Regional Flow Model of the Southern Willamette Valley Groundwater Management Area

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A user-friendly groundwater flow model was developed for policy makers, water quality educators, and scientists in order to better understand direction of groundwater flow, groundwater velocity, and nitrate transport pathways in the southern Willamette Valley, Oregon. The three-dimensional model was constructed using MODFLOW-MODPATH and GMS, focusing on the newly designated Groundwater Management Area (GWMA). Continual contact was kept with GWMA Committee staff throughout the duration of the project to ensure that their most important needs and questions could be addressed as best possible. Data collected to aid in model development include field investigations for construction of cross-sections and stratigraphic columns; 10 slug tests and 3 pump tests to determine hydraulic conductivity and storativity; 10 groundwater dates using CFC-11, CFC-12, and CFC-113; 3 wells instrumented to collect long-term continuous water level measurements; a well network of 42 wells selected for quarterly manual water level measurements; and a small number of groundwater chemistry samples. Additional data collected by state and federal cooperators have been used to build and calibrate the model, including precipitation; evapotranspiration; spatial hydrogeologic unit thicknesses; stream stages; pump tests; well specific capacities; and 14 quarterly water level measurements. The model was calibrated to steady-state conditions by comparison of simulated vs. observed measurements of water level, river flow, and groundwater age values, along with an overall mass balance analysis.

Results from groundwater chemistry sampling include nitrate values from 0.2 to 11.6 mg/L. Apparent groundwater age results indicate ages up to 45 years. Groundwater sampled beneath the Willamette Silt (4 locations) at shallow depths exhibits apparent groundwater ages greater than groundwater sampled where no Willamette Silt exists (6 locations).

Public presentations with the model consisting of community town-hall meetings and workshops to develop stakeholder contact will be conducted. This model will be used as a tool to improve groundwater and surface water quality by aiding policy-makers in developing voluntary Best Management Practices (BMPs), educate the public through extension on how using BMPs will improve groundwater quality, and help answer questions regarding remediation techniques and time frames for groundwater quality improvement.