Luis Mario Gutierrez *is the CEO of the Juárez Utilities Board, Ciudad Juárez. For the past two years he also has been the Juárez Zone Director of the Bancrecer Bank. Luis has had extensive experience in the banking business having worked for the Comermex Bank for 13 years and the Serfin Bank for eight years. He received a B.A. in accounting from the University of Chihuahua.*

Conference presentation was given by Alberto Ramirez.

INTERNATIONAL BORDER WATER ISSUES
JUNTA MUNICIPAL DE AGUA Y SANEAMIENTO (JMAS)

Presentation Outline

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INTRODUCTION

- Ciudad Juárez is located in the Mexican state of Chihuahua, and is the largest border city along the Rio Bravo/Grande international reach
- Current population: 1,219,926
- Annual rate growth: 4.23
- Main economic activity: Assembling Industry (maquiladora)

WATER SOURCES IN THE REGION

- Considering the climatic and environmental conditions prevailing in the area, as well the accelerated growth rate in the city, water provision for the city of Juárez constitutes an extraordinary challenge and probably the main environmental issue in the coming years
- Mexico receives annually 74 million cubic meters from the Rio Bravo/Grande, as part of the 1906 Convention
- This water is used entirely for agricultural irrigation in the Juárez Valley
- At the present time the sole source of water for the city is a binational aquifer, Bolsón del Hueco.
- Annual average extraction from El Hueco: 150 million cubic meters

EXISTING SITUATION

- The city has more than 145 wells along the entire urban area, which provide previously chlorinated water to the distribution system

- Total population connected to the system: 1,122,331, which is 92 percent of the total population, 84 percent with sewage service
- Existing population consisting mainly of young people; 65.2 percent of the population is under 29 years of age
- Average *per capita water consumption:* 330 l/h/d (less than 100 gal/p/d)
- Maximum water production capacity per year: 176.6 Mm3
- Considering existing population trends and no additional well drilling in the Hueco Bolsón, unless additional sources are developed, a major deficit could be faced by 2004, as well as increasing water quality degradation.

JUÁREZ AQUIFER'S CHARACTERISTICS

- The Bolsón del Hueco is a binational aquifer, the northern part located in the USA and the lower southern part in Mexico.
- The aquifer's limits are: to the north, the state of New Mexico; to the east, the Sierra Hueco; to the west, the Franklin Mountains and the Sierra Juárez; and to the South, the Sierra de Presidio. (Figures 1 and 2)

Location of groundwater sources (Figure 3)

WATER DEMAND FORECAST (Figures 4-6)

- Existing maximum water production capacity: 5,600 l.p.s. (176.6 Mm3 per year).
- A water deficit will start in the year 2004, if the actual groundwater extraction rate continues.
- This scenario considers that no new wells will be drilled and the population will continue to grow at the highest rate.
- Additionally, it doesn't consider closing down wells that are producing poor water quality, especially in the downtown area.

Water extraction from the Hueco Bolsón (Figure 7)

WATER PRESERVATION MEASURES TAKEN BY THE JMAS

Existing programs:

- Industrial and Commercial Discharges Pretreatment Program
- Groundwater Protection Program
- Water Reclamation and Reuse Program
- Internal planning process
- Participation and promotion of city planning activities through the Interagency Planning Committee

Planning activities:

- Update the Water and Sanitation Master Plan

Main issues:

- Financed by Border Environment Cooperation Commission (BECC)
- Search for additional water sources
- Analysis of alternative growth areas
- Follow-up and coordination with the Texas/New Mexico Commission's Project
- Long-term analysis of regional development based on water sustainable use
- Additional wastewater treatment and reuse systems evaluation; water markets design
- Identify potential location and technology for additional wastewater treatment plants

ALTERNATIVE WATER SOURCES

Surface water: Río Bravo
Existing groundwater: Bolsón del Hueco
Future groundwater: Bolsón de la Mesilla (Conejos-Médanos); Bismarck's Aquifer; Valle de Juárez's shallow aquifer
Water reclamation programs

LA MESILLA BOLSÓN (CONEJOS MÉDANOS)

Project description:

- 24 groundwater wells
- 30 kms (18.6 MI) aqueduct
- Approximate water production capacity: 1 m3/sec
- Storage tank (5000 cubic meters)
- Connection and branching lines
- Approximate cost: $30 million (US dollars)

RÍO BRAVO'S WATER POTABILIZATION

Issues:

- Existing international water delivery agreements
- Seasonal water availability and river's hydraulic operation
- Legal framework concerning the Mexican farmers' water rights on these waters, derived from the 1906 Agreement
- Technical issues concerning water quality and treatment

Project description:

- Estimated that the average flow that could be obtained for treatment is 1,500 l/sec.
- Water treatment plant could be located on either side of the border, depending on the results of feasibility study and financial resources available
- Approximate total cost: $14 million (US dollars)
- Conventional treatment technology has been considered, membrane systems are an option, considering seasonal water quality variations

WATER MANAGEMENT STRATEGIES IN JUÁREZ

- Develop sectarian service areas
- Reduce water loss (leaks)
- Base rate structure on effective cost
- Increase community participation on rational water-use educational programs
- Increase water reclamation and reuse programs
- Apply constant improvement policy to service

SUGGESTED BINATIONAL COORDINATION ACTIONS ON WATER ISSUES IN THE PASO DEL NORTE REGION

- Identify common interest issues
- Define joint planning strategies
- Joint analysis of growth trends in the region
- Evaluate existing and future water demands in the region
- Joint water uses prioritization
- Define common water management policies
- Joint water conservation programs
- Exchange and share technology

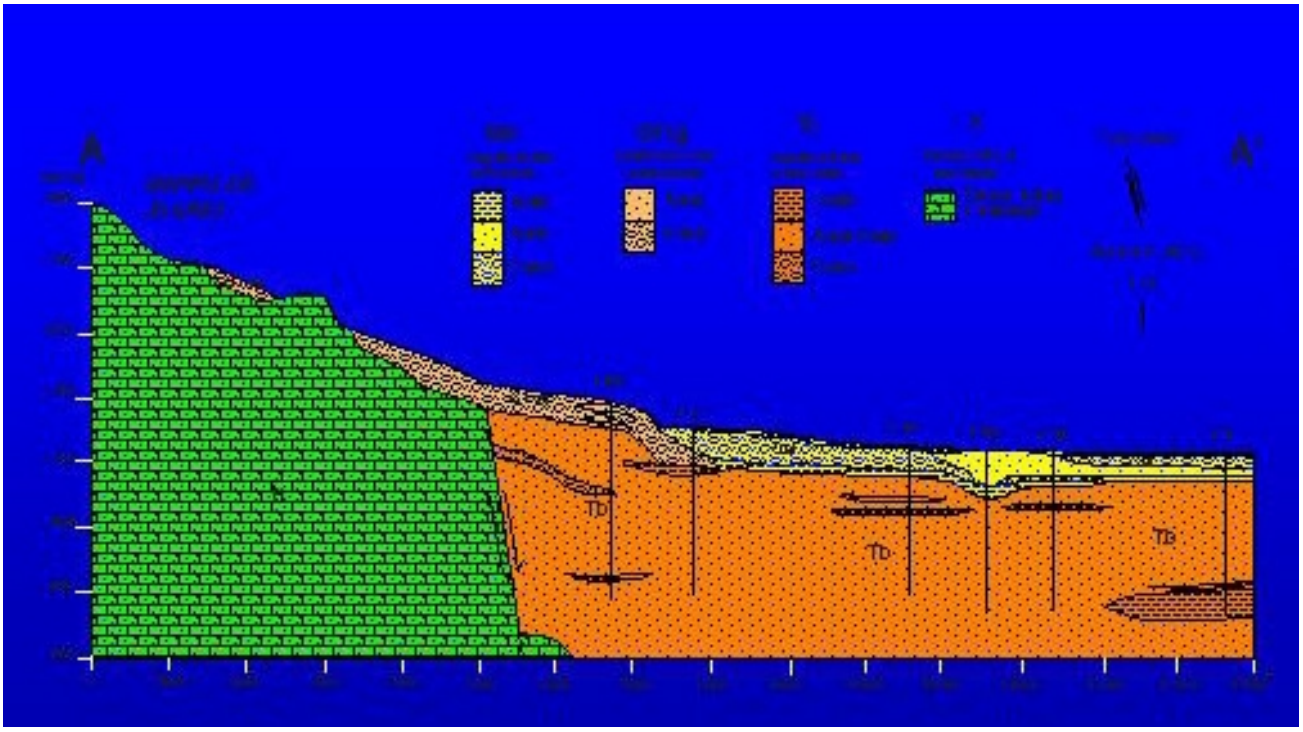

Figure 1. Bolsón Del Hueco: Hydrological Description of the System. The aquifer system in Juárez is formed by a shallow aquifer settled on alluvial rocks from the Quaternary and a deeper aquifer located on the Bolsón's deposits, made mainly of gravel, sand silt and clay from the Tertiary. The shallow aquifer, named Acuifero del Aluvion Rio Grande, gets its water mainly from infiltration from the river bed and from irrigation discharges. The extraction is performed mainly through wells. The deeper aquifer, called the Bolsón del Hueco, is recharged through lateral groundwater flows and water coming from the shallow aquifer.

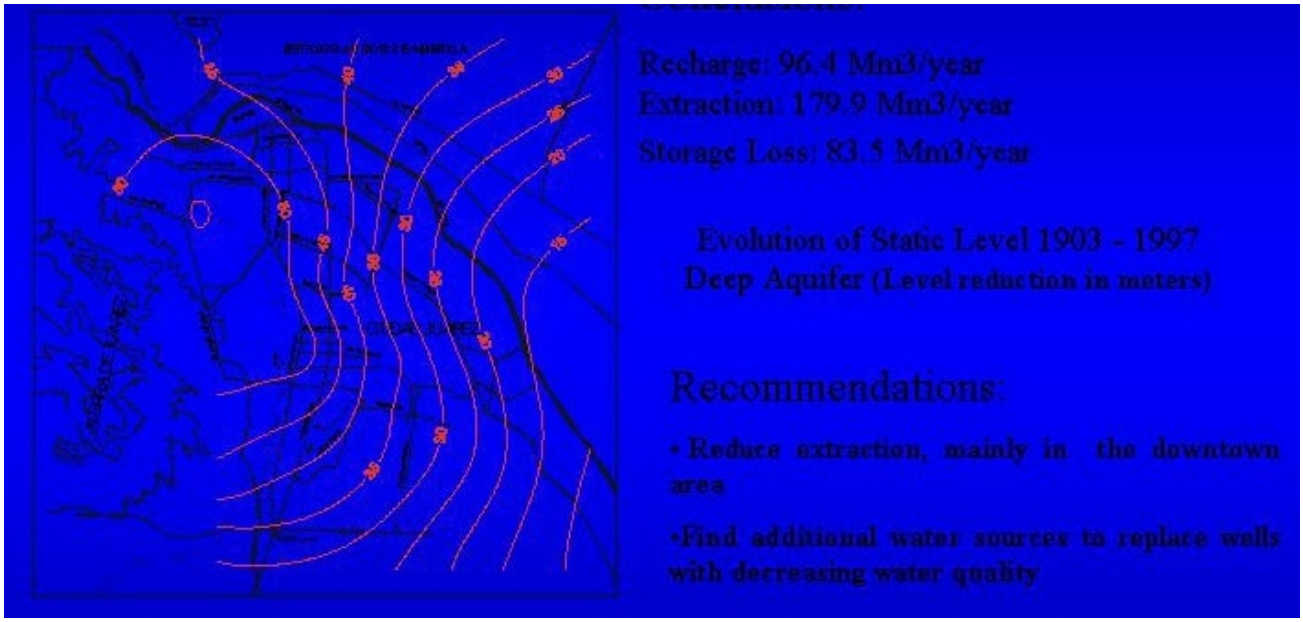

Figure 2. Bolson del Hueco (Zone de Cd. Juarez, Chih.) Hydrodynamic Flow Simulation Model

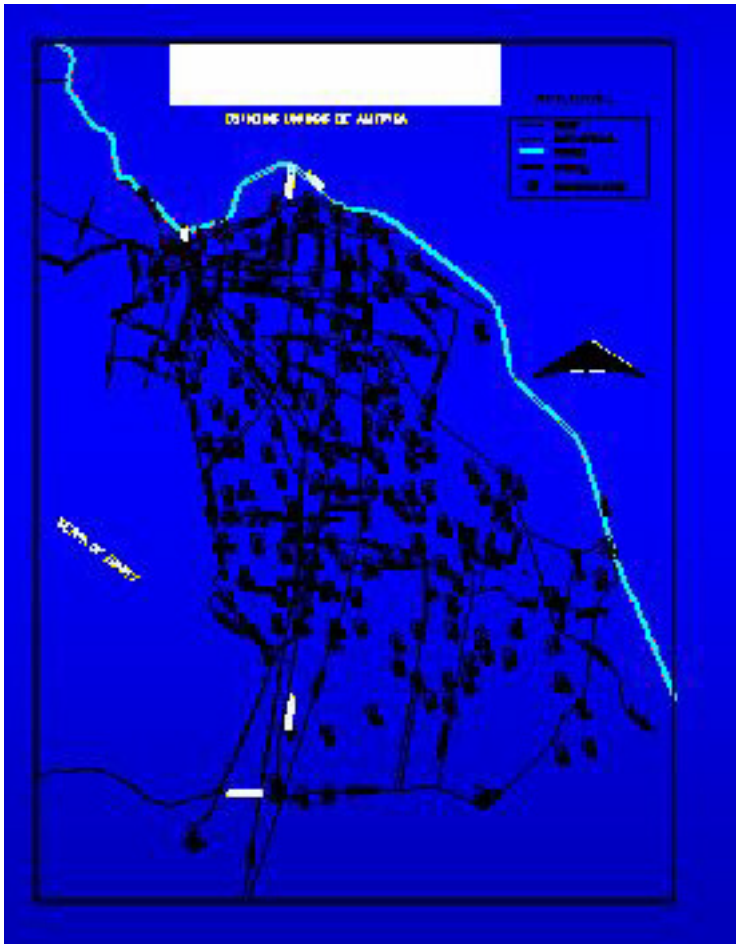

Figure. 3. Location of groundwater sources

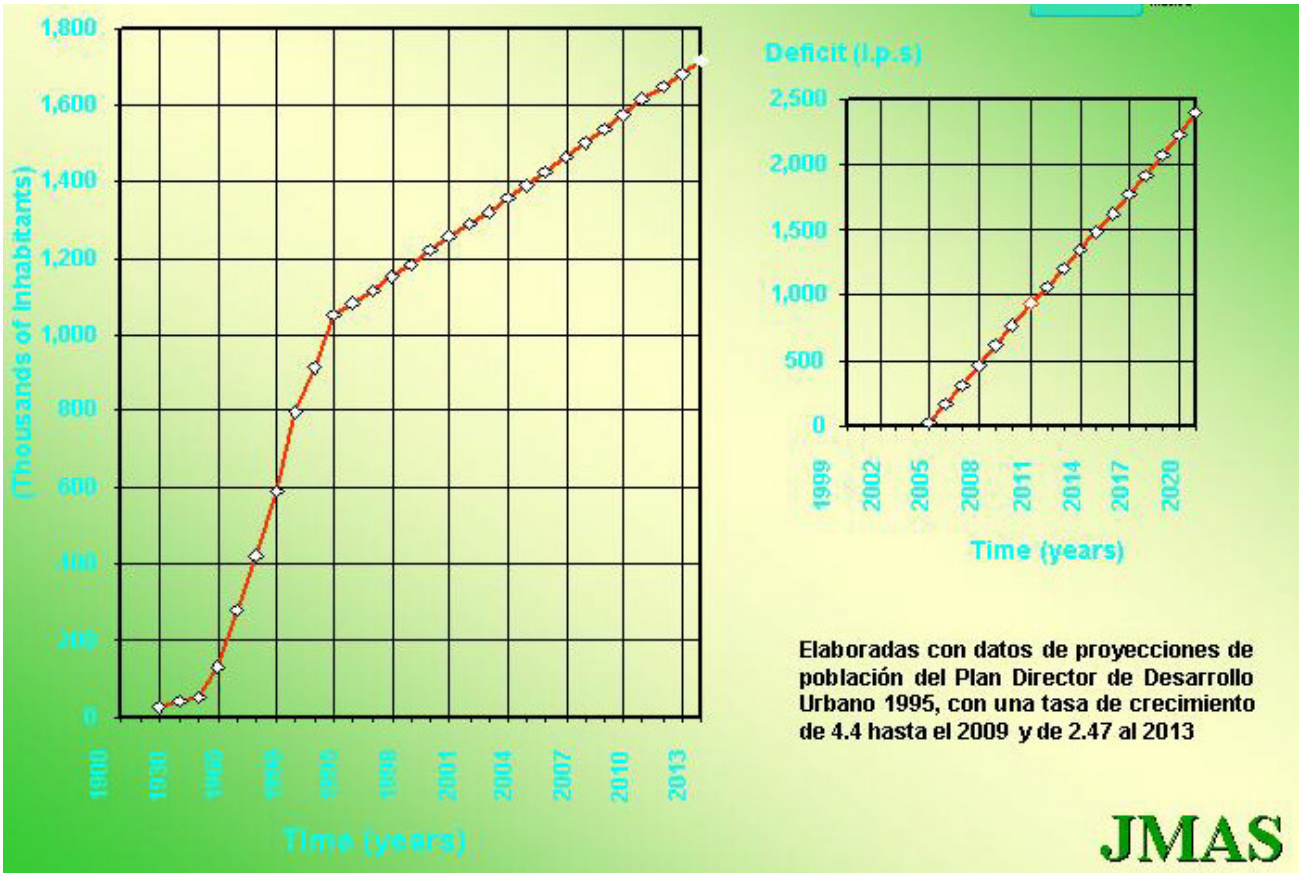

Figure 4. Population and water deficit projections in Cd. Juárez

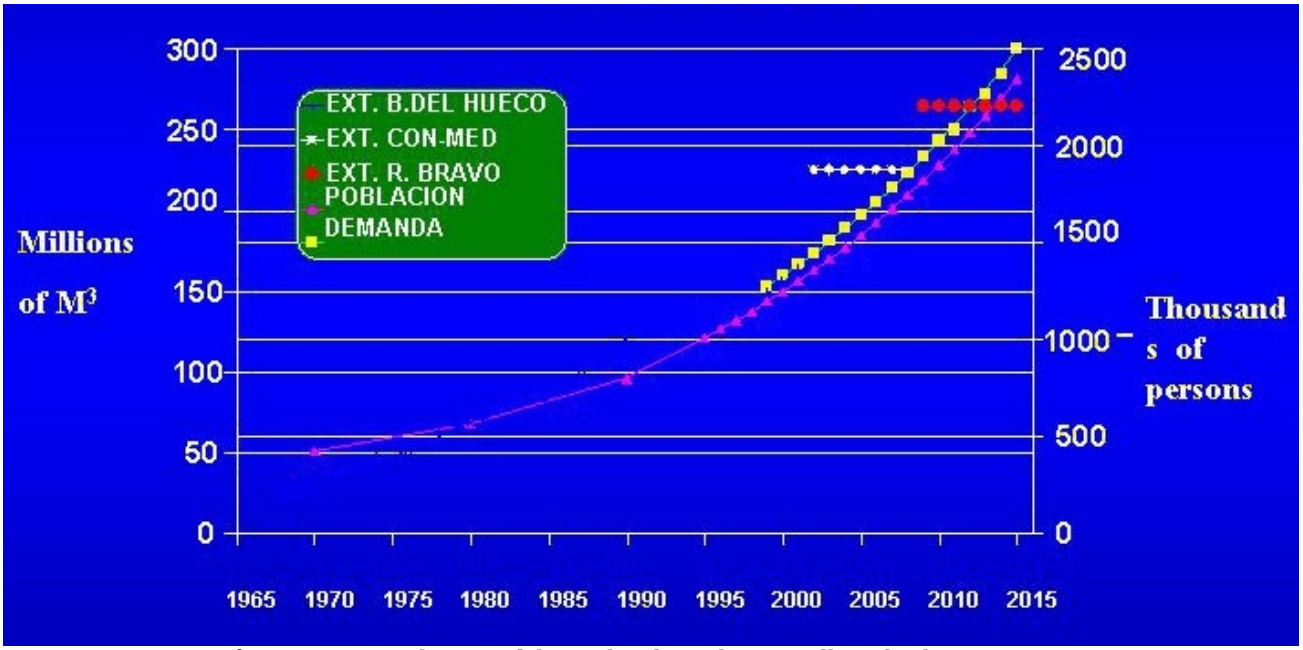

Figure 5. Projection of extraction, population and demand without closing wells in the downtown area

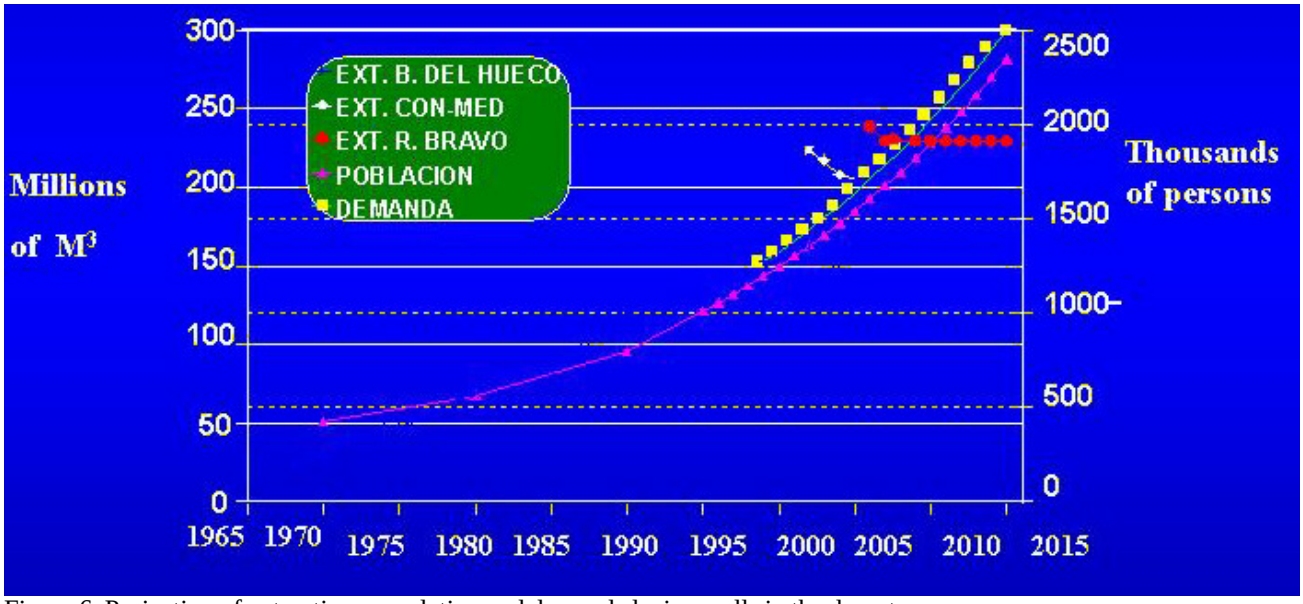

Figure 6. Projection of extraction, population and demand closing wells in the downtown area

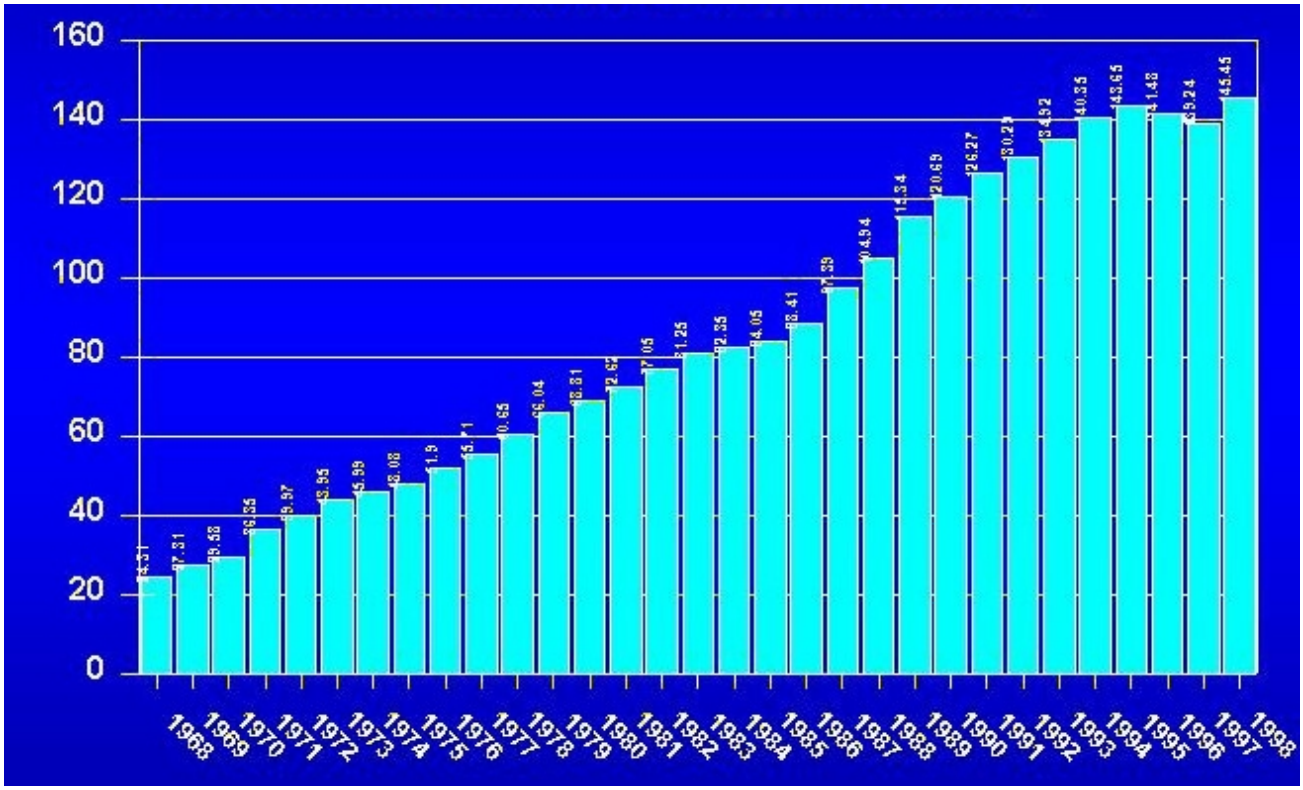

Figure 7. Water extraction from the Hueco Bolsón