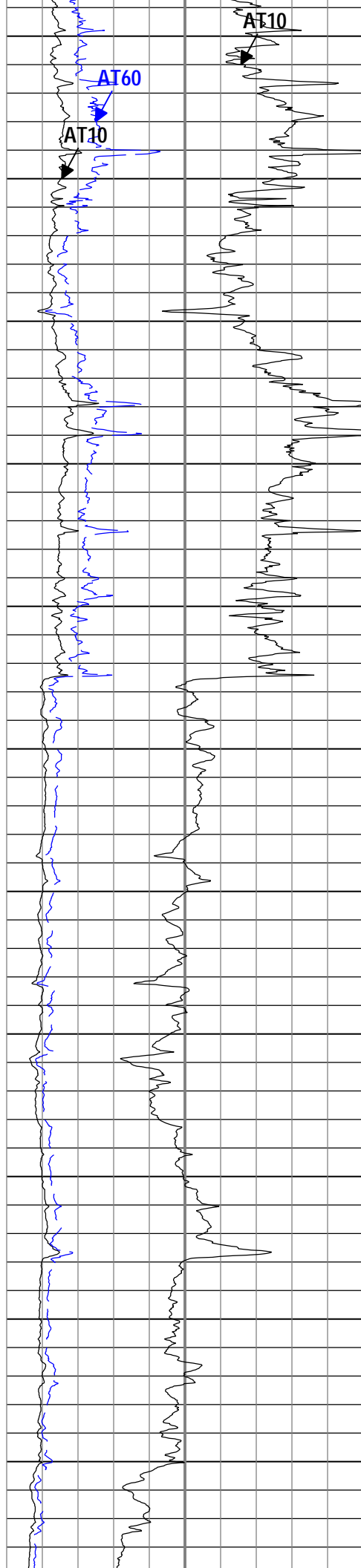
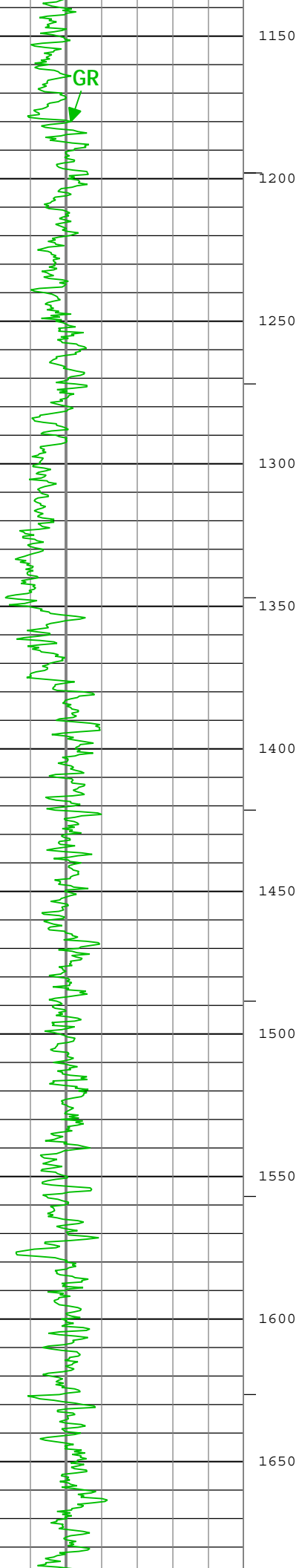


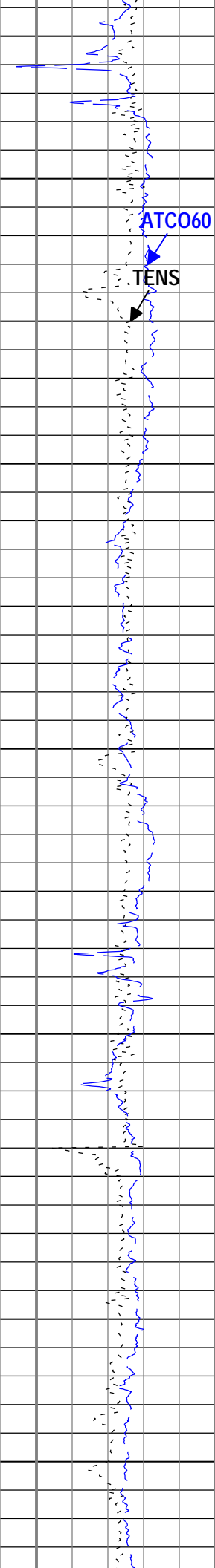
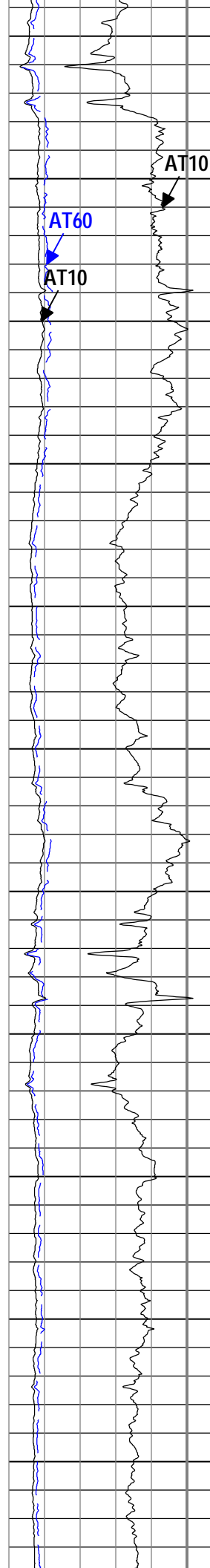
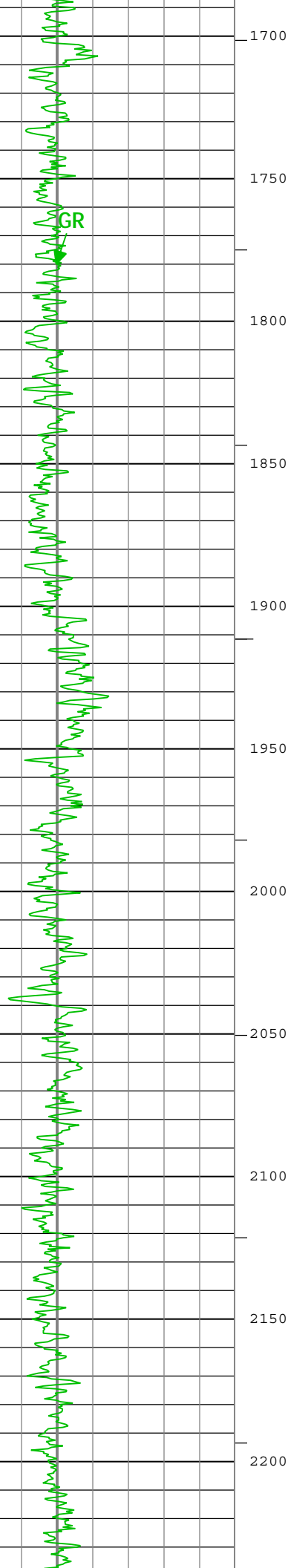
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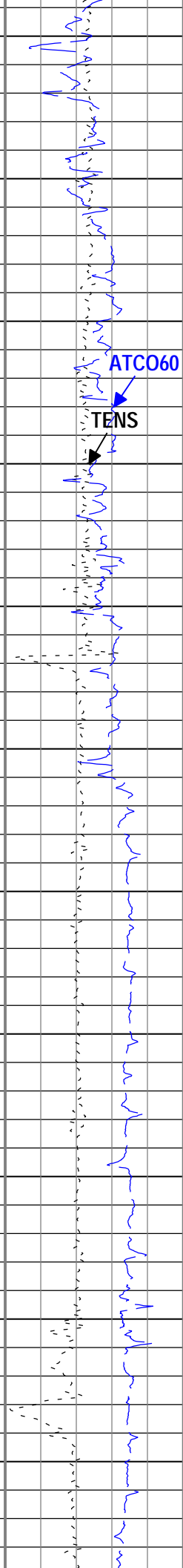
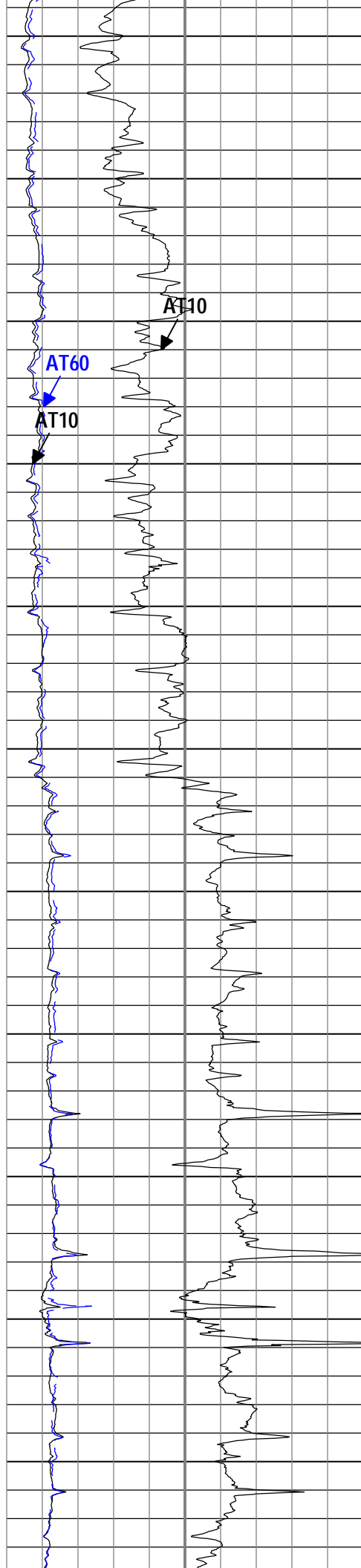
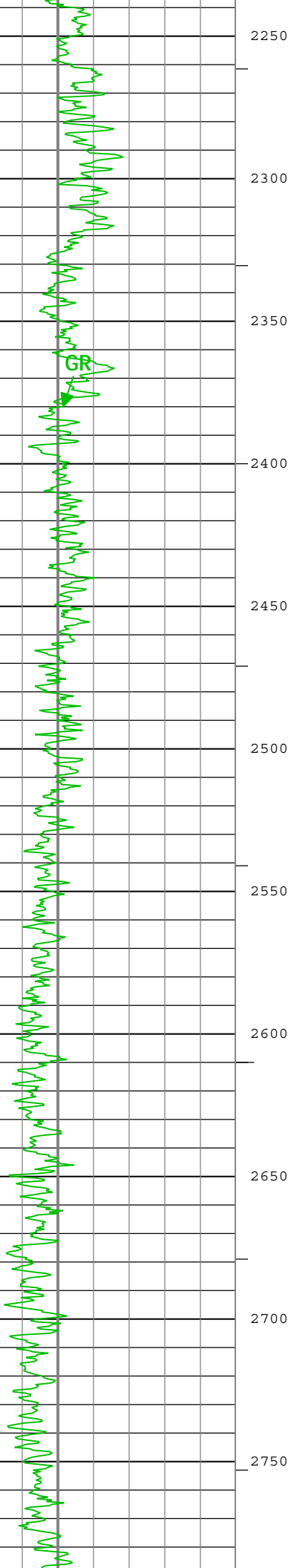
Run 1			
Depth Measuring Device			
Type	IDW-B		
Serial Number			
Calibration Date			
Calibrator Serial Number			
Calibration Cable Type			
Wheel Correction 1	0		
Wheel Correction 2	0		
Tension Device			
Type	CMTD-B/A		
Serial Number			
Calibration Date			
Calibrator Serial Number			

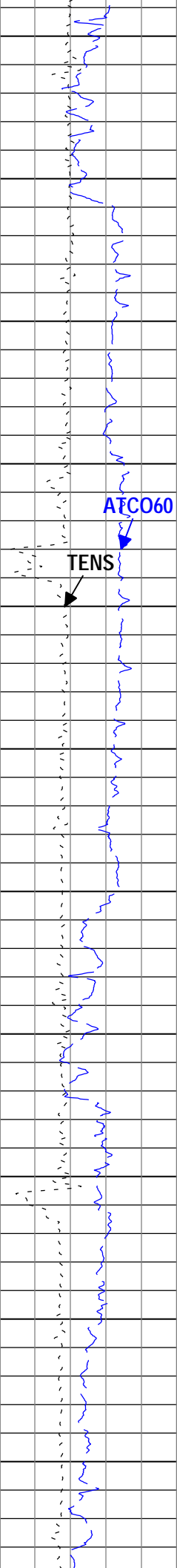
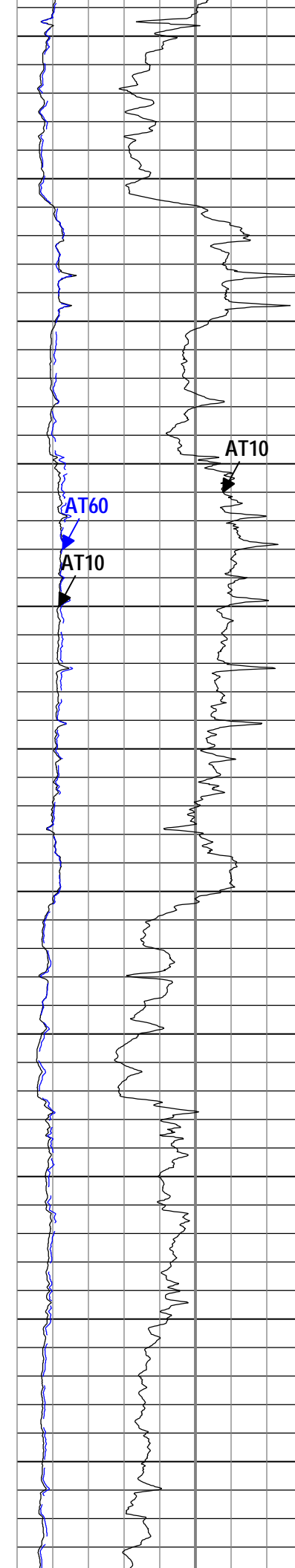
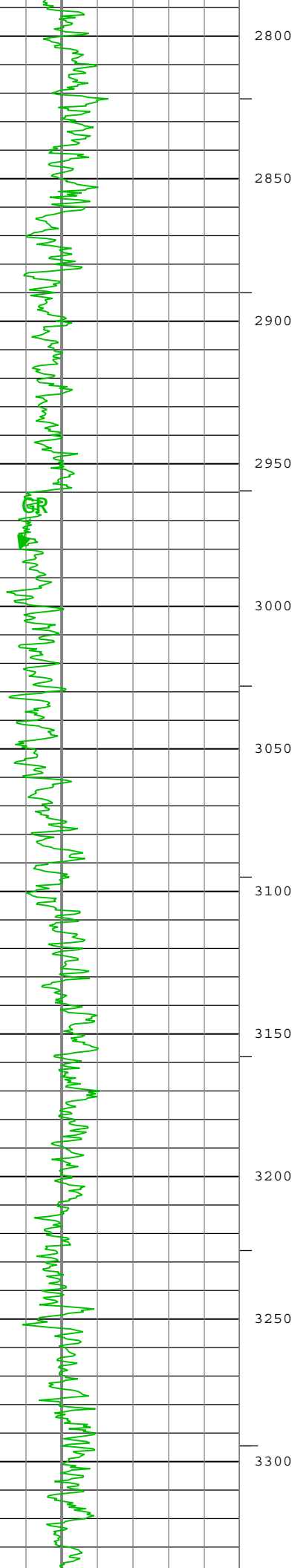
	└─ ICV - Integrated Cement Volume every 10.00 (ft3)
TIME_1900 - Time Marked every 60.00 (s)	└─ ICV - Integrated Cement Volume every 100.00 (ft3)











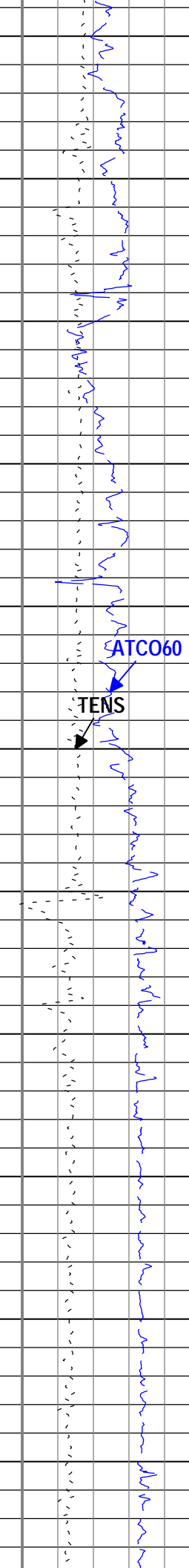
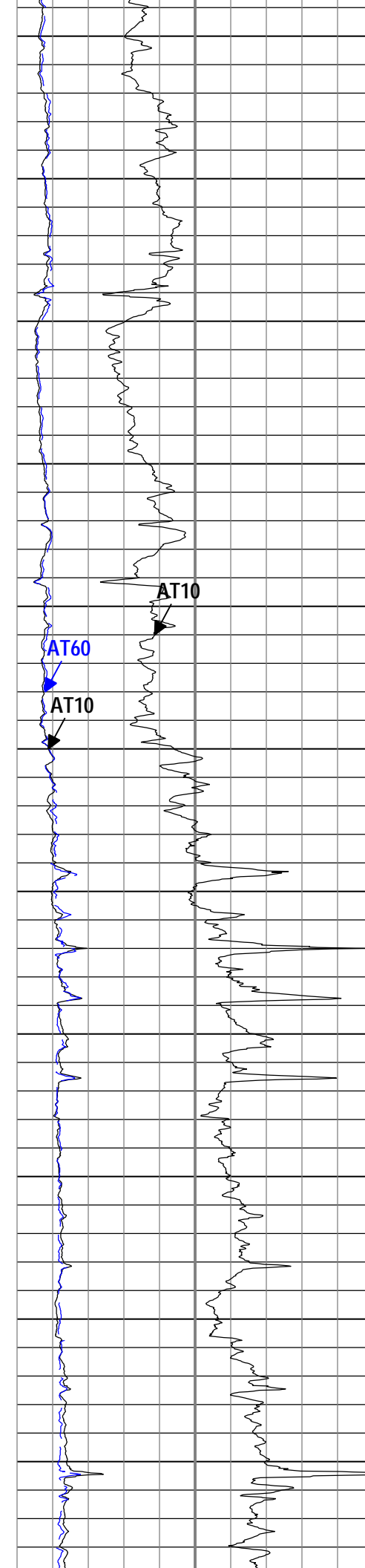
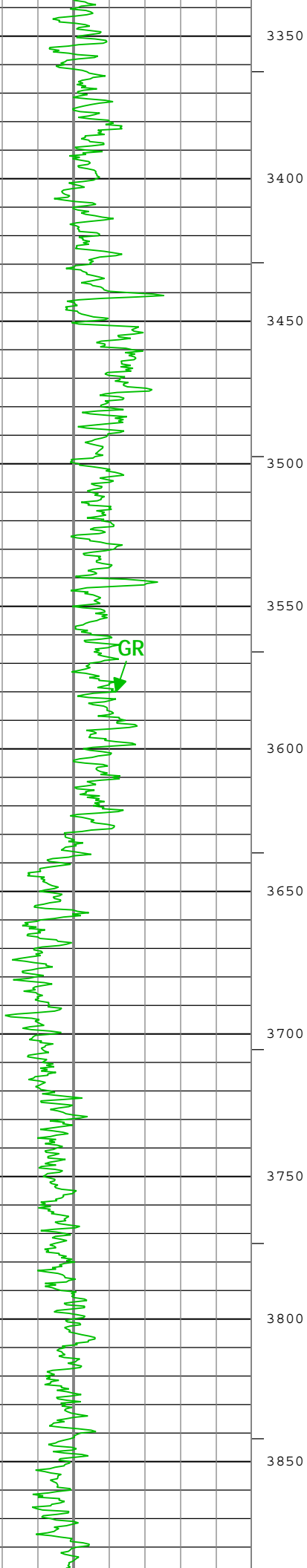
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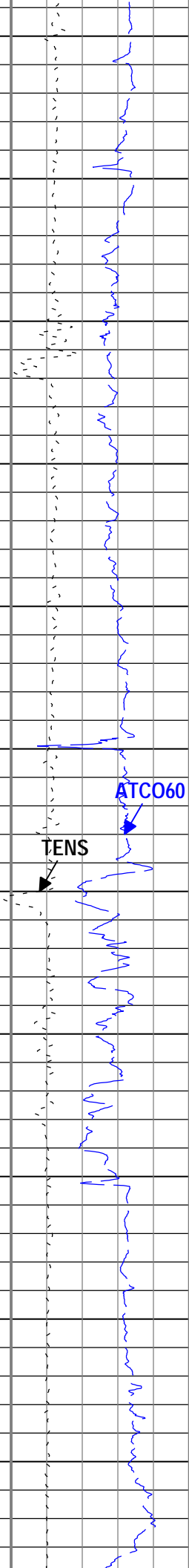
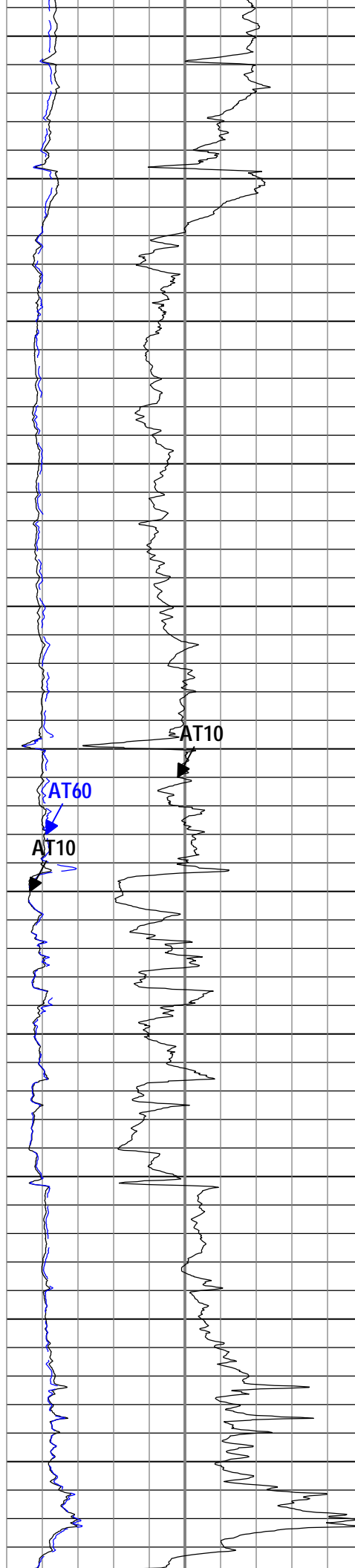
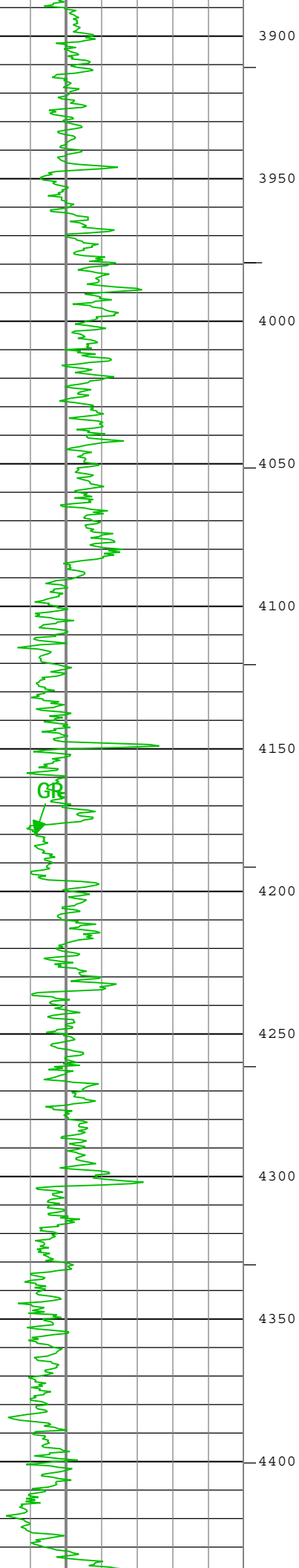
AT10

AT10

ATCO60

TENS





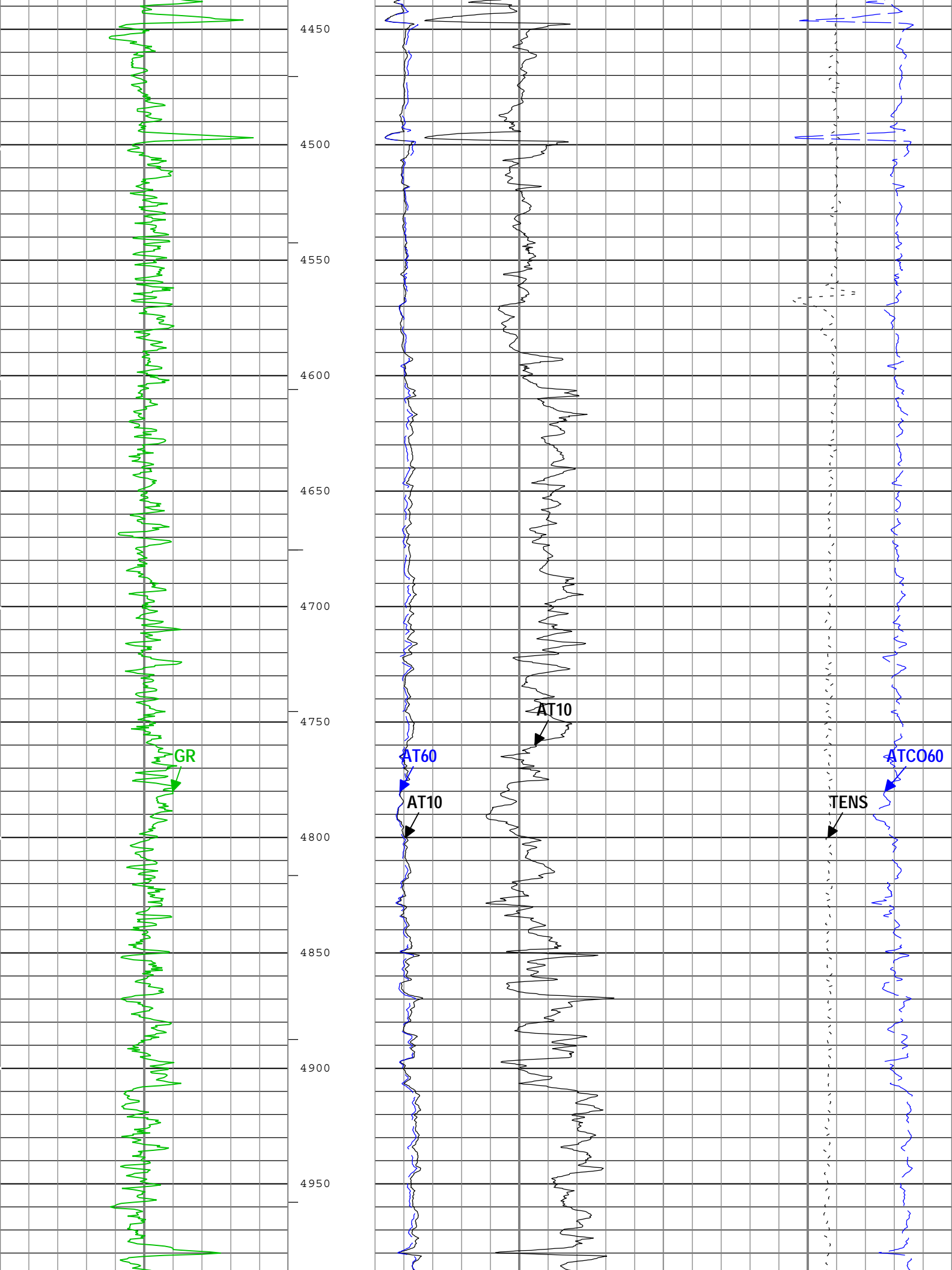
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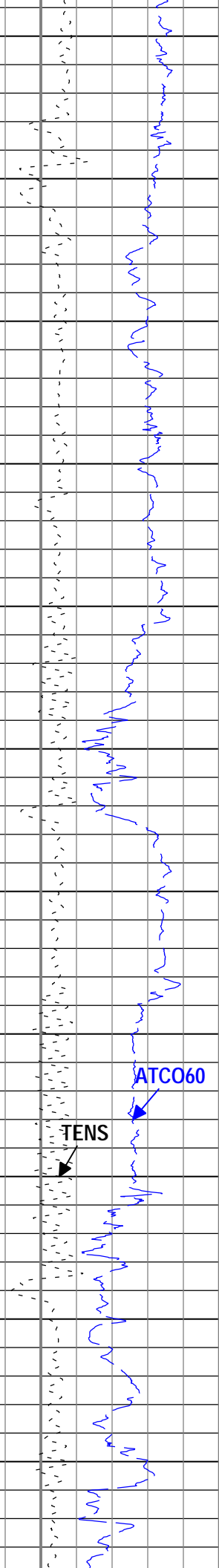
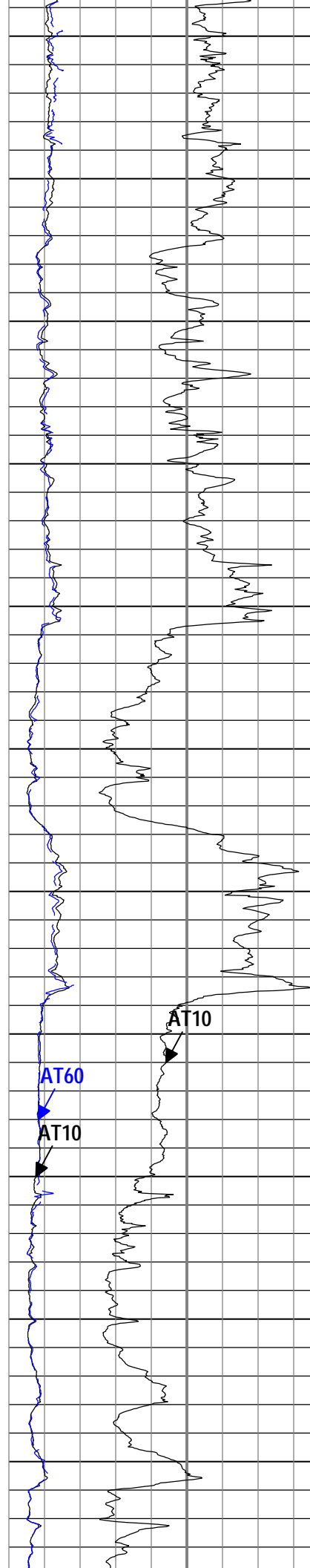
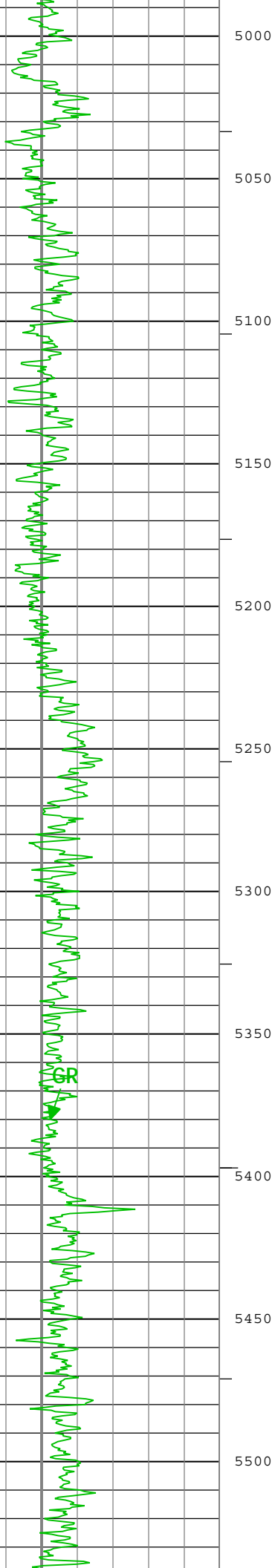
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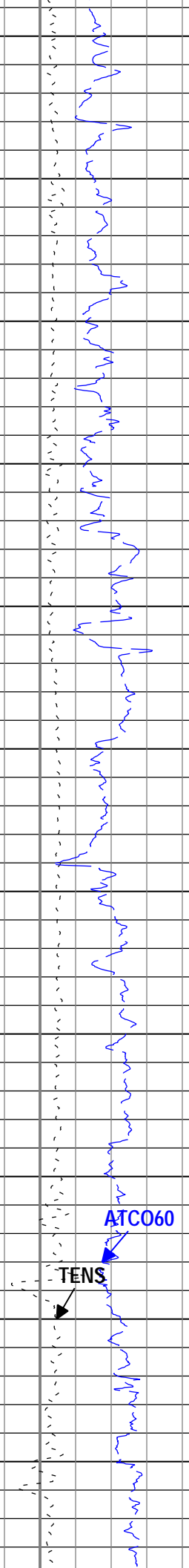
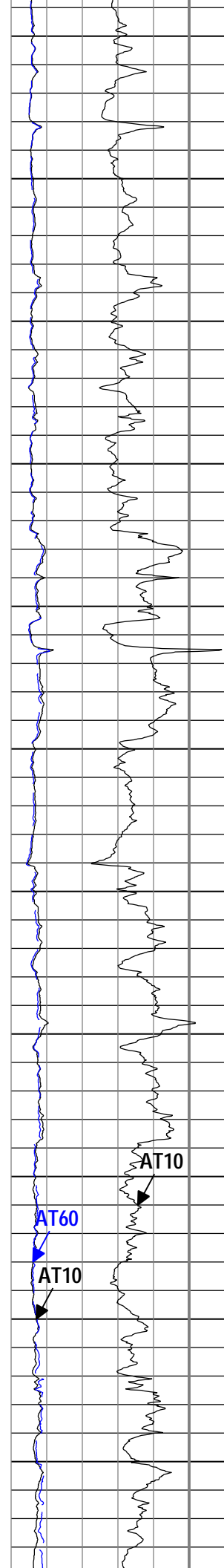
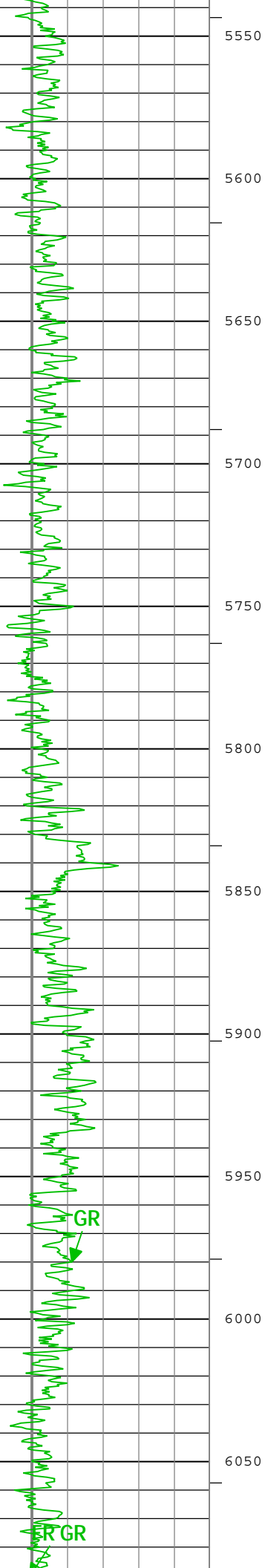
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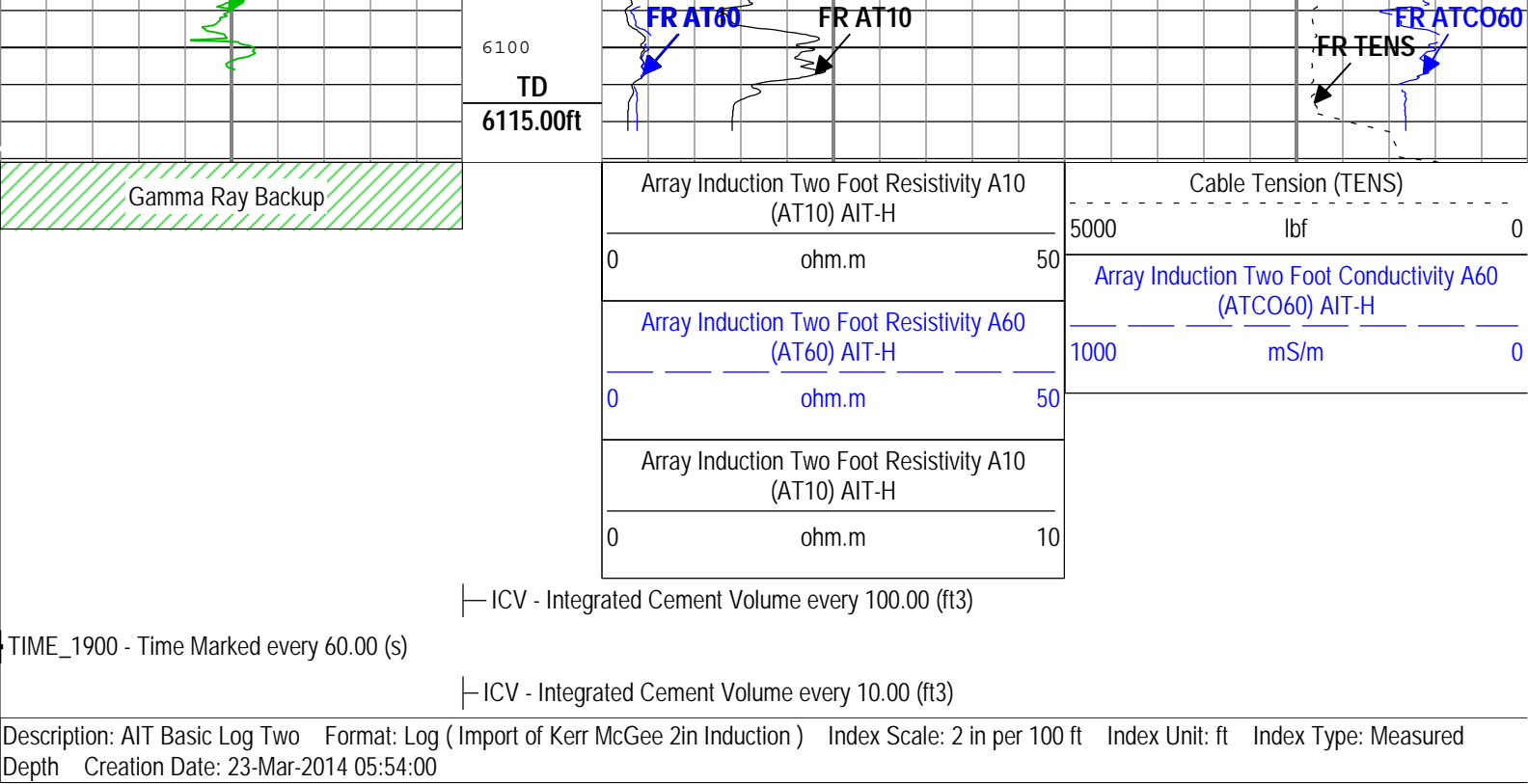
ATC060

TENS









Channel Processing Parameters				
Parameter	Description	Tool	Value	Unit
ABHM	Array Induction Borehole Correction Mode	AIT-H	Compute Standoff	
ACDE	Array Induction Casing Detection Enable	AIT-H	Yes	
ASTA	Array Induction Tool Standoff	AIT-H	1	in
BARI	Barite Mud Presence Flag	Borehole	No	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Open	
BS	Bit Size	WLSESSION	8.75	in
CBLO	Casing Bottom (Logger)	WLSESSION	729	ft
CDEN	Cement Density	HGNS-B	2	g/cm3
CSODDRL	Casing Outer Diameter - Zoned along driller depths	WLSESSION	9.625	in
DFD	Drilling Fluid Density	Borehole	9	lbm/gal
FCD	Future Casing (Outer) Diameter	WLSESSION	7	in
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	HD1	
GRSE	Generalized Mud Resistivity Selection, from Measured or Computed Mud Resistivity	Borehole	AMF	
SOCO	Standoff Correction Option	HGNS-B	Yes	

Tool Control Parameters				
Parameter	Description	Tool	Value	Unit
MAX_LOG_SPEED	Toolstring Maximum Logging Speed	WLSESSION	3600	ft/h

Run 1				

Integration Summary				
Output Channel(s)	Output Description	Input Parameter	Output Value	Unit
ICV	Integrated Cement Volume	GCSE_UP_PASS, FCD	771.76	ft3
IHV	Integrated Hole Volume	GCSE_UP_PASS	2214.42	ft3

Software Version				
Acquisition System		Version		

Computation	Description		Version
Borehole	Borehole Ensemble provides common Borehole Parameters and Channels		4.0.9213.3000
Tool Elements	Description	Software Version	Firmware Version
AHIS	Array Induction Sonde - H	4.0.9247.3000	
HGNS-B	HILT Gamma-Ray and Neutron Sonde, 125 degC	4.0.9231.3000	2.0

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
Run 1	Log[3]:Up	Up	171.29 ft	6130.89 ft	23-Mar-2014 4:02:59 AM	23-Mar-2014 5:09:30 AM	ON	0.00 ft	Yes

Company:Noble Energy Inc Well:Romero PC G10-79HN
Run 1: Log[3]:Up:S008

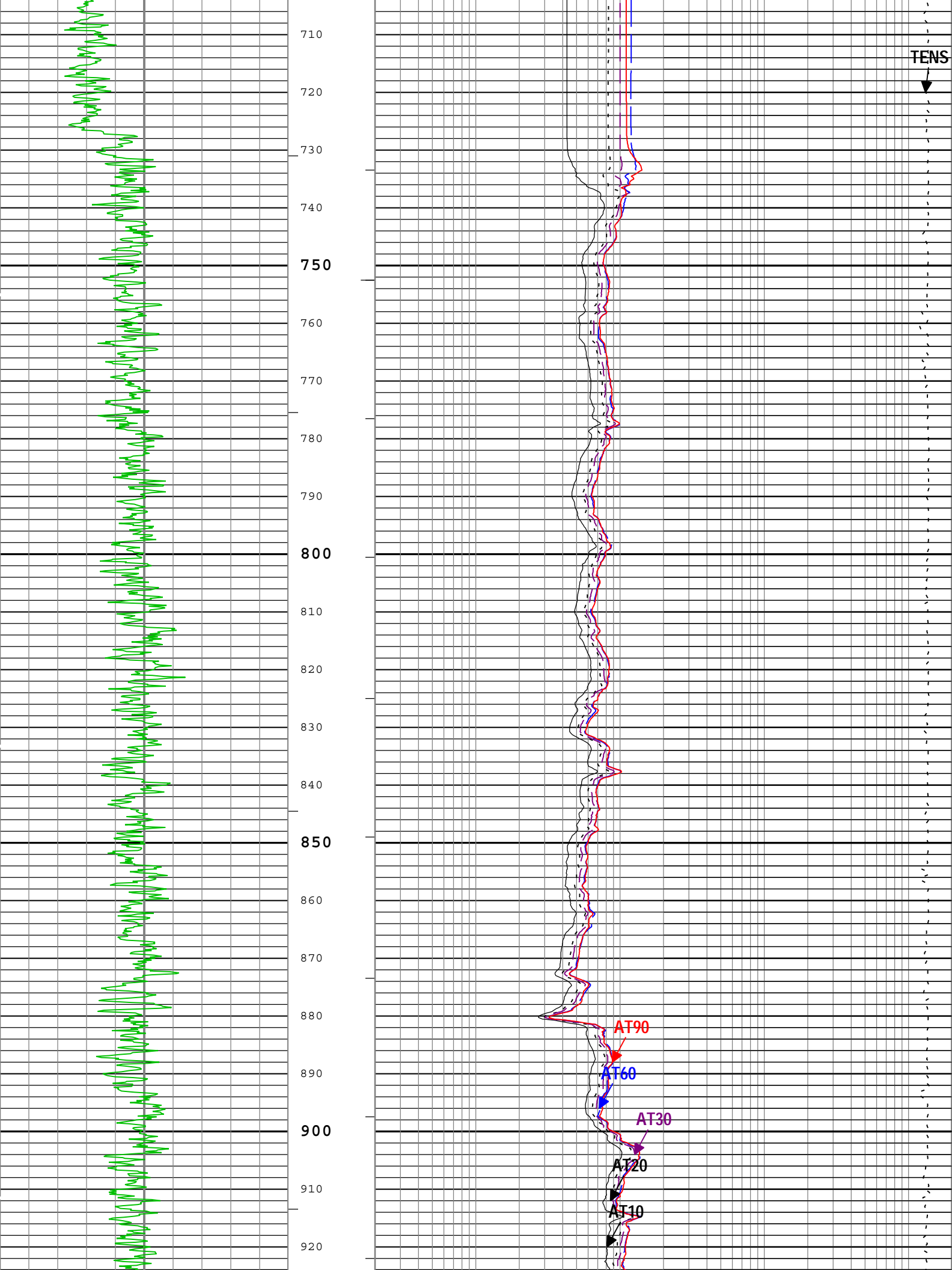
Channel	Source	Sampling
AT10	AIT-H:AHIS:AHIS	3in
AT20	AIT-H:AHIS:AHIS	3in
AT30	AIT-H:AHIS:AHIS	3in
AT60	AIT-H:AHIS:AHIS	3in
AT90	AIT-H:AHIS:AHIS	3in
GR.1	HGNS-B:HGNS-B:HGNS-B	2in
GR.2	HGNS-B:HGNS-B:HGNS-B	6in
ICV	Borehole	6in
IHV	Borehole	6in
INCL	WLWorkflow	6in
TENS	WLWorkflow	6in
TIME_1900	WLWorkflow	0.1in

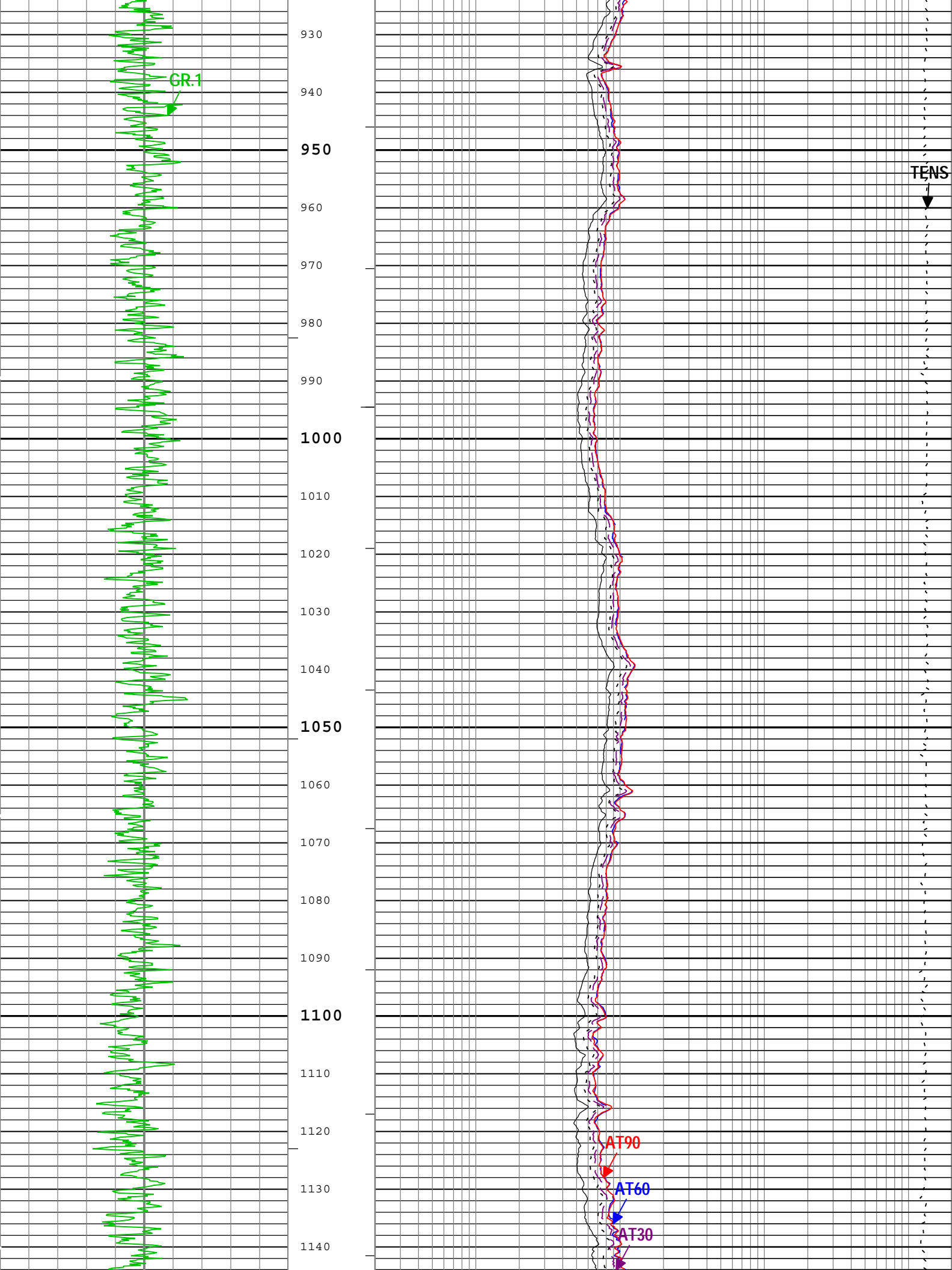
TIME_1900 - Time Marked every 60.00 (s)

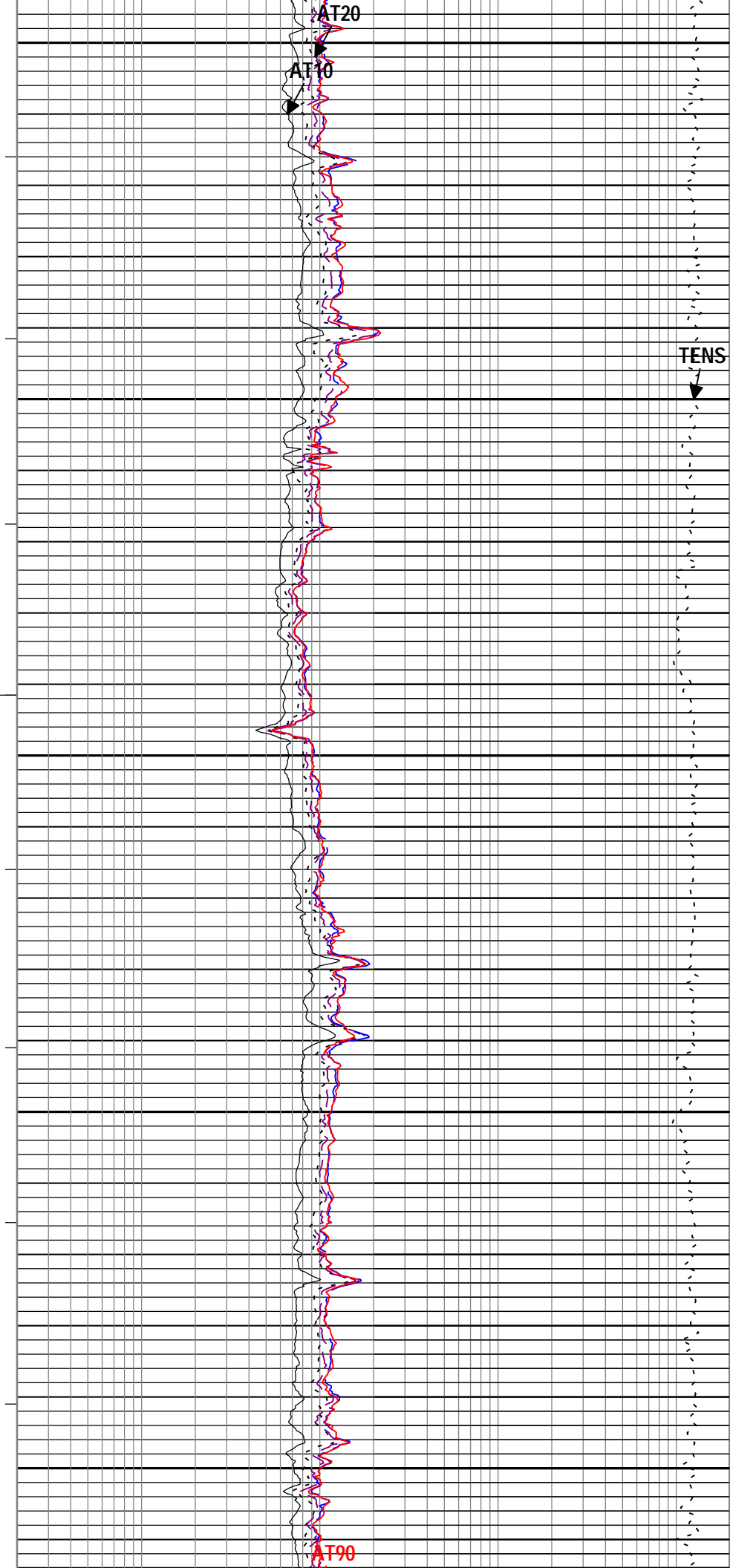
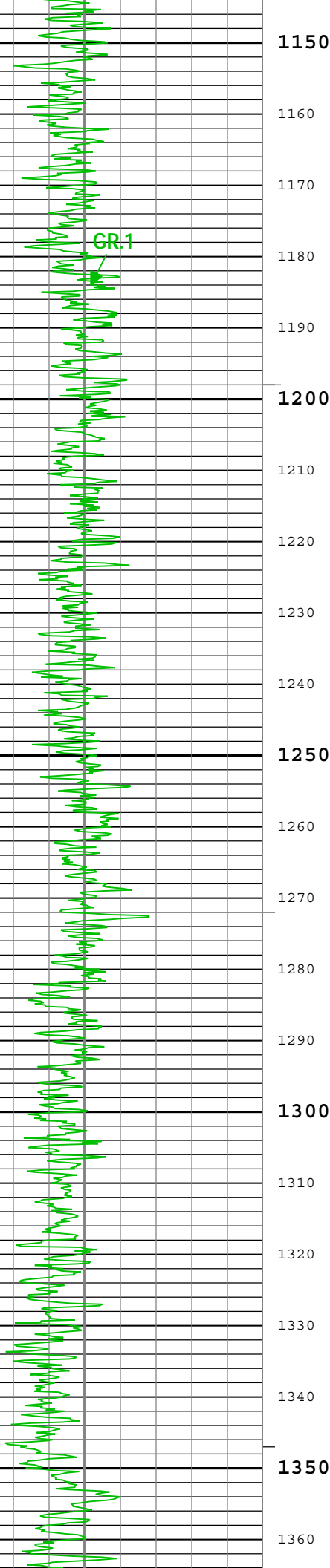
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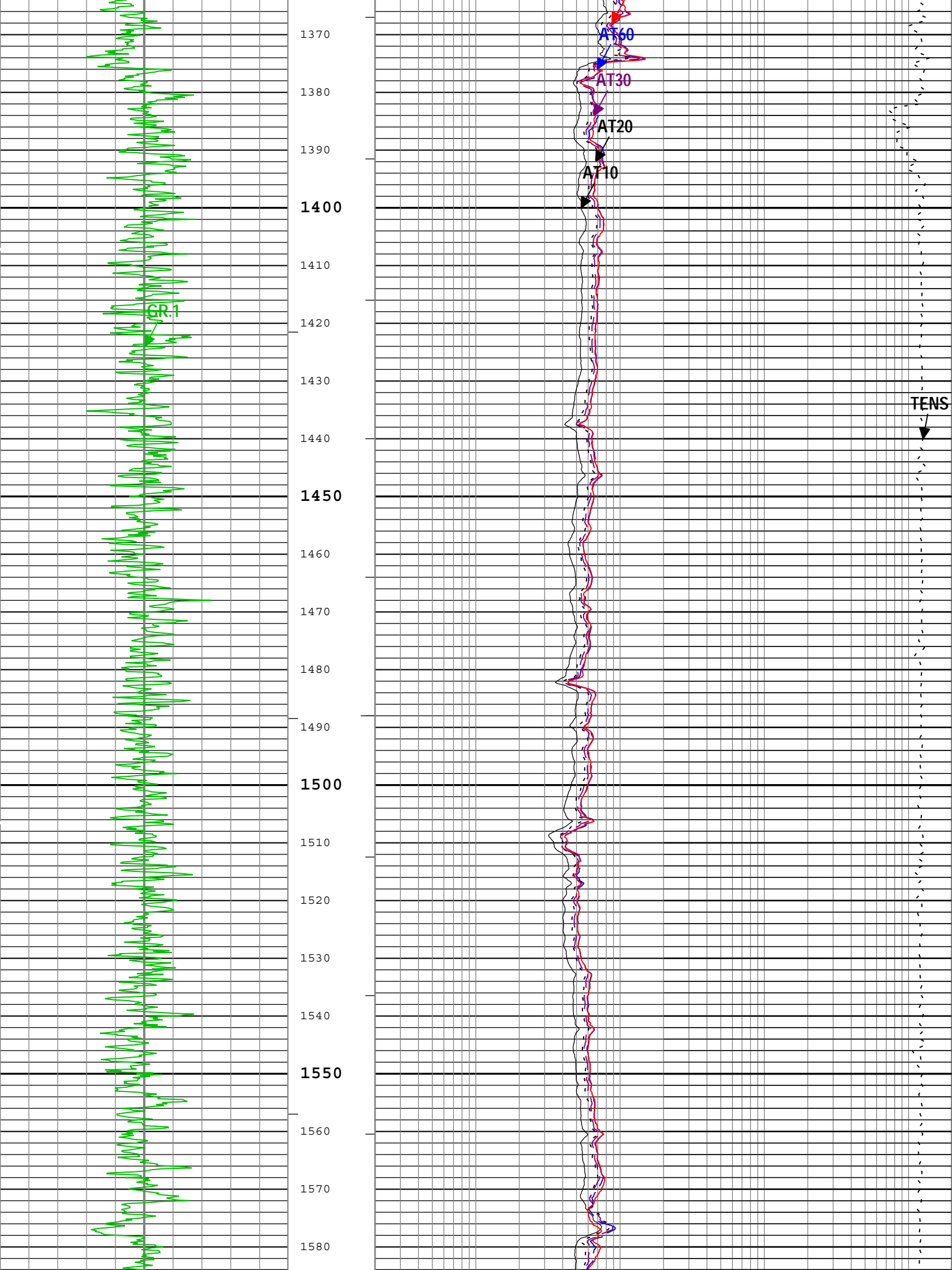
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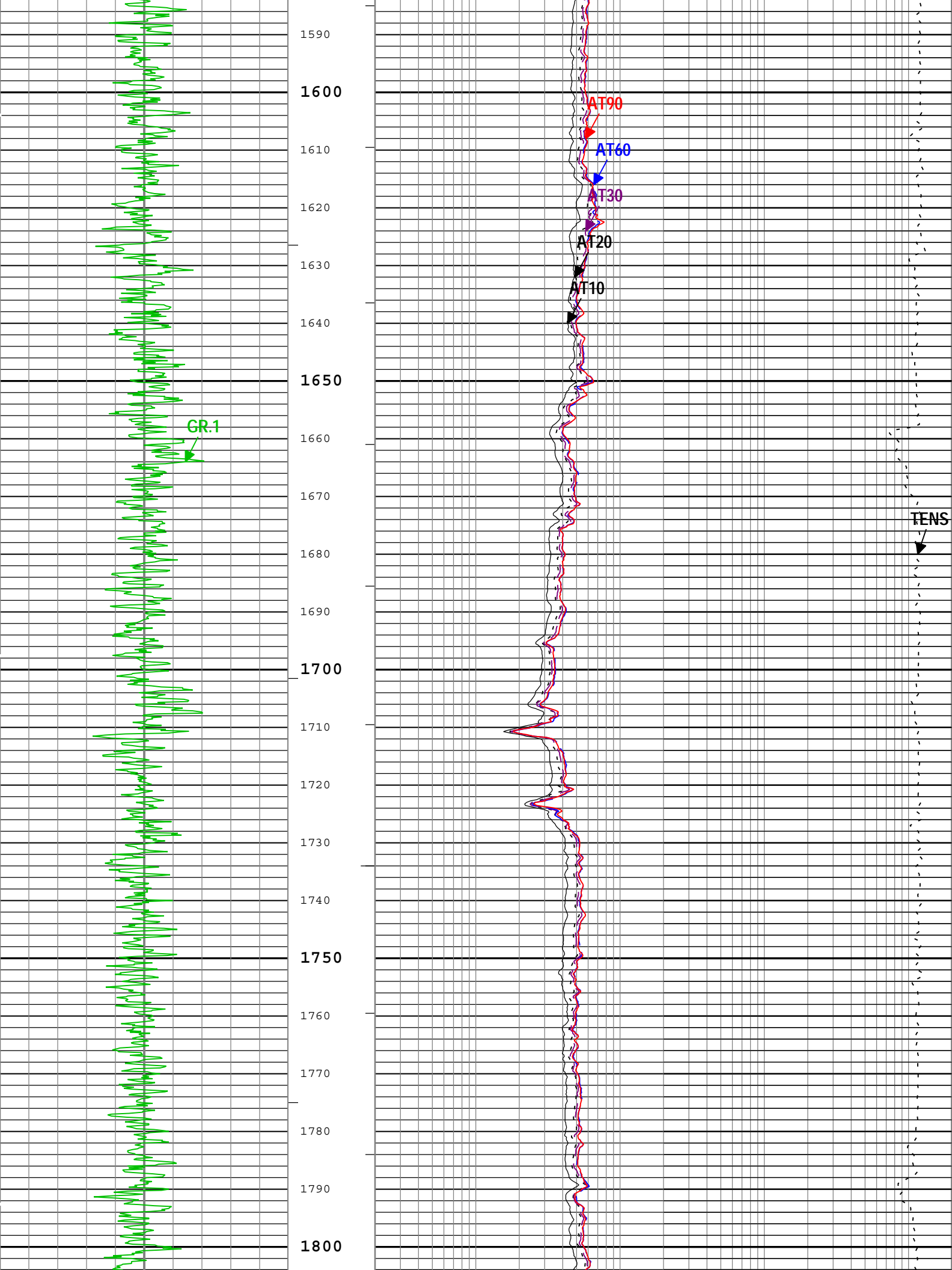
Array Induction Two Foot Resistivity A10 (AT10) AIT-H		
0.2	ohm.m	2000
Array Induction Two Foot Resistivity A20 (AT20) AIT-H		
0.2	ohm.m	2000
Array Induction Two Foot Resistivity A30 (AT30) AIT-H		
0.2	ohm.m	2000
Array Induction Two Foot Resistivity A60 (AT60) AIT-H		
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Array Induction Two Foot Resistivity A90 (AT90) AIT-H		
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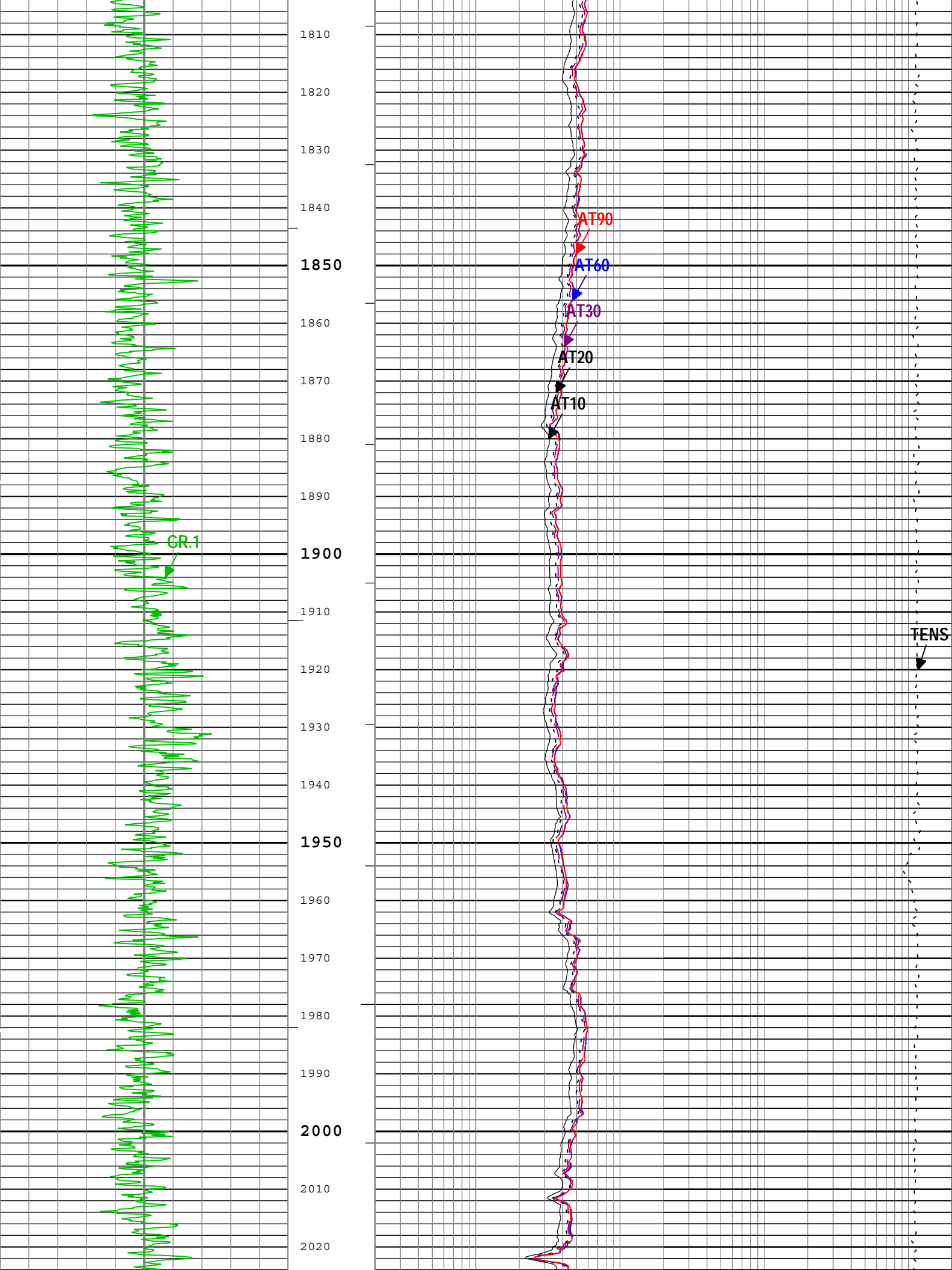


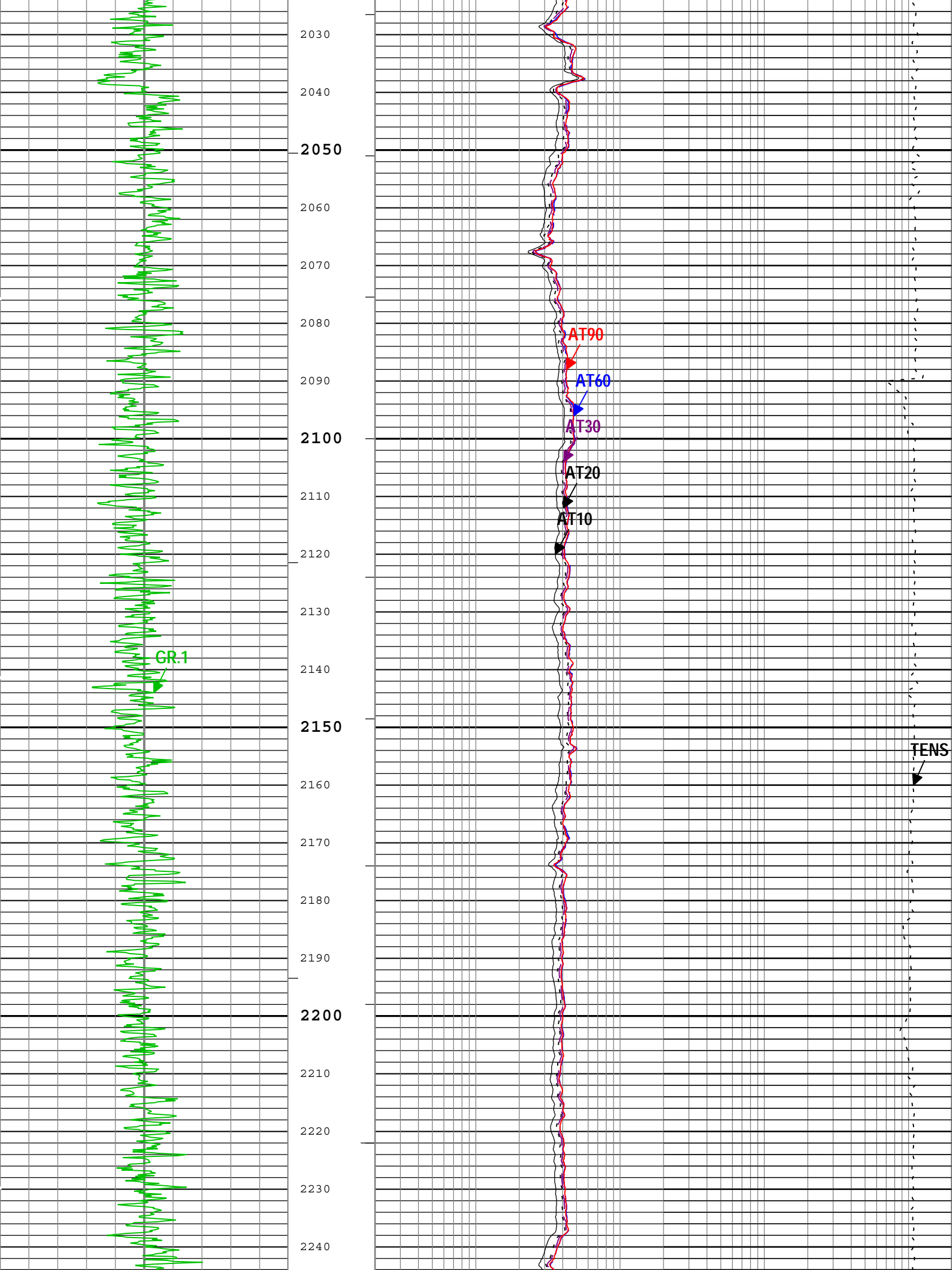


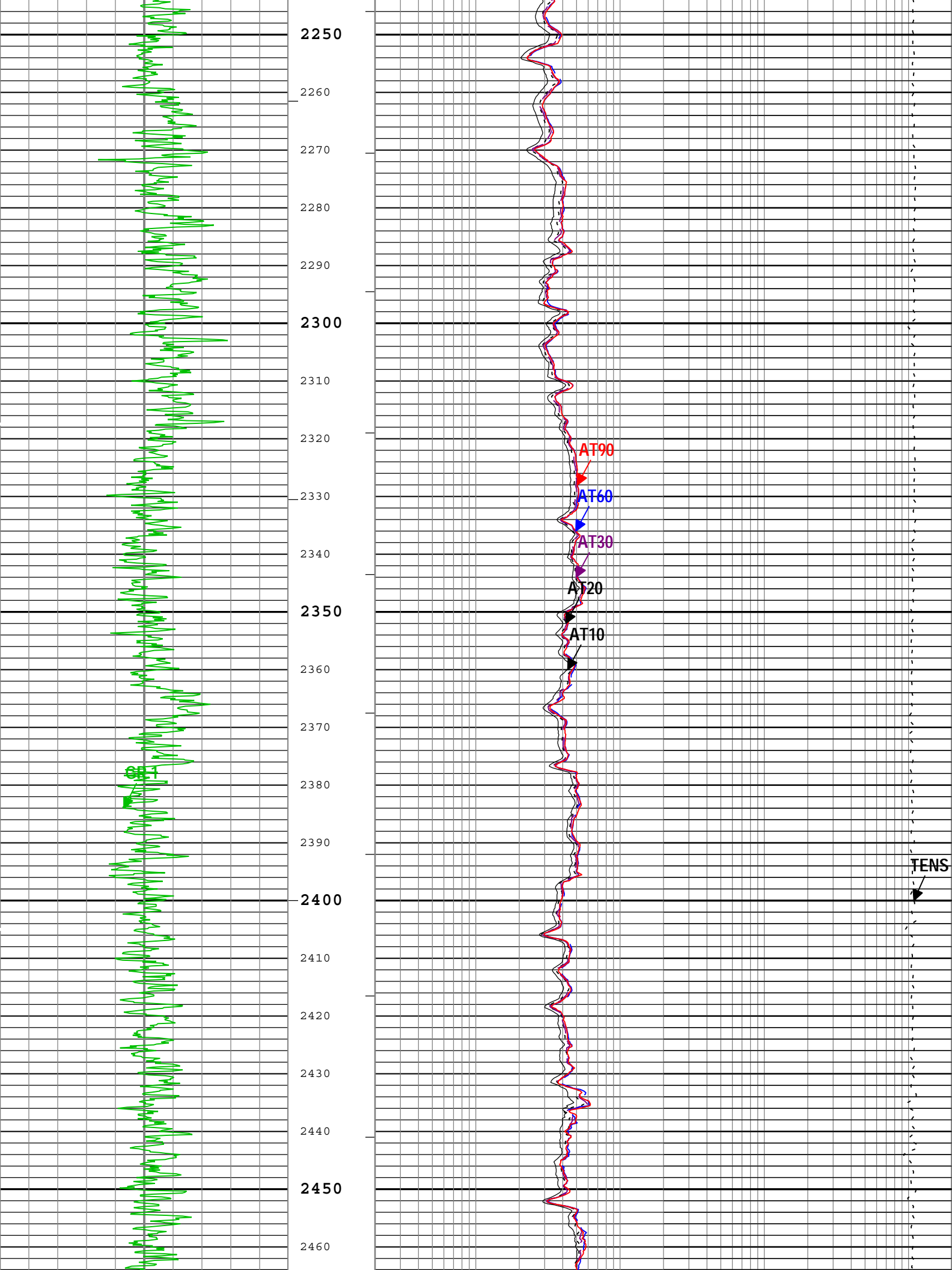


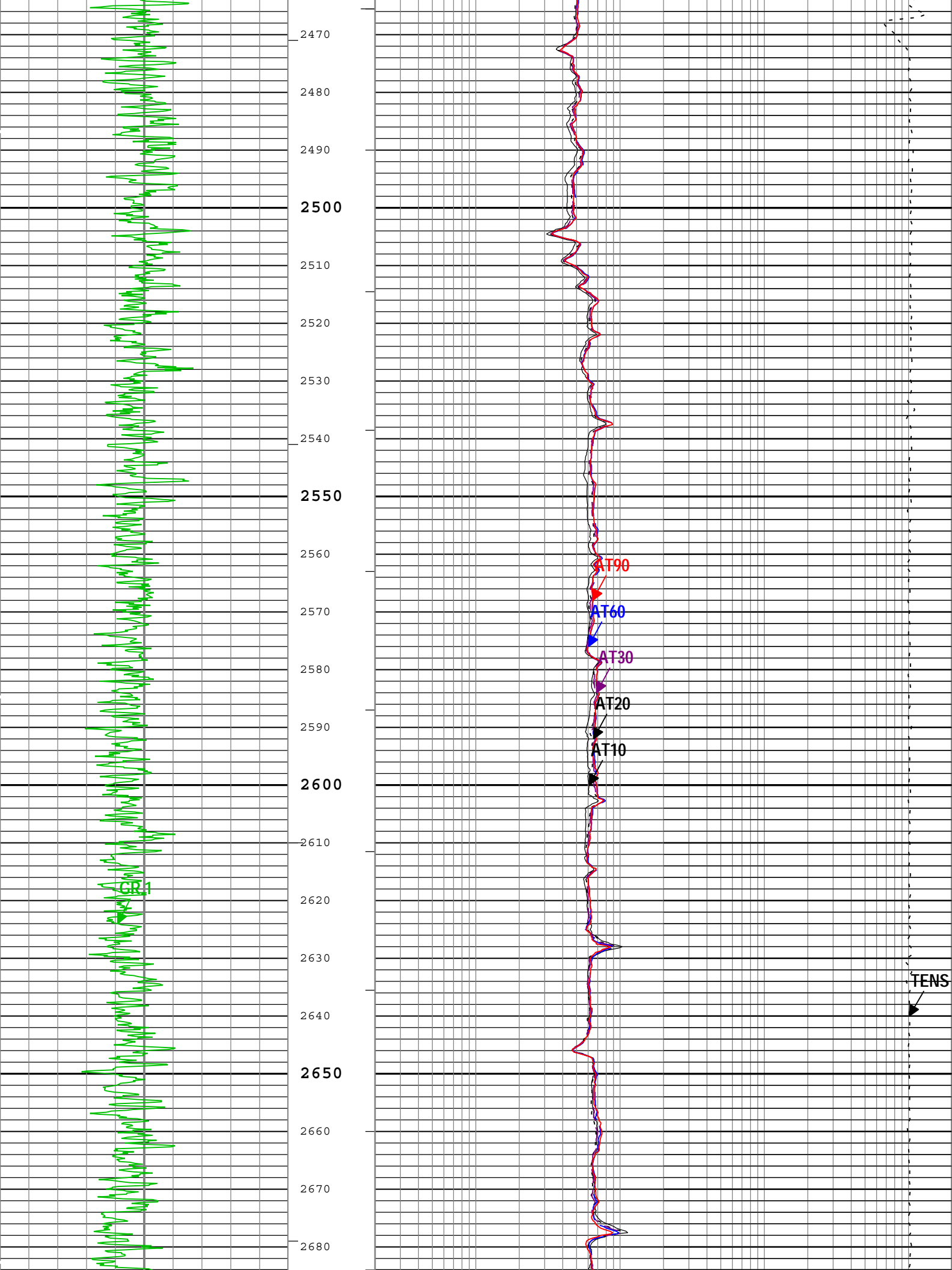


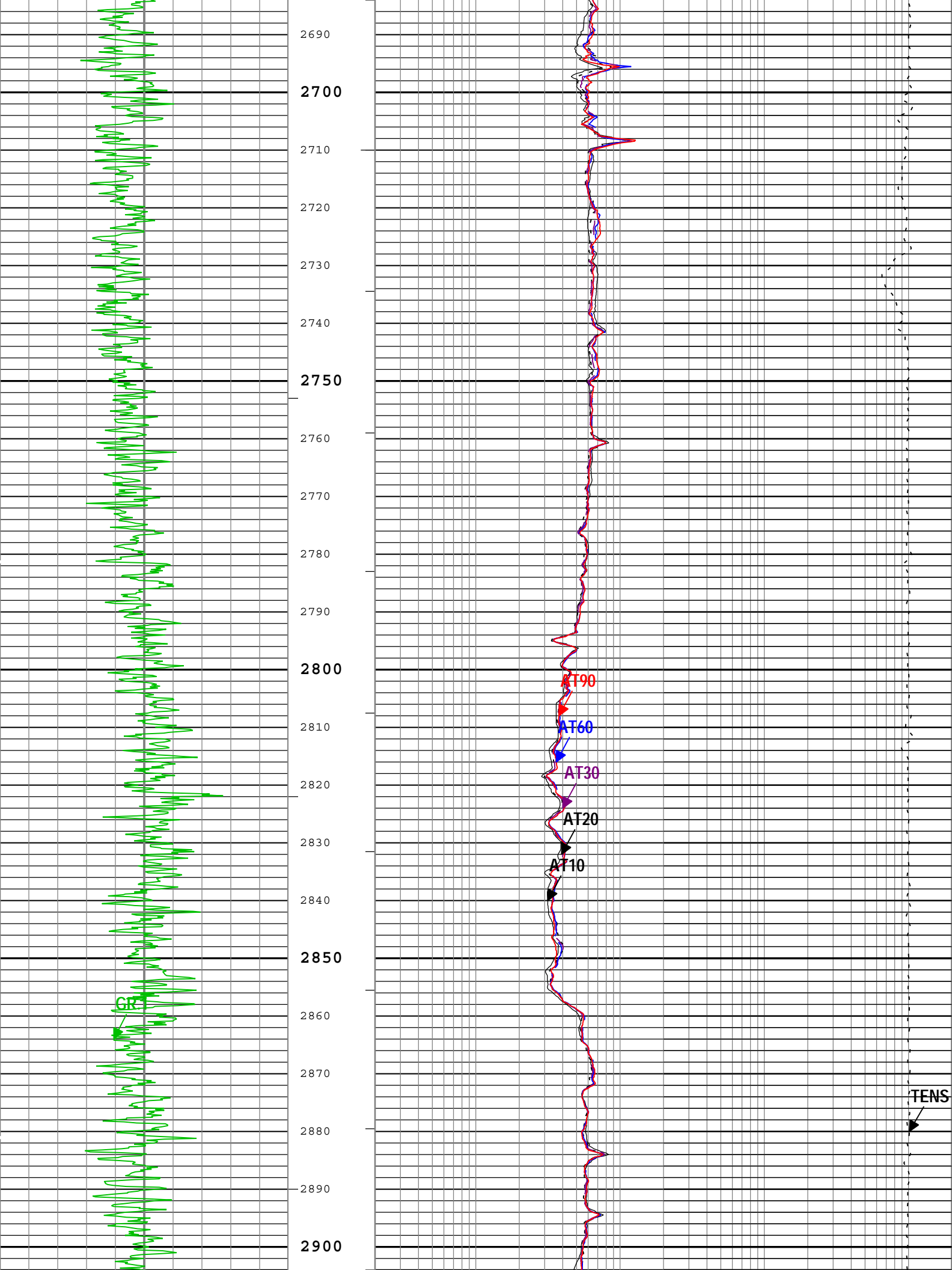


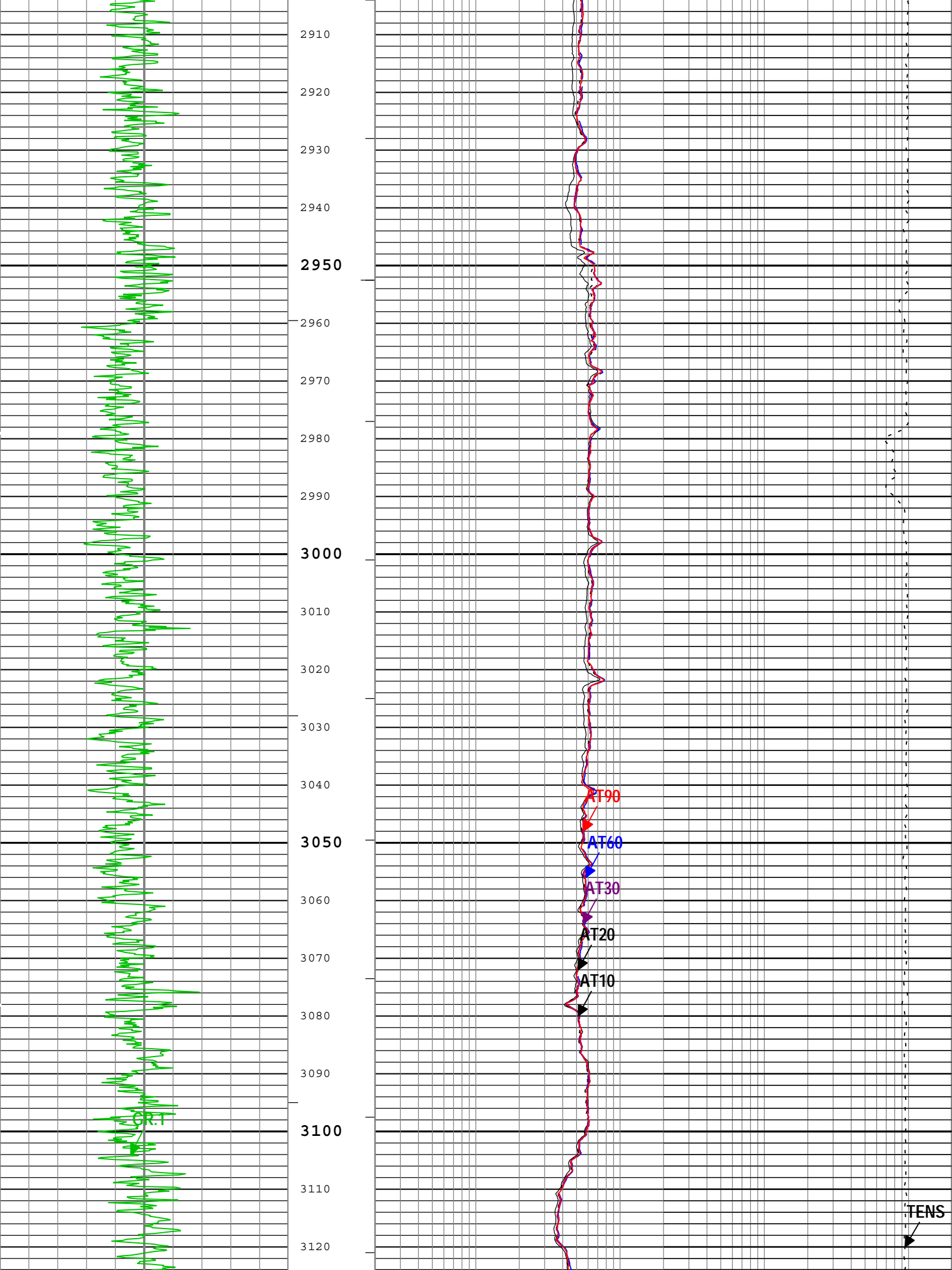


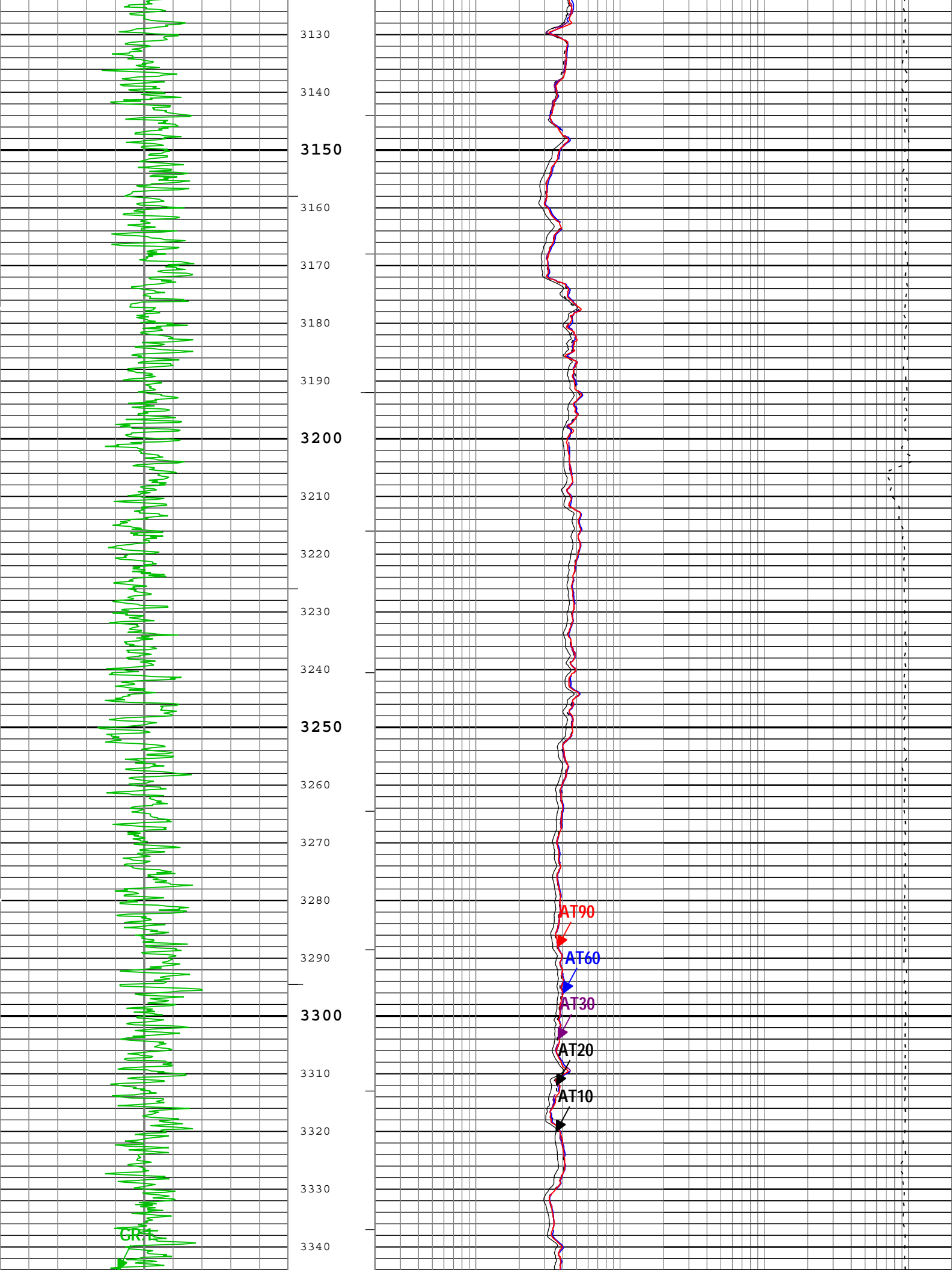


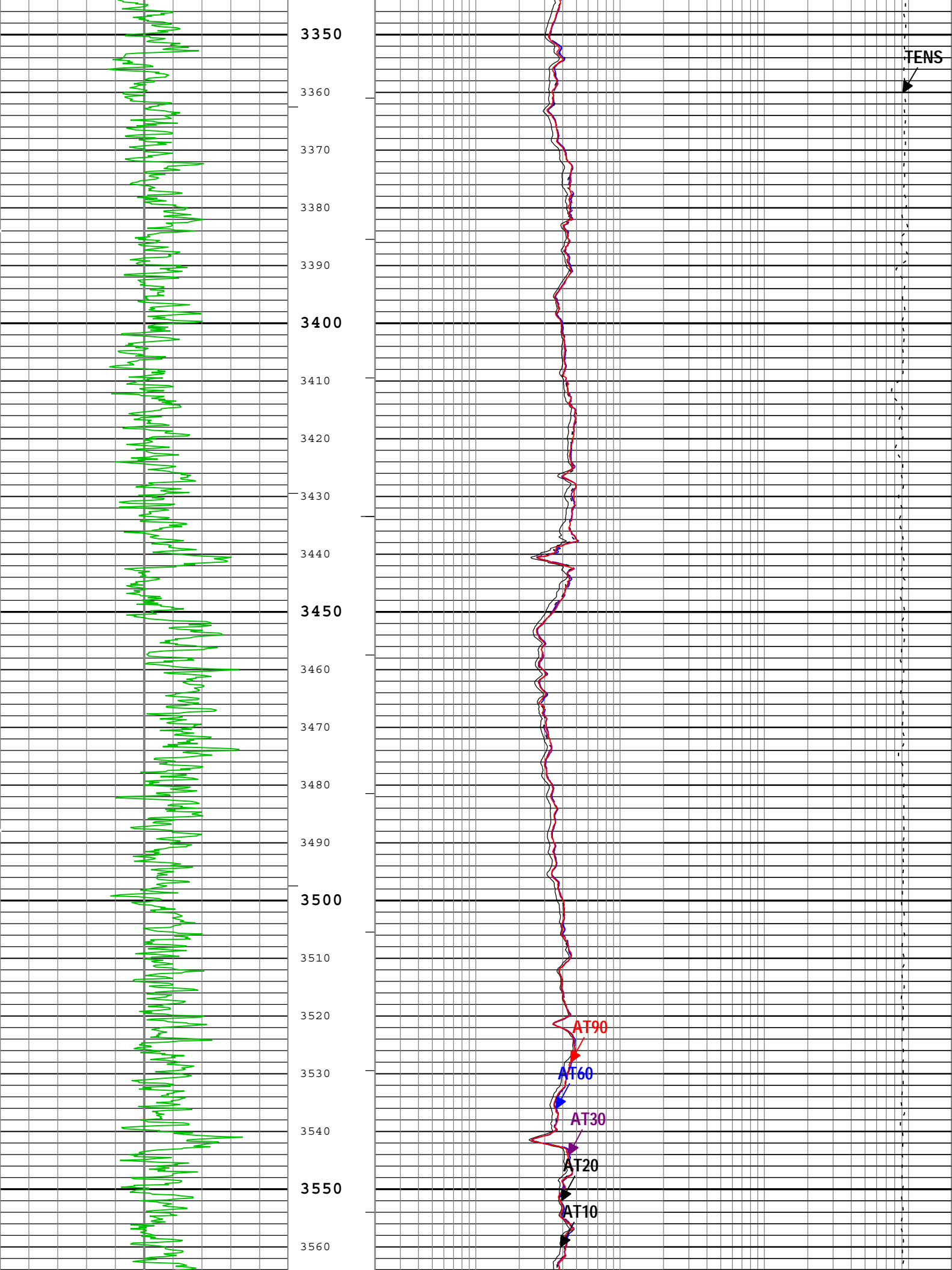


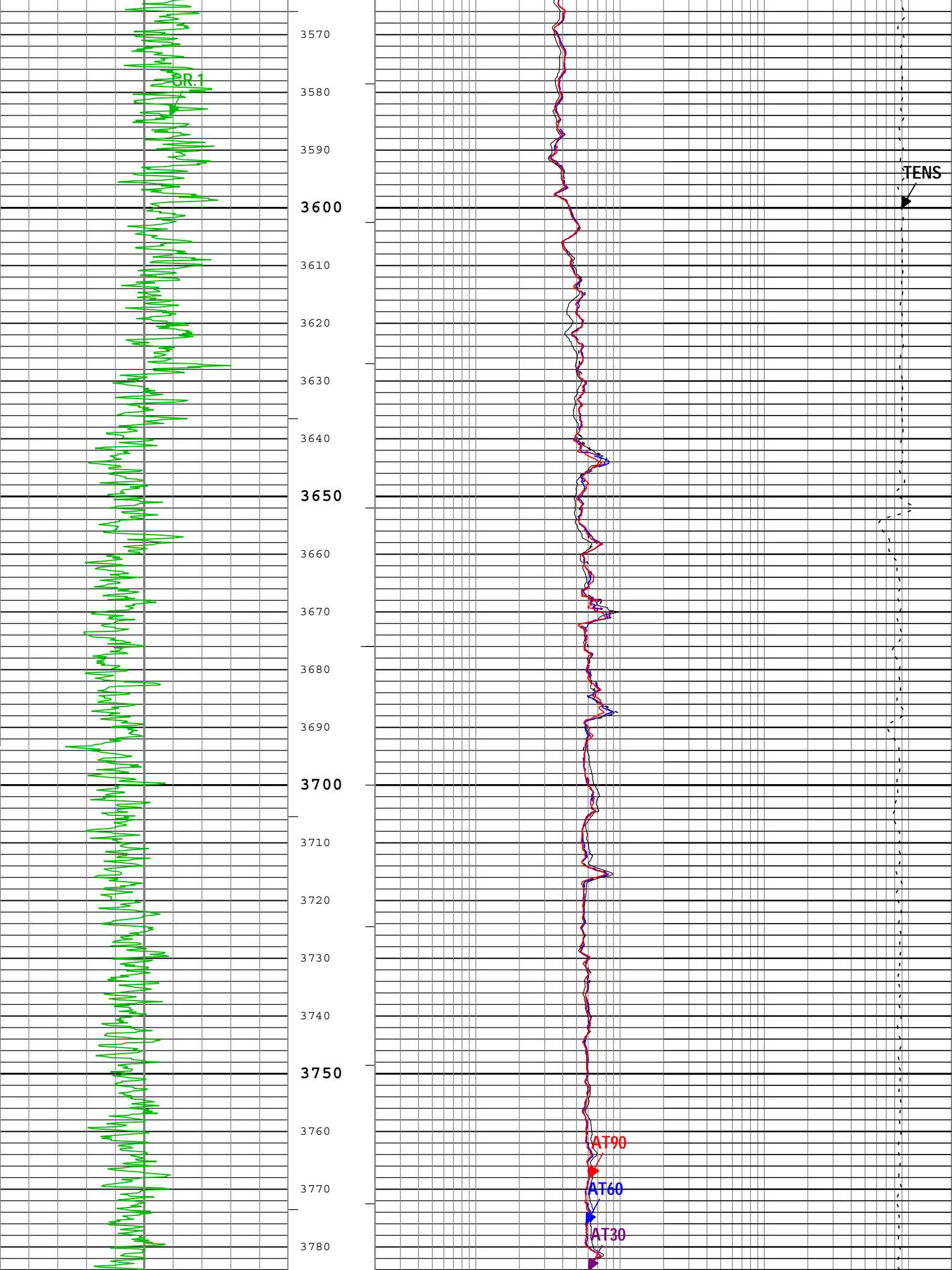


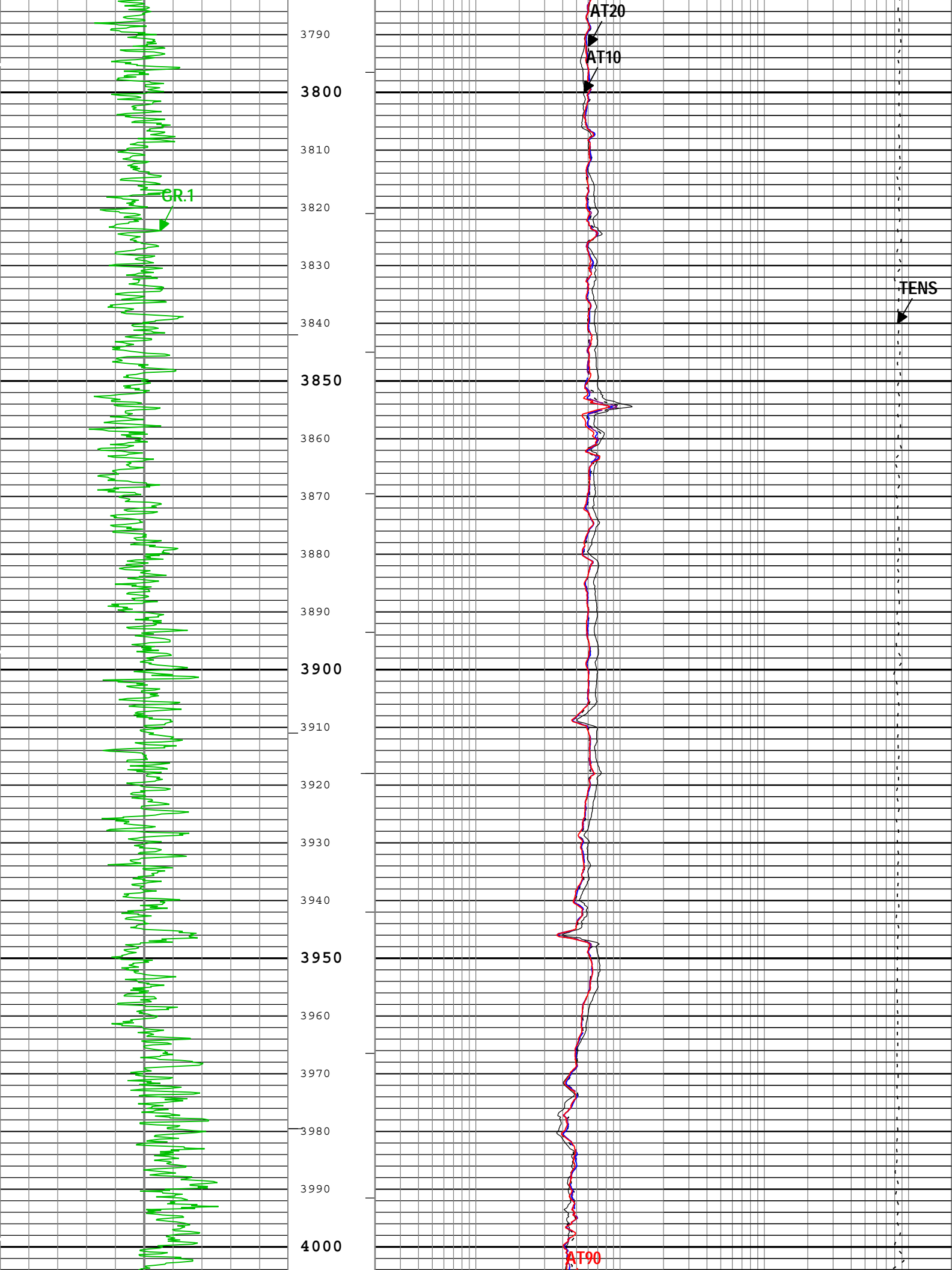


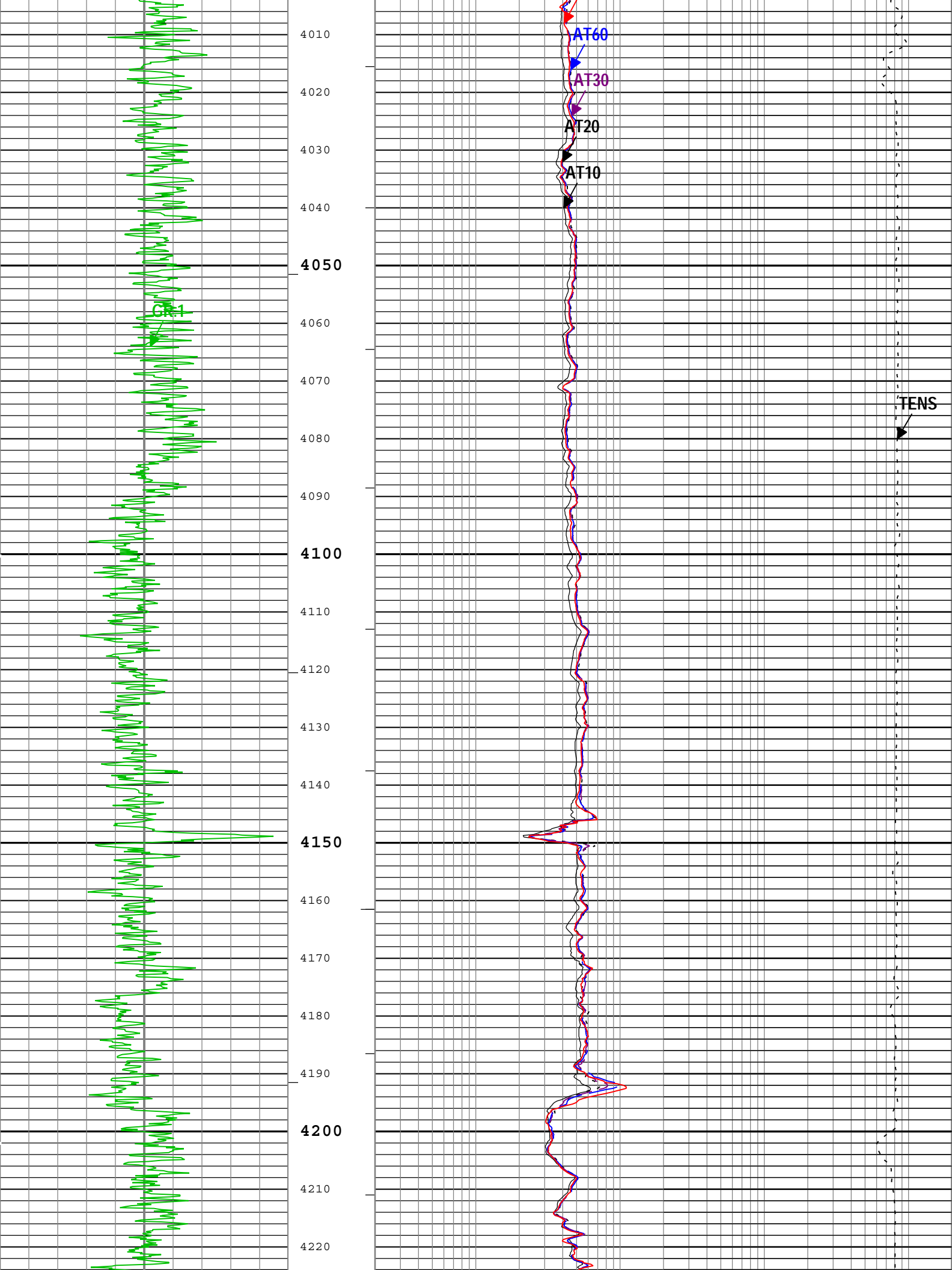


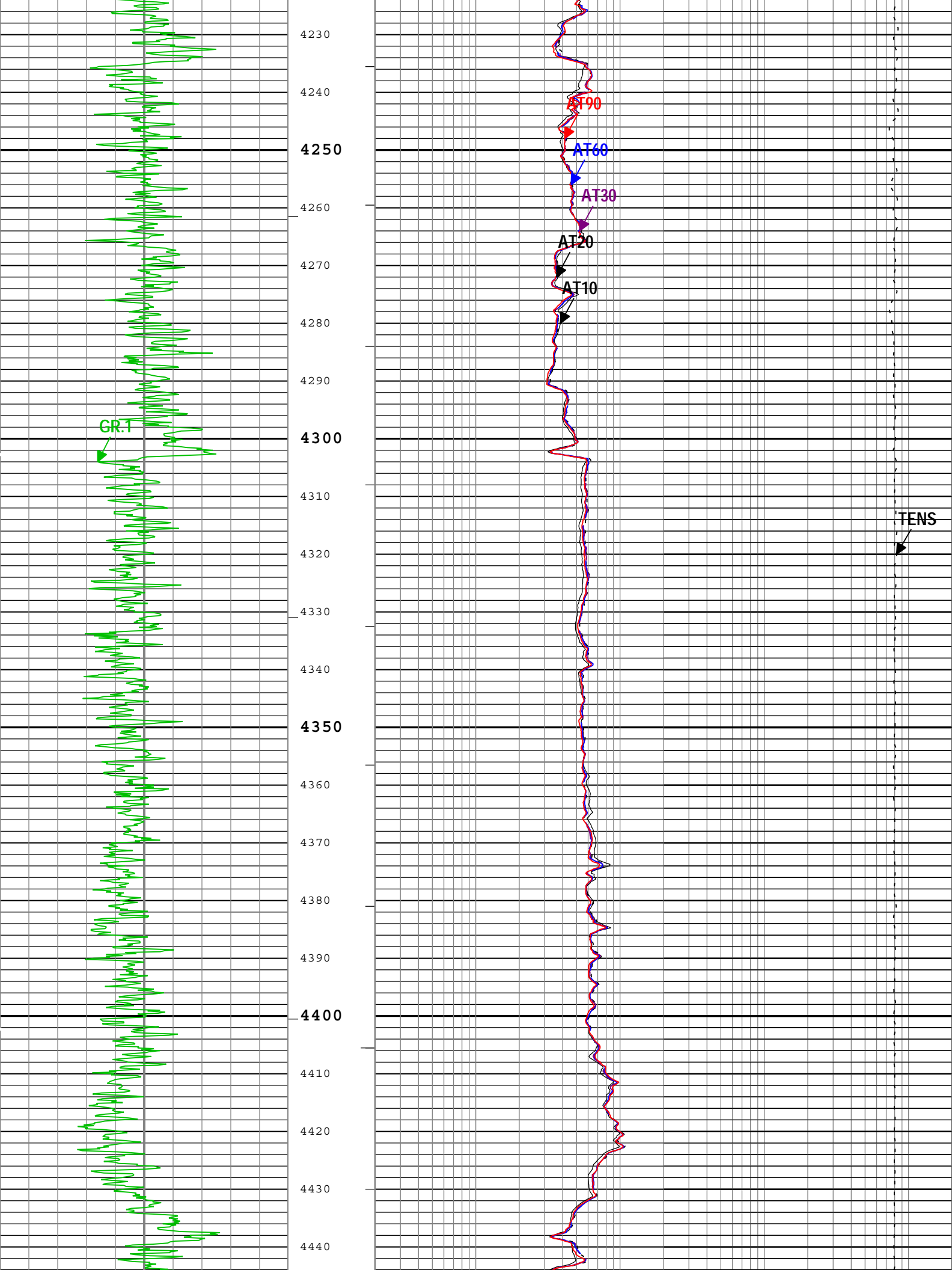


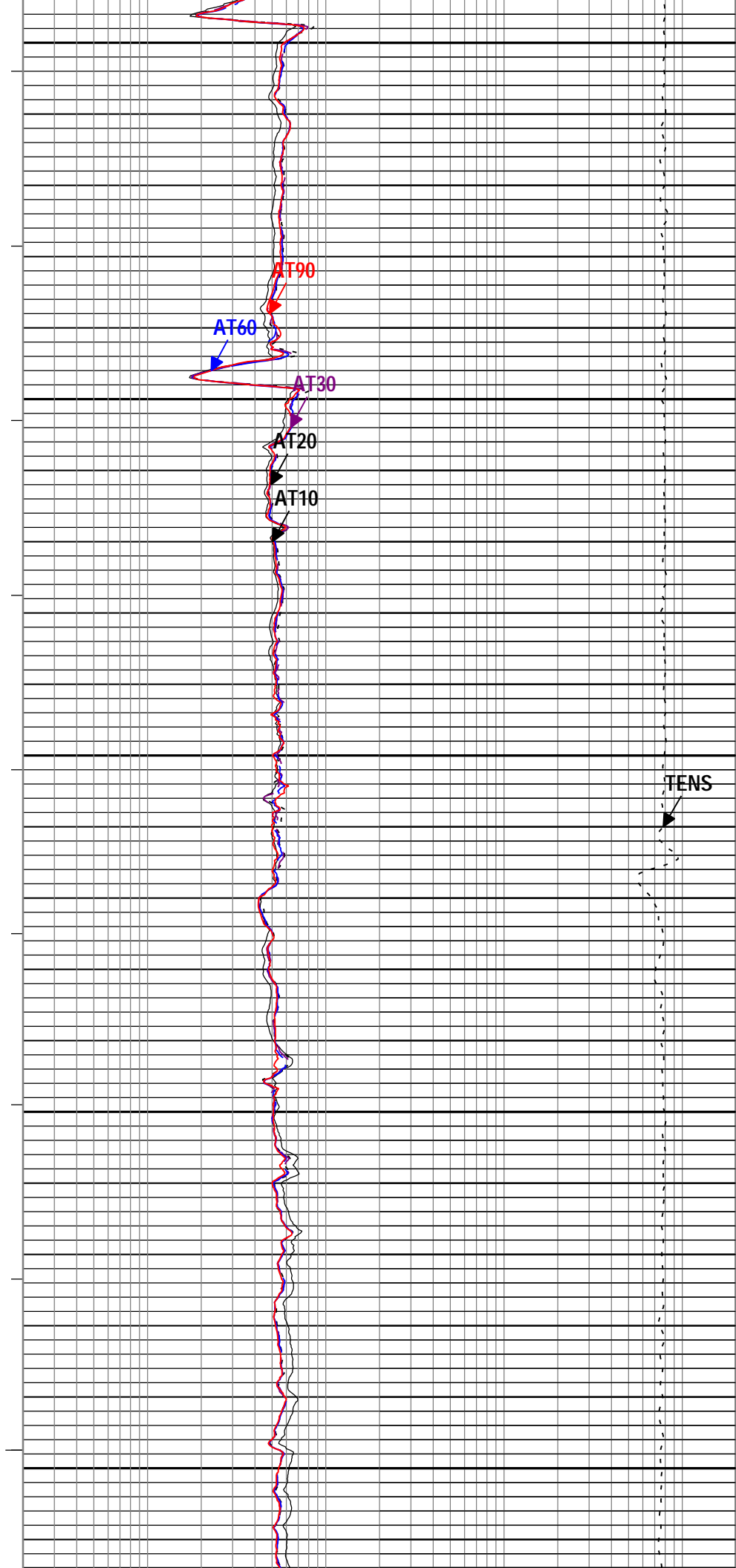
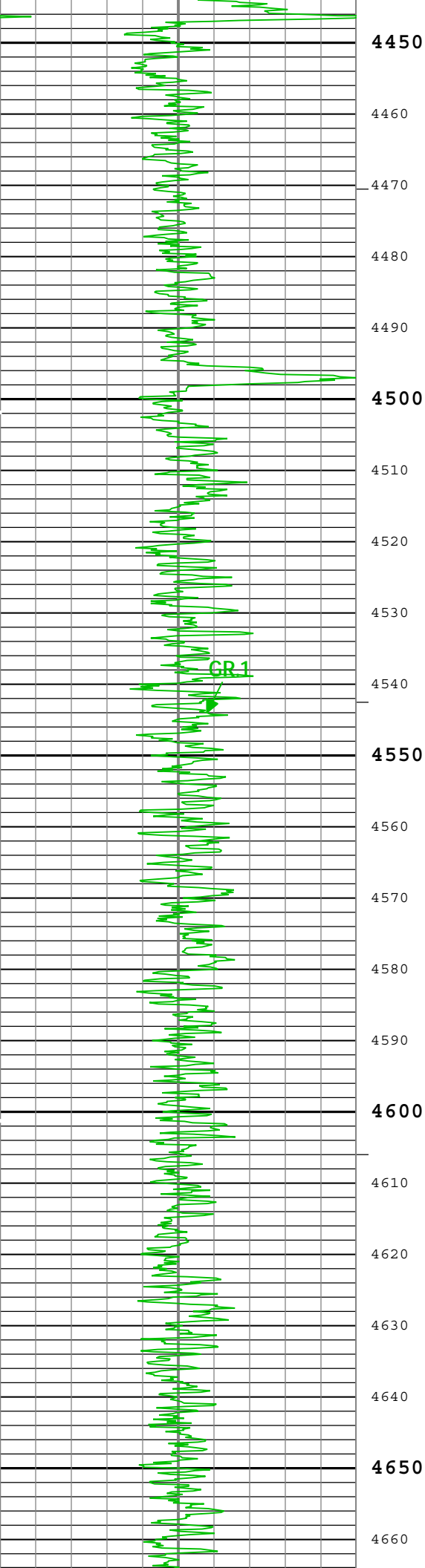


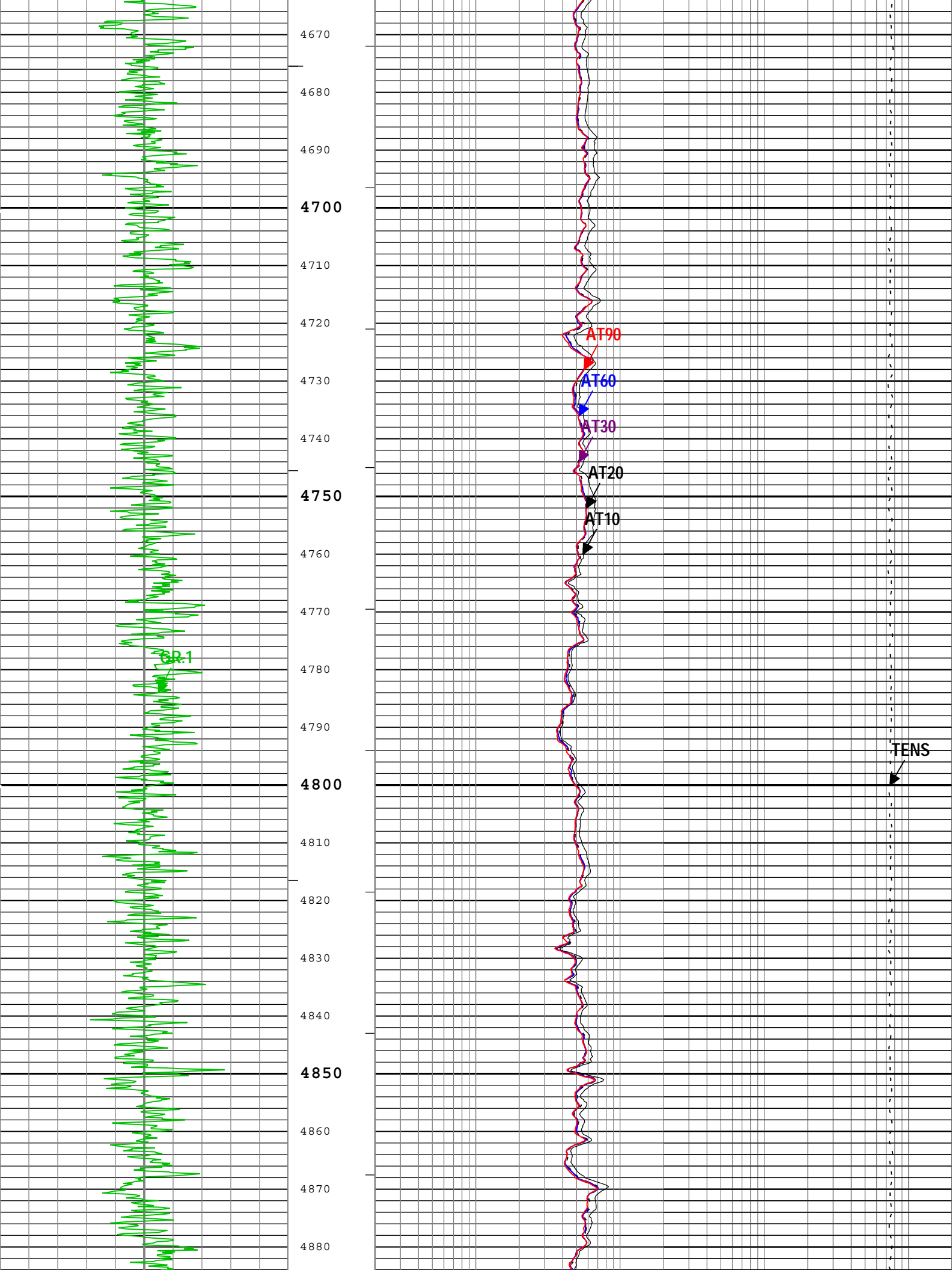


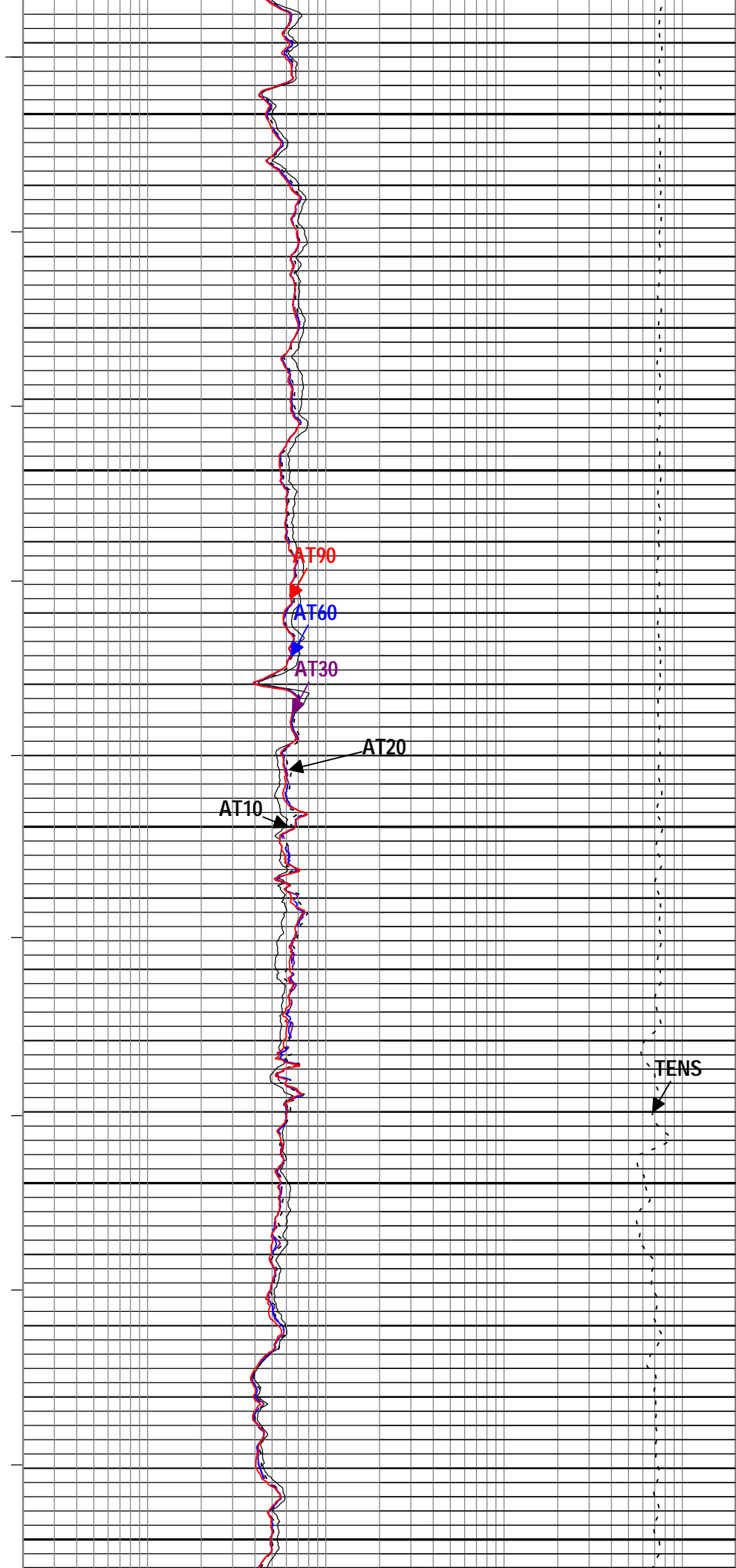
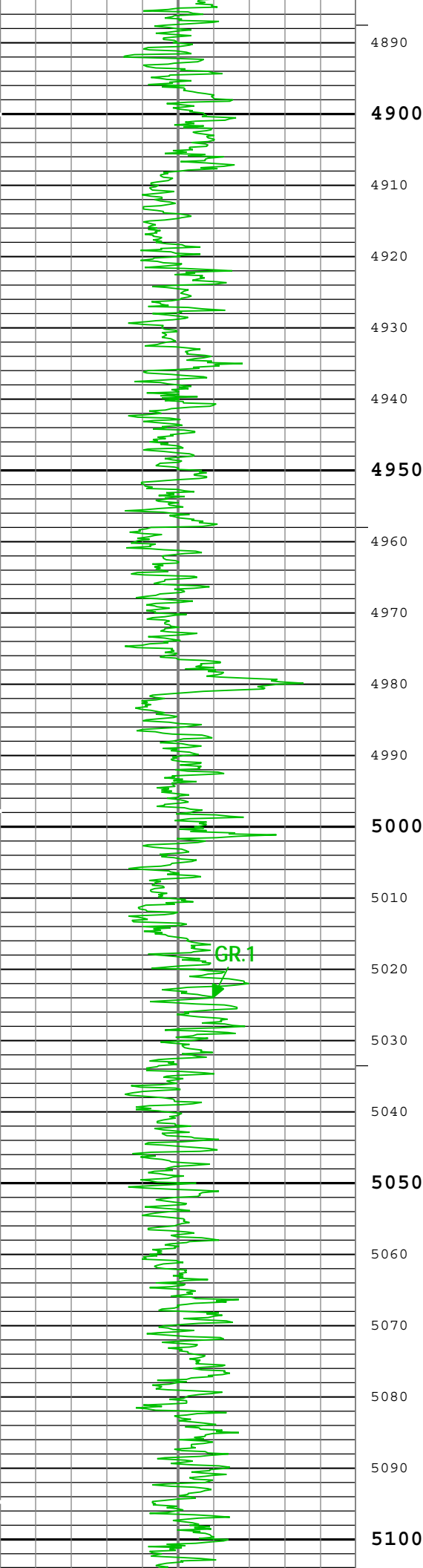


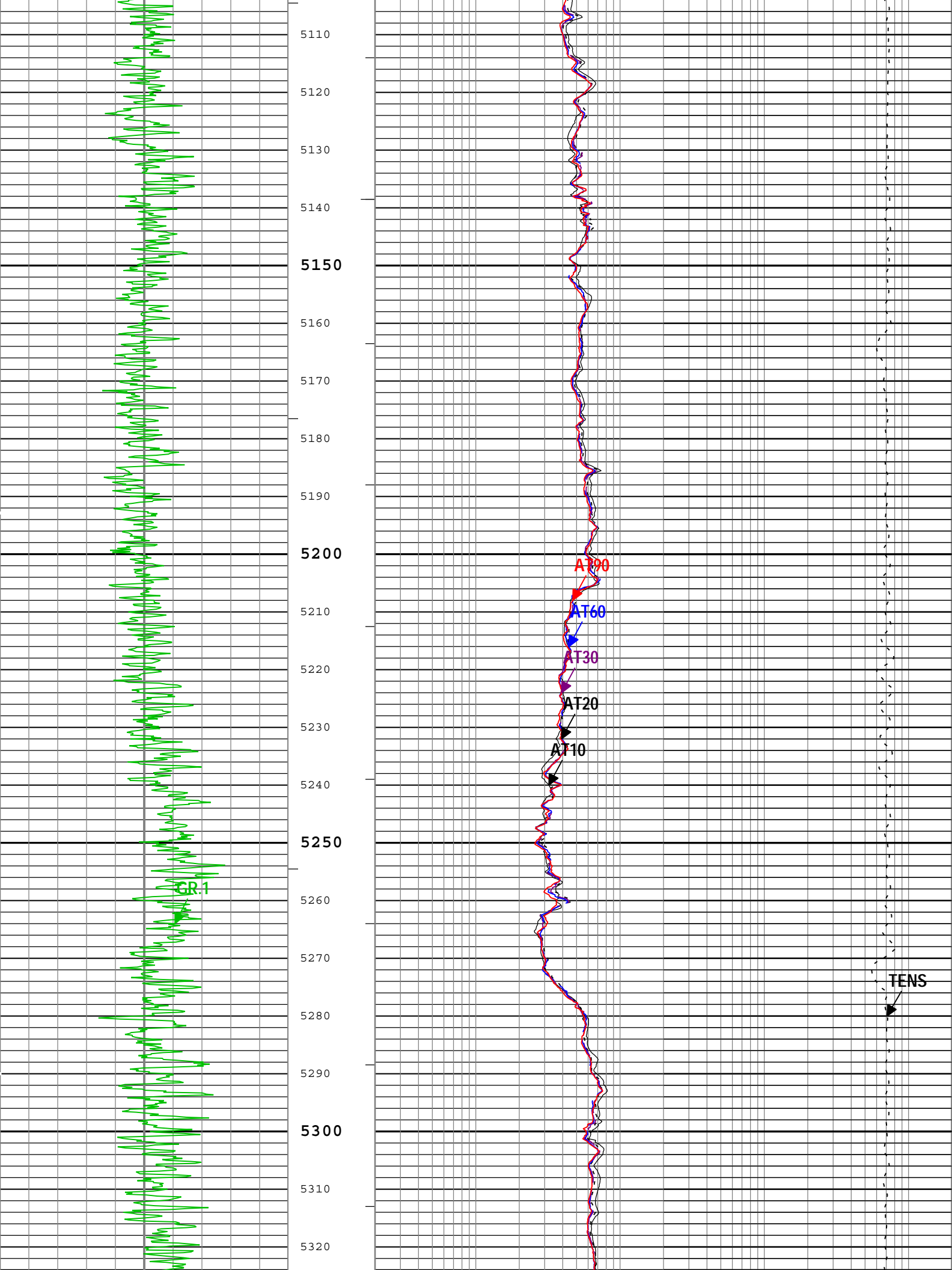


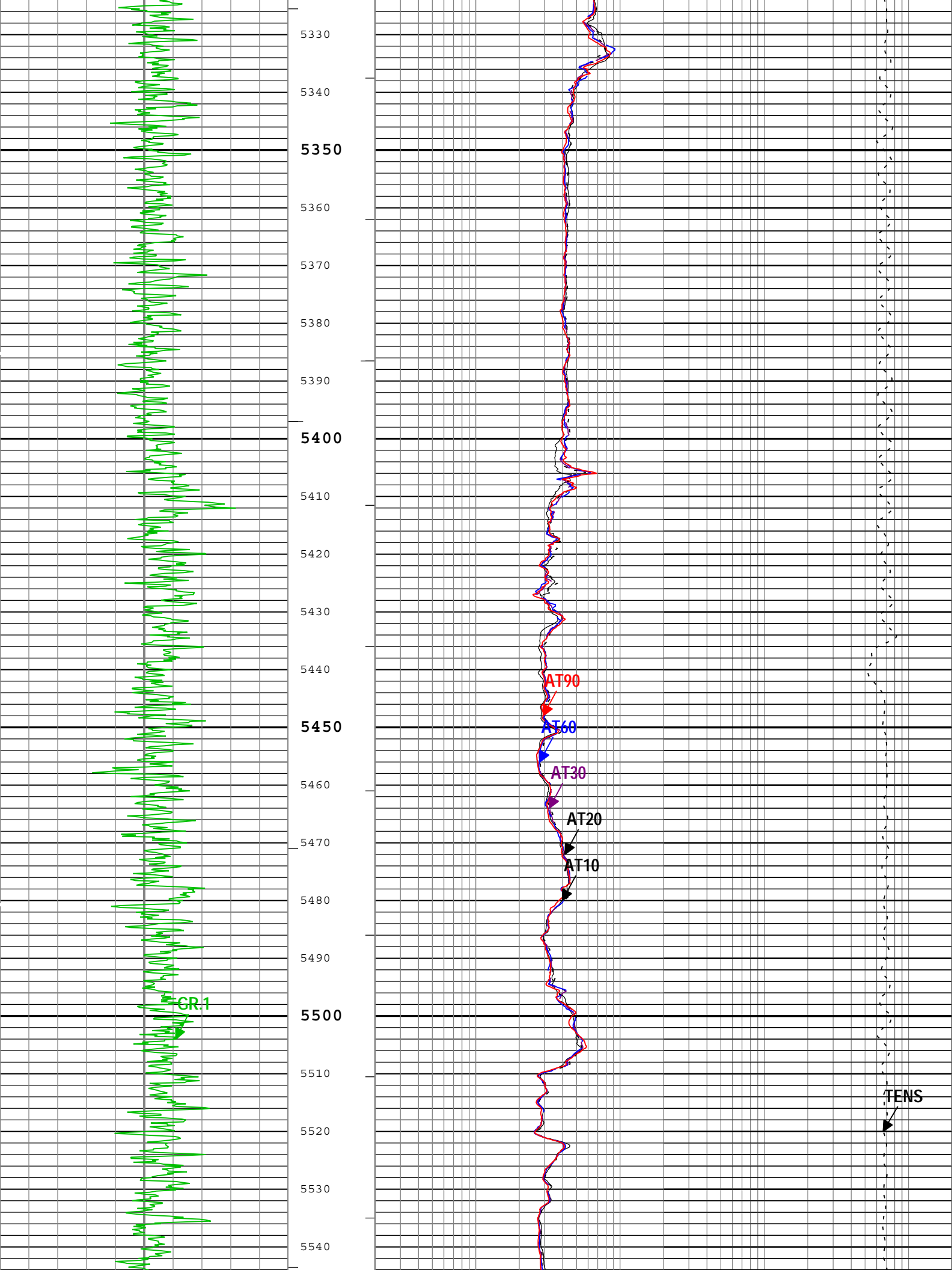


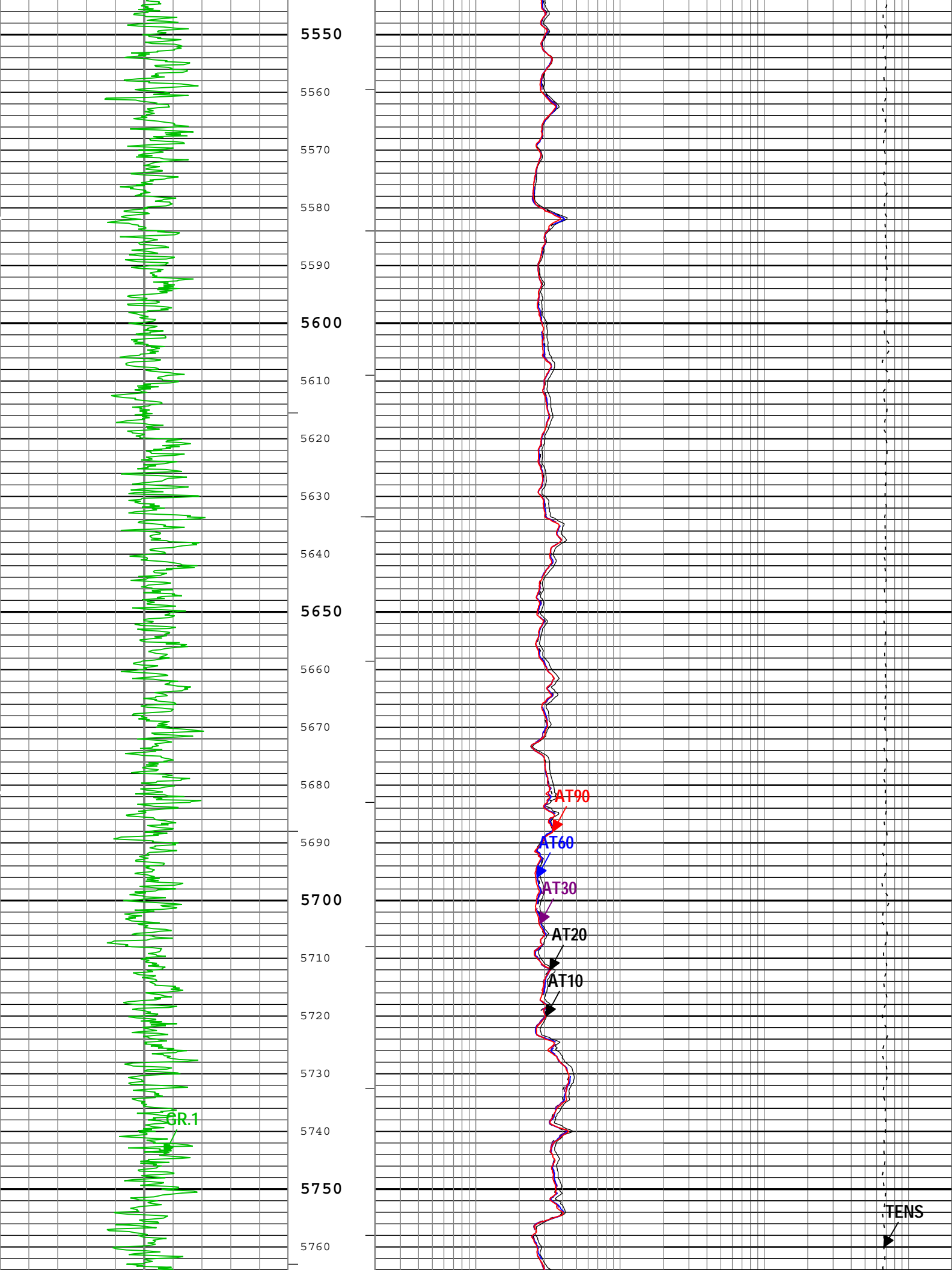


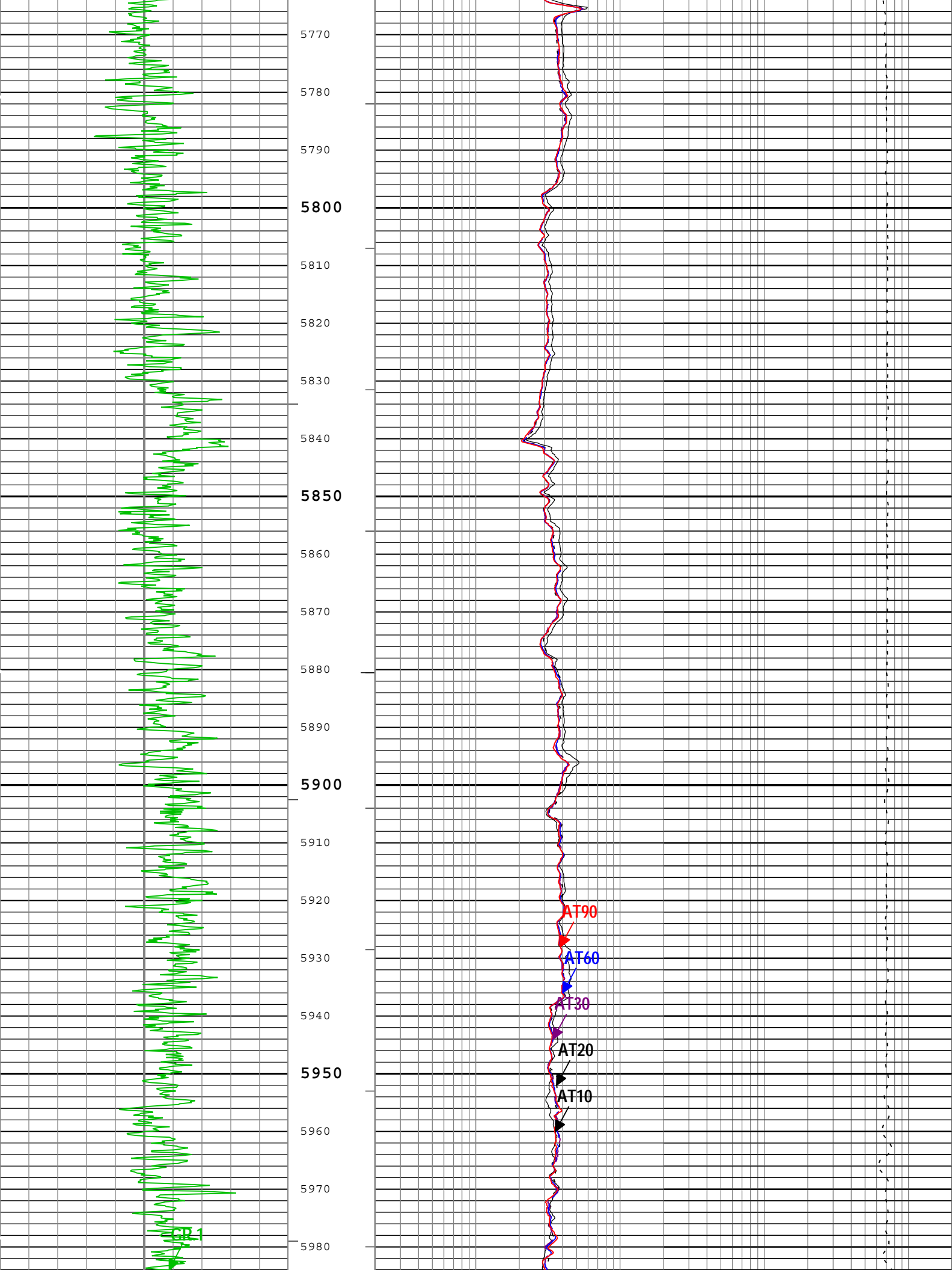


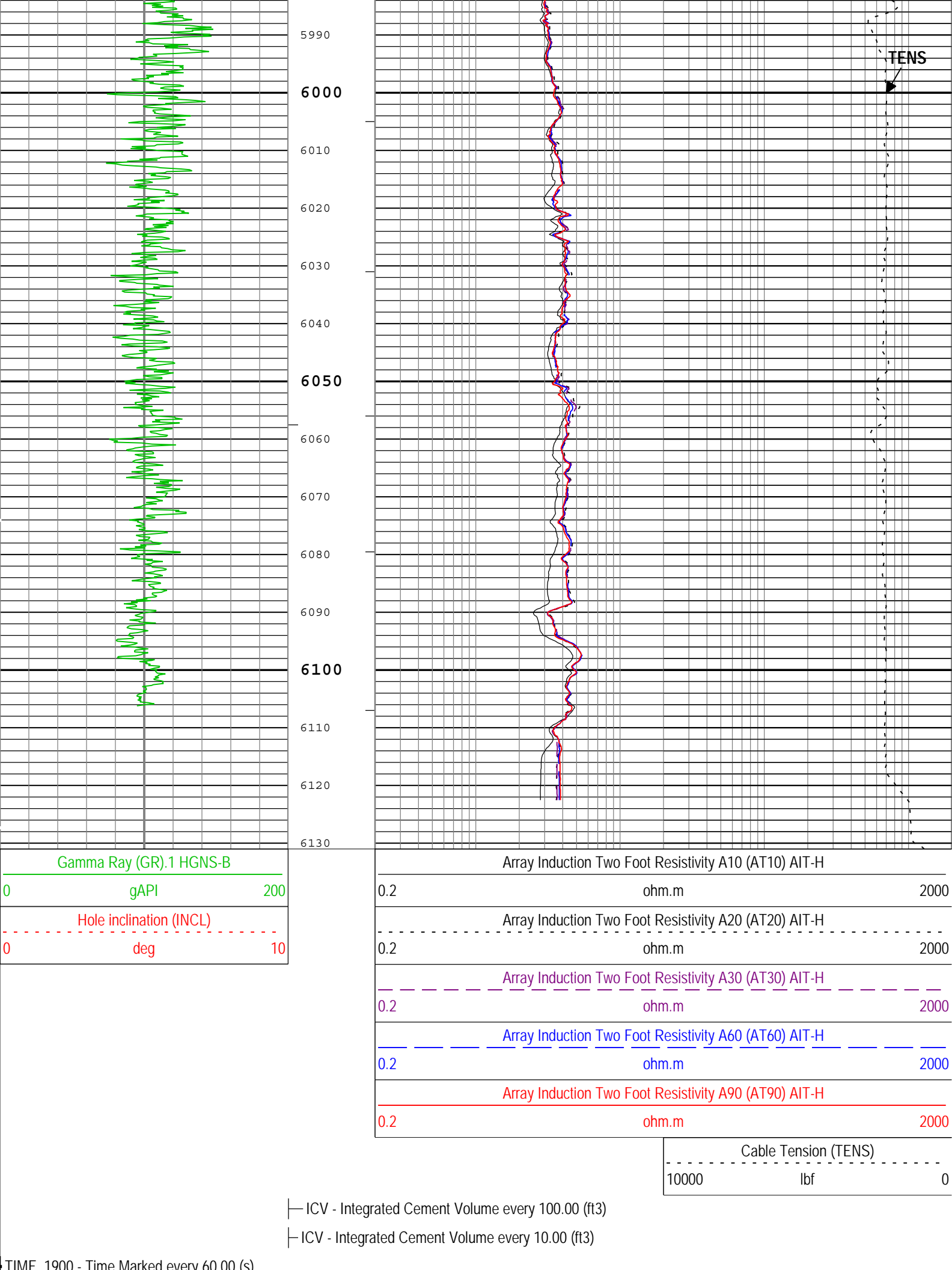












TIME_1900 - Time Marked every 60.00 (s)
—|IHV - Integrated Hole Volume every 100.00 (ft3)
—|IHV - Integrated Hole Volume every 10.00 (ft3)

Description: AIT Basic Log Two Format: Log (KM 5in Induction Upper) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 23-Mar-2014 05:54:02

Channel Processing Parameters				
Parameter	Description	Tool	Value	Unit
ABHM	Array Induction Borehole Correction Mode	AIT-H	Compute Standoff	
ACDE	Array Induction Casing Detection Enable	AIT-H	Yes	
ASTA	Array Induction Tool Standoff	AIT-H	1	in
BARI	Barite Mud Presence Flag	Borehole	No	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Open	
BS	Bit Size	WLSESSION	8.75	in
CBLO	Casing Bottom (Logger)	WLSESSION	729	ft
CDEN	Cement Density	HGNS-B	2	g/cm3
CSODDRL	Casing Outer Diameter - Zoned along driller depths	WLSESSION	9.625	in
DC_MODE	Depth Correction Mode	DepthCorrection	Real-time	
DFD	Drilling Fluid Density	Borehole	9	lbm/gal
ETIP	Elevation of the TIP above MSL	WLSESSION	4700	ft
FCD	Future Casing (Outer) Diameter	WLSESSION	7	in
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	HD1	
GRSE	Generalized Mud Resistivity Selection, from Measured or Computed Mud Resistivity	Borehole	AMF	
SOCO	Standoff Correction Option	HGNS-B	Yes	

Tool Control Parameters				
Parameter	Description	Tool	Value	Unit
MAX_LOG_SPEED	Toolstring Maximum Logging Speed	WLSESSION	3600	ft/h

Run 1									

Pass Summary									
Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
Run 1	Log[2]:Up	Up	5777.40 ft	6132.71 ft	23-Mar-2014 3:52:03 AM	23-Mar-2014 3:58:29 AM	ON	3.00 ft	Yes
Run 1	Log[3]:Up	Up	171.29 ft	6130.89 ft	23-Mar-2014 4:02:59 AM	23-Mar-2014 5:09:30 AM	ON	0.00 ft	Yes

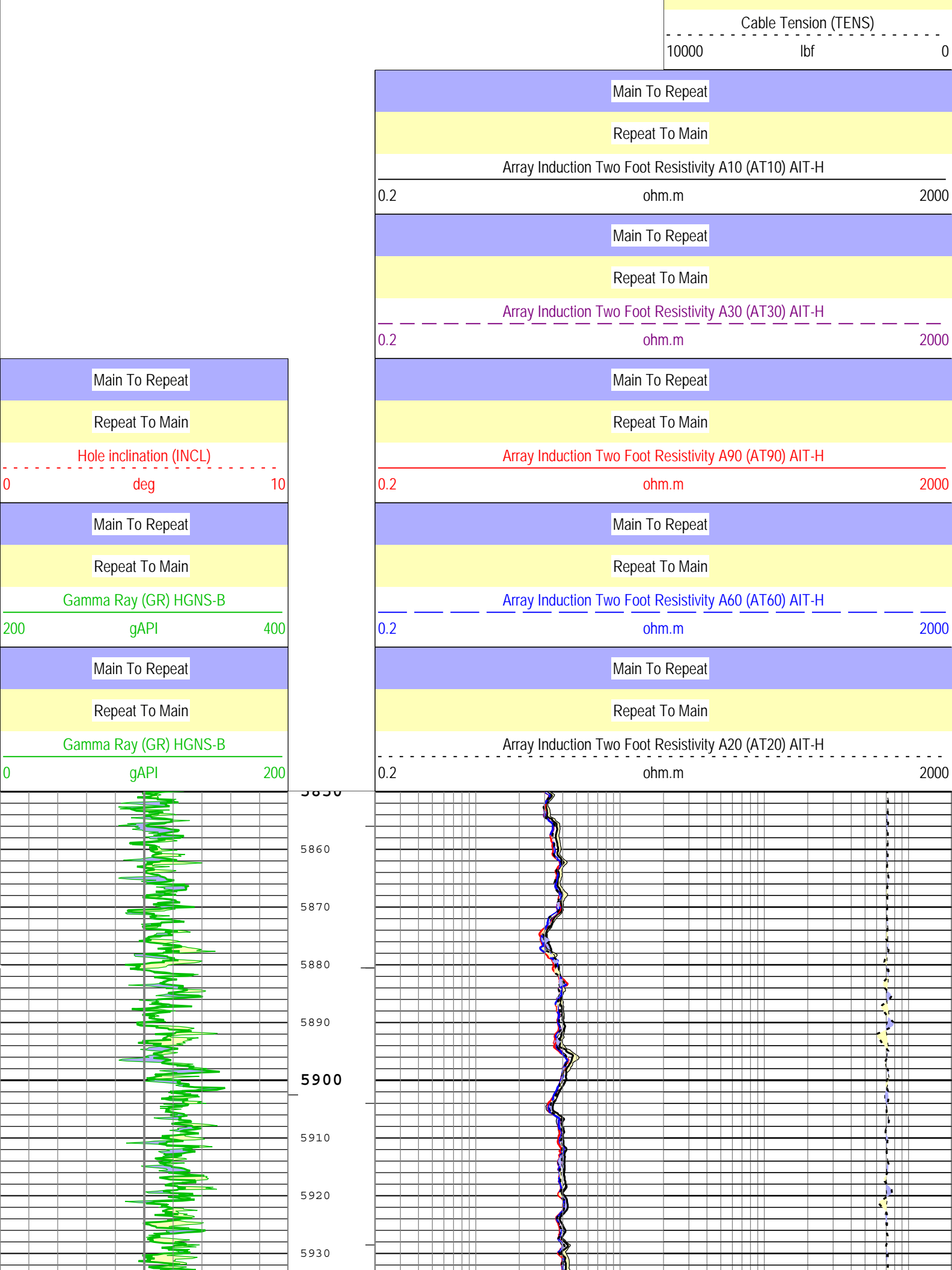
All depths are referenced to toolstring zero

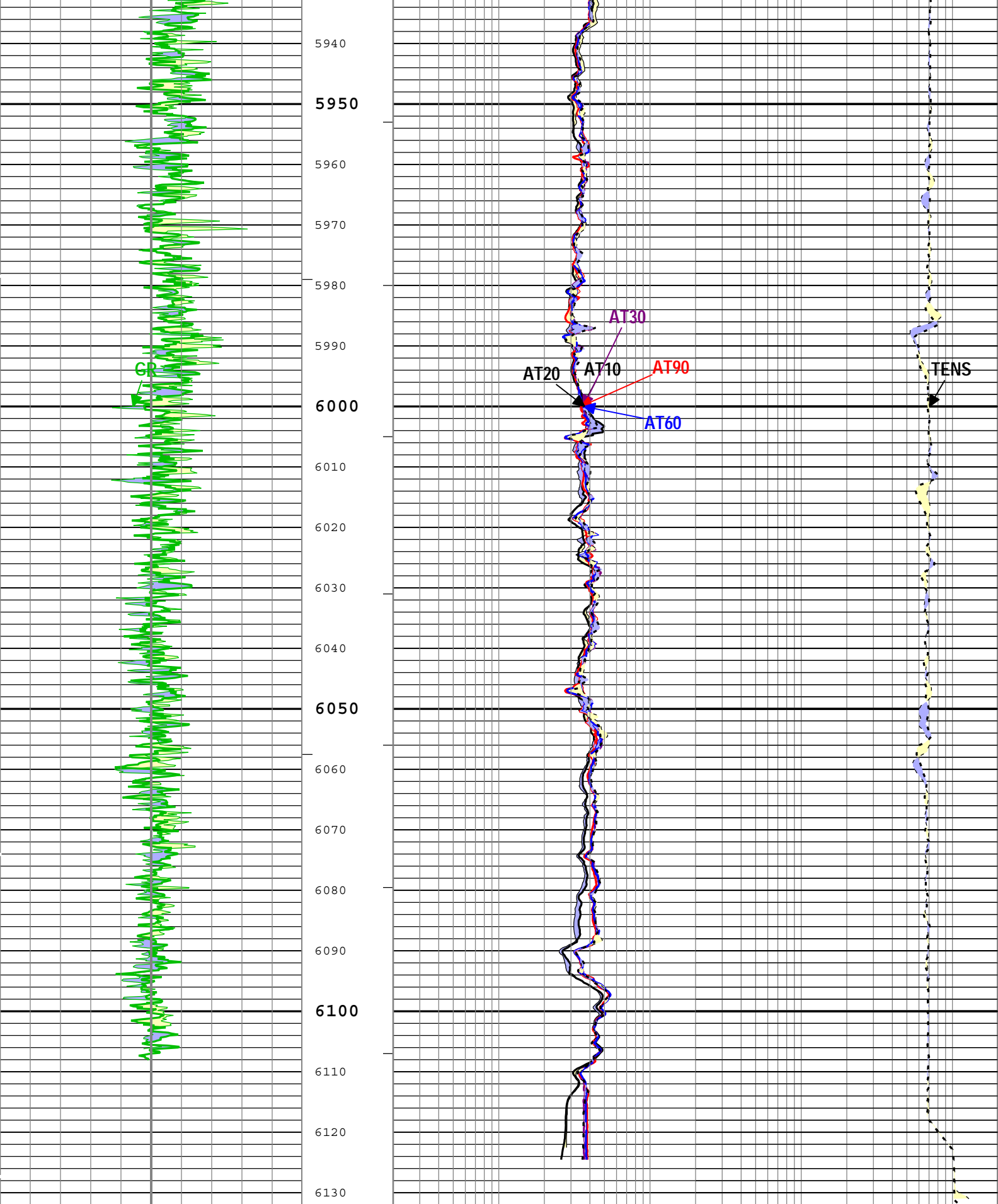
Log	Company:Noble Energy Inc Well:Romero PC G10-79HN Run 1: Log[3]:Up:S008
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Description: AIT Basic Log Two Format: Log (KM 5in Induction Upper RA) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth
Creation Date: 23-Mar-2014 05:54:04

—|IHV - Integrated Hole Volume every 10.00 (ft3)
—|IHV - Integrated Hole Volume every 100.00 (ft3)
TIME_1900 - Time Marked every 60.00 (s)
—|ICV - Integrated Cement Volume every 10.00 (ft3)
—|ICV - Integrated Cement Volume every 100.00 (ft3)

Main To Repeat
Repeat To Main





Main To Repeat

Repeat To Main

Hole inclination (INCL)

Main To Repeat

Repeat To Main

Array Induction Two Foot Resistivity A10 (AT10) AIT-H

TIME_1900 - Time Marked every 60.00 (s)

	Integrated Cement Volume every 100.00 (ft3)
	Integrated Cement Volume every 10.00 (ft3)
	IHV - Integrated Hole Volume every 100.00 (ft3)
	IHV - Integrated Hole Volume every 10.00 (ft3)

Calibration Report			
AIT-H (Array Induction Tool - H) Calibration - Run 1			
Primary Equipment :			
File code for AIT-HA Sonde Tool Element	AHIS	398	
Auxiliary Equipment :			
File code for AIT Bottom Nose Tool Element	AHRM	398	

Master (EEPROM):	11:29:18 04-Mar-2014
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Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Test Loop Gain - 0		Master	1.000	0.950	1.016	1.050	
Test Loop Phase - 0	deg	Master	0	-3.000	0.415	3.000	
Test Loop Gain - 1		Master	1.000	0.950	1.014	1.050	
Test Loop Phase - 1	deg	Master	0	-3.000	0.538	3.000	
Test Loop Gain - 2		Master	1.000	0.950	1.018	1.050	
Test Loop Phase - 2	deg	Master	0	-3.000	0.610	3.000	

Test Loop Phase - 2	deg	Master	0	-3.000	-0.012	3.000	
Test Loop Gain - 3		Master	1.000	0.950	1.016	1.050	
Test Loop Phase - 3	deg	Master	0	-3.000	0.032	3.000	
Test Loop Gain - 4		Master	1.000	0.950	0.998	1.050	
Test Loop Phase - 4	deg	Master	0	-3.000	-0.041	3.000	
Test Loop Gain - 5		Master	1.000	0.950	0.989	1.050	
Test Loop Phase - 5	deg	Master	0	-3.000	-0.262	3.000	
Test Loop Gain - 6		Master	1.000	0.950	0.997	1.050	
Test Loop Phase - 6	deg	Master	0	-3.000	0.066	3.000	
Test Loop Gain - 7		Master	1.000	0.950	1.013	1.050	
Test Loop Phase - 7	deg	Master	0	-3.000	-0.290	3.000	

AIT Sonde Calibration - Sonde Error Correction

Master (EEPROM):		11:29:18 04-Mar-2014					
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Sonde Error Correction Real - 0	mS/m	Master	-----	-231.000	-85.683	119.000	
Sonde Error Correction Quad - 0		Master	-----	-2250.000	107.989	2250.000	
Sonde Error Correction Real - 1	mS/m	Master	-----	114.000	168.640	204.000	
Sonde Error Correction Quad - 1		Master	-----	-625.000	138.061	625.000	
Sonde Error Correction Real - 2	mS/m	Master	-----	66.000	112.616	156.000	
Sonde Error Correction Quad - 2		Master	-----	-350.000	25.430	350.000	
Sonde Error Correction Real - 3	mS/m	Master	-----	39.000	59.140	89.000	
Sonde Error Correction Quad - 3		Master	-----	-250.000	51.811	250.000	
Sonde Error Correction Real - 4	mS/m	Master	-----	15.000	22.684	35.000	
Sonde Error Correction Quad - 4		Master	-----	-63.000	-10.829	63.000	
Sonde Error Correction Real - 5	mS/m	Master	-----	4.000	13.485	24.000	
Sonde Error Correction Quad - 5		Master	-----	-50.000	2.248	50.000	
Sonde Error Correction Real - 6	mS/m	Master	-----	5.000	9.284	15.000	
Sonde Error Correction Quad - 6		Master	-----	-30.000	5.817	30.000	
Sonde Error Correction Real - 7	mS/m	Master	-----	-5.000	-1.291	5.000	
Sonde Error Correction Quad - 7		Master	-----	-30.000	3.067	30.000	

AIT Mud Calibration - Mud Calibration Gain

Master (EEPROM):		11:29:18 04-Mar-2014					
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Coarse Gain		Master	1.000	0.800	0.805	1.200	
Fine Gain		Master	1.000	0.800	0.805	1.200	

AIT Electronics Check - Thru Calibration Check

Master (EEPROM):		11:29:18 04-Mar-2014		Before (Measured):		13:46:32 22-Mar-2014	
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Thru Cal Mag - 0	V	Master	-----	0.363	0.624	0.847	
		Before	-----	0.363	0.624	0.847	
		Before-Master	-----	-----	0.000	-----	
Thru Cal Phase - 0	deg	Master	-----	11.000	74.090	131.000	
		Before	-----	11.000	74.726	131.000	
		Before-Master	-----	-----	0.636	-----	
Thru Cal Mag - 1	V	Master	-----	0.762	1.279	1.778	
		Before	-----	0.762	1.280	1.778	
		Before-Master	-----	-----	0.001	-----	
Thru Cal Phase - 1	deg	Master	-----	10.000	73.061	130.000	
		Before	-----	10.000	73.707	130.000	
		Before-Master	-----	-----	0.646	-----	
Thru Cal Mag - 2	V	Master	-----	0.374	0.634	0.872	
		Before	-----	0.374	0.634	0.872	
		Before-Master	-----	-----	0.000	-----	
Thru Cal Phase - 2	deg	Master	-----	6.000	68.860	126.000	
		Before	-----	6.000	69.534	126.000	
		Before-Master	-----	-----	0.674	-----	
Thru Cal Mag - 3	V	Master	-----	0.422	0.720	0.986	
		Before	-----	0.422	0.720	0.986	
		Before-Master	-----	-----	0.000	-----	
Thru Cal Phase - 3	deg	Master	-----	5.000	67.958	125.000	
		Before	-----	5.000	68.633	125.000	
		Before-Master	-----	-----	0.675	-----	
Thru Cal Mag - 4	V	Master	-----	0.802	1.341	1.872	
		Before	-----	0.802	1.342	1.872	
		Before-Master	-----	-----	0.001	-----	

		Before-Master	-----	-----	0.001	-----	
Thru Cal Phase - 4	deg	Master	-----	-1.000	60.978	119.000	
		Before	-----	-1.000	61.690	119.000	
		Before-Master	-----	-----	0.712	-----	
Thru Cal Mag - 5	V	Master	-----	1.173	1.938	2.737	
		Before	-----	1.173	1.939	2.737	
		Before-Master	-----	-----	0.001	-----	
Thru Cal Phase - 5	deg	Master	-----	-3.000	58.780	117.000	
		Before	-----	-3.000	59.536	117.000	
		Before-Master	-----	-----	0.756	-----	
Thru Cal Mag - 6	V	Master	-----	1.173	1.934	2.737	
		Before	-----	1.173	1.934	2.737	
		Before-Master	-----	-----	0.000	-----	
Thru Cal Phase - 6	deg	Master	-----	-3.000	58.846	117.000	
		Before	-----	-3.000	59.602	117.000	
		Before-Master	-----	-----	0.756	-----	
Thru Cal Mag - 7	V	Master	-----	0.849	1.373	1.981	
		Before	-----	0.849	1.377	1.981	
		Before-Master	-----	-----	0.004	-----	
Thru Cal Phase - 7	deg	Master	-----	-7.000	53.092	113.000	
		Before	-----	-7.000	54.127	113.000	
		Before-Master	-----	-----	1.035	-----	
SPA Zero	mV	Master		-50.000	-0.034	50.000	
		Before		-50.000	-0.060	50.000	
		Before-Master	-----	-----	-0.026	-----	
SPA Plus	mV	Master		941.000	992.609	1040.000	
		Before		941.000	993.216	1040.000	
		Before-Master	-----	-----	0.607	-----	
Temperature Zero	V	Master		-0.050	0.000	0.050	
		Before		-0.050	0.000	0.050	
		Before-Master	-----	-----	0.000	-----	
Temperature Plus	V	Master		0.870	0.920	0.960	
		Before		0.870	0.920	0.960	
		Before-Master	-----	-----	0.000	-----	

Company:	Noble Energy Inc	Schlumberger
Well:	Romero PC G10-79HN	
Field:	Wattenberg	
County:	Weld	
State:	Colorado	
Array Induction with Linear Correlation		