Geomechanical Properties Advisor / 3D TIV MechPro Processing

Schlumberger

Geomechanical Properties Advisor

3D TIV MechPro Processing

Trip 5

COMPANY:	DCP Midstream LP
WELL:	Zia AGI D2
FIELD:	AGI Devonian Exploration
COUNTY:	Lea
STATE:	New Mexico
COUNTRY:	USA

API:30-025-42207

Location: Field: 1893' FSL & 950' FWL
Section: 19 Township: T19S Abstract: R32S

Section:19 Township:T19S Range:R32S

Other Services:

Permanent Datum:GL
Log Measured From:KB
Drilling Measured from:KB

Elevation:3547
27ft above the permanent

Elevations:
K.B. 3574 ft
D.F. 3573 ft
G.L. 3547 ft

Date	29-Nov-2016	
Depth Driller	13622 ft	
Depth Logger (Schl)	13637 ft	
Btm. Log Interval	13637 ft	
Top Log Interval	4702 ft	
Casing-Driller	9.625 in @ 4696 ft	
Casing-Logger	4702 ft	
Bit Size	8.75 in	
Type Fluid in Hole		
Dens. | Visc.	10 lbm/gal | 41 s	
pH | Fluid loss	10 | 9 in3	
Source of Sample	Active Tank	
	72 degF	
Rmf @ Meas.Temp.	0.08 ohm.m @ 72 degF	
Rmc @ Meas.Temp.	-999.25 ohm.m @ 68 degF	
Source: Rmf | Rmc	|	
	0.0347157 @ 174.75 degF	
Circulation Stopped	00:00:00	
Logger on Bottom	04:30:00	
Max Rec.Temp.	174.75 deg F	
Equipment | Location	9105 |Midland, TX	
Recorded by:	Danielle Krebs	

FOLD HERE

The well name, location and borehole reference data were furnished by the customer

DS Job #:DS-2016-33049 | DS Software:Techlog 2015.3 | Process Date: 1/11/2017 | PTS Center: Midland | Log Analyst: Jermaine Packer

Processing Parameters:

GENERAL - Parameters are assumed to be Default Parameters unless otherwise noted

BOREHOLE FLUID: (DTmud = 179-181 us/ft)
HOLE DIAMETER: 8.75 in
BOTTOM HOLE TEMPERATURE: 174.75

MECHPRO PARAMETERS:

Dynamic-Static YME corelation used = Modified Morales
Pore Pressure Gradient: 0.5 psi/ft
Overburden = 1.05psi/ft
UCS=Coates-denoo
Alpha =1

TRACK

Track 1: Gamma Ray
GR - standard gamma ray
BS- bit size
HD1-PPC1- Hole diameter 1 from powered positioning caliper 1
HD1-PPC2-Hole diameter 1 from powered positioning caliper 2
Mudcake area shading - indicates caliper < bit size
Washout area shading - Indicates caliper > bit size

Track 2: Depth
Depth numbers - depth scale
MinEne - overall minimum cross energy
MaxEne - overall maximum cross energy
OffEne area shading - indicates the difference betwenn MinEne and MaxEne
SLOANI- Slowness Anisotropy-Azimuthal

Track 3: Porosity
TNPH - neutron porosity
SPHI - sonic porosity

Track 7: Porosity
Aniso_Class- Anisotropic Classification (Blue- TIV, Red-TTH, White- Isotropic)

Track 8: UCS, Tensile and Compressive Strength
UCS, Tensile, and compressive strength are calculated using emperical equations and are best when calibrated to core

Track 8: Poisson's Ratio
PR_VERT_SSA_DYN - dynamic vertical Poisson's ratio from anisotropic model
PR_HORIZ_SSA_FSA_DYN - dynamic horizontal Poisson's ratio from anisotropic model
YME_VERT_DYN - dynamic vertical Young's moduls from anisotropic model
YME_HORIZ_SSA_DYN- dynamic horizontal Young's moduls from anisotropic model

Track 9: Young's Modulus
YME_HORIZ_SSA_STA - static vertical Young's moduls from anisotropic model
YME_VERT_STA- static horizontal Young's moduls from anisotropic model

RHOB - bulk density
N-D Crossover area shading - indicates NPH < DPH

Track 4: Resitivities

Track 3: Porosity
DTSM_SLOW-Slow Shear Slowness
DTSM_FAST-Fast Shear Slowness
DTCO-Compressional Slowness
STRVP_DTS-Shear based from stoneley wave

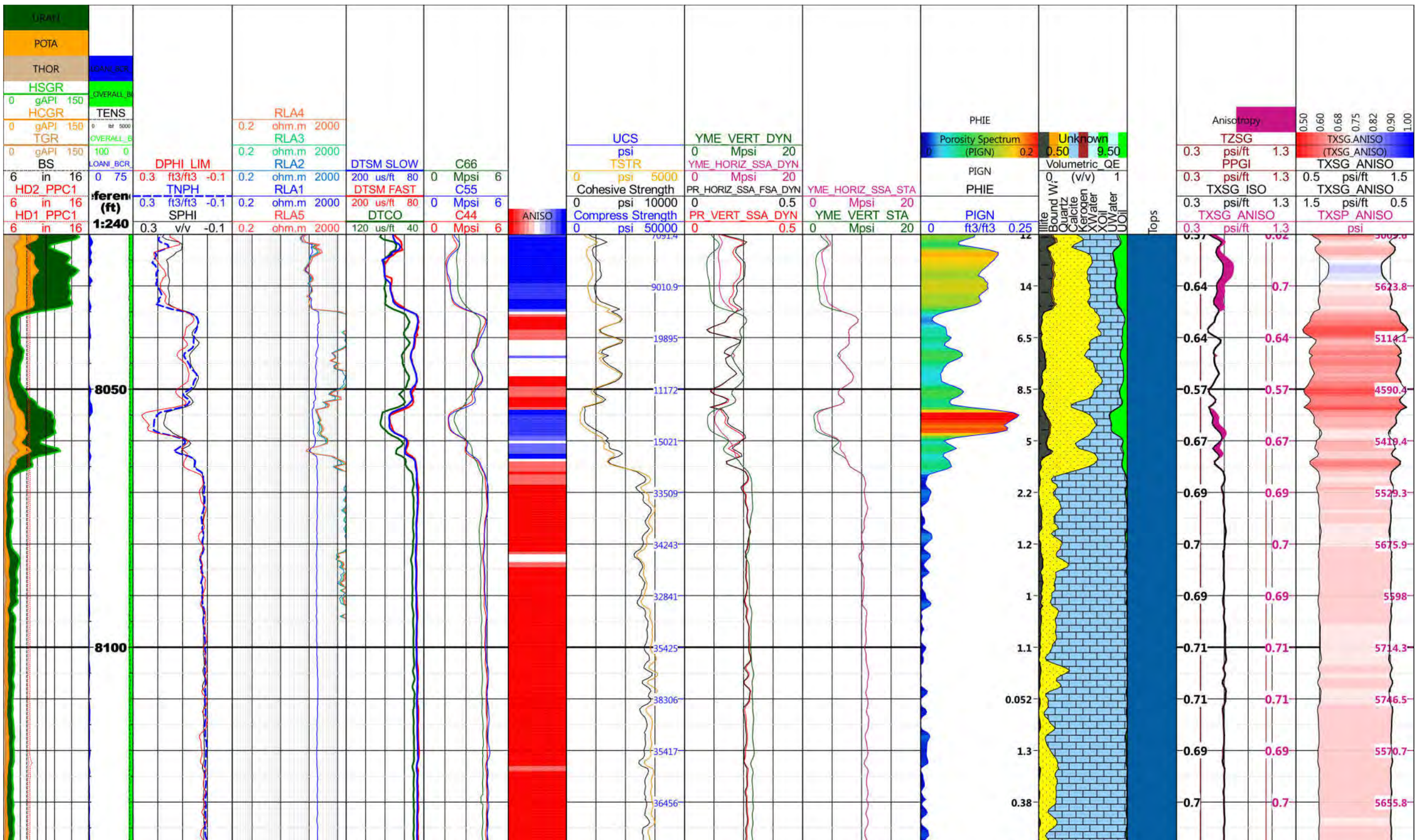
Track 6 Thomsen's Gamma/Stiffness Cofficients
C44-Vertically Polarized Shear modulus in the fast direction
C55- Vertically Polarized Shear modulus in the slow direction
C66-Horizontally polarized shear modulus

Track 10 : Porosity
PIGN-Effective Porosity

Track 11 : ELAN

Track 12 : Closures
TXSG_ANISO - VTI minimum horizontal stress gradient from anisotropic model
TXSG_ISO - minimum horizontal stress gradient from isotropic model
PPGI- pore pressure gradient
TZSG - overburden gradient/vericalsStress

Track 11 : 3D TIV Closure Gradient
TXSG_ANISO Color Bar - color map indicating low stress (red) and high stress (blue)
TXSP-Minimum horizontal stress psi



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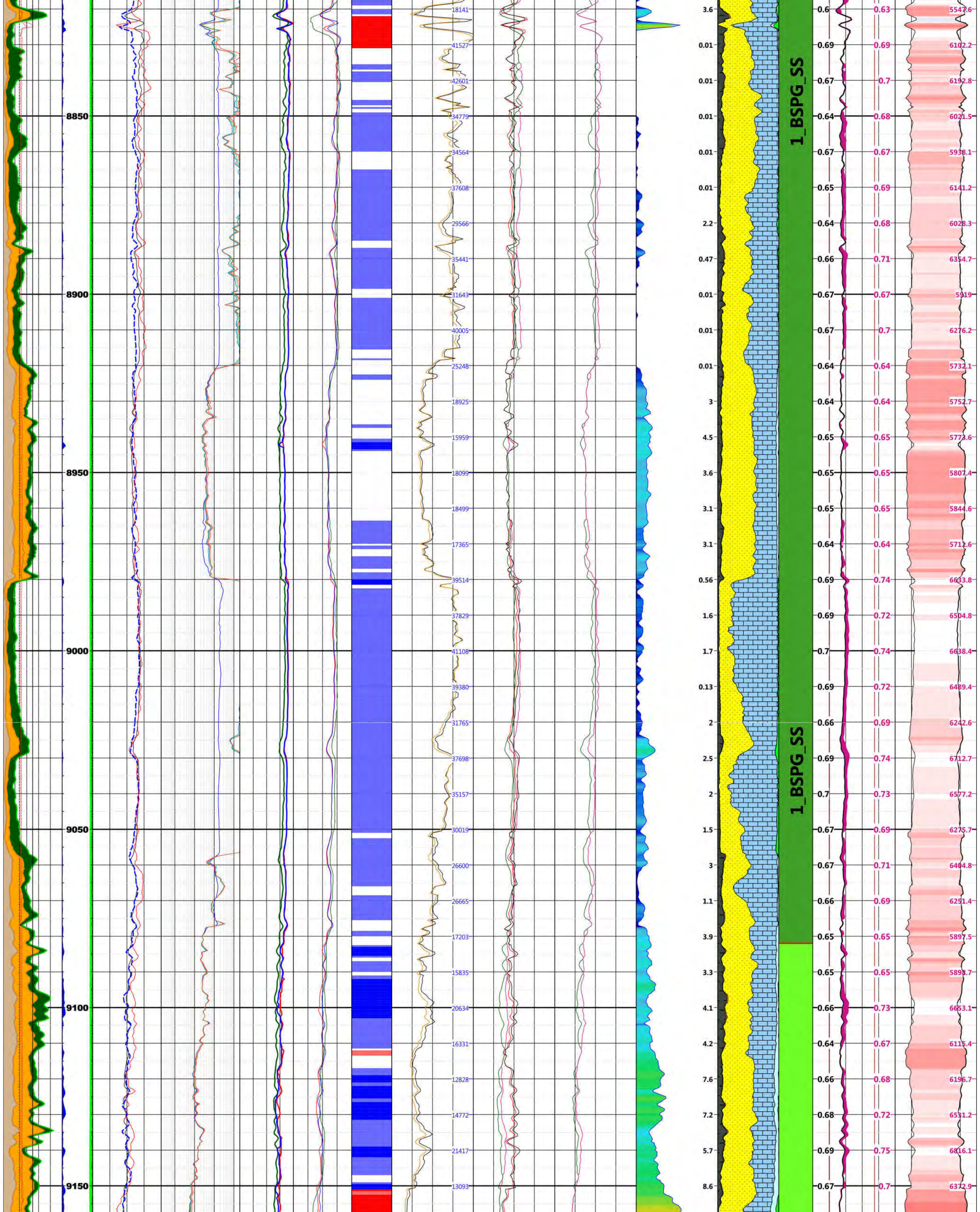

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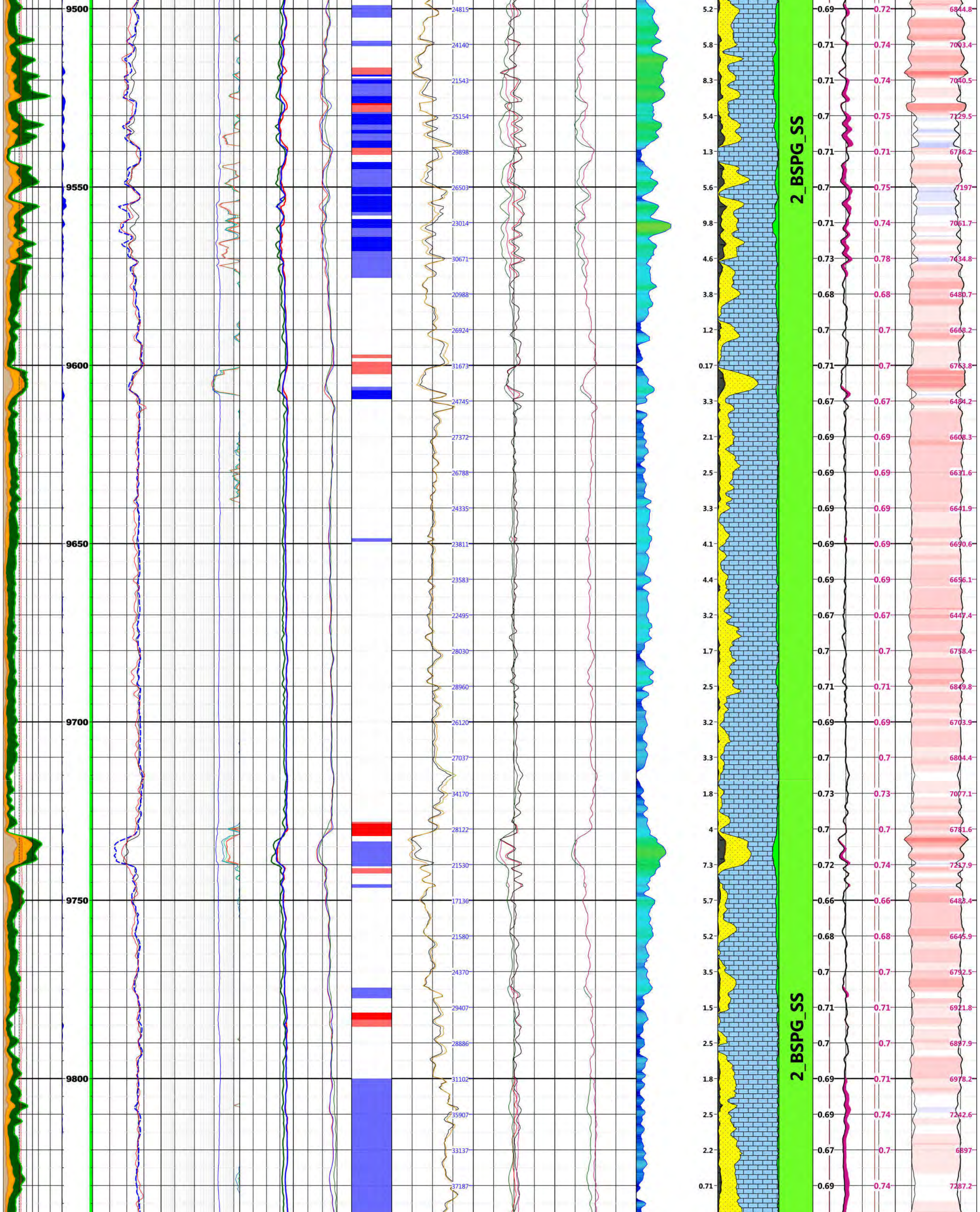
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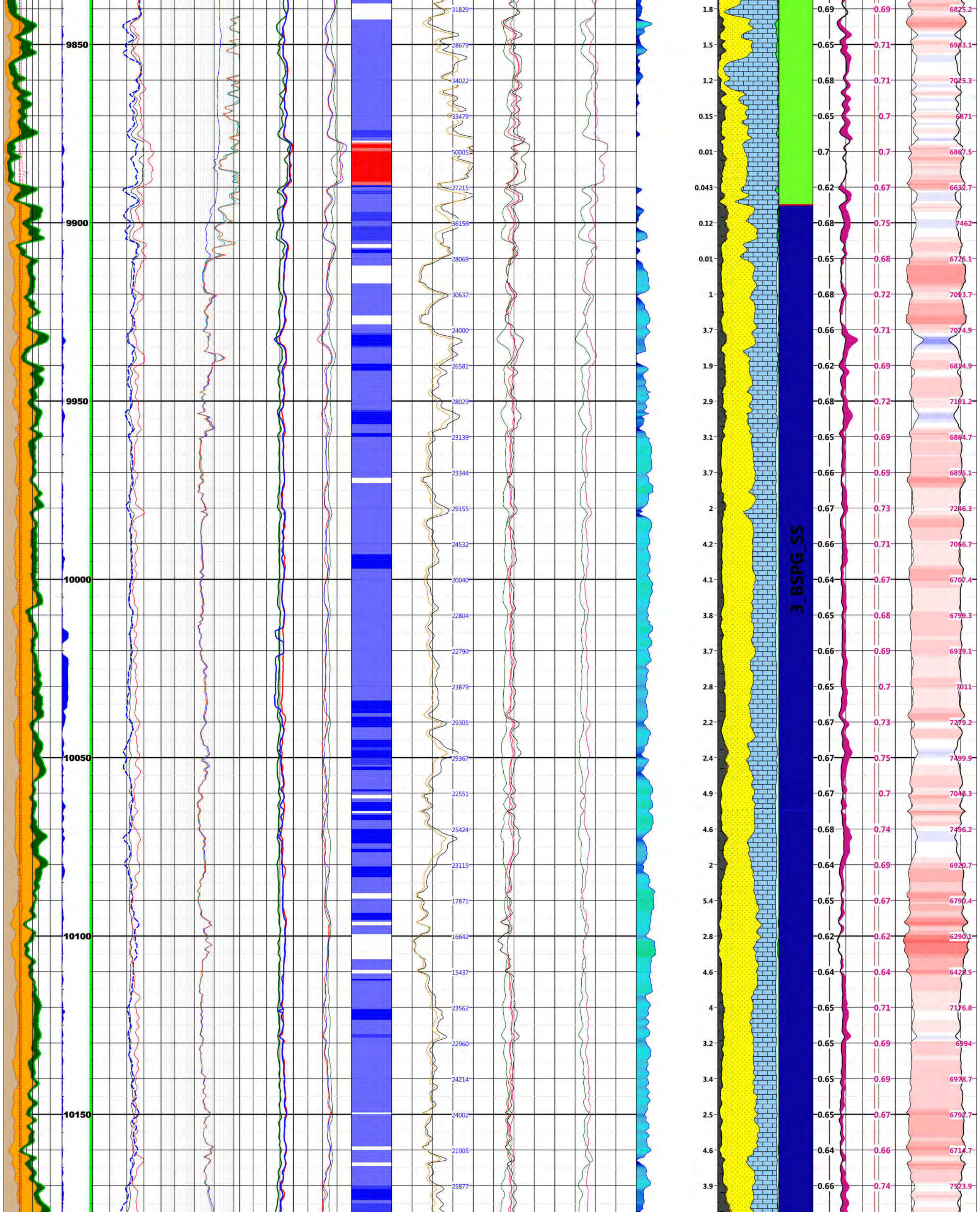
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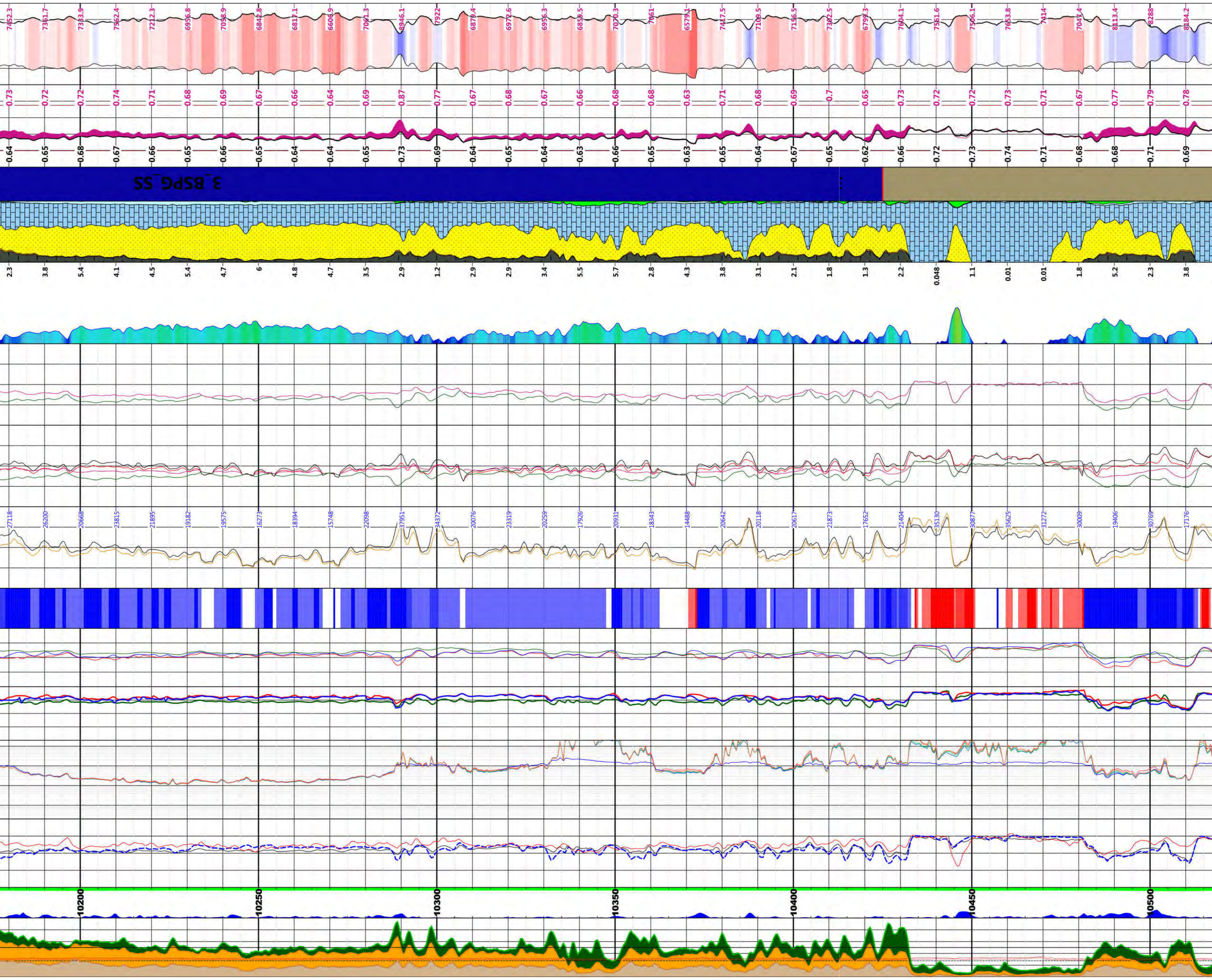
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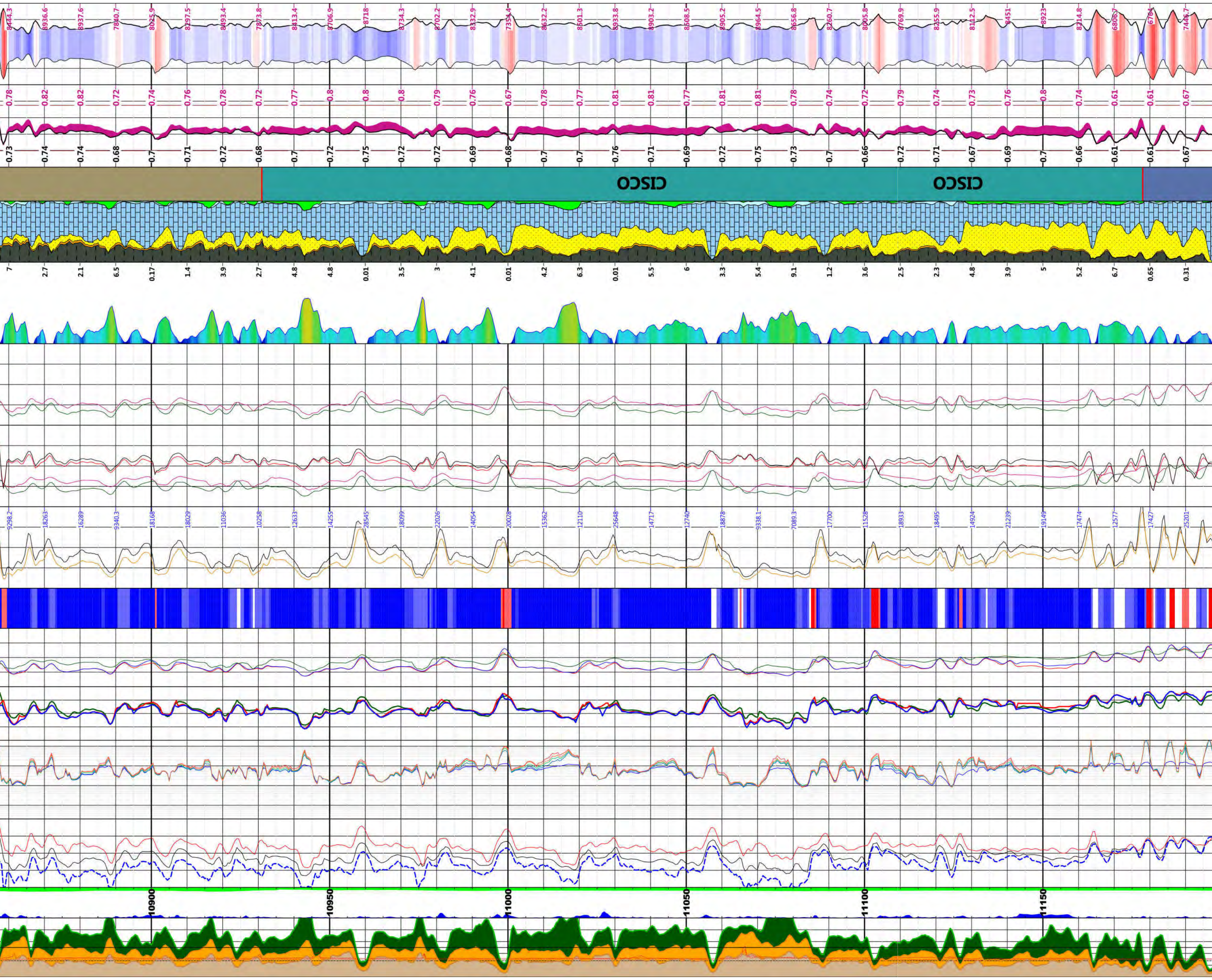
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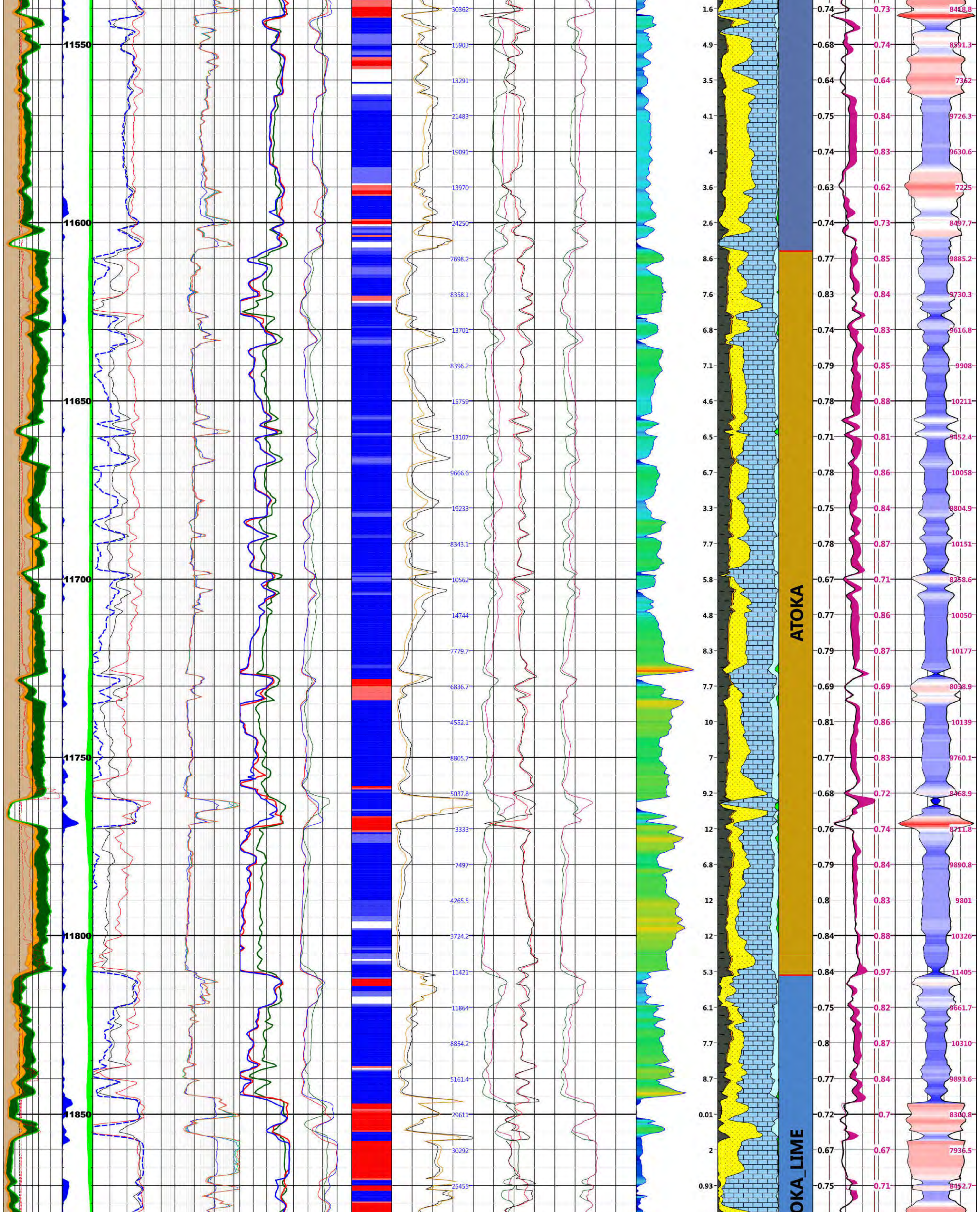

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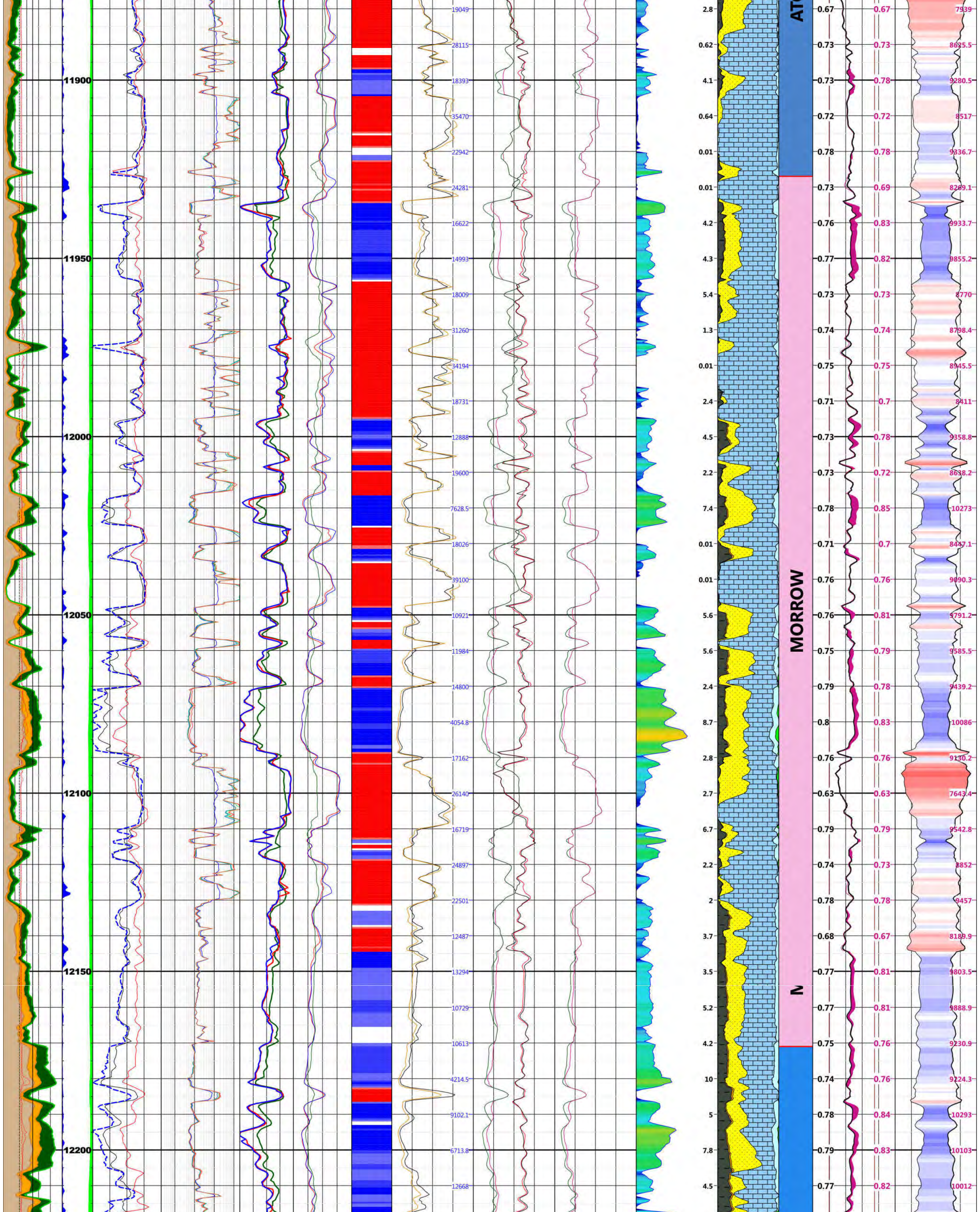
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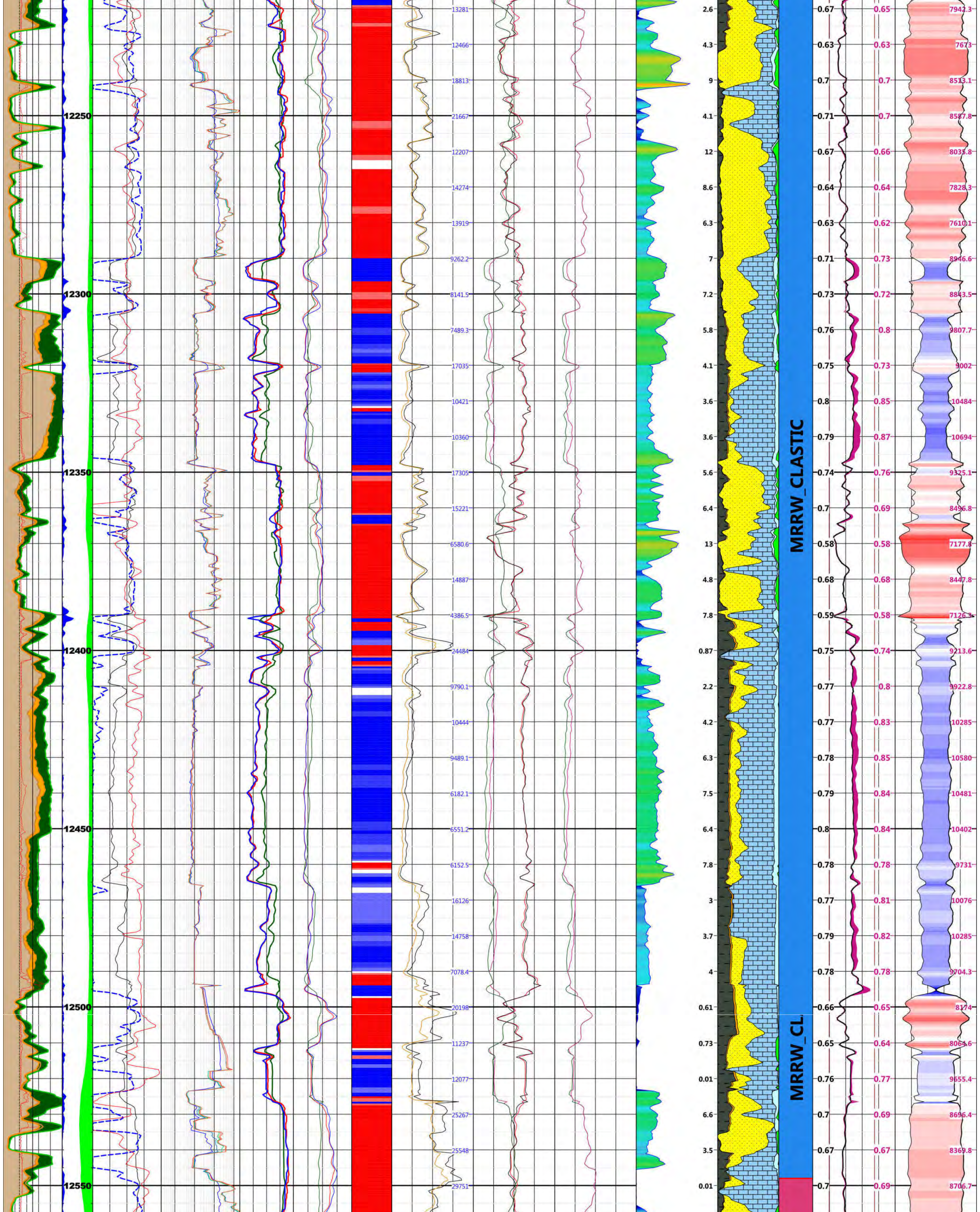

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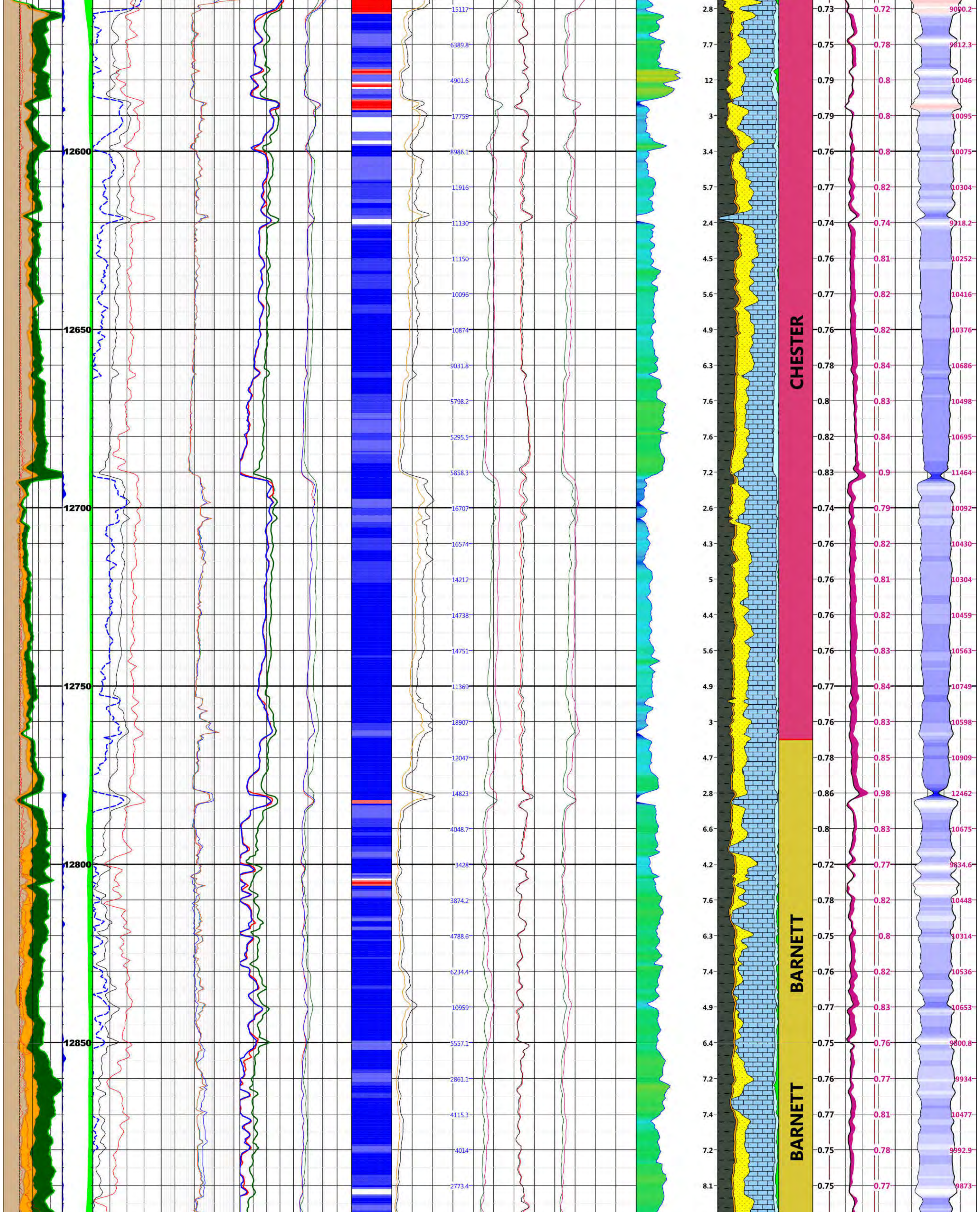
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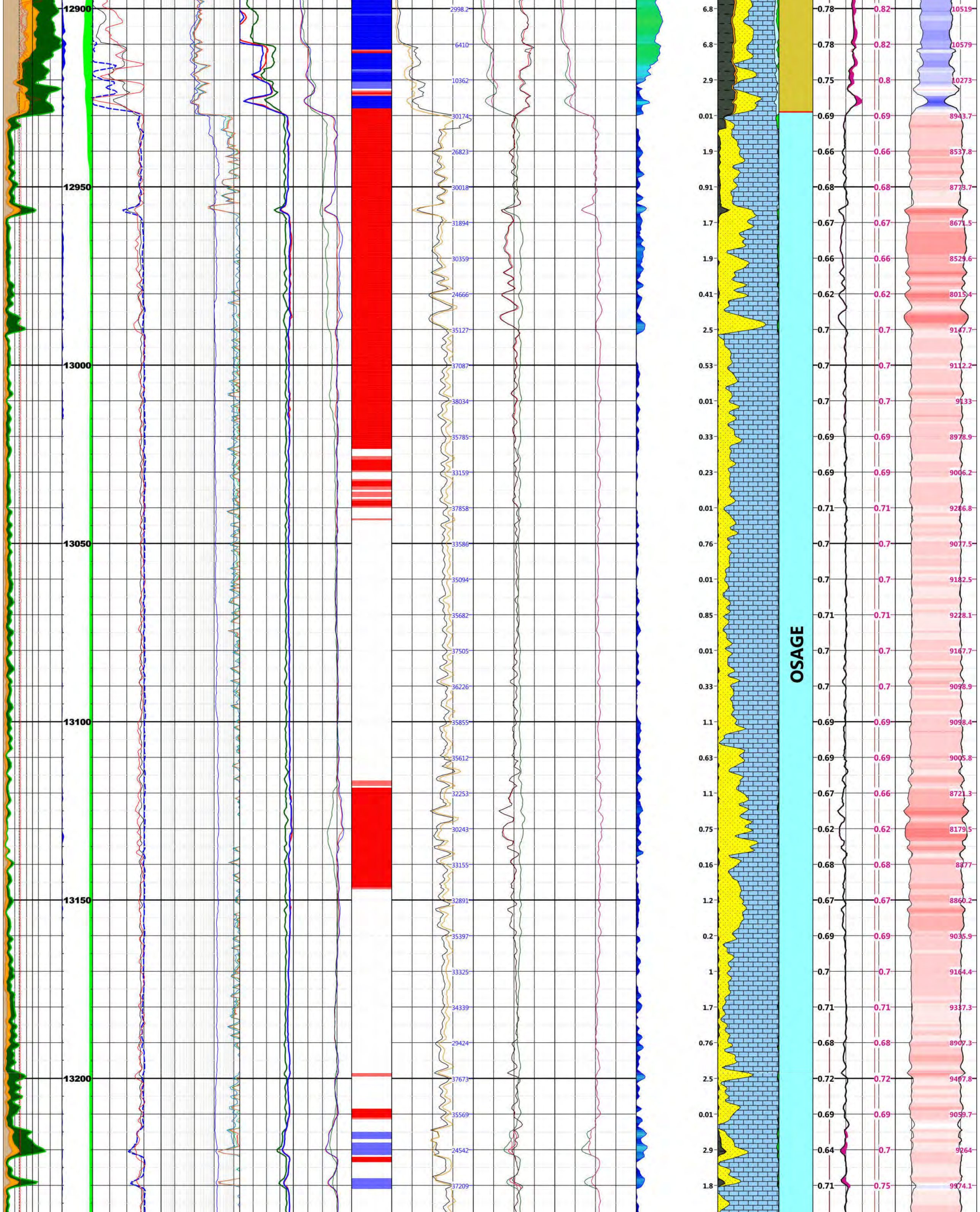
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0.67
0.69
0.7
0.71
0.68
0.72
0.69
0.64
0.71
0.82
0.82
0.8
0.69
0.66
0.68
0.67
0.66
0.62
0.7
0.7
0.7
0.69
0.71
0.7
0.71
0.7
0.69
0.66
0.62
0.68
0.67
0.69
0.7
0.71
0.68
0.72
0.69
0.7
0.75
10519
10579
10273
8943.7
8537.8
8773.7
8671.5
8529.6
8015.4
9147.7
9112.2
9133
8978.9
9006.2
9286.8
9077.5
9182.5
9228.1
9167.7
9098.9
9098.4
9005.8
8721.3
8179.5
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9497.8
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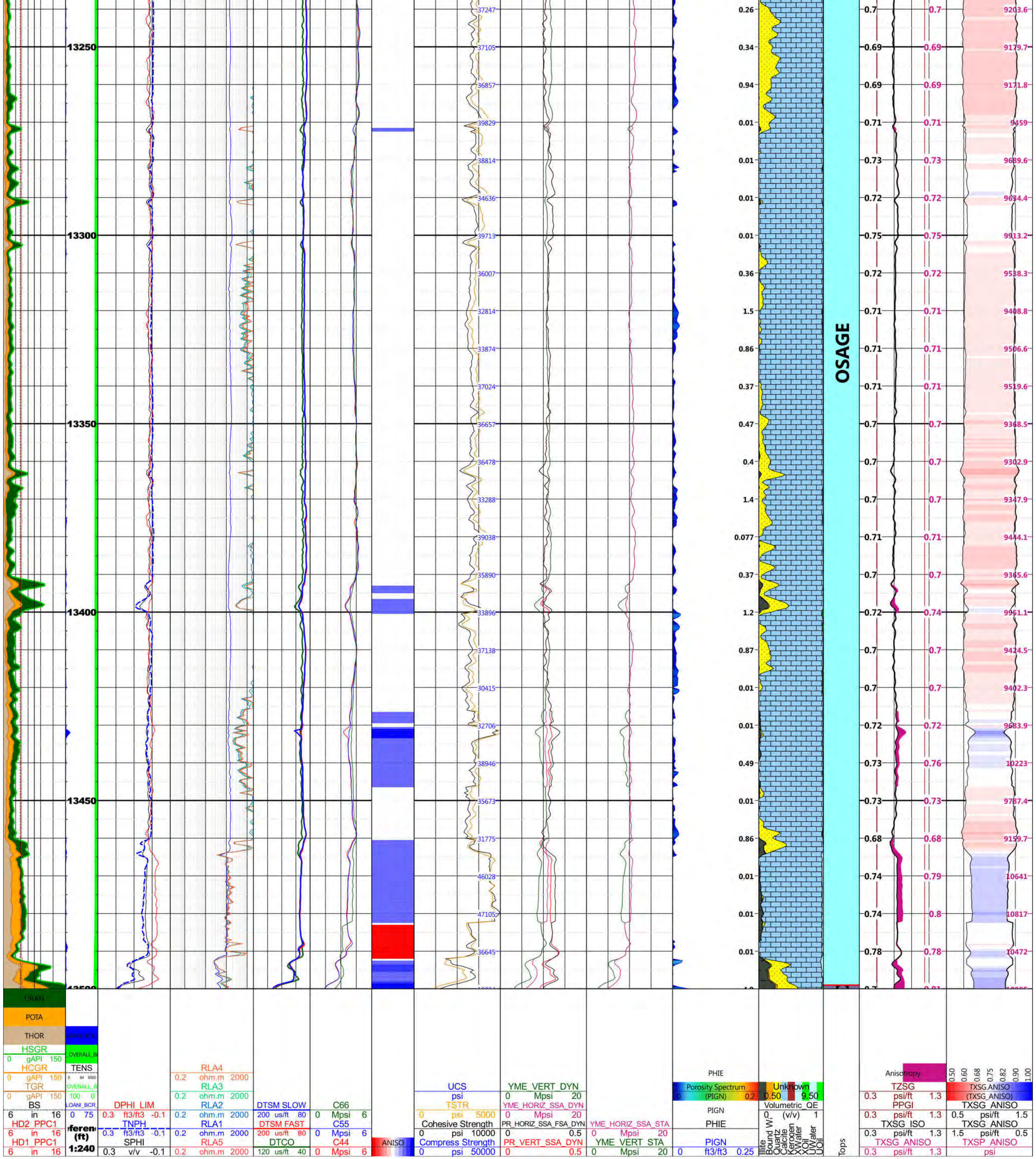
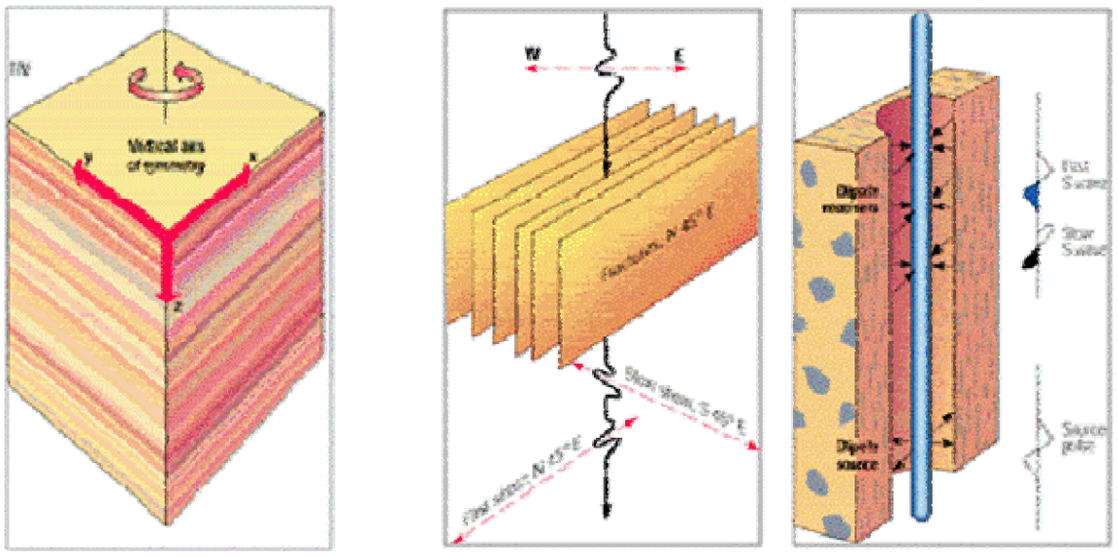
9264
9974.1
OSAGE



TIV ANISOTROPY

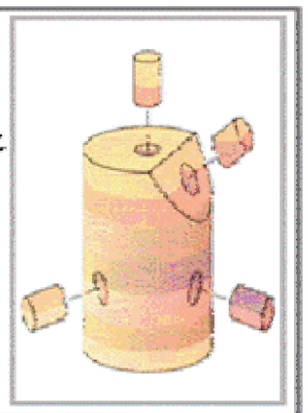
TIH ANISOTROPY

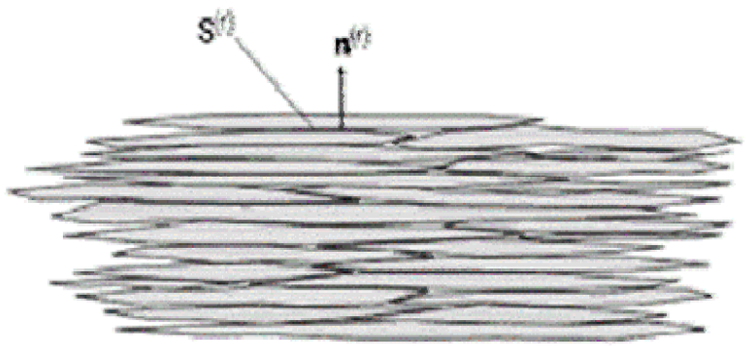
Poro Elastic Horizontal Strain Model with isotropy



From the Promise of Elastic Anisotropy, Schlumberger Oilfield Review, Oct 1994

Layered media often exhibts TIV anisotropy. Properties measured in the vertical direction are different than properties measured in the horizontal direction.





Figures courtsey of Sayers and Suarez-Rivera

$$\sigma_h - \alpha\sigma_{PP} = \frac{\nu}{1-\nu}\left(\sigma_V - \alpha\sigma_{pp}\right) + tectonics$$

Poro Elastic Horizontal Strain Model for TIV anisotropy

$$\sigma_h - \alpha\sigma_{PP} = \frac{E_h}{E_v}\frac{\nu_v}{1-\nu_h}\left(\sigma_V - \alpha\sigma_{pp}\right) + tectonics$$

σ_h = *Minimum horizontal stress*

σ_{PP} = *Pore Pressure*

σ_V = *Overburden stress*

α = *Poro – Elastic constant*

E_h = *Horizontal Young's Modulus*

E_V = *Vertical Young's Modulus*

ν_H = *Horizontal Poisson's Ratio*

ν_V = *Vertical Poisson's Ratio*

From Thiercelin and Plumb, SPE 21847

COMPANY: DCP Midstream LP
WELL:Zia AGI D2 Trip5
FIELD:AGI Devonian Exploration
COUNTY:Lea
STATE:New Mexico
COUNTRY: USA

Schlumberger

API No.: 30-025-42207

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