ROCKERVILLE QUADRANGLE: Groundwater Production by Aquifer

In the 56-square-mile area of the Rockerville Quadrangle, groundwater is produced from numerous aquifers, including metamorphic crystalline rocks of the Precambrian basement (in which water is contained only in fractures) and several sedimentary formations composed of sandstone, limestone, and dolomite. Of the latter, the Deadwood Formation, Pahasapa (Madison) Limestone, and Minnelusa Formation are dominant.

Information given in the following figures in regard to the volume of water produced, the depth of the wells, and the aquifer providing the water is taken from the website of the South Dakota Geological Survey http://www.sdgs.usd.edu/. The values are for private wells as reported in Well Drillers Reports of the South Dakota Water Rights Program and indicate the flow rates at the time of completion of the wells. Figure 1 shows that, for all wells reported, most produce less than 50 gallons per minute and that the lowest volumes are from wells into the Precambrian basement rocks.

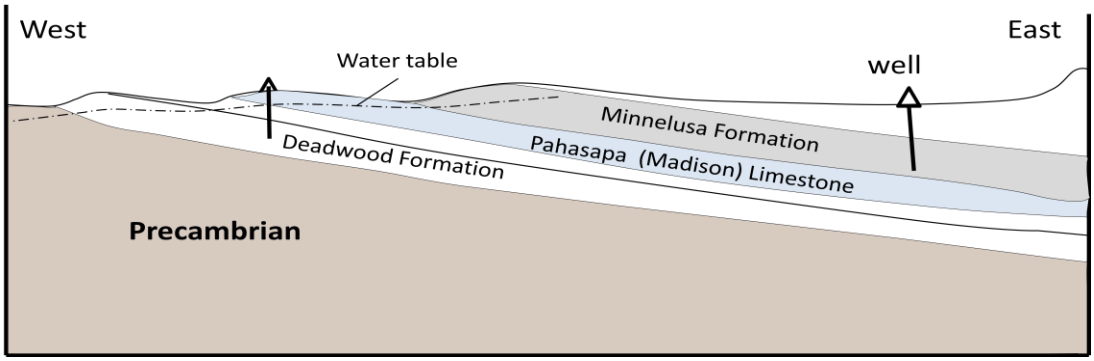

Figure 1. Diagrammatic cross section illustrating the relationships of aquifers in the Rockerville Quadrangle. Note that drilling depths are greater within each aquifer to the east. Also, in the areas of outcrop of the formations (their western edges) the thickness of the water-bearing zone is less and may be absent.

PRECAMBRIAN CRYSTALLINE AQUIFER (METAMORPHIC ROCKS)

In the western part of the quadrangle, Precambrian metamorphic rocks are exposed at the surface and are, therefore, the source of most groundwater in the area (a few shallow wells might be completed in the alluvium along valley bottoms). For the several wells for which information is available, the drill depths range from 150 to 1,000 feet (Figure 2). Water production from these wells varies from one to 16 gallons per minute. Such a range of rates is comparable to wells in the Keystone and Hill City area to the west, although in rare cases production of 100 gallons per minute is reported from wells there.

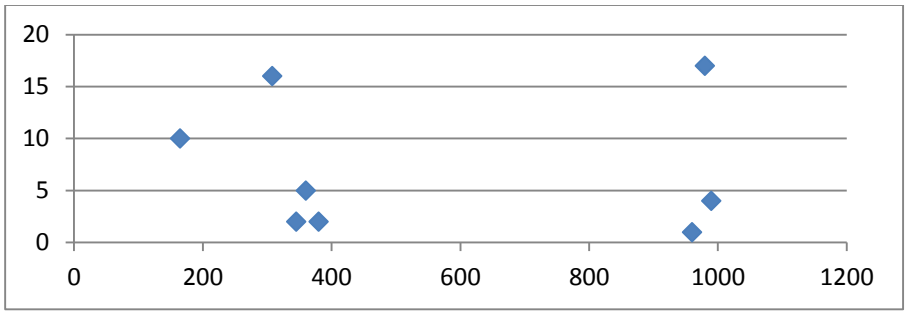

Figure 2. Water production for wells in the Precambrian crystalline basement, Rockerville Quadrangle. The base line indicates total depth of well. The vertical axis shows gallons per minute initial water flow.

DEADWOOD FORMATION

Water production reported from the Cambrian-age Deadwood Formation varies from one to 180 gallons per minute although, as illustrated in Figure 3, most values are less than 40 gallons per minute. For the 29 wells from the sandstone aquifer, depth does not seem to be a factor regarding volume of water produced, although the greatest volume is from wells in the 500 to 800 foot depth range.

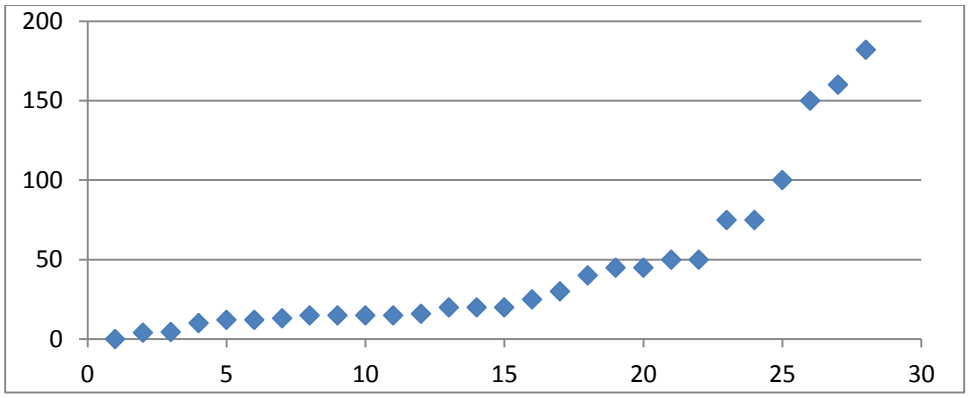

Figure 3. Water production from wells in the Deadwood Formation, Rockerville Quadrangle. The vertical axis shows gallons per minute initial water flow. The horizontal axis shows that information was available from 29 wells. Note that most wells yielded less than 40 gallons per minute.

PAHASAPA (MADISON) LIMESTONE

Mississippian-age limestone and dolomite of the Madison aquifer is called the Pahasapa Limestone in the Black Hills. This formation is a major water-bearing unit, in part because of the caves and fissures (called karst) which formed from dissolution of the rock mass by flowing water in fractures (a process that continues today). Water flows directly into such caves along Spring Creek within the area, helping to recharge the reservoir.

In the eastern one-half of the quadrangle, wells reach the Madison aquifer at depths of 400 to 1,000 feet. As shown in the graph of Figure 4, initial production from such wells varies between 10 and 50 gallons per minute. Elsewhere along the eastern flank of the Black Hills wells into the Madison aquifer can have flow rates of several hundred gallons per minute, but some wells might produce no water at all.

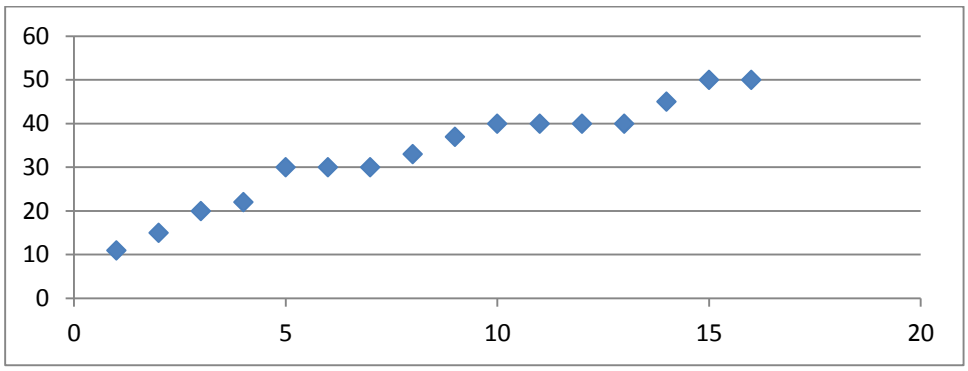

Figure 4. Water production from wells in the Pahasapa Limestone (Madison aquifer), Rockerville Quadrangle. The vertical axis shows gallons per minute initial water flow. The horizontal axis shows that information was available from 16 wells. Note that most wells produced less than 40 gallons per minute.

MINNELUSA FORMATION

Pennsylvanian and Permian-age sandstone, limestone, and dolomite comprise the Minnelusa Formation aquifer in the Black Hills. In the eastern one-half of the quadrangle, wells reach the Minnelusa at depths of 245 to 1,370 feet. The graph of Figure 5 indicates initial water production from 26 wells at rates of one to 125 gallons per minute. Most flow rates are less than 50 gallons per minute. The upper sandstone of the formation is the first productive aquifer reached by wells in the Red Valley along the eastern part of the quadrangle.

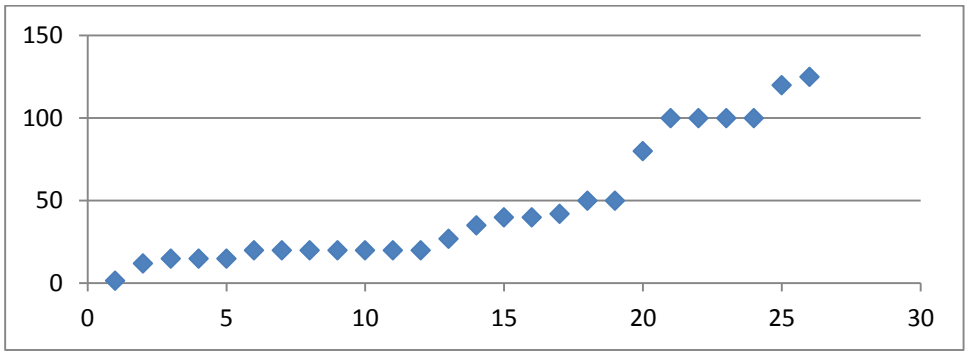

Figure 5. Water production from wells in the Minnelusa Formation, Rockerville Quadrangle. The vertical axis shows gallons per minute initial water flow. The horizontal axis shows that information was available from 26 wells. Note that most wells yielded less than 50 gallons per minute.