

Elevation Contour Map of the Madison Limestone Butte, Meade, and Lawrence Counties, South Dakota

By Crystal M. Hocking, P.G.
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INTRODUCTION

This map is a product of the Belle Fourche River Watershed Groundwater Study performed by RESPEC, and is part of a series of 1:180,000-scale structure contour and depth-to maps for the study. The study area consists of Butte, Meade, and Lawrence counties located in the Black Hills of South Dakota. The study focused on four major aquifers including the Inyan Kara, Minnelusa, Madison, and Deadwood. The purpose of this map is to show the elevation of the top (structure contours) of the Madison (Pahasapa) Limestone within the study area.

DATA

The outcrops and structural features shown on the map are from Martin and others (2004), with modifications to the structural features from Lisenbee (1985). The data points shown on this map were compiled from the interpretations of drillers' logs of numerous monitoring, water, and oil and gas test holes. The primary drill-hole data sources used in this study are digital databases generated by state government programs: (1) the well completion report database created by the Water Rights Program, South Dakota Department of Environment and Natural Resources, (2) the lithologic logs database created by the South Dakota Geological Survey Program, and (3) the oil and gas database created by the Minerals and Mining Program, South Dakota Department of Environment and Natural Resources (see REFERENCES). The locations of wells and drill holes are typically recorded based on legal location, thus the plotted latitude and longitude of these points is only approximate. The ground surface elevation was also determined in ArcGIS from 30 m DEMs.

Existing structural contour maps, such as those produced by Gries (1981) and by the U.S.G.S. as part of the Black Hills Hydrology study, were used as guides and modified according to available well log data. Few modifications were made to the U.S.G.S. structure contour maps near the outcrop, unless justified by additional well control data. In areas where no wells penetrated the formation, the altitude of the top of the formation was estimated based on the structural contours and well logs of shallower units; these areas are less accurate than areas nearer the outcrop and are dashed where distance from known data points increases.

The contour interval on this 1:180,000-scale map is 100 feet in proximity to the outcrop and where data points are dense enough to warrant such an interval. At distance from the outcrop, the contour interval is increased to 250 feet below the 1500 elevation contour. A few data in the drill-hole database are excluded from the map because they are interpreted to yield improbable elevations. In all cases where drill-hole data were not used for contouring, the data are still within the drill-hole database, and thus, can be considered in alternative interpretations by users of the map. Both the database and the contour lines are available digitally.

The decision of which data in the drill-hole database are reliable is based on all available geologic information, but ultimately it was subjective and at the discretion of the author. In general, the accuracy of the lithologic log may be questionable and/or the location could be inaccurate. Only wells that were believed to be accurate are displayed on the maps.

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