

U.S. GEOLOGICAL SURVEY 2006 NATIONAL RESEARCH PROGRAM LECTURESHIP SERIES

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Tucson

Lessons Learned from Analyses of Two 'Benchmark' Unconfined-Aquifer Tests

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Misconceptions pertaining to flow processes that occur during unconfined-aquifer tests have sometimes led to tests being improperly designed, executed, and analyzed. Unrealistic assumptions, in particular those regarding the interaction of the saturated zone with the unsaturated zone, have resulted in incorrect parameter estimates and incorrect predictions of aquifer performance. In this talk I will present the results of analyses (using WTAQ, VS2DT, and the parameter estimation algorithm PEST) of two very detailed and contrasting aquifer tests conducted in slightly heterogeneous and anisotropic, unconsolidated granular materials of glacial origin – one from Cape Cod, Massachusetts and one from Ontario, Canada. These high quality aquifer tests have led to model revisions that (1) improve comparisons between measured and simulated drawdowns in the saturated zone, (2) improve understanding of field-scale flow processes in the unsaturated zone, and (3) improve estimates of saturated and unsaturated zone hydraulic parameters. Recommendations are made regarding aquifer-test design, duration, and method of analysis to obtain optimal parameter estimates.