

**CONTROL METHODS AGAINST SEA WATER INTRUSION IN COASTAL
AQUIFERS. CASE OF GUAYMAS AND BOCA ABIERTA AQUIFERS IN
NORTHWEST OF MEXICO.**

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ABSTRACT

Some methods against sea water intrusion in progress are recovering of static levels and cone of depression in the right position between the seashore and the pumping area. The former can use artificial recharge technique like infiltration ponds or absorption wells and the second through batteries of pumping wells.

All around the world there are some experiences like “Los Angeles County Department of Public Works, Water Resources Division, Operations Section, in California, USA, developed facilities for recovering the static levels in coastal aquifers and Orange County has facilities for pumping saline water.

An example of Barrier Effectiveness in Los Angeles County presented by William Saunders, Department already mentioned, can be summarized in the next three items:

Groundwater Elevations Since 1964 to 1999, Lower San Pedro Aquifer ground water elevations have risen from -24 (-7.3m) feet below S.L. to 12 feet (3.7m) above sea level, an increase of 36 feet (11m). Since 1964 Silverado Aquifer ground water elevations have risen from -12 feet (3.7m) below S.L. to 16 feet (4.9m) above sea level, an increase of 28 feet (8.7m).

Seawater Intrusion. Since 1964 to 1999, intrusion across the Lower San Pedro Aquifer has dropped from a 94% to 18%. This represents a 76% improvement. Since 1964, intrusion across the Silverado & 200-Foot (60 m) Sand Aquifers has dropped from 74% to 10%. This represents a 64% improvement.

Water Use Since 1983 to 1999, similar protective elevations have been achieved with 16,855 less Acre Feet (20.8 hm³) per year. This represents a 50% reduction in total recharge and a 75% reduction in imported water when combined with a 50/50 blend of water.

One question is about how to pay the cost of building and operating the pumping or absorption wells and the observation wells nets and also what are the environmental impacts.

A desalinization plant for water supply could pay the costs. It's necessary the inlet of the plant not to be out of limits, for example between 3000 and 10000 mg/L TDS, at least in the useful life of the plant.

The effluents of such plant could pollute the bays, estuaries and wetlands. This impact must be considered. Esperansa Gacia y Enric Ballesteros in “El impacto de las plantas desalinizadoras sobre el medio marino: la salmuera en las comunidades bentónicas

mediterráneas”, made a description of the effects on flora and fauna in the near zone of coastal line for pouring the effluents of the basic desalinization processes: inverse osmosis and distillation, changing chemical composition and temperature of water in addition to contamination by chemical products for treatment and point discharge of membranes cleaning. The species considered include fishery. It recommends to pour effluents in zones of minimal impact on bentonic communities preferably without vegetation. Salmuera must be poured in high or medium hydrodinamic zones. Each effluent component must be studied alone and in interaction between them.

The aquifer of Guaymas had been seriously intruded with seawater. An average of 400 ha/y of agricultural land had been abandoned since 1950’s. The water table in the main cone of depression is in the order of 68 meters below sea level and the position of interface of intrusion is inland about 15 kilometers from the seashore.

The closest Boca Abierta’s aquifer has some damages by intrusion in the upper part, to 100 m depth, and seven kilometers from the seashore.

In the Guaymas case it’s a considerable volume of salty water that could be used as inlet for a desalinization plant; Boca Abierta by the contrary it’s an opportunity of preventive actions stopping seawater entrance.

There is a proposal for modeling the seawater intrusion in both aquifers. The objective is to assess the saline water volume, his position and chloride concentration range.

Keywords: Sea water intrusion, static levels, infiltration, pumping wells, desalinization plant

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