

A REGIONAL ANALYTIC ELEMENT GROUNDWATER FLOW MODEL

**Dave Dahlstrom, Senior Hydrogeologist, WHPA, Inc., Bloomington, IN,
toivodahl@insightbb.com; Vern Rash, Senior Engineer, Des Moines Water Works,
Des Moines, IA,**

Abstract: A two-well collector well system currently being installed on the Des Moines River north of Des Moines, Iowa was designed using predictive analysis, a process by which an independent prediction is either maximized or minimized while keeping a previously calibrated model essentially calibrated. The goal of the modeling was to provide a conservative estimate of the productivity of the proposed system.

A regional analytic element groundwater flow model was constructed using ModAEM and calibrated using hydraulic gradient data, hydraulic head data from synoptic water level measurements from a wet period and dry period, drawdown data from two aquifer tests, and baseflow data. Based on the calibrated model, a water supply system consisting of two radial collector wells was estimated to yield 13 MGD.

The minimum and maximum productivity of a two-well system were estimated using predictive analysis to be 9.2 MGD and 16.8 MGD, respectively. A series of well designs were then compared using local models (TimML) and the regional model. Arm elevations were optimized using the local, multiple-layer models and various arm lengths and orientations were compared to maximize the yield of the system under the worst-case condition. The optimal design maximized well capacity and maximized the ratio of surface water to groundwater produced by the system.