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

RAPID CITY WEST QUADRANGLE

Depth-to-Aquifer Maps

Depth-to-Aquifer Map

The depth-to-aquifer maps presented here use a color spectrum to indicate the approximate depths expected for drilling at any location underlain by the aquifer. Each color represents a depth range of 100 feet. Accuracy is expected to be within 50 feet closer to the recharge area and could be greater to the east where the depths are greater and there are fewer water wells to use as control points.

The maps are constructed in a Geographic Informational System (GIS) program by subtracting the structure contour values for the top of the aquifer from the surface topographic contour lines.

Madison aquifer (Pahasapa Limestone): (see map)

The Madison Aquifer can be encountered in drill holes in the eastern one-half of the quadrangle. In general, the surface of the aquifer increases in depth toward to the east and reaches a **maximum of about 2,000 feet along Sky Line Ridge in the eastern part of the map area and about 1,300 feet along the flood plain of Rapid Creek**. North of this area, across a fault (on which is located City Springs) and a south-facing monocline, drill depths to the aquifer are less along the crests of several north-trending anticlinal folds. In addition, the drill depth is locally affected by topography and will be much greater along Sky Line Ridge, for example. In lower elevations along the flood plain of Rapid Creek, Madison wells flow (Figure 1) under artesian head.



Figure 1. Artesian well producing from the Madison aquifer in west Rapid City, SD.

Minnelusa Formation (see map)

As shown on the accompanying Depth-to-Aquifer map, the Minnelusa Aquifer can be encountered in drill holes located across the eastern one-half of the quadrangle. In general, the surface of the aquifer increases in depth to the east and a **maximum of about 1,400 feet below the surface along Sky Line Drive** at the eastern edge of the area: **Along the flood plain of Rapid near “The Gap” the depth to the aquifer is approximately 700 feet.** North of this area, across a fault and a south-facing monocline, drill depths to the aquifer are **less than 300 feet along the crests of several north-trending anticlinal folds.**

The local depth is dependent upon both topography and folds of the aquifer surface, however. Drill depths are greater along ridges and less in adjacent valleys. In addition, a large anticlinal fold extends north-south across the entire quadrangle. Drill depths along the crest of this fold may be as much as 150 feet less than in the adjoining syncline trough paralleling the anticline to the west, although this figure varies greatly as a result of the topography.

Inyan Kara Group:

Only a small area along the eastern margin of this quadrangle comprises the recharge area of the Inyan Kara Group (Fall River Formation only). This area is above the water table and unsuitable for drilling to this aquifer.

REFERENCES

Fahrenbach, M. and Sawyer, J. F., 2001, Geologic Map of the Rapid City West Quadrangle, South Dakota, Geological Survey, South Dakota Department of Environment and Natural Resources, 7.5 Minute Geologic Quadrangle Map 3, 1,24,000 scale.