September 2018

Geophysical works in the TopSoil area GE-1

• **Data base for the geological model:** reinterpretation of 30 VES measured 1994 by the Geological Survey of Schleswig-Holstein the topsoil area, location Hohenfelde-Horst (see separate report)

• **Logistic and administrative support for field works of other research institutions**

Technical University Berlin, Institute of Applied Geosciences/Geophysics: resistivity and induced polarization measurements with fixed electrode arrays in 2 boreholes (Fig 1).

Fig. 1 IP and resistivity measurements in Münsterdorf August 2018

The measurements are completed. A continuation of the measurements (apparent resistivity by fixed borehole electrodes) by the LIAG using the SAMOS recording unit is in discussion.

Umweltforschungszentrum Leipzig (UFZ): direct push for resistivity and hydraulic conductivity determination (Fig. 3), installation of new groundwater monitoring stations, seismic measurements with borehole geophones to characterise the chalk layer (Fig. 2).

Fig. 2. Seismic measurements July 2018

Fig. 3. Drilling of groundwater monitoring stations, July 2018

Kiel University, Institute of Geosciences/Geophysics: continuation of GPR measurements in Münsterdorf, new reflection seismic and resistivity measurements

Bundesanstalt für Geowissenschaften und Rohstoffe (BGR): NMR test measurements (determination of noise level) in Münsterdorf and Elskop (Fig. 4)

Fig. 4 NMR test measurements in the Elskop area, June 2018

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Geophysical works in the TopSoil area GE-1 2018-2

Data interpretation and petrophysical characterisation: to support the data base of the geological model 32 VES soundings measured 1994 in the topsoil area (Ketelsen 2006) were digitised manually and inverted using the program IX1D (INTERPEX). The VES are located in the area Hohenfelde - Horst (Fig. 1), an example of raw data (sounding curve) and inversion is shown in Fig. 2. The area is situated east of the area reported in LLUR (2018).

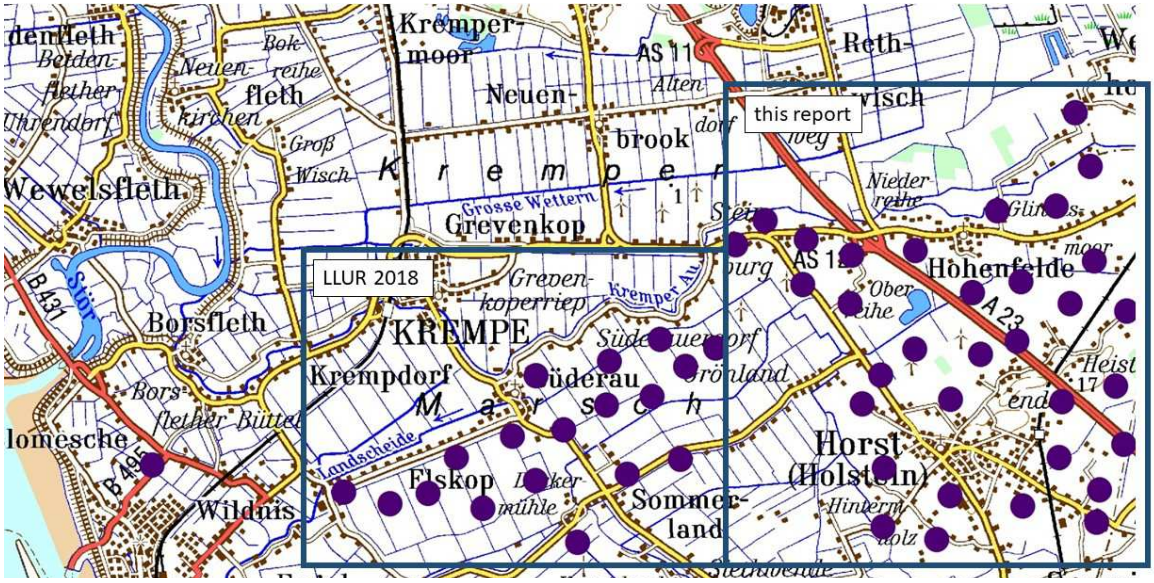

Fig. 1 location map of the reported VES

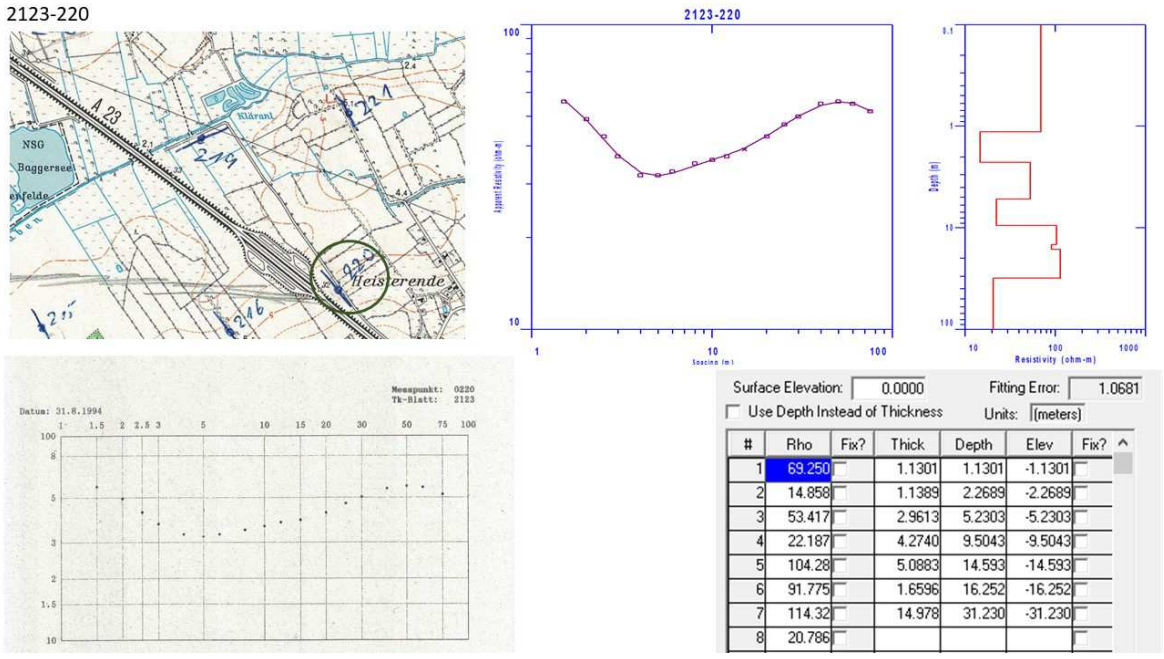

Fig. 2 example of sounding curve and data inversion

Schematically, the sounding curves are characterized by 3 layers:

- a low resistive top layer interpreted as clayey sediment (till, clay)
- an intermediate layer interpreted as aquifer (water saturated sand)
- a low resistive base (till or clay).

Both upper layers are divided into more layers, especially the top layer (e.g. very fine high resistive layers in the very shallow topsoil). A detailed look at the resistivity-depth-distribution of the top layer is shown in Fig. 3. Variations of the specific electrical conductivity are due to variations of the clay content.

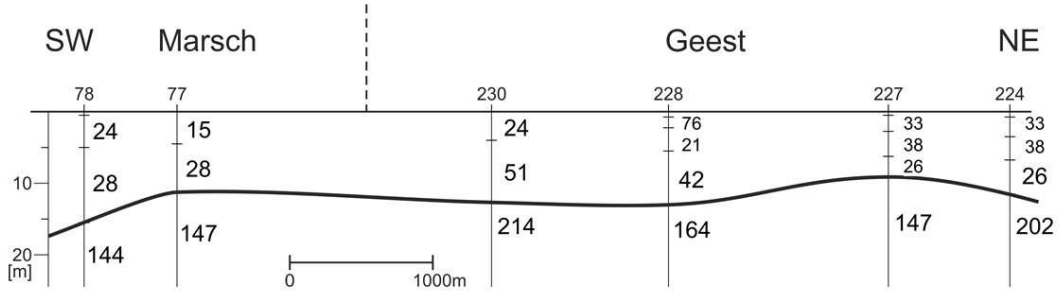

Fig. 3 resistivity depth profile of the top layers, specific electrical resistivities in Ωm (VES 77 and 78 are reported in LLUR (2018)

The area is characterised by glacial sediments and is part of the Geest core where the groundwater recharge of the Marsh area occurs. The mineralisation of the groundwater is very low leading to high specific resistivities of the aquifer layer. Compared to the Marsh area, also the covering layers have higher specific electrical resistivities caused by a lower clay content of this layers. This leads to higher hydraulic conductivities and better conditions for the infiltration of rainwater into the aquifer.

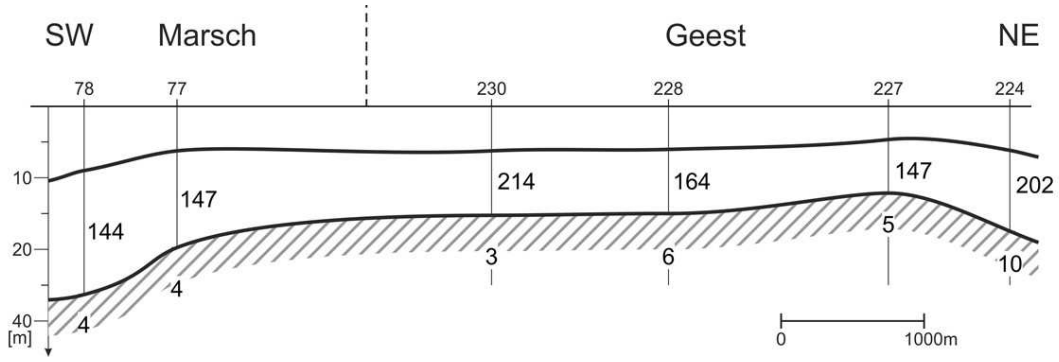

Fig. 4 resistivity depth profile of the aquifer, specific electrical resistivities in Ωm

Literature

Ketelsen, Riewert (2006): VES Dokumentation, TK 2122 und 2123, Geologisches Landesarchiv Schleswig-Holstein, Flintbek

LLUR (2018): Geophysical works in the TopSoil area GE1, Störmarsch and Münsterdorfer Geestinsel, location Elskop-Sommerland: 2018-1, technical report, Landesamt für Landwirtschaft, Umwelt und ländliche Räume Schleswig-Holstein, Flintbek