



GIS Based Methodology for Groundwater Flow Estimation across the Boundary of the Study Area in Groundwater Flow Modeling

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ABSTRACT

Pali district, Rajasthan, India has been facing severe pollution of groundwater due to release of untreated industrial effluent of textile industries into the Bandi River flowing through the Pali city. A groundwater flow and transport modeling exercise has been undertaken by MNIT, Jaipur, India to understand the groundwater flow regime and to study the different scenarios. In the modeling exercise partially penetrating ephemeral rivers have been taken as part of model boundaries wherever more appropriate boundaries were not available in the near vicinity. These boundaries have been considered as constant flow boundaries. Aim of this paper is to present a methodology to calculate the average flux through such boundaries from readily available data such as bore logs and groundwater levels. The study area boundary was divided into several cross sections and average values of groundwater flow gradients normal to the boundary were calculated for different monsoon and non monsoon seasons for different years. The entire boundary was then regrouped into 8 boundary segments on the basis of average values of gradients for individual line segments and mean gradient values for these line segments were calculated. Values of ground level, bottom elevations of hydrostratigraphic layers and average water depth were extracted for a number of points on these line segments from the respective layers and these values were used to calculate equivalent horizontal hydraulic conductivity of the multi-layered aquifer system at every point. The Darcy's law was then used to calculate inflow/outflow per m length of the boundary at each point. The methodology presented here is simple and is based on the assumption that the groundwater level gradients do not change significantly for different seasons and amongst different years which has been validated in the present groundwater modeling study. The paper demonstrates a GIS based methodology to work out inflow/outflow across boundary of a study area in the cases where no flow boundaries in the vicinity of the study area cannot be identified.

KEYWORDS

Groundwater Flow Model, Boundary Conditions, Flow Estimation, Geographical Information System

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