Ground-Water Hydraulics in Aquifer Management

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Abstract:

The method first replaces the differential equations of ground-water flow by finite-difference approximations that include unknown sink/source terms. The resulting system of algebraic linear equations has a rectangular matrix of coefficients. This system, together with linear inequalities relating sink/source terms, heads or both, and together with an objective function, forms a linear programming (LP) model. The method is applied to small-scale models of confined and unconfined saturated flow for steady-state and transient cases. The steady-state LP models are solved using available computer codes. For the transient confined model, the Crank-Nicolson scheme is used, and a single LP problem is solved covering all of the time steps. For the transient unconfined model, a predictor technique is used, and a LP problem is solved at each corrector step. The optimal solutions are consistent with the results of traditional analyses.

Subject Headings: Groundwater management | Hydraulics | Groundwater flow | Linear functions | Steady states | Computer models | Transient response | Differential equations

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INTRODUCTION: Ground water utilization & historical background, ground water in hydrologic water flow rates & flow directions, general flow equations through porous media;ADVANCED WELL HYDRAULICS: steady recharge, wastewater recharge for reuse, water spreading;SALINE WATER INTRUSION IN AQUIFERS: Ghyben-Herzberg computer models, ground water basin management concept, hydrologic equilibrium equation, ground water basin investigations, data collection & field work, dynamic equilibrium in natural aquifers, management potential & safe yield of aquifers, stream-aquifer interaction. Includes. On-demand Videos. Ground-water supplies are obtained from aquifers, which are subsurface units of rock and unconsolidated sediments capable of yielding water in usable quantities to wells and springs. The hydrologic characteristics of aquifers and natur-al chemistry of ground water determine the availability and suitability of ground-water resources for specific uses. Ground-Water Resources. Ground water is the part of precipitation that enters the ground and percolates downward through unconsolidated materials and openings in bedrock until it reaches the water table (figure 8). The water table is the surface b