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Publication date:
2016

Document Version
Publisher's PDF, also known as Version of record

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Citation (APA):
Mosthaf, K. (Author), Fjordbøge, A. S. (Author), Overheu, N. D. (Author), Rohde, M. (Author), Broholm, M. M. (Author), Bjerg, P. L. (Author), & Binning, P. J. (Author). (2016). Modeling contaminant transport in limestone aquifers. Sound/Visual production (digital), Technical University of Denmark, DTU Environment.

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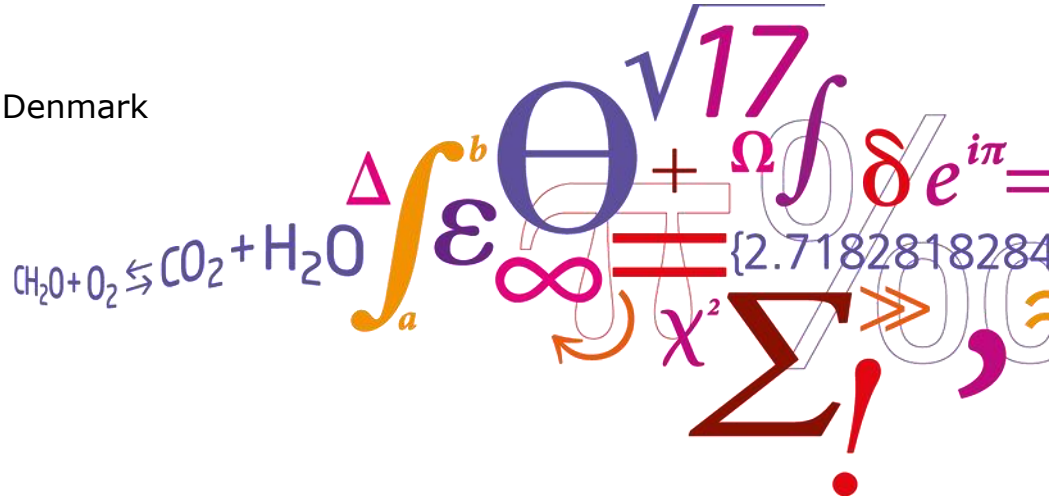
Modeling contaminant transport in limestone aquifers

Klaus Mosthaf[1], Annika S. Fjordbøge[1], Niels D. Overheu[2], Magnus Rohde[3], Mette M. Broholm[1], Poul L. Bjerg[1] and ***Philip J. Binning[1]***

1 – DTU Environment, Technical University of Denmark
2 – The Capital Region of Denmark
3 - GEO



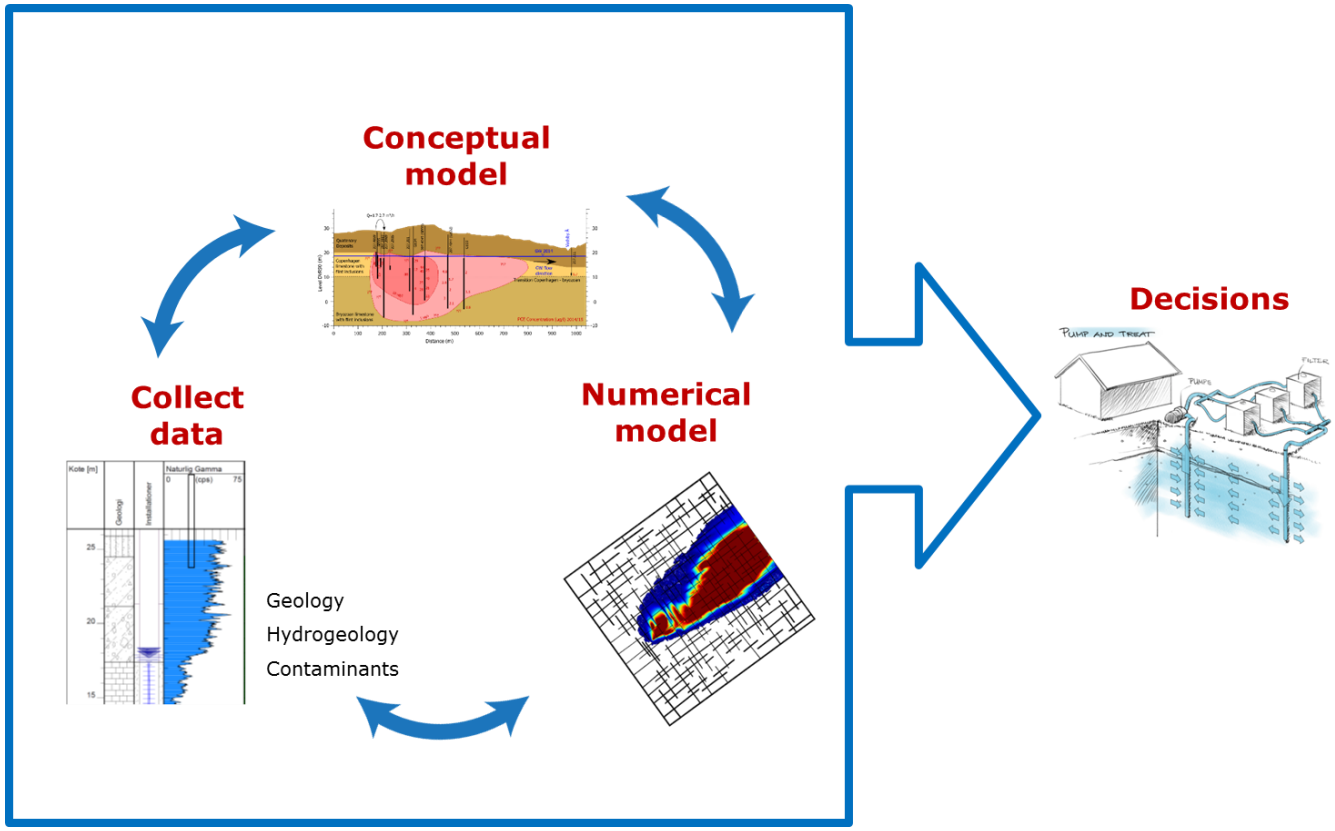
DTU Environment
Department of Environmental Engineering

GEO SUBSURFACE EXPERTISE
REGION H
The Capital Region of Denmark

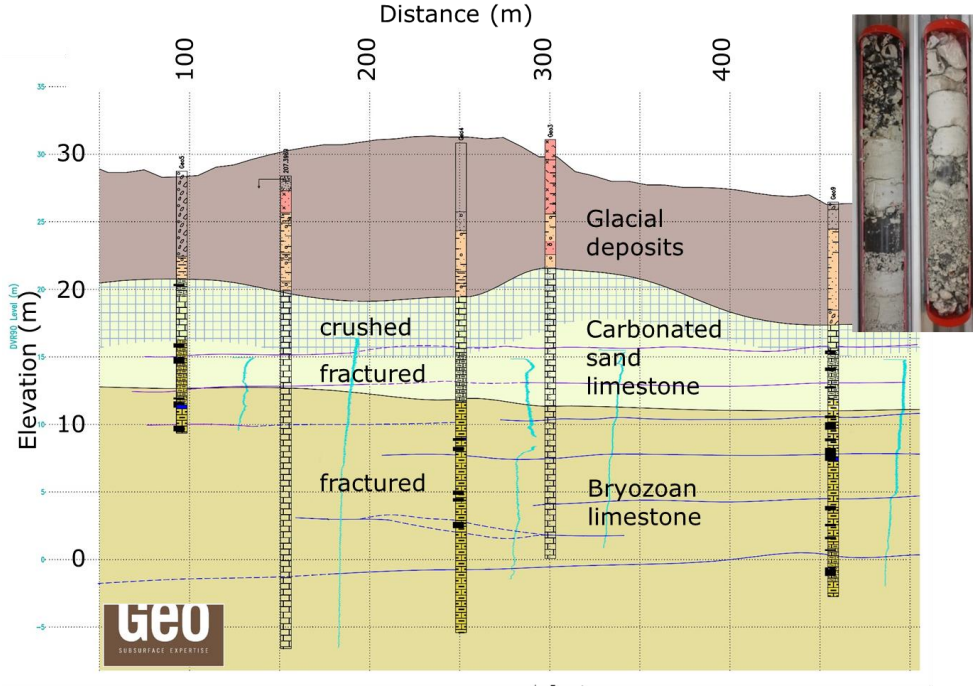
Objectives

Modeling of contaminant plume migration in fractured limestone

→ **Improved risk assessment, site monitoring and remediation design**

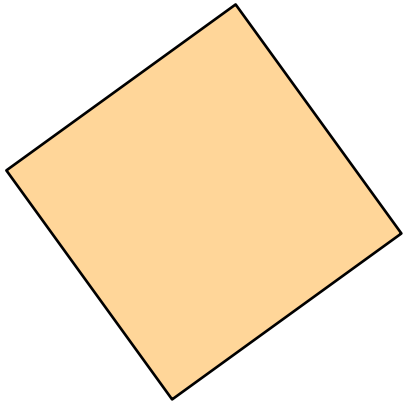


Site Assessment Geology



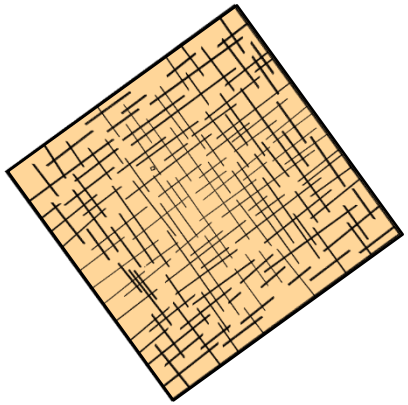
Equivalent Porous Media

(EPM)



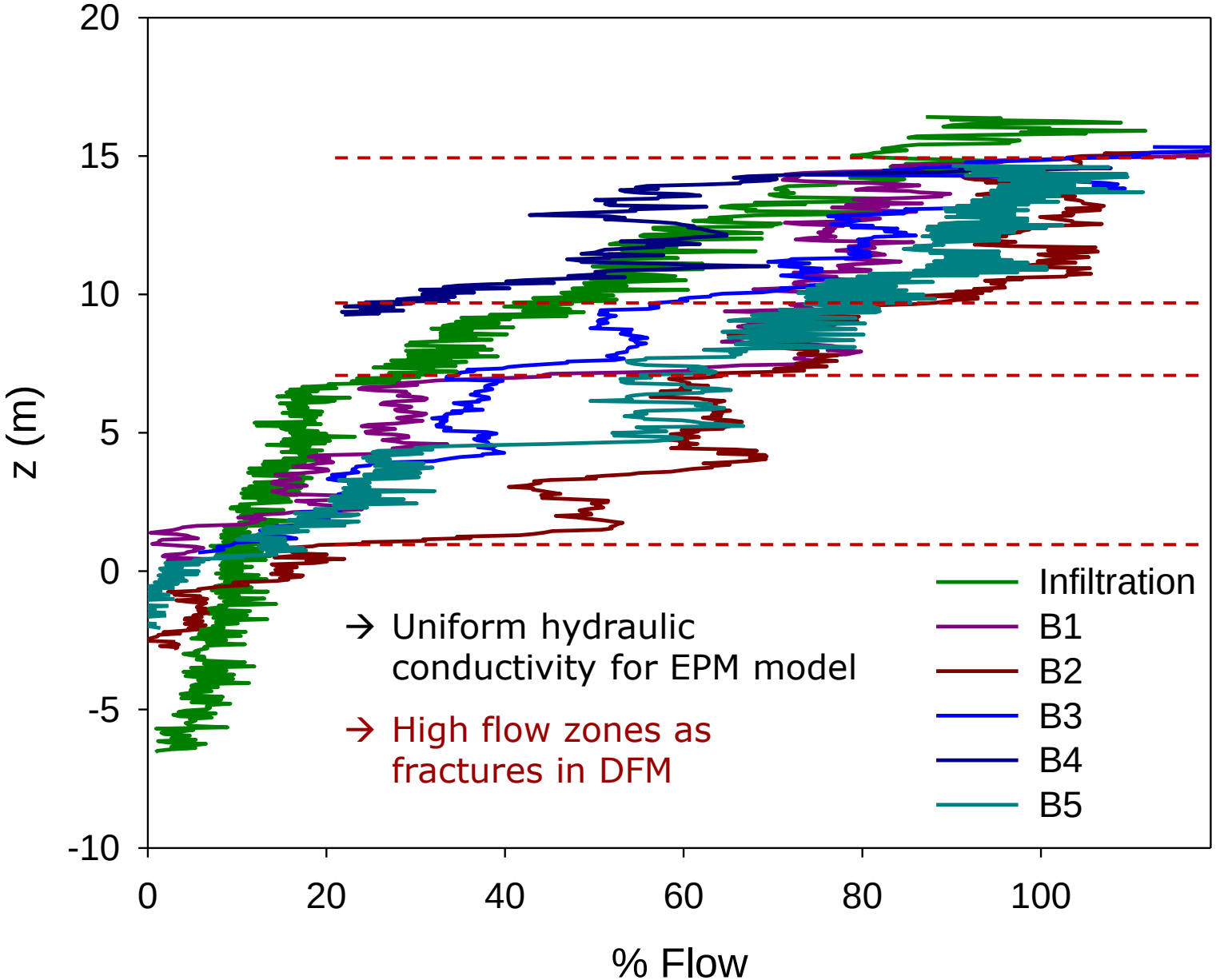
Discrete Fracture Model

(DFM)

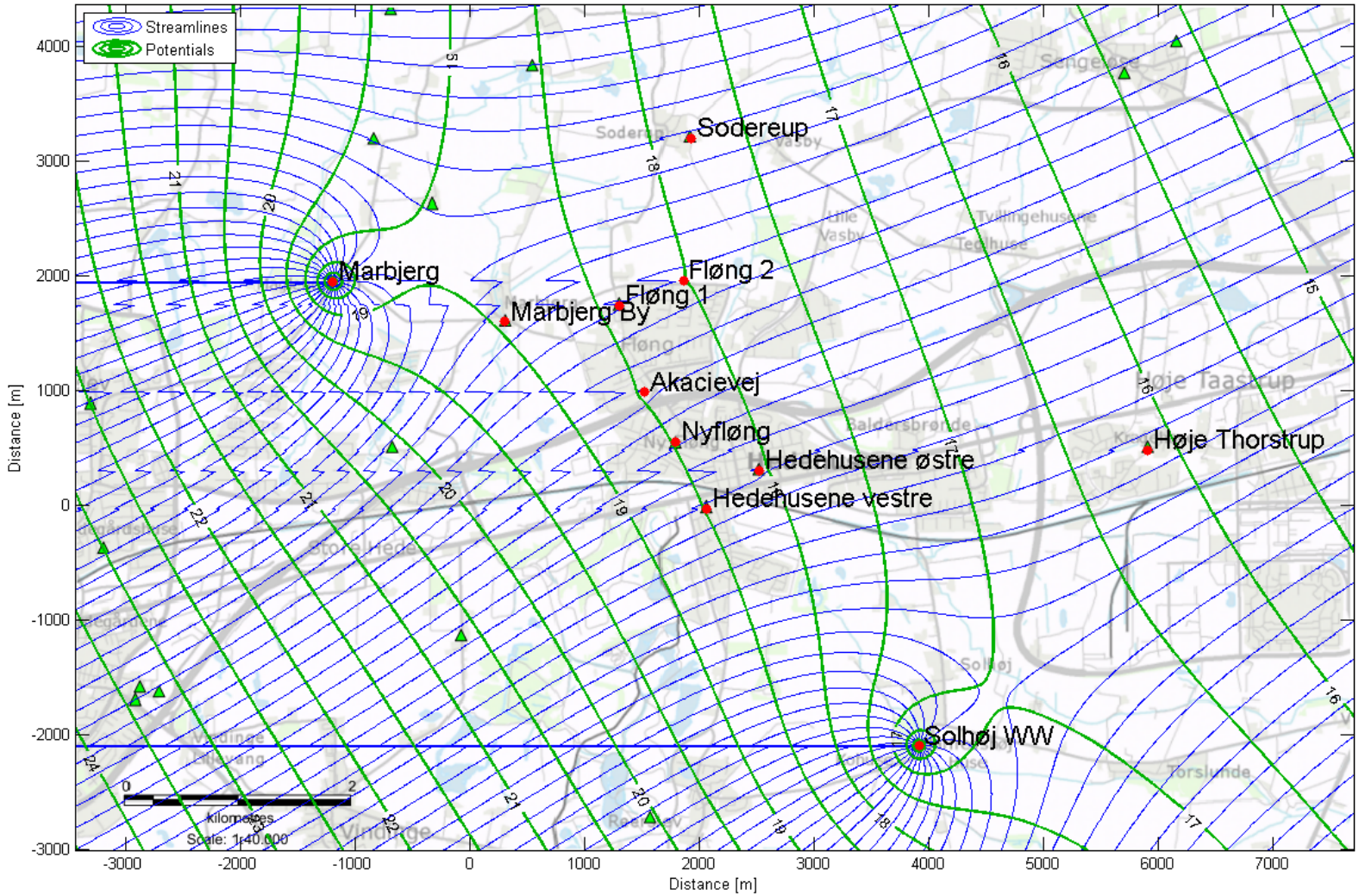


Which model is right?

Flow log data – high conductive zones

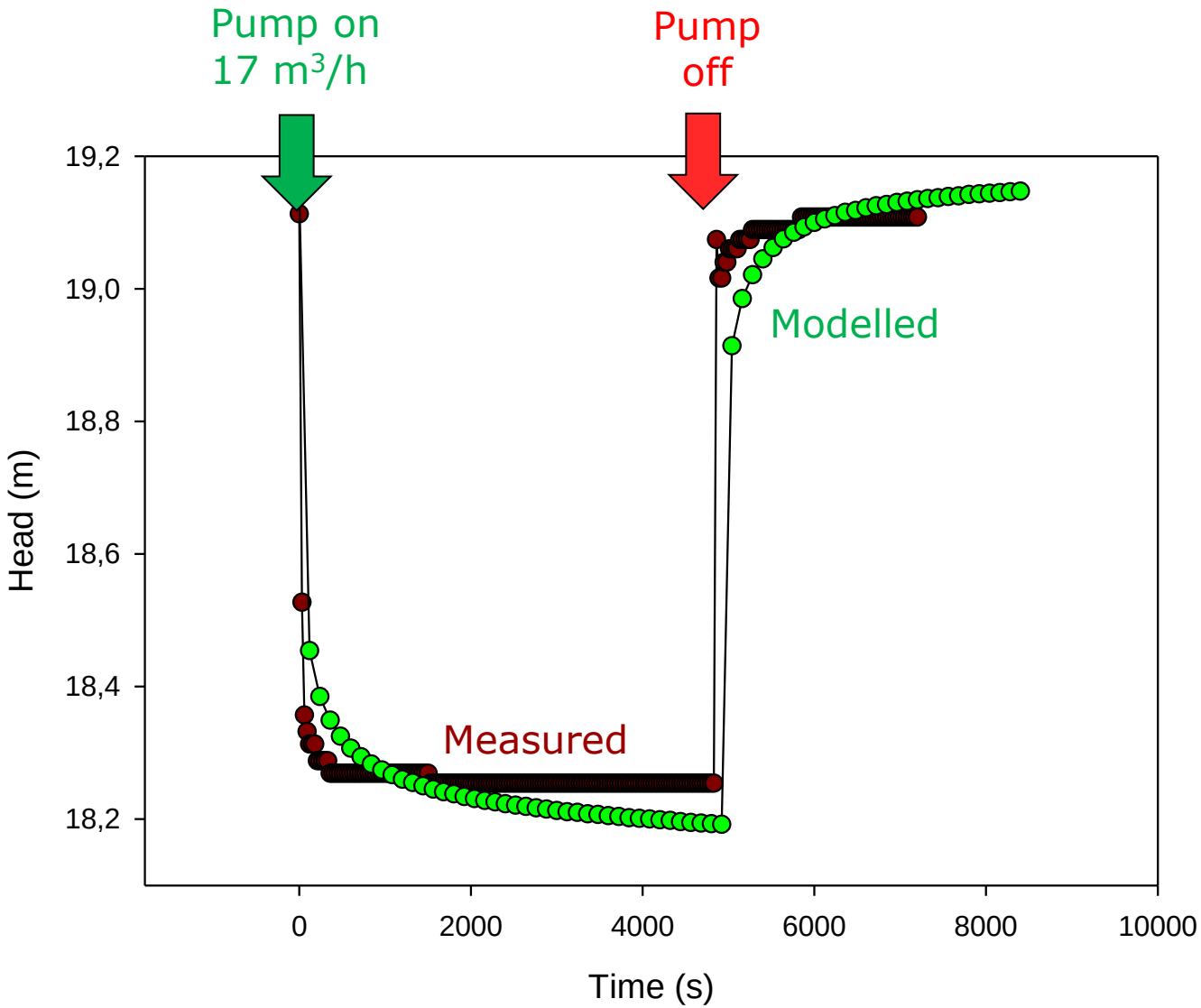


Site Assessment - Hydrogeology



Matlab model after Göltz et al.

Site Assessment - hydrogeology

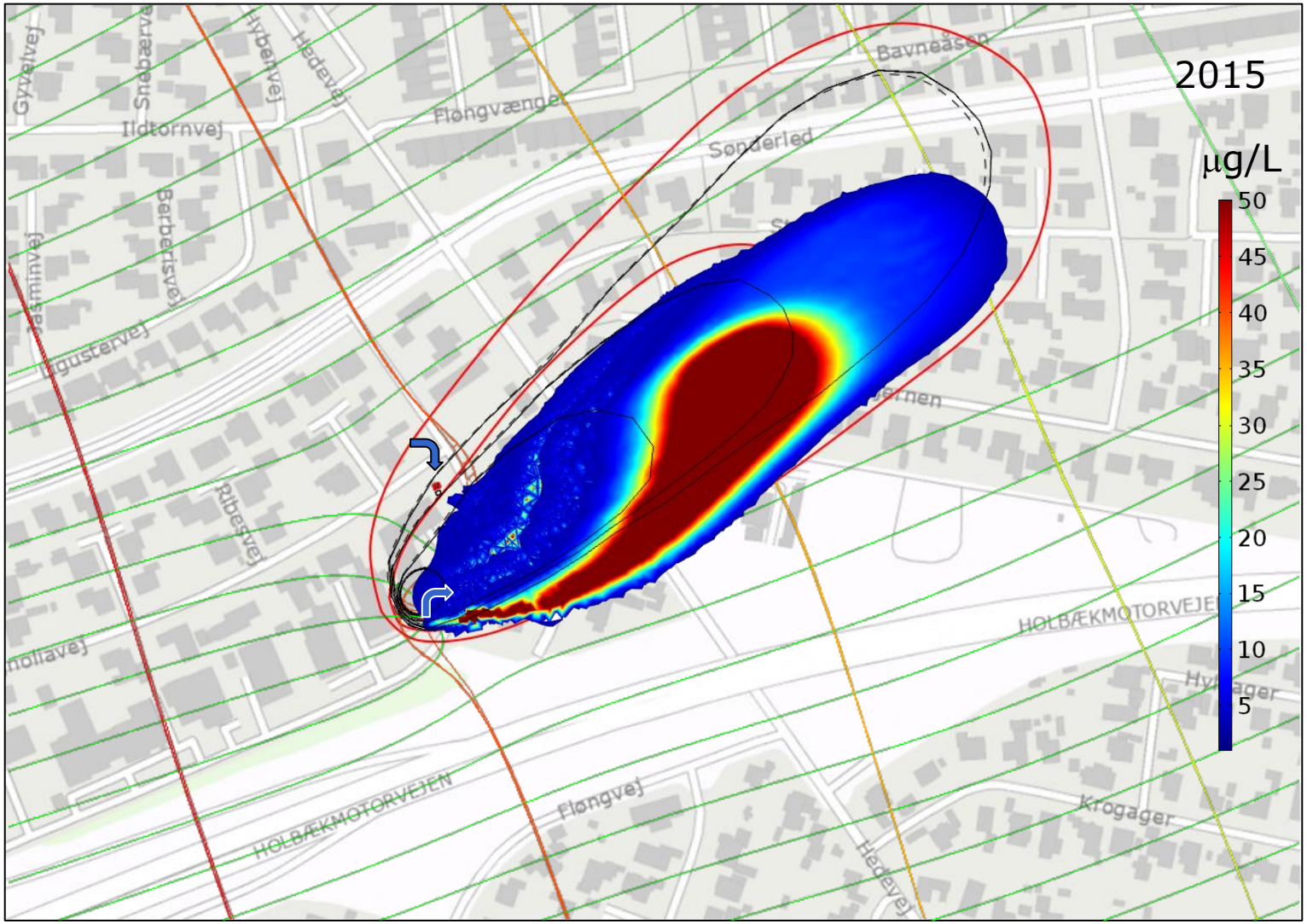


Smart pump tests – (almost) zero cost!

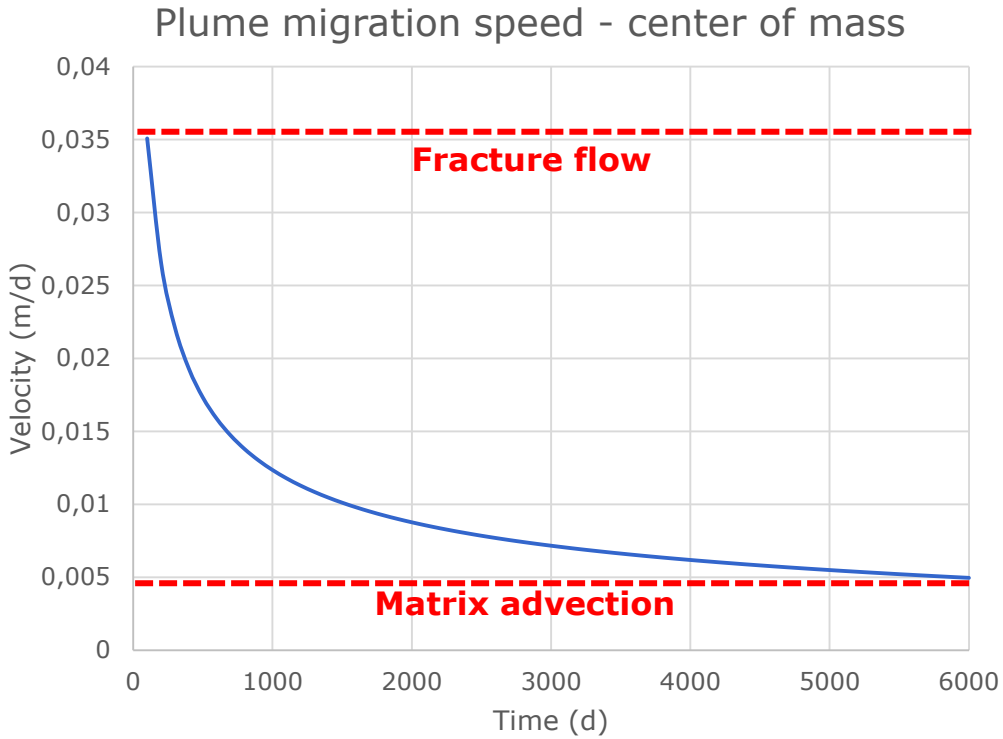
Site Assessment – contaminant distribution

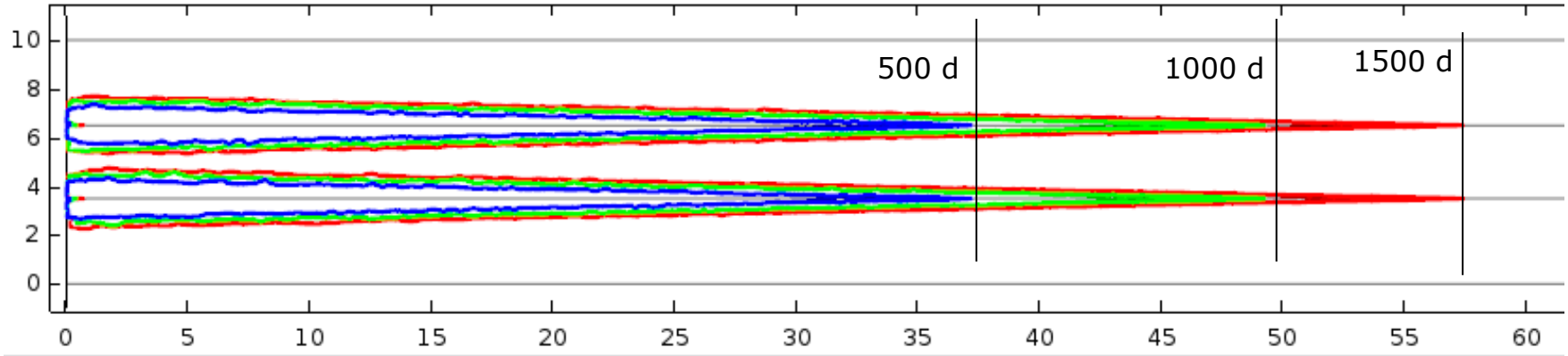
Modeled plume propagation 2007-2015

(equivalent porous medium model)

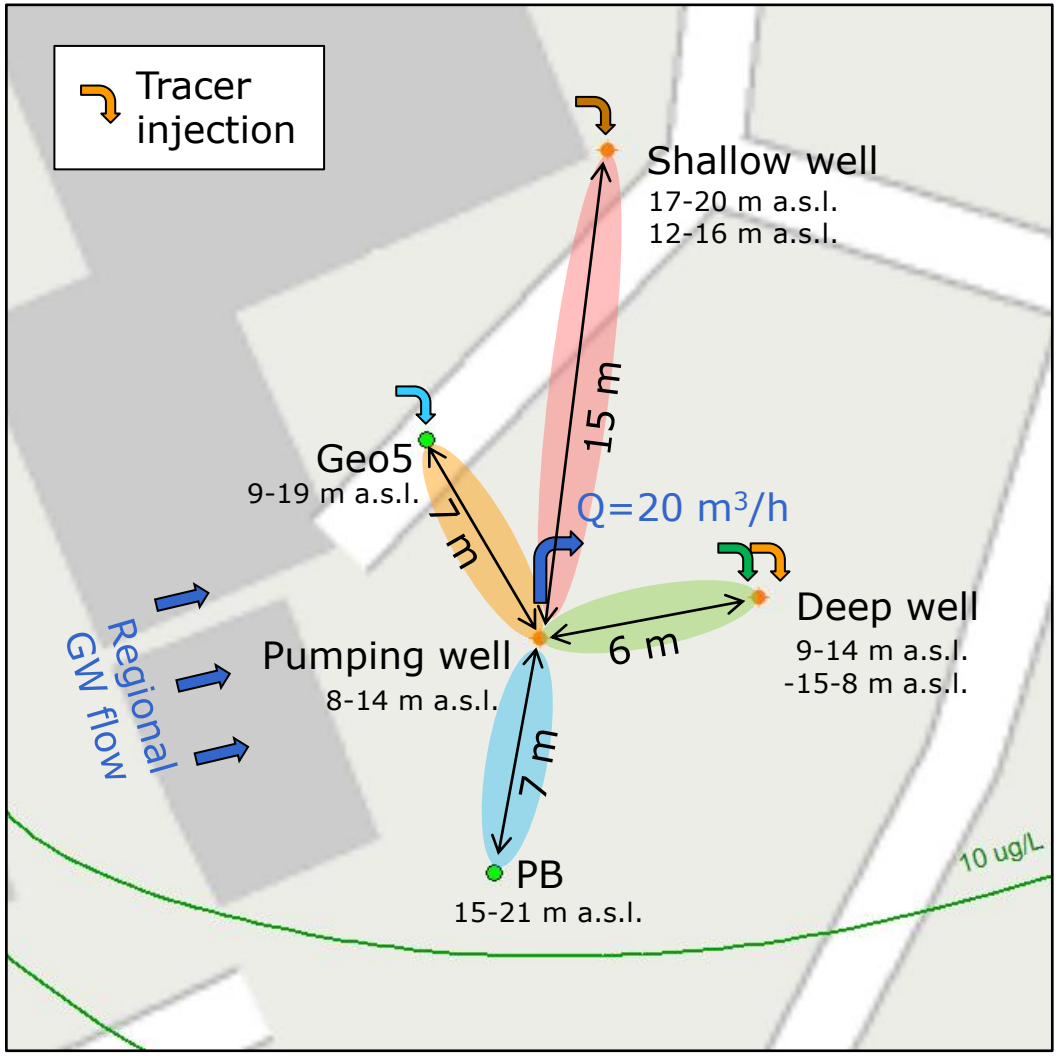


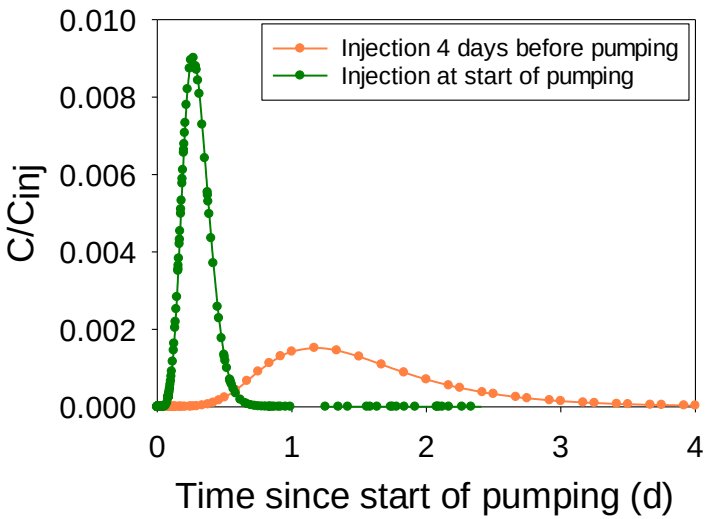
Site assessment - Contaminant distribution



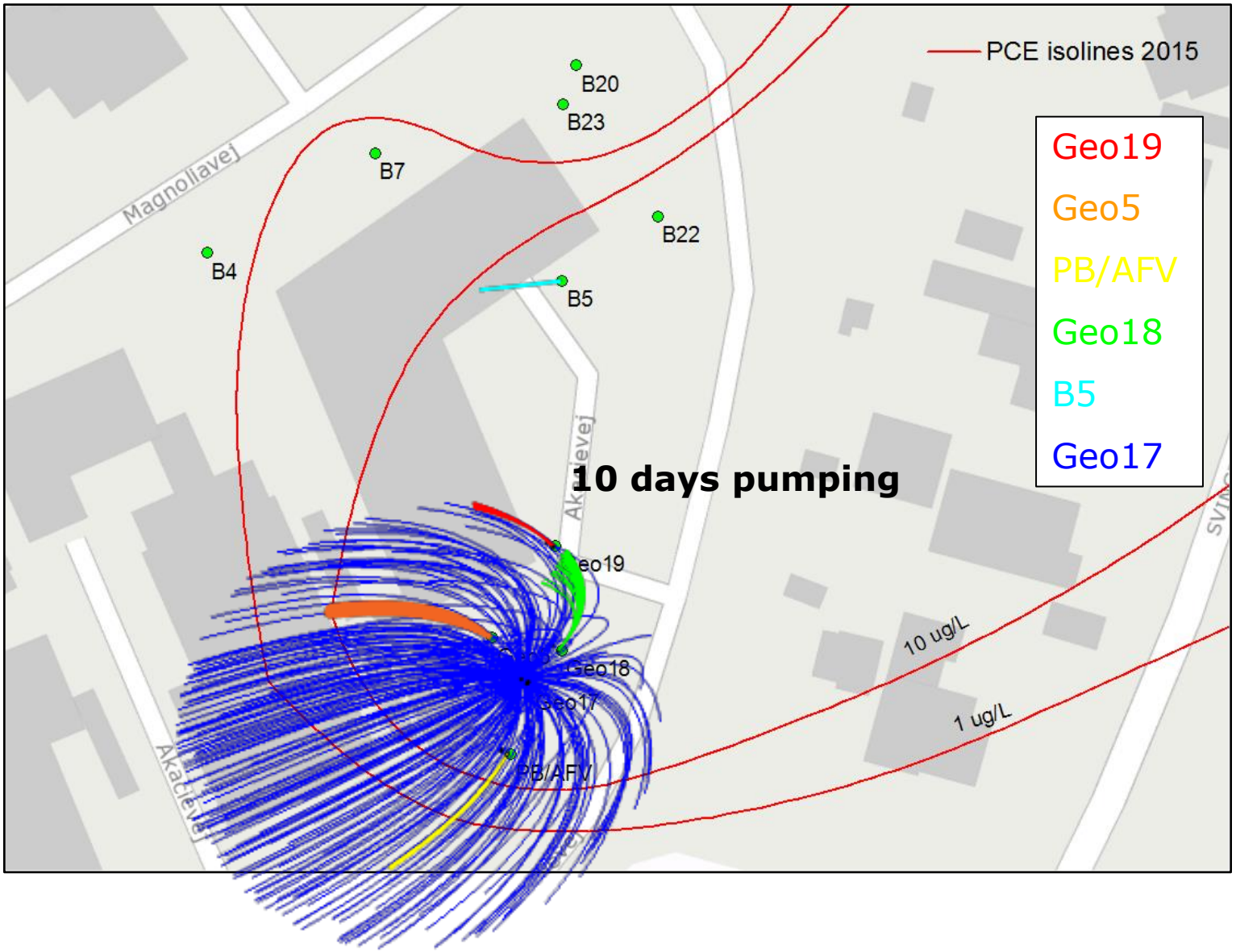


Site Assessment: field work planning

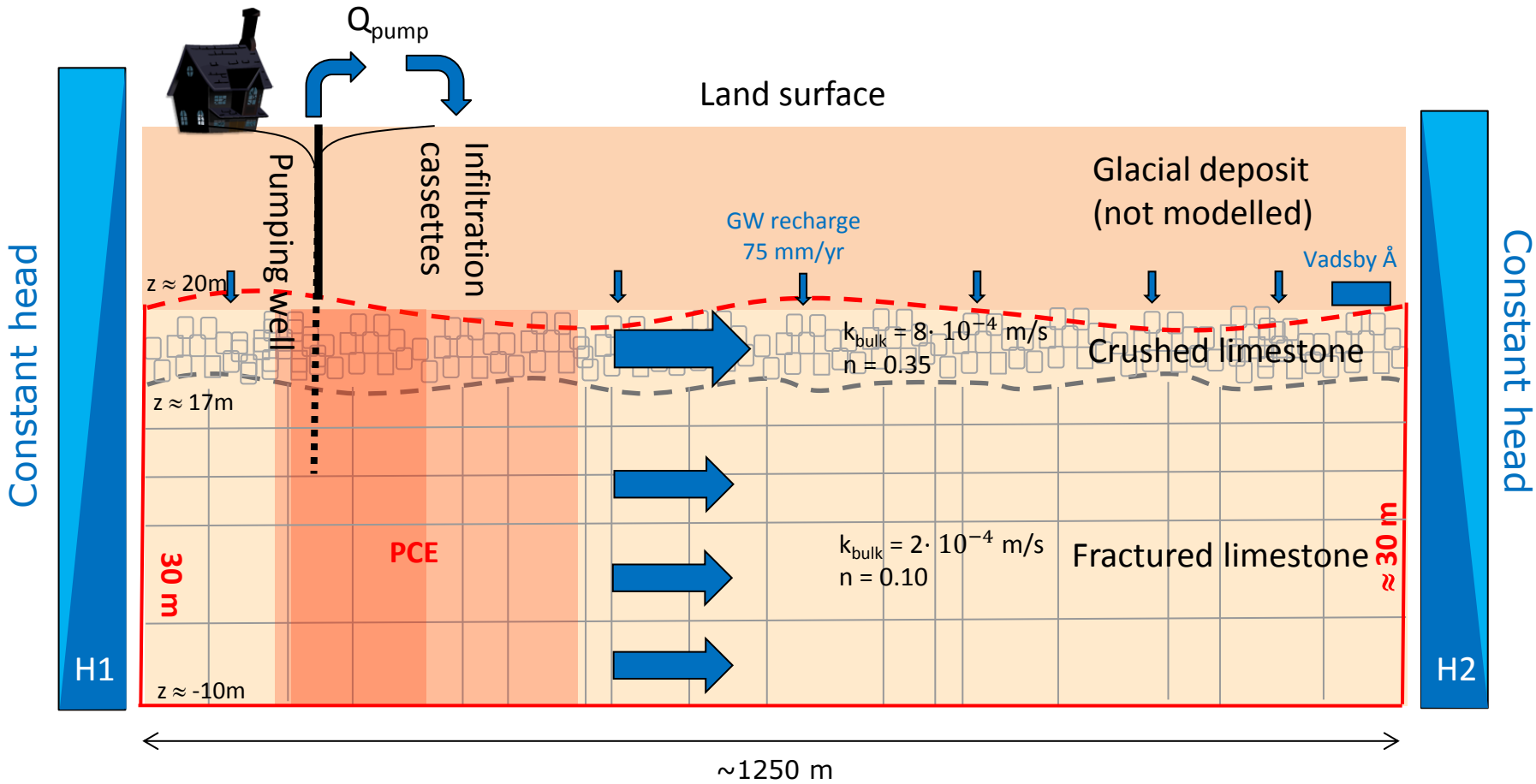




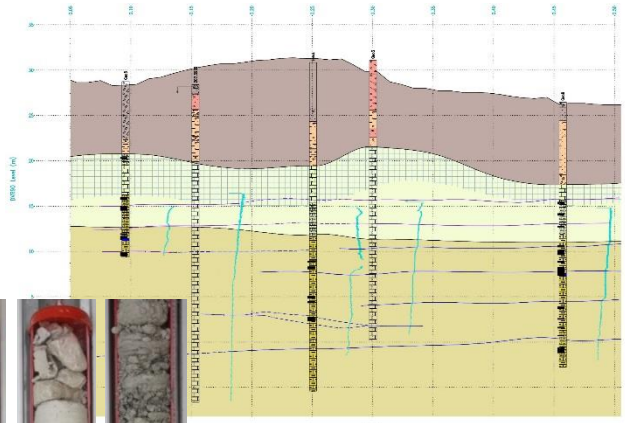
Site assessment – field work planning

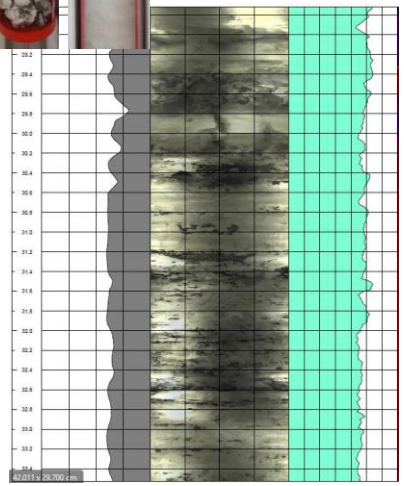


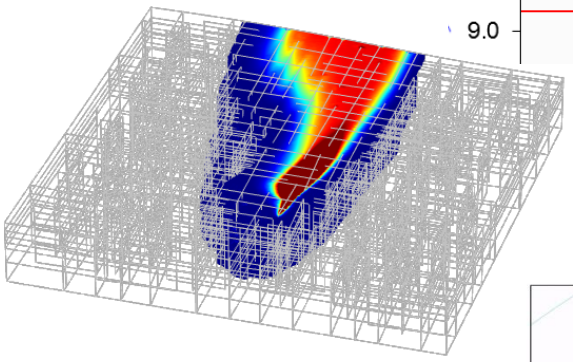
Conceptual model development

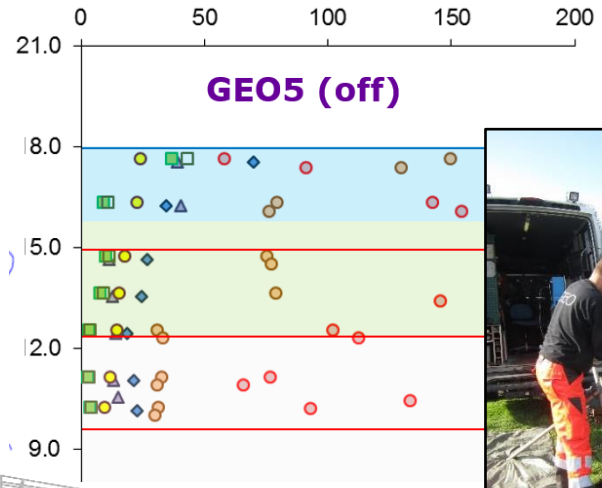


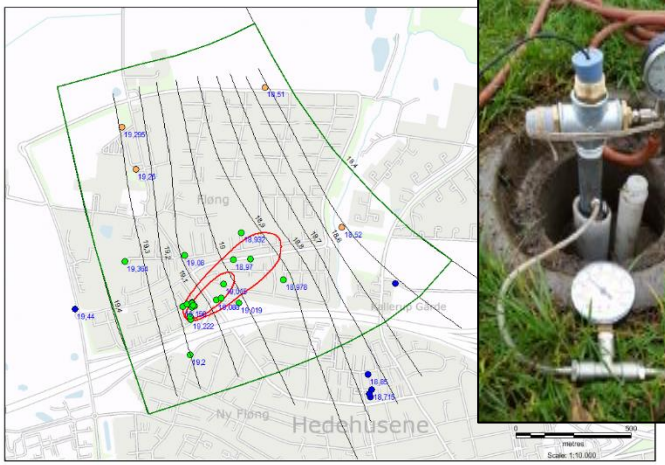
Conceptual model development





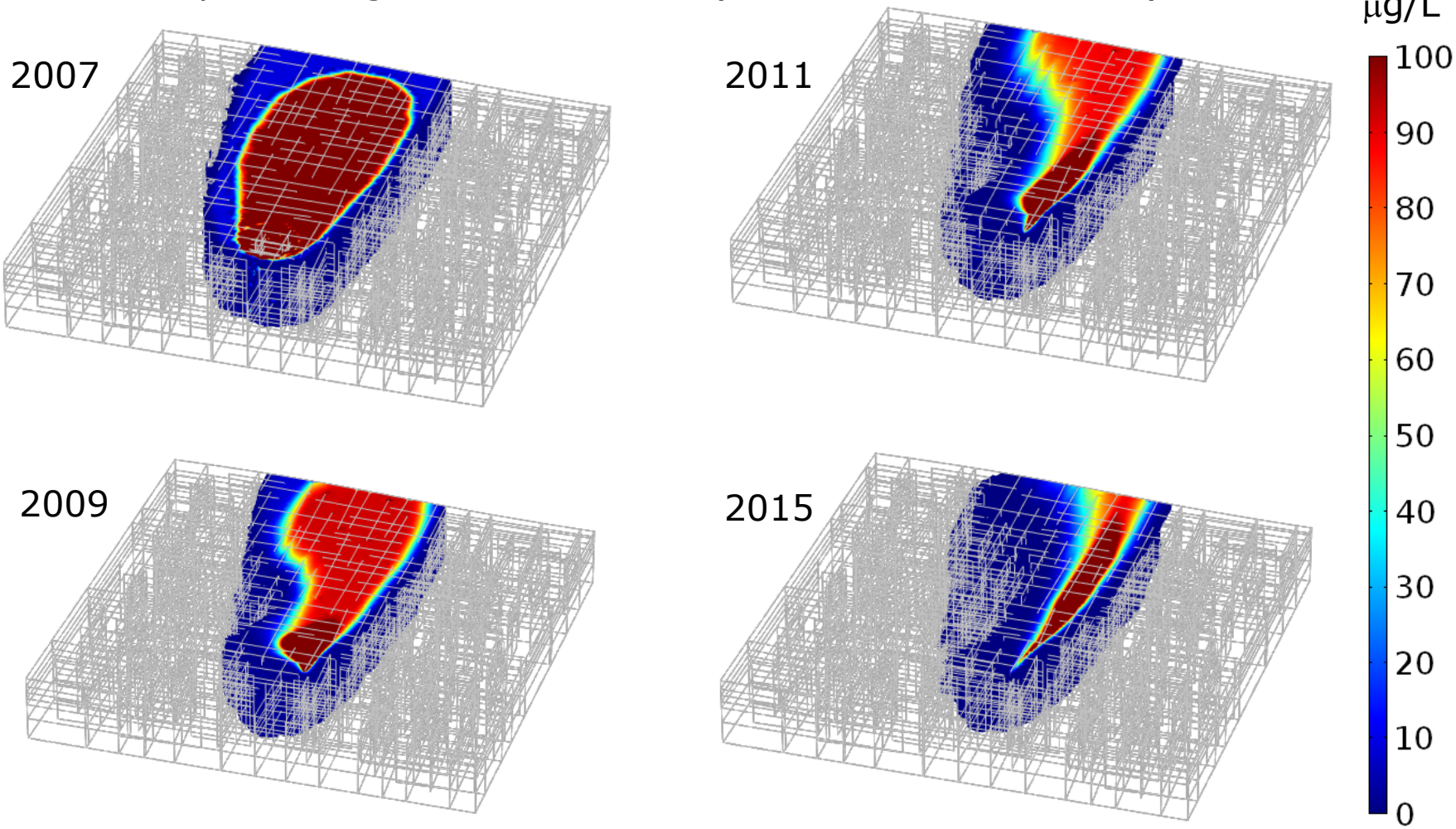






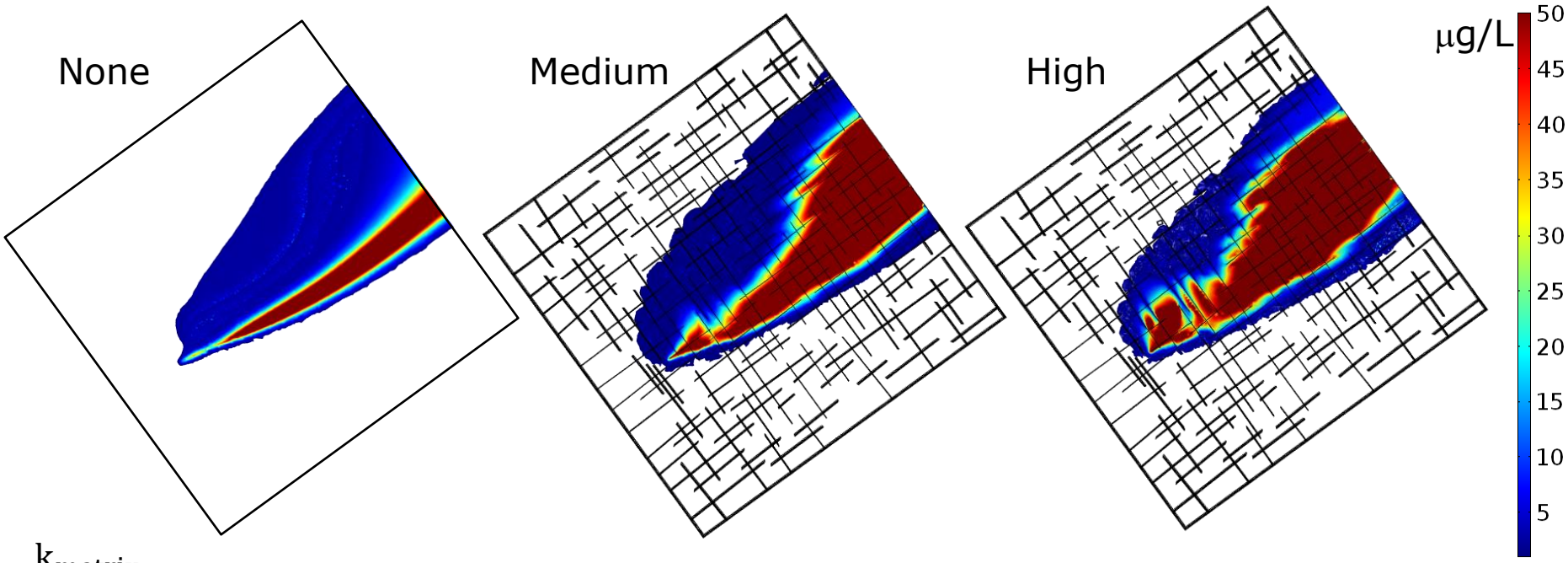
Models

Simulated plume migration 2007-2015 (Discrete-fracture model)



$$\frac{k_{\text{matrix}}}{k_{\text{fractures}}} = 1/4000$$

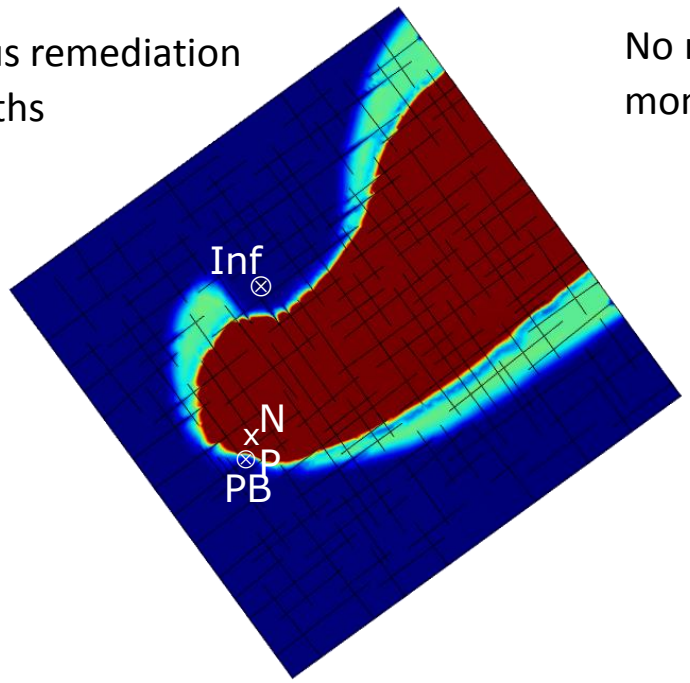
Models



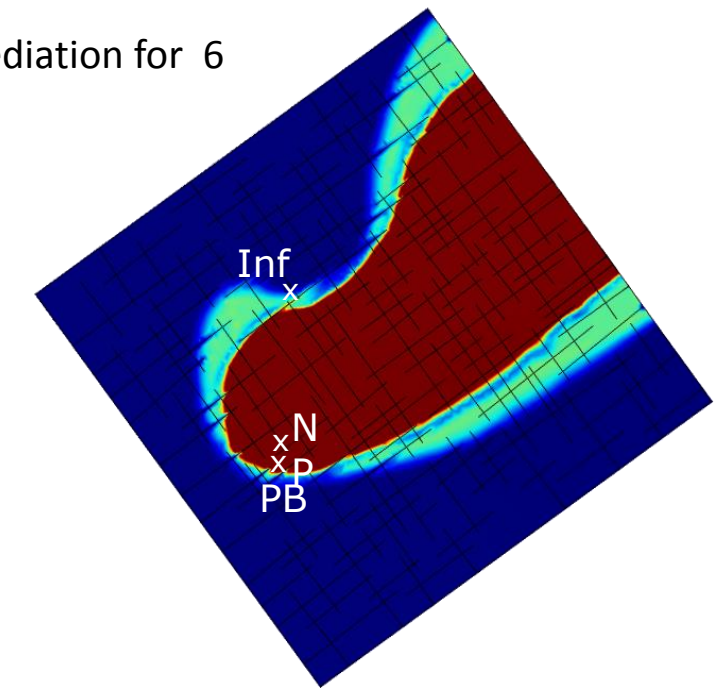
$\frac{k_{\text{matrix}}}{k_{\text{fractures}}}$ 1:1 1:12000 1:15000

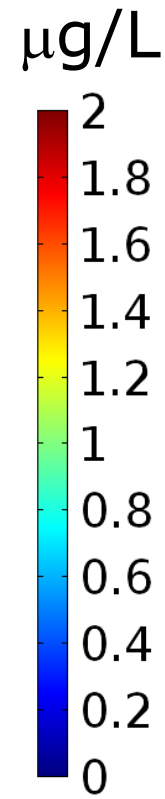
Decisions

Continuous remediation for 6 months



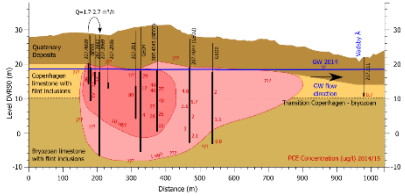
No remediation for 6 months



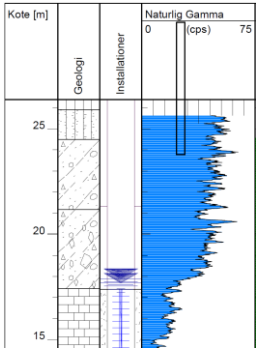


Improved site investigation

Conceptual model



Collect data

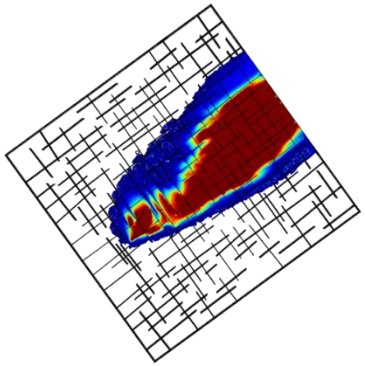


Geology

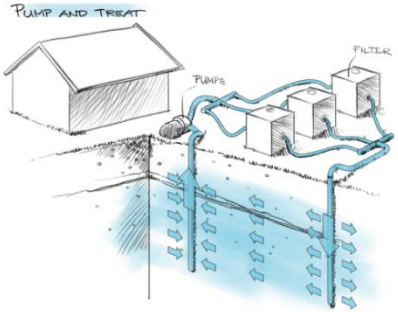
Hydrogeology

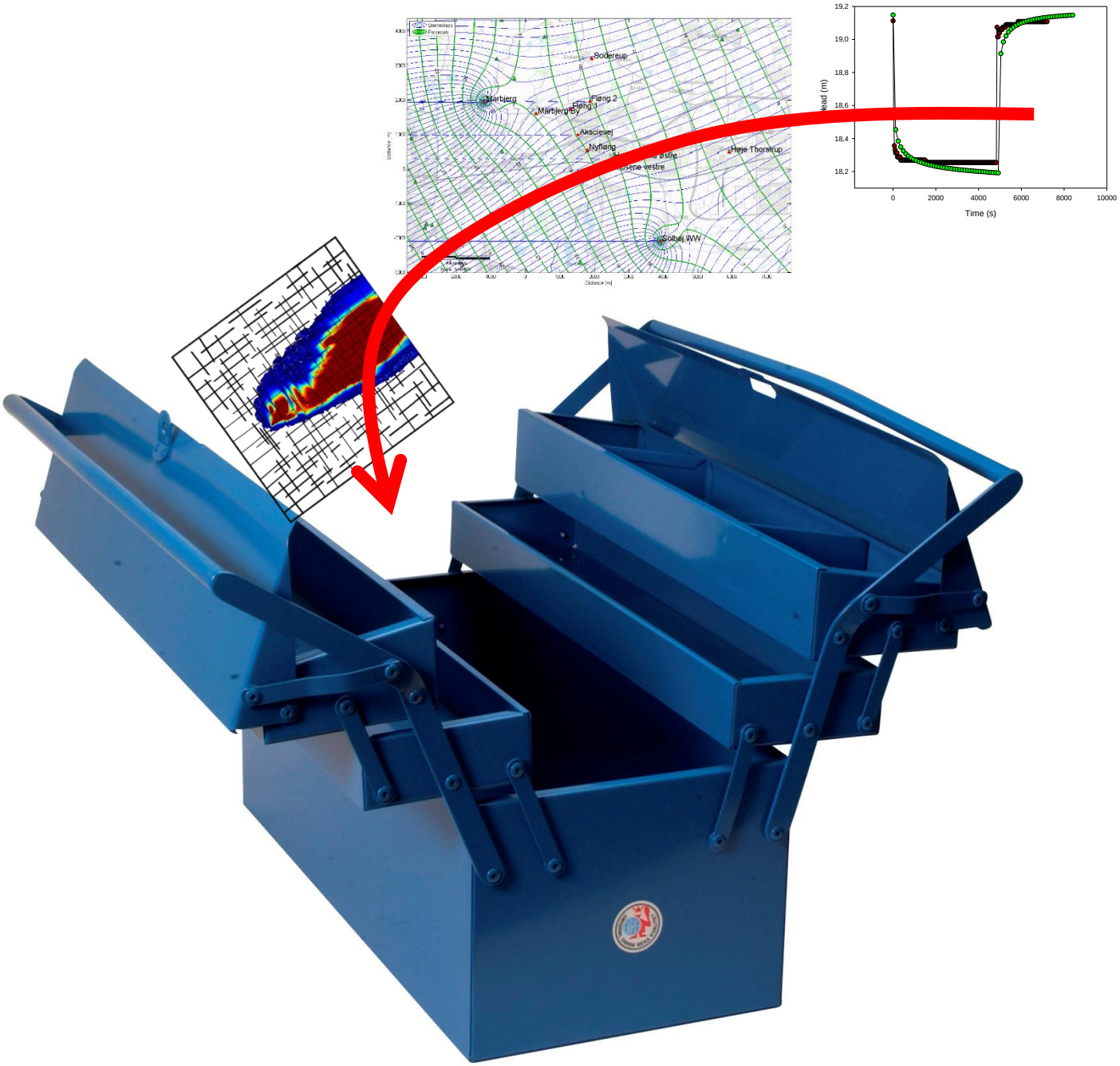
Contaminants

Numerical model



Decisions

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Marbjerg By
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Acknowledgements

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NIRAS

GEUS