Effect of cutoff wall on recharge water storage volume

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Artificial groundwater recharge is used to increase groundwater in areas with water scarcity. Understanding the hydromechanical features of aquifers during groundwater withdrawal and recharge is necessary for managing groundwater resources effectively. In practice, an artificial pool can be used to collect surface runoff so that it infiltrates the aquifer and recharges groundwater. A cutoff wall can be constructed to seal recharge water and prevent it from flowing from the recharge area. Additional studies are required to understand the effect of the various parameters of cutoff walls on groundwater recharge. This study used the finite difference software FLAC 8.0 to examine the influence of the location and size of gaps of a cutoff wall on recharge water storage volume. Each aquifer was in an unsaturated state before groundwater recharging; therefore, groundwater recharge analyses were simulated by the two-phase flow in unsaturated porous media. The results revealed that when the groundwater layer was sand and the cutoff wall was not extended into the fully impermeable layer, the recharge water completely flowed from the gap between the bottom of the cutoff wall and the fully impermeable layer after stopping groundwater recharge. The recharge water volume related to the size of the gap at the bottom of the cutoff wall. When the cutoff wall was not extended into the groundwater layer, the cutoff wall did not intercept water. The gap at the top of the cutoff wall retained more recharge water compared with the gap at the bottom of the cutoff wall.

Keywords: Groundwater recharge, Cutoff wall, Water storage volume

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