

## A 3D-model of the Uppsala esker

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### Introduction

In 2013 Uppsala Vatten initiated a strategic study of the Uppsala Esker in order to investigate the esker's continued viability as the main water supply for the City of Uppsala. This study includes the development of a digital database and a 3-D mathematical groundwater model. As a basis for the mathematical modelling, a conceptual hydrogeological model was developed of the relevant stretch of the esker and its catchment (c. 300 km<sup>2</sup>), see Figure 1.

The geological strata and its geometry are key components of the conceptual model which must to be transferred to the mathematical model. This was accomplished by constructing a 3-D geological model using the *Subsurface Viewer MX* software, with subsequent *ArcGIS* transformation in order to create continuous layers for input to the *Feflow* mathematical groundwater model.

### Development of the geological model

The digital data used for the geological modelling include c. 1200 borehole logs, published geological maps and sections, geophysical profiles, topographical maps and a digital terrain model (resampled to 25 m resolution). All data were simplified to a general vertical sequence of seven classes: bedrock, till, glaciofluvial sediment, silt and clay, outwash sand, organic soil and fill.

Borehole data were connected in almost 200 cross-sections, taking into account all the geological background information, including geophysical profiles. After review and approval by hydrogeological experts, the sections were used to define 3-D geological units based on the simplified stratigraphic model. The units and the sections are modelled in the software to create a block model. In the final model, "synthetic" cross-sections can be generated anywhere and the top and base of each unit can be exported into grids.

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