

## **Preliminary Hydrologic Survey of the Sierra Tarahumara, Chihuahua, Mexico**

Ryan B. Anderson<sup>1</sup>, James P. Durand<sup>1</sup>, Mallory A. Palmer<sup>1</sup>, Tracy L. Kemp<sup>1</sup>, Steven H. Emerman<sup>2,\*</sup>, Michael P. Bunds<sup>2</sup>, Connie K. Smith Barnes<sup>1</sup>, Joel A. Bradford<sup>3</sup>

<sup>1</sup>B.S. student, <sup>2</sup>Associate Professor, <sup>3</sup>Assistant Professor

Department of Earth Science, Utah Valley University, Orem, Utah 84058

**Abstract.** The objective of this study was to carry out a hydrologic survey of 185 km<sup>2</sup> of the Sierra Tarahumara volcanic tuff region near the village of Creel, Chihuahua, Mexico. This work was done in cooperation with a Jesuit mission that drills wells for the Tarahumara Indians and has been drilling an excessive number of dry wells. Hydraulic heads were measured for 11 wells and six springs and baildown tests were performed on seven wells. Fifteen chemical parameters were measured in all wells and springs and eight streams. In order to create consistent flow paths for groundwater, it was necessary to assign wells and springs to four separate aquifers. Using the Hvorslev Method, the geometric means of the hydraulic conductivities K were calculated as  $K = 3.0 \times 10^{-7}$  m/s for Aquifer A,  $K = 9.0 \times 10^{-9}$  m/s for Aquifer B, and  $K = 1.6 \times 10^{-7}$  m/s for Aquifer C. Average As concentrations were  $As = (0.08 \pm 0.02)$  mg/L for groundwater and  $As = (0.17 \pm 0.07)$  mg/L for surface water with the highest concentrations being  $As = 0.403$  mg/L for groundwater and  $As = 0.619$  mg/L for surface water. All As concentrations exceeded the Mexican standard of  $As = 0.025$  mg/L. For groundwater there was a positive correlation ( $R^2 = 0.79$ ) between As and Fe, which suggests that elevated As concentrations result from oxidation of arsenopyrite. Since Aquifers B and C have the same lateral extent, future work will focus on determining the depth to Aquifer C.

---

\* corresponding author, E-mail: StevenE@uvu.edu