

Regional Hydrology of the Nopal I Site, Sierra de Peña Blanca, Chihuahua, Mexico

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The U.S. Department of Energy sponsored the drilling of three wells in 2003 near the Nopal I uranium deposit at the Sierra Peña Blanca, Chihuahua, Mexico. Piezometric information is being collected to understand groundwater flow at local and regional levels as part of an ongoing natural analogue study of radionuclide migration. Water level monitoring reported at these and other wells in the region is combined with archival data to provide a better understanding of the hydrology at Nopal I. Initial results suggest that the local hydrology is dependent on the regional hydrologic setting and that this groundwater system behaves as an unconfined aquifer.

The region is dominated by an alternating sequence of highlands and basins that step down from west to east. The Sierra de Peña Blanca was downdropped from the cratonic block to the west during Cenozoic extension. The Nopal I area is near the intersection of two large listric faults, and the queda of ash flow tuffs that hosts the deposit has been subjected to complex structural events. The Peña Blanca Uranium District was originally characterized by 105 airborne radiometric anomalies, indicating widespread uranium mineralization.

The Nopal I uranium deposit is located in the Sierra del Peña Blanca between the Encinillas Basin to the west, with a mean elevation of 1560 m, and the El Cuervo Basin to the east, with a mean elevation of 1230 m. The Nopal I +10 level is at an intermediate elevation of 1463 m, with a corresponding groundwater elevation of approximately 1240 m. The regional potentiometric surface indicates flow from west to east, with the El Cuervo Basin being the discharge zone for the regional flow system. However, it appears that the local groundwater potential beneath the Nopal I site is more in accordance with the water table of the El Cuervo Basin than with that of the Encinillas Basin. This might indicate that there is limited groundwater flow between the Encinillas Basin and the Nopal I area.