

Classification and quality of groundwater supplies in lower part of Sisaket province, northeast of Thailand

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Abstract

Water quality of groundwater is significant issue for developments, life societies and human health. The chemical parameters of groundwater play an important role in classifying and assessing water quality. The study area located in Village name Nong Wa, Phayu subdistrict, Phayu district, Sisaket province. The groundwater quality in this area generally fair to good but their are high salinity values in some location. Difference water quality is the main problem of this area. In this study, 10 water samples were collected from 10 wells which various depth of the aquifer in order to determine the hydrochemical facies and understand the efficient management of existing groundwater resources of water supply. Water samples were analysed in range of chemical and physical property for 17 parameters that consist of Ca, Mg, Na, K, Fe, Mn, SO_4 , Cl, CO_3 , HCO_3 , F, NO_2 , NO_3 , $CaCO_3$ (total hardness), TDS (total dissolve solid), pH, and EC. (electrical conductivity). Water facies were classified by using Piper trilinear diagram to find out major contributing parameters involed in groundwater samples. The results revealed 3 water facies; Group 1 (G1), Sodium Chloride type, $Na^{2+}-Cl^-$ (5%,n=5), Group 2 (G2), Calcium Sodium Chloride type mixed Bicarbonate type, $Ca^{2+}-Na^{2+}-Cl^- -HCO_3^-$ (4%,n=4), and Group 3 (G3), Calcium Sodium Chloride type, $Ca^{2+}-Na^{2+}-Cl^-$ (1%,n=1). In addition, stiff diagram were used to analyse major ion composition of water samples, result shows that predominant cations are in order of abundance as $Na^{2+} > Ca^{2+} > SO_4^{2+}$ while the anions reveal in order of abundance as $HCO_3^- > Cl^-$. G1,G2 and G3 are water facies that commonly found in this area which distribution of chemical compound are related to local geology which surrounded by rock salt formation. Gypsum ($CaSO_4 \cdot 2H_2O$) and anhydrite ($CaSO_4$) are observed in rock sample that found after drilling borehole at depth from 36 meter onward. The groundwater wells in this study area range from 18 to 48 meter deep. The pH value was found in narrow range between 7.4 and 8. EC value was found in wide range between 745 and 1,810 us and the TDS value vary from 400 to 1,200 mg/l.. The analysis result of water sample shows almost all parameters were not exceeding the permissible limits. However, three water samples show slightly higher chemical concentration as Sulphate (SO_4), Fe and $CaCO_3$. The desirable and maximum permission limits for all parameters determined by WHO (World Health Organization). In conclusion, 100% (n=10) of groundwater wells in this study area are suitable for domestic. 70% (n=7) of wells are suitable for drinking water and the remaining 30%(n=3) are unsafe to drink, therefore the exceeding number of SO_4 , Fe and $CaCO_3$ must be reduced to meet the standard of drinking water quality to be safe.

Keywords: Groundwater; hydrochemical facies; Cations and Anions