

D1.1 Valisated regional scale groundwater model Noardburgum, SEAWAT modelling (see www.subsol.org)

Final, but not yet approved by European Commission

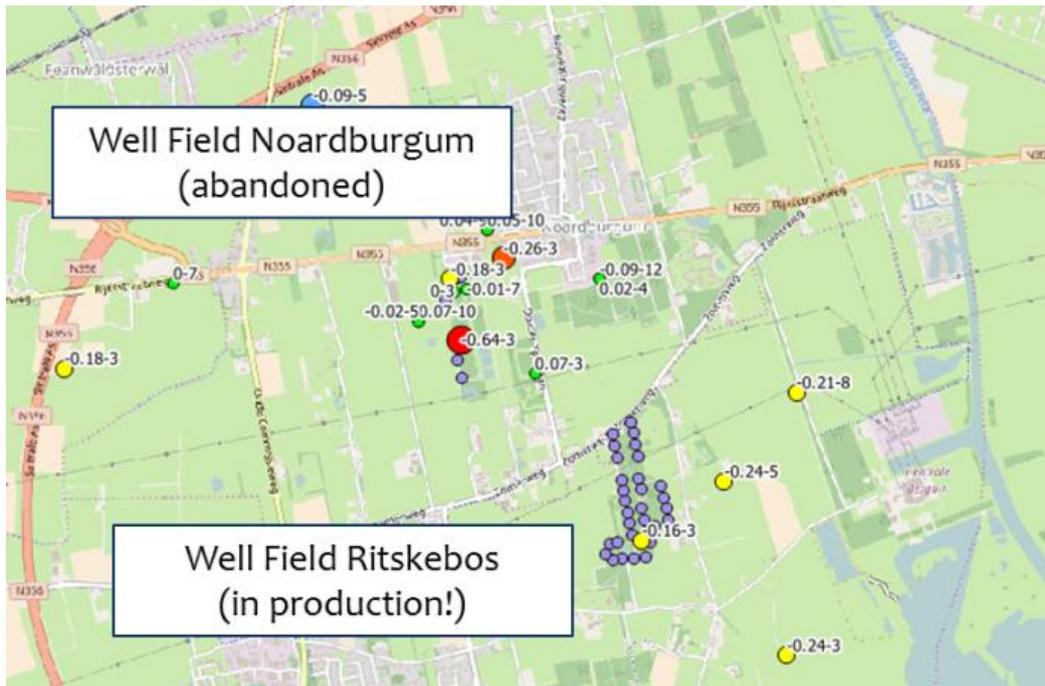
Scenario analyses with a regional scale SEAWAT groundwater model indicate that 2 million m³ of freshwater can be produced at Noardburgum in a sustainable way by applying the Freshkeeper concept. Vitens aims at full-scale application of this SWS concept in 2018.

A regional scale, density-driven groundwater model was setup, build and validated for the Noardburgum site (Task 1.1). The model was built in the SEAWAT code, after evaluation of the regional hydrogeology (literature, logs), existing non-density driven groundwater models and groundwater quality data (salinity), and validated against historical water quality data at the (abandoned) Noardburgum well field and the (still operating) well field Ritskebos.

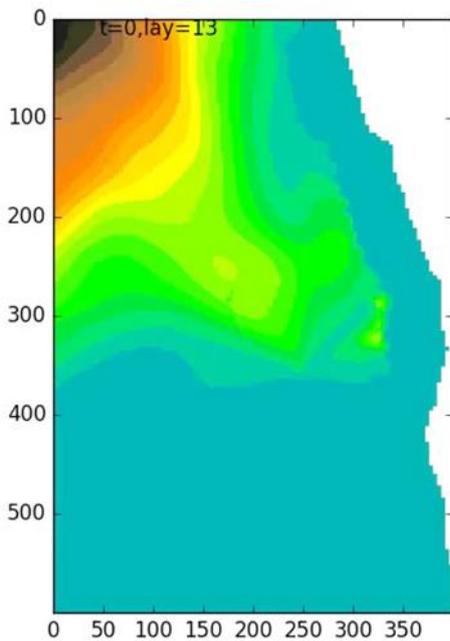
SUBSOL partner Vitens is looking for options to increase drinking water production in the region, without causing salinization of the groundwater bodies and well fields. The former Noardburgum well field (now SUBSOL pilot site) had to be abandoned in 1993 because of salinization.

The SEAWAT model was used to evaluate different scenarios to increase drinking water production in the region with 2 million m³ per year. Focus of the evaluations was on (the effects on) the regional salinity distributions (i.e. prevention of salinization) and on the salinity concentrations in surrounding well fields. One of the concerns is that full-scale Freshkeeper application at Noardburgum may result in increased salinity at Ritskebos, via a by-pass in the underground.

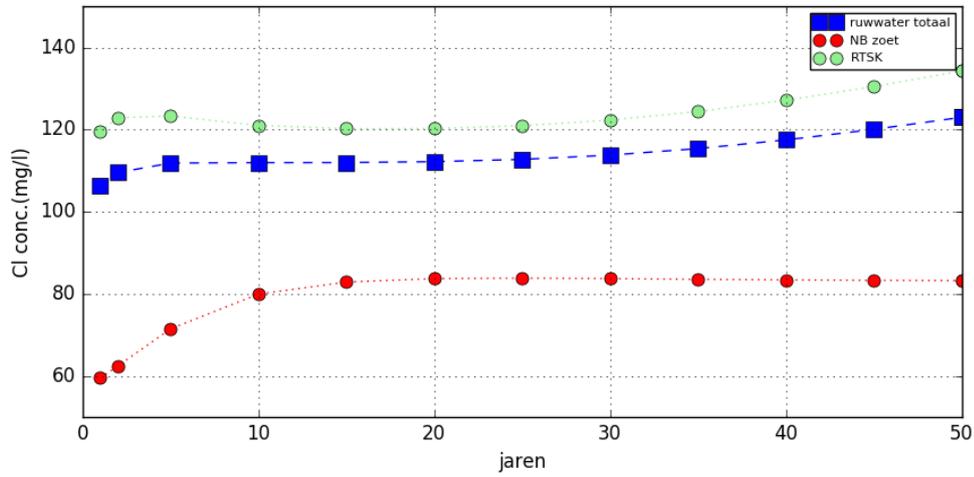
The scenario runs indicated that a sustainable additional 2 million m³/y drinking water production is possible both via the Ritskebos well field (standard wells) as well as at the Noardburgum well field by applying the Freshkeeper concept full-scale. Following these results, Vitens is aiming to increase production in 2018 by a combination of both scenarios: 1 million m³/y at each of the two well fields. As such, it is foreseen that the Freshkeeper concept will be applied full-scale (multiple wells) at Noardburgum within the timeframe of the SUBSOL project!



Location of the two well fields: Noardburgum (abandoned in 1993, now SUBSOL reference site) and well field Ritskebos (in production).



Still from one of the SEAWAT simulation runs, showing salinity distributions in the production aquifer of both well fields.



Chloride concentrations when applying the Freshkeeper concept in full-scale (2 million m³/yr) at Noardburgum. Top: concentrations in the intercepted (and injected) brackish groundwater. Bottom: concentrations in raw water at Ritskebos (green), Noardburgum (red) and total mix of both (blue). Results from regional scale SEAWAT model.