



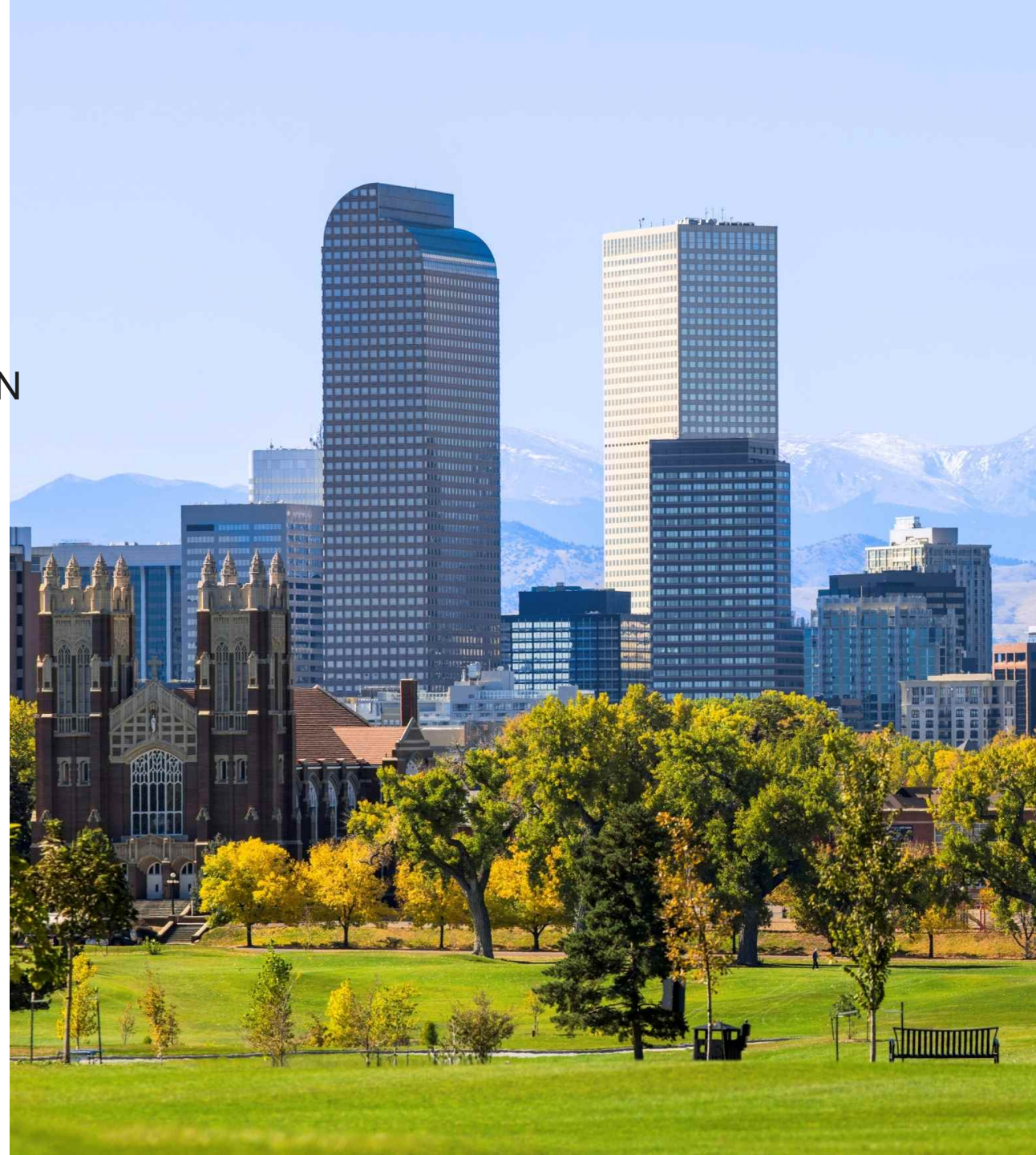
10D. CONCEPTUAL SITE MODELS:
IMPROVEMENTS IN DEVELOPMENT & APPLICATION

3D CSM Development as a Precursor to Groundwater Flow Modeling

BATTELLE CHLORINATED CONFERENCE 2024
DENVER, COLORADO

Sustainability is our business

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Part 1: Background/Objectives

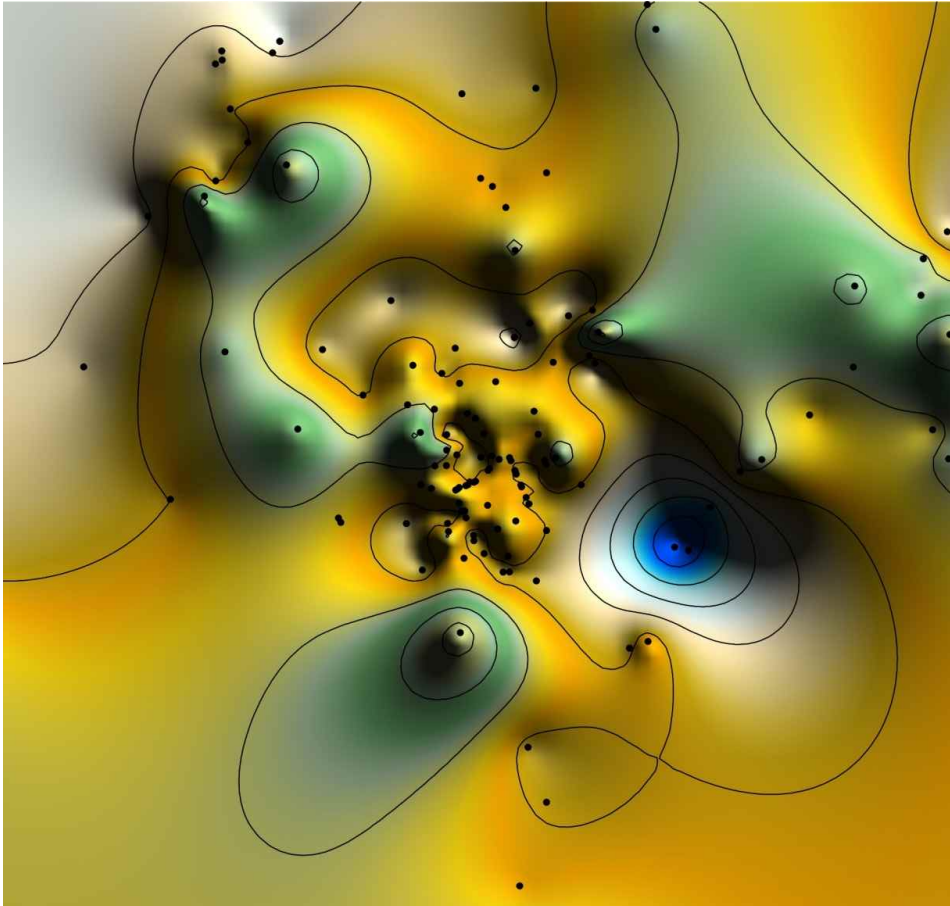
Part 2: Approach/Activities

Part 3: Results/Lessons Learned

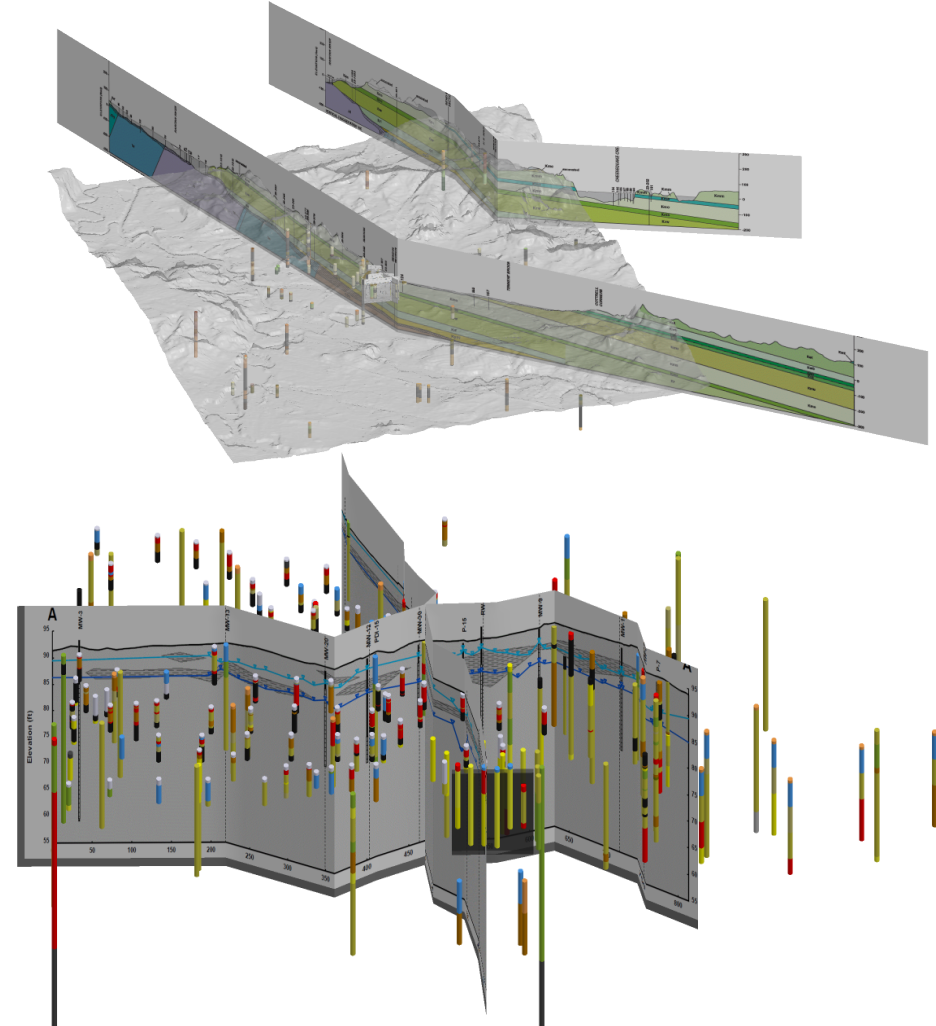
Introduction

Background

General modeling approach

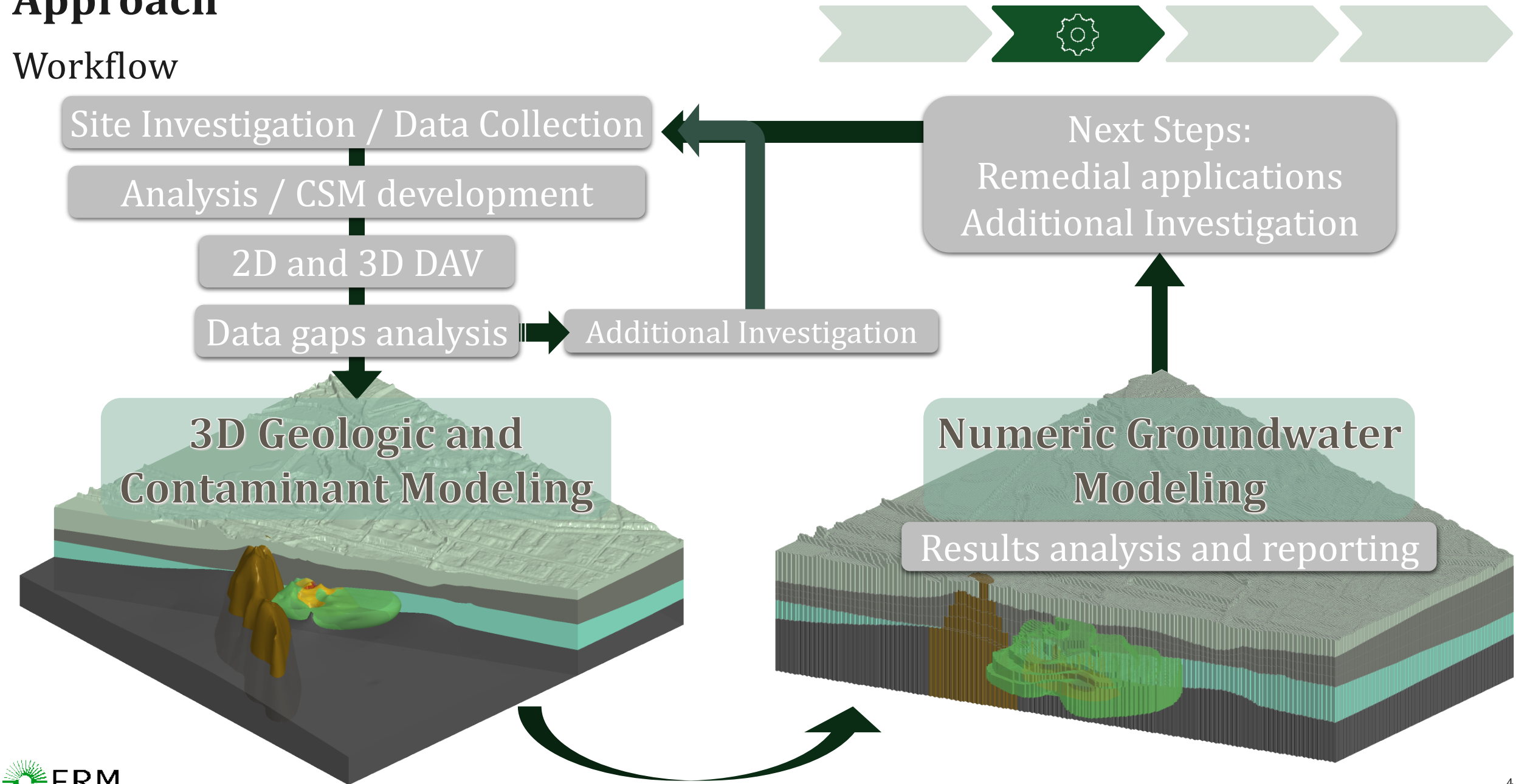


3D CSM Modeling Approach



Approach

Workflow



Approach

Data Compilation



Borehole Data



Analytical Data



HRSC



Historic Site Data



Surfaces



**Regional Geology
and Hydrogeology**

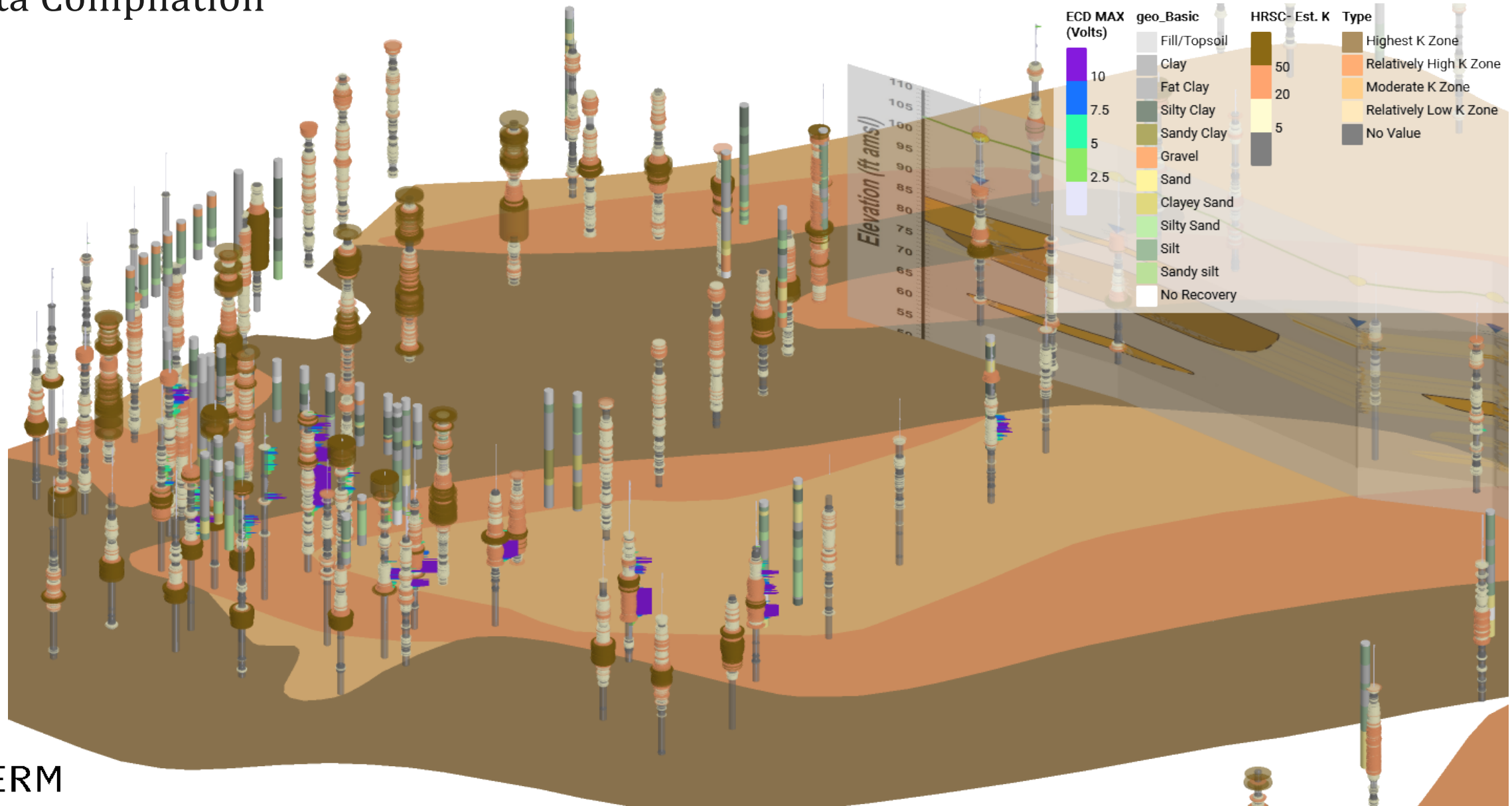


**3D
Modeling
Platform**



Approach

Data Compilation



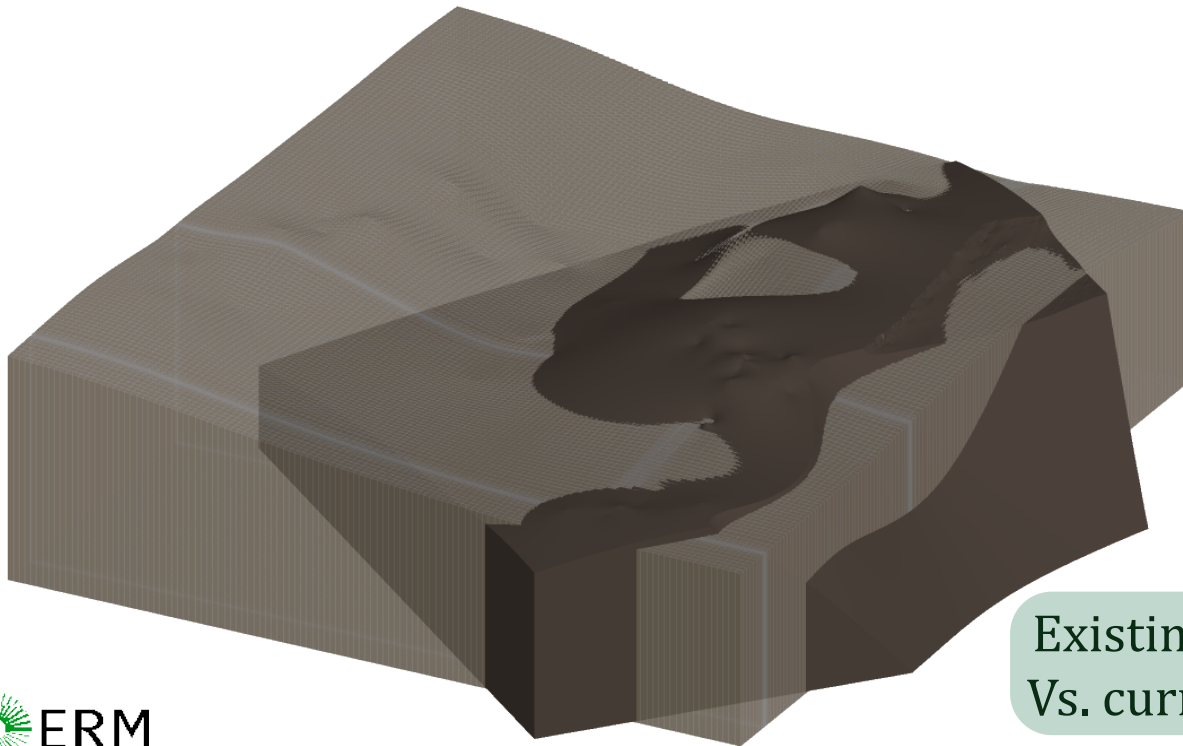
Modeling Considerations and Applications

Geologic and Hydraulic features

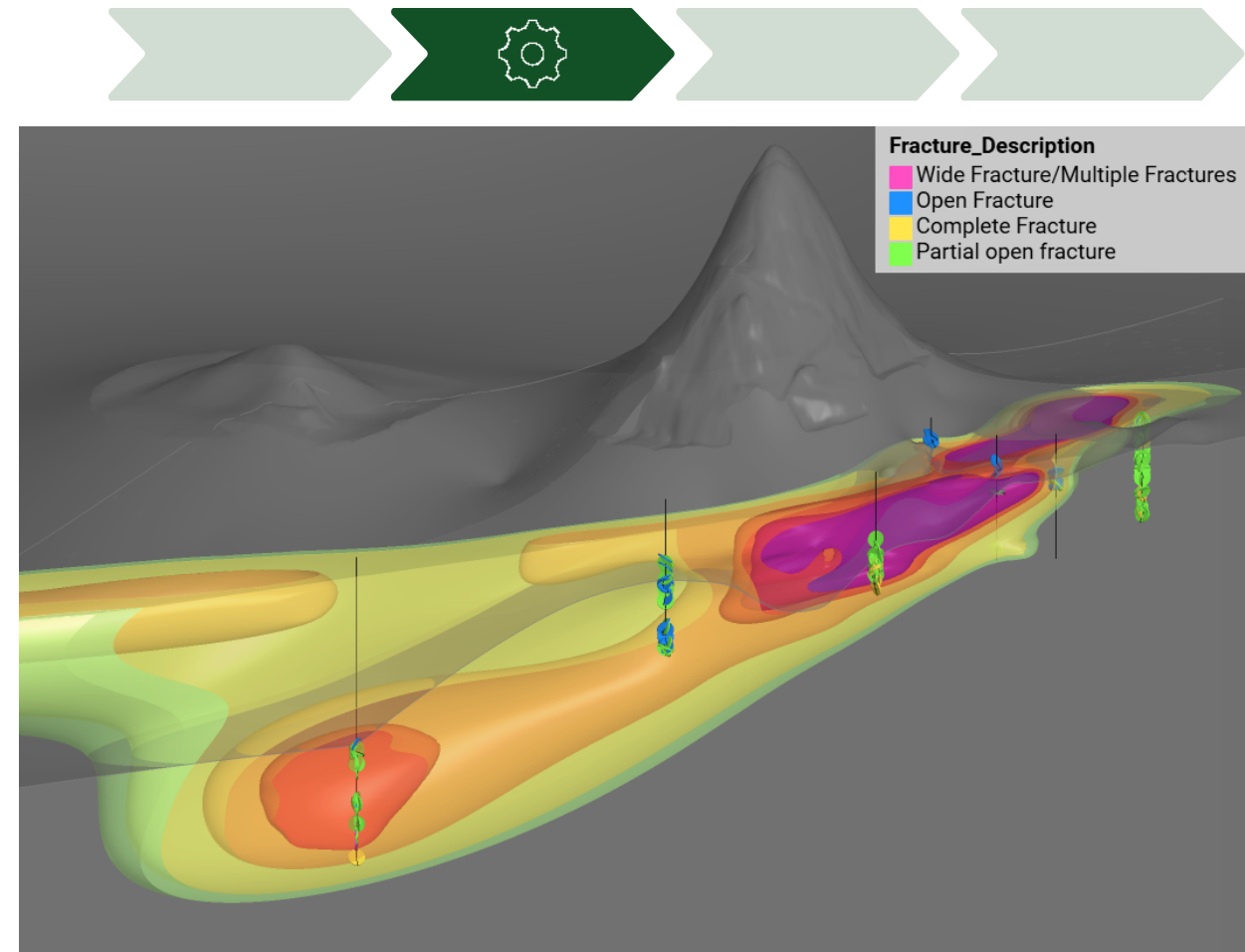
Source and Plume behaviors

Remedial Planning and Design

Existing Flow Models



Existing groundwater model
Vs. current 3D interpretation



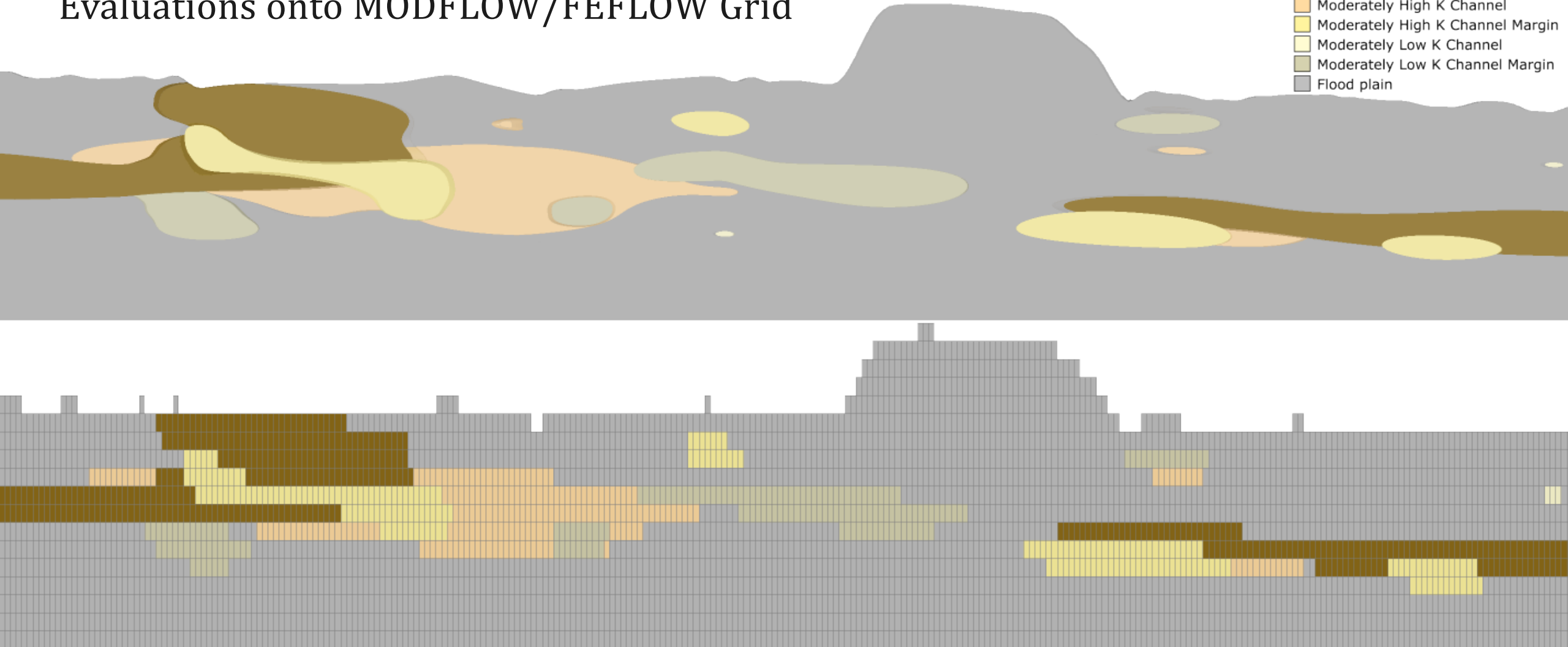
Modeling Considerations and Applications

Evaluations onto MODFLOW/FEFLOW Grid

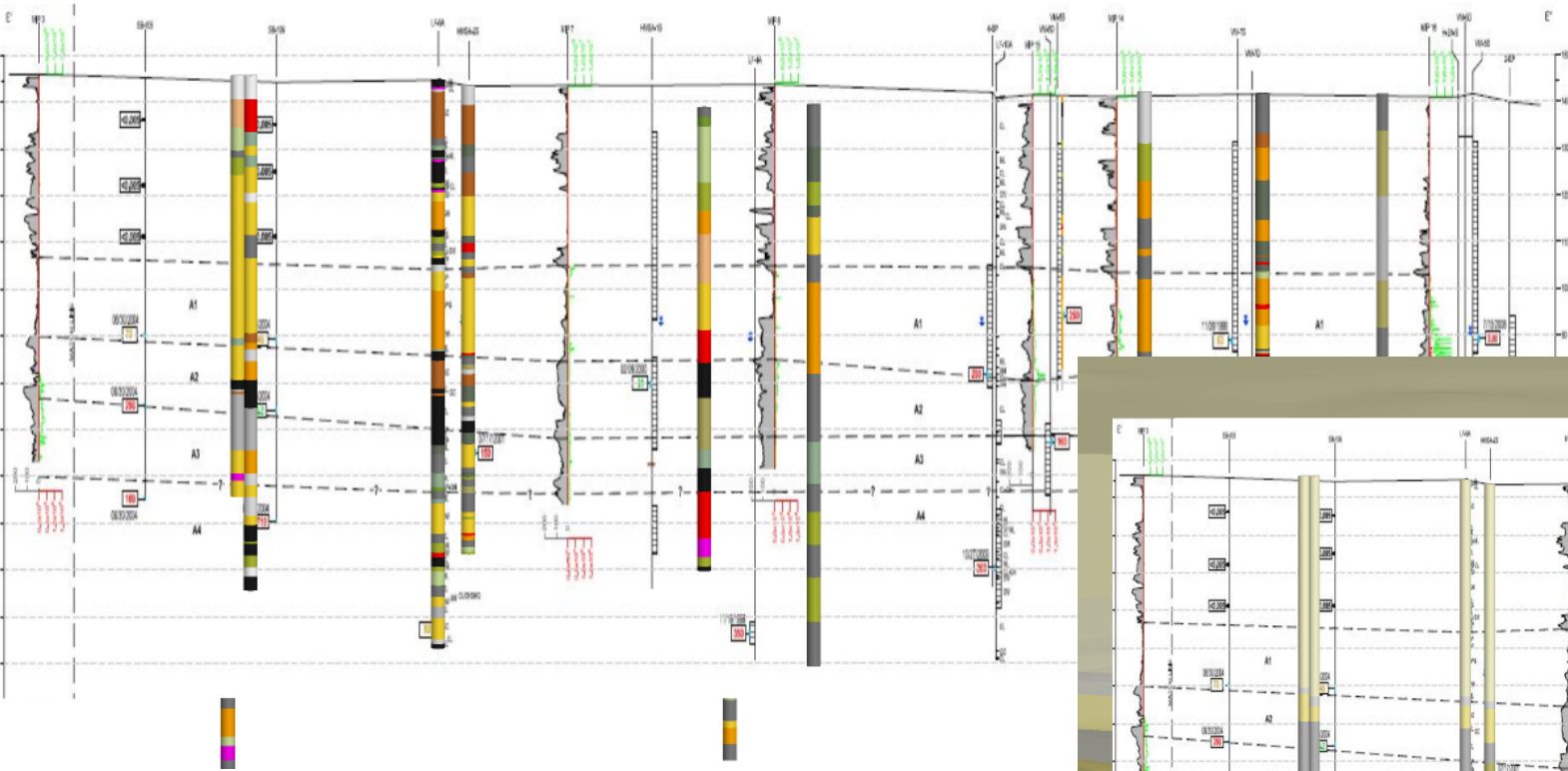


Geology

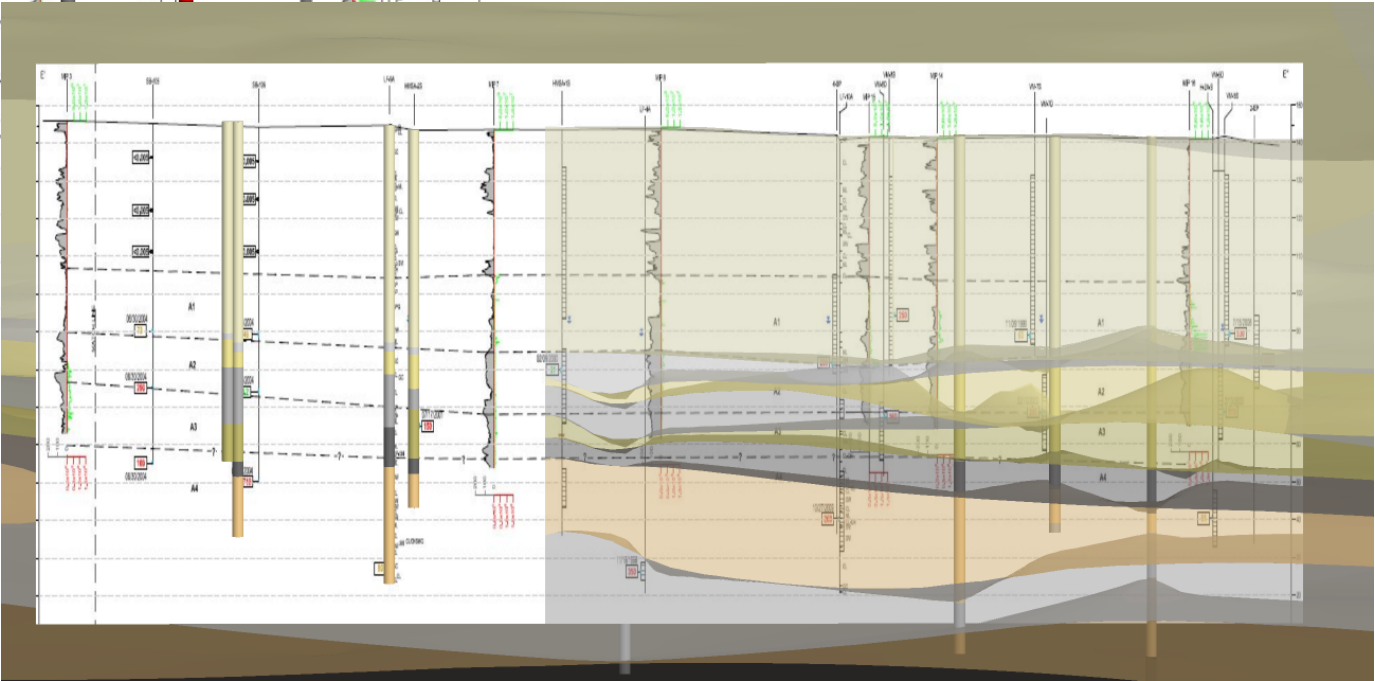
- Highest K Channel
- Moderately High K Channel
- Moderately High K Channel Margin
- Moderately Low K Channel
- Moderately Low K Channel Margin
- Flood plain



Geologic Upscaling

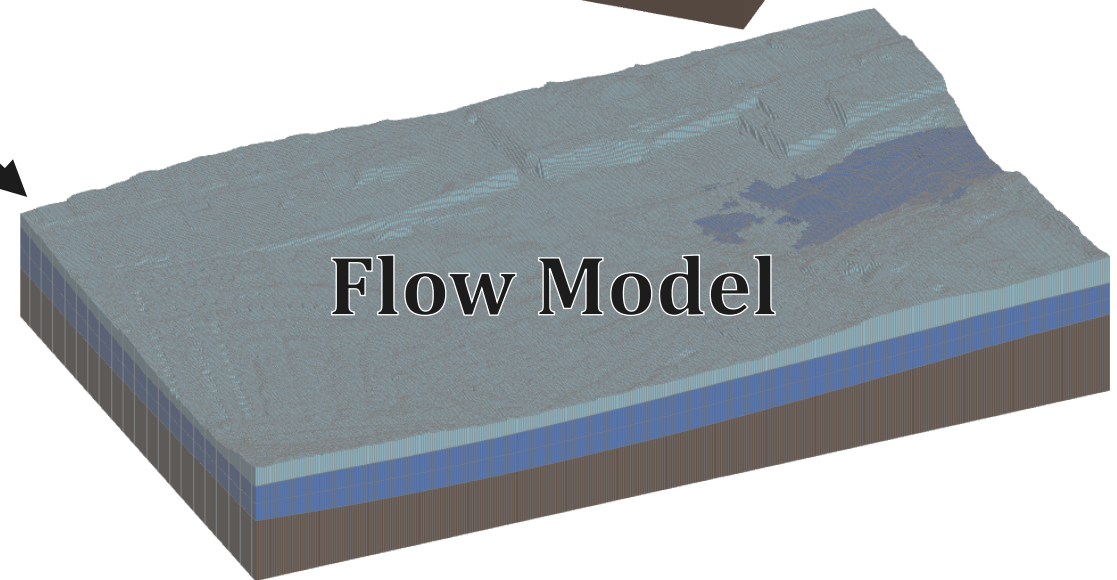
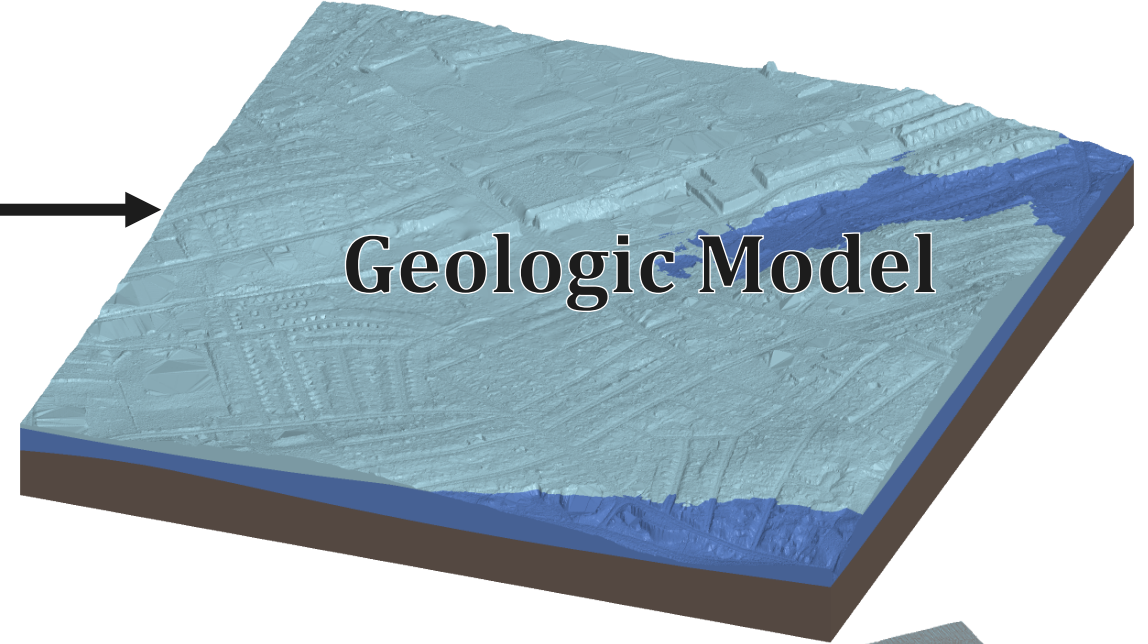
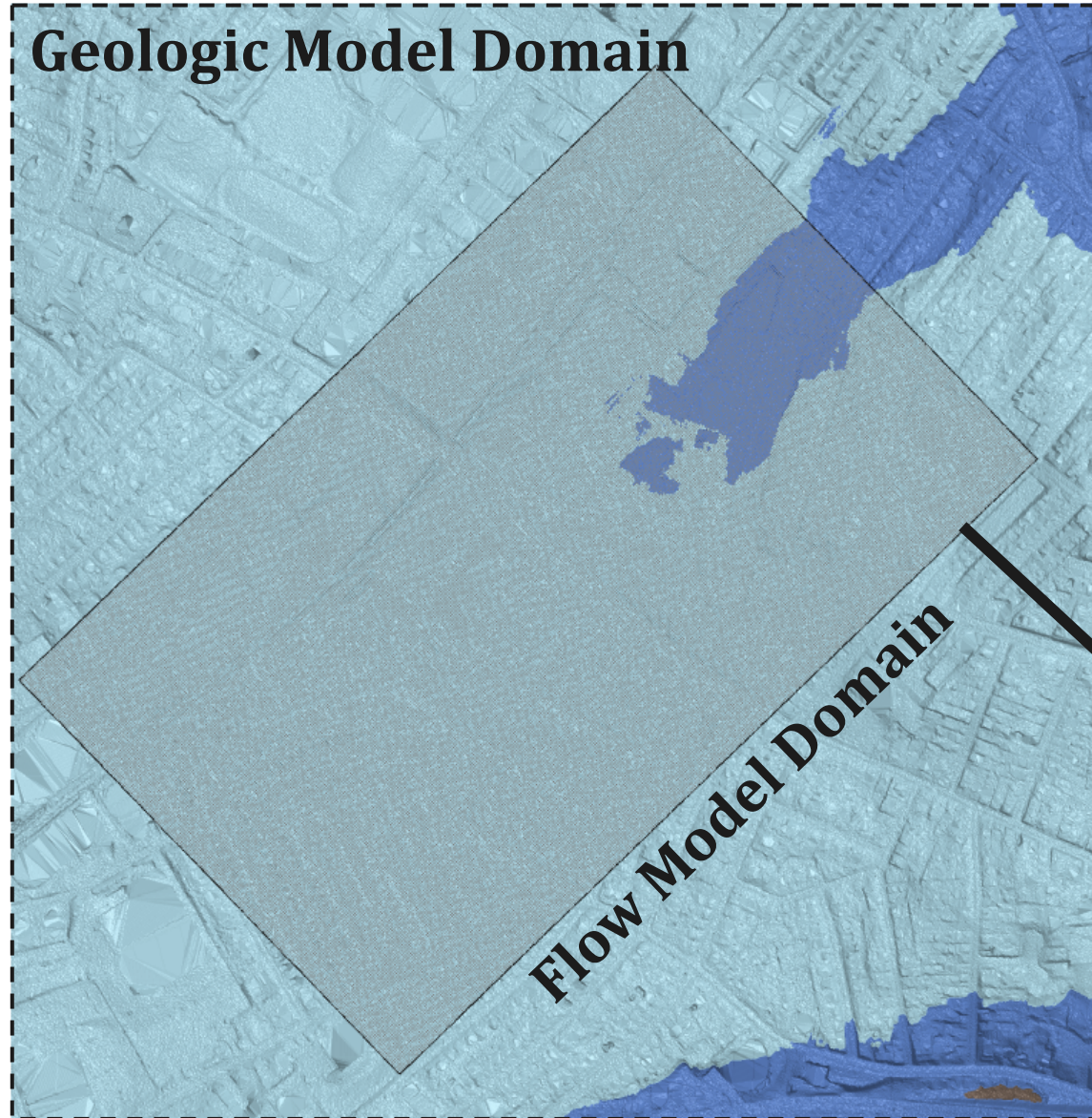


Raw Borehole Geology



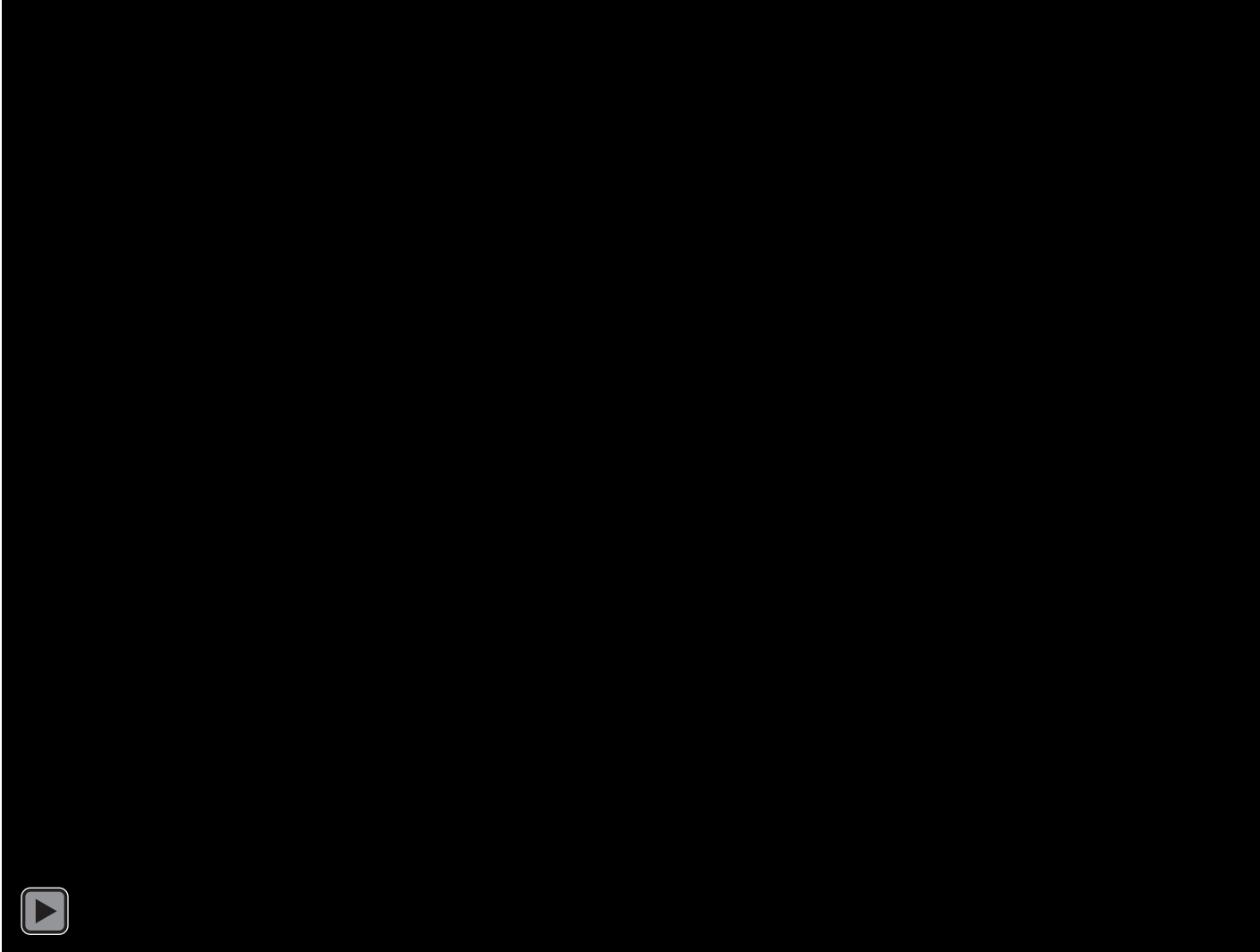
Upscaled Geology and Interpretation

3D Geologic Model to Numeric Model

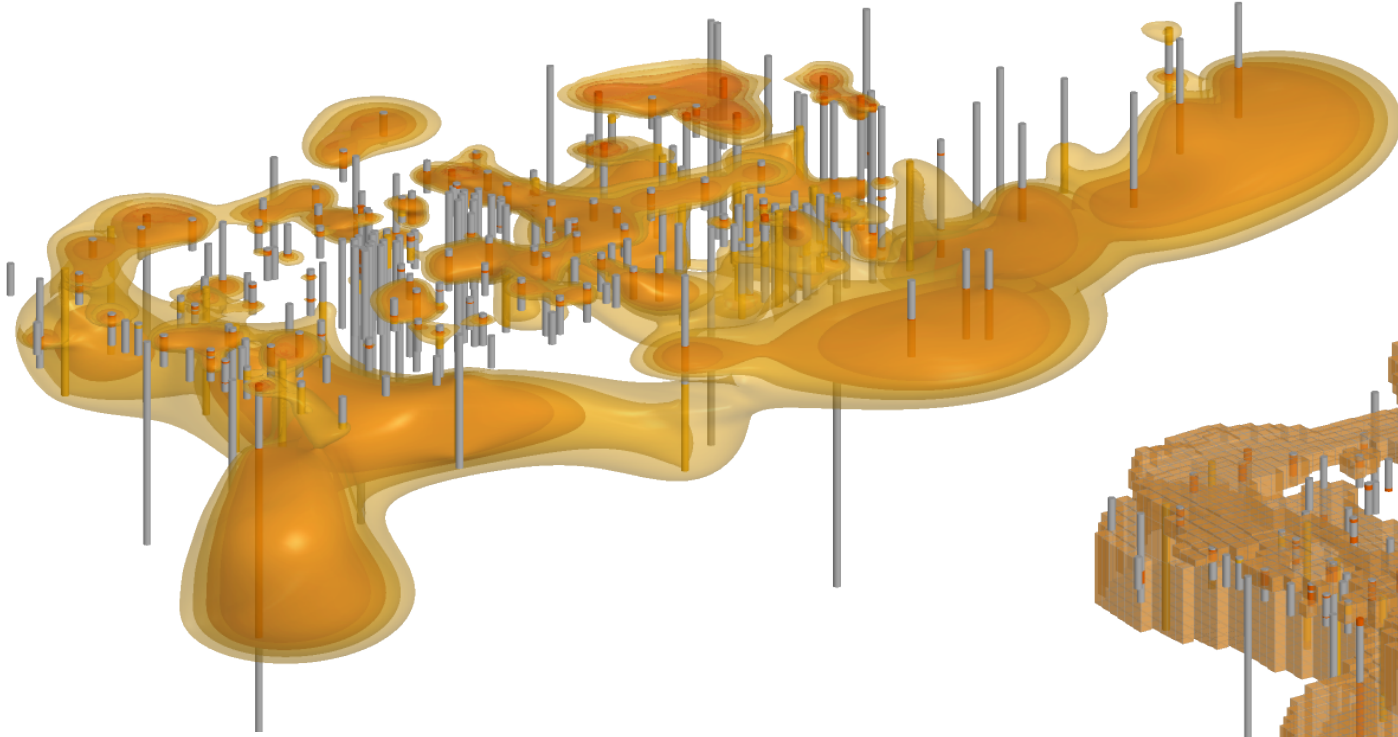


Approach

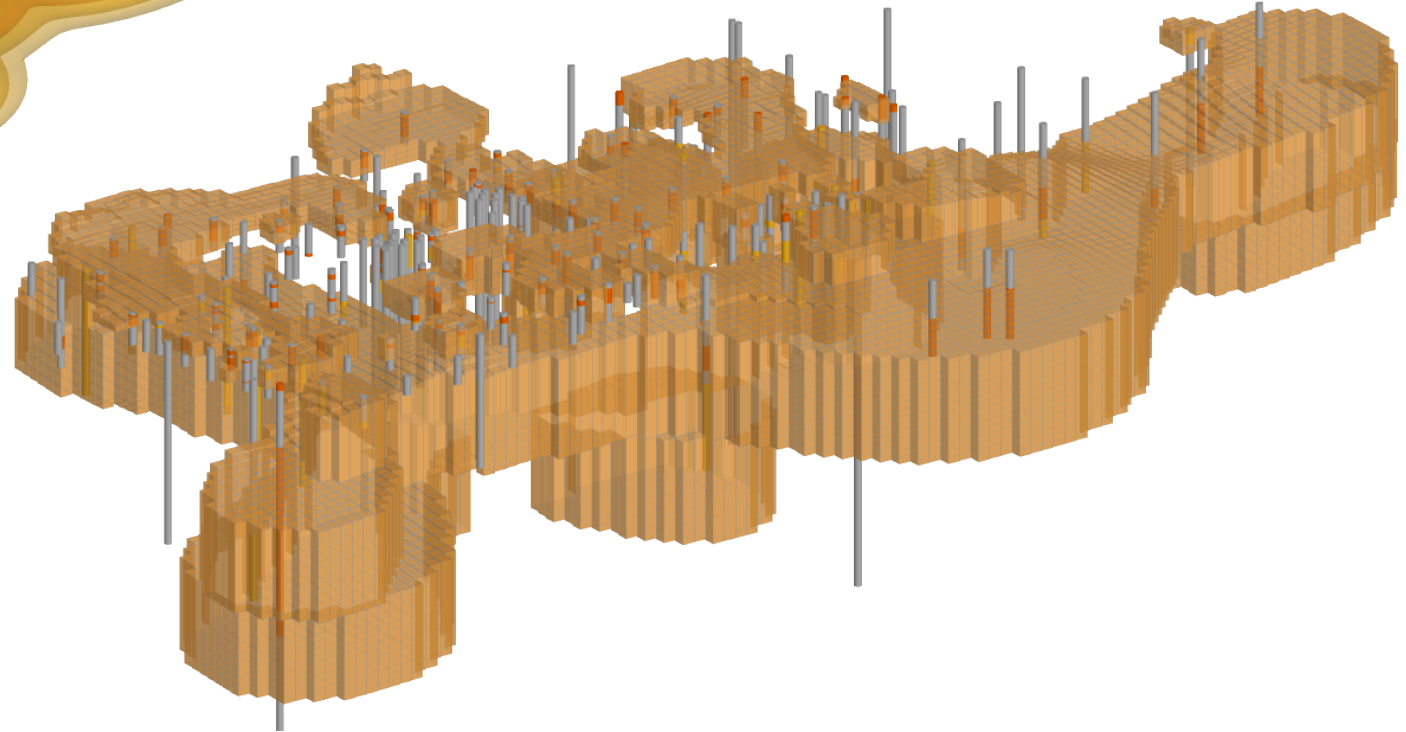
Summary



Case Study – Mapping High Permeability Zones

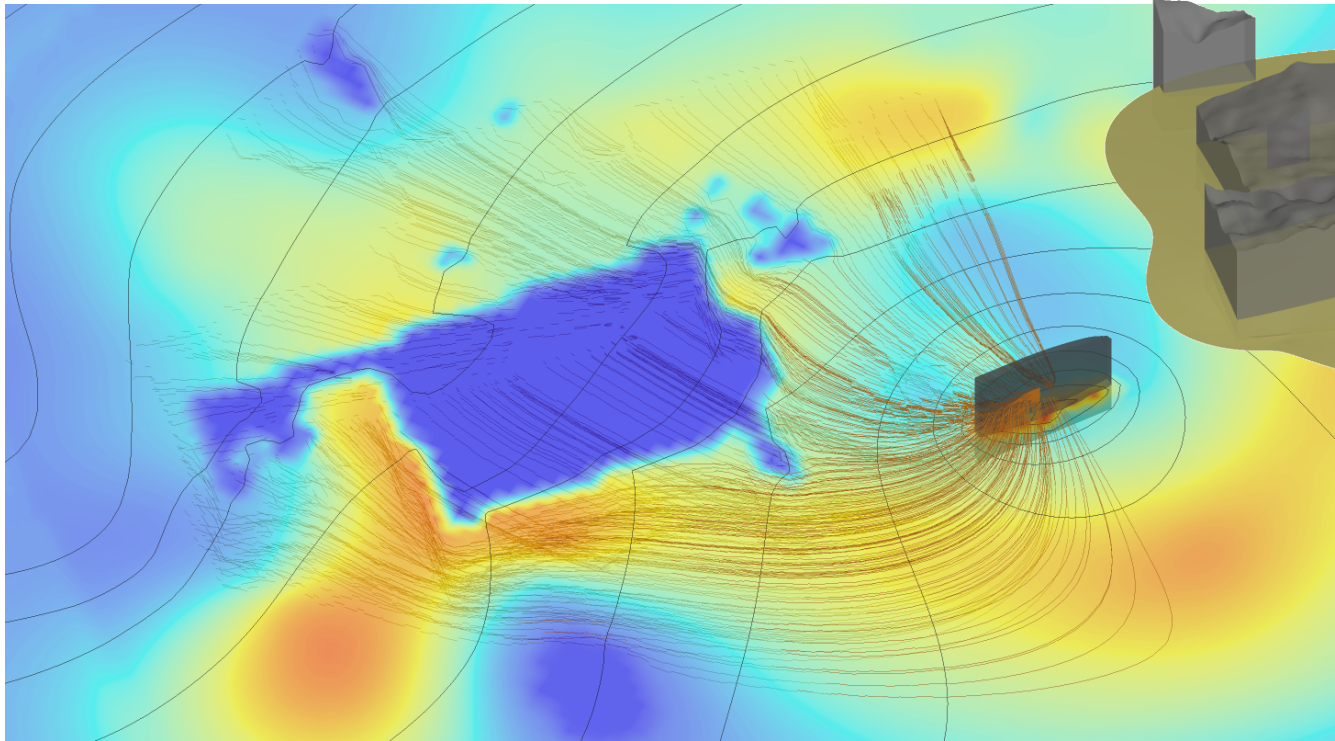


Modeled permeability channels

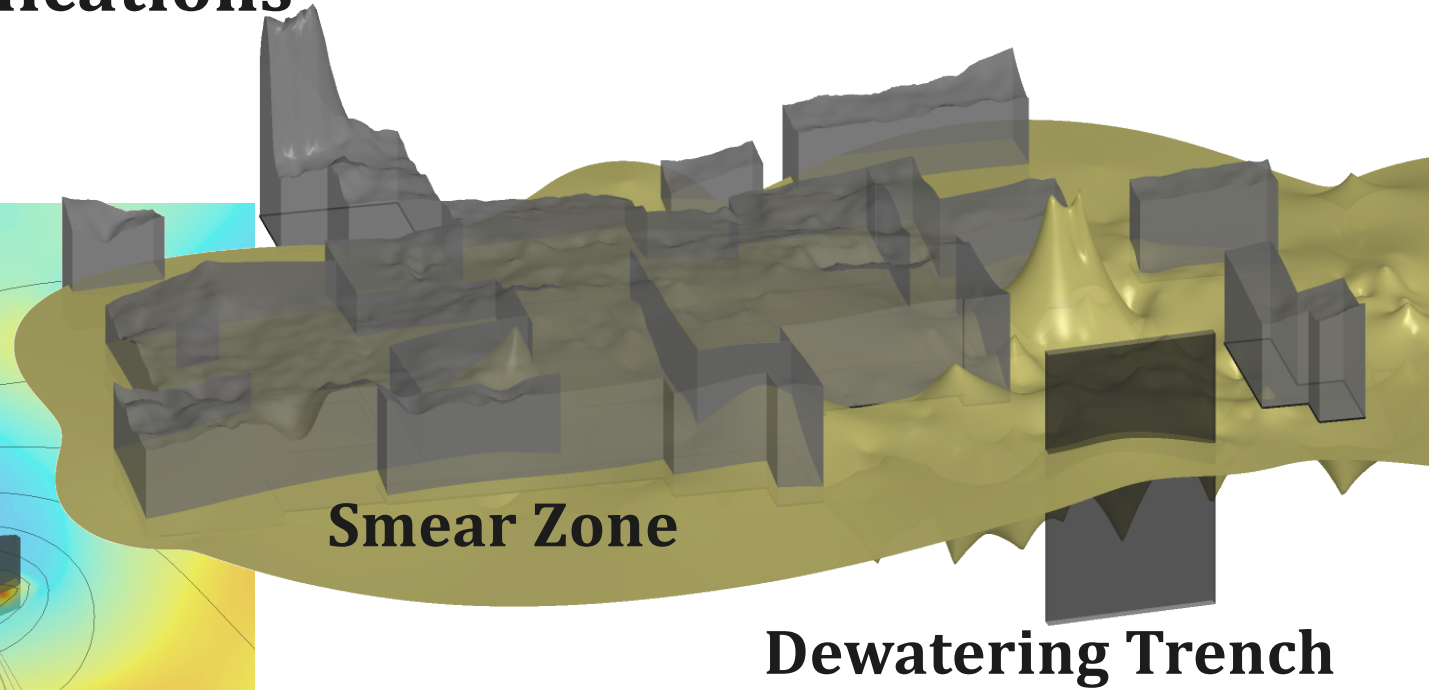


Evaluated permeability channels

Case Study – Aligning to Field Remedial Applications



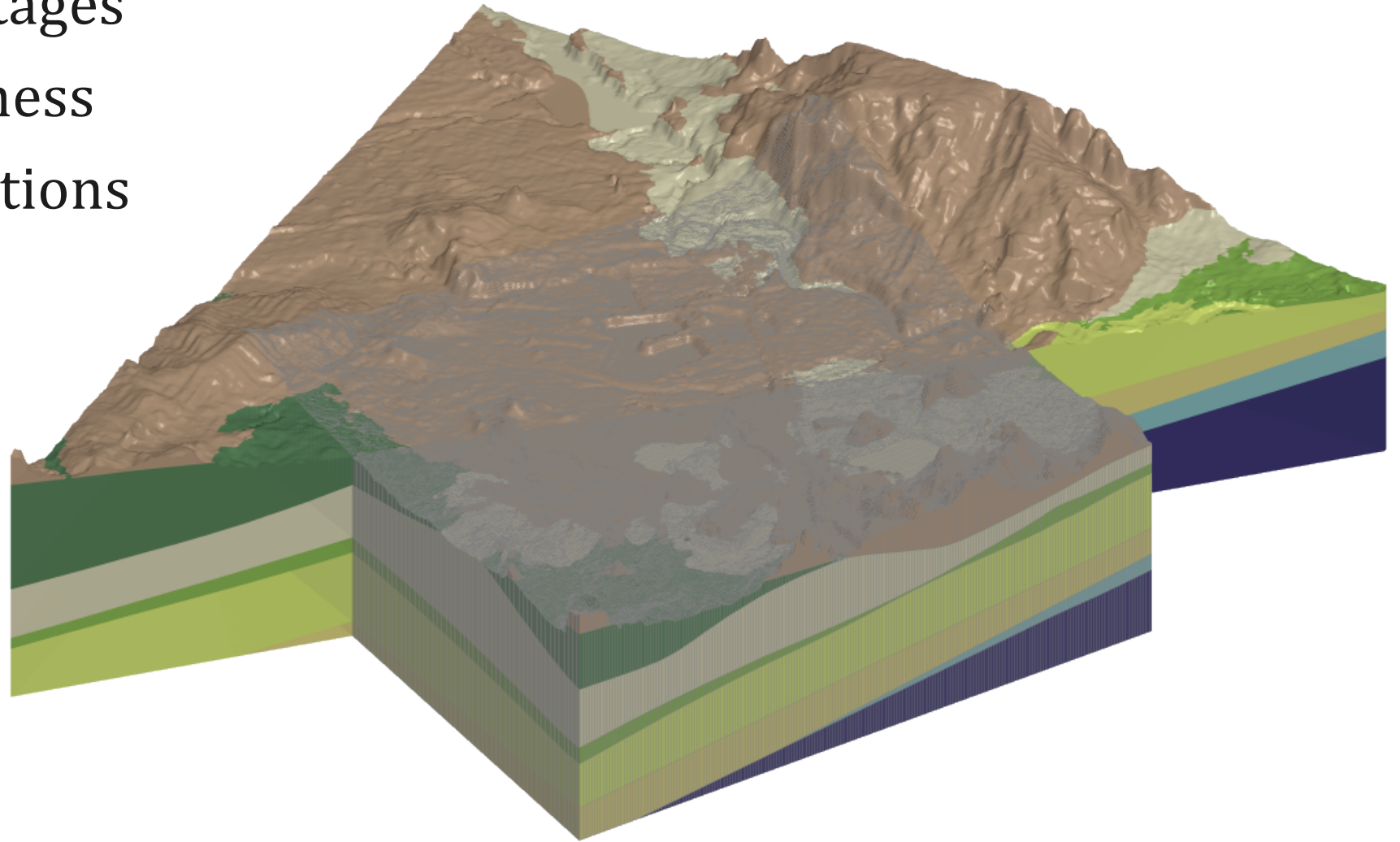
**Modeled Particle Paths and
Hydraulic Conductivity**



Results



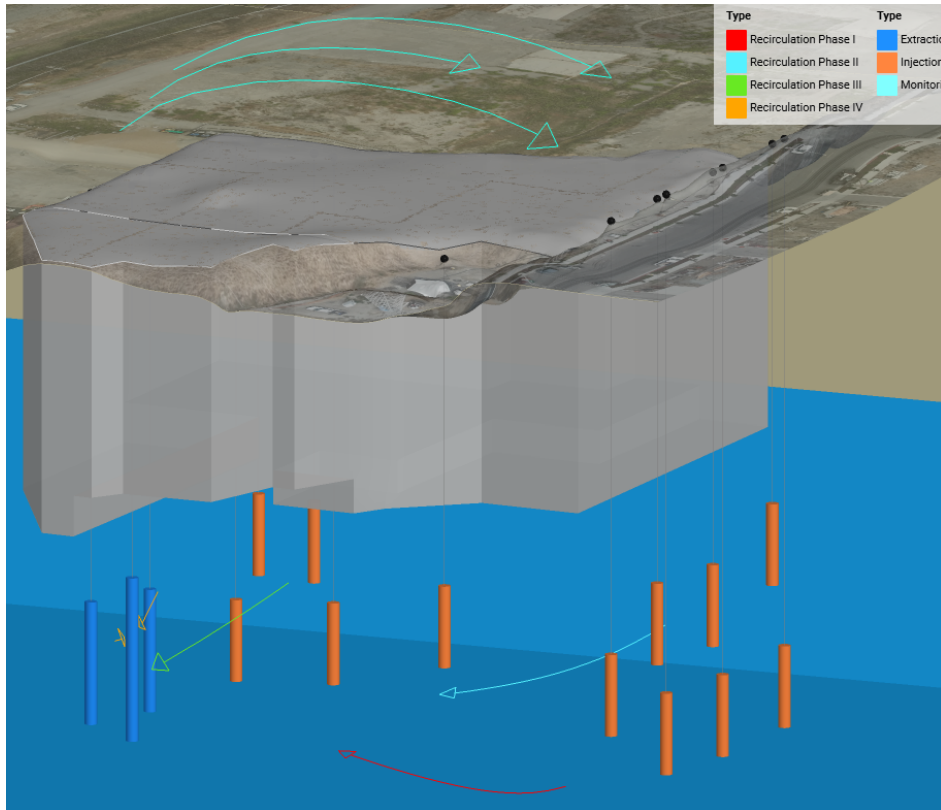
- Benefits and Advantages
- Value and Effectiveness
- Financial Considerations



Lessons Learned

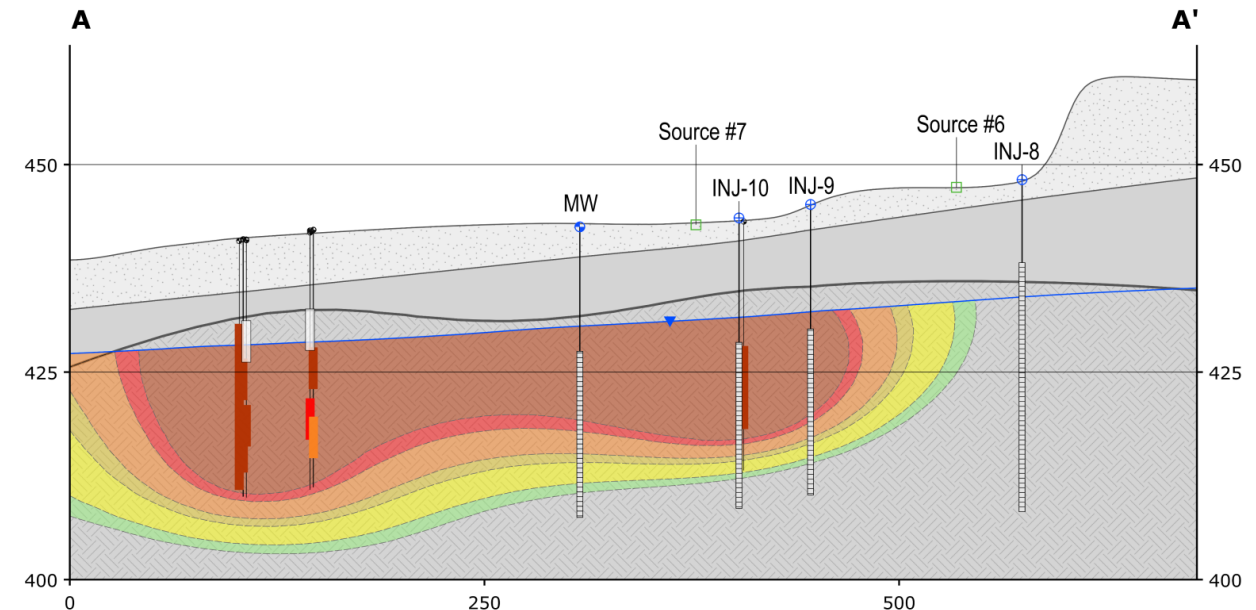
Future Use

- Visual database/tool for the Site
- Stakeholder value



Reality

- 3D model and MODFLOW relationship
- Timelines



Thank you

Questions?

**Integrated Three-Dimensional Geological and
Numerical Groundwater Model Development**

<https://doi.org/10.1111/gwmr.12593>