MIKE BY DHI CASE STORY

# REGULATION OF GROUNDWATER LEVELS

## Evaluating possible measures of regulating groundwater levels in Schönebeck

When changes to a city's drinking water supply are made without regard for possible repercussions, it can have widespread, negative impacts on the entire urban area. However, with knowledgeable groundwater management and regulation measures, it is possible to prevent many subsequent and unsuitable issues such as flooding and degradation of water quality. The town of Schönebeck in Germany experienced various challenges with regard to their groundwater, including increasing water levels, causing water logging and urban flooding. DHI-WASY was contracted by University of Applied Sciences Magdeburg-Stendal to find the best possible measure of regulating groundwater levels. Using detailed analyses, they found dewatering wells to be the best possible solution to the town's challenges.

### INCREASING WATER LEVELS

The town of Schönebeck is located in the German federal state of Saxony-Anhalt adjacent to the Elbe River. The town experienced negatively impacting changes in their groundwater causing:

- an increase in water logging in several parts of the city
- the highest groundwater levels in recorded history.

In the winter of 2010-2011, the highest water levels were witnessed causing flooding and water damage in several basements in the town.

### WATER SUPPLY MANAGEMENT – CHANGES WITH CONSEQUENCES

The above-mentioned changes in groundwater levels were the consequences of three main issues causing problems for the town's water infrastructure:

- changes in the drinking water supply
- melting snow causing additional water in the river at spring time
- ongoing renovations of the sewer systems

Previously, the town's supply of drinking water mainly consisted of water from local freshwater wells located in the south of the town. However, beginning around 1994, these wells were shut down and the water supply was changed to long-distance supply.

In addition, particularly in the spring, the melting snow caused constantly rising water levels in the Elbe River. This also meant that additional surface water from within the catchment of Schönebeck could not be dissipated into the Elbe River by


### SUMMARY

#### CLIENT

University of Applied Sciences Magdeburg-Stendal

#### CHALLENGE

- Rising groundwater levels
- Increased water logging and flooding of urban areas
- Degradation of drinking water quality

#### SOLUTION

- Thorough and detailed analyses using a coupled hydrological model system
- Implementation of three dewatering wells placed at strategic points

#### VALUE

- Increased flexibility and adaptability to future groundwater challenges
- Flood risk prevention
- Water quality maintenance

#### LOCATION/COUNTRY

Schönebeck, Germany

#### SOFTWARE USED

- FEFLOW

#### MARKET AREA

Groundwater and porous media

the existing trenches in time. Thus, this situation led to infiltration of surface water from the trenches into the ground, adding to groundwater levels and aggravating the situation even more.

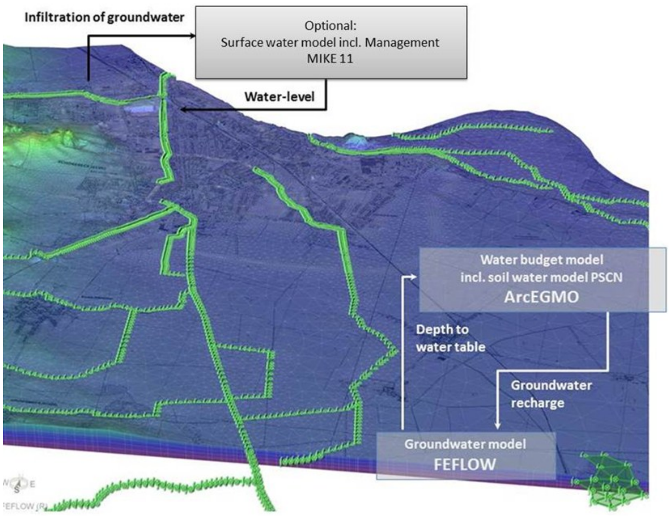
The third reason for the problems comprised of ongoing renovations of the sewer system. This might have caused additional elevated groundwater levels.

## ANALYSING REMEDIATION MEASURES

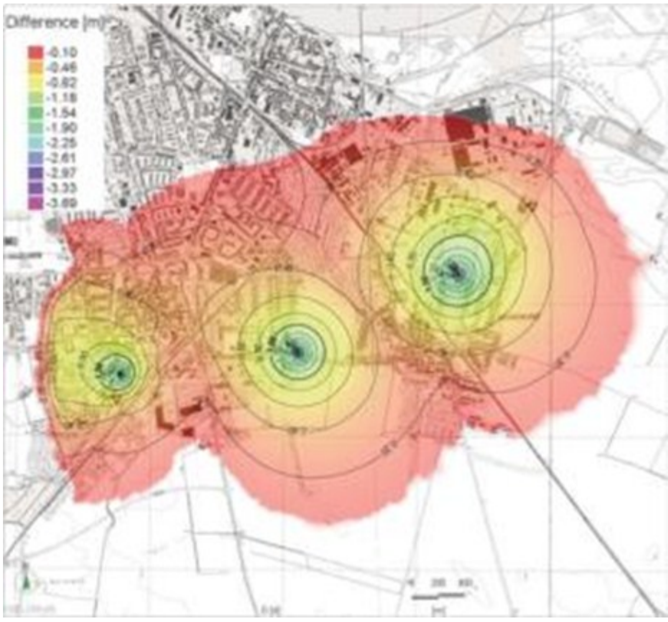
DHI-WASY was contracted to investigate how passive or active measures in the area could affect groundwater levels in the town.

After thorough and detailed analyses, DHI-WASY reached the conclusion that passive measures, such as modifying trenches, only provided relatively small improvements. However, active measures such as dewatering wells were far more effective.

Even though the maintenance and operational costs of this solution were relatively high, these wells could be regulated according to specific events. Thus, they could provide the required flexibility and adaptability to the town's future groundwater challenges.




*Coupling between ArcEGMO and FEFLOW. ArcEGMO calculates and provides the groundwater recharge in area and time dependent distribution as input for the groundwater model. The data are then used in FEFLOW to calculate the groundwater conditions and transfer the groundwater depth back to ArcEGMO. This is used as an essential boundary condition for the groundwater influenced parts of the soil water model. © DHI*




*The effect of three groundwater dewatering wells that were placed at strategic points to achieve the maximum result in groundwater reduction in Schönebeck's problem zones. Each well was set with a pumping rate of 5000 m³/d. © DHI*

## COUPLED HYDROLOGICAL MODEL SYSTEM

In order to evaluate the situation in Schönebeck and reach this conclusion, detailed analyses of the following were needed:

- additional dewatering of wells
- advanced water retention in rural areas
- adaptation of the existing trench system

As such, DHI-WASY developed a coupled hydrological model system. This system incorporated two models:

- a soil water budget model (ArcEGMO, BAH) to provide information about the inflow from the catchment area and time dependent groundwater recharge
- a FEFLOW groundwater flow model to simulate the regional subsurface flow of the groundwater

The two models were then coupled using the FEFLOW plug-in, IfmArcEGMO, which is available in FEFLOW 6.1.

DHI-WASY calibrated the model system and simulated seven possible measures. They then evaluated the measures using a nodal expression feature, which is also available in FEFLOW 6.1.

Contact: Bertram Monninkhoff - bmo@dhigroup.com
For more information visit: www.mikebydhi.com