

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

### *Structure Contour Map*

***Structure Contour Map:*** A map showing by means of contour lines of equal elevation the shape of the surface of a selected rock layer (contact) beneath the Earth's surface.

### *BLACKHAWK QUADRANGLE*

As illustrated in the generalized cross section below, the sedimentary formations within the Blackhawk Quadrangle are affected by a regional tilt (dip) of eight to ten degrees to the east. This regional dip is interpreted, however, by folds (anticlines and synclines) in which the common limb dips to the west as much as 35°.

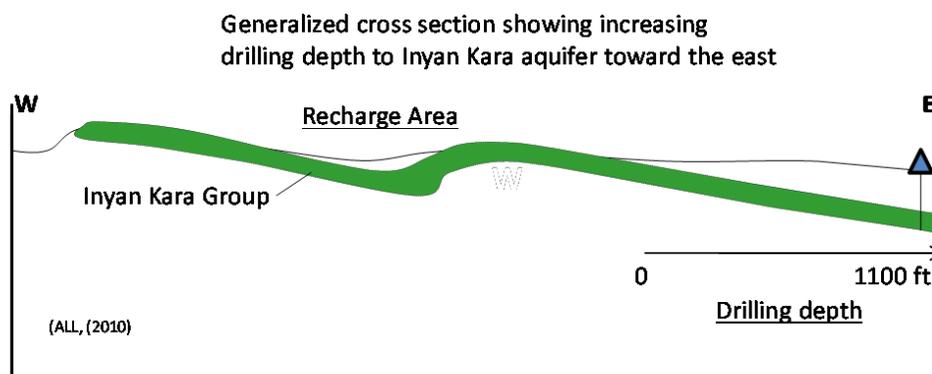


Figure 1. Diagrammatic east-west cross section illustrating eastward tilt of layers and folds within the Blackhawk Quadrangle.

### *Inyan Kara Group:* (see map)

Surface exposures of the Inyan Kara aquifer (combined Lakota Formation and Fall River Formation) extend diagonally across the Blackhawk Quadrangle from the northwest to the southeast corners. North-northwest-trending structure contour lines reveal that the upper contact of the unit, the east side, extends from the surface, at elevations of approximately 3,700 feet, to 2000 feet above sea level at the northeast corner of the quadrangle, a horizontal distance of about seven miles.

A northerly trending fold, the Piedmont Anticline, extends the entire length of the quadrangle in its central portion. The folds display parallel anticlinal-synclinal axes, recognized

as sharp bends in the contour lines. The maximum amount of vertical offset between the anticlinal and synclinal axes of this fold is approximately 300 feet: dips in this west fold limb are as much as 35° west. A smaller, north-trending anticline-syncline pair, are present in the southeastern most portion of the quadrangle.

Two faults are interpreted as well. In the north, an easterly trending fault offsets the axis of the Piedmont Anticline: The north side of the fault is down as much as 100 feet relative to the south side. The second fault, with an offset of 25 feet or less, trends north near the middle portion of the eastern margin of the quadrangle.

*Minnelusa aquifer (see map)*

The Minnelusa Formation is exposed at the surface along a length of six miles in the southwest corner of the quadrangle. Structure contours reveal that the upper contact of the unit extends from the surface, at elevations of approximately 4,000 feet, to 300 feet above sea level at the northeastern corner of the quadrangle. The locations are separated horizontally by about eight miles.

The northerly trending Piedmont Anticline extends across the entire length of the quadrangle in its central portion. The maximum vertical offset between the anticlinal and synclinal axes of this fold is approximately 300 feet: dips in the west fold are as much as 35° west at the surface and may be greater at the depth of the Minnelusa aquifer. The anticline axis is offset, down to the north, by an east-trending fault along Elk Creek.

*Madison aquifer (Pahasapa Limestone):*

The Pahasapa Limestone (Madison aquifer) is exposed at the surface for a two mile length in the southwest corner of the quadrangle. Structure contours reveal that the upper contact of the unit extends from the surface, at elevations of approximately 4,400 feet, to one hundred feet below sea level at the northeastern corner of the quadrangle. The locations are separated horizontally by about eight miles.

In addition to the overall northeastward dip, the surface is folded by two large anticlines. The south-plunging Hudson Ranch Anticline crosses the southwest corner of the quadrangle. The northerly trending Piedmont Anticline extends across the entire length of the quadrangle in its central portion. The maximum vertical offset between the anticlinal and synclinal axes of this fold is approximately 300 feet: dips in the west fold are as much as 35° west at the surface and may be greater at the depth of the Madison aquifer. Several petroleum tests along the crest of this fold encountered only water in the Pahasapa Limestone.

## REFERENCES

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