

## **Underground injection and moderately saline groundwater in the Uinta Basin, Utah**

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The base of the moderately saline water (BMSW) in the Uinta Basin was first mapped in 1987 and re-mapped in this study using similar methods. Oil and gas operators in the Uinta Basin seeking underground disposal are generally required to inject waste production water below the BMSW or in waters greater than 10,000 mg/L total dissolved solids (TDS). Approximately 8000 new wells have been drilled in the basin since the 1987 study, providing new data for refining the previous mapping. Water samples from primarily oil and gas activities through the basin's history were compiled into a database (2772 records) and used as an aid in mapping. In addition, interpreted oil and gas geophysical logs, in particular resistivity measurements ( $R_w$ ), serve as an approximate proxy for the TDS of formation water. From the pool of new drilling, geophysical logs from 259 wells distributed throughout the basin were interpreted and used in mapping the BMSW. The Archie method, SP, and other resistivity methods were used in the interpretation of logs. Regional groundwater flow paths, saline minerals, structural shape of the basin, and faults and fractures strongly influence the distribution of TDS levels. Both older and new data points were used to create an elevation contour map of the position of the shallowest occurrence of the BMSW below the surface. Depth-correlated water analysis data were mapped and compared to the log-derived BMSW. Mapped water analysis data indicate the northern portion of the basin has numerous occurrences of water fresher than 10,000 mg/L below the BMSW, indicating a complex stratification of salinity coincident with the area of primary recharge, whereas shallow saline waters dominate the central portion of the basin. Data also demonstrate a poor correlation between TDS and the depth of the sample. Water samples from a few isolated areas show clear evidence of a change in TDS through time.