Infiltration of groundwater with DSI-technology

The extraction of groundwater can be necessary at urban or infrastructural construction projects and at open-mining or mining activities. According to the needed drawdown and the aquifer properties the groundwater level is lowered in the surrounding of the project. By (re-)infiltration of an equivalent amount of water in the affected aquifer, a large scale groundwater lowering and associated negative side effects such as settlements of buildings as well as drying up of wetlands and headwaters, can be avoided.

In addition to conventional infiltration technologies, such as infiltration wells, infiltration trenches or drainage systems, the patented Jet-Suction-Infiltration (German: Düsensauginfiltration, hw-DSI®) provides an alternative way for the (re-)infiltration of groundwater. DSI-wells are constructed with relatively small drilling diameters and filter dimensions. Often in spite of a relatively small well diameter compared to conventional infiltration wells a significantly higher amount of water can be infiltrated. At the first DSI-drilling of a new project soil layers with high hydraulic efficiency are identified by an infiltration test. After installation, the DSI-wells are operated in a closed system. With a nozzle installed in the filter area the velocity of the water is increased. After the passage of the nozzle the water flows through the filter area into the aquifer. This process is like an injection of water into the ground. Depending on the aquifer properties, especially the isotropy and the hydraulic conductivity, the groundwater level rises slightly at the infiltration point but within a large area.

The DSI is already successfully used in practice. However, there are in theory still unresolved correlations. Currently the DSI-wells have to be designed during the project start based on infiltration tests and test wells. The aim for the future is to develop a design manual which can be used to determine DSI-wells with the knowledge of the hydrogeological situation at the planning stage. The development of this design manual is part of the current research project.Zusammengestellte

In the framework of the research project collected data and knowledge from the construction and operation of several projects will be evaluated. Based on these data a numerical flow model for the short-range area around the filter will be set up. The model will afterwards be calibrated by laboratory tests. The results will be used for the design and dimensioning of new systems. The final aim is to formulate a design manual for the practical dimensioning of the systems. Thus often more expensive and more complex conventional infiltration technologies could be replaced with the DSI.

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