

## **SEAWATER INTRUSION AT GUAYMAS VALLEY, MEXICO: A FLOW AND TRANSPORT MODEL**

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### **ABSTRACT**

The study area is located in a semiarid region along the coast of southwestern Sonora, Mexico. Groundwater represents the main water source for municipal and agricultural consumption. Heavy water abstraction for agricultural use started in 1950, reversing the natural hydraulic gradient. Steadily declining water levels near the coast have allowed seawater to intrude the aquifer. Several water wells and adjacent farming areas had to be abandoned. As sea water intrudes upon the fresh water aquifer, the groundwater quality is deteriorated, impacting water usage for municipal and industrial activities.

Geological, geophysical and geochemical data were interpreted to develop the groundwater flow system. Geological setting of the area is regarded as a classical "Basin and Range" type, characterized by horst and graben structures. Geophysical soundings detected a chaotic distribution of a Jeep clay unit.

A coupled flow-transport model of the aquifer was developed to simulate the evolution of the seawater intrusion. Coupling process was achieved through a Picard method to allow fluid density dependency of groundwater flow. Modeled drawdowns of 60 meters below mean sea level as well as the sea water front (2,000 ppm), which has advanced up to 10 km inland, closely matched observed values. On the other hand, modeled results show that water from storage represented 71 % of total abstraction volume and that leakage from a deep unit has increased over time.

**Keywords:** seawater, intrusion, drawdown.

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