

**THE WATER RESOURCES DEVELOPMENT IN LA MISION COASTAL AQUIFER,
BAJA CALIFORNIA, MÉXICO.**

O. García^{1a}, O. A. Escolero¹, R. Chávez¹, C. Gómez², J.F. Telles²

ABSTRACT

In Mexico, aquifer recharge is estimated at 75 billions m³/year, of which the country uses 28 billion m³/year. If we take a look at the national water balance, withdrawal is less than the renewable volume. Nevertheless, this global balance does not reveal the critical situation that prevails in arid regions where balance is negative and groundwater reserves are running low. Meanwhile, in the country's areas with more rain and less development, there is a significant amount of water that is not being used.

The groundwater has a strategic importance because the groundwater supplies 2/3 of population needs and 1/3 of agricultural uses; 50% of the water for industrial purposes comes from the groundwater. In the case of Baja California Peninsula, the overdrafting has caused a deterioration in water quality due to seawater intrusion and fossil groundwater migration.

In this context, the CNA has been analyzing different schemes to protect the groundwater storage of coastal aquifers, in order to reduce the freshwater discharge into the sea, which represents an important water loss, specially in arid and semiarid regions, located at the northern portion of the country, mainly in the Baja California Peninsula.

In response to growing water scarcity and deterioration of water quality in coastal aquifers in the Baja California Peninsula, the CNA, in collaboration with the Japan Green Resources Corporation (JGRC), have agreed to develop a pilot study in La Mision coastal aquifer, Baja California State. The main goal of CNA for this study is to contribute on the water resources development in La Mision zone through a Subsurface Dam.

La Mision aquifer is located approximately 40 km north of Ensenada City Baja California State (~latitude 32° 05' North and at longitude 116° 47' West). It represents 613 km². Local climate corresponds to temperate semiarid conditions with a mean annual temperature of 16 Celsius degrees and an annual average precipitation below 300 mm.

The subsurface dam in La Mision, will have two main purposes. First one will be to retain the groundwater flow into the sea during the rainy season, and second one will be to protect the local fresh water aquifer from the advance of the seawater intrusion. Its construction will contribute to increase the availability of groundwater, mainly used to developing rural areas in agricultural land irrigation and potable water supply to the nearby urban areas including Ensenada City.

In the La Mision area, farming management is actively improved by farmers themselves. Production of vegetables and cattle raising in the area could be expanded effectively, if there would be enough groundwater. Then, there is a big selling market though Ensenada, Tijuana and the United States of America from La Mision area. Some advanced farmers have already exported their vegetables to USA.

The Second International Conference on Saltwater Intrusion and Coastal Aquifers — Monitoring, Modeling, and Management. Mérida, Yucatán, México, March 30 - April 2, 2003.

At the moment, CNA in collaboration with JGRC have collected the basic data, regarding groundwater level and groundwater quality distribution, hydro-meteorological, agricultural and socioeconomic. Also electrical prospecting and well boring to reach basement rock and characterize geological properties were performed at the subsurface dam site.

Partial results of the compilation of basic data and field investigation on this study are:

La Mision aquifer is a unconfined aquifer, mainly consisting of alluvial deposits (silt, sand and gravel) with high hydraulic conductivity values, laying over impervious shales represented by the Upper Cretaceous Rosario Formation. At the dam site, aquifer is ~55 m thick and its underground valley reaches ~420 m wide.

The ground water abstraction shows an excessive increased tendency that is responsible of the seawater intrusion mainly during dry seasons.

The Rosario Formation is considered as the impervious basement consisting locally of shales that could function as the foundation of the subsurface dam.

There is a possibility of landsliding at the southern side of La Mision Valley.

The hydraulic conductivity value of the alluvial deposits at dam site, resulting from pumping test analysis vary from 1.4×10^{-3} to 9.6×10^{-3} cm/s.

La Mision site has strong possibilities to hold a saltwater cutoff-type subsurface dam.

At this moment, the water balance analysis of the subsurface dam project area in La Mision is being performed. This analysis is necessary to understand the available water volume resulting from the subsurface dam construction, and it is based on the collected data, such as ground water level, hydro-meteorological and geological data. A groundwater flow modeling is being constructed to analyze and predict the dynamics of fresh seawater relationships with and without a subsurface dam.

O. García^{1a}, O. A. Escolero¹, R. Chávez¹, C. Gómez², J.F. Telles²

¹Groundwater Management, National Water Commission, Mexico City, Mexico

²Regional Management Office of Baja California Peninsula, National Water Commission, Mexicali, B.C., Mexico

***Motoi Kotoku, Tadashige Tanaka
Japan Green Resources Corporation,***