

Company: St. Croix Operating Inc.

Well: Armstrong #1

Field: Wildcat

County: Washington State: Colorado

TCOM	
600' FSL & 2040' FEL	Elev.: K.B. 4675.00 ft G.L. 4667.00 ft D.F. 4674.00 ft
Location:	Permanent Datum: Ground Level Log Measured From: Kelly Bushing Drilling Measured From: Kelly Bushing
API Serial No. 05-121-11088	Section: 21 Township: 51W Range: 3S
County: Washington	
Field: Wildcat	
Location: 600' FSL & 2040' FEL	
Well: Armstrong #1	
Company: St. Croix Operating Inc.	

Logging Date	04-Nov-2019
Run Number	1A
Depth Driller	4200.00 ft
Schlumberger Depth	4205.00 ft
Bottom Log Interval	4205.00 ft
Top Log Interval	
Casing Driller Size @ Depth	8.625 in @ 506.00 ft
Casing Schlumberger	506 ft
Bit Size	7.875 in
Type Fluid In Hole	Water
Density	9 lbm/gal
Fluid Loss	PH 44 s
MUD	
Source of Sample	Active Tank
RM @ Meas Temp	0.2 ohm.m @ 68 degF
RMF @ Meas Temp	0.15 ohm.m @ 68 degF
RMC @ Meas Temp	
Source RMF	RMC
RM @ BHT	0.12 @ 122 0.09 @ 122
Max Recorded Temperatures	122 degF
Circulation Stopped	04-Nov-2019 15:30:00
Logger on Bottom	04-Nov-2019 18:00:00
Unit Number	9115
Recorded By	Caroline I.
Witnessed By	Tom Thomas

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.

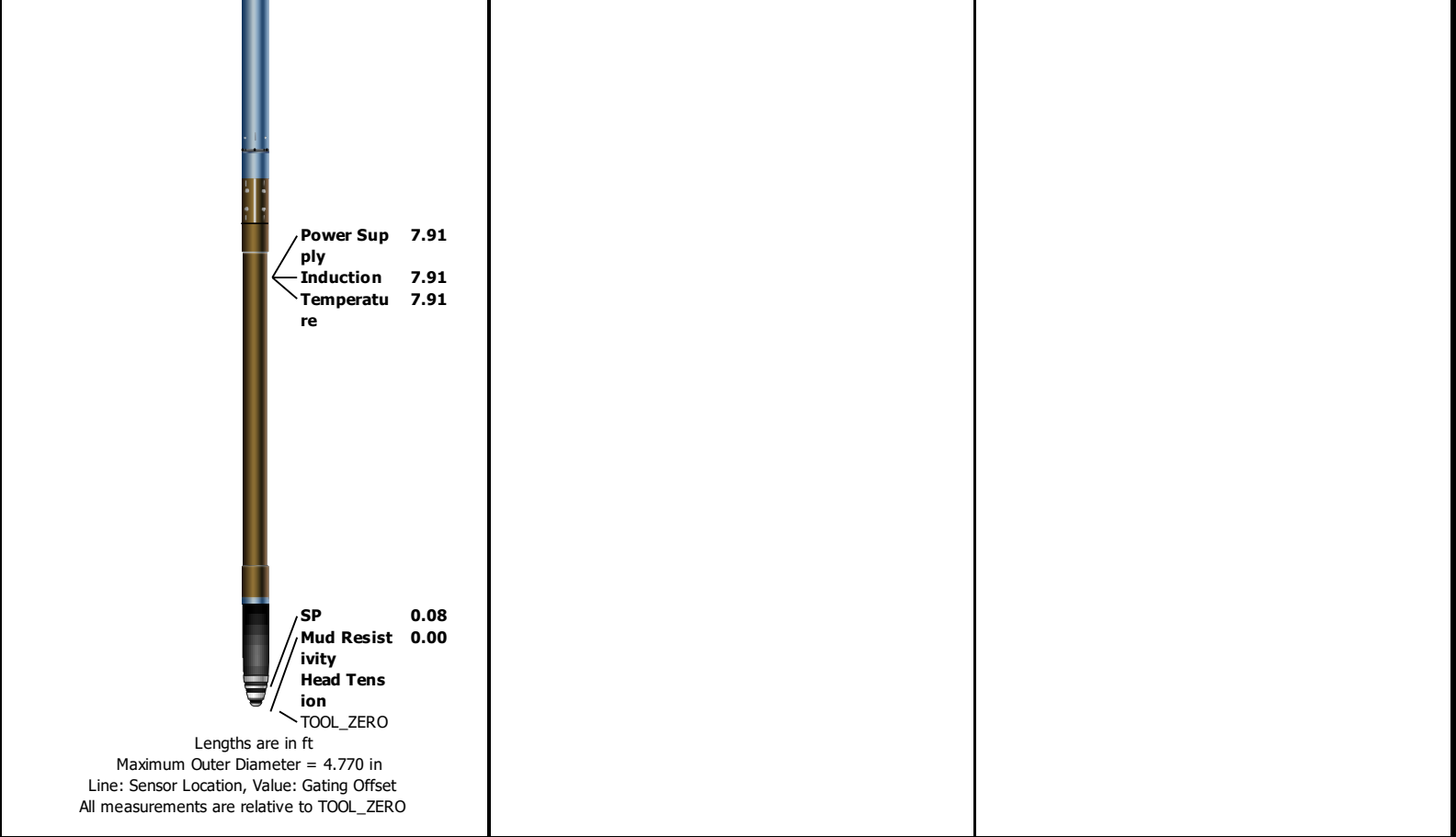
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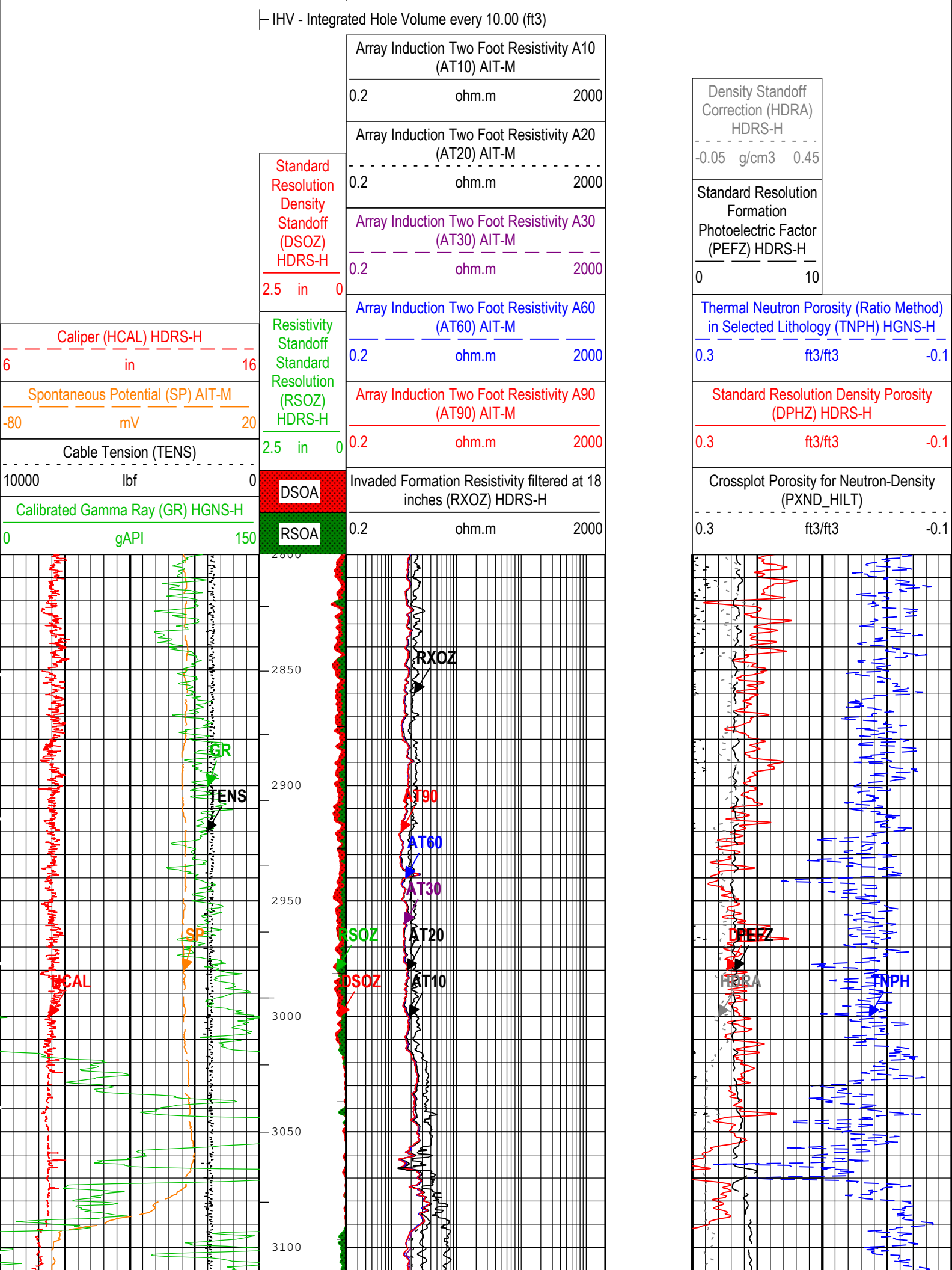
Remarks and Equipment Summary

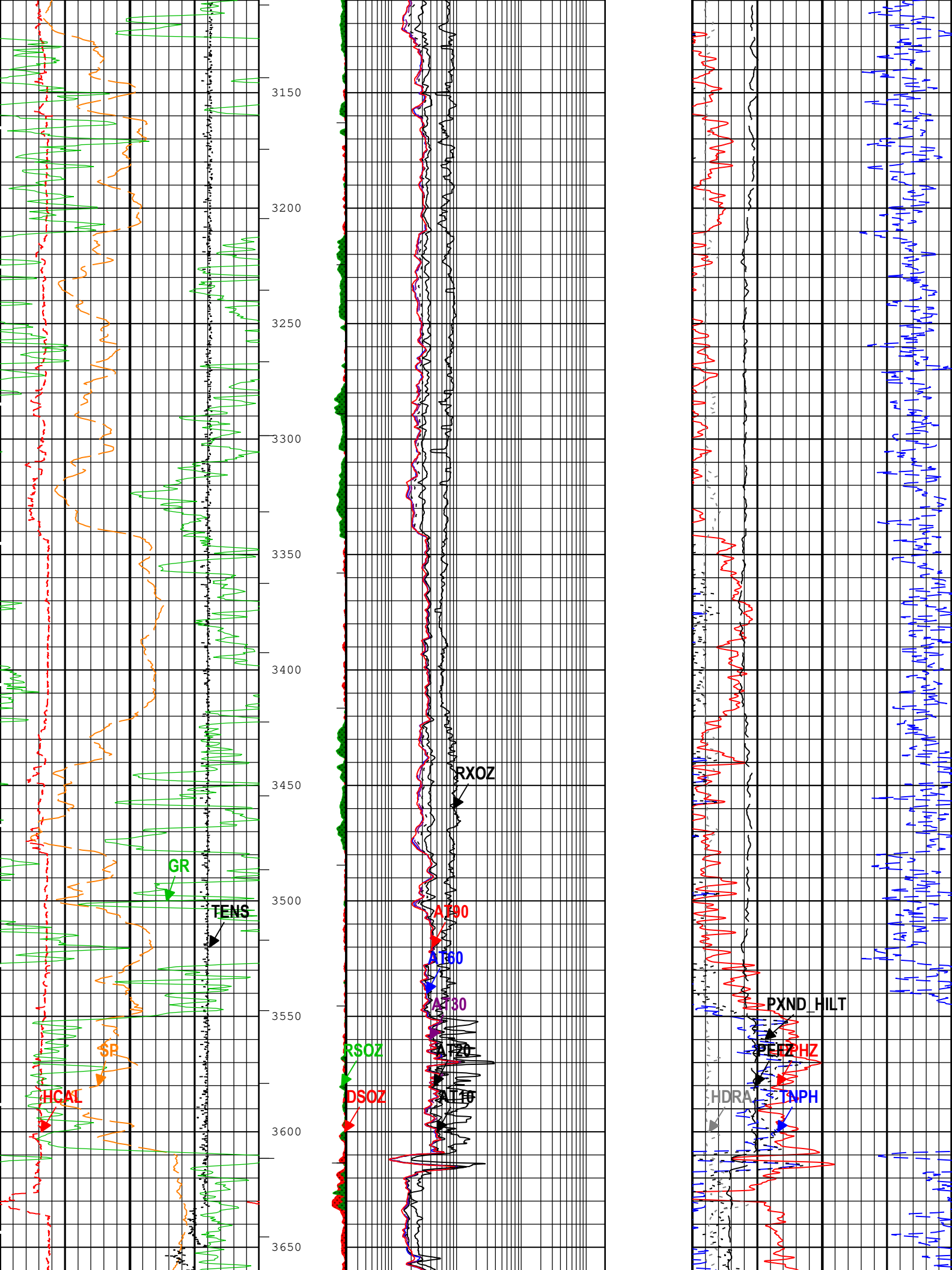
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<div>Equip name</div> <div>LEH-QT</div> <div>LEH-QT</div>	<div>Length</div> <div>51.14</div>	<div>MP name</div> <div></div>	<div>Offset</div> <div></div>	<div></div>
<div>EDTC-H</div> <div>EDTH-H</div> <div>EDTC-H</div>	<div>47.65</div>	<div>CTEM</div>	<div>46.9</div>	
		<div>HV</div>	<div>0.00</div>	
		<div>ACCZ</div>	<div>0.00</div>	
		<div>Gamma Ra</div>	<div>41.22</div>	
		<div>y</div>	<div></div>	
		<div>Edtch Statu</div>	<div>39.65</div>	
		<div>s</div>	<div></div>	
<div>HGNS-H</div> <div>HGNH</div> <div>NSR-F:5203</div> <div>NPV-N</div> <div>HMCA-H</div> <div>HGNS-H</div> <div>HACCZ-H:153</div> <div>7</div>	<div>39.65</div>	<div>TelStatus</div> <div>39.65</div> <div>Temperatu</div> <div>39.62</div> <div>re</div> <div>GR</div> <div>38.91</div>		
		<div>CNL Poros</div>	<div>32.58</div>	
		<div>ity</div>	<div></div>	
		<div>HGNS</div>	<div>30.24</div>	
		<div>HMCA</div>	<div>30.24</div>	
		<div>Accelerom</div>	<div>0.00</div>	
		<div>eter</div>	<div></div>	
<div>HDRS-H</div> <div>ECH-MEB</div> <div>HRCC-H</div> <div>HRMS-H</div> <div>Short Spacing</div> <div>:27732</div> <div>Backscatter</div> <div>GSR-J:5259</div> <div>GPV-Q</div> <div>HRGD-H:3921</div> <div>Long Spacing</div>	<div>30.24</div>	<div>HRCC</div>	<div>26.24</div>	<div></div>
		<div>MCFL</div>	<div>20.81</div>	
		<div>Caliper</div>	<div>20.32</div>	
		<div>TLD Densi</div>	<div>19.94</div>	
		<div>ty</div>	<div></div>	
<div>AH-184</div>	<div>18.00</div>			
<div>AIT-M:129</div> <div>AMIS:129</div> <div>AMRM</div>	<div>16.00</div>			

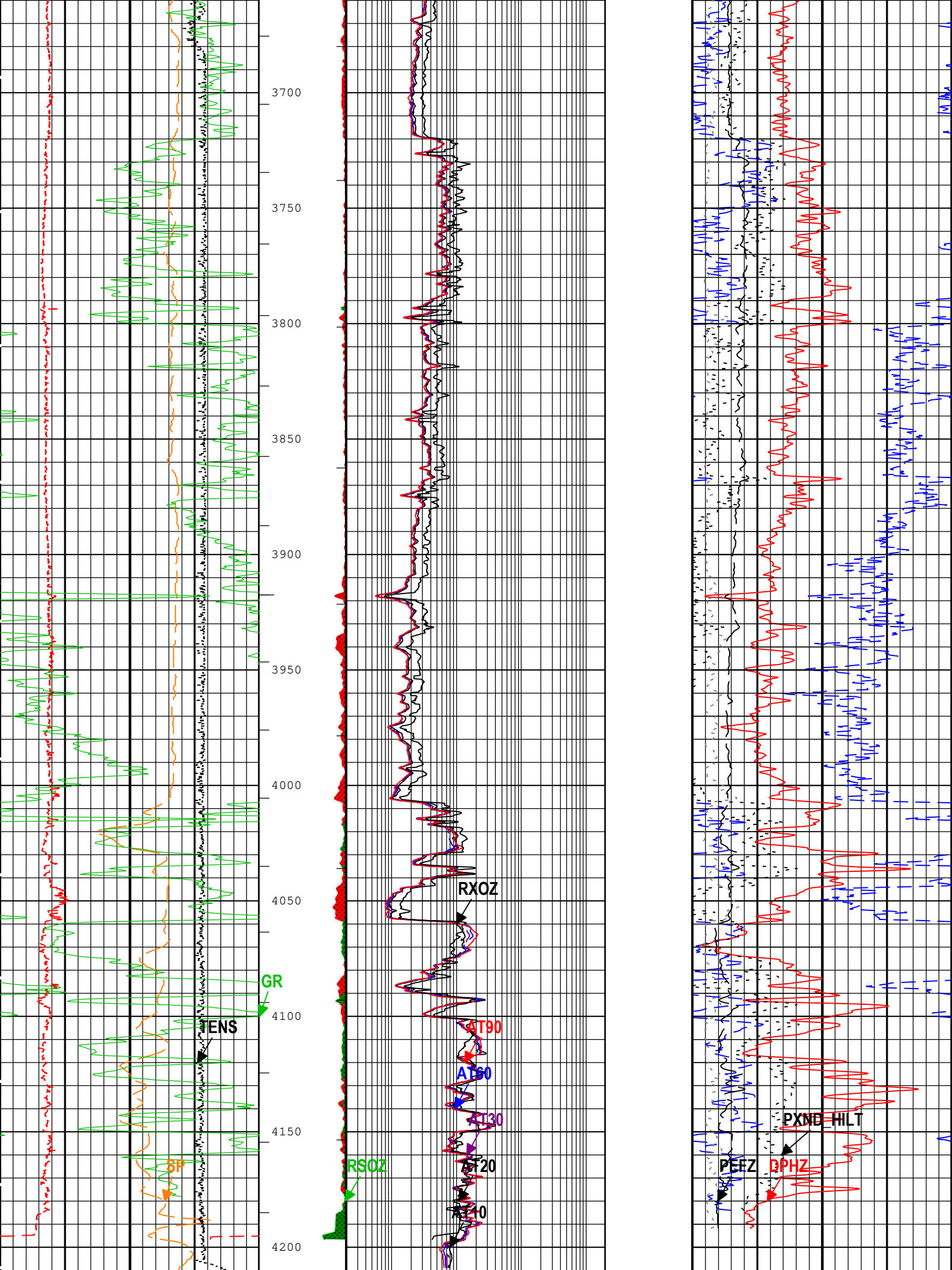


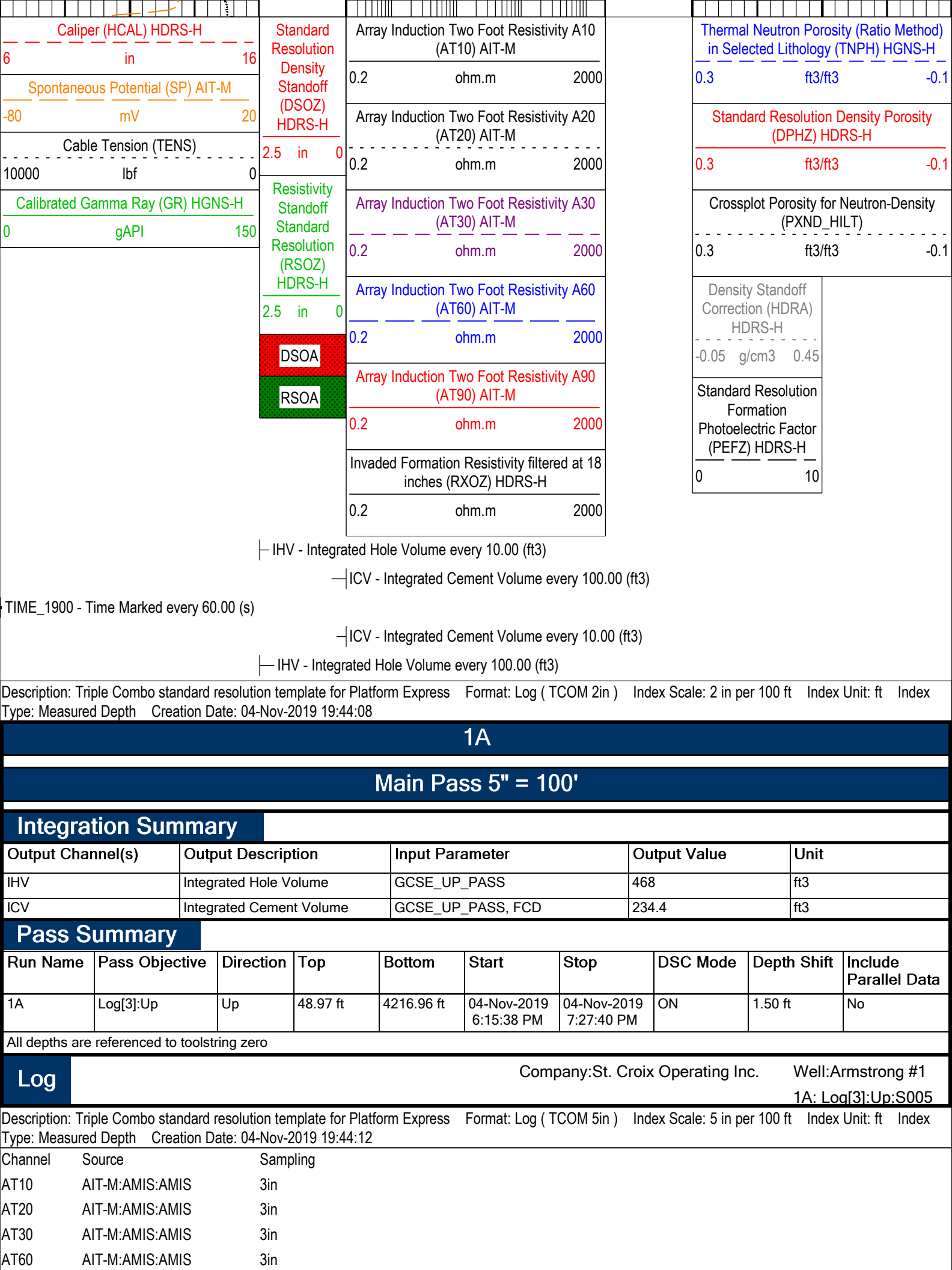
Depth Summary			
	1A		
Depth Measuring Device			
Type	IDW-B		
Serial Number			
Calibration Date			
Calibrator Serial Number			
Calibration Cable Type			
Wheel Correction 1	0		
Wheel Correction 2	0		
Tension Device			
Type	CMTD-B/A		
Serial Number			
Calibration Date			
Calibrator Serial Number			
Number of Calibration Points	0		
Logging Cable			
Type	7-46NT-XS		
Serial Number			
Length	24000.00 ft		
Conveyance Type	Wireline		
Rig Type			
1A:Depth Control Parameters		Depth Control Remarks	
Log Sequence	First Log In the Well	All Schlumberger depth control procedures followed.	
Rig Up Length At Surface	136.00 ft	IDW used as primary depth device.	

—ICV - Integrated Cement Volume every 100.00 (ft3)









IHV - Integrated Hole Volume every 10.00 (ft3)

ICV - Integrated Cement Volume every 100.00 (ft3)

TIME\_1900 - Time Marked every 60.00 (s)

ICV - Integrated Cement Volume every 10.00 (ft3)

IHV - Integrated Hole Volume every 100.00 (ft3)

Description: Triple Combo standard resolution template for Platform Express

Format: Log ( TCOM 2in )

Index Scale: 2 in per 100 ft

Index Unit: ft

Index Type: Measured Depth

Creation Date: 04-Nov-2019 19:44:08

1A

Main Pass 5" = 100'

Integration Summary

Output Channel(s)	Output Description	Input Parameter	Output Value	Unit
IHV	Integrated Hole Volume	GCSE_UP_PASS	468	ft3
ICV	Integrated Cement Volume	GCSE_UP_PASS, FCD	234.4	ft3

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
1A	Log[3]:Up	Up	48.97 ft	4216.96 ft	04-Nov-2019 6:15:38 PM	04-Nov-2019 7:27:40 PM	ON	1.50 ft	No

All depths are referenced to toolstring zero

Log

Company:St. Croix Operating Inc.

Well:Armstrong #1

1A: Log[3]:Up:S005

Description: Triple Combo standard resolution template for Platform Express

Format: Log ( TCOM 5in )

Index Scale: 5 in per 100 ft

Index Unit: ft

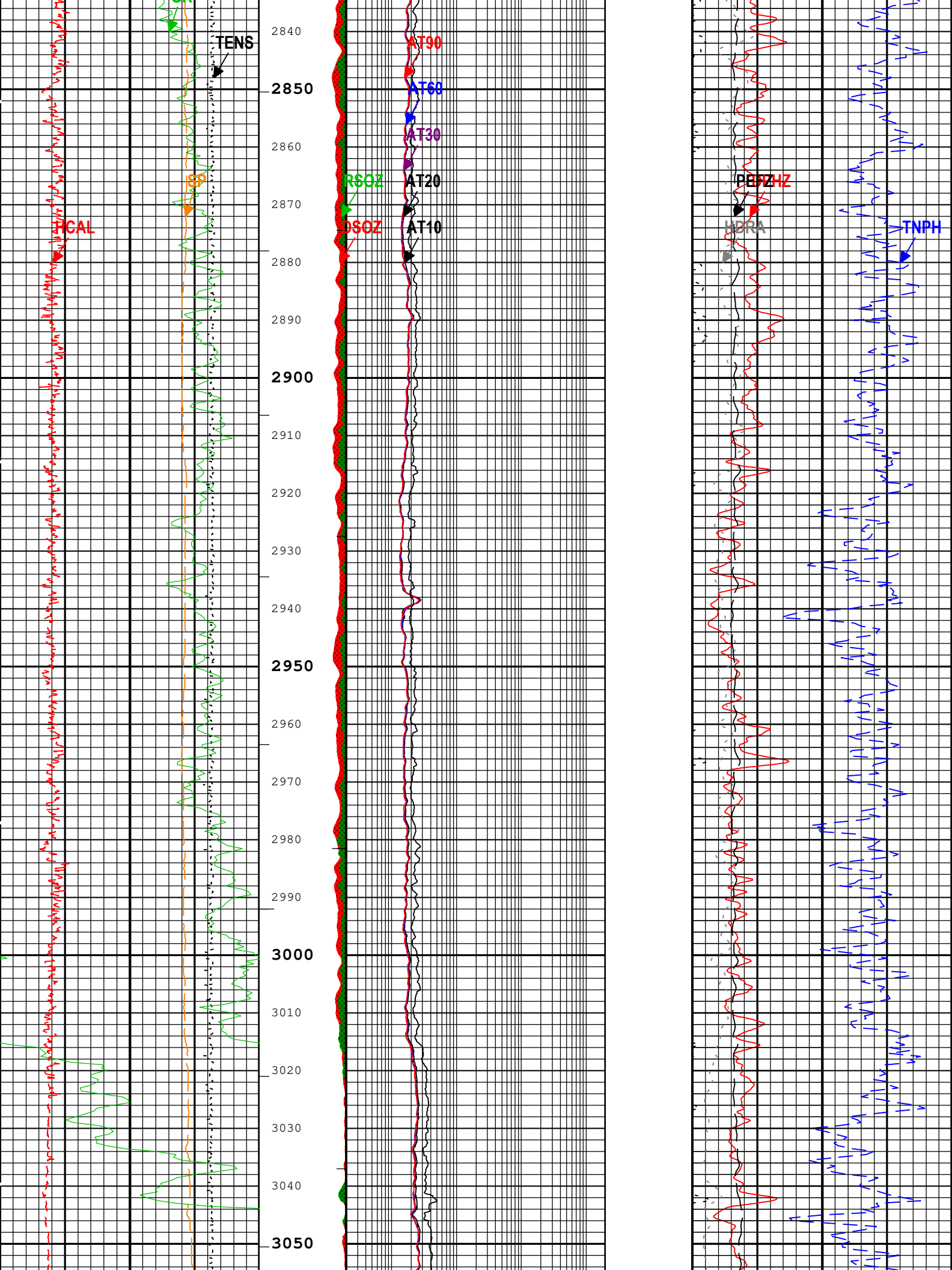
Index Type: Measured Depth

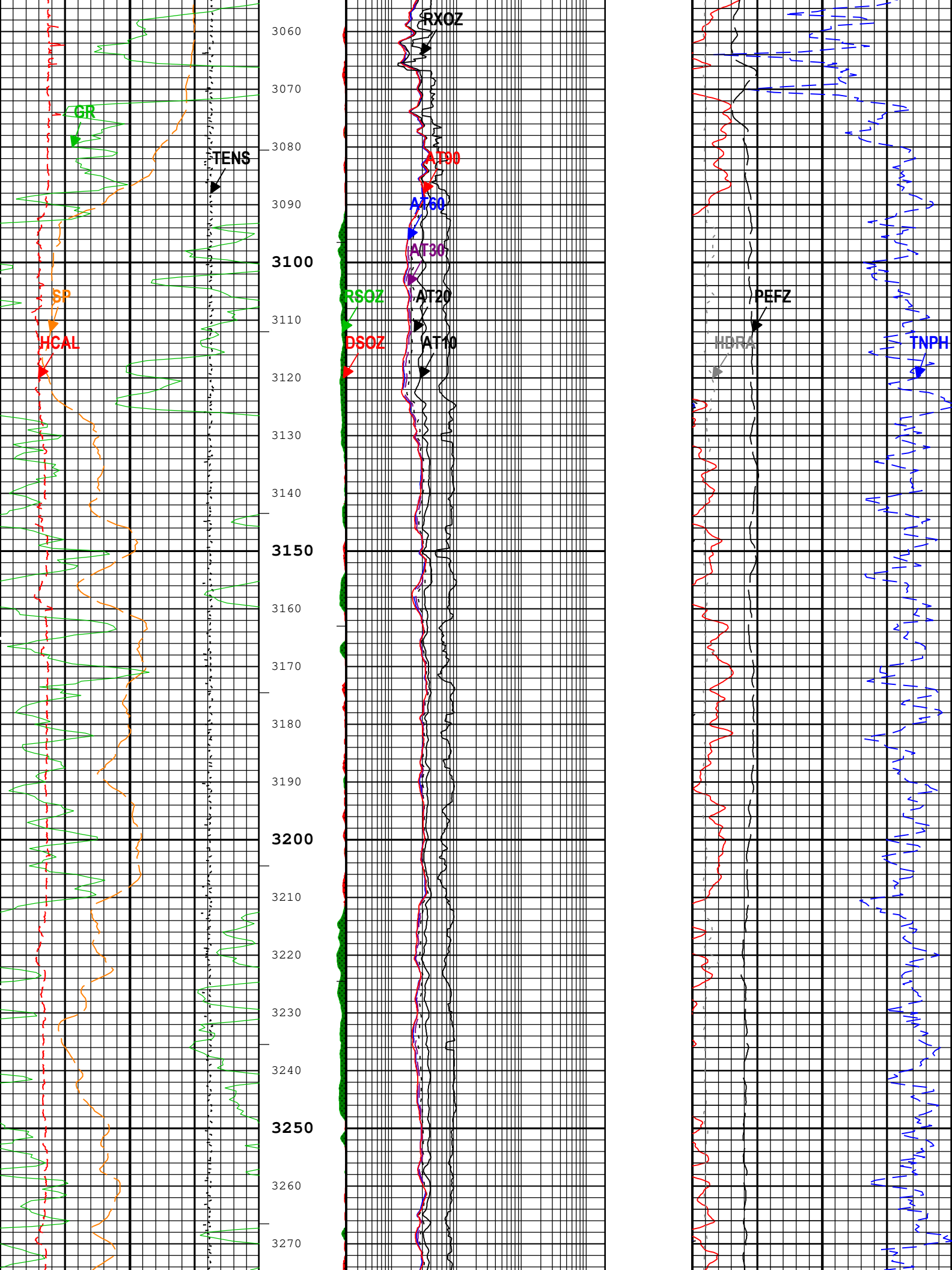
Creation Date: 04-Nov-2019 19:44:12

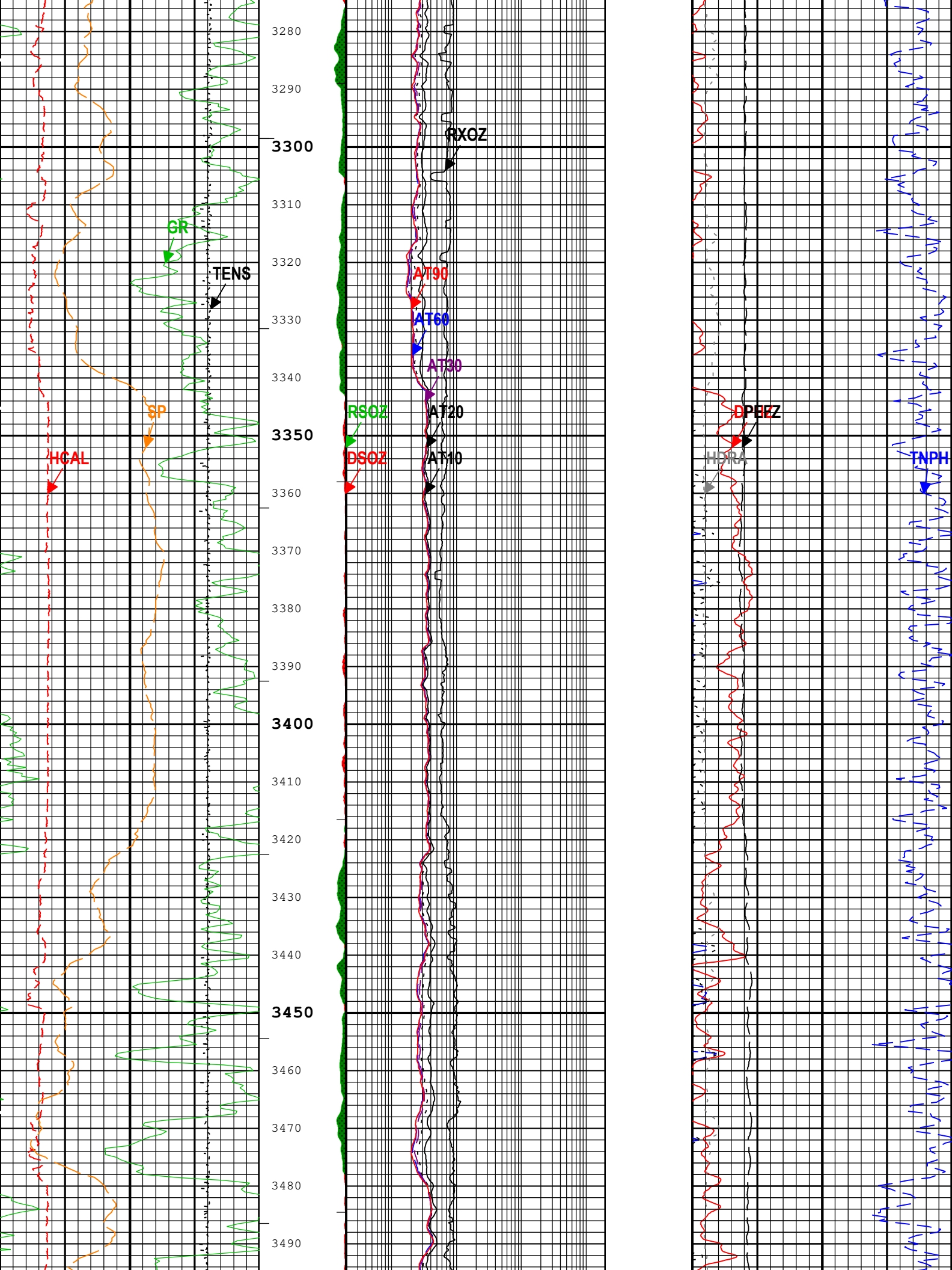
Channel	Source	Sampling
AT10	AIT-M:AMIS:AMIS	3in
AT20	AIT-M:AMIS:AMIS	3in
AT30	AIT-M:AMIS:AMIS	3in
AT60	AIT-M:AMIS:AMIS	3in

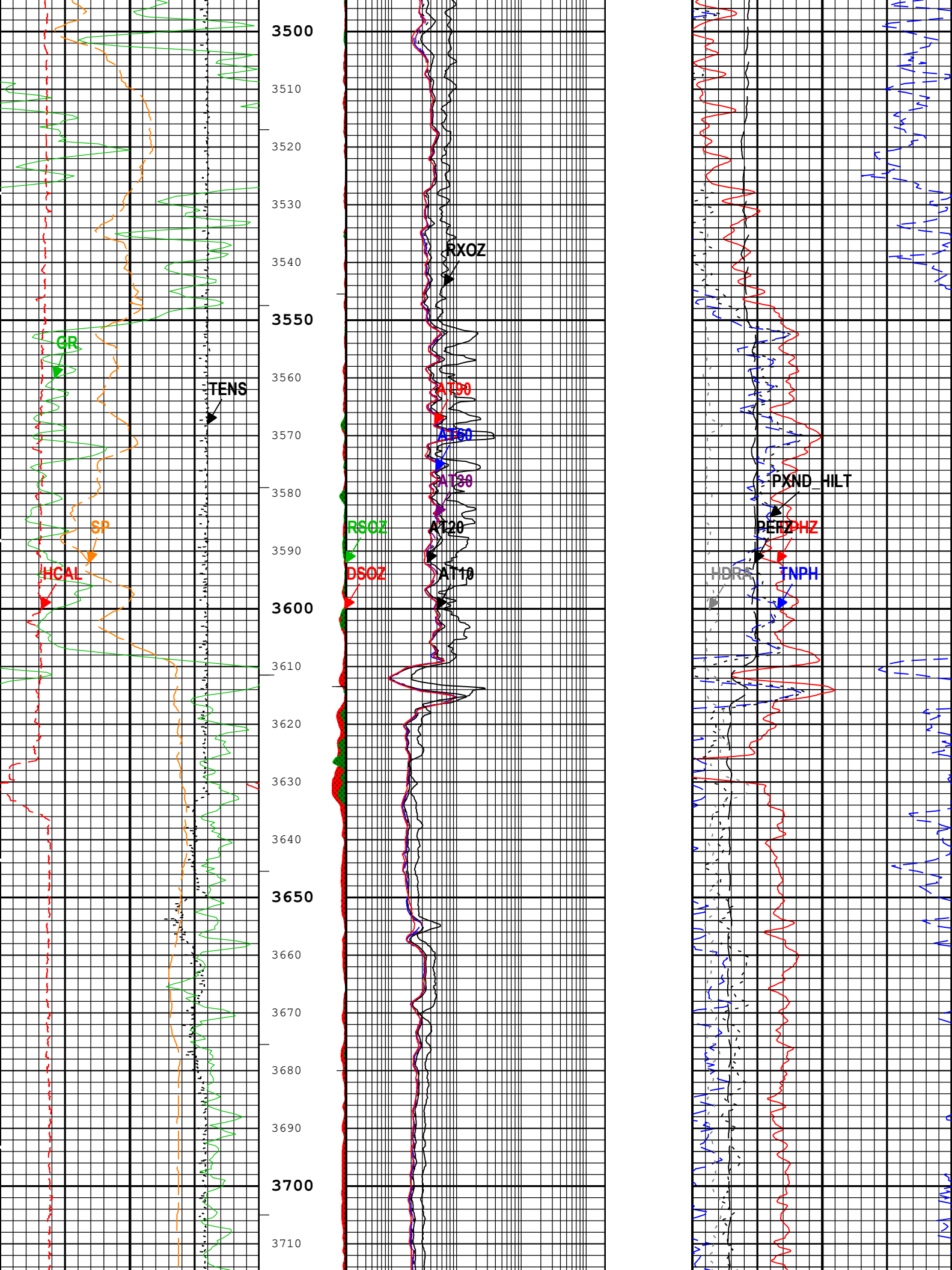


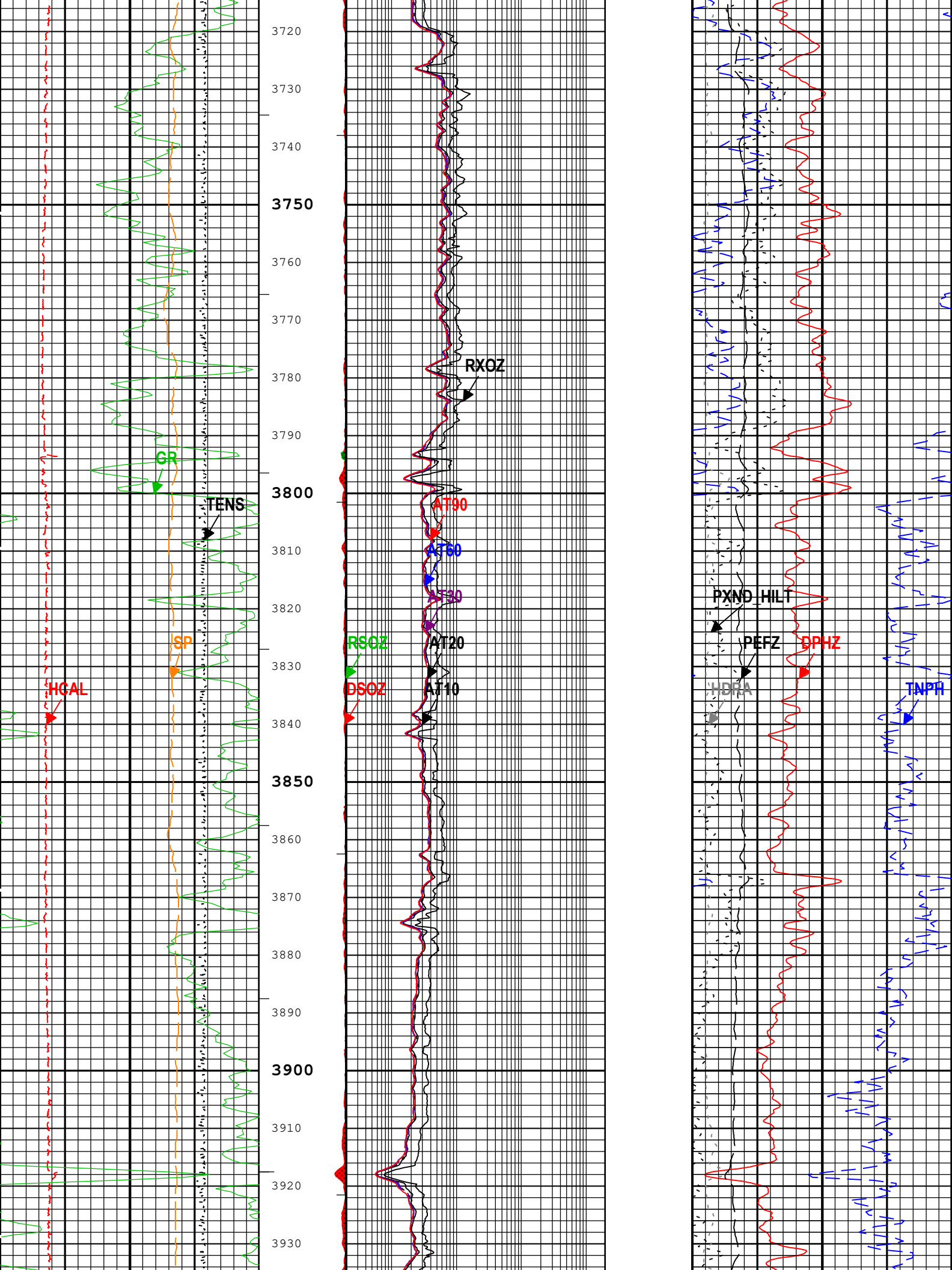
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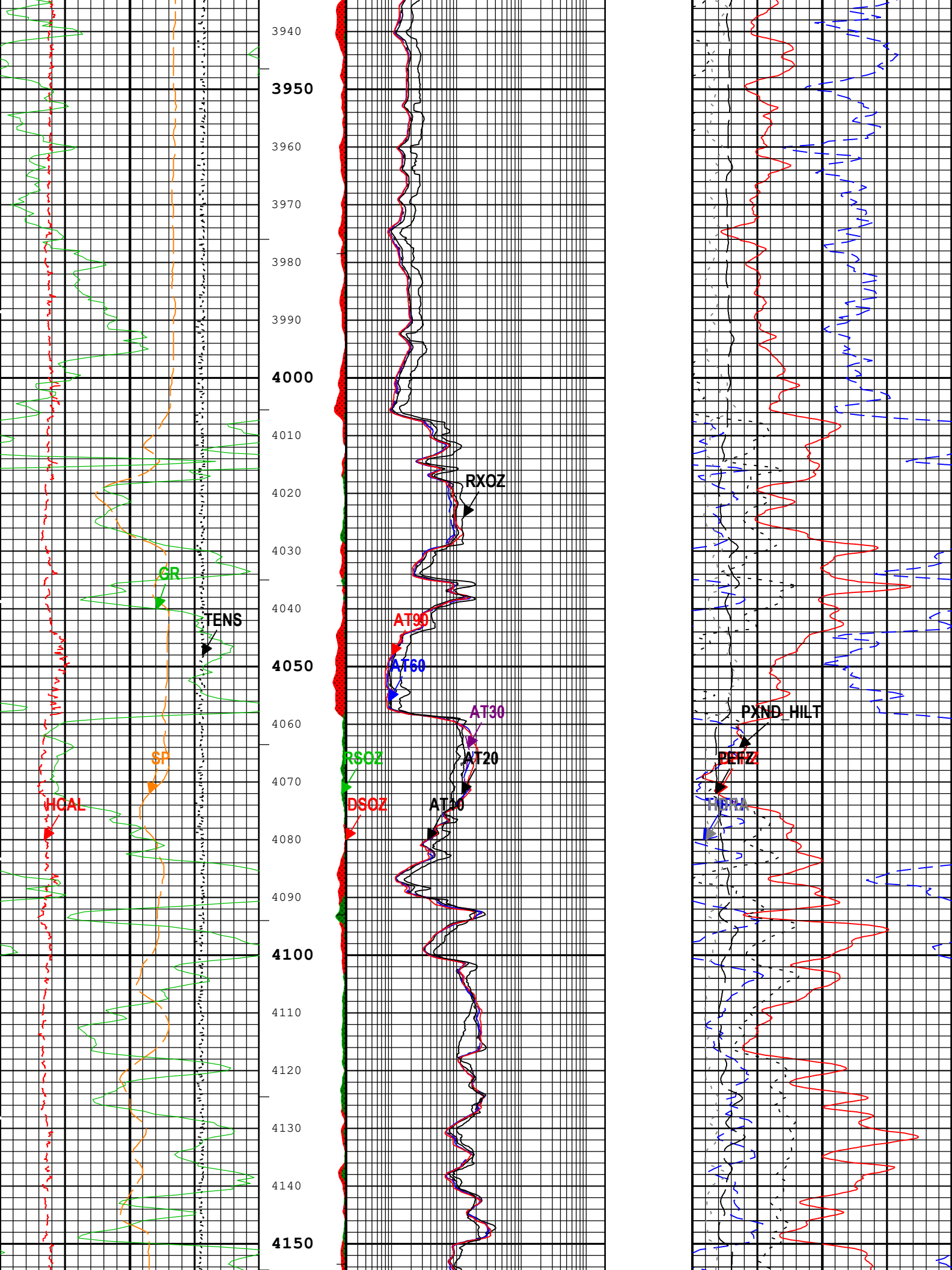


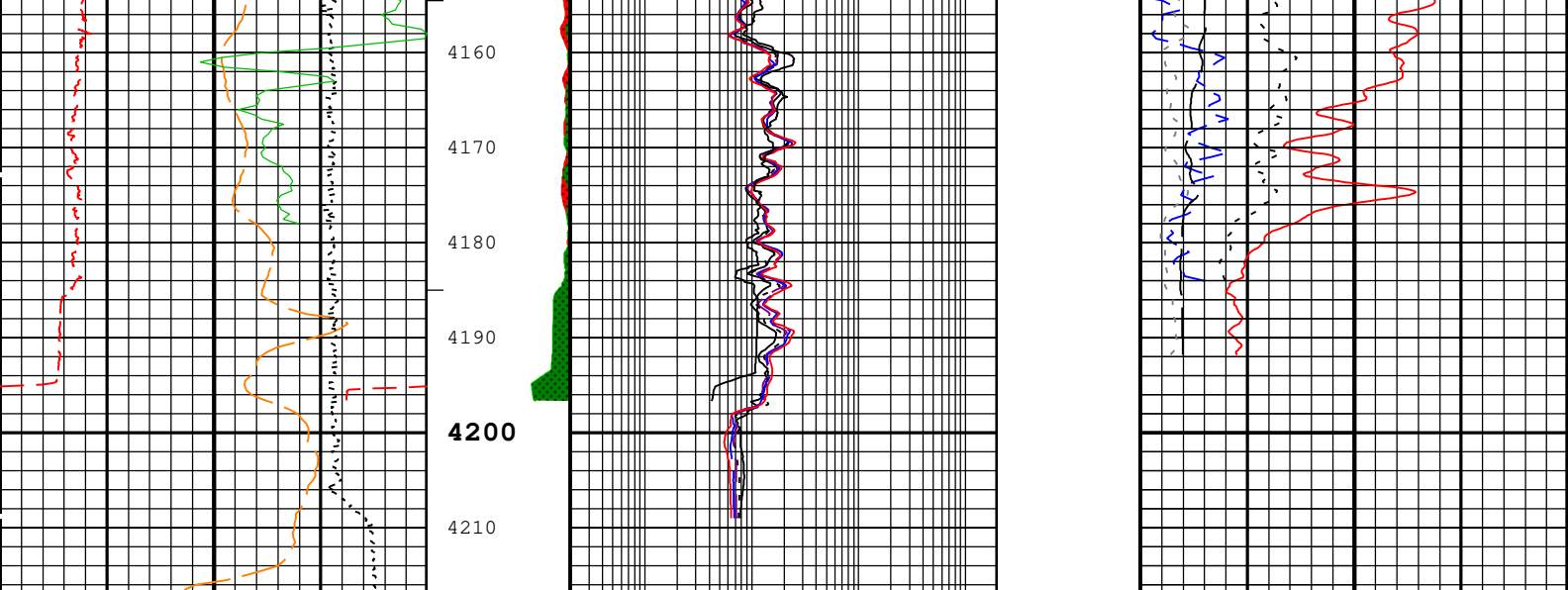












Caliper (HCAL) HDRS-H	Standard Resolution Density Standoff (DSOZ) HDRS-H	Array Induction Two Foot Resistivity A10 (AT10) AIT-M	Thermal Neutron Porosity (Ratio Method) in Selected Lithology (TNPH) HGNS-H
6 in 16	2.5 in 0	0.2 ohm.m 2000	0.3 ft3/ft3 -0.1
Spontaneous Potential (SP) AIT-M	Resistivity Standoff Standard Resolution (RSOZ) HDRS-H	Array Induction Two Foot Resistivity A20 (AT20) AIT-M	Standard Resolution Density Porosity (DPHZ) HDRS-H
-80 mV 20	2.5 in 0	0.2 ohm.m 2000	0.3 ft3/ft3 -0.1
Cable Tension (TENS)	DSOA	Array Induction Two Foot Resistivity A30 (AT30) AIT-M	Crossplot Porosity for Neutron-Density (PXND_HILT)
10000 lbf 0	RSOA	0.2 ohm.m 2000	0.3 ft3/ft3 -0.1
Calibrated Gamma Ray (GR) HGNS-H		Array Induction Two Foot Resistivity A60 (AT60) AIT-M	Density Standoff Correction (HDRA) HDRS-H
0 gAPI 150		0.2 ohm.m 2000	-0.05 g/cm3 0.45
		Array Induction Two Foot Resistivity A90 (AT90) AIT-M	Standard Resolution Formation Photoelectric Factor (PEFZ) HDRS-H
		0.2 ohm.m 2000	0 10
		Invaded Formation Resistivity filtered at 18 inches (RXOZ) HDRS-H	
		0.2 ohm.m 2000	

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

TIME\_1900 - Time Marked every 60.00 (s)

- IHV - Integrated Hole Volume every 100.00 (ft3)

Description: Triple Combo standard resolution template for Platform Express    Format: Log ( TCOM 5in )    Index Scale: 5 in per 100 ft    Index Unit: ft    Index Type: Measured Depth    Creation Date: 04-Nov-2019 19:44:12

## Channel Processing Parameters

### 1A: Parameters

Parameter	Description	Tool	Value	Unit
ABHM	Array Induction Borehole Correction Mode	AIT-M	Compute Standoff	
ASTA	Array Induction Tool Standoff	AIT-M	0.6	in
BARI(ISSBAR)	Barite Mud Presence Flag	Borehole	No	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Open	



BHT	Bottom Hole Temperature	Borehole	122	degF
BS	Bit Size	WLSESSION	7.875	in
BSAL	Borehole Salinity	Borehole	500	ppm
CALI_SHIFT	CALI Supplementary Offset	HDRS-H	0	in
CBLO	Casing Bottom (Logger)	WLSESSION	506	ft
DC_MODE	Depth Correction Mode	DepthCorrection	Real-time	
DFD	Drilling Fluid Density	Borehole	9	lbm/gal
DFT_CATEGORY	Drilling Fluid Type	Borehole	Water	
DHC	Density Hole Correction	HDRS-H	Bit Size	
EDF	Elevation of Derrick Floor Above Permanent Datum	WLSESSION	7	ft
EPD	Elevation of Permanent Datum (PDAT) above Mean Sea Level	WLSESSION	4667	ft
FCD	Future Casing (Outer) Diameter	WLSESSION	5.5	in
FD	Fluid Density	Borehole	1	g/cm3
FSAL	Formation Salinity	Borehole	0	ppm
GCSE_DOWN_PASS	Generalized Caliper Selection for WL Log Down Passes	Borehole	BS(RT)	
GCSE_UP_PASS	Generalized Caliper Selection for WL Log Up Passes	Borehole	CALI	
GGRD	Geothermal Gradient	Borehole	1	0.01 degF/ft
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	
MATR	Rock Matrix for Neutron Porosity Corrections	Borehole	Depth Zoned	
MDEN	Matrix Density for Density Porosity	Borehole	Depth Zoned	g/cm3
MFST	Mud Filtrate Sample Temperature	Borehole	68	degF
MST	Mud Sample Temperature	Borehole	68	degF
PDAT	Permanent Datum	WLSESSION	GL	
RMFS	Resistivity of Mud Filtrate Sample	Borehole	0.15	ohm.m
RMS	Resistivity of Mud Sample	Borehole	0.2	ohm.m
SHT	Surface Hole Temperature	Borehole	68	degF
SOCO	Standoff Correction Option	HGNS-H	Yes	
SPDR	SP Drift Per Foot	AIT-M	0	mV/ft

## Depth Zone Parameters

Parameter	Value	Start ( ft )	Stop ( ft )
MATR	LIMESTONE	2800	3750
MATR	SANDSTONE	3750	4217
MDEN	2.71	2800	3750
MDEN	2.65	3750	4217

All depth are actual.

## Tool Control Parameters

### 1A: Parameters

Parameter	Description	Tool	Value	Unit
HMCA_BOARD_TYPE	HMCA Board Type	HGNS-H	1	
HRGD_BOARD_TYPE	HRGD Board Type	HDRS-H	WITH_HET	
MAX_LOG_SPEED	Toolstring Maximum Logging Speed	WLSESSION	3600	ft/h

1A

Repeat Pass 5" = 100'

## Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include
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Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	OSC Mode	Depth Shift	Include Parallel Data
1A	Log[2]:Up	Up	3759.88 ft	4222.08 ft	04-Nov-2019 6:01:40 PM	04-Nov-2019 6:10:16 PM	ON	1.50 ft	No
1A	Log[3]:Up	Up	48.97 ft	4216.96 ft	04-Nov-2019 6:15:38 PM	04-Nov-2019 7:27:40 PM	ON	1.50 ft	No

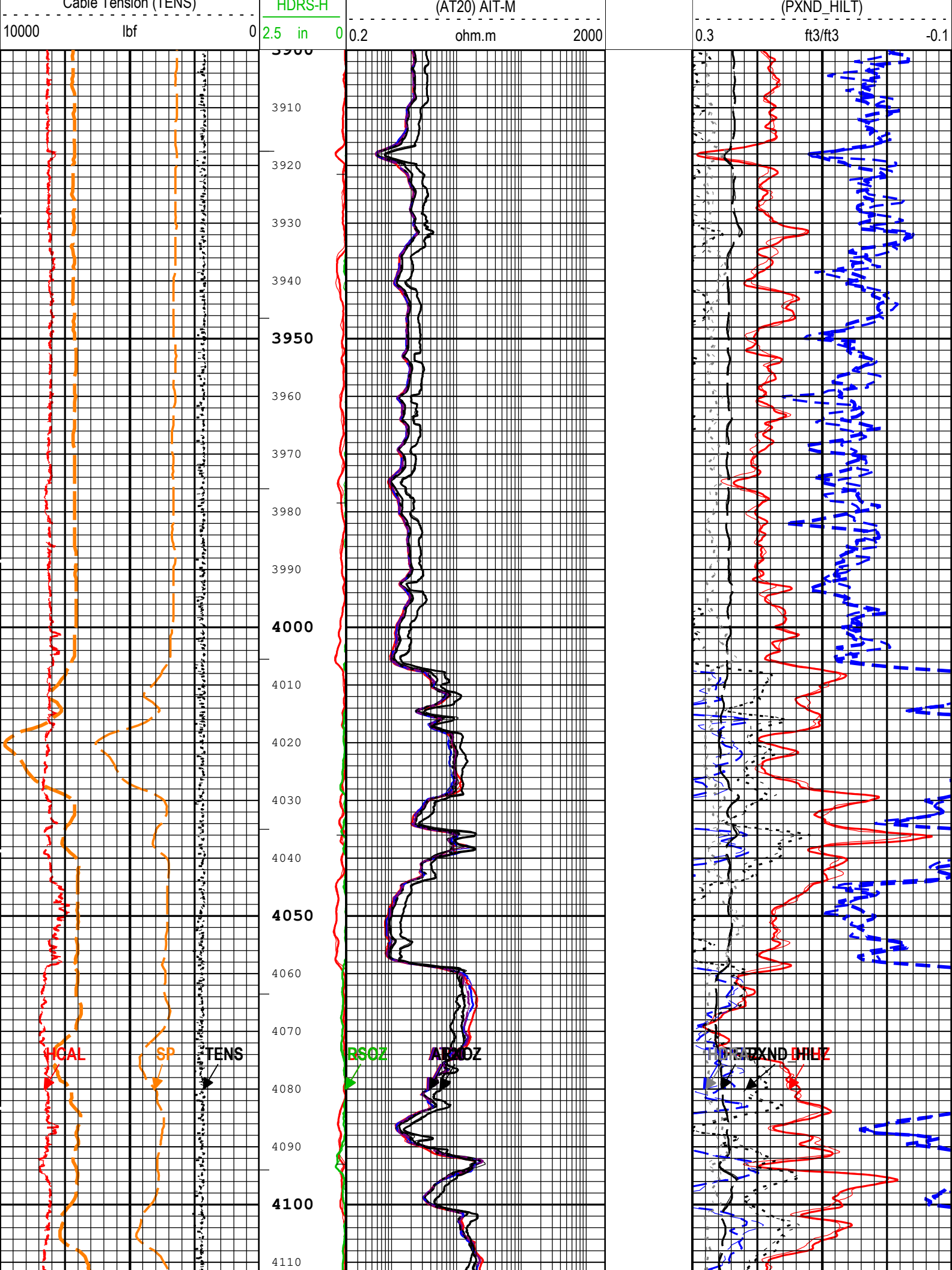
All depths are referenced to toolstring zero

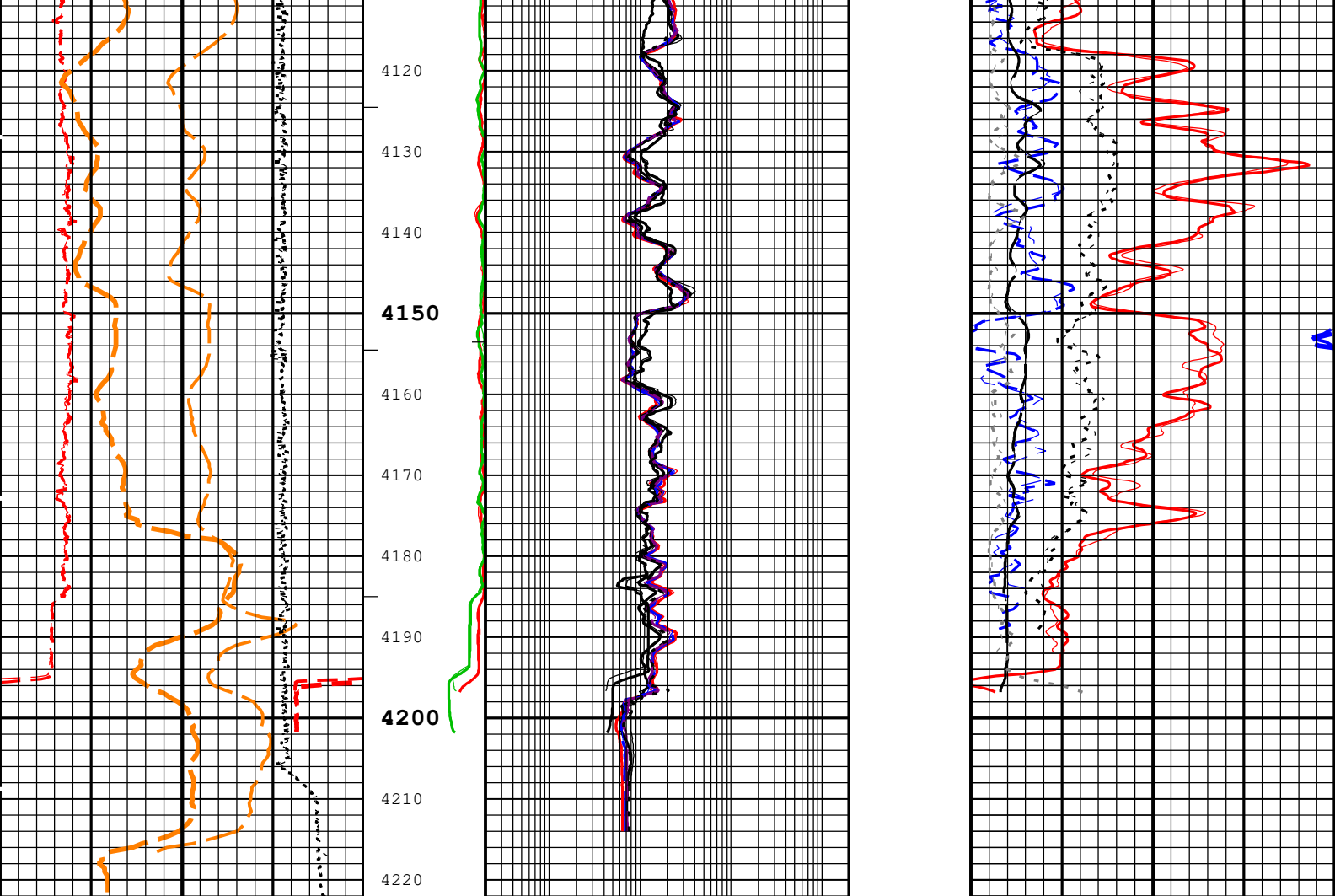
Log	Company:St. Croix Operating Inc.      Well:Armstrong #1 1A: Log[3]:Up:S005
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Description: Triple Combo standard resolution template for Platform Express    Format: Log ( TCOM 5in RA )    Index Scale: 5 in per 100 ft    Index Unit: ft  
Index Type: Measured Depth    Creation Date: 04-Nov-2019 19:44:15

TIME\_1900 - Time Marked every 60.00 (s)

			<div> <div> <div>ICV - Integrated Cement Volume every 10.00 (ft3)</div> <div>ICV - Integrated Cement Volume every 100.00 (ft3)</div> <div>IHV - Integrated Hole Volume every 10.00 (ft3)</div> <div>IHV - Integrated Hole Volume every 100.00 (ft3)</div> </div> </div>		
			<div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Array Induction Two Foot Resistivity A90 (AT90) AIT-M</div> <div>0.2ohm.m2000</div> </div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Array Induction Two Foot Resistivity A10 (AT10) AIT-M</div> <div>0.2ohm.m2000</div> </div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Array Induction Two Foot Resistivity A60 (AT60) AIT-M</div> <div>0.2ohm.m2000</div> </div> </div>		
			<div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Standard Resolution Formation Photoelectric Factor (PEFZ) HDRS-H</div> <div>010</div> </div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Density Standoff Correction (HDRA) HDRS-H</div> <div>-0.05g/cm30.45</div> </div> </div>		
			<div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Standard Resolution Density Porosity (DPHZ) HDRS-H</div> <div>0.3ft3/ft3-0.1</div> </div> </div>		
			<div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Thermal Neutron Porosity (Ratio Method) in Selected Lithology (TNPH) HGNS-H</div> <div>0.3ft3/ft3-0.1</div> </div> </div>		
			<div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Crossplot Porosity for Neutron-Density</div> </div> </div>		
			<div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Array Induction Two Foot Resistivity A20</div> </div> </div>		
			<div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Invaded Formation Resistivity filtered at 18 inches (RXOZ) HDRS-H</div> <div>0.2ohm.m2000</div> </div> </div>		
			<div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Standard Resolution Density Standoff (DSOZ) HDRS-H</div> <div>2.5in0</div> </div> </div>		
			<div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Caliper (HCAL) HDRS-H</div> <div>6in16</div> </div> </div>		
			<div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Spontaneous Potential (SP) AIT-M</div> <div>-80mV20</div> </div> </div>		
			<div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Resistivity Standoff Standard Resolution (RSOZ) HDRS-H</div> </div> </div>		





Main To Repeat Repeat To Main Caliper (HCAL) HDRS-H 6 in 16		Main To Repeat Repeat To Main Standard Resolution Density Standoff (DSOZ) HDRS-H 2.5 in 0	Main To Repeat Repeat To Main Array Induction Two Foot Resistivity A90 (AT90) AIT-M 0.2 ohm.m 2000	Main To Repeat Repeat To Main Standard Resolution Density Porosity (DPHZ) HDRS-H 0.3 ft3/ft3 -0.1
Main To Repeat Repeat To Main Spontaneous Potential (SP) AIT-M -80 mV 20		Main To Repeat Repeat To Main Resistivity Standoff Standard Resolution (RSOZ) HDRS-H 2.5 in 0	Main To Repeat Repeat To Main Array Induction Two Foot Resistivity A10 (AT10) AIT-M 0.2 ohm.m 2000	Main To Repeat Repeat To Main Thermal Neutron Porosity (Ratio Method) in Selected Lithology (TNPH) HGNS-H 0.3 ft3/ft3 -0.1
Main To Repeat Repeat To Main Cable Tension (TENS) 10000 lbf 0			Main To Repeat Repeat To Main Array Induction Two Foot Resistivity A60 (AT60) AIT-M 0.2 ohm.m 2000	Main To Repeat Repeat To Main Crossplot Porosity for Neutron-Density (PXND_HILT) 0.3 ft3/ft3 -0.1
			Main To Repeat Repeat To Main Array Induction Two Foot Resistivity A30 (AT30) AIT-M 0.2 ohm.m 2000	Main To Repeat Repeat To Main Standard Resolution Formation Photoelectric Factor (PEF7) HDRS-H 0.3 ft3/ft3 -0.1

(FLIZ) HDRS-H
0 10
Main To Repeat
Repeat To Main
Density Standoff Correction (HDRA) HDRS-H
-0.05 g/cm3 0.45

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Sonde Error Correction Real - 0	mS/m	Master	-----	-231.000	-83.167	119.000	
Sonde Error Correction Quad - 0		Master	-----	-2250.000	-316.754	2250.000	
Sonde Error Correction Real - 1	mS/m	Master	-----	114.000	167.806	204.000	
Sonde Error Correction Quad - 1		Master	-----	-625.000	110.009	625.000	
Sonde Error Correction Real - 2	mS/m	Master	-----	66.000	107.589	156.000	
Sonde Error Correction Quad - 2		Master	-----	-350.000	-82.171	350.000	

Sonde Error Correction Real - 3	mS/m	Master	-----	39.000	58.227	89.000	
Sonde Error Correction Quad - 3		Master	-----	-250.000	20.054	250.000	
Sonde Error Correction Real - 4	mS/m	Master	-----	15.000	25.302	35.000	
Sonde Error Correction Quad - 4		Master	-----	-63.000	7.066	63.000	
Sonde Error Correction Real - 5	mS/m	Master	-----	4.000	11.986	24.000	
Sonde Error Correction Quad - 5		Master	-----	-50.000	10.548	50.000	
Sonde Error Correction Real - 6	mS/m	Master	-----	5.000	9.775	15.000	
Sonde Error Correction Quad - 6		Master	-----	-30.000	-2.755	30.000	
Sonde Error Correction Real - 7	mS/m	Master	-----	-5.000	-1.574	5.000	
Sonde Error Correction Quad - 7		Master	-----	-30.000	-10.719	30.000	

## AIT Mud Calibration - Mud Calibration Gain

Master (EEPROM): 19:35:50 21-Jan-2019

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Coarse Gain		Master	1.000	0.800	0.815	1.200	
Fine Gain		Master	1.000	0.800	0.815	1.200	

## AIT Electronics Check - Thru Calibration Check

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Master (EEPROM):	19:35:50 21-Jan-2019	Before (Measured):	11:21:52 04-Nov-2018
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Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	<div><div></div><div></div></div>
Thru Cal Mag - 0	V	Master	----	0.366	0.622	0.854	<div><div></div><div></div><div></div></div>
		Before	----	0.366	0.622	0.854	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	0.000	----	<div><div></div><div></div><div></div></div>
Thru Cal Phase - 0	deg	Master	----	137.000	-174.143	-103.000	<div><div></div><div></div><div></div></div>
		Before	----	137.000	-174.306	-103.000	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	-0.163	----	<div><div></div><div></div><div></div></div>
Thru Cal Mag - 1	V	Master	----	0.762	1.276	1.778	<div><div></div><div></div><div></div></div>
		Before	----	0.762	1.276	1.778	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	0.000	----	<div><div></div><div></div><div></div></div>
Thru Cal Phase - 1	deg	Master	----	136.000	-175.242	-104.000	<div><div></div><div></div><div></div></div>
		Before	----	136.000	-175.407	-104.000	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	-0.165	----	<div><div></div><div></div><div></div></div>
Thru Cal Mag - 2	V	Master	----	0.372	0.632	0.868	<div><div></div><div></div><div></div></div>
		Before	----	0.372	0.632	0.868	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	0.000	----	<div><div></div><div></div><div></div></div>
Thru Cal Phase - 2	deg	Master	----	132.000	-178.822	-108.000	<div><div></div><div></div><div></div></div>
		Before	----	132.000	-178.989	-108.000	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	-0.167	----	<div><div></div><div></div><div></div></div>
Thru Cal Mag - 3	V	Master	----	0.420	0.715	0.980	<div><div></div><div></div><div></div></div>
		Before	----	0.420	0.715	0.980	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	0.000	----	<div><div></div><div></div><div></div></div>
Thru Cal Phase - 3	deg	Master	----	131.000	-179.595	-109.000	<div><div></div><div></div><div></div></div>
		Before	----	131.000	-179.762	-109.000	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	-0.167	----	<div><div></div><div></div><div></div></div>
Thru Cal Mag - 4	V	Master	----	0.804	1.338	1.876	<div><div></div><div></div><div></div></div>
		Before	----	0.804	1.339	1.876	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	0.001	----	<div><div></div><div></div><div></div></div>
Thru Cal Phase - 4	deg	Master	----	125.000	174.179	-115.000	<div><div></div><div></div><div></div></div>
		Before	----	125.000	174.007	-115.000	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	-0.172	----	<div><div></div><div></div><div></div></div>
Thru Cal Mag - 5	V	Master	----	1.176	1.945	2.744	<div><div></div><div></div><div></div></div>
		Before	----	1.176	1.946	2.744	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	0.001	----	<div><div></div><div></div><div></div></div>
Thru Cal Phase - 5	deg	Master	----	122.000	172.534	-118.000	<div><div></div><div></div><div></div></div>
		Before	----	122.000	172.358	-118.000	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	-0.176	----	<div><div></div><div></div><div></div></div>
Thru Cal Mag - 6	V	Master	----	1.176	1.942	2.744	<div><div></div><div></div><div></div></div>
		Before	----	1.176	1.943	2.744	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	0.001	----	<div><div></div><div></div><div></div></div>
Thru Cal Phase - 6	deg	Master	----	121.000	172.576	-119.000	<div><div></div><div></div><div></div></div>
		Before	----	121.000	172.403	-119.000	<div><div></div><div></div><div></div></div>
		Before-Master	----	----	-0.173	----	<div><div></div><div></div><div></div></div>
Thru Cal Mag - 7	V	Master	----	0.846	1.396	1.974	<div><div></div><div></div><div></div></div>
		Before	----	0.846	1.396	1.974	<div><div></div><div></div><div></div></div>

		Before	-----	0.040	1.390	1.374	<div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-----	0.000	-----	<div><div></div><div></div><div></div><div></div><div></div></div>
Thru Cal Phase - 7	deg	Master	-----	115.000	171.775	-125.000	<div><div></div><div></div><div></div><div></div><div></div></div>
		Before	-----	115.000	171.597	-125.000	<div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-----	-0.178	-----	<div><div></div><div></div><div></div><div></div><div></div></div>
SPA Zero	mV	Master		-50.000	-0.117	50.000	<div><div></div><div></div><div></div><div></div><div></div></div>
		Before		-50.000	-0.106	50.000	<div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-----	0.011	-----	<div><div></div><div></div><div></div><div></div><div></div></div>
SPA Plus	mV	Master		941.000	990.569	1040.000	<div><div></div><div></div><div></div><div></div><div></div></div>
		Before		941.000	990.770	1040.000	<div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-----	0.201	-----	<div><div></div><div></div><div></div><div></div><div></div></div>
Temperature Zero	V	Master		-0.050	0.000	0.050	<div><div></div><div></div><div></div><div></div><div></div></div>
		Before		-0.050	0.000	0.050	<div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-----	0.000	-----	<div><div></div><div></div><div></div><div></div><div></div></div>
Temperature Plus	V	Master		0.870	0.918	0.960	<div><div></div><div></div><div></div><div></div><div></div></div>
		Before		0.870	0.918	0.960	<div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-----	0.000	-----	<div><div></div><div></div><div></div><div></div><div></div></div>

## HDRS-H (HILT Density and Rxo Sonde, 150 degC) Calibration - Run 1A

Primary Equipment :						
	HILT High-Resolution Control Cartridge, 150 degC	HRCC-H				
	HILT Resistivity Gamma-Ray Density Device, 150 degC	HRGD-H			3921	
Auxiliary Equipment :						
	HRDD Backscatter Detector	Backscatter				
	HRDD Long Spacing Detector	Long Spacing				
	HRDD Short Spacing Detector	Short Spacing			27732	
	Cesium 137 Gamma-Ray Logging Source	GSR-J			5259	
	HILT High-Resolution Control Cartridge, 150 degC	HRCC-H				
	HILT High-Resolution Mechanical Sonde, 150 degC	HRMS-H				
Calibration Parameter :						
	Small Ring Size (Caliper Calibration Small Ring)	8.00				
	Large Ring Size (Caliper Calibration Large Ring)	12.00				

## HDRS Caliper Calibration - Caliper Accumulations

Before (Measured):		11:23:51 04-Nov-2019					
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	<div><div></div><div></div><div></div><div></div><div></div></div>
Small Ring	in	Before	8.00	6.00	7.17	10.00	<div><div></div><div></div><div></div><div></div><div></div></div>
Large Ring	in	Before	12.00	9.00	11.62	15.00	<div><div></div><div></div><div></div><div></div><div></div></div>

## HDRS Density Calibration - Inversion Results

Master (EEPROM):		09:36:00 22-Oct-2019					
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	<div><div></div><div></div><div></div><div></div><div></div></div>
Rho Aluminum	g/cm3	Master	2.596	2.586	2.595	2.606	<div><div></div><div></div><div></div><div></div><div></div></div>
Rho Magnesium	g/cm3	Master	1.686	1.676	1.690	1.696	<div><div></div><div></div><div></div><div></div><div></div></div>
Pe Aluminum		Master	2.570	2.470	2.544	2.670	<div><div></div><div></div><div></div><div></div><div></div></div>
Pe Magnesium		Master	2.650	2.550	2.625	2.750	<div><div></div><div></div><div></div><div></div><div></div></div>

## HDRS Density Calibration - Deviation Summary

Master (EEPROM):		09:36:00 22-Oct-2019					
Before (Measured):		11:27:50 04-Nov-2019					
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	<div><div></div><div></div><div></div><div></div><div></div></div>
BS Average Deviation	%	Master	0	-0.6000	0.3618	0.6000	<div><div></div><div></div><div></div><div></div><div></div></div>
BS Max Deviation	%	Master	0	-1.6000	0.8744	1.6000	<div><div></div><div></div><div></div><div></div><div></div></div>
SS Average Deviation	%	Master	0	-1.0000	0.3871	1.0000	<div><div></div><div></div><div></div><div></div><div></div></div>
SS Max Deviation	%	Master	0	-2.5000	0.9585	2.5000	<div><div></div><div></div><div></div><div></div><div></div></div>
LS Average Deviation	%	Master	0	-1.5000	0.7221	1.5000	<div><div></div><div></div><div></div><div></div><div></div></div>
LS Max Deviation	%	Master	0	-3.5000	1.3355	3.5000	<div><div></div><div></div><div></div><div></div><div></div></div>

## HDRS Density Calibration - Background Summary

Master (EEPROM):		09:36:00 22-Oct-2019		Before (Measured):		11:27:50 04-Nov-2019	
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	<div><div></div><div></div><div></div><div></div><div></div></div>

BS Window Ratio		Master Before Before-Master	1.0000 0.7392 -----	0.7022 -----	0.7392 0.7388 -0.0004	0.7761 -----	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
BS Window Sum	1/s	Master Before Before-Master	1 23388 -----	22219 -----	23388 23349 -39	24558 -----	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
SS Window Ratio		Master Before Before-Master	1.0000 0.4828 -----	0.4586 -----	0.4828 0.4825 -0.0003	0.5069 -----	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
SS Window Sum	1/s	Master Before Before-Master	1 11224 -----	10663 -----	11224 11218 -6	11785 -----	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
LS Window Ratio		Master Before Before-Master	1.0000 0.3011 -----	0.2860 -----	0.3011 0.3022 0.0011	0.3161 -----	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
LS Window Sum	1/s	Master Before Before-Master	1 1184 -----	1125 -----	1184 1181 -3	1244 -----	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

### HDRS Density Calibration - Photo-multiplier High Voltages

Master (EEPROM): 09:36:00 22-Oct-2019		Before (Measured):		11:27:50 04-Nov-2019			
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
BS PM High Voltage	V	Master		1000.0	1378.8	2400.0	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before		1000.0	1381.3	2400.0	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-100.0	2.5	100.0	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
SS PM High Voltage	V	Master		1000.0	1523.9	2400.0	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before		1000.0	1524.4	2400.0	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-100.0	0.5	100.0	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
LS PM High Voltage	V	Master		1000.0	1352.6	2400.0	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before		1000.0	1348.9	2400.0	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-100.0	-3.7	100.0	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

### HDRS Density Calibration - Crystal Quality Resolutions

Master (EEPROM): 09:36:00 22-Oct-2019		Before (Measured):		11:27:50 04-Nov-2019			
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
BS Crystal Resolution	%	Master		5.00	12.34	25.00	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before		5.00	12.40	25.00	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-1.00	0.06	1.00	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
SS Crystal Resolution	%	Master		5.00	9.95	20.00	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before		5.00	9.84	20.00	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-1.00	-0.11	1.00	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
LS Crystal Resolution	%	Master		5.00	8.64	20.00	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before		5.00	8.59	20.00	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
		Before-Master	-----	-1.00	-0.05	1.00	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

### HDRS MCFL Calibration - MCFL Accumulations

Before (Measured): 17:47:43 04-Nov-2019							
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
Main Resistivity	ohm.m	Before	3875	3565	3903	4185	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
Deep Resistivity	ohm.m	Before	3830	3524	3829	4136	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
Shallow Resistivity	ohm.m	Before	3830	3524	3851	4136	<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

### HGNS-H (HILT Gamma-Ray and Neutron Sonde, 150 degC) Calibration - Run 1A

Primary Equipment :						
	HILT Gamma-Ray and Neutron Sonde, 150 degC		HGNS-H			
Auxiliary Equipment :						
	HGNS Accelerometer, 150 degC		HACCZ-H		1537	
	AmBe Neutron Logging Source		NSR-F		5203	
Calibration Parameter :						
	Water Temperature					



## HGNS Accelerometer Calibration - Accelerometer Accumulations

Before (Measured): 17:46:34 04-Nov-2019

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
AZ Vertical Measurement	ft/s2	Before	32.2	31.5	31.5	32.8	

## HGNS Accelerometer EEPROM - Accelerometer EEPROM Read

Master (EEPROM): 17:00:00 14-Mar-2002

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Accelerometer Manufacturer		Master			QAT_160		
Accelerometer Reference Temperature	degF	Master		30.2	77.0	122.0	
Accelerometer Coefficients - 0		Master	-----	-----	-530.200	-----	
Accelerometer Coefficients - 1		Master	-----	-----	-13.059	-----	
Accelerometer Coefficients - 2		Master	-----	-----	-0.001	-----	
Accelerometer Coefficients - 3		Master	-----	-----	0.000	-----	
Accelerometer Coefficients - 4		Master	-----	-----	2.721	-----	
Accelerometer Coefficients - 5		Master	-----	-----	0.000	-----	
Accelerometer Coefficients - 6		Master	-----	-----	0.000	-----	
Accelerometer Coefficients - 7		Master	-----	-----	0.000	-----	
Accelerometer Coefficients - 8		Master	-----	-----	298.900	-----	
Accelerometer Coefficients - 9		Master	-----	-----	1.007	-----	

## HGNS Neutron Calibration - HGNS Neutron Accumulations

Master (EEPROM): 15:28:16 06-Aug-2019 Expired by 1 days Before (Measured): 11:28:26 04-Nov-2019

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Near Zero Measurement	1/s	Master	0	5.0	27.8	40.0	
		Before	0	5.0	28.3	40.0	
		Before-Master	-----	-4.2	0.5	4.2	
Far Zero Measurement	1/s	Master	0	5.0	29.7	40.0	
		Before	0	5.0	28.0	40.0	
		Before-Master	-----	-4.5	-1.7	4.5	
Near Plus Measurement	1/s	Master	6031.0	4700.0	5270.0	6900.0	
		Before	-----	-----	-----	-----	
		Before-Master	-----	-----	-----	-----	
Far Plus Measurement	1/s	Master	2793.0	1900.0	2280.0	2900.0	
		Before	-----	-----	-----	-----	
		Before-Master	-----	-----	-----	-----	
Near Corrected Plus Measurement	1/s	Master		4700.0	5237.0	6900.0	
		Before	-----	-----	-----	-----	
		Before-Master	-----	-----	-----	-----	
Far Corrected Plus Measurement	1/s	Master		1900.0	2247.0	2900.0	
		Before	-----	-----	-----	-----	
		Before-Master	-----	-----	-----	-----	

## HGNS Gamma-Ray Calibration - Gamma-Ray Accumulations

Before (Measured): 11:44:59 04-Nov-2019

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
RGR Zero Measurement	gAPI	Before	30.0	0	91.7	120.0	
RGR Plus Measurement	gAPI	Before	174.2	147.6	154.0	193.8	
GR Calibration Gain		Before	0.89	0.80	1.01	1.05	

Company:	St. Croix Operating Inc.	<b>Schlumberger</b>
Well:	Armstrong #1	
Field:	Wildcat	
County:	Washington	
Operator:	St. Croix Operating Inc.	

TCOM

1A

Main Pass 1" = 100'

Integration Summary				
Output Channel(s)	Output Description	Input Parameter	Output Value	Unit
IHV	Integrated Hole Volume	GCSE_UP_PASS	468	ft3
ICV	Integrated Cement Volume	GCSE_UP_PASS, FCD	234.4	ft3

Pass Summary									
Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
1A	Log[3]:Up	Up	48.97 ft	4216.96 ft	04-Nov-2019 6:15:38 PM	04-Nov-2019 7:27:40 PM	ON	1.50 ft	No

All depths are referenced to toolstring zero

Log	Company:St. Croix Operating Inc. Well:Armstrong #1 1A: Log[3]:Up:S005
-----	--

Description: Triple Combo standard resolution template for Platform Express    Format: Log ( TCOM 1in )    Index Scale: 1 in per 100 ft    Index Unit: ft    Index Type: Measured Depth    Creation Date: 04-Nov-2019 19:44:22

Channel	Source	Sampling
AT10	AIT-M:AMIS:AMIS	3in
AT20	AIT-M:AMIS:AMIS	3in
AT30	AIT-M:AMIS:AMIS	3in
AT60	AIT-M:AMIS:AMIS	3in
AT90	AIT-M:AMIS:AMIS	3in
CALI	HDRS-H:HRCC-H:HRCC-H	1in
DPHZ	HDRS-H:HRMS-H:HRGD-H	2in
DSOZ	HDRS-H:HRMS-H:HRGD-H	2in
GR_CAL	HGNS-H:HGNS-H:HGNS-H	6in
HDRA	HDRS-H:HRMS-H:HRGD-H	2in
ICV	Borehole	6in - RT
IHV	Borehole	6in - RT
PEFZ	HDRS-H:HRMS-H:HRGD-H	2in
PXND	PEQL	6in
RSOZ	HDRS-H:HRMS-H:HRGD-H	2in
RXOZ	HDRS-H:HRMS-H:HRGD-H	2in
SP	AIT-M:AMIS:AMIS	6in
TENS	WLWorkflow	1in
TIME_1900	WLWorkflow	0.1in
TNPH	HGNS-H:HGNS-H:HGNS-H	6in

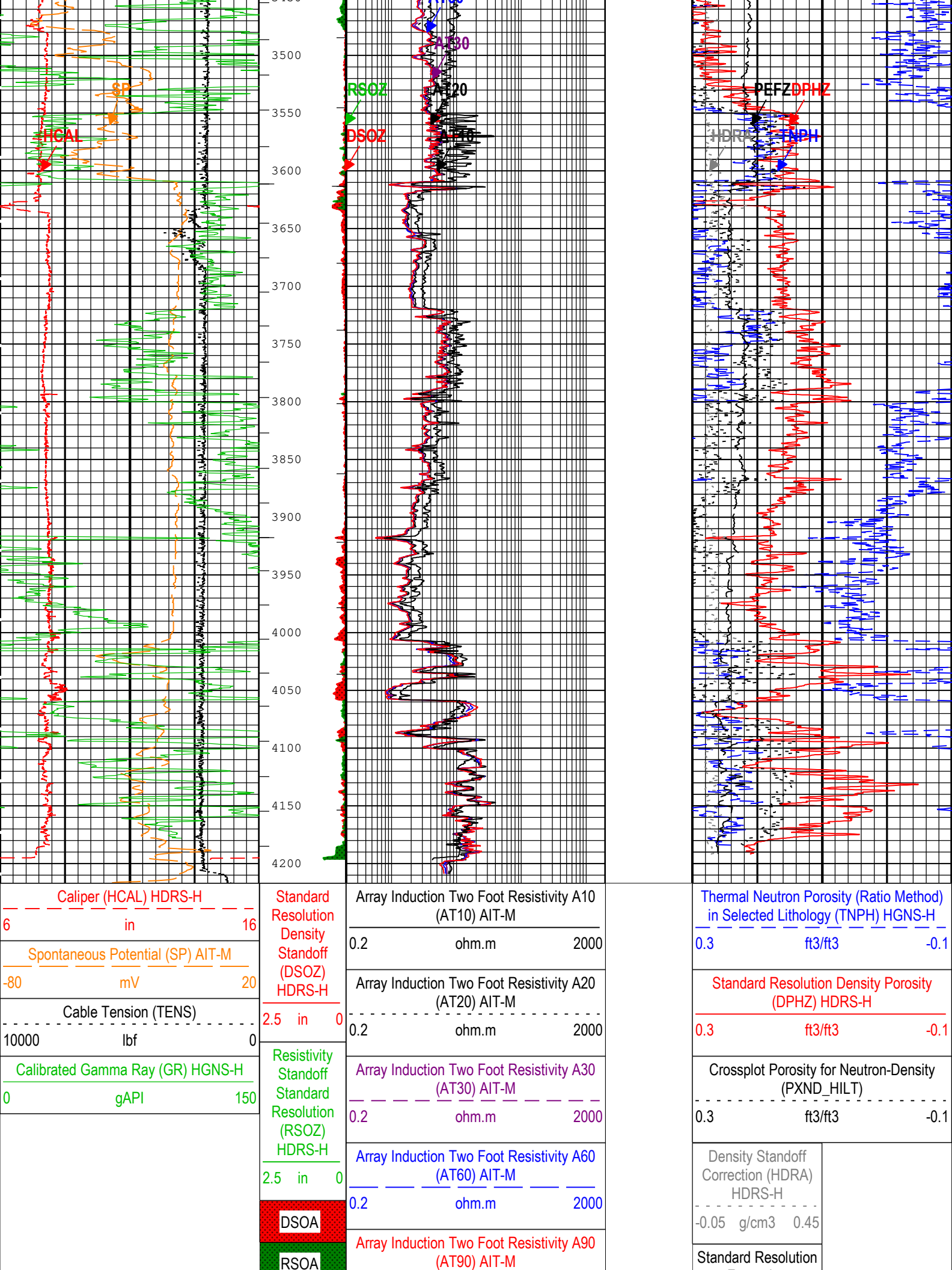
TIME_1900 - Time Marked every 60.00 (s)	— IHV - Integrated Hole Volume every 100.00 (ft3)
	— ICV - Integrated Cement Volume every 10.00 (ft3)
	— ICV - Integrated Cement Volume every 100.00 (ft3)
	— IHV - Integrated Hole Volume every 10.00 (ft3)

			Array Induction Two Foot Resistivity A10 (AT10) AIT-M			Density Standoff Correction (HDRA) HDRS-H		
			0.2 ohm.m 2000			-0.05 g/cm3 0.45		
			Array Induction Two Foot Resistivity A20 (AT20) AIT-M			Standard Resolution Formation Photoelectric Factor (PEFZ) HDRS-H		
			0.2 ohm.m 2000			0 10		
			Array Induction Two Foot Resistivity A30 (AT30) AIT-M			Thermal Neutron Porosity (Ratio Method) in Selected Lithology (TNPH) HGNS-H		
			0.2 ohm.m 2000			0.3 ft3/ft3 -0.1		
			Array Induction Two Foot Resistivity A60 (AT60) AIT-M			Standard Resolution Density Porosity (DPHZ) HDRS-H		
			0.2 ohm.m 2000			0.3 ft3/ft3 -0.1		
			Array Induction Two Foot Resistivity A90 (AT90) AIT-M			Crossplot Porosity for Neutron-Density (PXND_HILT)		
			0.2 ohm.m 2000			0.3 ft3/ft3 -0.1		
			Invaded Formation Resistivity filtered at 18 inches (RXOZ) HDRS-H					
			0.2 ohm.m 2000					
Caliper (HCAL) HDRS-H			Resistivity Standoff Standard Resolution (RSOZ) HDRS-H					
6 in 16			2.5 in 0					
Spontaneous Potential (SP) AIT-M			DSOA					
-80 mV 20			RSOA					
Cable Tension (TENS)								
10000 lbf 0								
Calibrated Gamma Ray (GR) HGNS-H								
0 gAPI 150								

The log plot displays the following tracks from left to right:

- Caliper (HCAL) HDRS-H:** Red line, scale 6 to 16 inches.
- Spontaneous Potential (SP) AIT-M:** Orange line, scale -80 to 20 mV.
- Cable Tension (TENS):** Black line, scale 10000 to 0 lbf.
- Calibrated Gamma Ray (GR) HGNS-H:** Green line, scale 0 to 150 gAPI.
- DSOA:** Red checkered bar.
- RSOA:** Green bar.
- Invaded Formation Resistivity filtered at 18 inches (RXOZ) HDRS-H:** Black line.
- RXOZ:** Black line.
- Crossplot Porosity for Neutron-Density (PXND\_HILT):** Red and blue lines, scale 0.3 to -0.1 ft3/ft3.

Depth markers are provided on the left side of the plot, ranging from 2800 to 3450 feet.





0.2	ohm.m	2000
Invaded Formation Resistivity filtered at 18 inches (RXOZ) HDRS-H		
0.2	ohm.m	2000

Formation	
Photoelectric Factor (PEFZ) HDRS-H	
0	10

|— IHV - Integrated Hole Volume every 10.00 (ft3)

—| ICV - Integrated Cement Volume every 100.00 (ft3)

—| ICV - Integrated Cement Volume every 10.00 (ft3)

TIME\_1900 - Time Marked every 60.00 (s)

|— IHV - Integrated Hole Volume every 100.00 (ft3)

Description: Triple Combo standard resolution template for Platform Express    Format: Log ( TCOM 1in )    Index Scale: 1 in per 100 ft    Index Unit: ft    Index Type: Measured Depth    Creation Date: 04-Nov-2019 19:44:22