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Session 4: Innovative techniques for pollution control remediation

Validation of an On-Site Component-Specific Detection Method for Volatile Organic Components: EnISSA-MIP

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Validation of an On-Site Component-Specific Detection Method for Volatile Organic Components: EnISSA-MIP

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4. Cost comparison
5. Conclusions

1. Introduction



Tackling urban soil and groundwater contamination caused by chlorinated solvents

improve the quality and minimize the pollution of soil and groundwater by developing an **integrated approach** to tackle the threats caused by contamination with chlorinated solvents in urban areas.

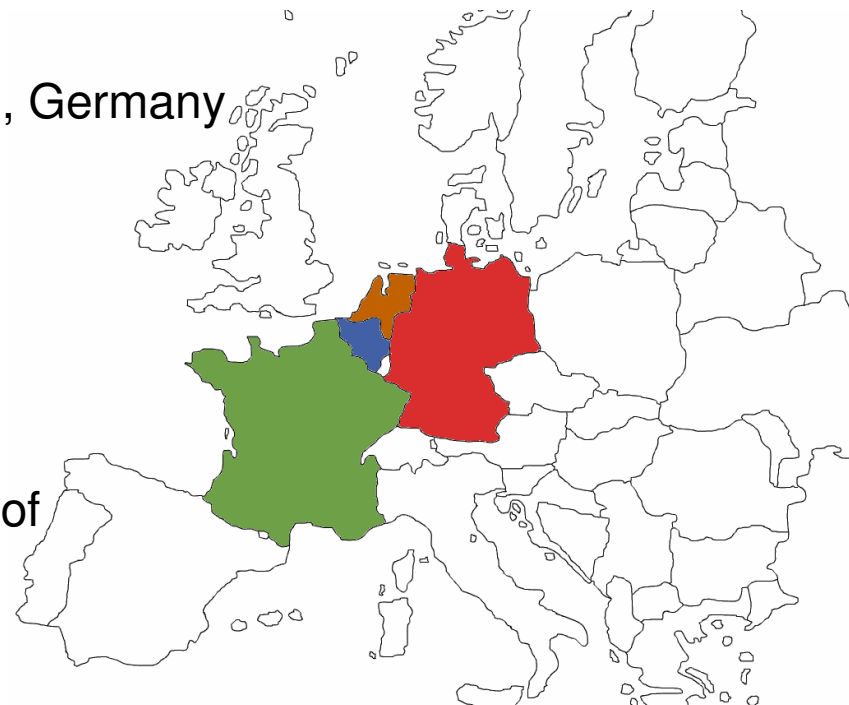
9 partners from Flanders, Netherlands, France, Germany



Lead partner: OVAM



The Public Waste Agency of Flanders, Belgium



1. Introduction

Research budget 5.2 M€ (50% funded by Interreg IV NWE project)

Focus on:

- Social-economical aspects
- Remediation techniques
- Characterisation techniques

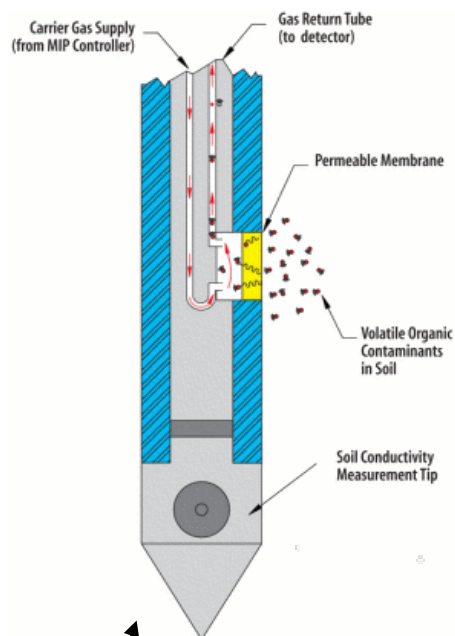


→ **Pilot project 2:**

Validation & demonstration of an innovative site characterisation tool

EnISSA
enhanced in-situ soil analysis

2. MIP

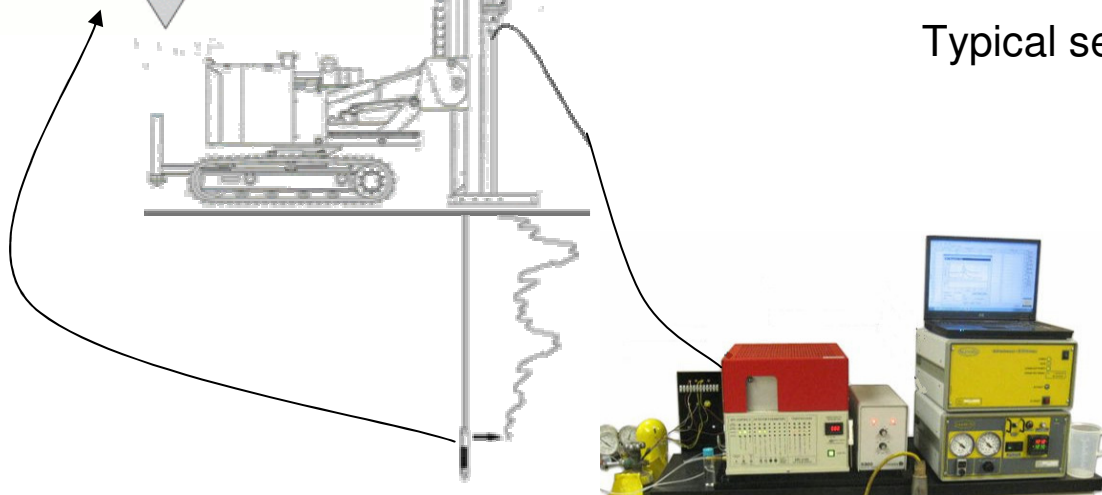


Membrane Interface Probe

- Screening tool for VOC
- Cone: heated block and hydrophobic semi permeable membrane
- Direct push
- Local heating of soil
- Volatilization and diffusion through membrane
- Inert carrier gas & transport to detector

Typical setup: **Combination of three detectors:**

- * Dry electrolytic detector (DELCD) or Halogen specific detector (XSD)
- * Photo ionisation detector (PID)
- * Flame ionisation detector (FID)



2. MIP → EnISSA MIP

PID, FID, DELCD & XSD

- Summation-detectors: no information on individual contaminants: pollutant cocktails!
- response is component specific → quantification difficult
- detection limit > groundwater clean-up values in Flanders : $\mu\text{g/l}$

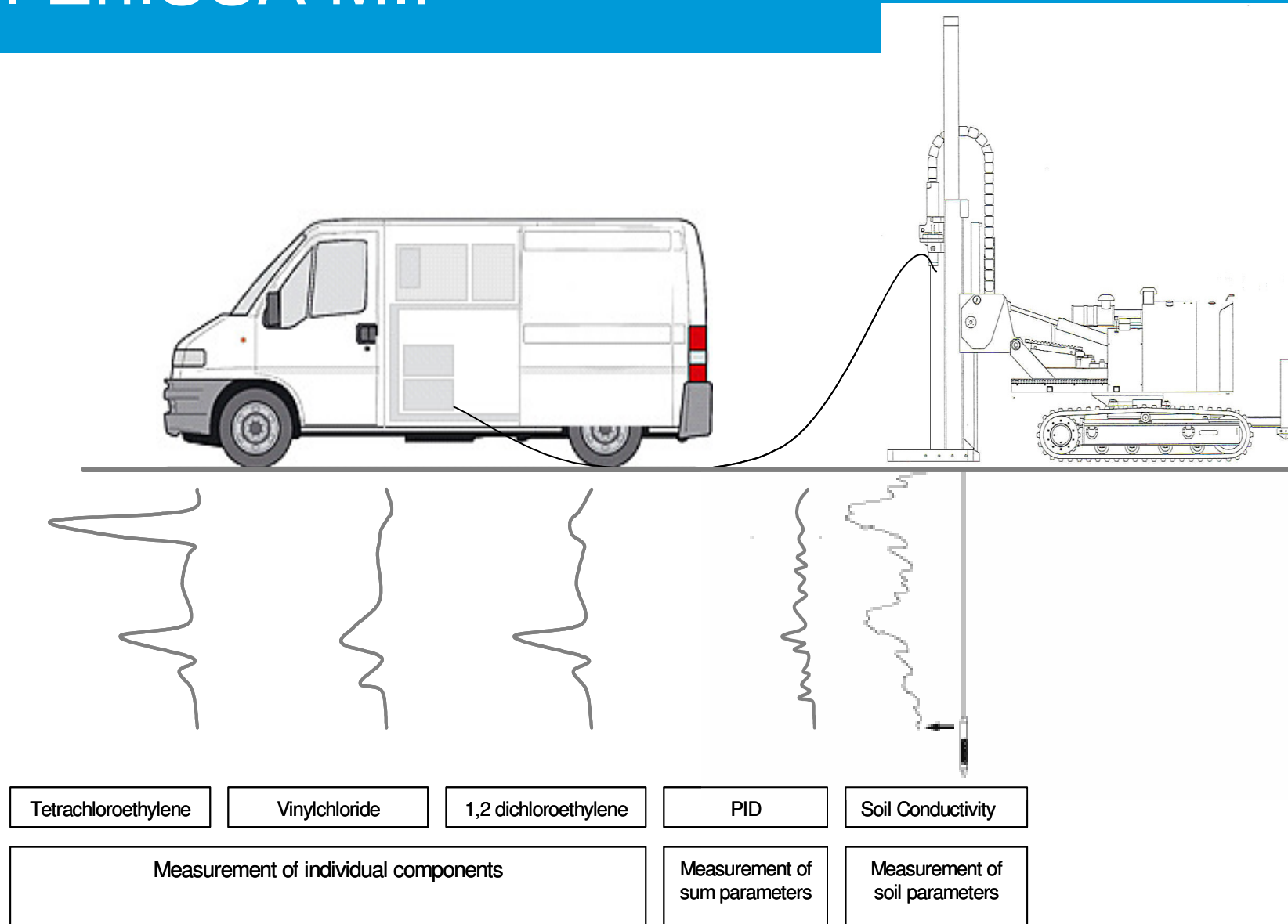
EnISSA MIP

- MIP with dedicated **GC-MS detection** combined with proprietary contaminant sampling technology
- GC-MS: Optimized for field measurements:
 - * ruggedized
 - * **cycle/analysis time: 1 min**
 - **1 measurement per 30 cm at probing speed of 30 cm/min**
 - * **up to 12 compounds simultaneously**

Highly detailed profiles for individual compounds on ppb level



2. EnISSA MIP



3. Pilot Study Field results

Site description:

- * Location: Kortrijk (Belgium)
- * Former spinning and weaving mill
- * Contaminants: CVOC & BTEX
- * Three sources, possible DNAPL



Purpose: Validation of the EnISSA MIP by traditional sampling

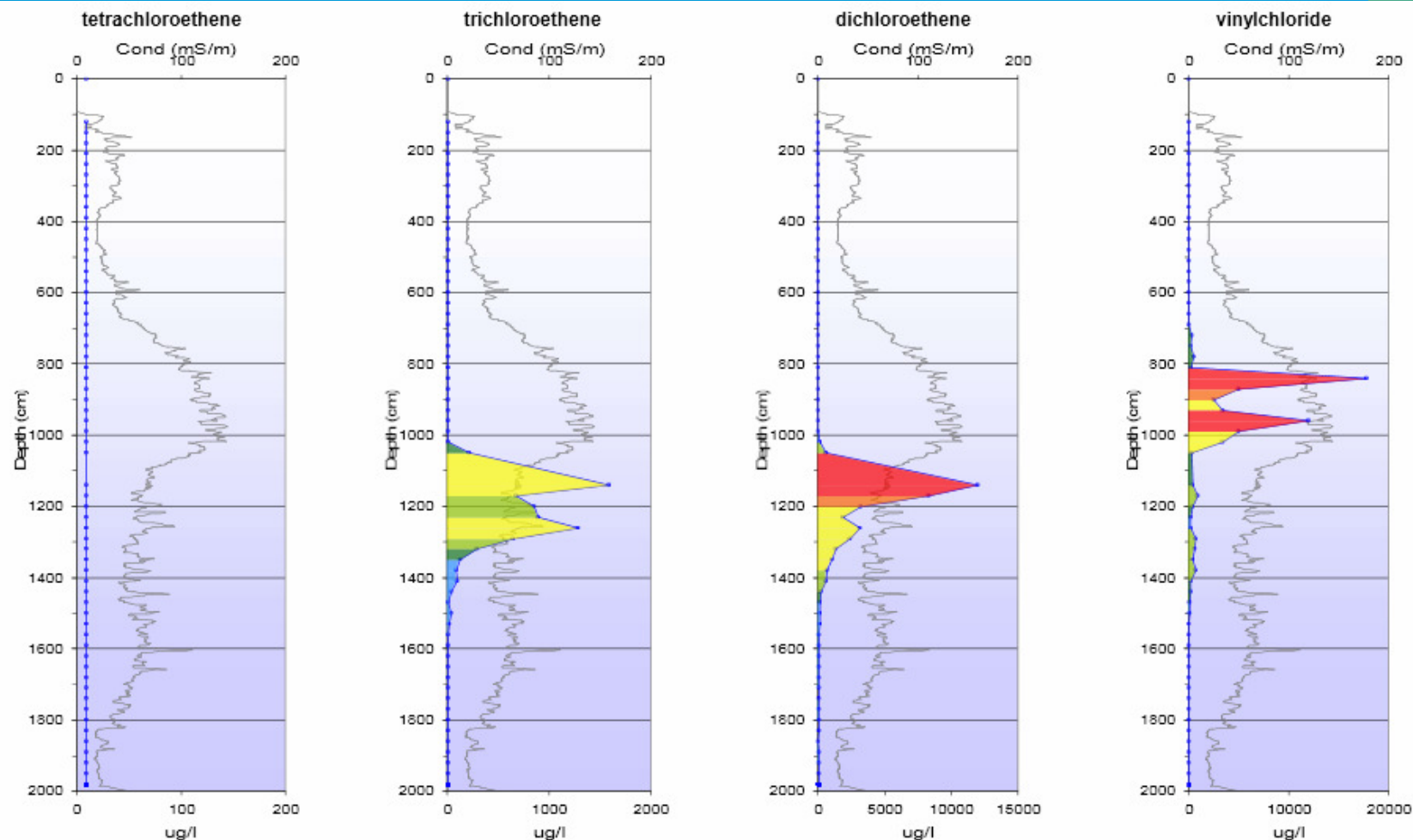
MIP configuration:

MIP Controller Model MP6505 / Field Instrument Model FI6000

40 m unheated Teflon-PEEK trunkline

35 ml/min N₂ flow

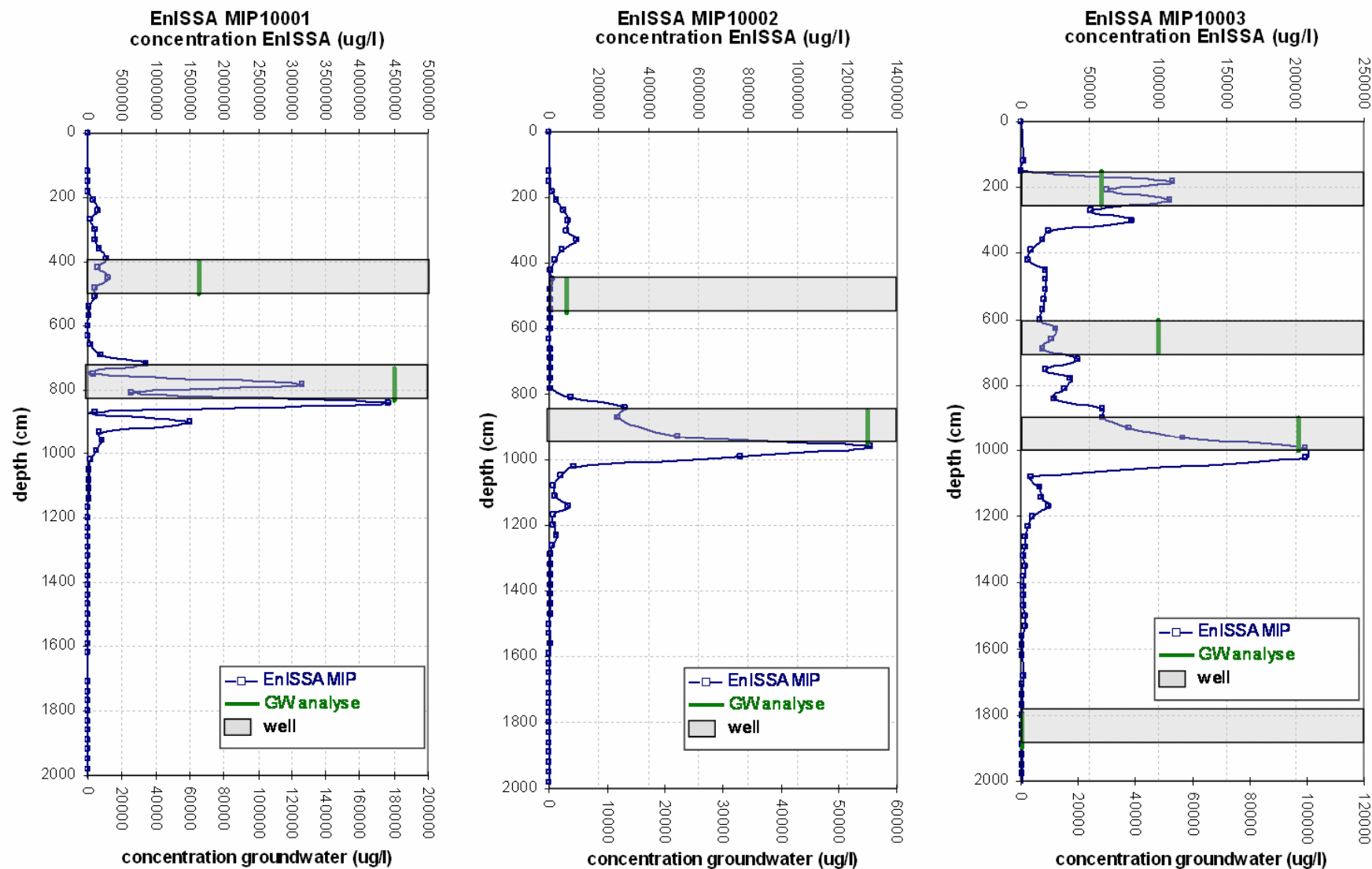
3. Field results: EnISSA MIP 10004



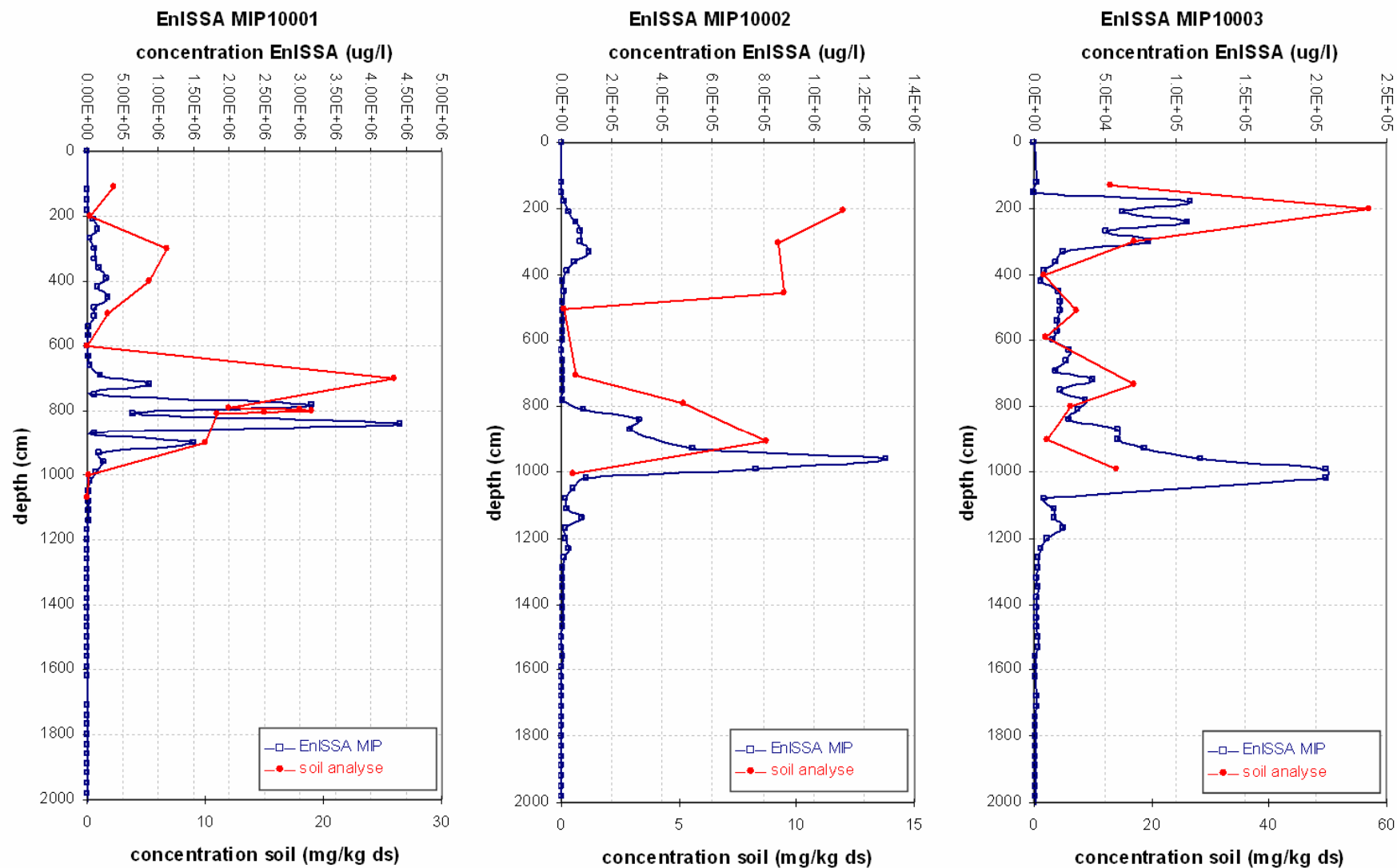
EnISSA → detailed soil profiles for individual compounds

- * low detection limit
- * each 30 cm or less: characterization of up to 12 compounds

3. Field results: Source area: DCE



3. Field results: Source area: DCE



3. Field results: Source area

EnISSA gives a soil/ground water profile for each component:

- ▶ profile confirmed by soil & groundwater samples

EnISSA gives indication of presence of DNAPL:

- ▶ visually determined during ground water sampling
 - ▶ soil & groundwater samples also indicate presence of DNAPL

EnISSA concentrations correlate with groundwater concentrations:

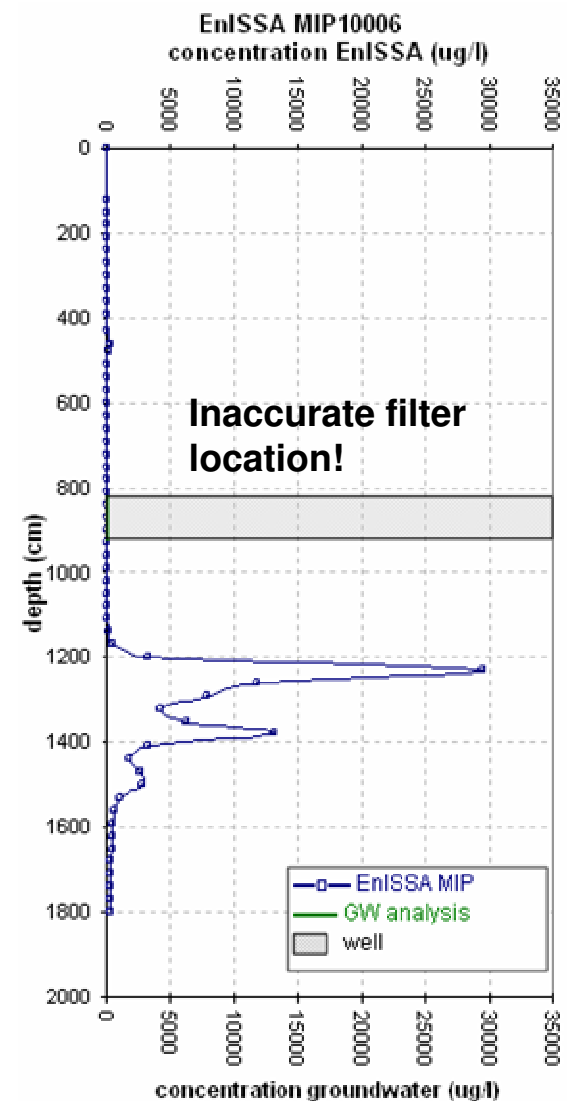
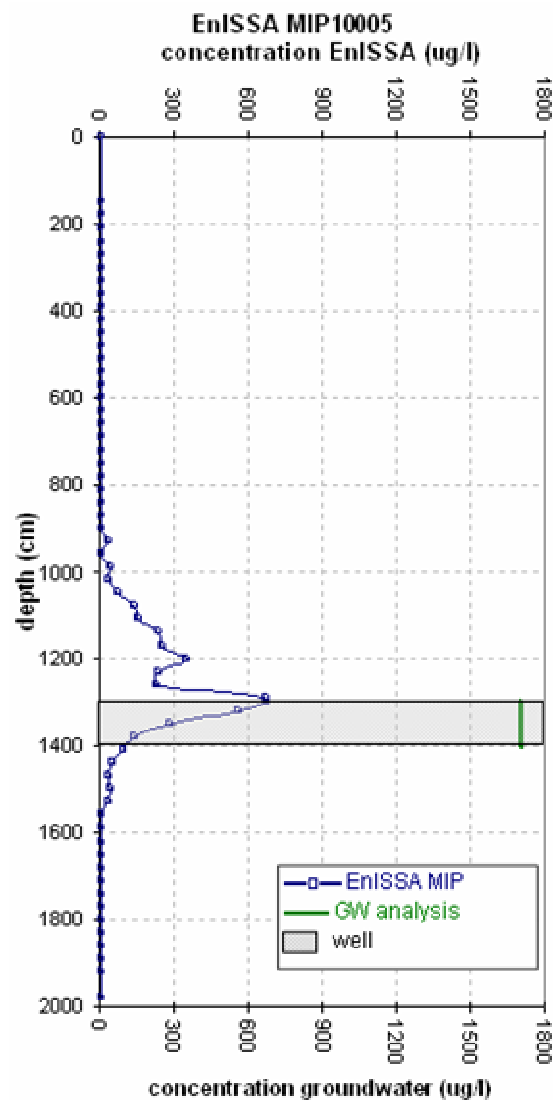
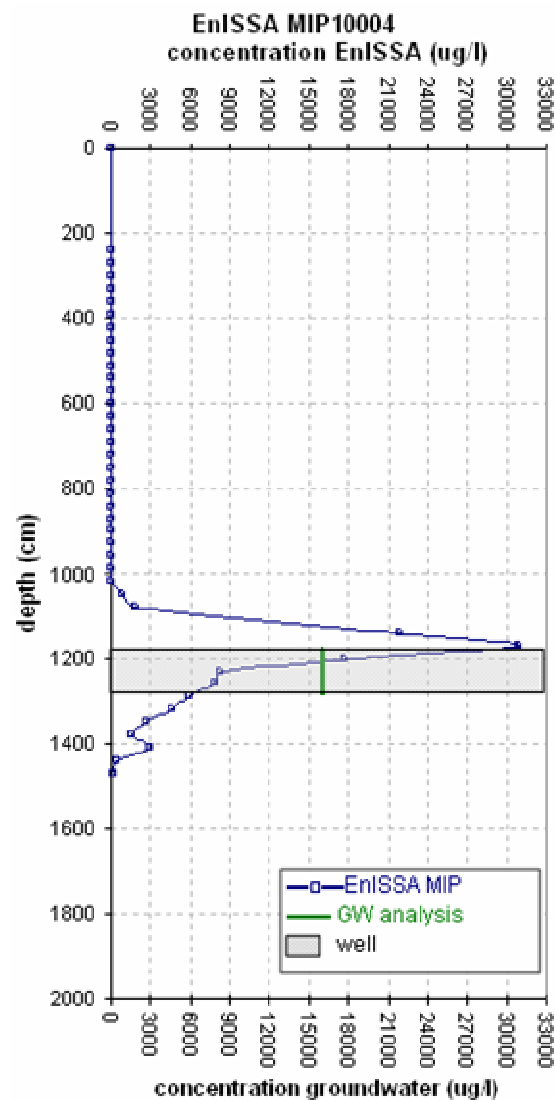
- ▶ remarks:

phase

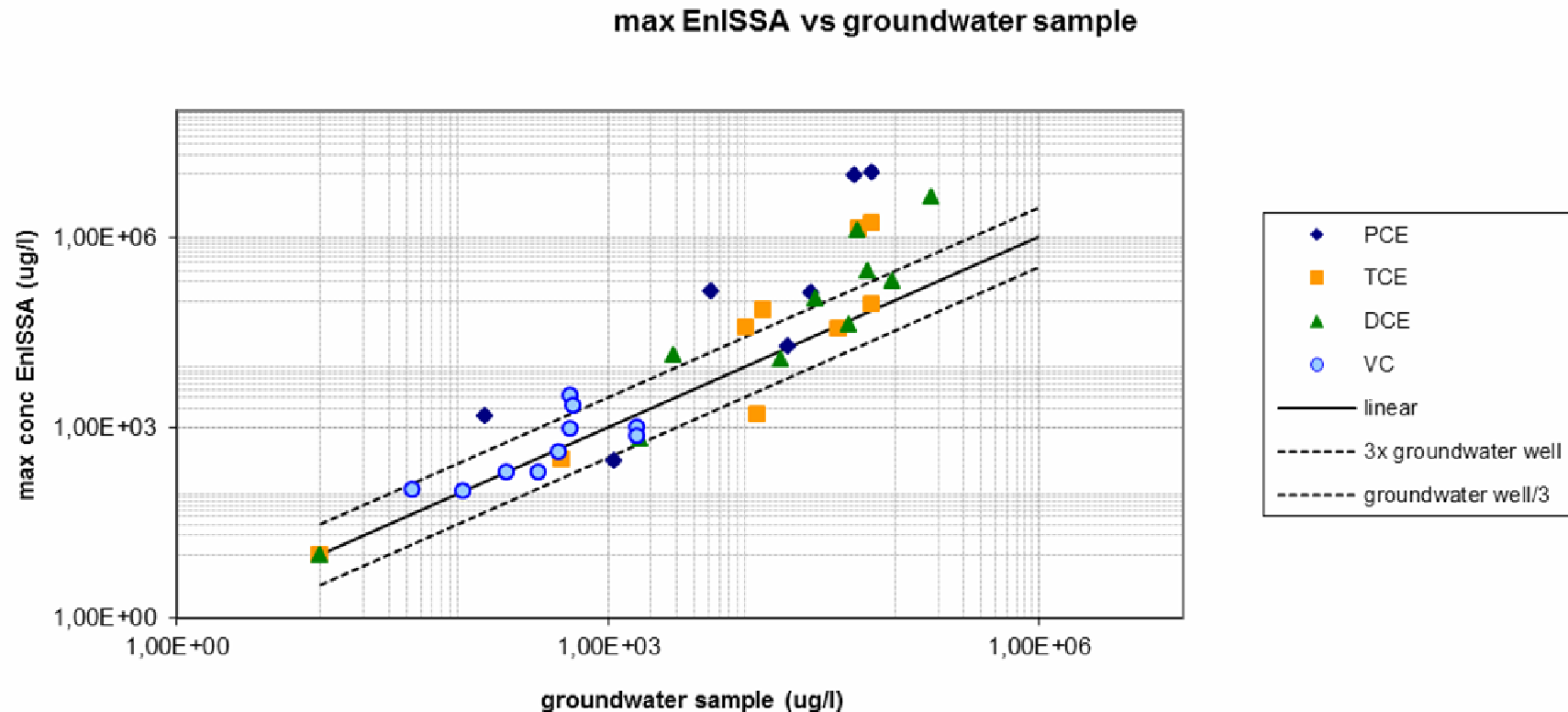
! EnISSA measures soil, groundwater & pure product

! EnISSA is calibrated with aqueous solution

3. Field results: Plume area: DCE



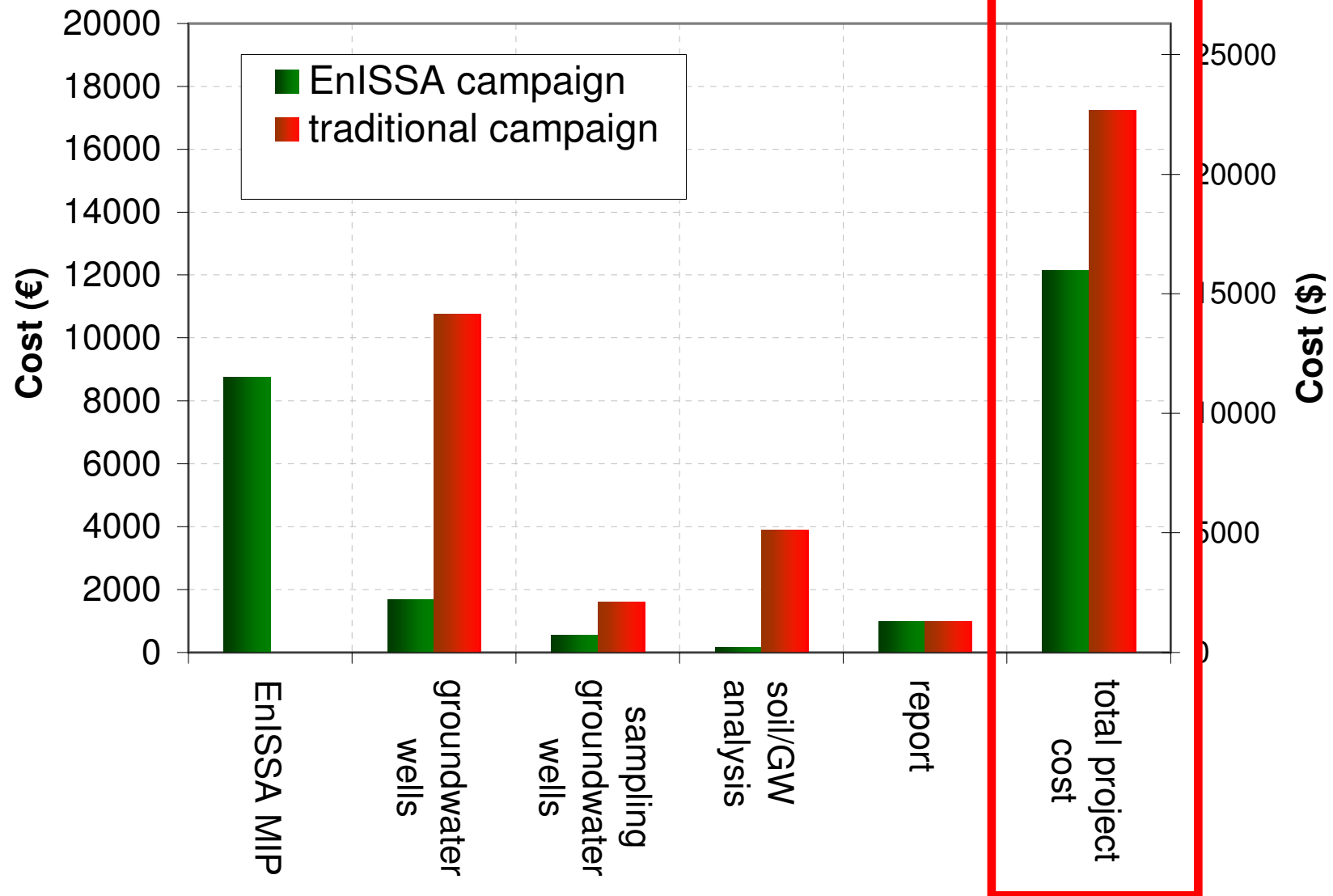
3. Field results



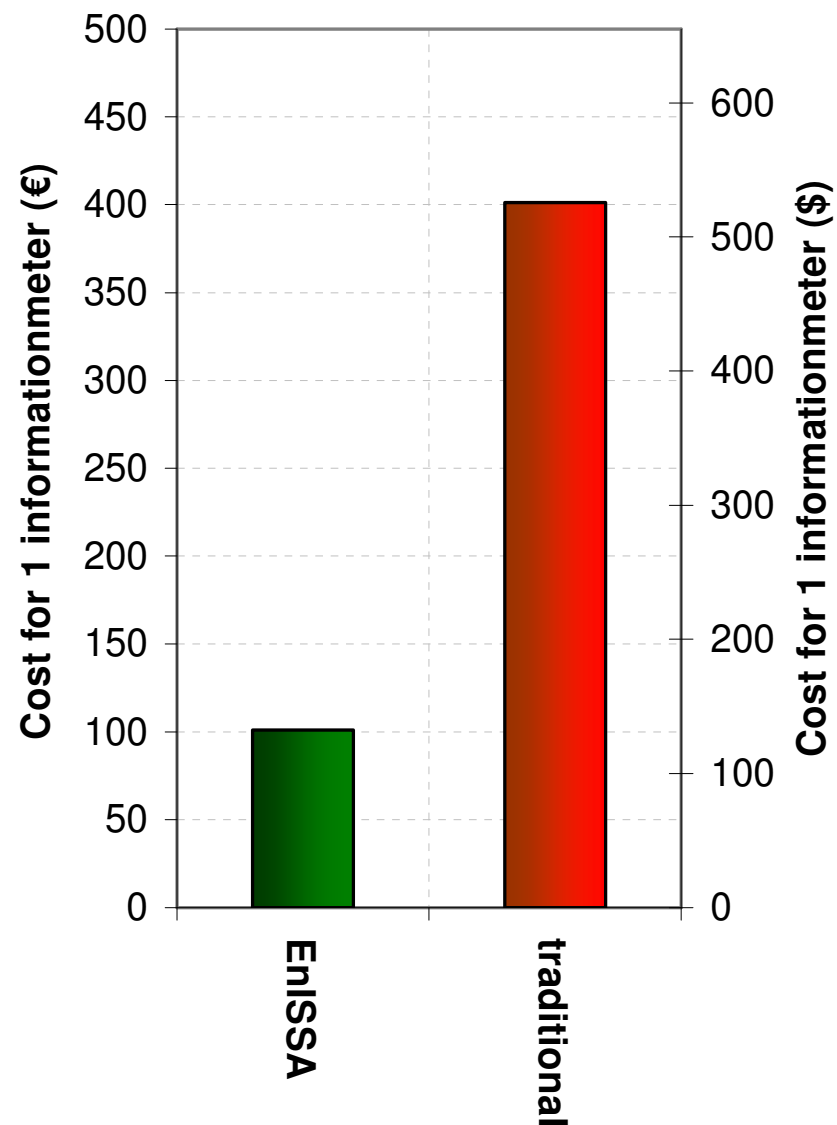
* contribution of the adsorbed contaminants which will be measured by EnISSA but not by the groundwater samples

* EnISSA results vs. groundwater results: order of magnitude is comparable → semi-quantitative

4. Cost comparison: Project cost

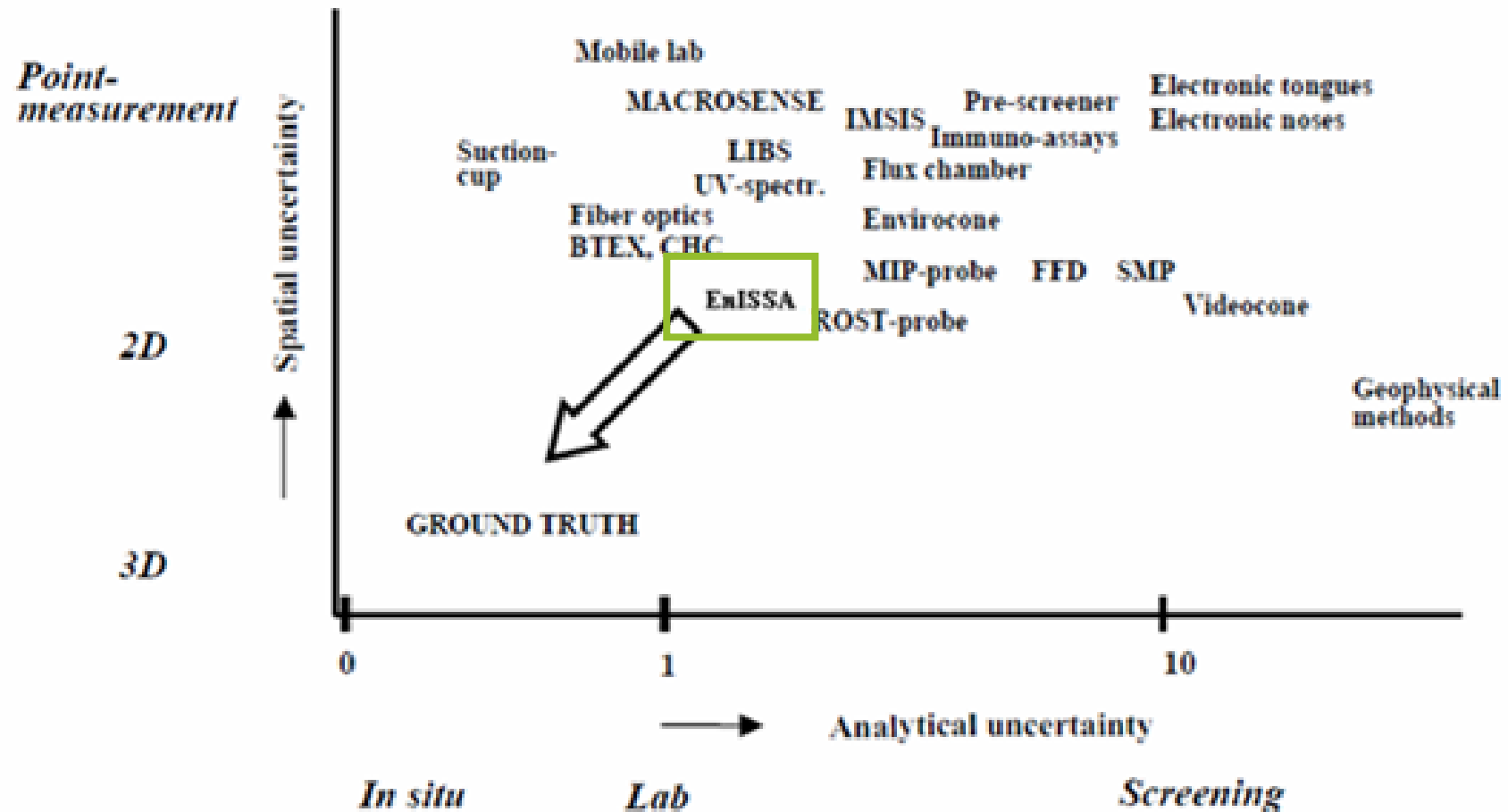


4. Cost comparison: information meter



5. Conclusions

ARE WE THERE YET?



5. Conclusions

entire delineation of contamination: source + plume

EnISSA MIP measures on **ppb** level

→ source and plume

(Conventional MIP measures on sub-ppm level)

- Order of magnitude = groundwater sample → high quality screening tool -

“On site” information on pollution cocktails:

EnISSA MIP measures **individual compounds** in contrast to the sum-detectors used in conventional MIP

- Each 30 cm up to 12 compounds can be distinguished -

strategic sampling well locations:

The entire delineation of source and plume obtained by EnISSA MIP makes it possible to place sampling wells at strategic locations **reducing sampling costs and time.**



More information:



Final Conference CityChlor, May 16-17, 2013 Ghent



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EnISSA
enhanced in-situ soil analysis