A new US uranium province; calcrete-type uranium in the Southern High Plains, Texas and New Mexico

Susan M. Hall[1] and Bradley S. VanGosen[2]

1 – US Geological Survey Energy Resources Program, US Geological Survey, Box 25046, M.S. 939, Denver, CO 80225 susanhall@usgs.gov, 1-303-236-1656

2 – US Geological Survey Mineral Resources Program, US Geological Survey, Box 25046, M.S. 973, Denver, CO 80225

The semiarid Southern High Plains (SHP) physiographic region of Texas and New Mexico is a new US uranium province that hosts surficial calcrete-type uranium deposits. Although calcete-type uranium deposits had not been publically reported to occur in the US, the US Geological Survey (USGS) examined patterns of known calcrete provinces worldwide, and determined that the critical controlling mechanisms for this deposit type existed in the southwestern US. Review of regional geology, geochemistry, climate and geophysics for the SHP suggested that this region is highly prospective. The existence of calcrete-type uranium deposits in the area was confirmed through reports from a 1970's exploration program in the SHP by the Kerr-McGee Corporation. These records are now held by the Uranium Energy Corporation, who made them available to the USGS for examination. Outcropping mineralization adjacent to a drilled deposit was sampled and analyzed. These results were further evaluated to develop a genetic deposit model.

In the SHP, two deposits, Sulfur Springs Draw and Buzzard Draw, and an additional prospect, Seminole, are found in Pleistocene sedimentary rocks that include thick intervals of calcrete. A total resource of about 4 million lbs of U_3O_8 using a cutoff of 300 ppm for Buzzard and Sulfur Springs Draw combined are reported in historic Kerr-McGee Company files. USGS dating of uranyl vanadates, and volcanic ash found in the host rock indicates that periodic mineralization occurred between about 631,000 (tephrochrology of ash in host rocks) and 4,000 ybp (U-series dating of the youngest identified uranium minerals). The entire SHP is characterized by elevated dissolved uranium in groundwater. Possible U sources include the Triassic Dockum Formation/Group and Pleistocene sediments, many of which contain volcanic ash. Elevated dissolved vanadium in groundwater in some portions of the SHP defines areas that are most highly prospective for the formation of carnotite – the major ore mineral for this deposit type. Portions of the SHP with greater hydraulic conductivity may indicate fluid-flow paths that conducted groundwater to shallow depths that favored mineralization. Mineral-solution equilibrium modeling indicates that evaporative concentration of some local groundwater compositions could produce saturation with carnotite, suggesting that the mineralizing systems may remain active. The USGS has delineated permissive, favorable and prospective areas of the SHP for calcrete-hosted deposits, and completed a quantitative assessment of this emerging US uranium province. The results of this assessment are expected to be released by the end 2017.