

PSP Interpretation Results

Company: University of Utah
Well: Forge 16A(78)-32
Field: Wildcat
County: Beaver, Utah
Log Date: 17-Aug-2024
Log Analyst: Leonid Kolomytsev / Casey Chadwick



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Objectives:

Quantitative downhole injection profile.

Well / Job Information:

Casing: 7", 38#, T-95 @ 10787' MD

Open Hole: 8-3/4" OH @ 10987' MD

Tubing: None

KOP @ 5957' MD / 5955.66' TVD / 5.67 degrees deviation

EOB @ 7377' MD / 7045.98' TVD / 67.49 degrees deviation

Toe @ 10995' MD / 8558.83' TVD / 68.6 degrees deviation

Perforations: 9270'-9276' (top), 10560'-10580' MD (bottom)

Primary Depth Reference: Perforations as reported University of Utah

Tool String: High Temp PSP

General Logging Procedure:

- 1) Shut-In. RU & RIH @ 100 fpm to 5900' MD (KOP)
- 2) Shut-In. Record Spinner Calibration passes, 4D/4U, 5900'-5600' MD, 60/90/120/150 fpm.
- 3) Start Injection. Record Station @ 5900' MD and establish stable injection rate.
- 4) Injection @ 10 bpm. Pull Up 200' MD @ 90 fpm to confirm safe working tension during injection.
- 5) Injection @ 10 bpm. Record D1 @ 90 fpm to Bottom Log Interval (BLI) @ 10680' MD (100' below bottom shot) (DO NOT exist casing shoe @ 10787' MD).
- 6) Injection @ 10 bpm. Record U1 @ 90 fpm from BLI to Top Log Interval (TLI) @ 9170' (100' above top shot) stopping for Stations (2 minutes each) as outline in client document (blue and red) (between each cluster and stage).
- 7) Injection @ 10 bpm. Record Station @ 9170' MD (TLI) to confirm stable injection rate.
- 8) Injection @ 10 bpm. Record a continuous Down and Up pass (D2/U2) @ 90 fpm from TLI to BLI.
- 9) Injection @ 10 bpm. Record Station @ 9170' MD (TLI)
- 10) Confirm data with Domain Champion. Additional passes or stations may be requested.
- 11) Confirm with client. Stop injection. Record ROH pass at safe working speed.

Interpretation Remarks

This interpretation is based on Ultra-High Temperature Production Services Platform (HT-PSP) data conveyed on SLB wireline and recorded on 17-Aug-2024 by Amine Mekrache and Douglas Shackelford SLB Engineer. Two main down and up passes with stations were recorded over the log interval (8980'-10179'MD).

Color coding for curves: Red (Down 1), Dark Blue (Up 1), Green (Down 2), Light Blue (Up 2).

Initial depth correlation is by the field engineer/specialist. Minor log depth shifting and log depth matching is applied by the log analyst as needed to improve the correlation. Correlation to the reported perforations.

Top Log Interval (TLI) @ 8980' MD. Bottom Log Interval (BLI) @ 10070' MD.

X-Y Caliper (C1C2) is compressed due to deviation and tool weight. A nominal ID of 5.92" is used in the interpretation calculations.

Downhole Pressure (WPRE) is not stable during the first main pass (red) but becomes relatively stable on the next logging passes which are used preferentially in the interpretation.

Downhole Temperature (WTEP) trends are repeatable between logging passes with variations (offsets) mostly related to injection rate and time. Average down pass temperature is used in the interpretation calculations.

Turbine Spinner data quality is good and works continuously for all logging passes and stations. All passes and station stops are used in the velocity calculations for the interpretation.

Downhole rate (Q) is calculated using the velocity (V) from the spinner times the pipe area (A) using nominal ID, or $Q = V \times A$. Rates are presented in downhole barrels on the log snapshots and then converted to surface rates at standard conditions for the results table.

Overall, data quality is good, unless noted, and the downhole environment is relatively stable resulting in a high level of confidence in the interpretation calculations and results.

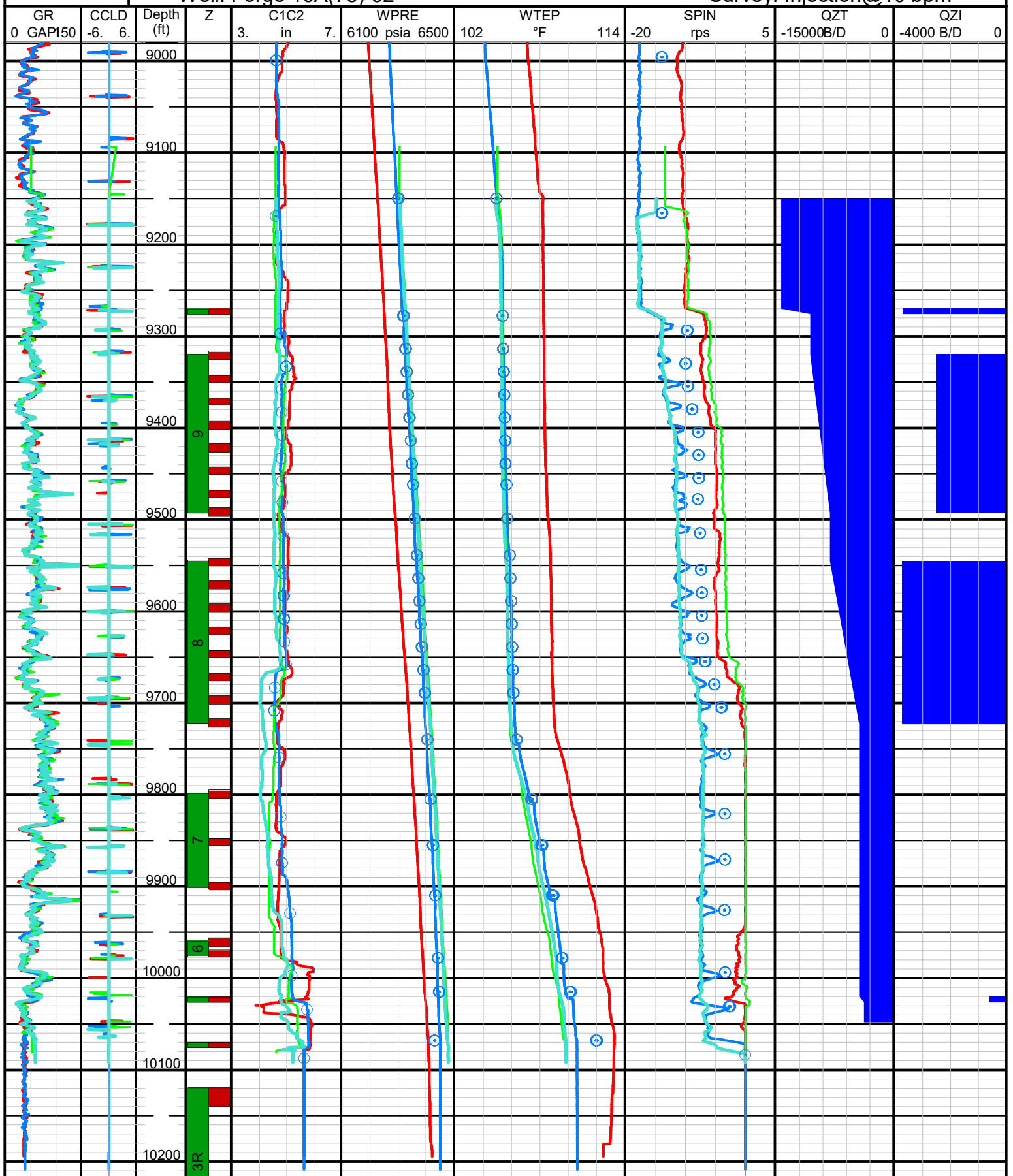
Injection Test Results: Stage

Stage	Perforations		Water (bpd)	Water (%)
10	9270	9276	-3728.4	25.8%
9	9320	9493	-2539.4	17.6%
8	9545	9723	-3768.7	26.1%
7	9798	9901	0.0	0.0%
6	9959	9976	0.0	0.0%
5	10020	10026	-604.2	4.2%
4	Below 10026		-3825.7	26.4%
3R				
Totals			-14466.4	100.0%



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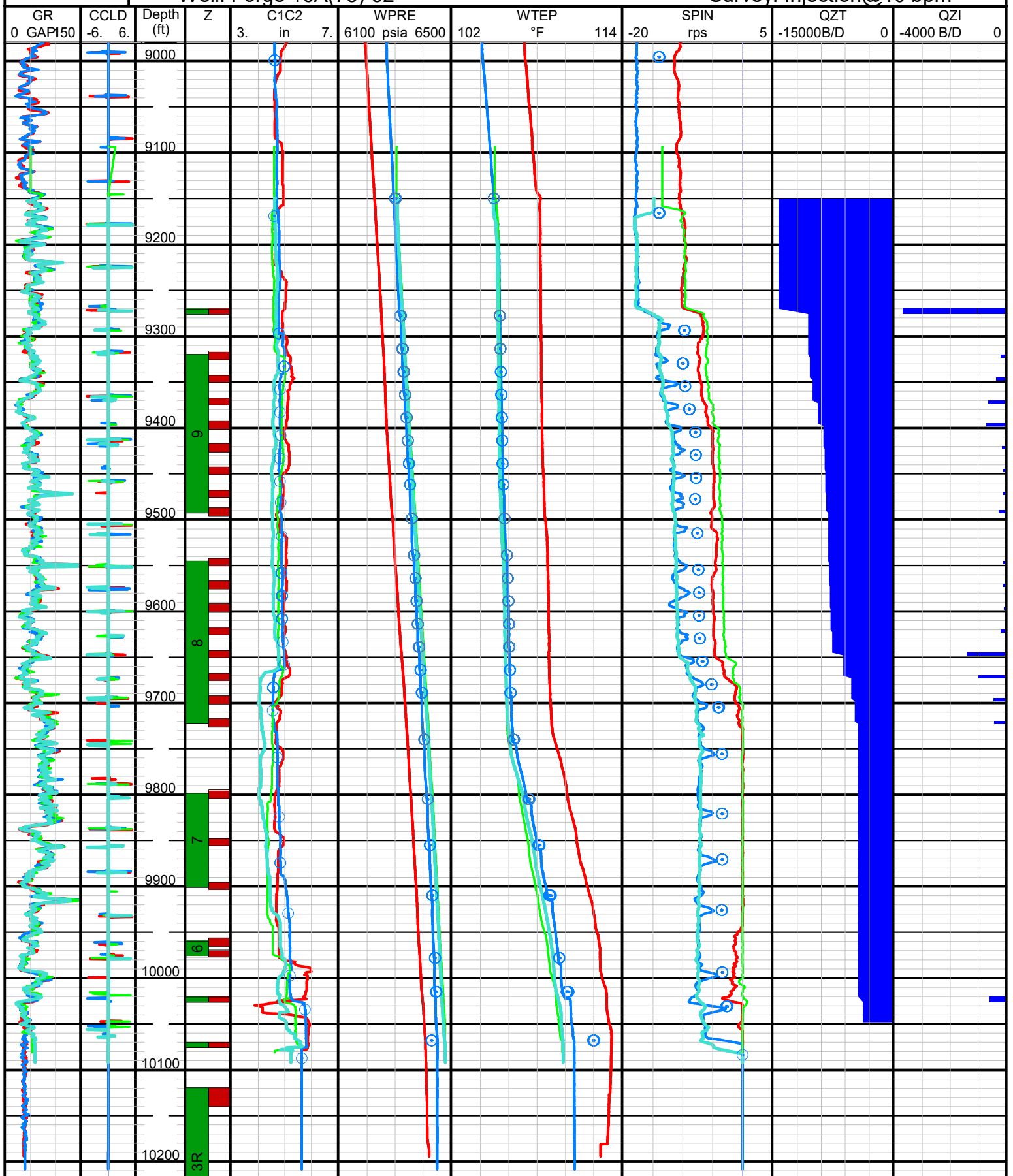
Injection Test Results: Detail

Stage	Perforations		Water (bpd)	Water (%)
10	9270	9276	-3728.4	25.8%
9	9320	9323	-201.5	1.4%
	9345	9348	-362.8	2.5%
	9370	9373	-644.9	4.5%
	9395	9398	-725.5	5.0%
	9420	9423	-151.2	1.0%
	9445	9448	-90.7	0.6%
	9470	9473	-100.8	0.7%
	9490	9493	-262.0	1.8%
8	9545	9548	-100.8	0.7%
	9570	9573	-100.8	0.7%
	9595	9598	-80.6	0.6%
	9620	9623	-201.5	1.4%
	9645	9648	-1410.7	9.8%
	9670	9673	-1007.7	7.0%
	9695	9698	-443.4	3.1%
	9720	9723	-423.2	2.9%
7	9798	9801	0.0	0.0%
	9850	9853	0.0	0.0%
	9898	9901	0.0	0.0%
6	9959	9962	0.0	0.0%
	9970	9976	0.0	0.0%
5	10020	10026	-604.2	4.2%
4-3R	below 10026		-3825.7	26.4%
Totals			-14466.4	100.0%



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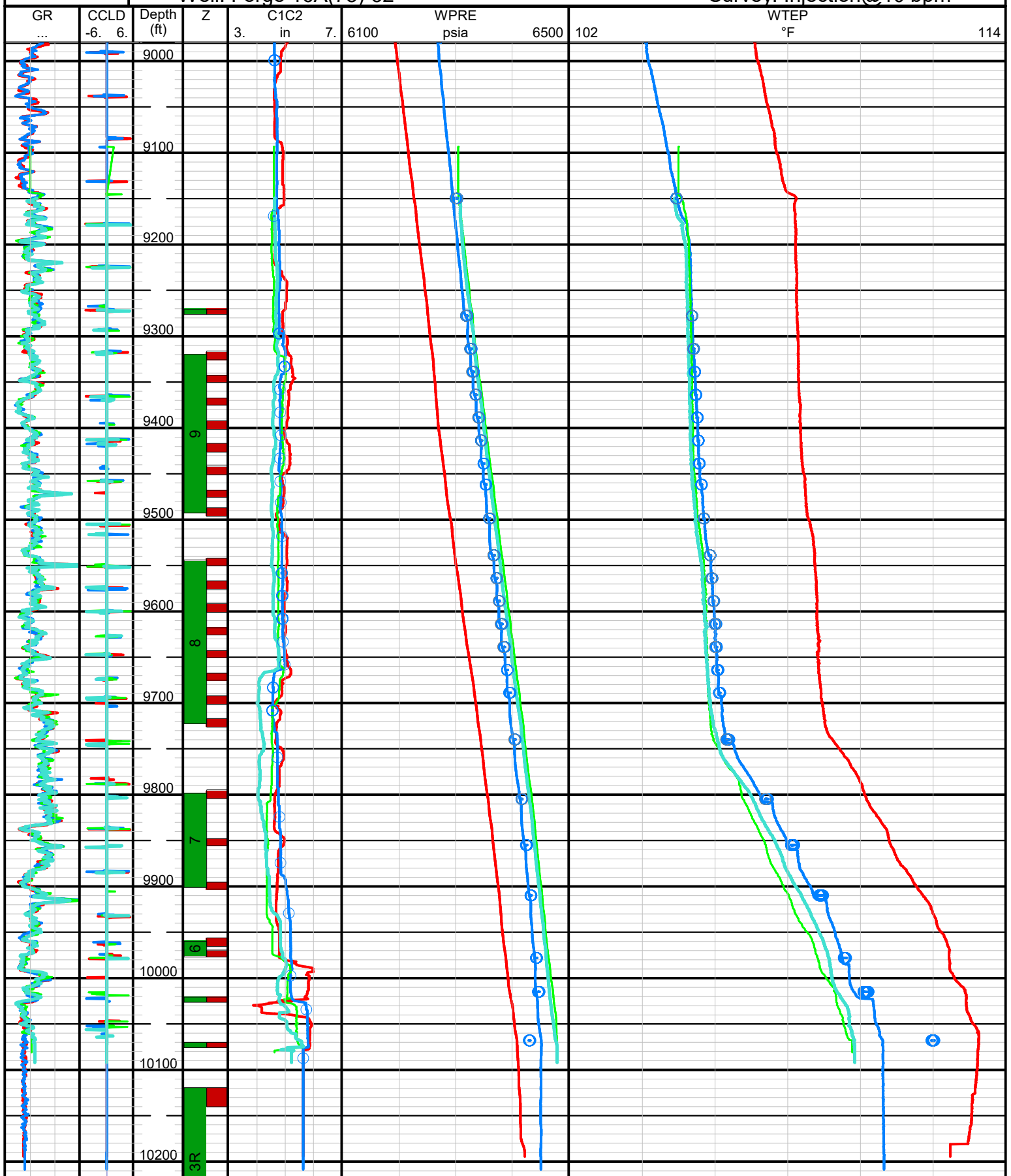


Hi-Temp PSP - Pressure & Temperature

UnivUtah_Forge_16A(78)-32_HT...

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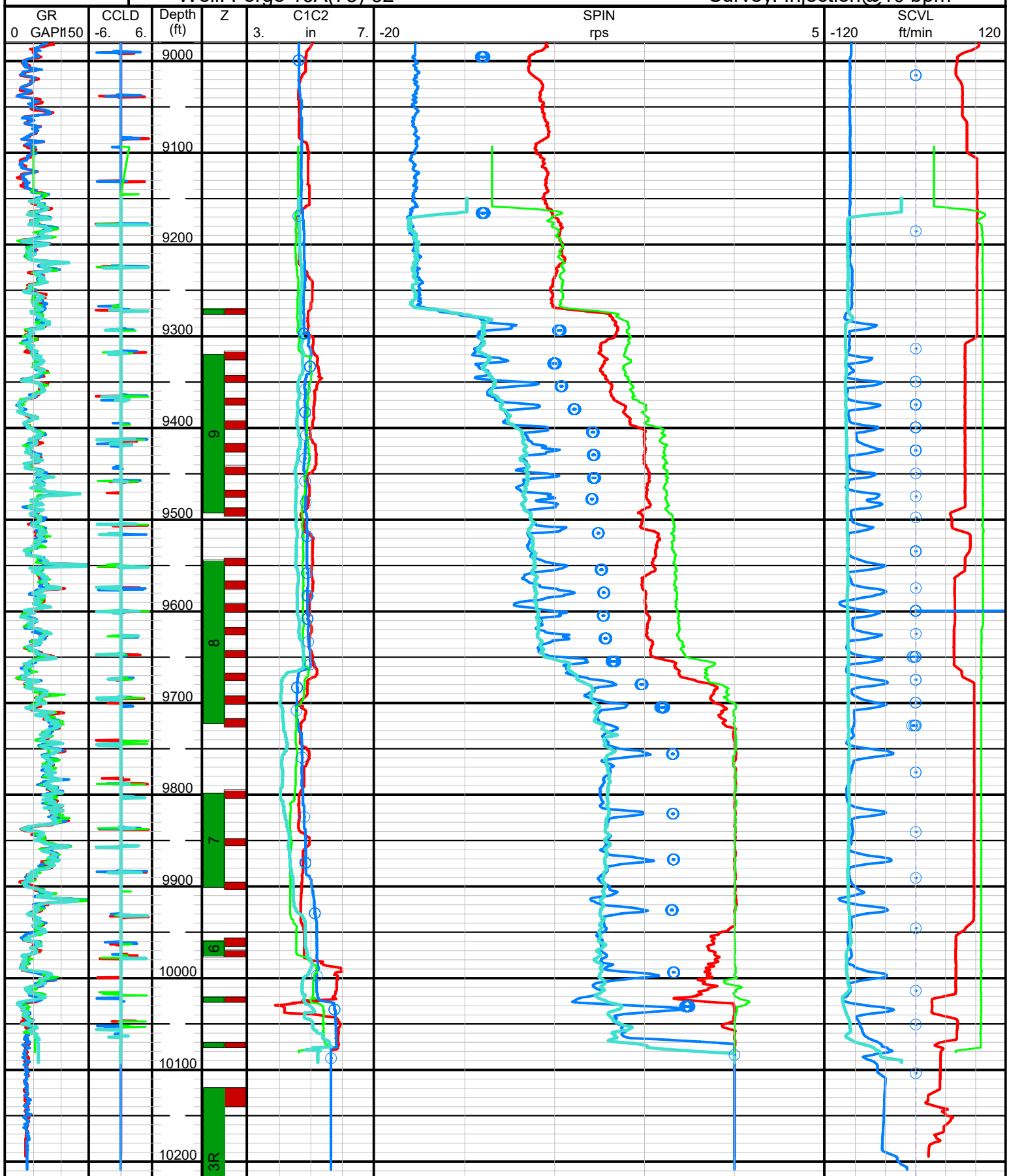


Hi-Temp PSP - Spinner & Cable Velocity

UnivUtah_Forge_16A(78)-32_HT...

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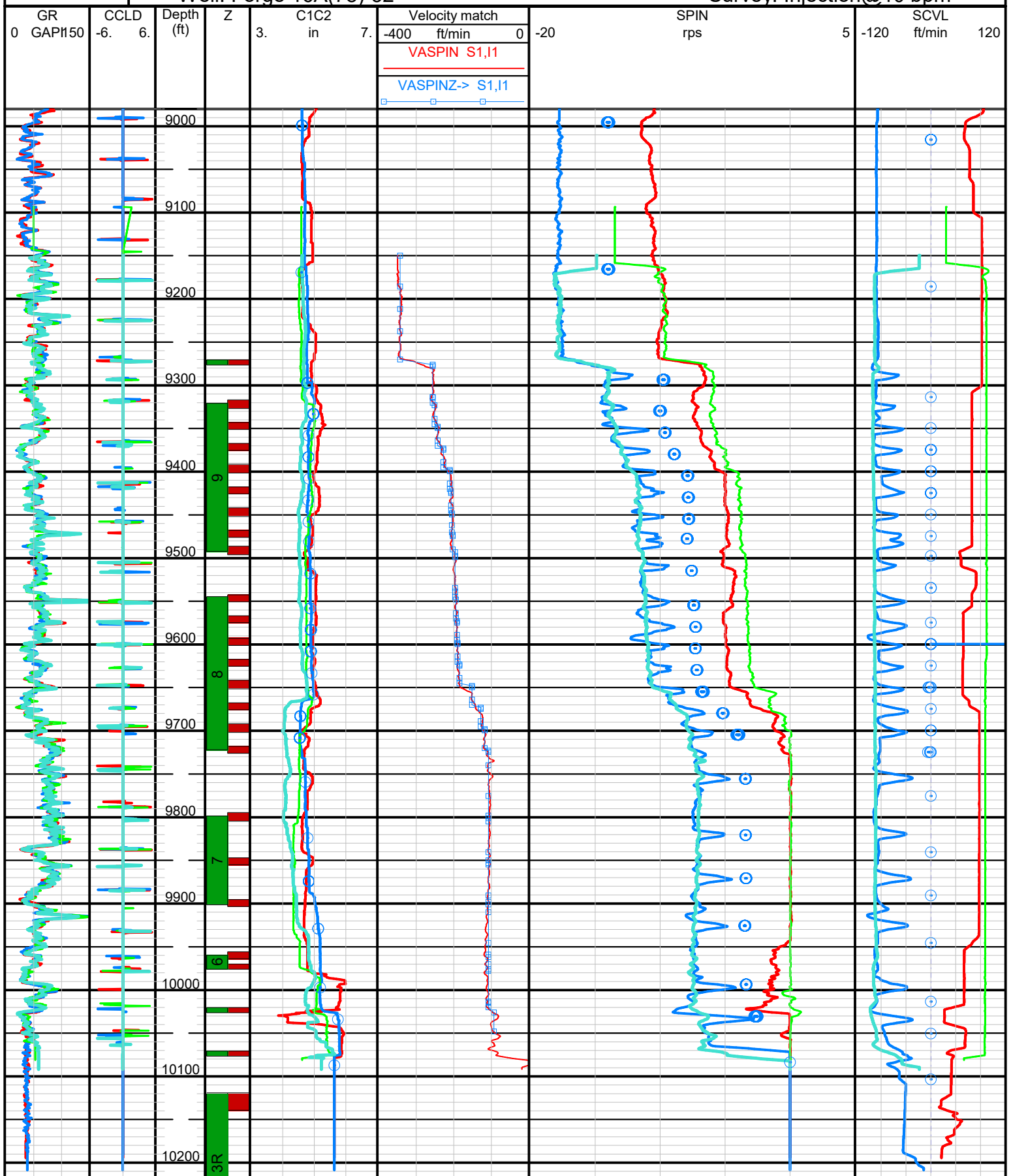


Hi-Temp PSP - Spinner & Velocity Match

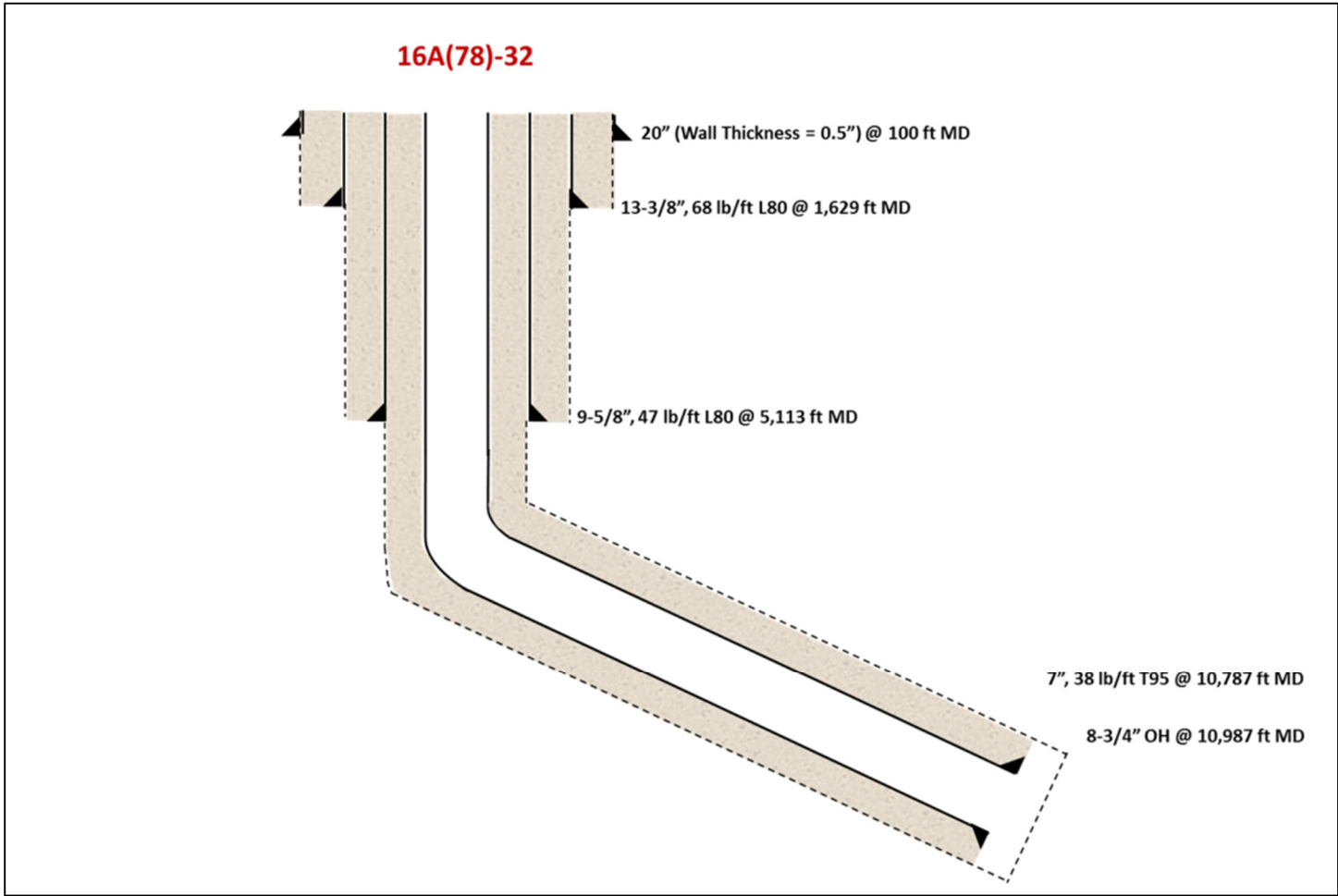
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Well Sketch



Tool Sketch

Tool Sketch : Ultra High Temp PSP

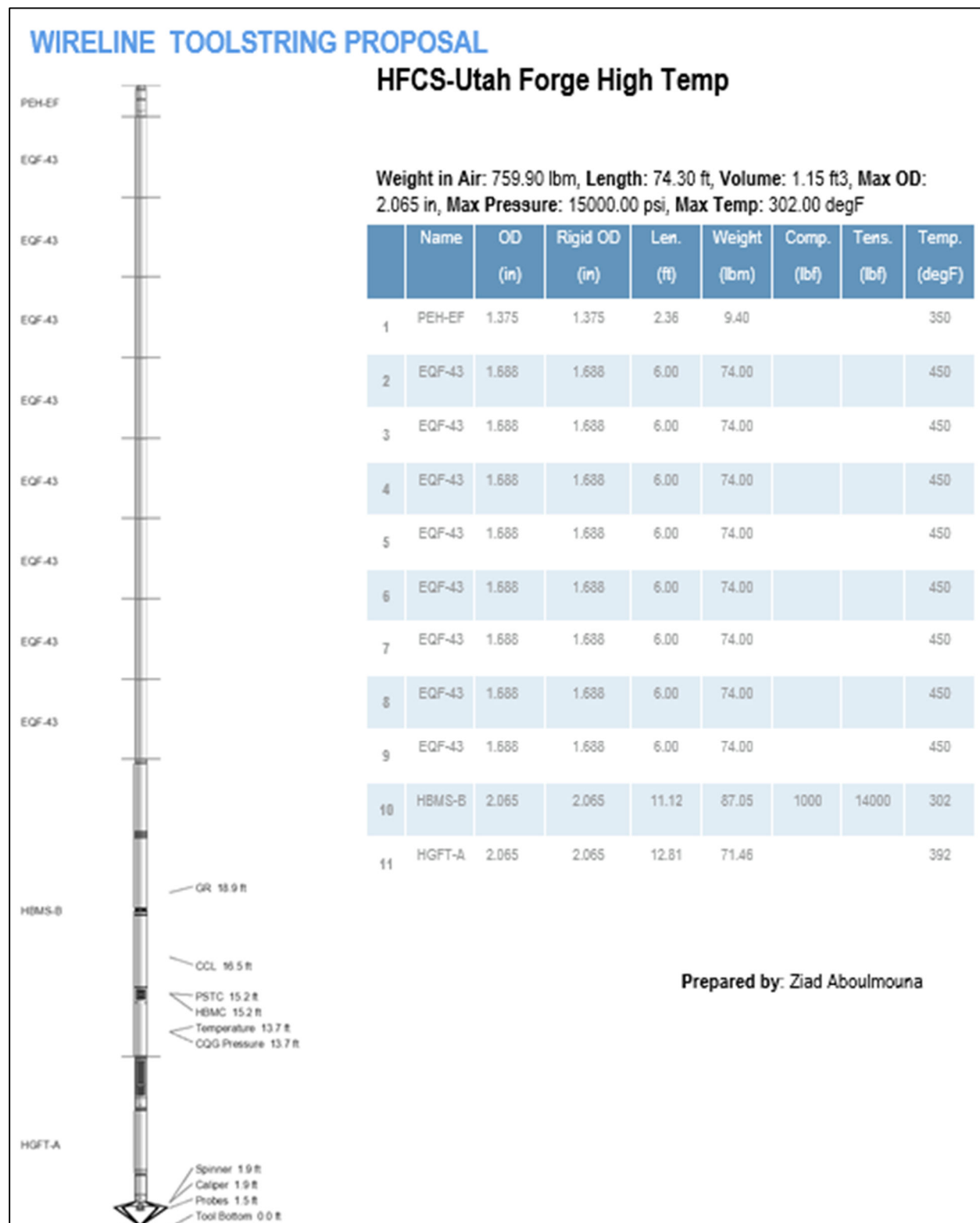


Table of Abbreviations

Tool Mnemonics List

PSP	Production Services Platform
PBMS	Production Basic Measurement Sonde (Temperature, Pressure, CCL, GR)
PCMS	Production Compression Measurement Sonde
PGMC	Production Gradio Manometer Carrier (Density)
PFCs	Production Flowmeter Caliper Sonde (Holdup, Caliper, Full Bore Spinner)
PILS	Production In-Line Spinner
DEFT	Digital Fluid Entry Tool (Electrical Probes)
GHOST	Gas Holdup Optical Sensor Tool (Optical Probes)
FSI	Flow Scanner Imager

Data/Sensor Mnemonics List

CALI_FSI	Flow Scanner Caliper
CCLC/CCLD	Casing Collar Locator
CVEL/SCVL	Cable Velocity
D1RB DEFT	Relative Bearing Probe 1
DFBFx_FSI (0-5)	FSI Vertical DEFT Bubble Count Array (0=Bottom,5=Top)
DFBM	PSP Mean DEFT Bubble Count
DFBx (1-4)	PSP Individual Probe DEFT Bubble Count
DFHFX_FSI (0-5)	FSI Vertical DEFT Water Holdup Array (0=Bottom,5=Top)
DFHM	PSP Mean DEFT Water Holdup
DFHx (1-4)	PSP Individual Probe DEFT Water Holdup
GHBFX_FSI (0-5)	FSI Vertical GHOST Bubble Count Array (0=Bottom,5=Top)
GIBM2	PSP Mean GHOST Bubble Count
GHBx (5-8)	PSP Individual Probe GHOST Bubble Count
GHHFX_FSI (0-5)	FSI Vertical GHOST Gas Holdup Array (0=Bottom,5=Top)
GHHM2	PSP Mean GHOST Gas Holdup
GHHx (5-8)	PSP Individual Probe GHOST Gas Holdup
GR	Gamma Ray
HTEN	Head Tension/Compression
MWFD	Pressure Derived Density
PFC1	PSP Caliper 1 (X)
PFC2	PSP Caliper 2 (Y)
RB_FSI	FSI Relative Bearing
SPIN/SPI1	Full Bore Spinner / Inline Spinner
SPIFX_FSI (0-4)	FSI Vertical Micro-Spinner Array (0=Bottom,5=Top)
WFDE	Gradio Well Fluid Density
WPRE	Well Pressure
WTEP	Well Temperature

Interpretation Mnemonics List

QGD/QGZT	Gas Rates (down hole unless otherwise stated)
QWD/QGZT	Water Rates (down hole unless otherwise stated)
QOD/QOZT	Oil Rates (down hole unless otherwise stated)

Color Coding is typically the same for all the curves that belong to the same pass.

RED – Pass One / Dark Blue – Pass Two / Green – Pass Three / Light Blue – Pass Four

References

For more information, please visit:

FloScan Imager (FSI)

<https://www.slb.com/-/media/files/wireline-production-services/brochure/flow-scanner-br.ashx>

Production Services Platform (PSP)

<https://www.slb.com/-/media/files/fe/product-sheet/ps-platform-ps.ashx>

Reservoir Saturation Tool - Water Flow Log (RST-WFL)

<https://www.slb.com/-/media/files/fe/brochure/rstpro-brochure.ashx>

TuffTRAC iX Tractor (TTiX)

<https://www.slb.com/products-and-services/innovating-in-oil-and-gas/well-intervention/slickline-and-wireline-intervention/wireline-tractors/tufftrac-ix-intelligent-extreme-wireline-tractor>

End of Report