

Groundwater modeling to study brine disposal impact from desalination plant in Sharm El-Sheikh, South Sinai, Egypt

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ABSTRACT

Seawater desalination is considered a non-conventional source for suitable drinking water supply; still considerations about negatively environmental adverse effects are raised. Disposal of rejected brine represents major environmental challenges for most desalination plants. The aim of this paper is to explore the adverse environmental impacts of entailing huge amounts of brine into the local coastal aquifer along the Red Sea coast of Sharm El-Sheikh area, South Sinai. Brine water and ten production wells of the largest water desalination plant; El-Montazah, were sampled for all available chemical and trace elements analysis. The speciation and saturation with respect to minerals have been done using geochemical modeling indicating super-saturation of dolomite in feed water, while; calcite and dolomite were supersaturated minerals in brine water. Mathematical modeling of groundwater flow using MODFLOW-2000 was applied with variably-density miscible salt transport using SEAWAT code governing equations applying three different scenarios up to 50 y was used to investigate and predict the impact of brine disposal on the coastal aquifer. Simulation results indicate that; Miocene aquifer was affected by both sea water intrusions (laterally) and the effluent of brine water through the injection well (vertically). Some Mitigation actions were recommended to lessen the harmful and destructive environmental impacts of brine water disposal.

Keywords: Brine disposal; Environmental impact; Hydrochemistry; Groundwater modeling; Sharm El-Sheikh, Egypt

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