

Recharge and aquifer response: Manukan island's aquifer, Sabah, Malaysia

Abstract

Manukan Island is a small island located in North-West of Sabah, Malaysia was used as a case study area for numerical modeling of an aquifer response to recharge and pumping rates. The results in this study present the variations of recharge into the aquifer under the prediction simulations. The recharge rate increases the water level as indicated by hydraulic heads. This shows that it can alter groundwater of Manukan Island which has been suffering from an overexploration in its unconfined the aquifer. The increase in recharge rate (from 600 mm/year to 750 mm/year) increases the water level indicated by hydraulic heads. A reduction in pumping rate (from 0.072 m³/day to 0.058 m³/day) not only increases the amount of water levels in aquifer but also reduces the supply hence a deficit in supply. The increase in hydraulic heads depends on the percentage reduction of pumping and recharges rates. The well water has 1978.3 mg/L chloride with current pumping (0.072 m³/day) and recharge rates (600 mm/year). However, with an increased of recharge rate and current pumping rate it has decreased about 1.13%. In addition, reduction in pumping rate made the chloride concentration decreased about 2.8%. In general, a reduction in pumping with an increase in recharge rate leads to a decreased in chloride concentrations within the vicinity of cone of depression. Next, to further develop the numerical model, the model should focus on climate change variables such as consequences of climate change are increase in air temperature, increase in sea surface temperature, and more extreme weather conditions. These parameters are considered critical parameters for climate change impact modeling in aquifers. The behavior of the aquifer and its sustainable pumping rate can be done by applying a computer modeling component.