A MODELING PERSPECTIVE ON THE TRANSBOUNDARY NATURE OF THE ALLENDE – PIEDRAS NEGRAS AQUIFER

LAURA RODRIGUEZ[*1], ROSARIO SANCHEZ[3], PETER KNAPPETT[2], HONGBIN ZHAN[2]

[1]*texas a&m university*, [2]*Texas A&M University*, [3]*Texas A&M University - TWRI*

The Allende-Piedras Negras (APN) aquifer is located between the states of Texas (U.S) and Coahuila (Mexico). The Rio Grande/Rio Bravo crosses the aquifer acting as a natural and political divide between the countries. However, it is still unclear if the APN aquifer can be recognized as a truly transboundary aquifer, an issue that is critically important for managing aquifers shared by two different administrative units. In this case the aquifer would need to be co-managed by two different countries. The main purpose of this work is to provide evidence of the transboundary nature of this aquifer. This was achieved by developing a new hydrogeological model to perform a detailed analysis of the flow paths in the APN aquifer using Visual MODFLOW (VMF). The model quantified an average accumulated drawdown of 0.76 m in 17 years for the entire aquifer. The flow convergence zone, previously located directly below the Rio Grande/Rio Bravo, shifted to the U.S side in most places owing to the high pumping rates of the water wells located near the river. This shifting of the convergence zone from one country to another means that groundwater recharge from one side flows underneath the river to the other side. This qualifies the APN aquifer as a "transboundary groundwater flow" system. The methodology followed in this study could be applied in other aquifers that straddle the U.S.-Mexico border and can motivate future modeling studies on other poorly studied aquifers around the world to enable joint aquifer management.

Keywords : Transboundary, USA, Mexico, numerical model