

HYDROCHEMISTRY AND QUALITY OF GROUNDWATER FROM TWO-TIER AQUIFER SYSTEM IN PARTS OF AMOL-GHAEMSHAHR PLAIN, MAZANDARAN PROVINCE, N. IRAN.

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Abstract

Amol-Ghaemshahr plain, Mazandaran province, Iran, is bestowed with a large two-tier aquifer system (area: 1100 sq. km) confined to detrital sediments of Quaternary age. Upper unconfined aquifer is located in 10 to 60 m (av. 25 m) thick detrital sediments. The unconfined aquifer is underlain by a detrital sedimentary impervious layer varying from 4 m to 62 m (av. 19 m). Confined aquifer located below the impervious sedimentary layer is found in 50 to 200 m (av. 150 m) thick detrital sediments. It is underlain by sand and silt horizon with salt water (brine). Groundwater from 40 shallow and 33 deep bore wells drilled, respectively in the confined and unconfined aquifers reveal the presence of two hydrochemically differing facies. In comparison with the groundwater of the unconfined aquifer, the groundwater from the confined aquifer contains, on average, lower concentrations of Ca^{2+} , Mg^{2+} , K^+ , HCO_3^- , SO_4^{2-} , NO_3^- and total ions and higher concentrations of Na^+ and Cl^- . Groundwater from the confined aquifer consists of Ca-HCO₃, Na-Cl, Na-HCO₃ and Ca-Cl type waters, whereas the same from the unconfined aquifer is made up of Ca-HCO₃, Ca-Cl and Na-HCO₃ type waters. Presence of Na-Cl type groundwater in the confined aquifer is mainly due to intrusion (upconing) of saline water from the saltwater-bearing sandy clay horizon underlying the confined aquifer as a result of over pumping. Groundwater from 9 bore wells from the confined aquifer and 7 bore wells from the unconfined aquifer is unfit for drinking purposes owing to the presence of one or more among 4 parameters (viz., EC, TH, Na^+ and HCO_3^-) in excess of the maximum permissible limits. On the bivariate SAR versus EC diagram, groundwater from 40 bore wells from the unconfined aquifer plot in the Richards' C3S1 (n=39) and C4S1 (n=1) water classes. Groundwater from 33 bore wells from the confined aquifer belongs to Richards' C2S1 (n=7), C3S1 (n=20), C3S2 (n=4) and C4S2 (n=2) water classes. Quality-wise, the groundwater from the unconfined aquifer belongs practically to "marginally good" water class, whereas the same from the confined aquifer consists of "good", "marginally good", "bad" and "very bad" water classes.

Keywords: Two-tier aquifer, Groundwater, Hydrochemical facies, Water quality, Amol-Ghaemshahr plain, Northern Iran.