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Artificial recharge via injection wells for salinity ingress control of Salalah plain aquifer, Sultanate of Oman

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ABSTRACT

Seawater intrusion (SWI) has been considered one of the most widespread environmental problems that deeply threatened the quality and sustainability of fresh groundwater resources along coastal aquifer in Salalah. The main objective of this study is to determine the results of the same investigation conducted in 2008 by the same author with the results of the current actual transient scenario for the same period of years 2006–2020. The developed 3D flow showed that the wedge of the SWI in 2020 could possibly be tracked up to 2 km and less than 500 m from the shoreline under the predictive scenario and current actual transient scenario, respectively under constant underflow. The findings of the modeling simulation explained that the maximum path lines of the injection fluids were able to reach the abstraction wells located more than 1.2 km southward of the injection bores in one year travel time under the current actual transient scenario under constant underflow. In 2020 the injection of municipal treated effluents was found to be effective in pushing back the SWI zone front by more than 1.2 km under the current actual transient scenario compares to less than 500 m under predictive scenario under constant underflow, especially at the middle of the injection boreholes of the aquifer. This study revealed that the application and simulation of the method helped increase the groundwater levels and decrease the salinity total dissolved solids levels along the vicinity of the injection line.

Keywords: Salalah plain aquifer; Seawater intrusion; 3D groundwater modeling simulation; Injection boreholes; Artificial groundwater recharge; Municipal treated effluents

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