



Abstract

Assessment of groundwater potential is key component for development of sustainable well fields in any area. In different cities of many countries, especially in the area having fresh and saline groundwater zones, well fields for drinking purpose are developed near rivers and canals which act main source or replenishment of groundwater reservoir. Faisalabad, the 3rd populated city of Pakistan has such situation where drinking water is supplied from wellfield installed on right side of main Jhang Branch Canal (JBC). An area of 36 km x 54 km along JBC, Faisalabad has been selected for planning and sustainable development of new well fields through groundwater modeling approach to cater for the increasing demand of water. Conceptual hydrological model of the area has been developed by fixing boundary and initial conditions. Various inputs and outputs to the system have been estimated from the available data.

Groundwater levels of 65 locations in the study area have been collected from DLR, IRI and SMO for period 2005-2011. Hydrograph of groundwater levels indicate that potential head is higher near river and canal due to significant recharge. Depth to water table along canal is less than 6 meter from NSL. In existing well field, groundwater level is decreasing continuously due to over exploitation and in 2011 it has reached to 158.9 (m). A numerical groundwater developed by USGS (MODFLOW 2000), has been selected for solution of governing equations for the flow through porous media. Model has been calibrated and verified for thirteen time steps 2005-2011. The one time step consists of one cropping season i.e Rabi (16 October to 15 April) & Kharif (16 April to 15 October). After successful calibration & verification, the model has been applied to predict the groundwater potential after installation/operation of old and new well fields in the area under the same conditions. Model results show that after operation of JICA well field, groundwater flow system shows no conspicuous changes in groundwater flow pattern but the sink in WASA old well field will increase both vertically and latterly. The WASA old well field is a critical area where existing water level will decrease to 154 m till 2018 and depth to water table may reach up to 24 (m), which shows depletion of groundwater reservoir on long term basis. Groundwater quality near river and canal is fresh and contain Total Dissolved Solids (TDS) less than 500 ppm but when we move from south-east of JBC to Faisalabad, groundwater becomes saline with TDS even more than 3000 ppm. According to model prediction groundwater will flow to the north-west direction due to cone of depression and may cause deterioration of fresh water quality. The study will help in planning for sustainable development of well fields in the study area.