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RECALL-Symposium, November 18-22 2002, México

"Resource Utilization:
Globalization and Local Structure"

Groundwater Resources Management for the City of Monterrey, NE-Mexico: The Buenos Aires Wellfield in the Huasteca Canyon

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Abstract

The Buenos Aires wellfield in the Huasteca Canyon is the most important groundwater source for the City of Monterrey, a commercial and financial center of more than 3.5 million inhabitants in NE-Mexico. It supplies up to 18 % of Monterrey´s total water consumption which is 10 m3/s.

Of 41 mostly deep wells drilled in the 1970´s, 18 never produced water or were depleted soon after operating began. The operating wells show a significant variation in mean discharge (10 to 209 l/s). In some wells dynamic levels have dropped close to 100 meters. The Monterrey Water Authority needed to know:

1. An explanation for the dry wells and the differences in discharge of neighboring wells,
2. The amount of water safely exploitable in the aquifer, and
3. Recommendations for the location of new wells.

The area of the wellfield was geologically mapped at a scale of 1:10,000. Three aquifer systems were identified and classified into ranges of hydraulic conductivity. A hydrogeologic map shows the hydraulic parameters at groundwater level. Surface flow conditions are known for each point within wellfield´s catchment area. The analysis was done with the ARC/INFO GIS. Groundwater resources were determined at approximately 51 million m3/year.

The main (deepest) aquifer system consists of upper cretaceous limestone and has a maximum thickness of up to 900 meters. The unproductive wells were drilled close to the axis of the syncline where fractures are closed and do not permit groundwater circulation. Piezometric levels suggest a groundwater flow in the flanks where the most productive wells are found, explaining the vicinity of unproductive and highly productive wells. The flanks consist of the aquifer limestone itself and represent the areas of recharge.

Groundwater extraction from the Buenos Aires wellfield was at 1,535 l/s in 1998. Contrary to previous concepts, the aquifer is not considered at risk of depletion. The occurrence of major precipitation events (hurricanes) in NE-Mexico is factored into the hydrologic balance. Within time frames of 10-12 years groundwater mining at present, or even slightly higher discharge, is considered an appropriate means of managing the aquifer.

Keywords: Aquifer assessment, hydrologic modeling, groundwater mining, GIS, Monterrey