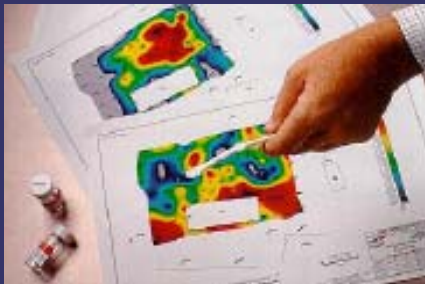


# *GoreSorber® Survey to delineate a shallow CHC-plume*

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Carcassonne (France)  
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# Outline of this Presentation

- 1. The problem**
- 2. Possible solution :  
GoreSorber® survey**
- 3. Field application:  
delineation of a shallow  
CHC plume**
- 4. Questions & answers**



# 1. The problem

- Most of the site investigation and remediation project-related moneys are currently being spent on (semi-) volatile organic compound impacted sites
- Our toolbox contains the following technologies: soil sampling, active soil gas sampling, GeoProbe MIP-probing, monitoring well installation, ...



# 1. The problem (cont'd)

- **Potential issues when developing an accurate conceptual site model:**
  - Labor intensive
  - Sampling can be invasive in sensitive settings (residential/production areas)
  - Iterative phases
  - Cost effectiveness & timing
  - Reputation impacts & communication issues



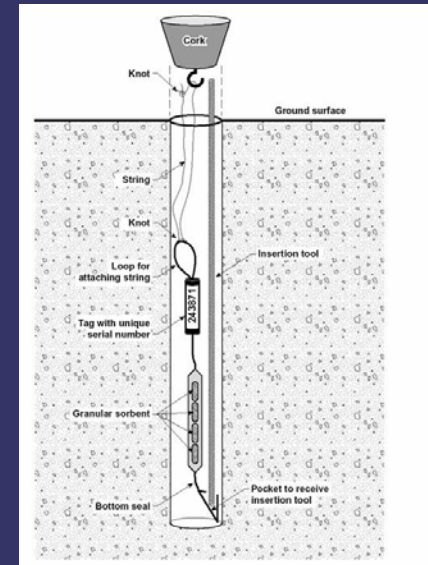
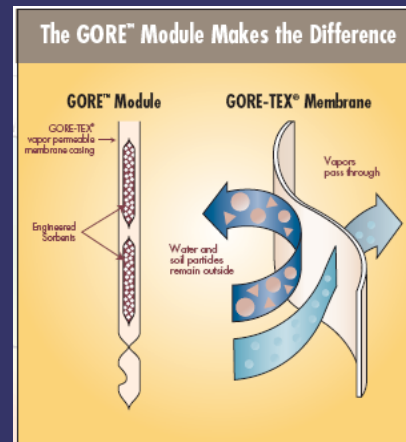
# 1. The problem (cont'd)

- **Need for fast, accurate and affordable evaluation tools helping the selection of the critical 'zones' requiring soil, soil gas, & groundwater sampling**
- **Increase cost-effectiveness and data accuracy**

# 2. Possible solution: GoreSorber® survey

- **The GoreSorber Module:**

- Passive soil gas sampling
- Vapor permeable module
- Water-proof (Gore-Tex®) membrane
- Sorbent-based (polymeric and carbonaceous resins)
- 'Shoe-lace' type fabric, 1-foot long retrievable cord
- Time-integrated application
- Exposure time 1 to 14 days
- High sensitivity for a broad range of organic compounds at low concentrations
- Detection limits 0,01 to 0,1 microgram
- Sorbent saturation may occur at high VOC concentrations



## 2. Possible solution: GoreSorber® survey (cont'd)

- **Easy installation:**

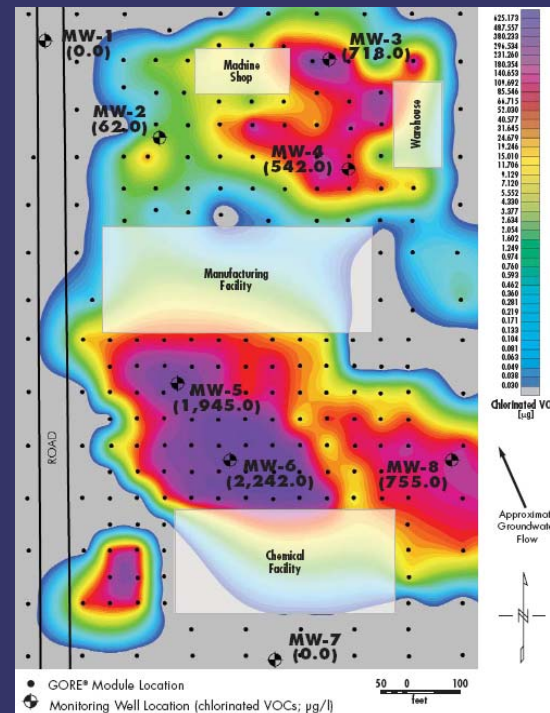
- Pilot hole using slide hammer and a tile probe, or hand-drill
- Sampler installed manually using push rod
- Installation time <10 minutes/module
- Passive soil gas sampling over 1-14 days
- Sampler retrieved by hand



## 2. Possible solution: GoreSorber® survey (cont'd)

- **Chemical Analysis & data processing:**

- Done at the Gore labs
- 'Exotic' compound characterization possible, if needed
- Data results given in both in mass units & concentrations
- Maps generated



### 3. Field application: Delineation a shallow CHC groundwater plume

- **Background**
- **(Hydro)geology & groundwater pollution**
- **Fieldwork & testing**
- **Results & costs**
- **Conclusions**

# Background

- **Industrial site**
- **Key production facility for the European market**
- **Sensitive setting :**
  - residential neighborhood
  - highways & major canal
- **Pro-active environmental liability strategy taken by the multinational chemical company (confidential)**
- **Voluntary site investigation and remedial actions taken**



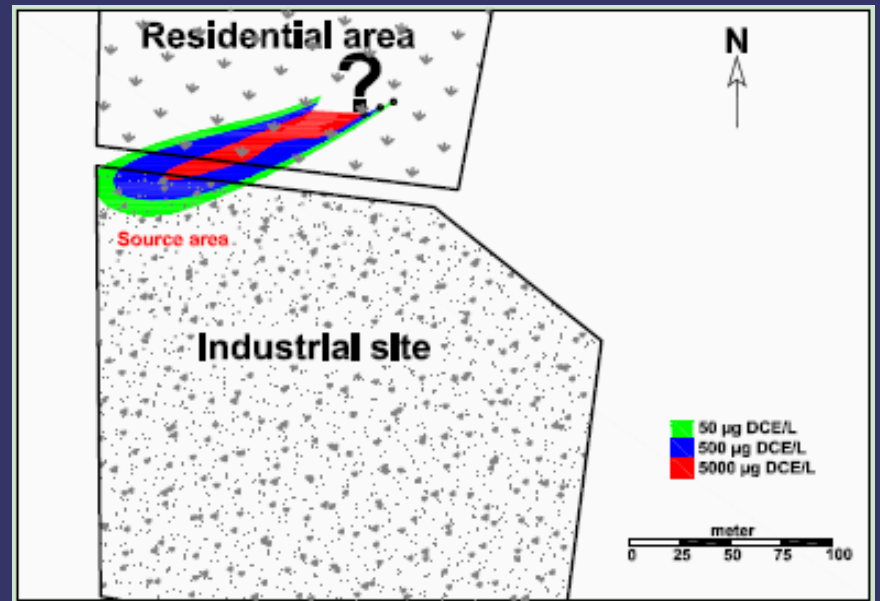
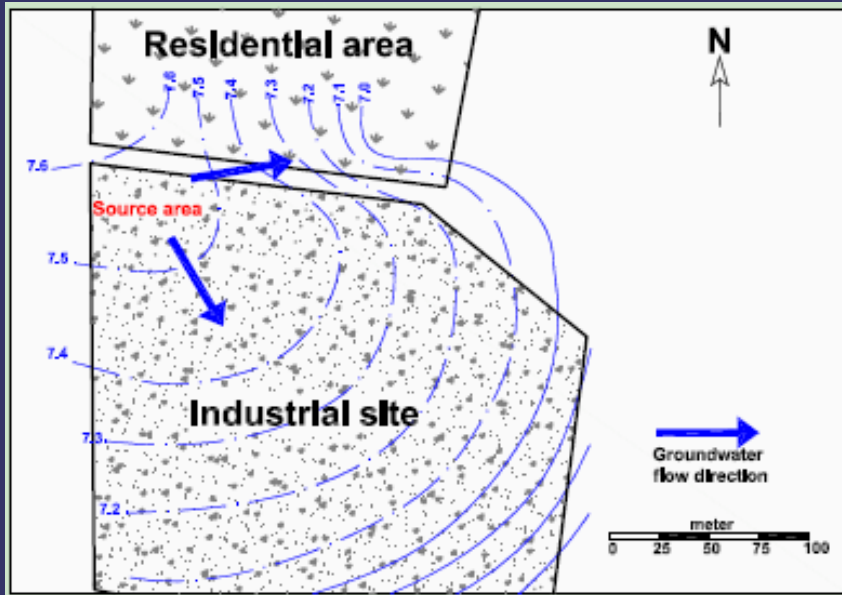
# (Hydro)geology & pollution

- Sandy/silty geology with confining clay layer at 10 mbgl
- Shallow phreatic groundwater at 1,7 mbgl (industrial site) and 0,5 mbgl (residential area)
- Groundwater impacted with TCE and its degradation compounds (cis-DCE & VC)
- Strong indication for natural attenuation, TCE to DCE/VC shift and total CHC mass dropping
- No vapor issues for the residential neighbors detected during ambient air sampling (risk assessment related)

	Source area			Near off-site wells		
	TCE	DCE	VC	TCE	DCE	VC
<b>1998</b>	100000	n.a.	n.a.	2540	n.a.	n.a.
↓	2200	36000	4500	426	7030	417
<b>2005</b>	750	24850	4300	640	1366	33
	301	21300	5900	300	1473	72

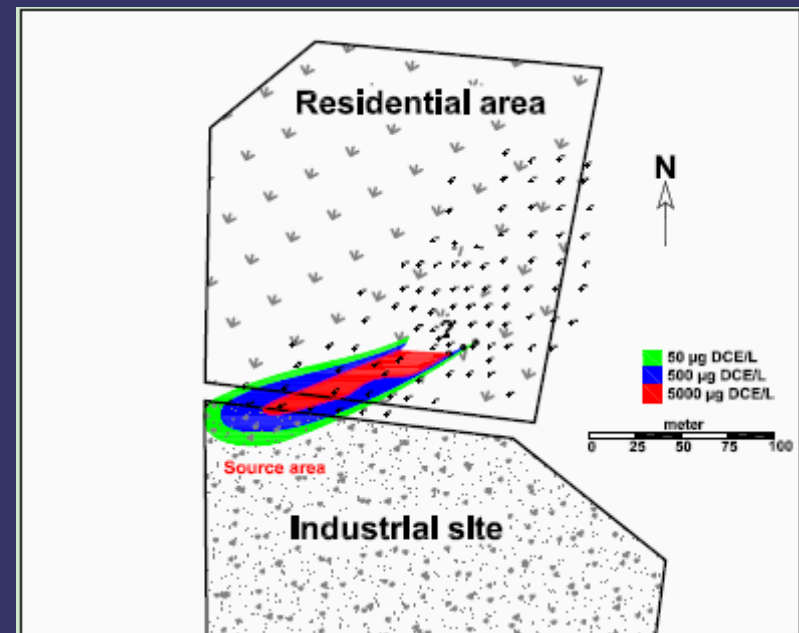
*in µg/L*

# (Hydro)geology & pollution (cont'd)



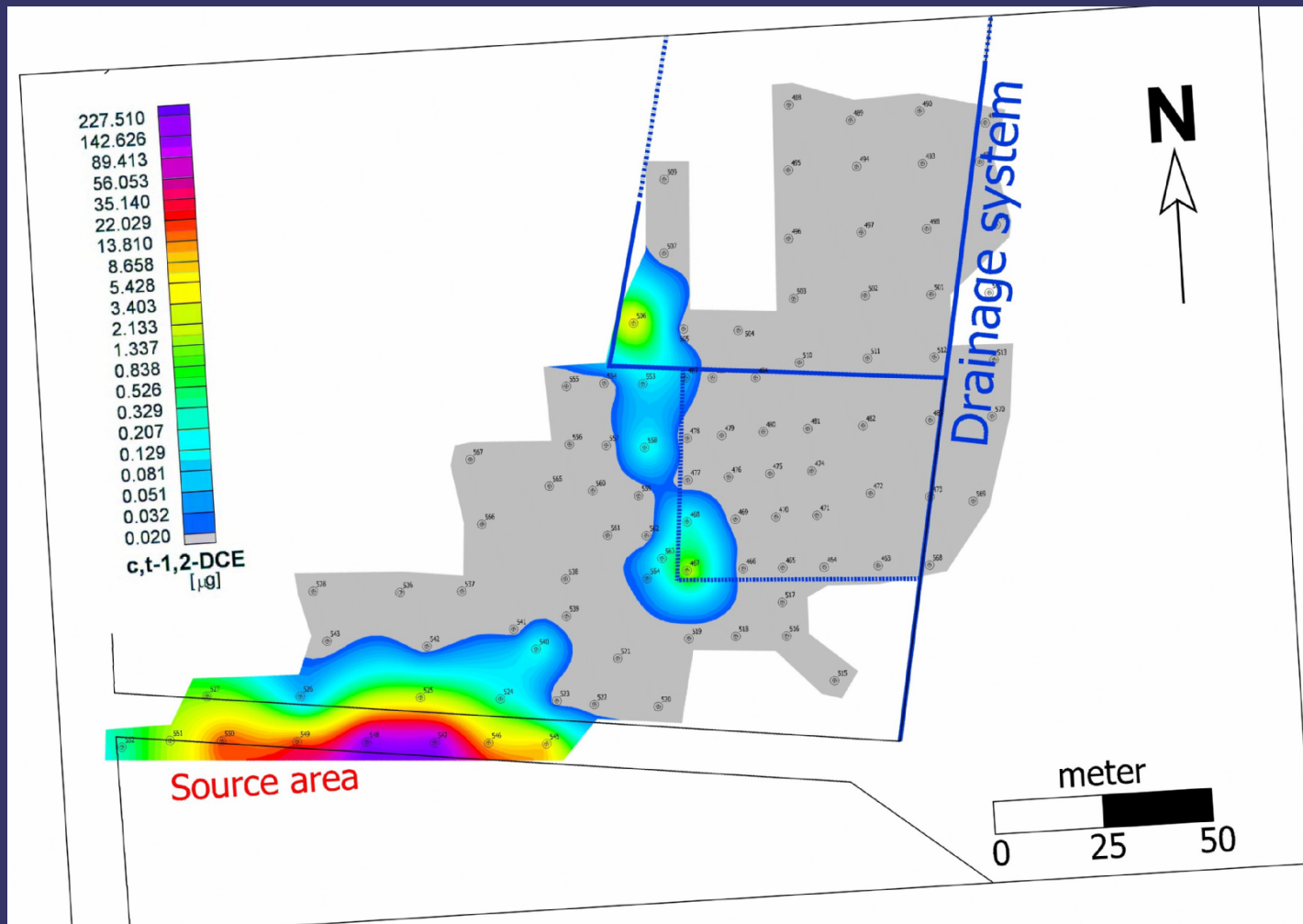
# Fieldwork & testing

- 100 GoreSorber modules installed to 0,75 mbgl
- 2 field technicians – 8hrs
- 40,000 m<sup>2</sup> surface area in residential setting sampled
- Pre-defined grid, 10-20 meters spacing
- 2 weeks of passive soil gas sampling
- 8 hours needed to recover the modules
- Testing and data processing done in the Maryland (US) Gore labs
- Total time needed for installation, sampling, analysis and data processing: 4 weeks

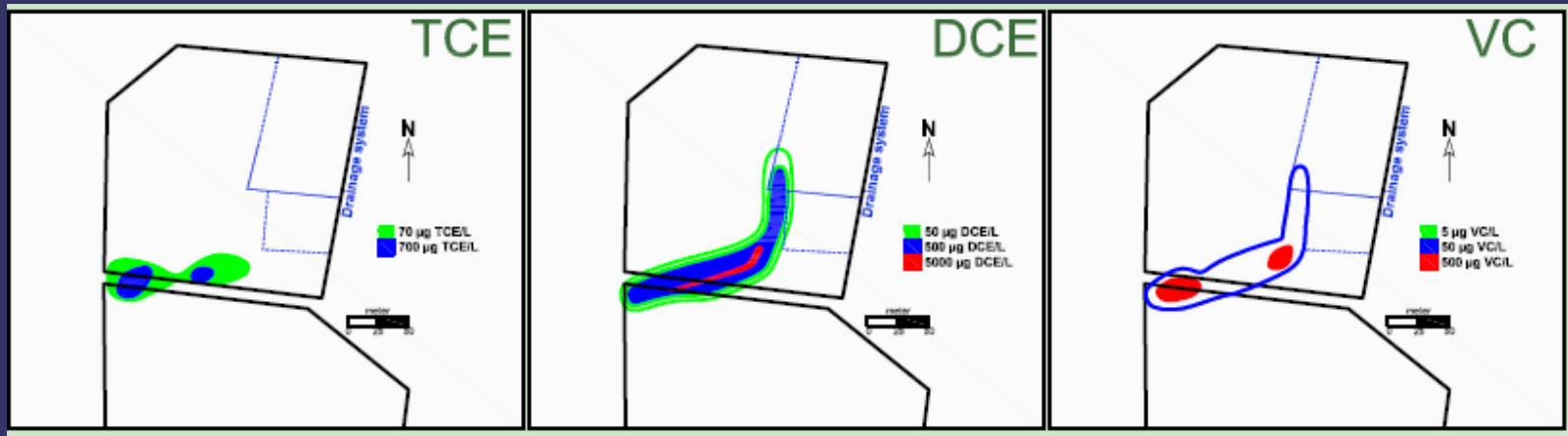
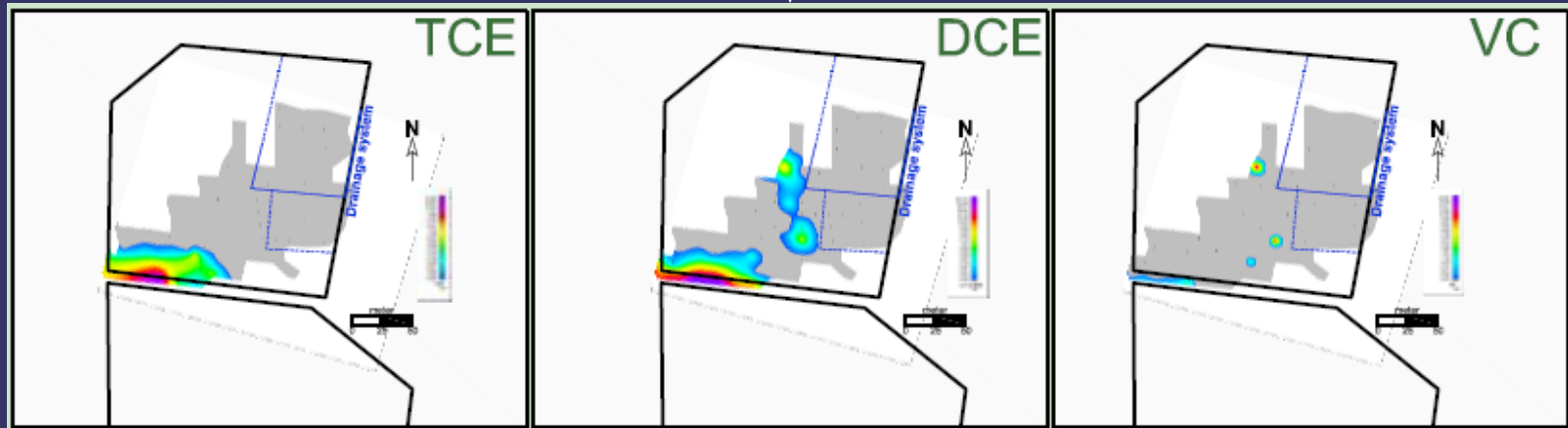


# Results & costs

- **The GoreSorber results confirm the initial groundwater investigation data, strong correlation between the groundwater data and the passive soil gas data**
- **The on- and off-site plumes for all the CHC compounds are better identified**
- **The off-site migration info clearly deviates from the local groundwater flow data, an 'unknown' drainage system and limited, discontinuous crawlspace dewatering have created this interference**
- **Based on the GoreSorber data 9 additional monitoring well locations were installed to confirm these soil gas findings**
- **Monitoring well data confirm the GoreSorber findings, with the exception of the VC-data for the drainage area**
- **Both sampling tools demonstrate a depleting on-site source zone combined with a strongly attenuating off-site plume**
- **Costs: 220 €/sample (all-in)**



# GoreSorber data



# Well data

# Conclusions

- **The GoreSorber data confirmed the initial groundwater data and the downgradient CHC plume**
- **Interference on the groundwater flow pattern via a drainage system and local water extraction (crawl space dewatering) was detected via GoreSorber**
- **The monitoring well network was defined and confirmed the passive soil gas data**
- **GoreSorber is a fast, cost-effective and low invasive tool for the characterization and monitoring (both MNA & remediation) of volatile organic compound impacted sites**

## 6. Questions & answers

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- **Goresorber info on <http://www.gore.com/surveys>**

# ERM services portfolio

Strategic Advice	Development Impacts & Planning	Managing Liabilities & Risks	Contaminated Site Management	Permitting & Technical Work
<p>Social &amp; environmental performance</p> <p>Climate change, biodiversity, natural resources</p> <p>Policies for sustainable development</p> <p>Strategies to manage risks, liabilities and EHS costs</p>	<p>Strategic and economic assessments</p> <p>Environmental planning and environmental impact assessments</p> <p>Environmental mitigation actions</p> <p>Social impact assessment &amp; Management Plans</p>	<p>Evaluation of potential liabilities</p> <p>Quantification &amp; Management of Risk</p> <p>Management Systems</p> <p>Compliance audit</p> <p>Environmental Management Information Systems</p>	<p>Site Investigation &amp; Remediation</p> <p>Strategies for contaminated sites</p> <p>Construction management services</p> <p>Decontamination, decommissioning &amp; demolition</p>	<p>Air Quality &amp; Noise</p> <p>Water, Wastewater &amp; Waste Management</p> <p>Health &amp; Safety</p> <p>Risk Management</p> <p>Auditing &amp; Verification</p>

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