

MULTIPLE POINT STATISTICS AND NEW INVERSION METHODOLOGY USED TO FIND LOCALIZED AQUIFERS FOR WATER UTILITY

Tom Martlev Pallesen, I•GIS, Aarhus, Denmark
Thomas Bager Rasmussen, I•GIS, Aarhus, Denmark
Thomas Mejer Hansen, Aarhus University, Aarhus, Denmark
Mats Lundh Gulbrandsen, I•GIS, Aarhus, Denmark
Ulrika Sabel, VA Syd, Malmö, Sweden

VA Syd is a water company situated in the southwestern Sweden, near the city of Malmö. It delivers drinking water to the city of Malmö from several protected catchment areas. Grevie Vattentäkt (catchment area) is one of those. At Grevie Vattentäkt, groundwater is abstracted from a quaternary gravel layer at the base of a buried valley, Alnarpsdalen. The catchment area is an important part of the water supply for the city of Malmö. The groundwater resource is quite vulnerable due to natural conditions: The gravel layer is part of an ancient river system, and is found in a larger area, but as localized structures. The thickness varies from 0 to 10 meter, and the layer, where present, is covered by approximately 60 m of sand and till. The bottom of the valley is at the top of chalk, containing residual saline water, leading to rising salinity levels when pumping.

Geological and hydrological conditions make it very expensive to make new wells: the groundwater is mostly artesian, and the boreholes need to be stabilized by casing during the drilling process. Combined with a relatively high chance of not finding the gravel layer, this calls for a method which can optimize the chances for finding the gravel layer.

AEM data are present, but given the geological settings, including the low thickness of the aquifer at a relatively large depth, traditional inversion methods cannot be expected to resolve the gravel layer. Well data are present but quite sparse in relation to the gravel layers extent.

Based on these circumstances, it was decided to apply a new probabilistic inversion methodology of the AEM data, combined with Multiple Point Statistics. A conceptual geological model was made and used as a prior in the inversion. For the MPS modelling, a training image based on existing knowledge of the geology in the area, was developed. The results from the entire process are presented as a thematic map, showing areas with low, medium, and high chances of finding the gravel layer. This map will be used as the basis for where to place test wells in the future.

In this presentation we present the workflow, challenges met, workarounds, and the results from the project.