

# **PARAMETERIZATION OF A FRACTURED HARDROCK AQUIFER IN WESTERN FOOTHILLS OF THE SIERRA NEVADA, CALIFORNIA**

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**Thesis Defense for Master of Science in Geology  
July 20, 2007, 1-3 pm  
Science II, Room 109**

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This study is aimed at characterizing the fractured granite aquifers in the foothill areas of western Sierra Nevada, Madera County of California, and model parameterization to obtain the best values of Transmissivity and Storativity of the specific aquifer through long term pumping tests. The ultimate purpose is to predict the long-term well yield (pumping rates and volume) versus groundwater drawdown relations in the area.

Theoretical feasibility studies of the aquifer-testing methods were first conducted, with the conclusion that the constant-drawdown pumping method, as compared to the constant-discharge and step-drawdown methods, was more appropriate for the site which did not cause the wells to run dry due to limited water discharge from the local fractures. Lineaments studies were carried out using Digital Elevation Models and Geographical Information System (GIS) software to delineate the directions and depths of the major fracture sets in the region. The multiple-borehole tests were conducted and ran for up to 34 days, involving two test wells and 17 observation wells at a 540-acre study area enclosing Madera Ranch Quarry. Two hypotheses (radial or linear flow patterns) were assumed and tested using the field experimental data.

Variations in the results of different pumping tests suggested that both the flow patterns (radial or linear) and the model parameters (transmissivity and storativity) were scale-dependent, and the "scale effect" is related to heterogeneity within the aquifer, not to the testing methods. The long-term pumping tests at two wells on the site suggested that, to characterize a large area of the fractured hardrock aquifer, at least 15 days was required to get a realistic trend line of drawdown versus time.

The long term pumping-test results also indicated that drawdowns at observation wells as far as 4,000 feet radius can still be influenced by linear flow intersecting the pumping well, but the influence radius (with > 0.5 ft drawdown) did not exceed 5000 feet. Models that assumed uniform aquifer properties can not be applied to the site, although some generalization can be made.