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**GEOCHEMISTRY OF THE FOX HILLS-LOWER HELL CREEK AQUIFER NEAR THE  
CEDAR CREEK ANTICLINE, SOUTHEAST, MONTANA**

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The Fox Hills Sandstone and lower part of the Hell Creek Formation compose an extensive aquifer that underlies most of eastern Montana and western North and South Dakota. The Cedar Creek anticline in southeast Montana is an important control on the ground-water chemistry in the Fox Hills-lower Hell Creek aquifer (FHHC). Throughout most of eastern Montana the aquifer is at depths of 600 - 1600 ft, except where it is exposed along the Cedar Creek anticline. The Pierre Shale is exposed at the core of the anticline and is overlain by the FHHC. Dips on the western flank are steep, up to 850 ft/mi, resulting in narrow (less than 1 mi-wide) surface exposures of the FHHC. Dips on the eastern flank are more gentle, about 70 ft/mi, resulting in FHHC exposures of about 6 - 10 mi wide. Potentiometric surface mapping indicates that the wider exposures result in more recharge from the east side of the anticline; there is little recharge from the anticline to the west. Chemical analyses of 84 samples, and specific conductance measurements of 191 samples reveal a halo of poor quality water in the FHHC around the anticline. The highest TDS concentrations (1350 - 3865 mg/L) occur near the anticline where the aquifer and Pierre Shale are exposed at the surface, and east of the anticline where the aquifer dips more gently into the subsurface. West of the anticline TDS concentrations are generally less than 1350 mg/L. There are also pronounced differences in SO<sub>4</sub> distribution related to the anticline. The highest SO<sub>4</sub> concentrations (150 - 2000 mg/L) occur near the anticline, suggesting that the Pierre Shale is the source. West of the anticline SO<sub>4</sub> concentrations decrease down flow path to less than 50 mg/L and HCO<sub>3</sub> concentrations increase, indicating that SO<sub>4</sub> reduction is an active process. East of the anticline the effects of SO<sub>4</sub> reduction are not as pronounced; SO<sub>4</sub> concentrations are generally greater than 200 mg/L.