



Modeling and Optimization of Seawater Intrusion Barriers in Southern California Coastal Plain

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Saltwater intrusion is a problem that threatens the water quality of many coastal aquifers around the world. An effective way to mitigate seawater intrusion is to form subsurface hydraulic barriers by injecting freshwater into an array of wells aligned parallel to the coastline. We have successfully simulated the complexity of barrier operations with a state-of-the-art groundwater flow and transport model. This model is being applied to develop management strategies to improve the operation and efficiency of the three major coastline barriers of Los Angeles County. It will also allow the investigation of alternative and competing strategies and their cost-effectiveness for future operation.

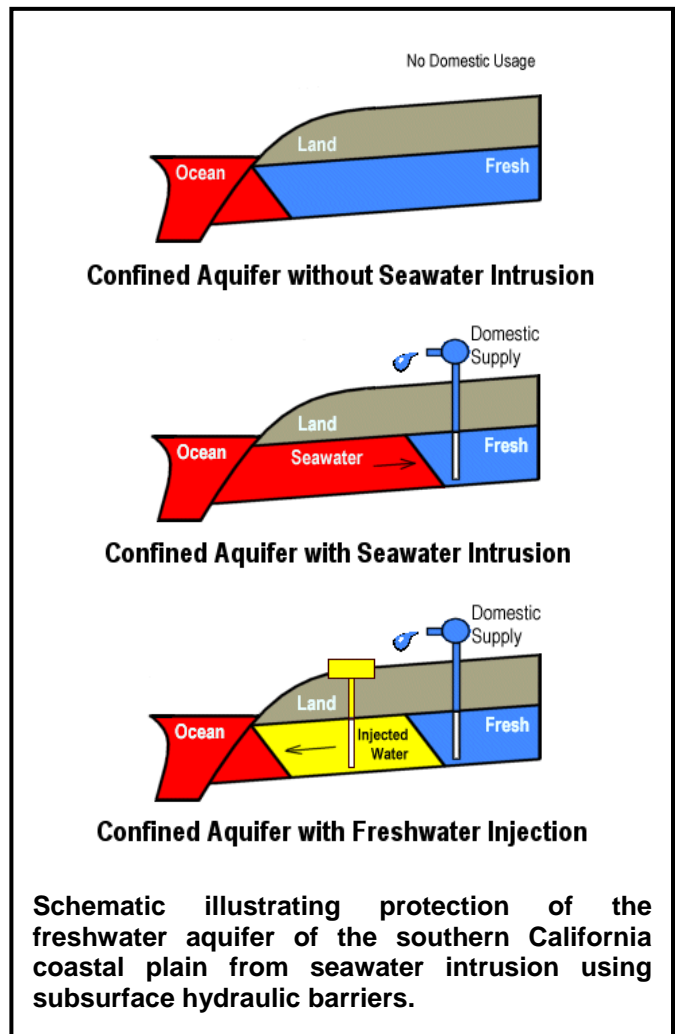
Today, there are three major hydraulic barriers in operation along the coastline of Los Angeles County. Here reclaimed water is injected into the subsurface in order to protect freshwater pumping wells in the coastal plain. This process raises the water level to prevent seawater intrusion into the freshwater aquifer, and protects the 20,300,000 acre-foot groundwater reservoir used to meet approximately 35% of the potable water supply for 3.2 million residents.

The goal of this research project is to use state-of-the-art groundwater modeling and optimization techniques to develop management strategies that will improve the operation and efficiency of one of the three Los Angeles County barriers, the Los Alamitos Gap Barrier. Specifically, the objectives are to: (1) calibrate and validate a flow and transport computer model to simulate the complex barrier operations, (2) determine the optimal management strategy of the existing barrier facilities, (3) identify the optimal candidate sites for additional injection wells, and (4) investigate alternative and competing management strategies that may be cost effective in addressing the seawater intrusion problem.

Currently the first phase of the study, the model development and calibration, has been completed. Documentation of the model has been ongoing during transition to its use to determine management strategies. The random hydraulic conductivity field has been estimated using natural-neighbor-kriging (NNK). For each aquifer considered, the NNK results are consistent with prior maps of hydraulic conductivity trends based on physical characteristics.

Transport calibration requires significantly longer computer simulation runs to maintain accuracy. An optimal lumped transport parameter setting is identified, and the model error could not be reduced further by

increasing the transport parameter complexity. A draft manuscript has been completed describing the model development and calibration phase and has been



formally submitted for journal publication. Completion of the second management phase and documentation is slated for November 2005.

Collaborative Efforts

Youn Sim, Ph.D., P.E., Water Resources Division, County of Los Angeles, Department of Public Works.

Professional Presentations

Bray, B.S., Y. Sim, , W.W-G Yeh, "Calibration of a Complex Three-Dimensional Coastal Aquifer with Density-Dependent Flow", American Geophysical Union 2004 Fall Meeting, San Francisco, Dec. 13-17, 2004.

Acknowledgements

Thanks to the Water Resources Division, County of Los Angeles, Department of Public Works for illustrations.

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