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Potential effects of groundwater and surface water contamination in an urban area, Qus City, Upper Egypt

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ABSTRACT

The potential effects of anthropogenic activities, in particular, unsafe sewage disposal practices, on shallow groundwater in an unconfined aquifer and on surface water were evaluated within an urban area by the use of hydrogeological, hydrochemical, and bacteriological analyses. Physico-chemical and bacteriological data was obtained from forty-five sampling points based on33 groundwater samples from variable depths and 12 surface water samples. The pollution sources are related to raw sewage and wastewater discharges, agricultural runoff, and wastewater from the nearby Paper Factory. Out of the 33 groundwater samples studied, 17 had significant concentrations of NO_3^-, Cl^- and SO_4^{2-}, and high bacteria counts. Most of the water samples from the wells contained high Fe, Mn, Pb, Zn, Cd, and Cr. The majority of surface water samples presented high NO_3^- concentrations and high bacteria counts. A scatter plot of HCO_3^- versus Ca indicates that 58 % of the surface water samples fall within the extreme contamination zone, while the others are within the mixing zone; whereas 94 % of groundwater samples showed evidence of mixing between groundwater and wastewater. The bacteriological assessment