CPT und LIF-Sensorik
- Anwendungsbeispiele und –grenzen -

Dr. Michael Neuhaus
FUGRO CONSULT GMBH

Ausbreitung von Produktphasen (NAPL) im Untergrund

Die laterale und vertikale Eingrenzung und Charakterisierung von Schadstoffquellen sowie die Kenntnis der Bodenbeschaffenheit sind substanziell für eine korrekte Einschätzung des Gefahrenpotentials und des Sanierungsaufwands. In-Situ-Erkundungsmethoden wie MIP und LIF (Laser-Induzierte Fluoreszenz), die eine ungestörte Direktmessung von Kontaminationen im Untergrund erlauben, sind daher unverzichtbar.

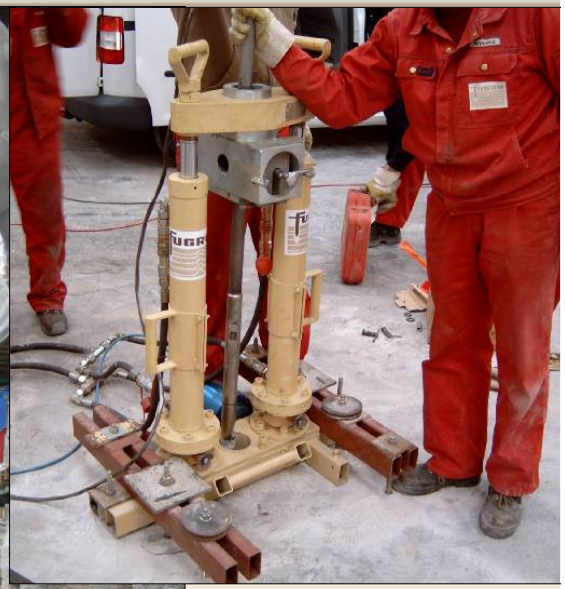
PROCEEDINGS, TOUGH Symposium 2006

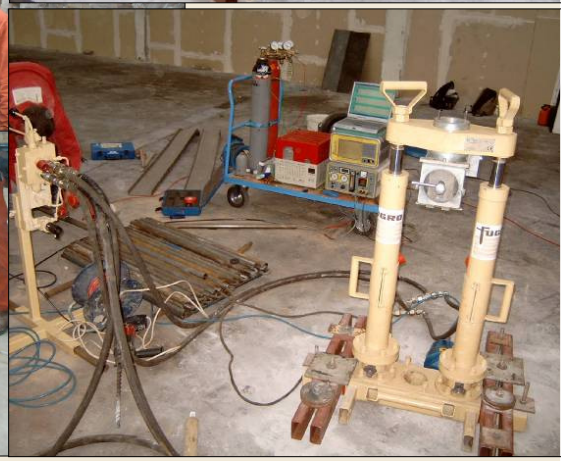
Lawrence Berkeley National Laboratory, Berkeley, California, May 15–17, 2006

MODELLING NAPL SOURCE ZONE FORMATION IN STOCHATICALLY HETEROGENEOUS LAYERED MEDIA – A COMPARISON WITH EXPERIMENTAL RESULTS

CPT (Cone Penetration Test) - Drucksondierfahrzeuge

Mobile 20t-Minicrawler



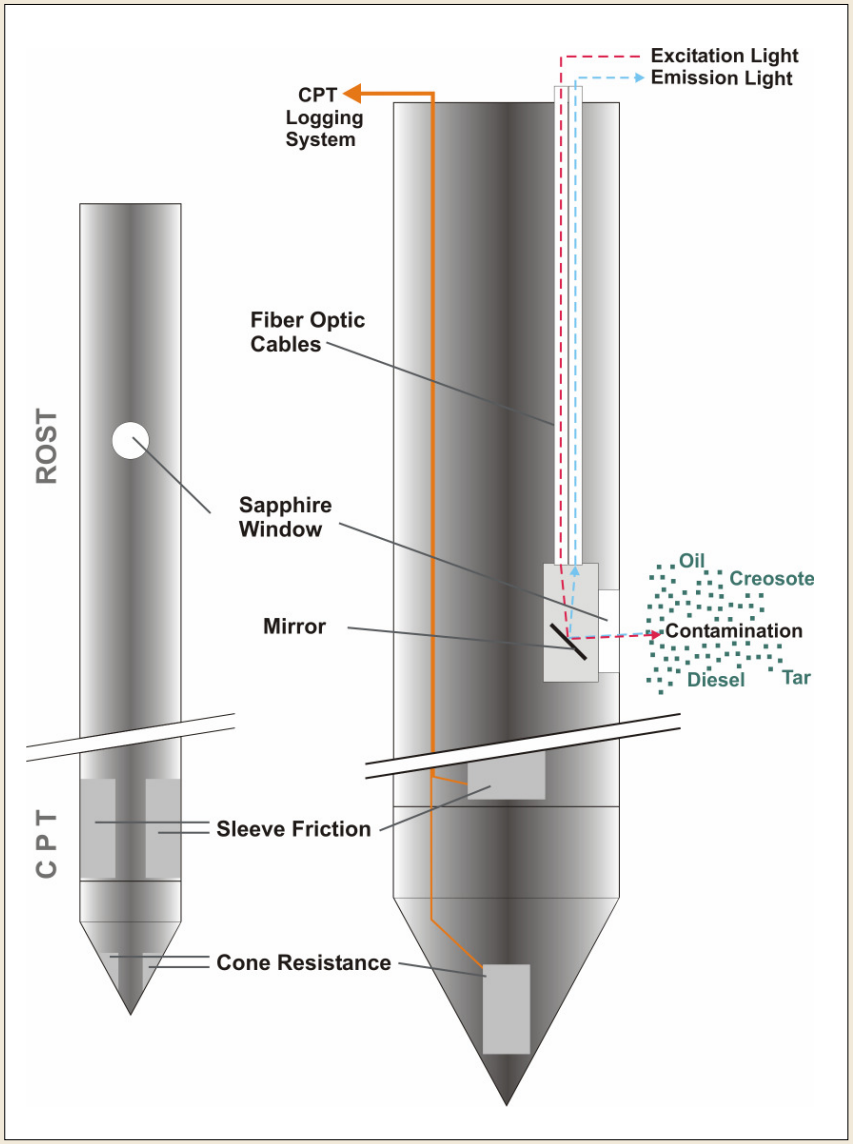


Stand-Alone-CPT-Rig (15 t)

Mobile Drucksondiergeräte

Aufgestempeltes
Drucksondierfahrzeug

Hydraulischer Sondiertisch und Messeinheit

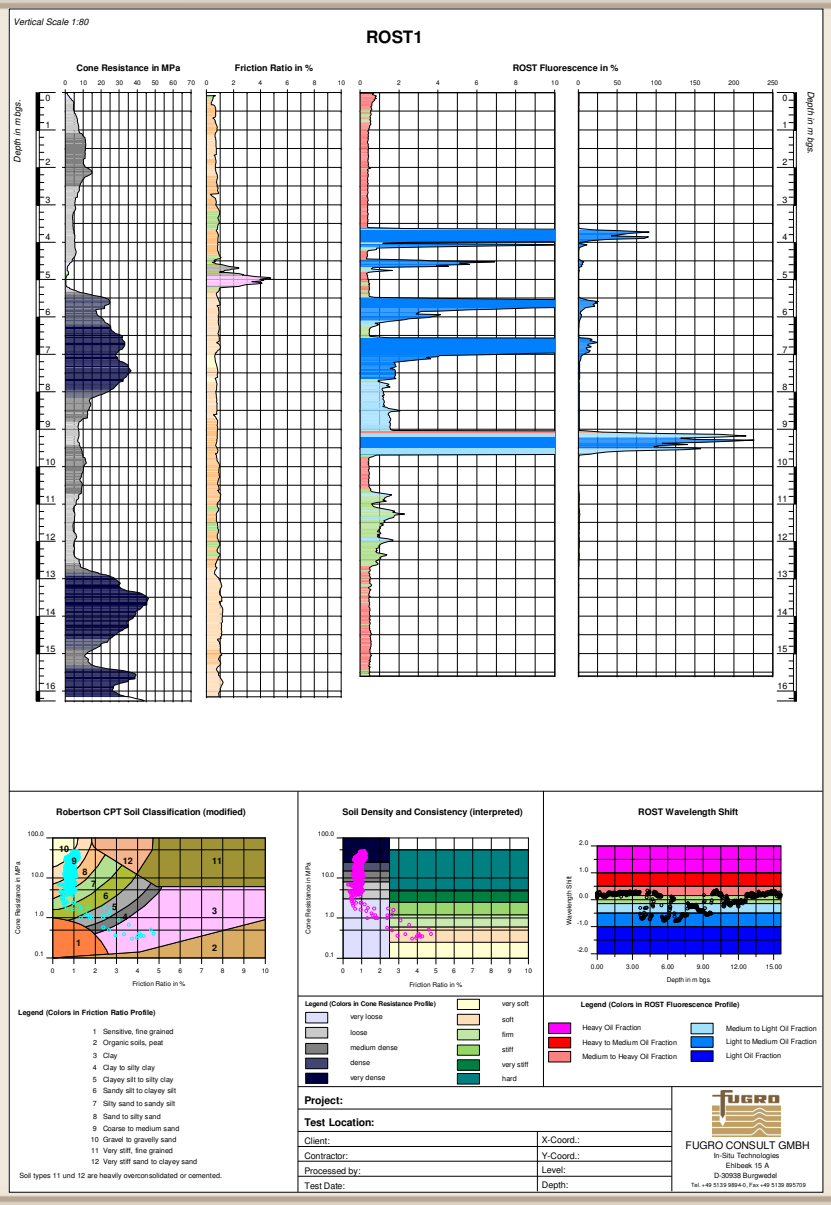


ROST™
(Rapid Optical Screening Tool)
Nd-YAG-Laser/Dye-Laser
Excitation 290 nm
Emission Wavelengths
340 - 390 - 440 - 490 nm

Upcoming !!
TarGOST™
(Tar-Specific Green Optical Screening Tool)
Green laser especially and solely designed for Tar DNAPL (Coal Tar, Creosote etc.)

UVOST™
(UltraViolet Optical Screening Tool)
Excimer Laser
Excitation 308 nm
Emission Wavelengths
350 - 400 - 450 - 500 nm

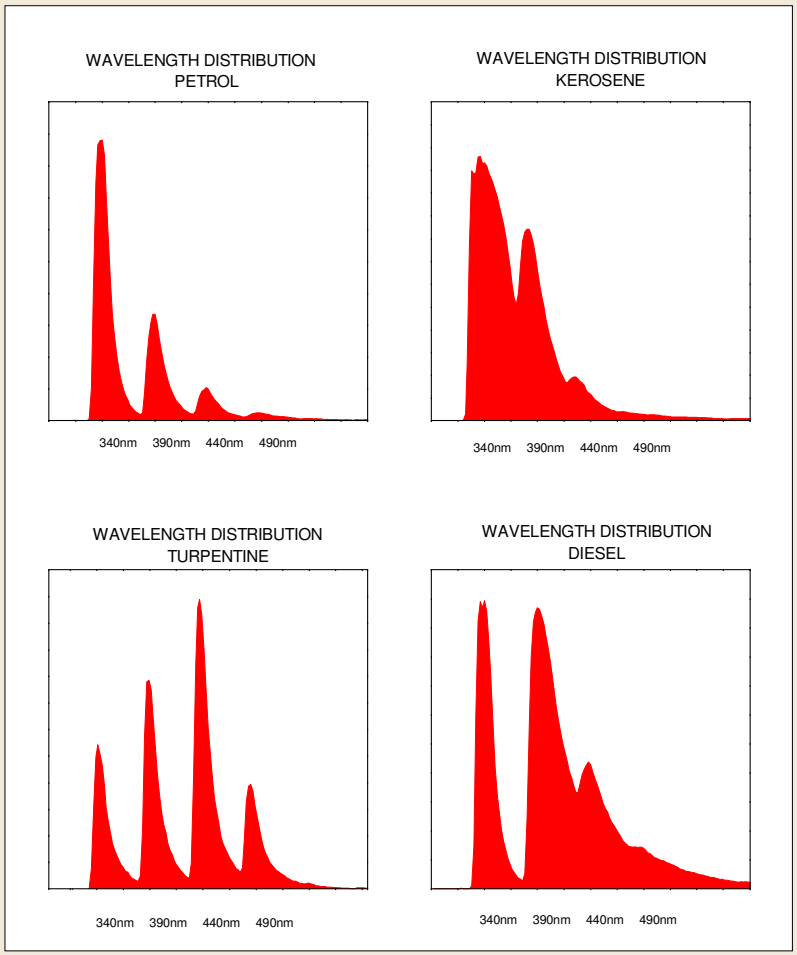
LIF/CPT - Sensorik

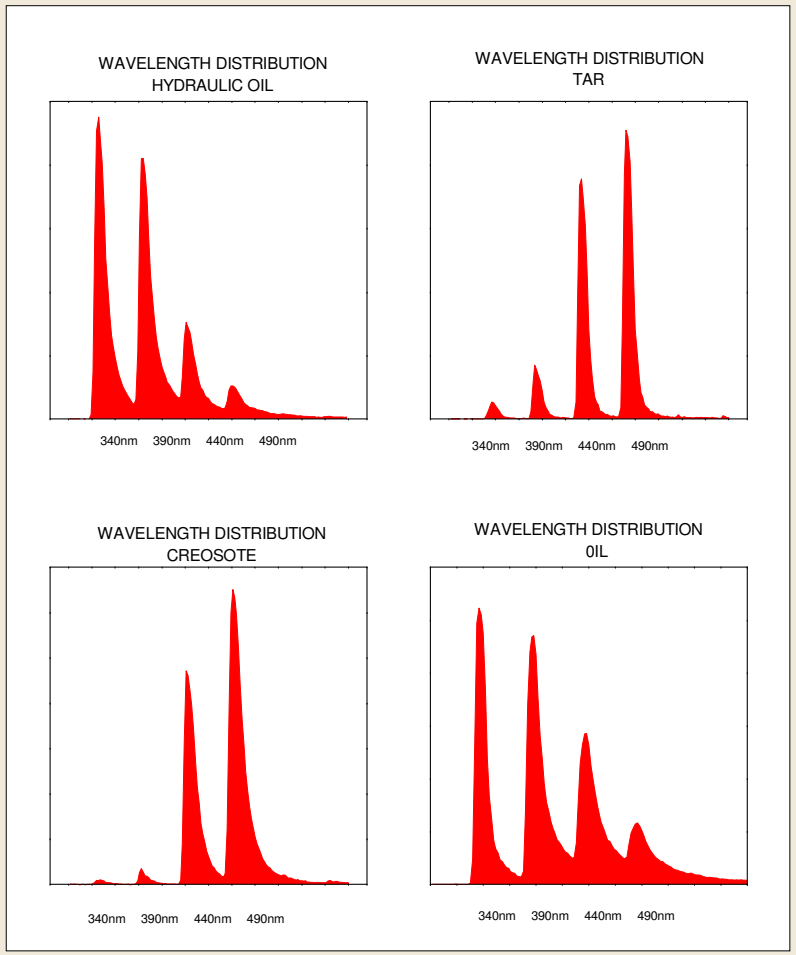


LIF-CPT

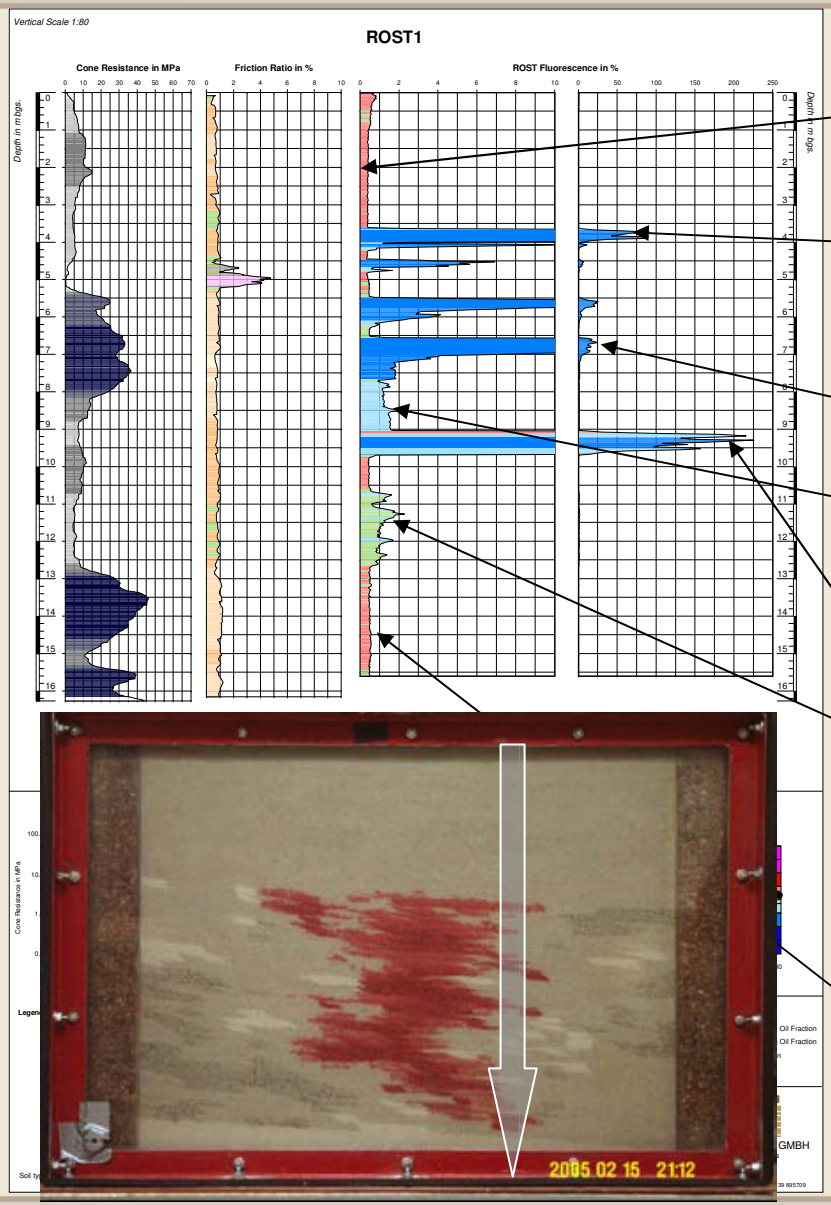
- Halbquantitative Direktmessung von Kohlenwasserstoffverunreinigungen im Untergrund – z.B. Benzin, Diesel, Kerosin, Rohöl, Teer etc.
- Simultane Erkundung des Bodenschichtaufbaus mittels CPT
- Produktidentifikation über Wellenlängenmuster
- Digitale Datenerfassung
- Flexible Anpassung der Untersuchungsstrategie vor Ort (gleitende Projektierung)

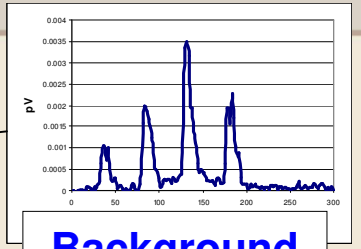
Sensors #2: LIF (Laser Induced Fluorescence)



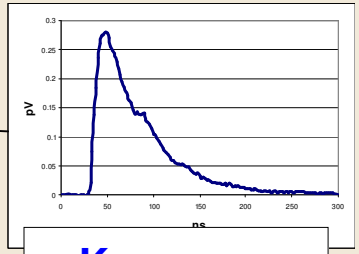


ROST™ - Waveforms

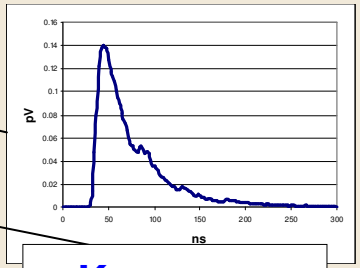




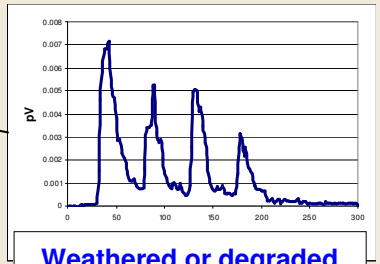
Background



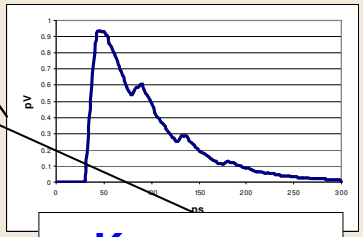
Kerosene



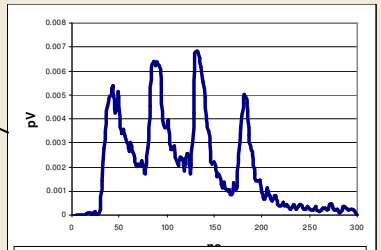
Kerosene



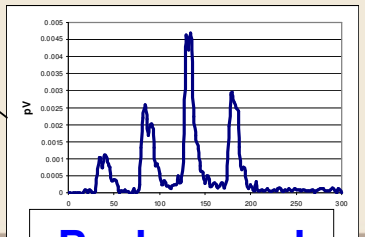
Weathered or degraded Kerosene



Kerosene

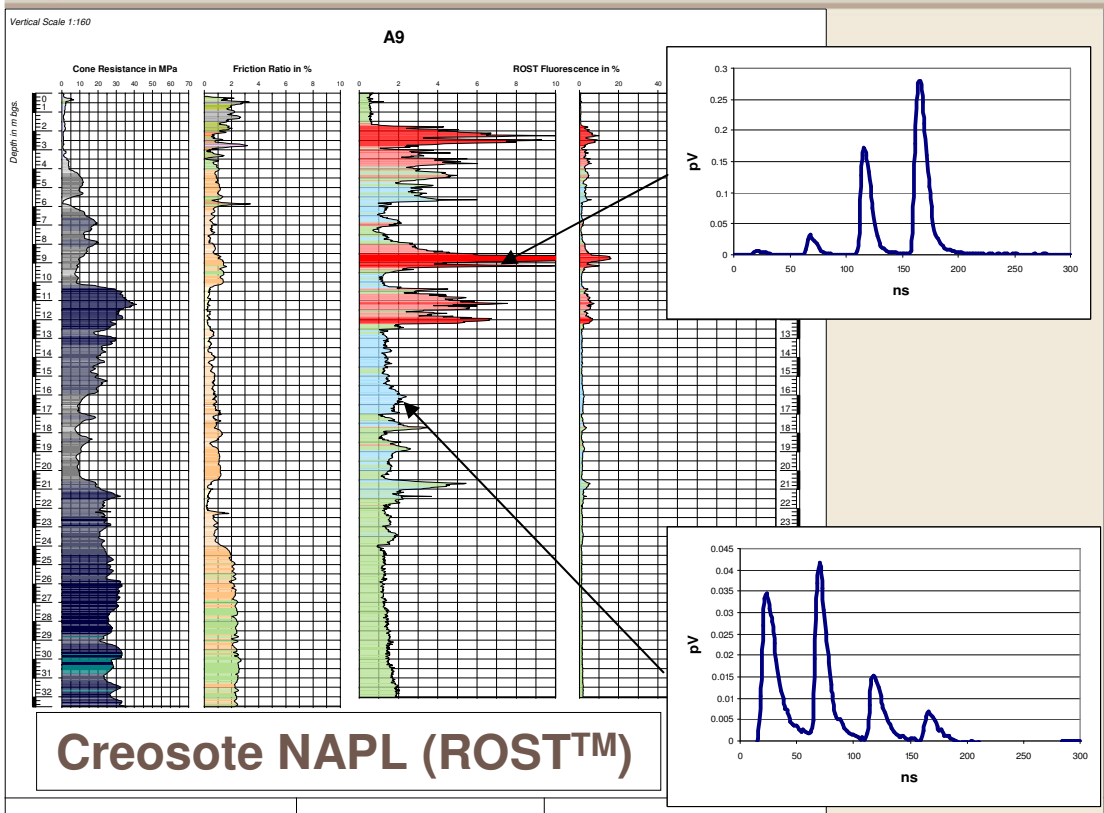


Dissolved Fraction

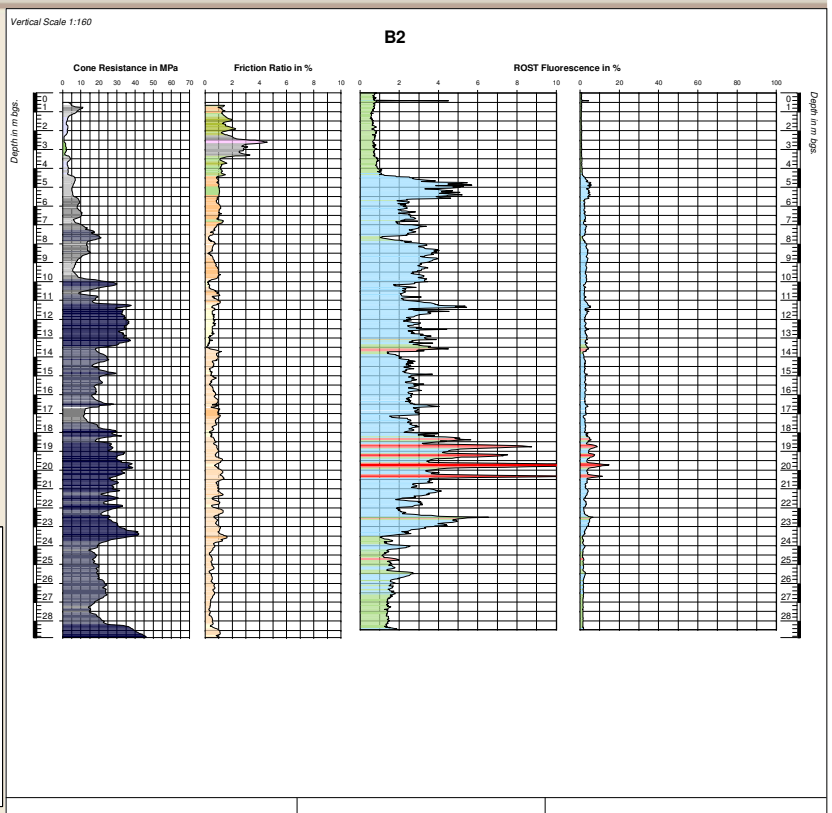


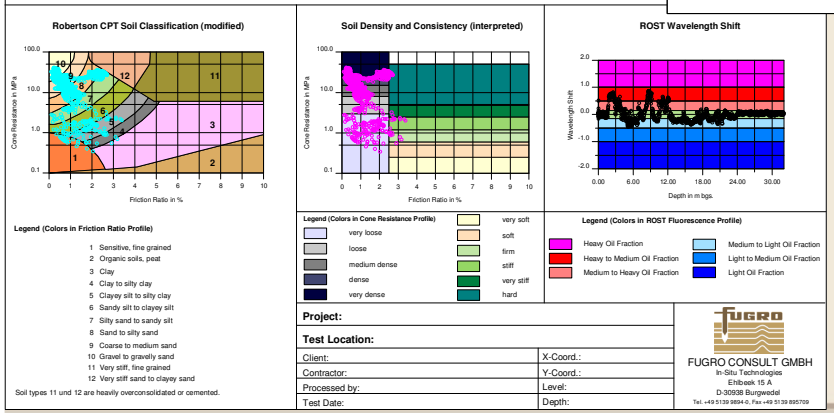
Background

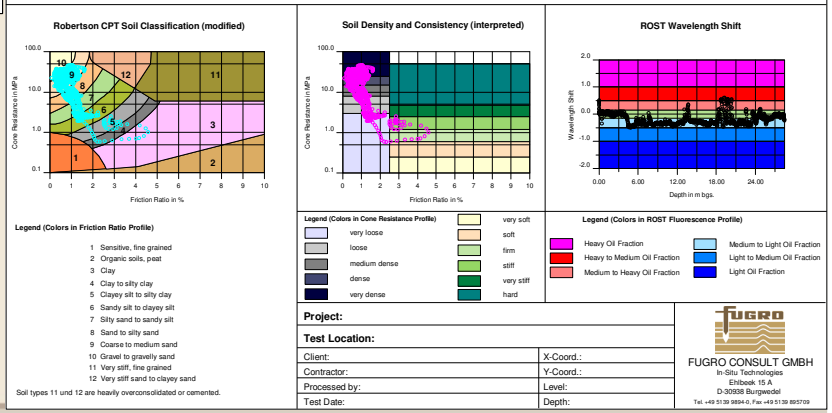
CPT und LIF-Sensorik
- Anwendungsbeispiele und -grenzen -

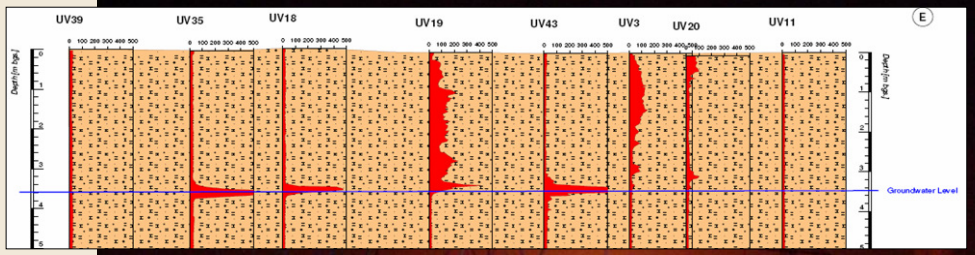


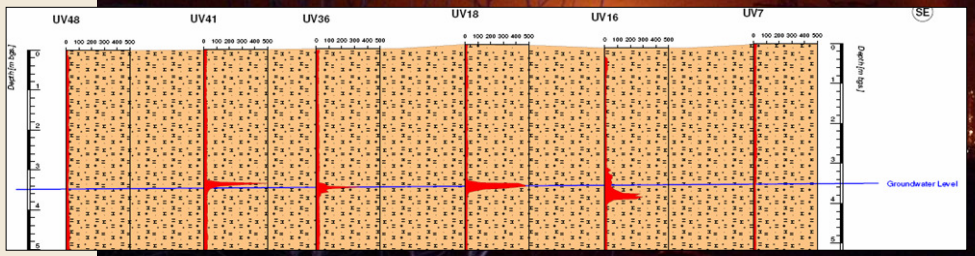
Creosote NAPL (ROST™)

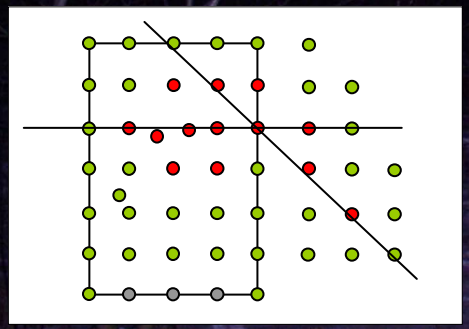


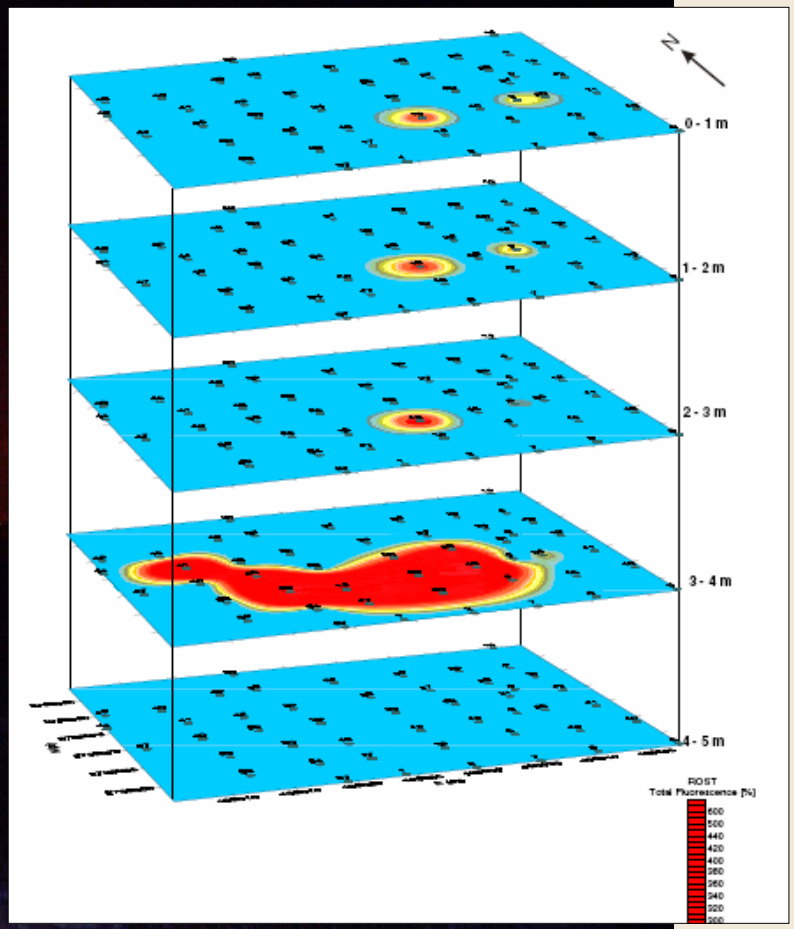






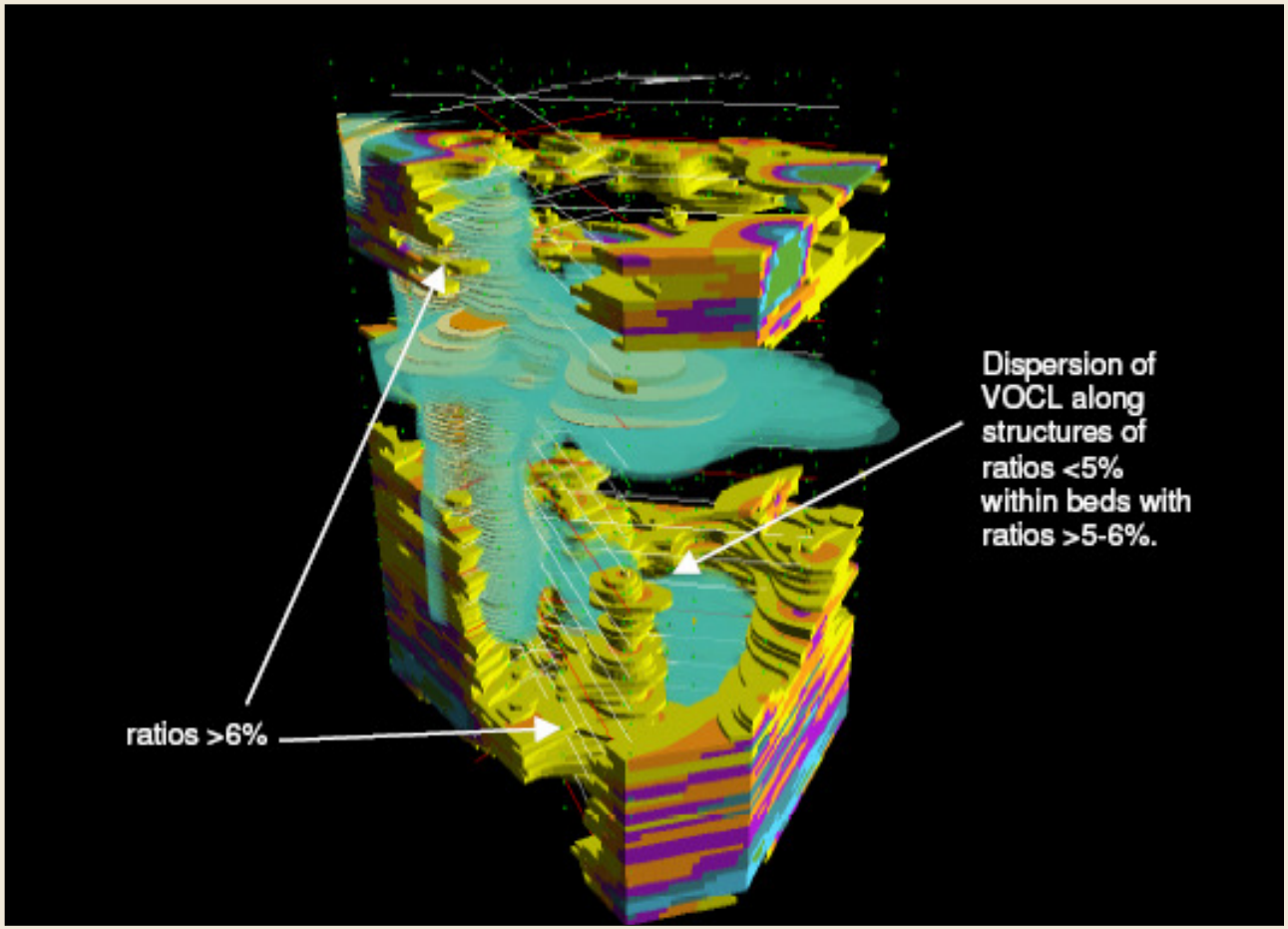






2D- and 3D-Visualisierung von LIF-Daten

Conceptual Site Models (CSM)



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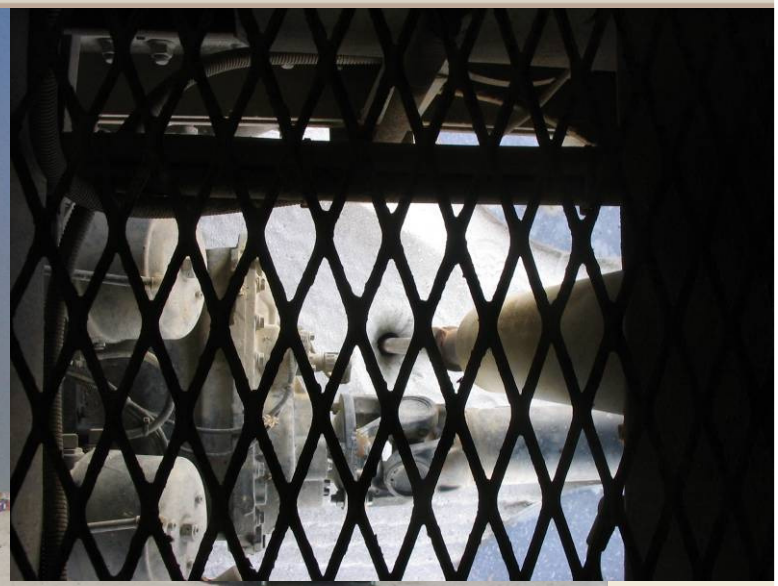
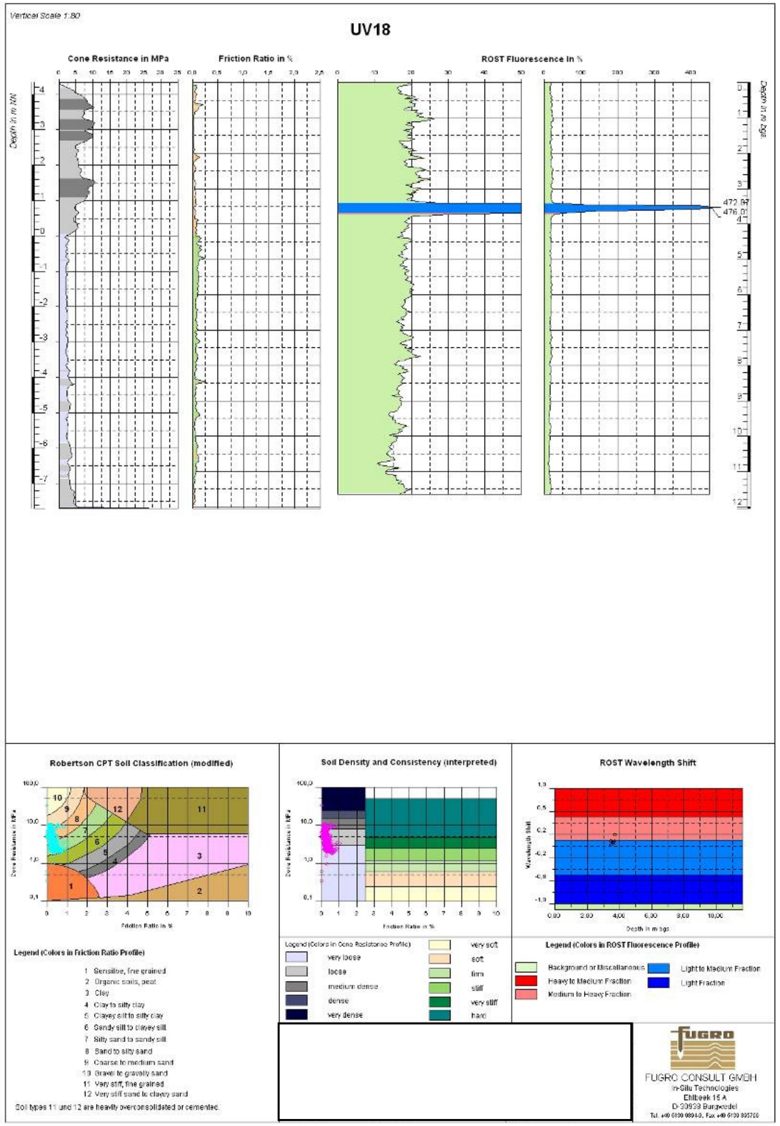
Dr. Pelzer und Partner Hildesheim

UVOST Dubai

Location:	**Palm Deira, Dubai**
Objective:	**Investigate Diesel Spill**
Scope of work:	**56 UVOST-CPT to 15 m**

CPT und LIF-Sensorik
- Anwendungsbeispiele und -grenzen -




UV18
Cone Resistance in MPa
Friction Ratio in %
ROST Fluorescence in %
Robertson CPT Soil Classification (modified)
Soil Density and Consistency (interpreted)
ROST Wavelength Shift
Legend (Colors in Friction Ratio Profile)
1 Sensitive, fine grained
2 Organic soils, peat
3 Clay
4 Clay to silty clay
5 Clayey silt to silty clay
6 Sandy silt to clayey silt
7 Silty sand to sandy silt
8 Sand to silty sand
9 Coarse to medium sand
10 Gravel to gravelly sand
11 Very stiff, fine grained
12 Very stiff sand to clayey sand
Soil types 11 and 12 are heavily overconsolidated or cemented.
very loose
loose
medium dense
dense
very dense
very soft
soft
firm
stiff
very stiff
hard
Legend (Colors in ROST Fluorescence Profile)
Background or Miscellaneous
Heavy to Medium Fraction
Medium to Heavy Fraction
Light to Medium Fraction
Light Fraction
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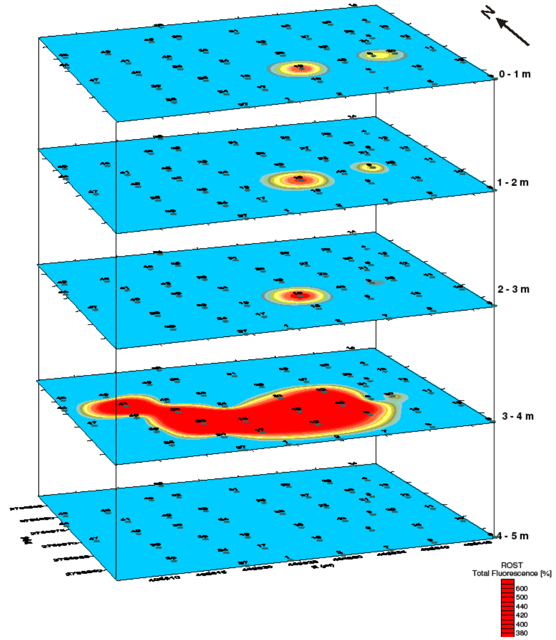
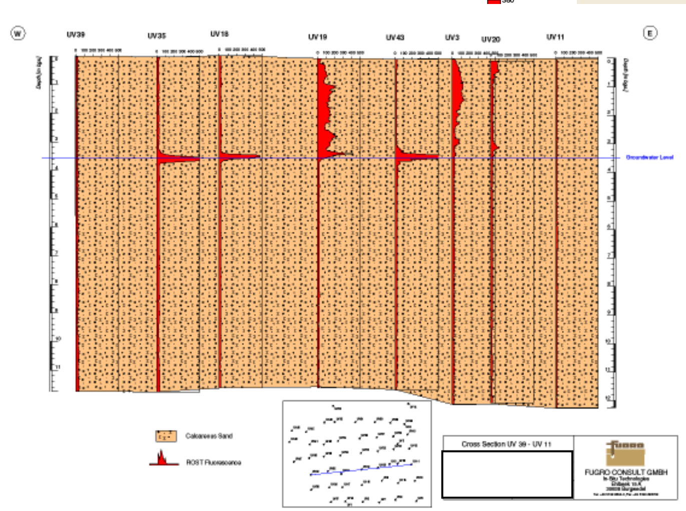

N
0 - 1 m
1 - 2 m
2 - 3 m
3 - 4 m
4 - 5 m
ROST
Total Fluorescence [%]


W
E
UV39
UV35
UV18
UV19
UV43
UV3
UV20
UV11
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MIP/ROST Perth

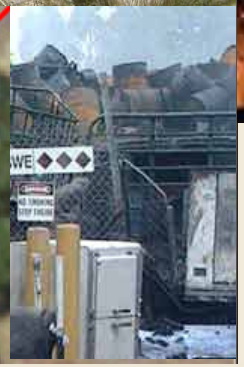
Location:	**Perth, Western Australia**
Objective:	**Delineate Toxic NAPL Spill**
Scope of work:	**54 ROST, 22 MIP-CPT to 12 m**











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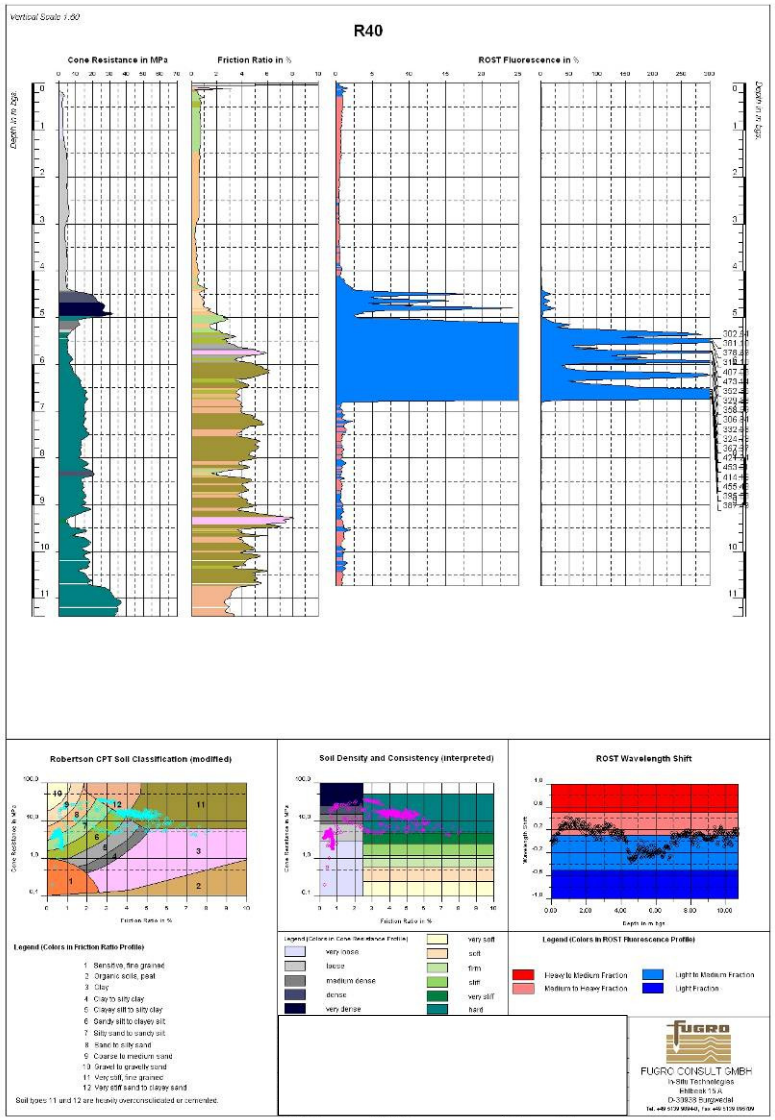

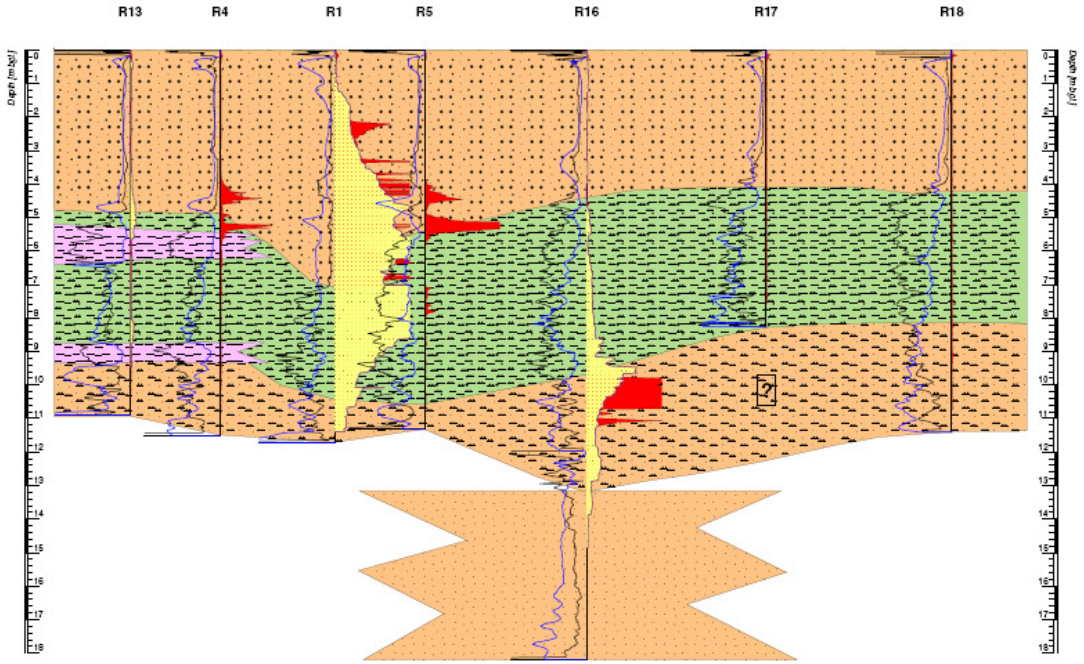


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