

CASE STORY

Water - Saline aquifer intrusion

| ERT |

► Fresh Water intrusion in saline aquifer

CLIENT

Acacia Water (www.acaciawater.com) assigned by the Dutch Water Board (HHNK - Hoogheemraadschap Hollands Noorderkwartier, www.hhnk.nl/)

Background - The influence of the rivers and sea

The Netherlands is located in the delta of the rivers Rhine, Meuse and Scheldt. The influence of the rivers and the sea has shaped the country. Large parts of the country have saline groundwater. The large inner sea in the Netherlands has been closed off by the 'Afsluitdijk' in 1932, after which the inner sea became fresh by the inflow from the IJssel river (after the fresh water intrusion, the lake is now called IJsselmeer).

The Netherlands is also known for its polders: half of the country is located below sea level. These polders receive leakage from surrounding higher areas, both higher water bodies, and higher land areas where infiltration takes place. From the IJsselmeer fresh water is seeping into the surrounding low laying polders. This is a slow process.

Challenge

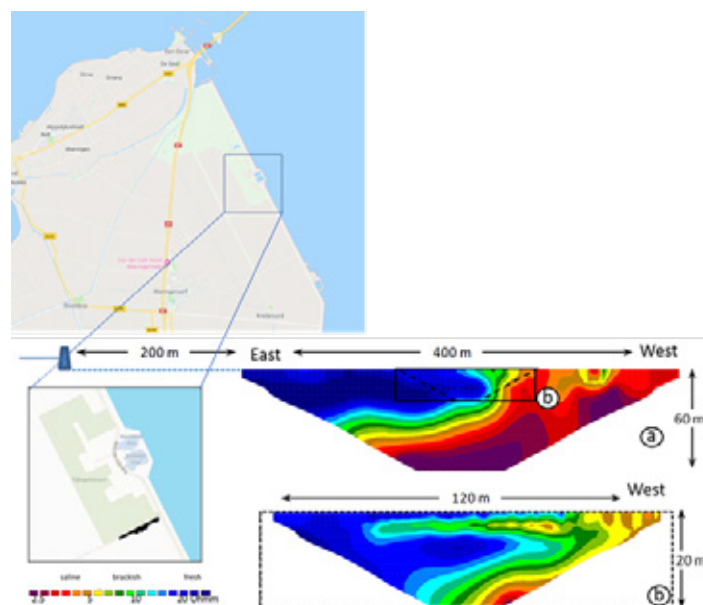
The construction of the 'Afsluitdijk' has resulted in the creation of a fresh water lake. Because the water level of the lake is higher than the surrounding polders, fresh water from this lake is seeping into these polders. The result is that the saline aquifer is slowly desalinating. The Dutch Water Board (HHNK) wanted to know at what rate this desalination of the groundwater was occurring.

Solution

Acacia Water has carried out 2 ERT measurements perpendicular to the dike. With the first one, a 400 m ERT at 200 m distance from the lake, the intrusion zone was captured (top ERT results in the figure to the right). The second ERT measurement was 120 m long at 340 m from the lake, at the center of the first ERT measurement (bottom ERT results in the figure). The second ERT shows clearly that in the upper 5 meters of the ERT, the clay layer is present which is also slowly desalinating.

Results

The ERT measurements have helped the Dutch waterboard with an improved understanding of the desalinating process that is taking place: the fresh water moves with an average speed of around 6 m per year in the aquifer, while desalination of the clay layer occurs at a slower rate. This case story shows that ERT measurements are very suitable for measuring the fresh/saline dynamics in sedimentary formations. With the different ERT lengths, both large scale processes and detailed aspects of these processes can be made visible with the ERT measurements.



PROJECT

- **Method:** ERT (Electrical Resistivity Tomography)
- **Configuration/Solution:** ABEM SAS 1000, 4x21 configuration and 5 meter spacing (400 m ERT at 200 m distance from lake) respectively 1.5 meter spacing (120 m long at 340 m from the lake).
- **Inversion & Visualization SW:** RES2DINV

ACKNOWLEDGEMENT

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