

Updated 10-18-2015

HYDROLOGIC ATLAS OF THE BLACK HILLS, PENNINGTON COUNTY, SOUTH DAKOTA

RAPID CITY WEST QUADRANGLE

Aquifer Susceptibility Maps

Aquifer Susceptibility:

In general, the capabilities of rocks to absorb water are referred to as *aquifer susceptibility*. The susceptibility rating (low to high) is based upon the intrinsic characteristics of the rock, without regard to human influences. See chart at lower left of map for factors utilized in determining susceptibility rating.

Madison Aquifer (Pahasapa Limestone): (see map)

The recharge area of the Madison aquifer in the Rapid City West Quadrangle comprises about six and one-half square miles along the western margin of the quadrangle. The formation consists of layers of karstic limestone and dolomite (Miller, 2005).

Because the Madison aquifer is strongly affected by fractures and karst (caves, breccia pipes, etc.) it is assigned an overall rating of **high susceptibility** (red color). Where alluvial deposits overlie the Madison along streams, e.g., along Rapid Creek and Boxelder Creek, the susceptibility is even greater as a result of the longer period of time in which water contained in the alluvial material (these sands and gravels comprise an aquifer themselves) may be in contact with the underlying layers.

Minnelusa Formation (see map)

The recharge area of the Minnelusa aquifer in the Rapid City West Quadrangle comprises about 16 square miles, extending north-south through the entire central part of the quadrangle. The formation consists of layers of limestone, dolomite, sandstone and shale in the lower part and dominantly sandstone and mudstone in the upper part (Hargrave, 2005).

As shown on the Aquifer Susceptibility Map, these rock layers are assigned a rating of **medium to high susceptibility** (shown in gold), although the sandstone units in the upper part (Figures 1 and 2) might be at the upper limit of this range.

Along drainages, e.g., Rapid Creek and Boxelder Creek, a rating of **high susceptibility** (shown in orange) is assigned to that part of the Minnelusa aquifer overlain by alluvial deposits. The increased rating results from the likelihood of a longer period of contact of water contained in the gravel (these gravels comprise an aquifer themselves) with the underlying layers.

Inyan Kara Group

A small part of the recharge area of the Inyan Kara Group (composed of the Fall River Formation and the underlying Lakota Formation) is present along the eastern edge of the quadrangle. Only the lower part of the aquifer, the Lakota Formation, is present. This formation, composed of interlayers of sandstone and mudstone, is assigned a rating of **medium to high susceptibility**.



Figure 1. The upper Minnelusa Formation exposed in a cut along Nemo Road northwest of Rapid City. The upper part is sandstone, the cream and rose layers are mixed sandstone and mudstone. The upper sandstone is generally the first aquifer for water wells drilled in the “Red Valley” surrounding the Black Hills.

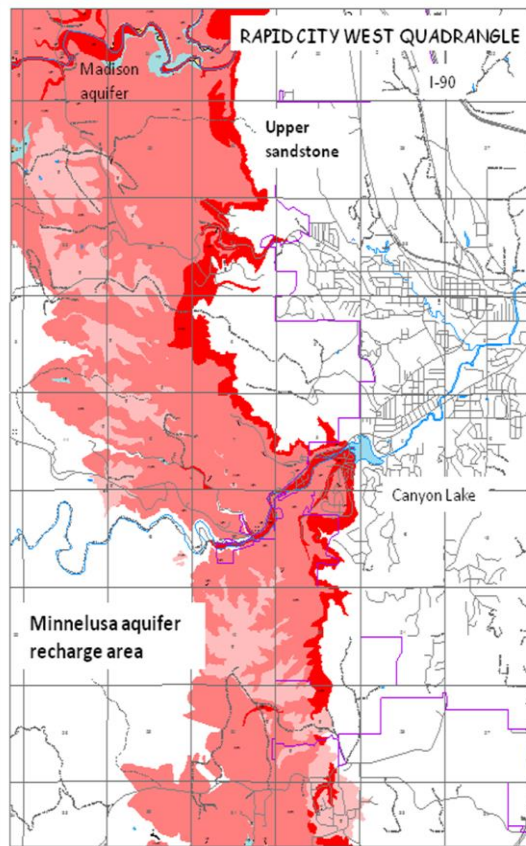


Figure 2. Minnelusa aquifer susceptibility within the area of the Rapid City West quadrangle. The bright red area along the eastern margin of the aquifer indicates the location of the upper sandstone, the area of highest susceptibility rating for the aquifer. Pink = gravel cover.

REFERENCES

- Hargrave, R. G, 2005, Vulnerability of the Minnelusa Aquifer to Contamination in the Rapid City West Quadrangle, Pennington County, South Dakota: unpub. M. S. thesis, South Dakota School of Mines and Technology, 80 p.
- Miller, S. L, 2005, Influence of Geologic Structure and Stratigraphy on Ground Water Flow-Paths in the Karstic Madison Aquifer in the Rapid City Area, South Dakota: Ph.D. dissertation, South Dakota School of Mines and Technology, 191 p.