

# Sít' výzkumných institucí a podniků pro infrastrukturu Forschungs- und Unternehmensnetz für Infrastrukturen

RENI-100686680



## Sít'ovací setkání

Vrtné zařízení Geoprobe s HPT sondou (Hydraulic Profiling Tool): vertikální profilování propustnosti sedimentů

## Network building meeting

Das Bohrgerät Geoprobe mit einer HPT-Sonde (Hydraulic Profiling Tool): vertikale Profilierung der Durchlässigkeit von Sedimenten

20. května 2025

20. Mai 2025

# Vrtné zařízení Geoprobe s HPT sondou (Hydraulic Profiling Tool): vertikální profilování propustnosti sedimentů

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**Interreg**



Kofinanciert von  
der Europäischen Union  
Spolufinancováno  
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Sachsen – Tschechien | Česko – Sasko

## Our mission

To provide tailor-made solutions to the environmental challenges and issues of various industrial sectors, international and national organizations



## Our services

- Environmental remediation
- Waste treatment and management
- Consultancy services (EIA, ESIA, Feasibility studies, Risk assessment, Clean-up design)
- 24/7 Emergency response service
- Research and development
- Laboratory services
- Equipment and technologies (Biofilters, Stabilisation/Solidification plant, etc.)

## Dekonta in numbers

- Holding of 15 business
- 15 Offices
- 2 R&D centers
- 1 chemical lab
- 1 microbiological lab
- 20 waste management centers

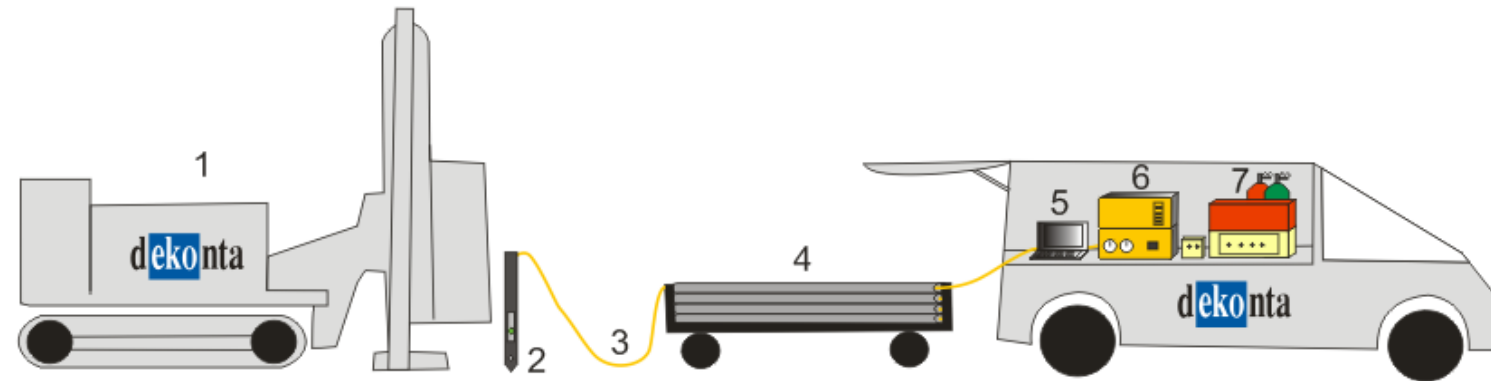
> 150 employees 80% hold a degree

> 50 patents filed by our R&D

*Long term vision:  
R&D spending is 9% of  
our revenue*

*No language barriers  
with our customers:  
21 languages spoken*

## HPT = Hydraulic Profiling Tool



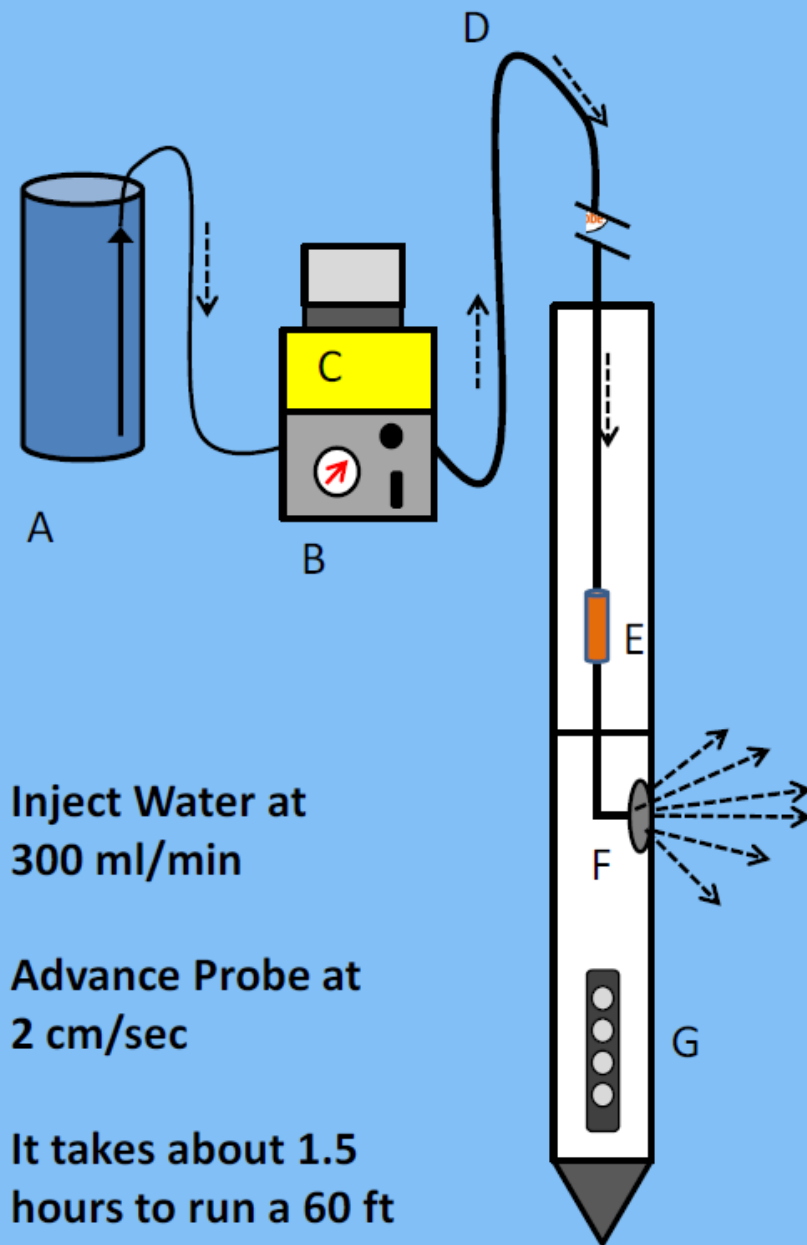
### Geoprobe Direct Sensing family

- HPT (Hydraulic Profiling Tool)
- MIP (Membrane Interface Probe)
- OIP (Optical Image Profiler)
- NMR (Nuclear Magnetic Resonance)
- CPT (Cone Penetration Testing)
- + konduktivita





# HPT Principles of Operation



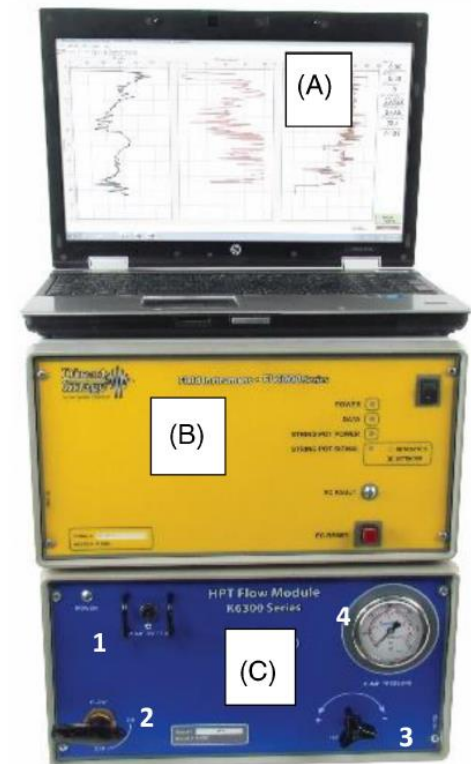
Inject Water at  
300 ml/min

Advance Probe at  
2 cm/sec

It takes about 1.5  
hours to run a 60 ft  
(20 m) log & trip out

- A) Water Tank
- B) Pump & Flow Meter
- C) Electronics/computer
- D) Trunkline
- E) Pressure Sensor
- F) Screened Injection Port
- G) Elec. Conductivity Array

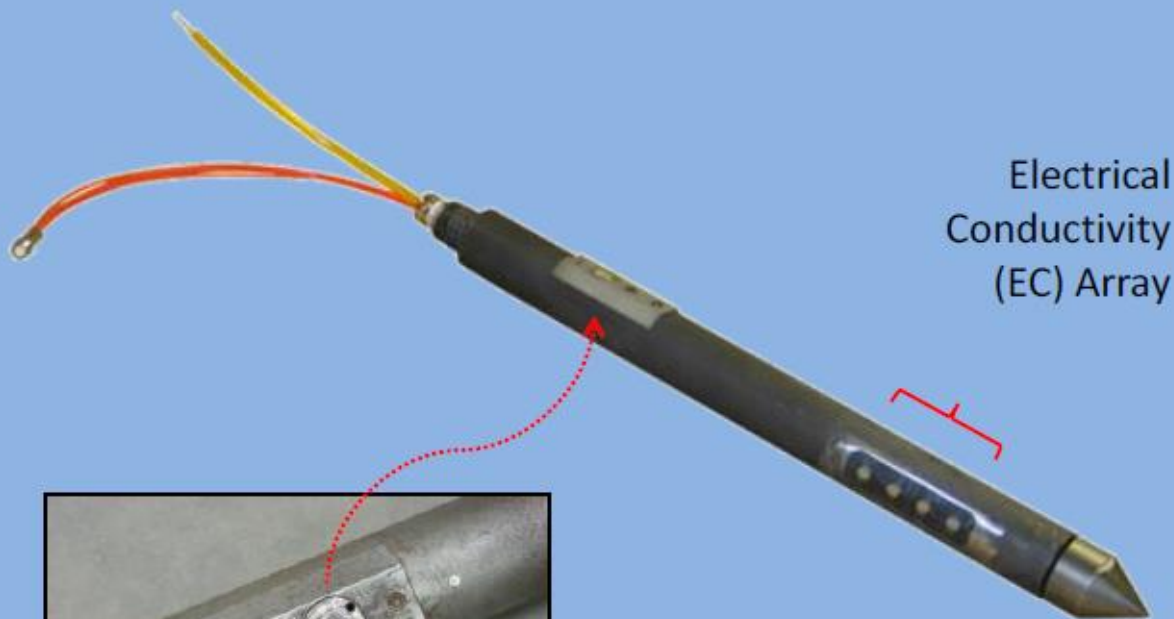
Water Flow Lines



# Components of the HPT System : HPT Probe



Pressure  
Sensor  
Module  
100 psi/  
690kPa



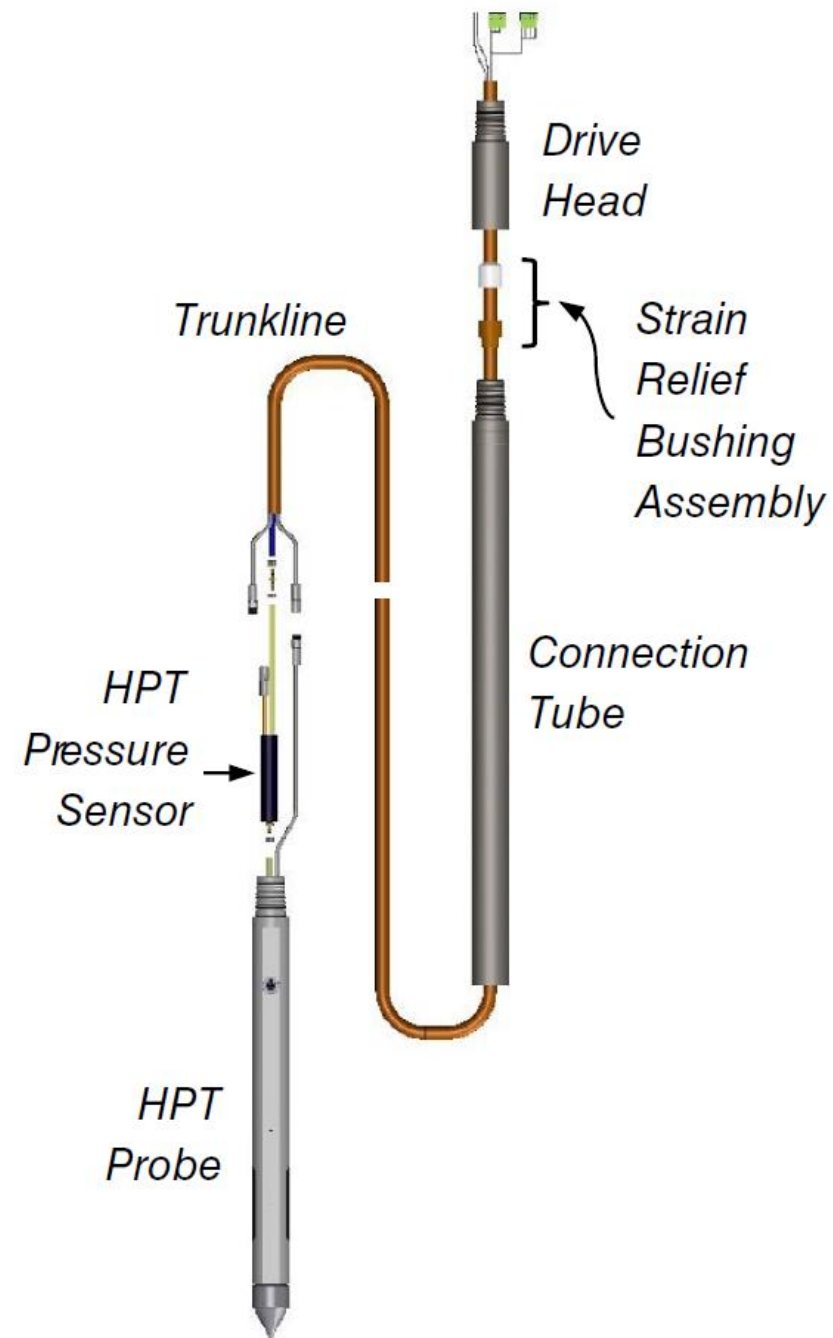
Electrical  
Conductivity  
(EC) Array

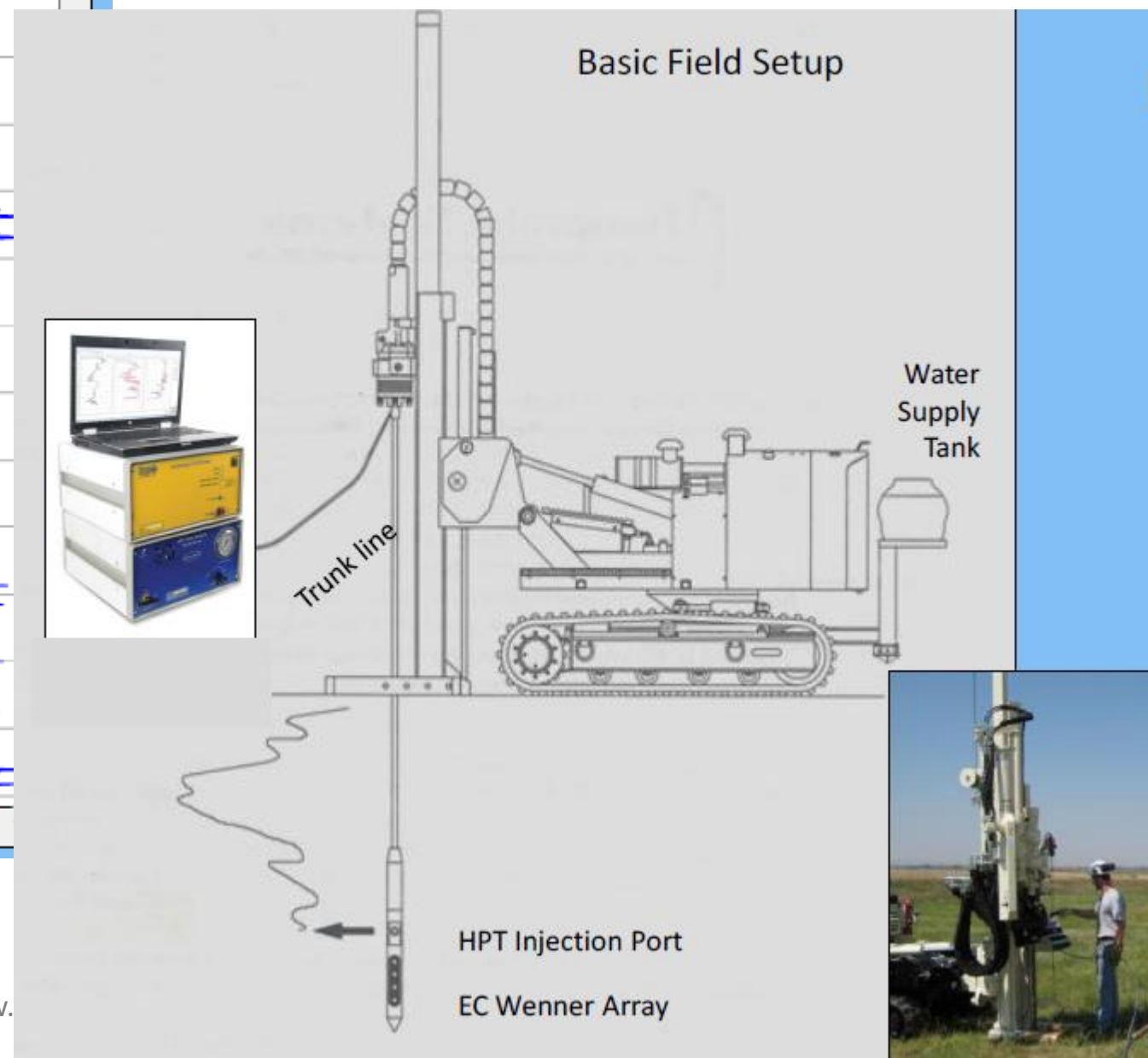
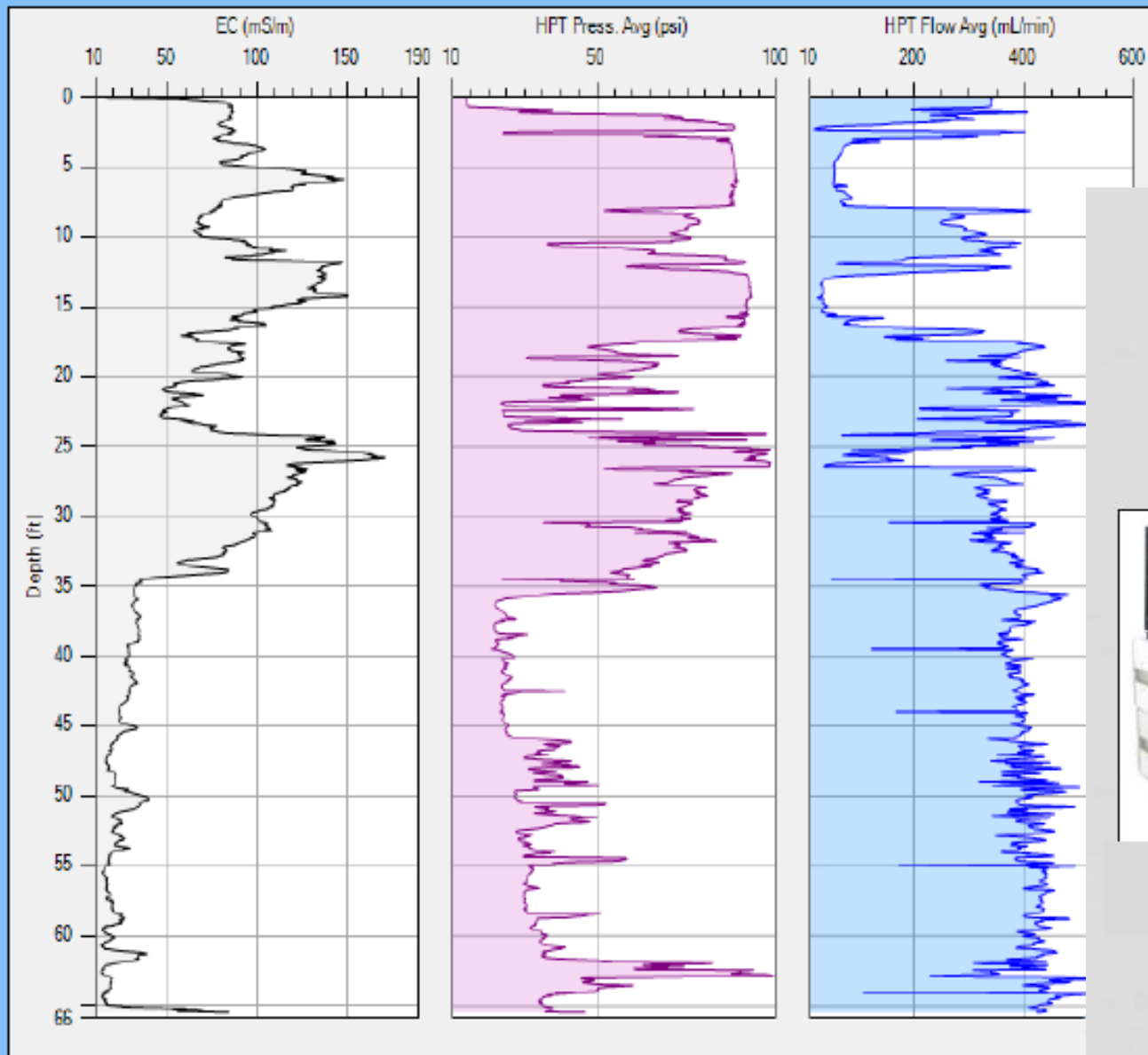


Replaceable  
Screens



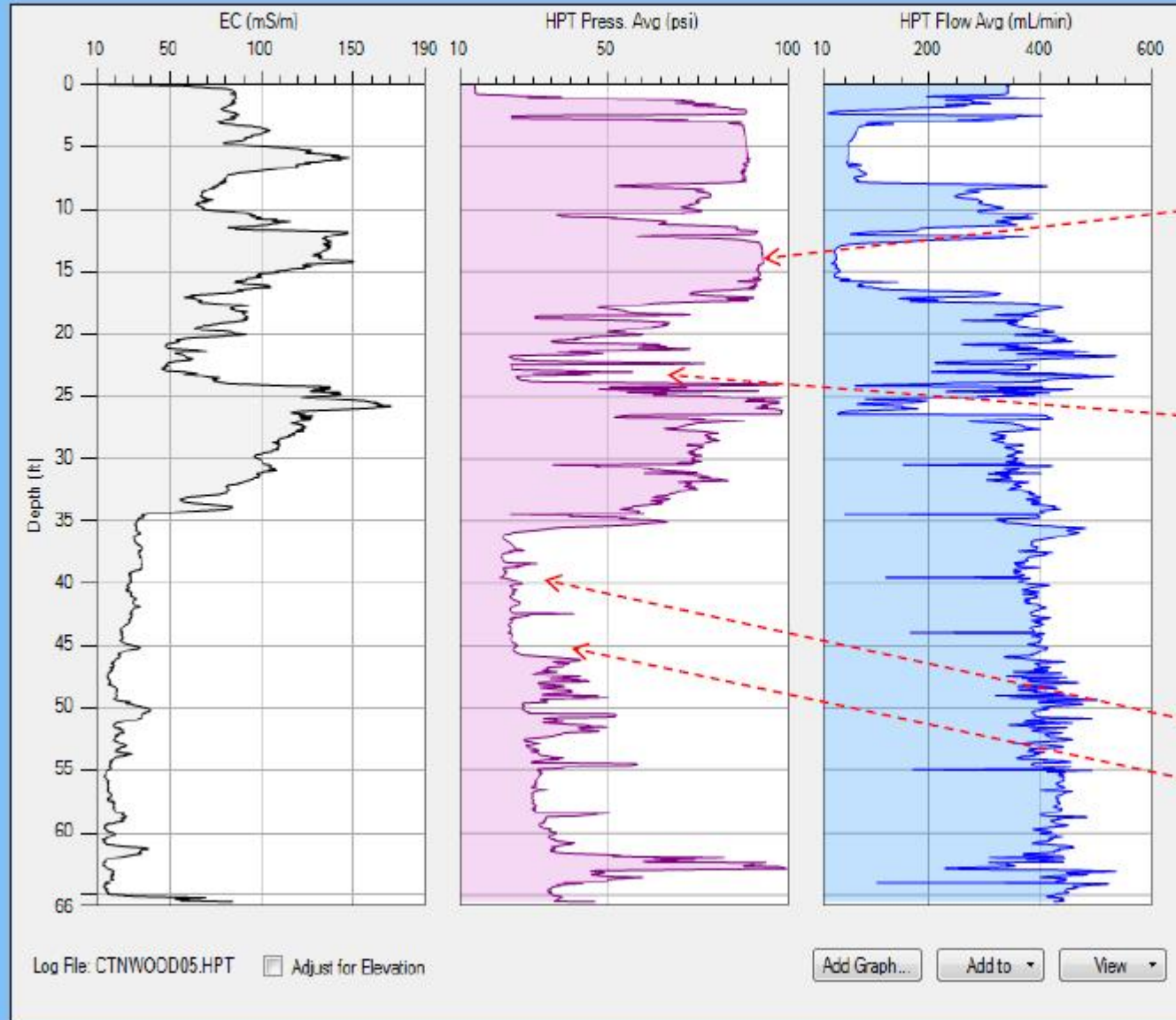
HPT  
Trunkline







# A Basic HPT Log & Interpretation

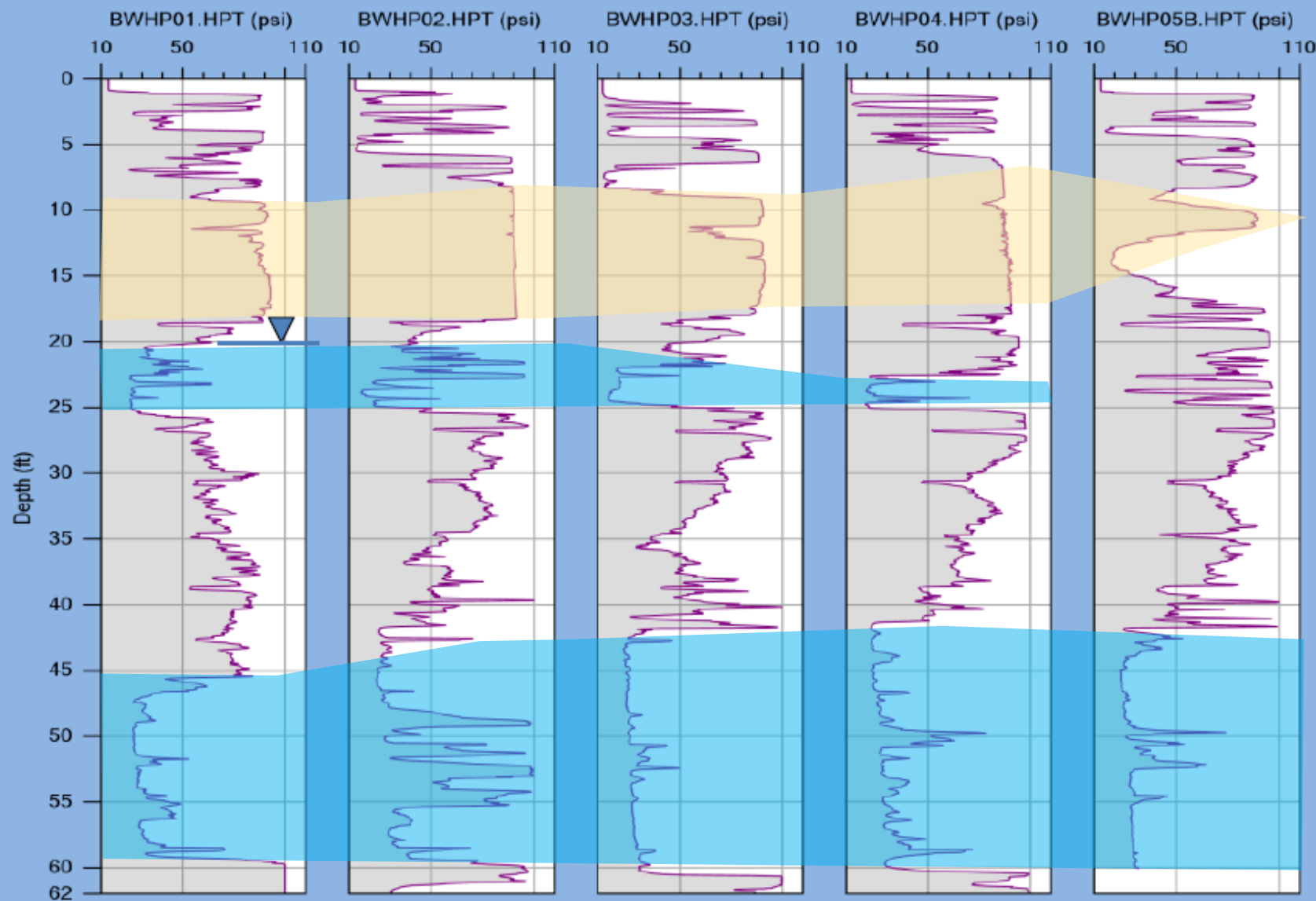




# Hydrostratigraphy with HPT Pressure Cross Section

West

East



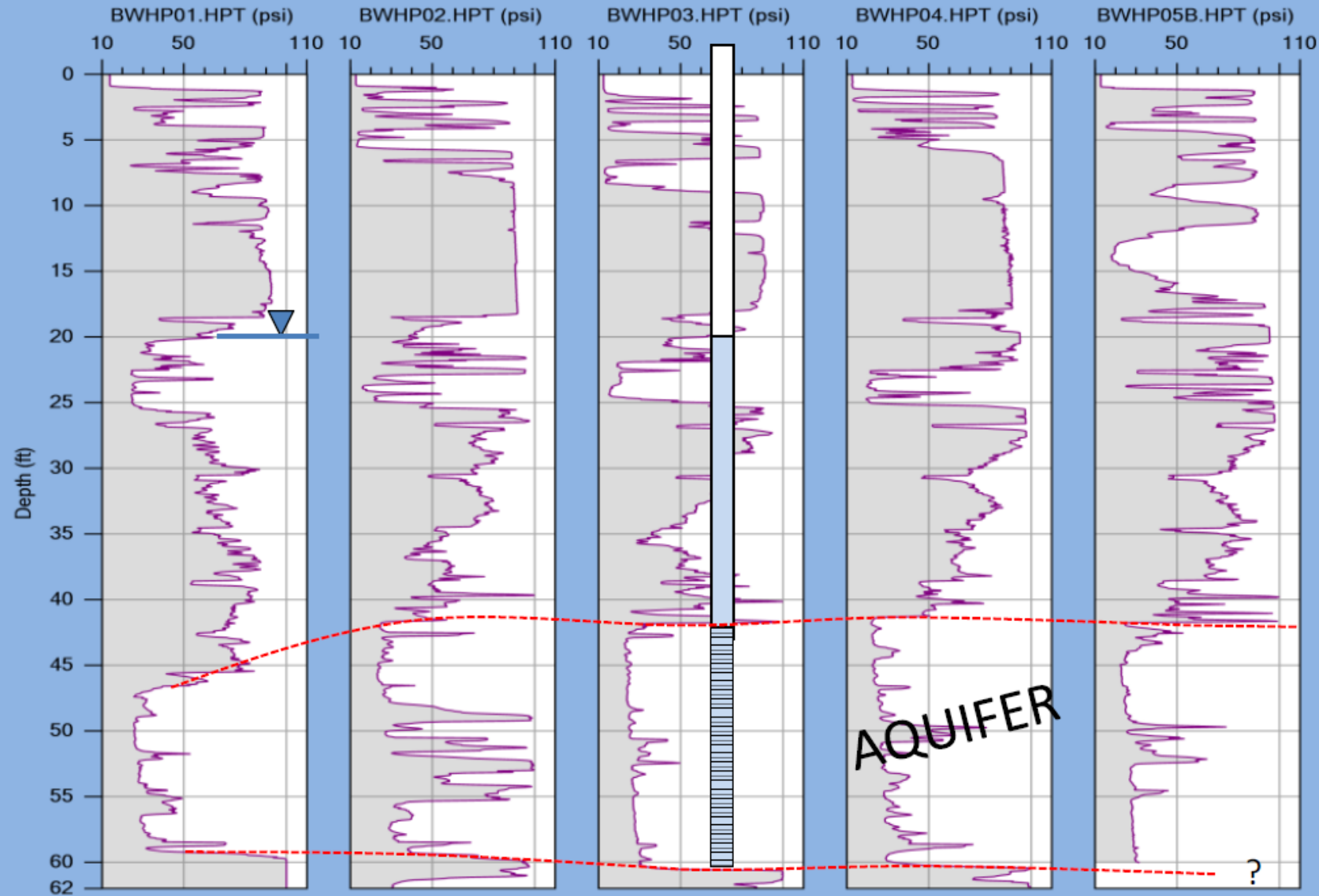
Facing North: 50 ft spacing between log locations: alluvial deposits

HPT Press. Avg 19

# Hydrostratigraphy ... Aquifer Boundaries

West

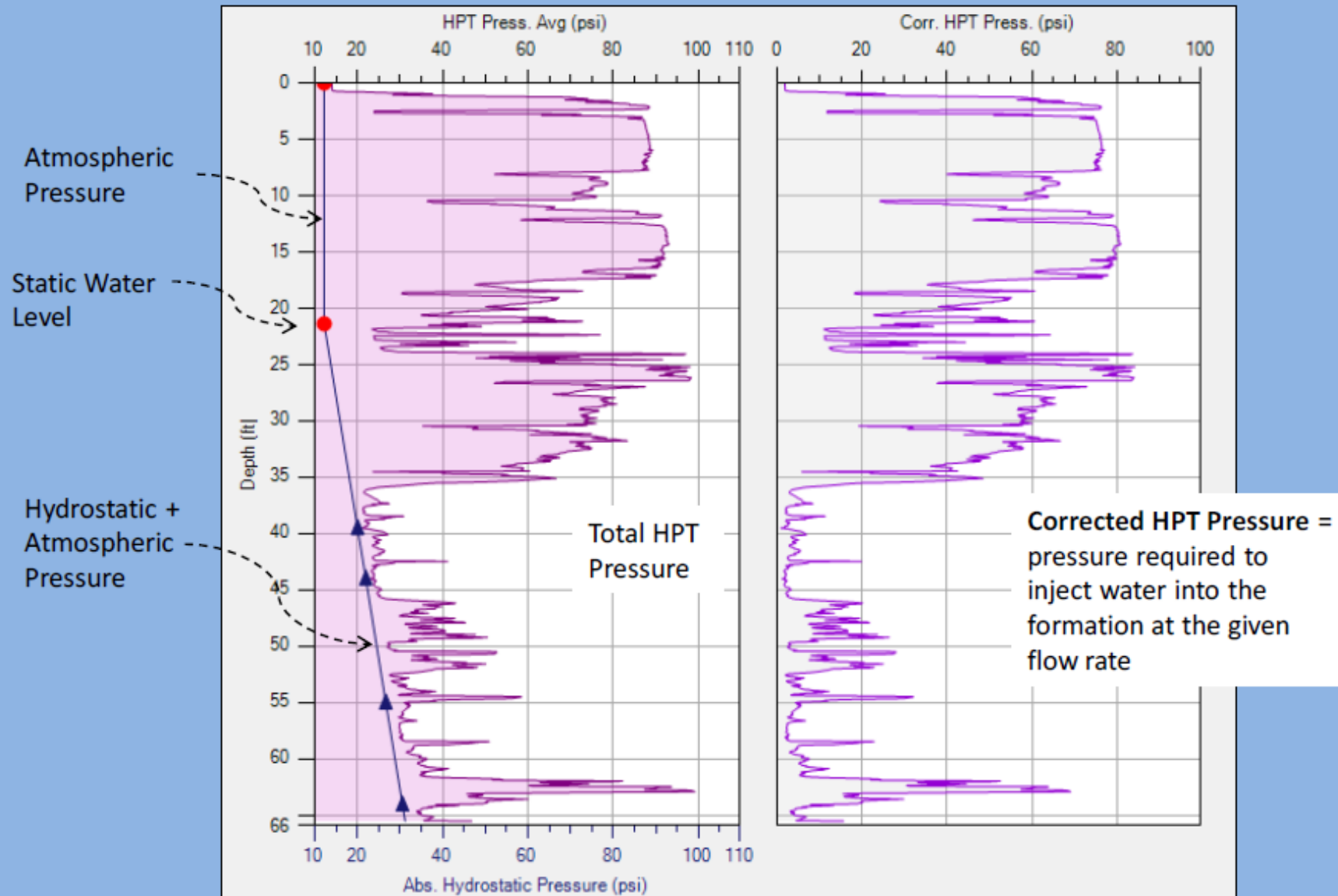
East



Aquifer Boundaries

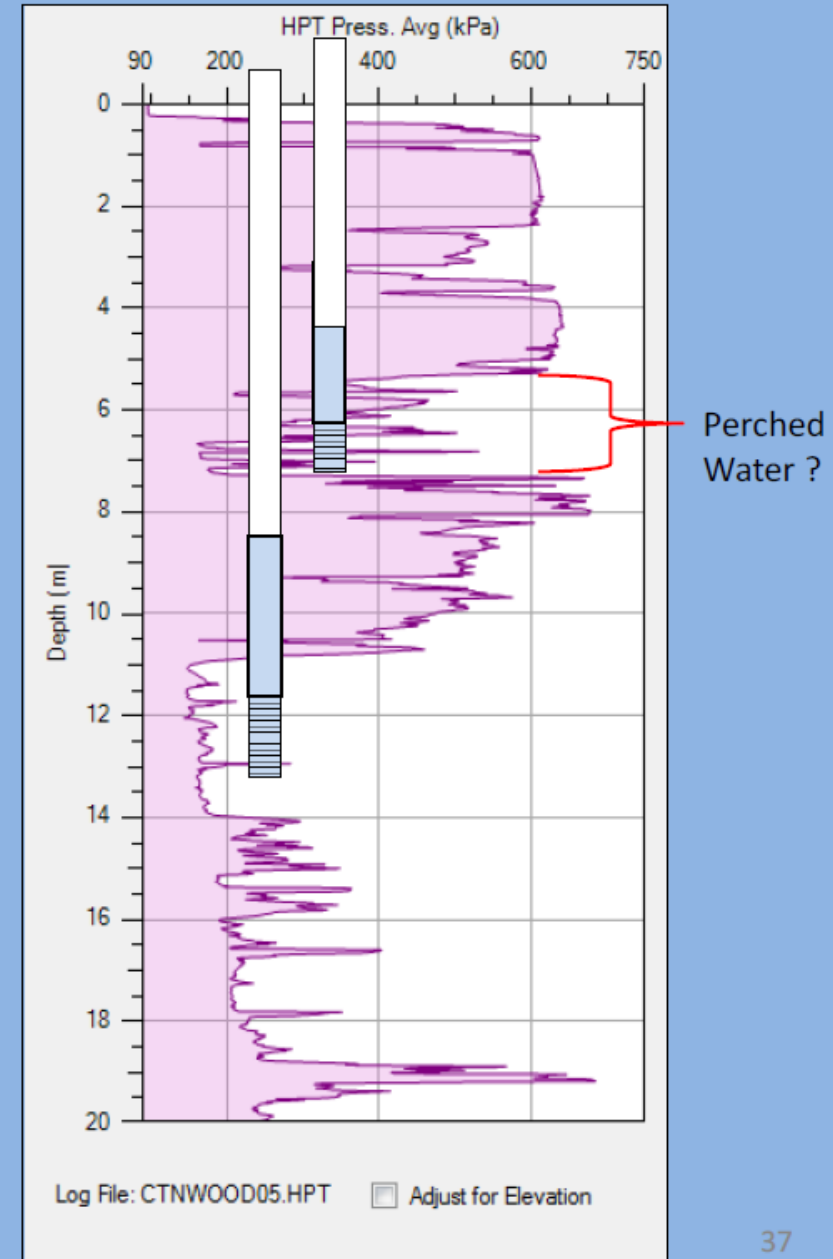
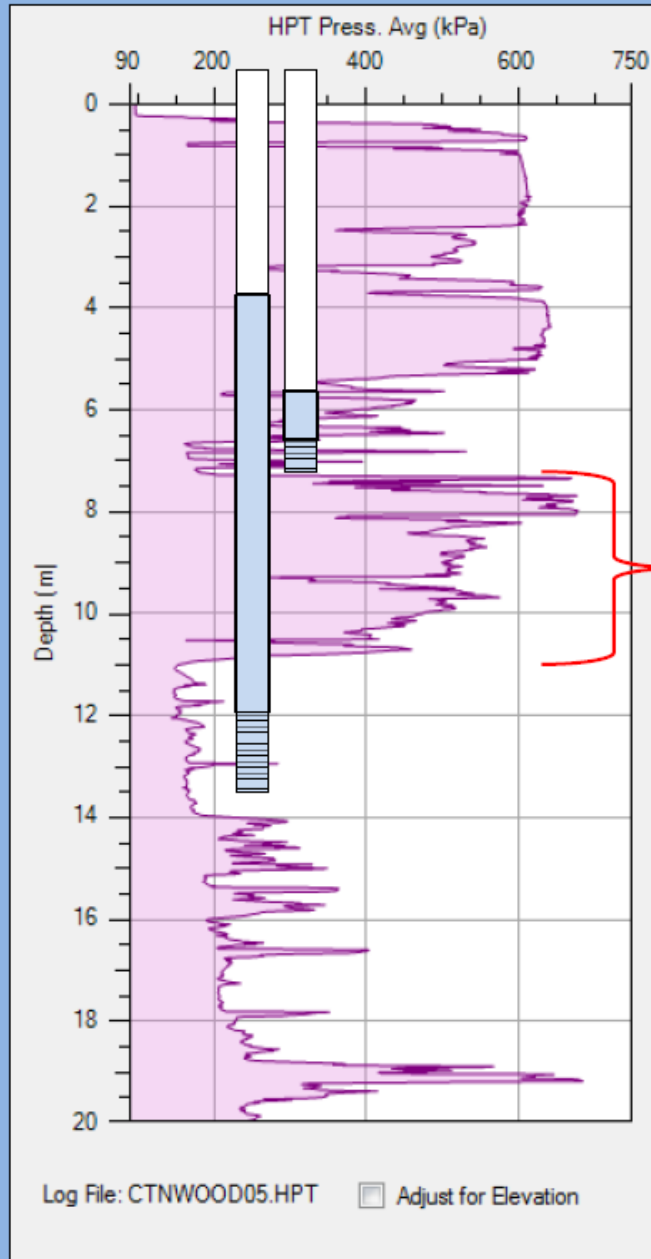
HPT Press. Avg

# Corrected HPT Pressure





# However, in the real world ...



# Estimating Hydraulic Conductivity (K) with HPT Log Data

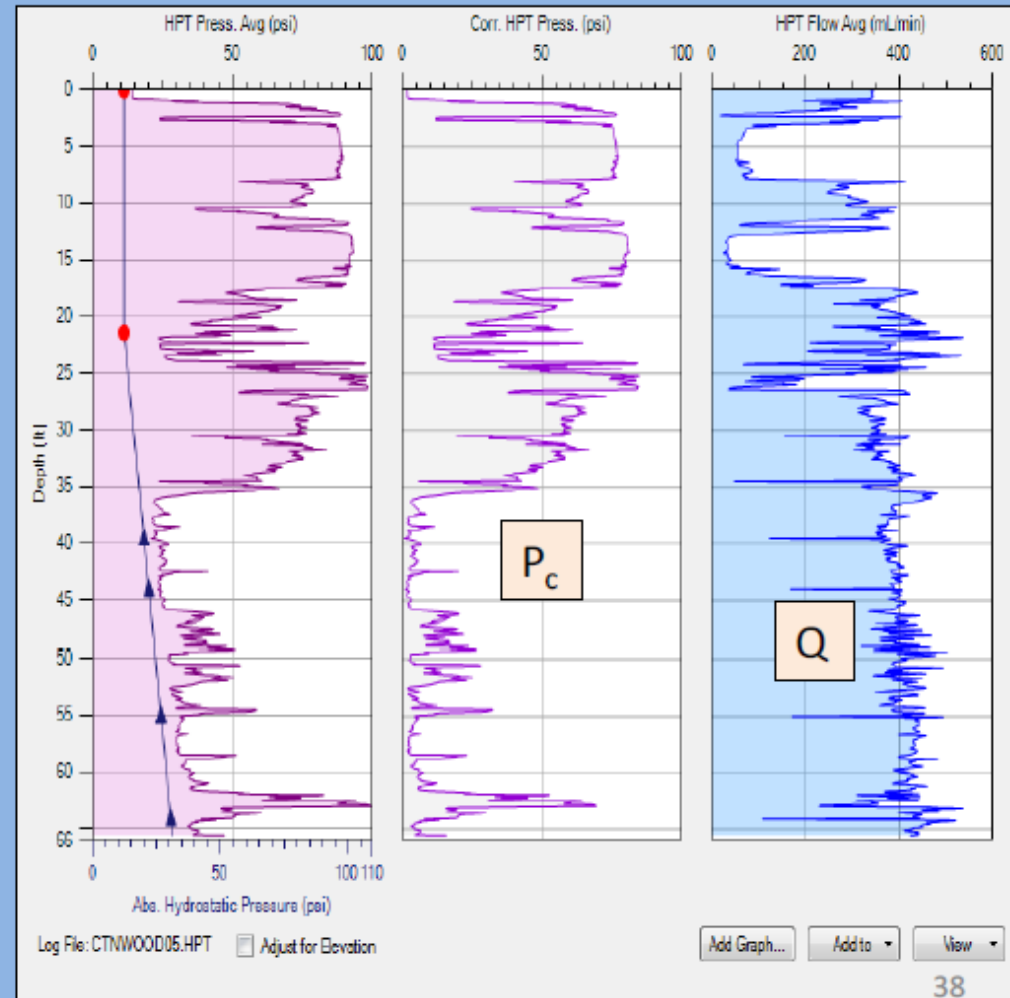
From Darcy's Law:

Hydraulic Conductivity ( $K$ ) =  $f(Q/P)$

HPT logs provide both:

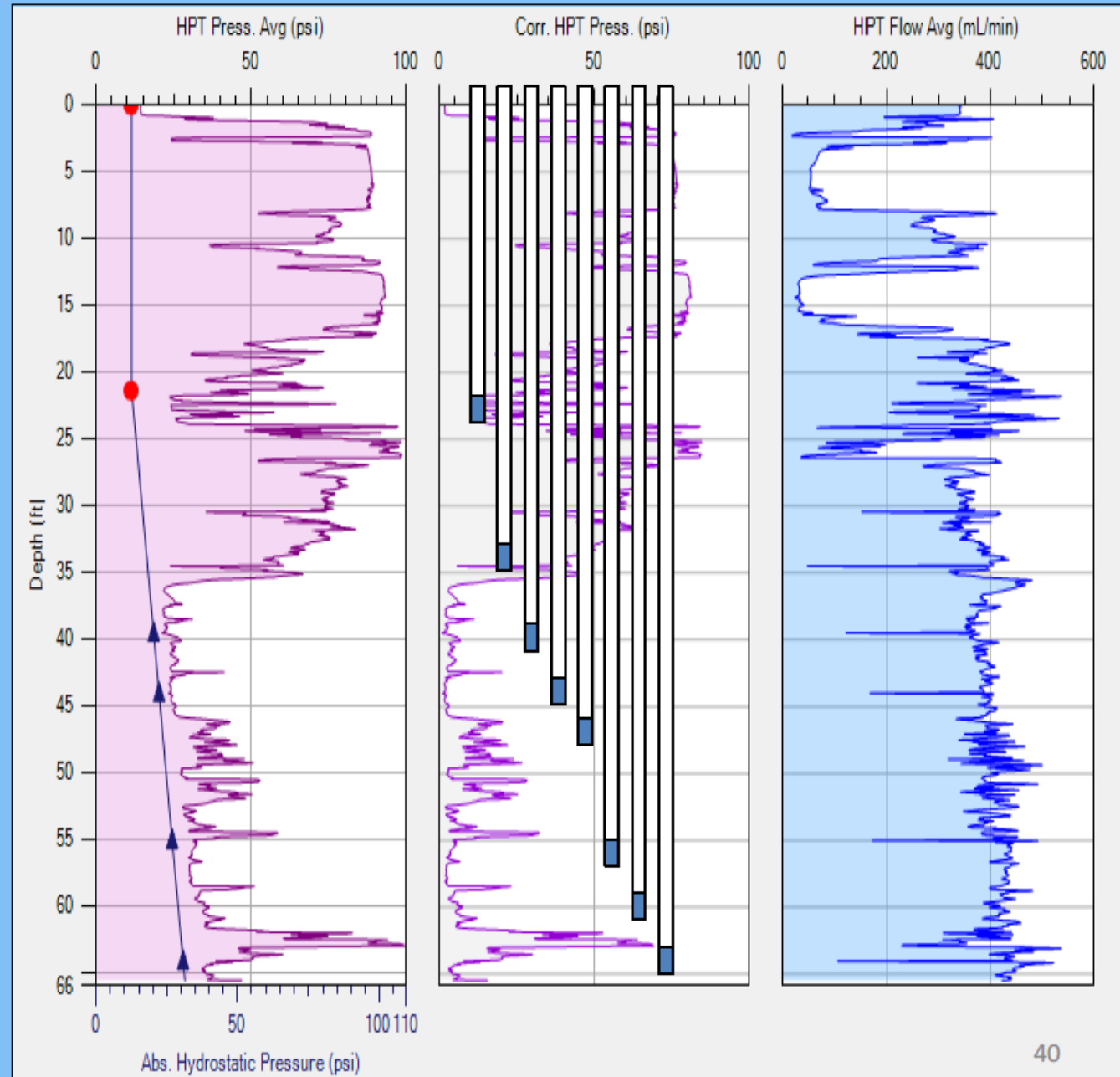
Corrected Pressure ( $P_c$ )

And Flow Rate ( $Q$ )



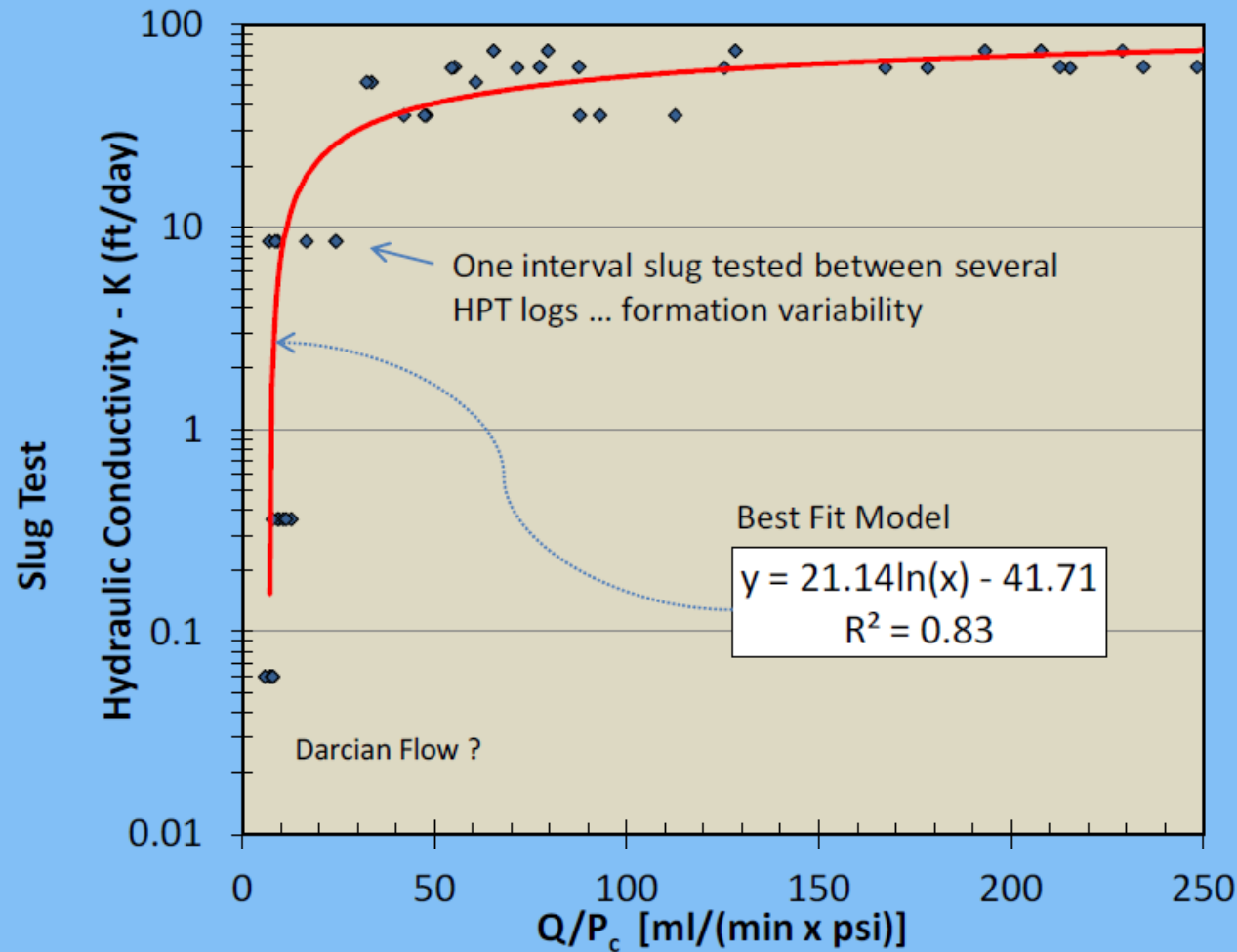
# Multi-Level Discrete Interval Slug Tests

$$K = f(Q/P_c)$$





# Empirical Model for Estimating K with HPT Q & P<sub>c</sub>



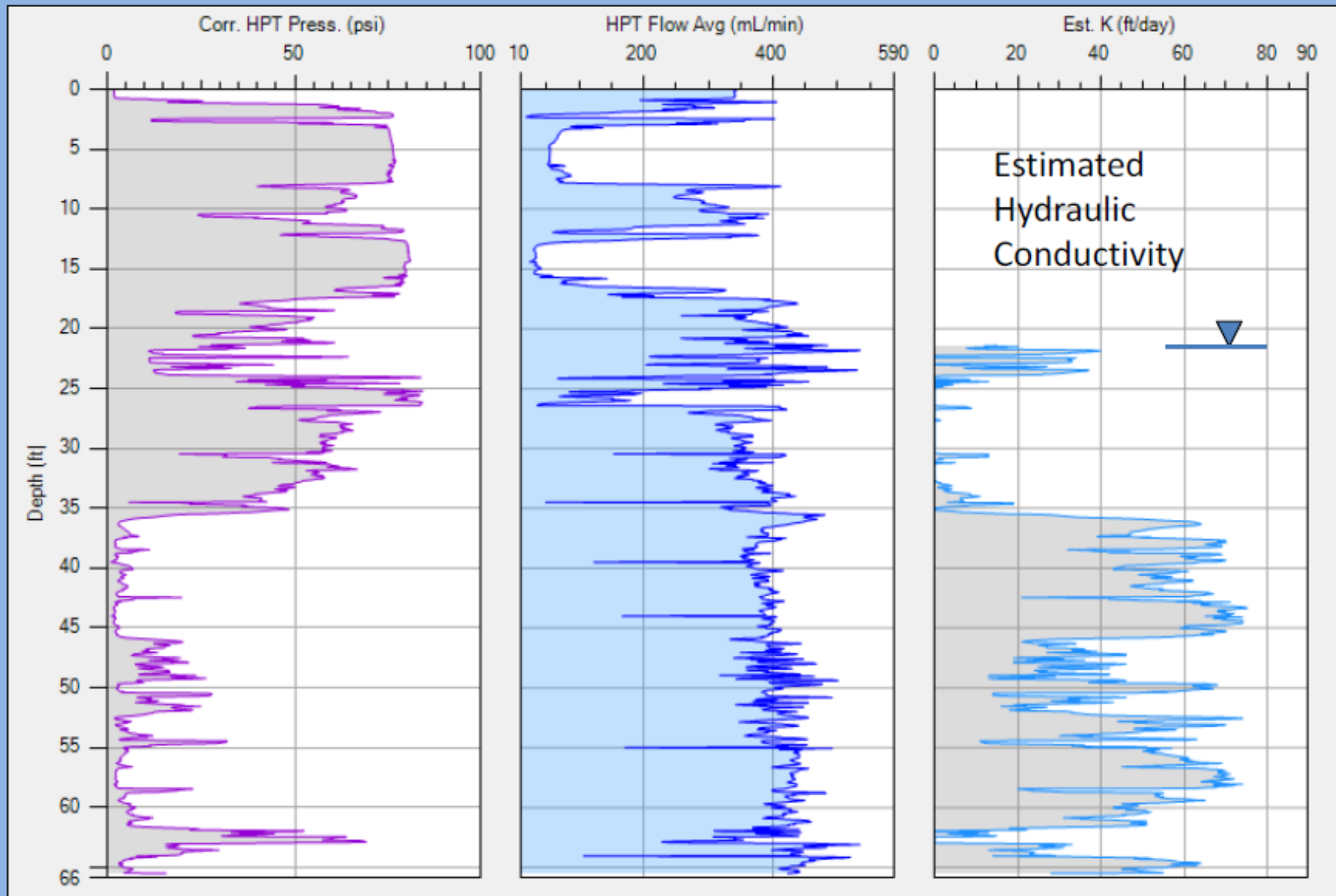
## Model Limits

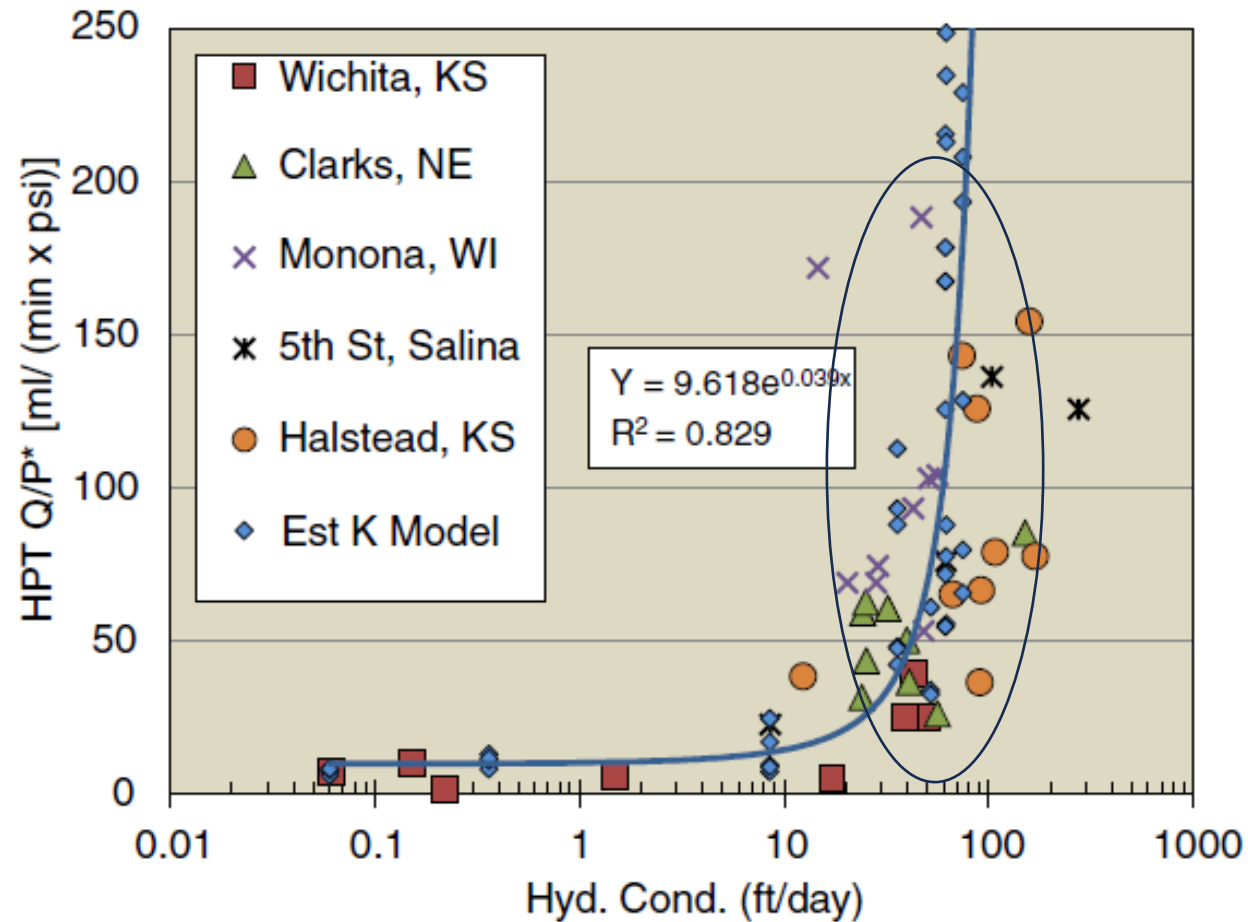
~ 0.1 ft/day to  
75 ft/day

or

3.5E-5 cm/sec to  
2.6E-2 cm/sec

# Estimated K with the DI Viewer Software





$K > 2E-4$  m/s

## The Hydraulic Profiling Tool for Hydrogeologic Investigation of Unconsolidated Formations

W. McCall and T.M. Christy/ Groundwater Monitoring & Remediation 40, no. 3/ Summer 2020/pages 89–103



## A Physically Based Approach for Estimating Hydraulic Conductivity from HPT Pressure and Flowrate

Korelace na skutečné K

by Robert C. Borden<sup>1,2</sup>, Ki Young Cha<sup>3</sup>, and Gaisheng Liu<sup>4</sup>

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### Abstract

The hydraulic profiling tool (HPT) is widely used to generate profiles of relative permeability vs. depth. In this work, prior numerical modeling results are used to develop a relationship between probe advance rate  $V$  (cm/s), probe diameter  $D$  (cm), water injection rate  $Q$  (mL/min), corrected pressure  $P_c$  (psi), and hydraulic conductivity  $K$  (feet/d)

$$K = E(0.1235 VD^2 + 0.119Q)P_c^{-1.017}$$

where  $E$  is an empirically derived hydraulic efficiency factor. The relationship is validated by 23 HPT profiles that, after averaging  $K$  vertically, were similar to slug test results in adjoining monitoring wells. The best fit value of  $E$  for these profiles was 2.02. This equation provides a physically based approach for generating hydraulic conductivity profiles with HPT tooling.

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# Další možnosti Direct Sensing od Geoprobe

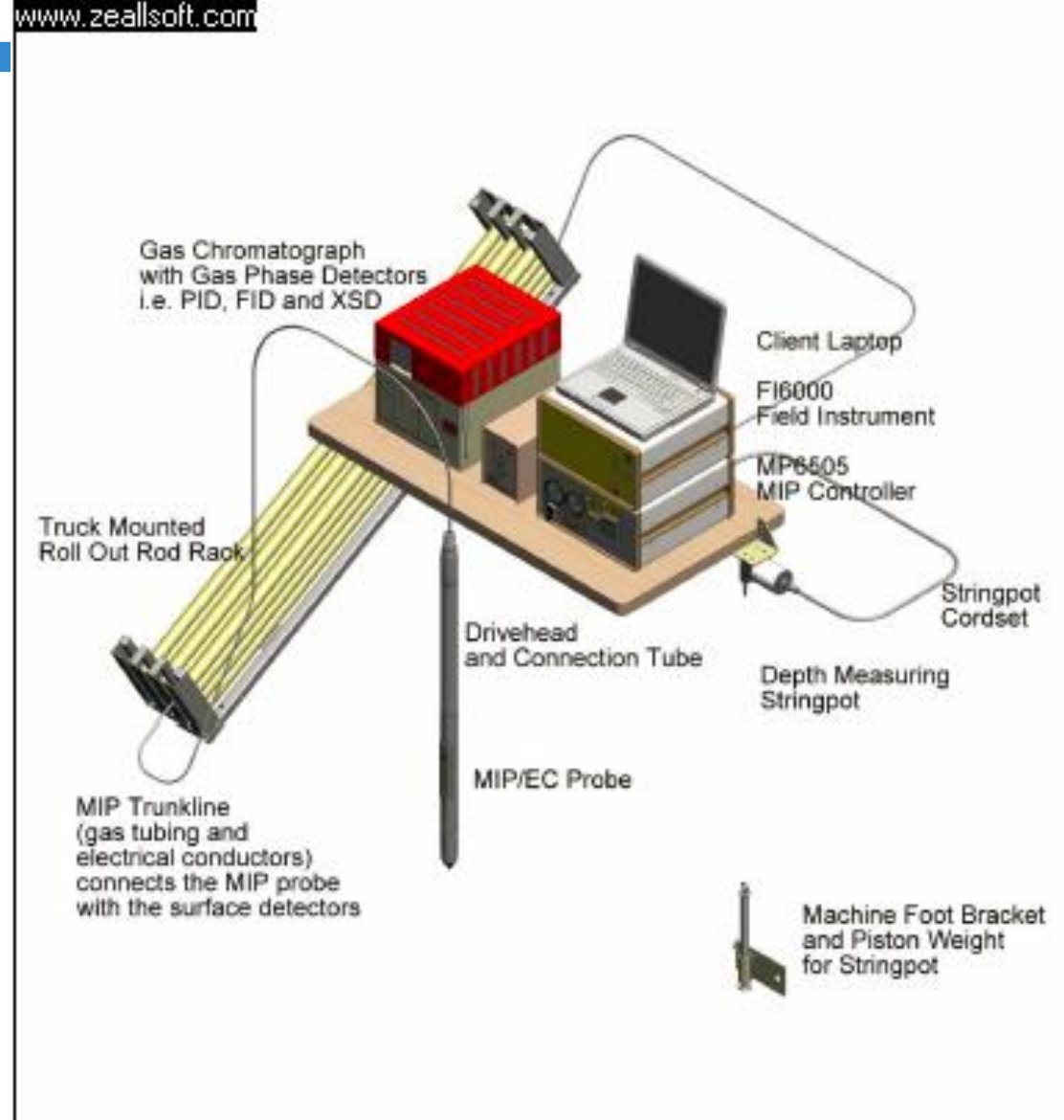
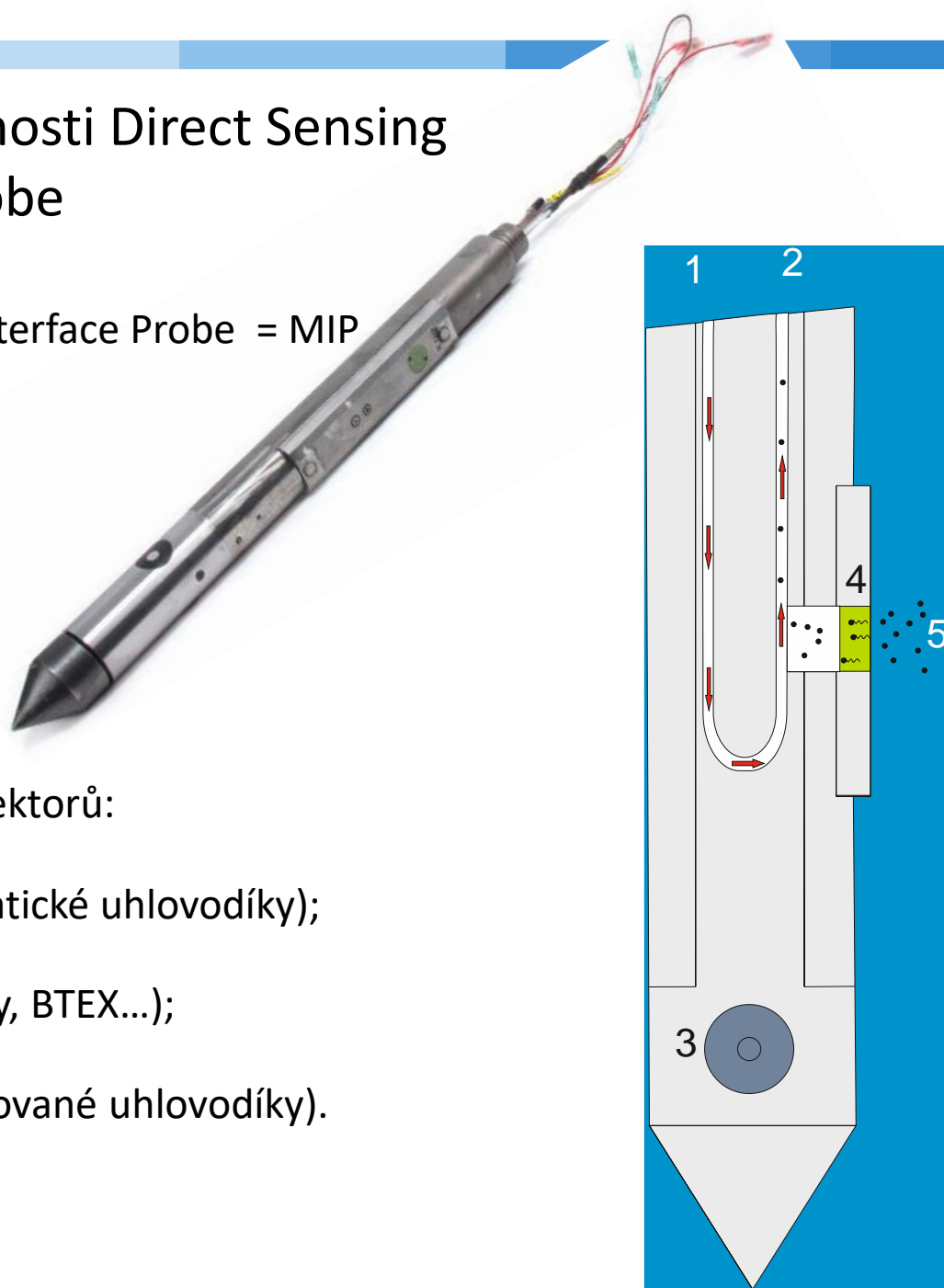
Membrane Interface Probe = MIP

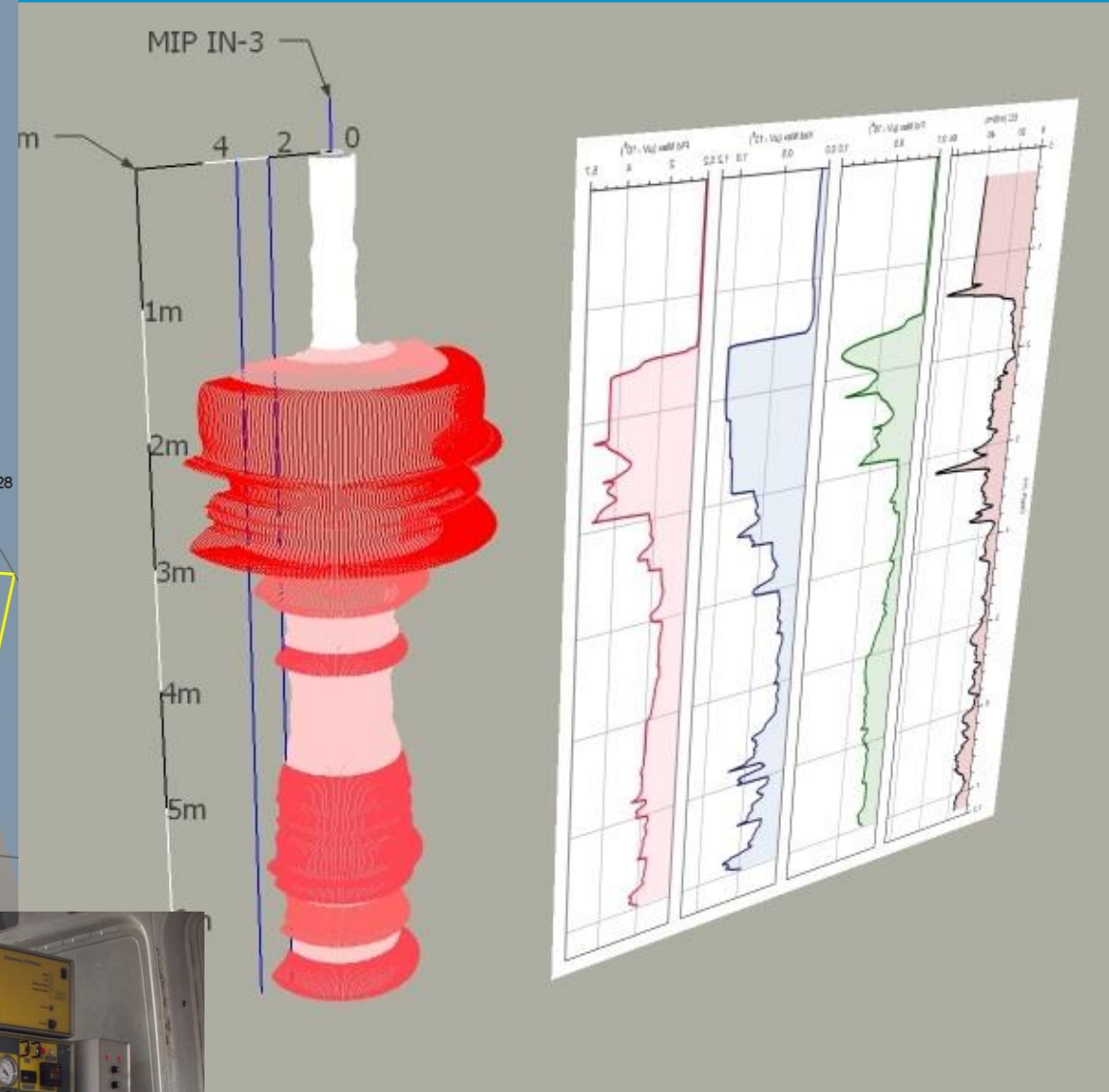
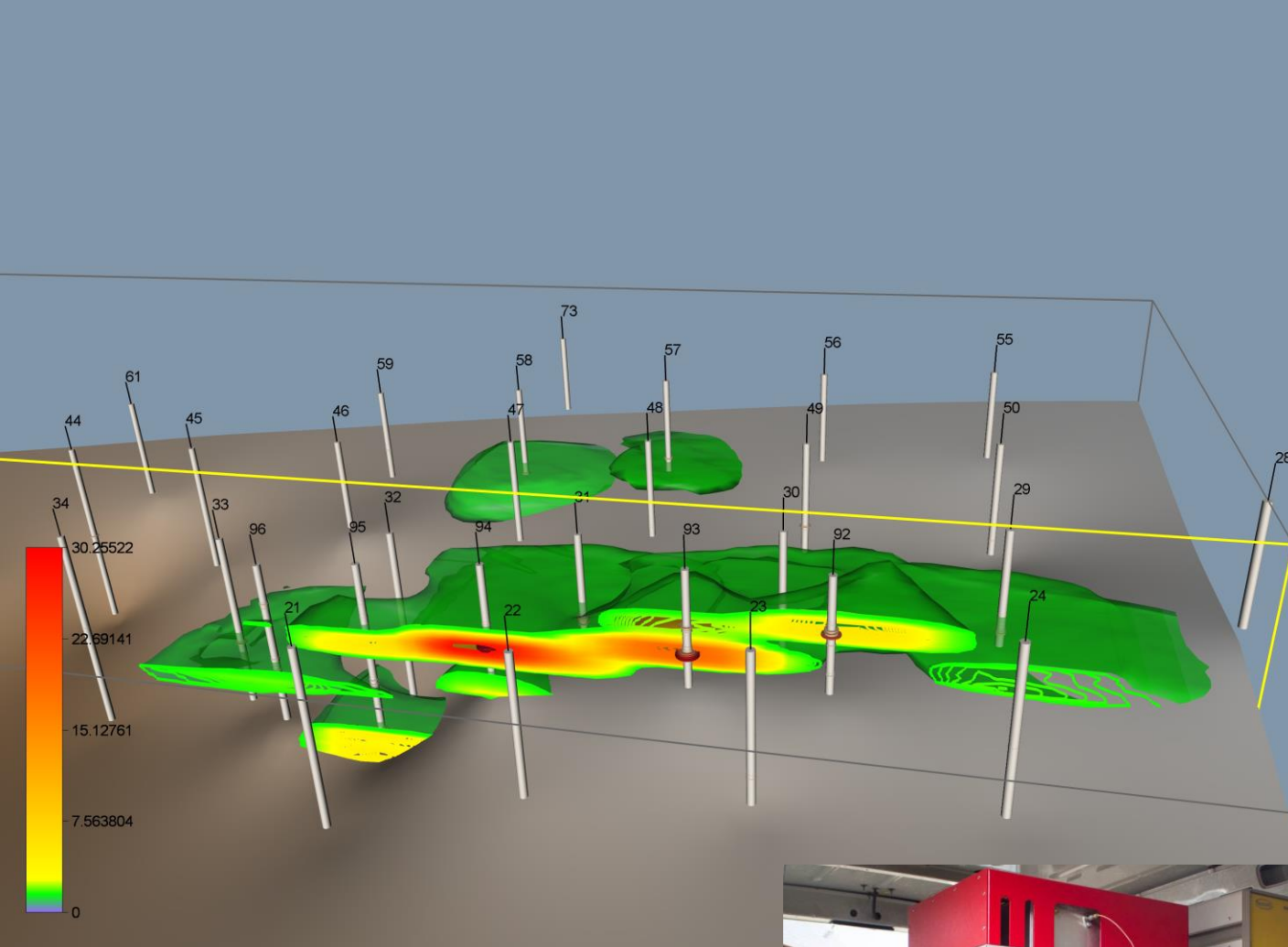
3 typy detektorů:

PID (aromatické uhlovodíky);

FID (etheny, BTEX...);

XSD (chlorované uhlovodíky).



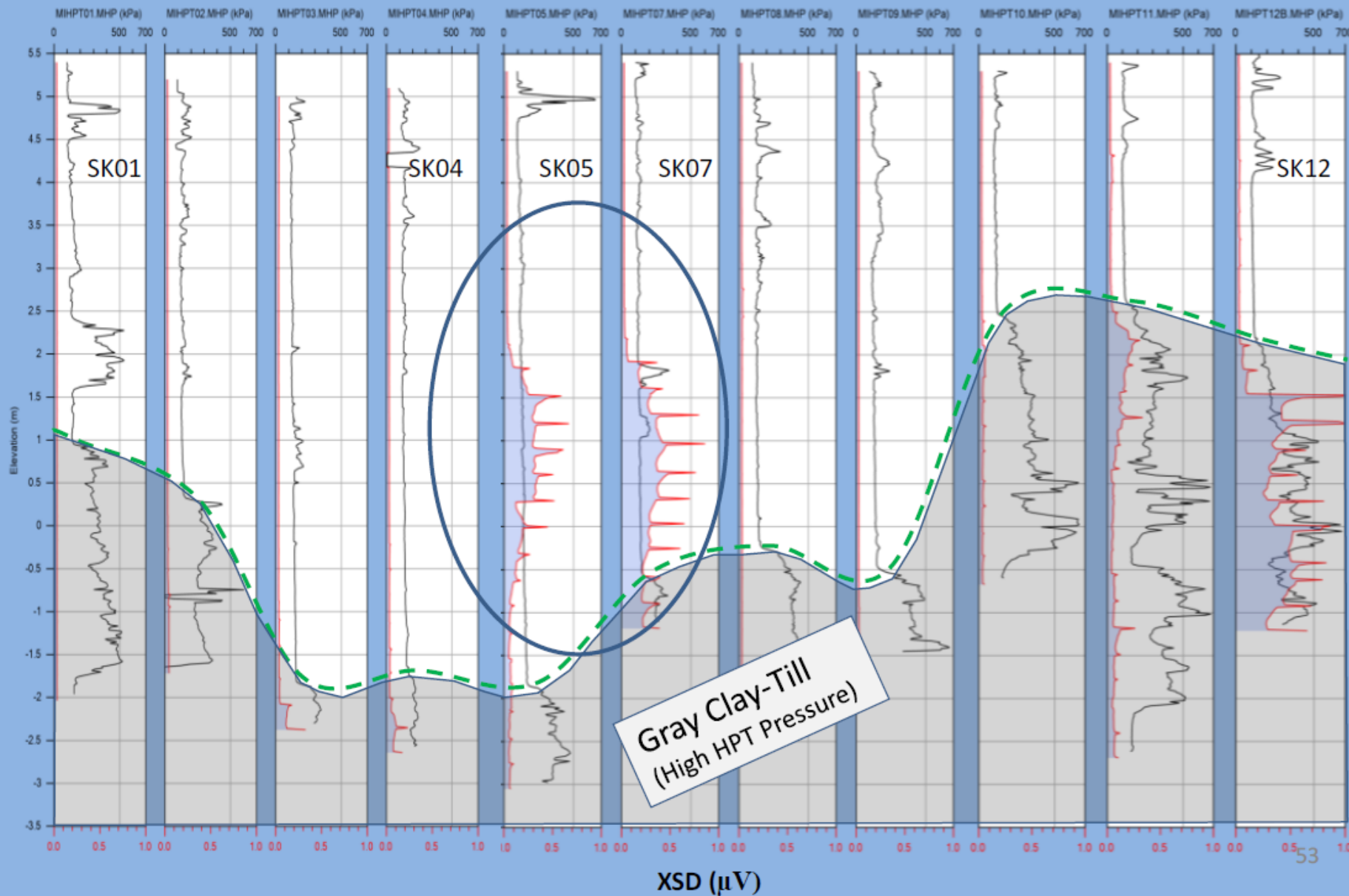


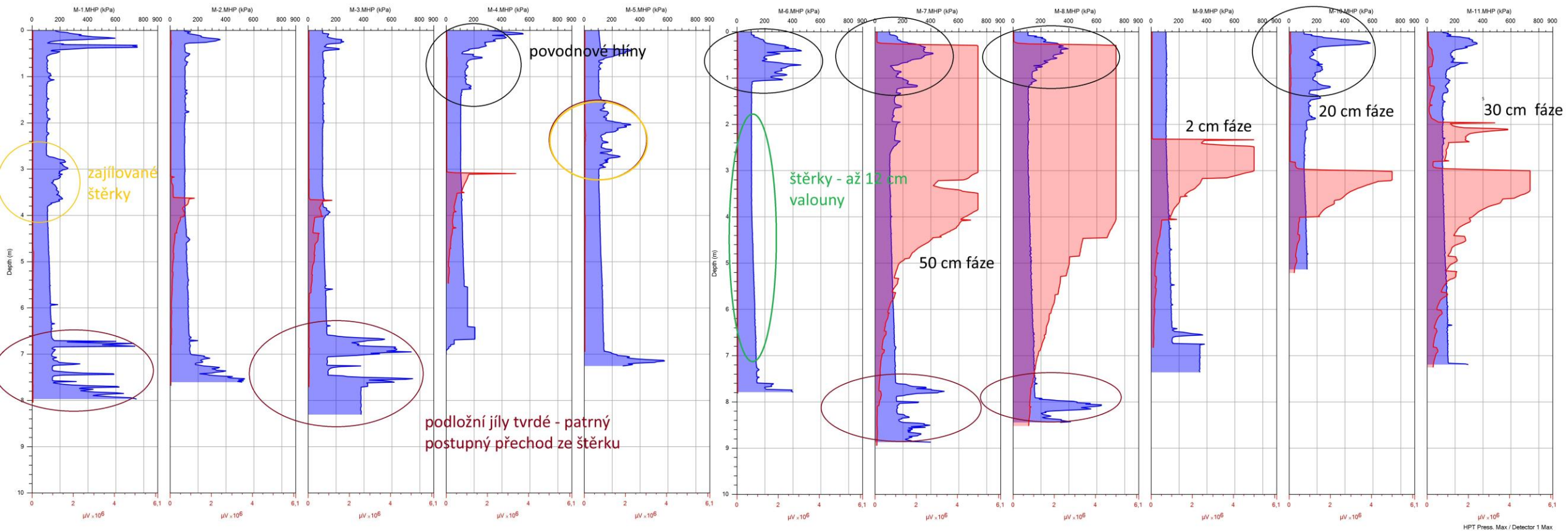


# Skuldelev HPT Pressure and XSD Cross Section

East

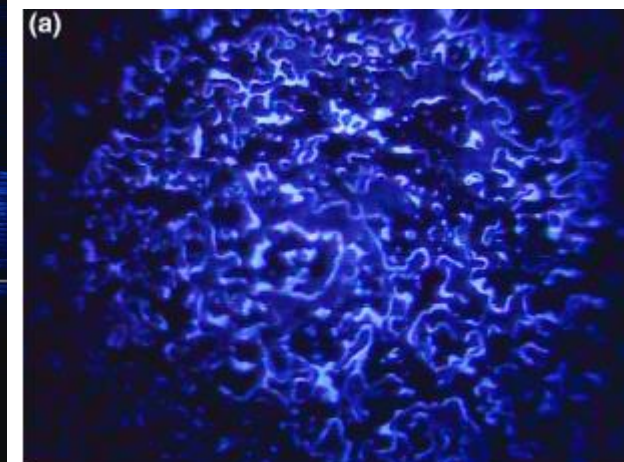
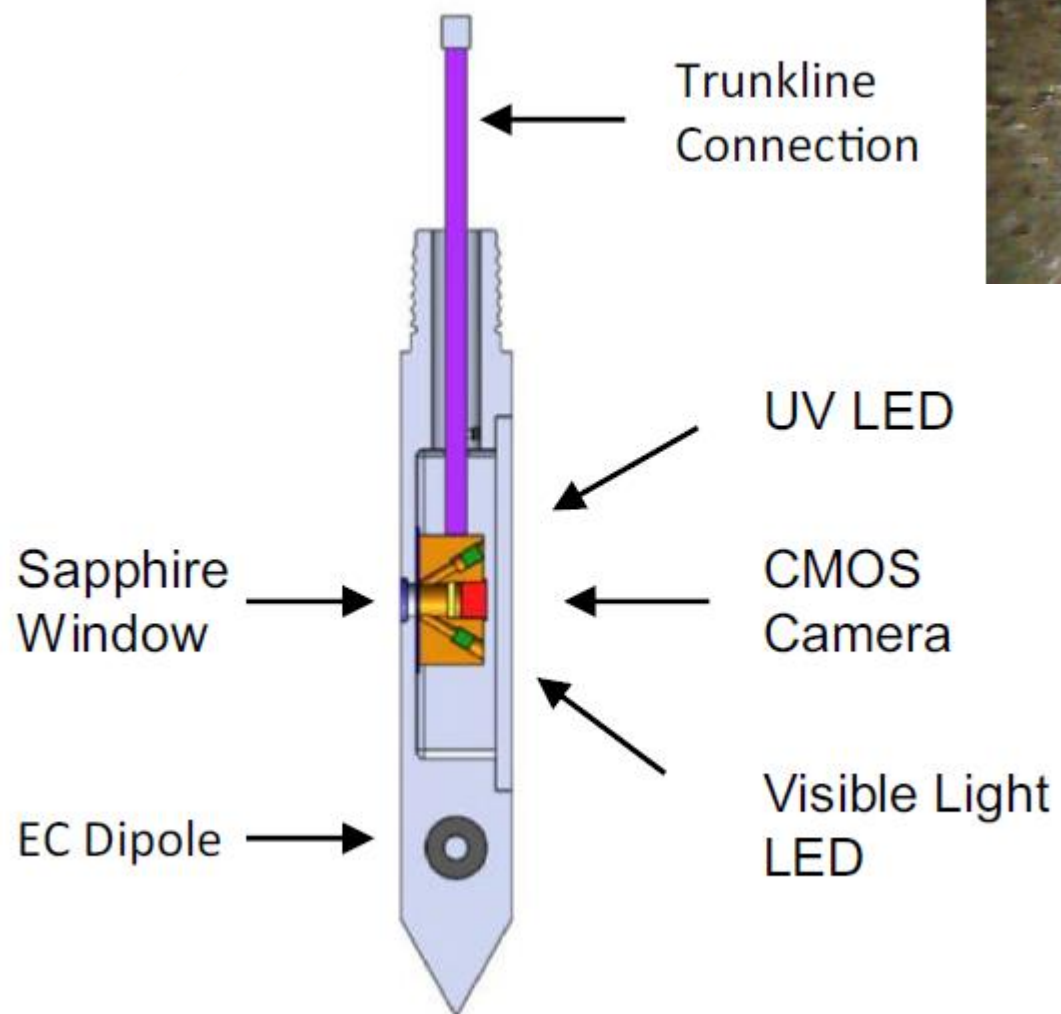
West



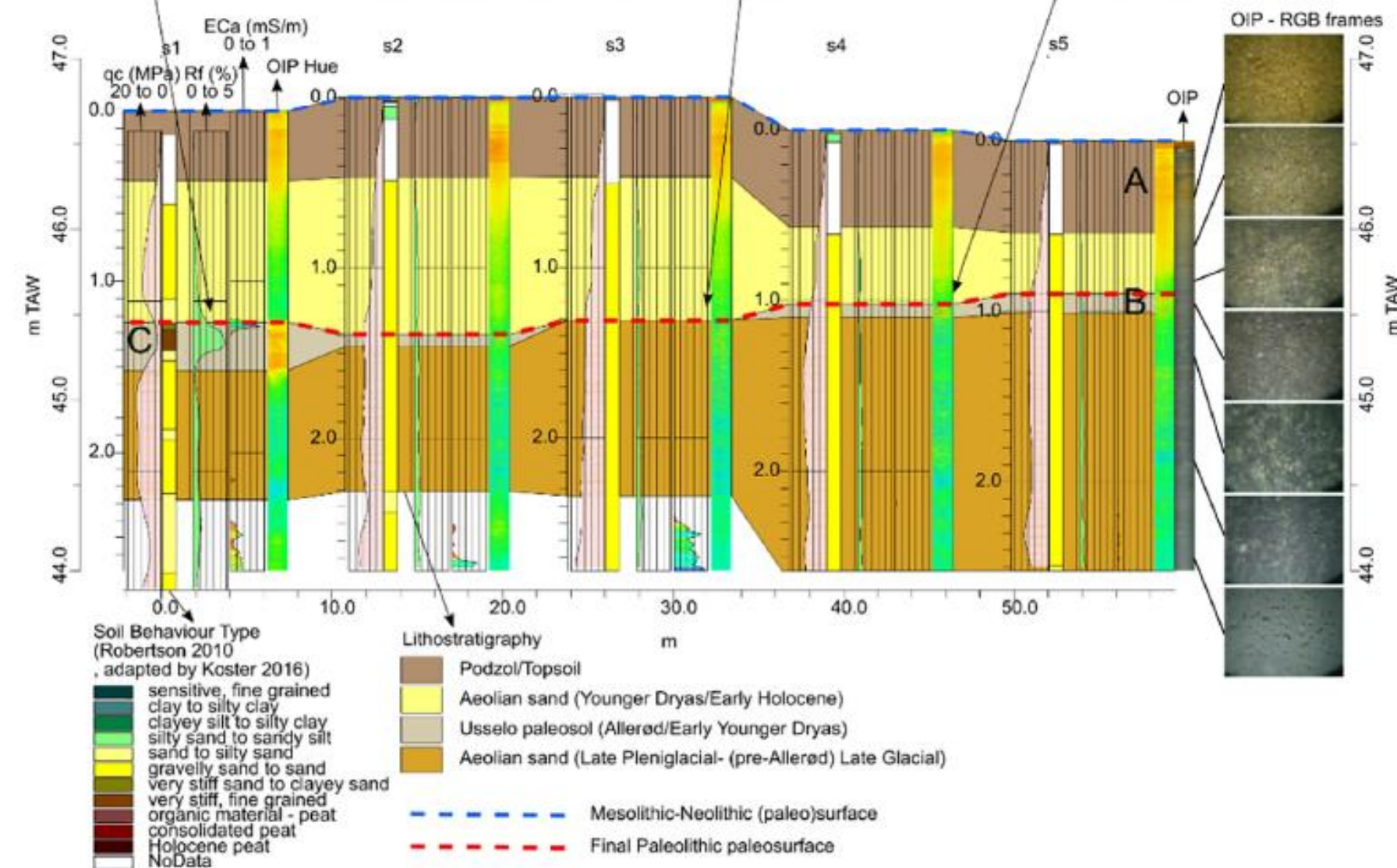


# Další možnosti Direct Sensing od Geoprobe

Optical Image Profiler = OIP





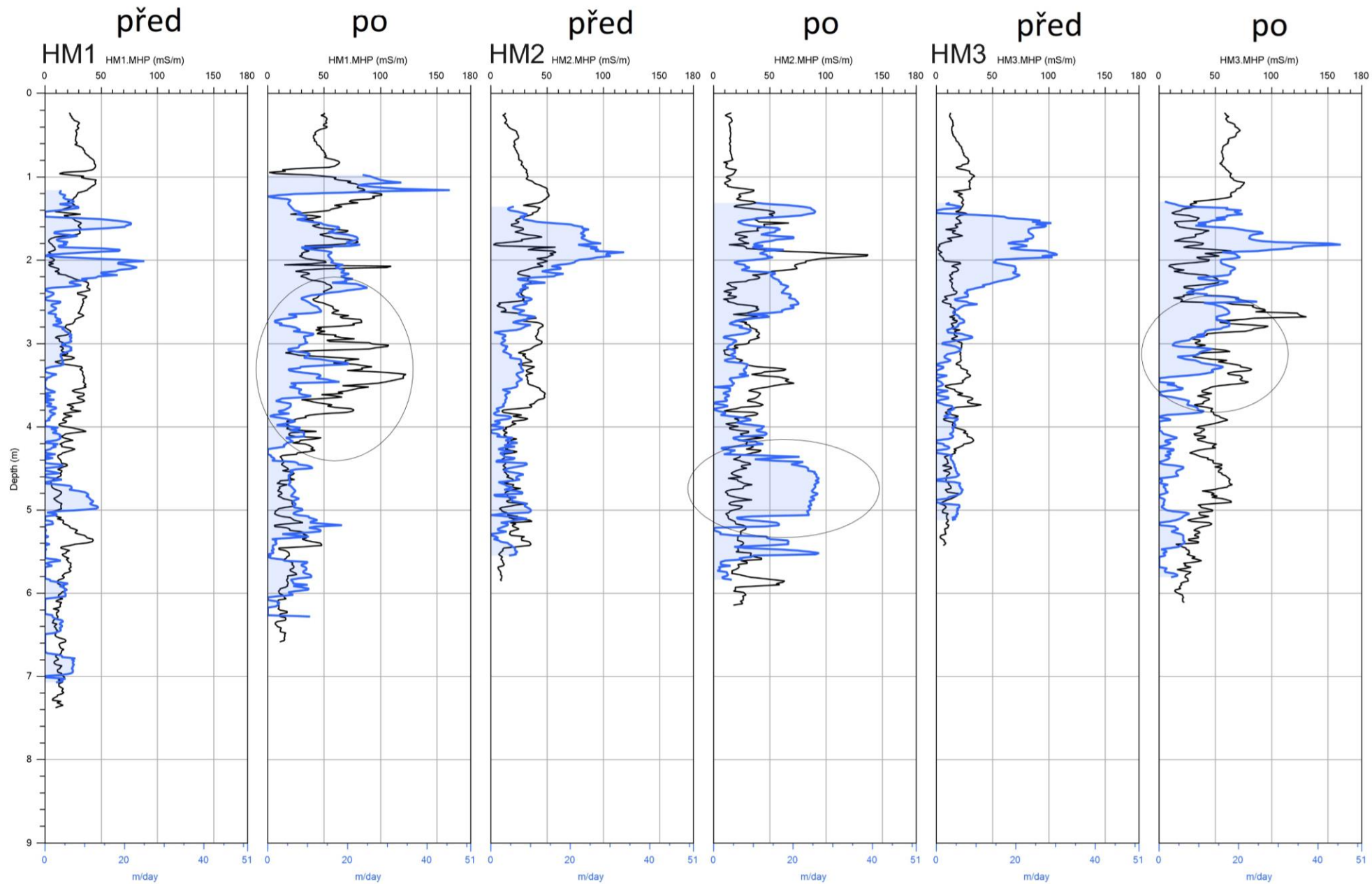




Dual tube  
– systém pro odběr  
zemín do plastového  
lineru, který je umístěn  
uvnitř soutyčí









## CONTACT

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