DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

WATER-RESOURCES INVESTIGATIONS 82-4039

INTRODUCTION

In 1978 the U.S. Geological Survey began a 4-year study of aquifers in the northern Great Plains. The purpose of this map, which is a product of that study, is to show the altitude of the top of the Lakota Formation and equivalent rocks. Other maps show the total thickness (Feltis, 1982a), cumulative thickness of sandstone (Feltis, 1982b), and potentiometric surface of water (Levings, 1982) in the Lakota Formation and equivalent rocks. These maps are part of a series that describes the geology and potentiometric surface of selected rock units of Jurassic or younger age in the plains area of Montana.

SOURCE OF DATA

Most geologic data used to compile the map have been obtained from records of oil and gas exploration wells on file in offices of the Montana Department of Natural Resources and Conservation and the U.S. Geological Survey. The data were derived from interpretation of geophysical logs of oil or gas test wells. One site per township was the optimum density of data selected for map compilation; however, geophysical logs were not available for all townships.

LAKOTA FORMATION AND EQUIVALENT ROCKS

The Lakota Formation is the basal Cretaceous rock unit in eastern Montana and generally is a fluvial sandstone or conglomeratic sandstone that was deposited on the eroded surface of Jurassic rocks, mostly the Morrison Formation. These deposits represent sediments that were deposited by an Early Cretaceous drainage system that extended as far south as Arizona and from Utah east to Kansas (McGookey and others, 1972, p. 193, 196). The Lakota stratigraphically is equivalent to the Pryor Conglomerate Member, Third Cat Creek sandstone (of subsurface usage), and Sunburst Sandstone Member--all of the Kootenai Formation of south-central and central Montana. In the northwest part of the area, the Lakota is equivalent to the Cut Bank Sandstone Member of the Kootenai Formation. In central Montana, Gardner (1959) reported the basal sandstone of the Kootenai Formation as a 20- to 100-foot-thick unit that forms long prominent ridges but locally thins or disappears.

STRUCTURAL FEATURES

The map shows the range in altitude and the configuration of several structural features. The Williston basin is separated from the Powder River basin by the Miles City arch and Cedar Creek anticline in eastern Montana. In the northern part of the State the map shows the Sweetgrass arch, Sweet Grass Hills, Bearpaw and Little Rocky Mountains, Hogeland basin, Bowdoin dome, and Blood Creek syncline. In the center of the State is the Big Snowy anticlinorium with the Big Snowy, Judith, and North and South Moccasin Mountains at the west end and the Porcupine dome on the east. In south-central Montana the map shows the Bull Mountains and Wheatland basins, the Big Coulee-Hailstone dome, the anticlinal noses of the Big Horn and Pryor Mountains, and the north end of the Big Horn basin and east side of the Crazy Mountains basin connected by the Reed Point syncline. The Black Hills uplift is shown in the southeast corner of the State. These structures are all shown on the map by Dobbin and Erdmann (1955).

REFERENCES CITED

Dobbin, C. E., and Erdmann, C. E., 1955, Structure contour map of the Montana Plains: U.S. Geological Survey Oil and Gas Investigations Map OM-178B, scale 1:1,000,000.

Feltis, R. D., 1982a, Map showing total thickness of the Lakota Formation and equivalent rocks, Montana: U.S. Geological Survey Water-Resources Investigations 82-4026, scale 1:1,000,000.

_____1982b, Map showing cumulative thickness of sandstone in the Lakota Formation and equivalent rocks, Montana: U.S. Geological Survey Water-Resources Investigations 82-4040, scale 1:1,000,000.

Gardner, L. S., 1959, Geologic map of the Lewistown area, Fergus County, Montana: U.S. Geological Survey Oil and Gas Investigations Map OM-199, scale 1:63,360.

Levings, G. W., 1982, Potentiometric-surface map of water in the Lakota Formation and equivalent units in the northern Great Plains area of Montana: U.S. Geological Survey Open-File Report 82-563, scale 1:1,000,000.

McGookey, D. P., and others, 1972, Cretaceous System, *in* Geologic atlas of the Rocky Mountain region, 1972: Denver, Colorado, Rocky Mountain Association of Geologists, p. 190-228.

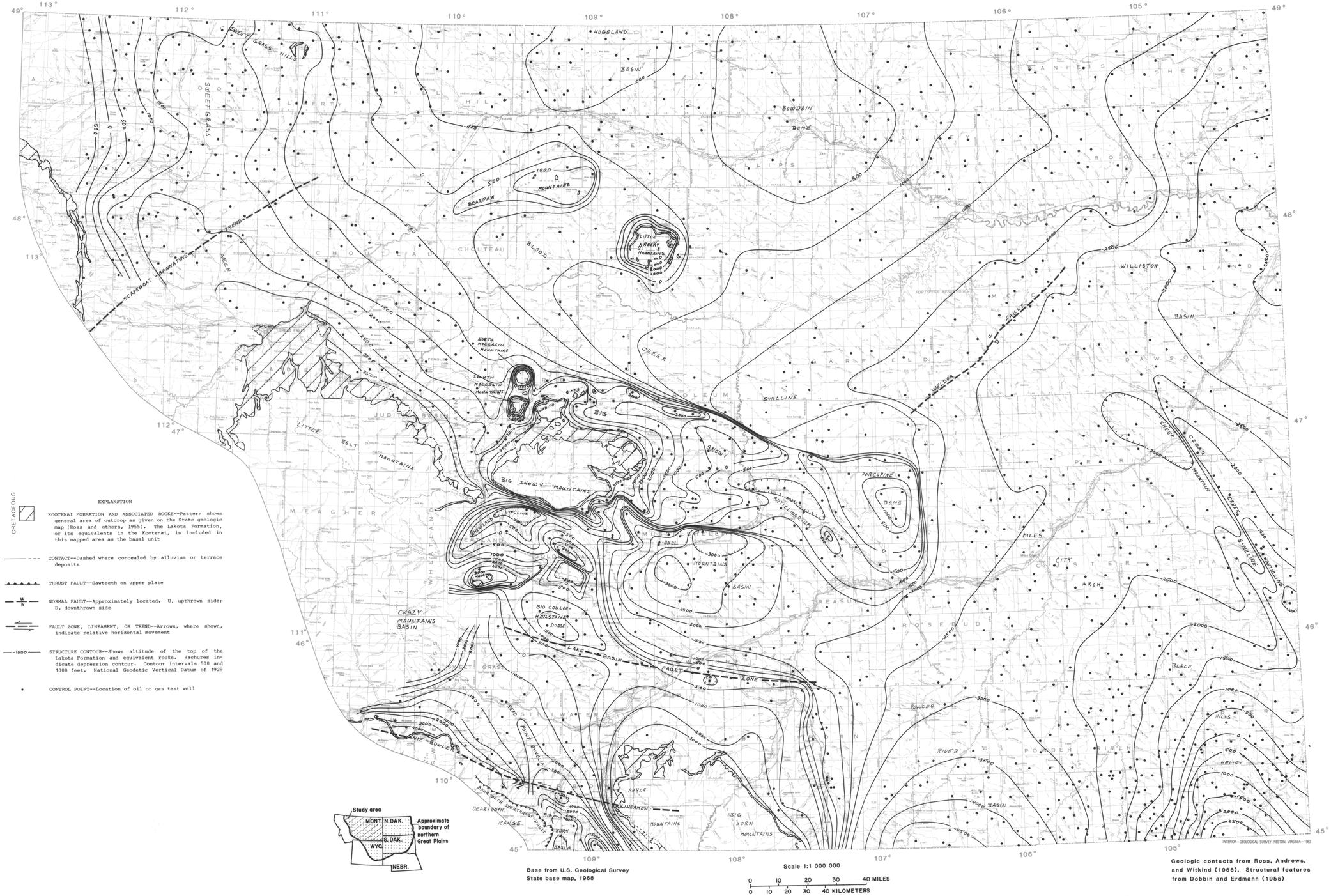
Ross, C. P., Andrews, D. A., and Witkind, I. J., 1955, Geologic map of Montana: U.S. Geologic Survey, scale 1:500,000, 2 sheets.

METRIC CONVERSION TABLE

The following factors can be used to convert inch-pound units in this report to the International System of units (SI):

Multiply inch-pound unit	By	To obtain SI unit
foot	0.3048	meter
mile	1.609	kilometer

National Geodetic Vertical Datum of 1929: A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called mean sea level.



EXPLANATION

CRETACEOUS

KOOTENAI FORMATION AND ASSOCIATED ROCKS--Pattern shows general area of outcrop as given on the State geologic map (Ross and others, 1955). The Lakota Formation, or its equivalents in the Kootenai, is included in this mapped area as the basal unit

CONTACT--Dashed where concealed by alluvium or terrace deposits

THRUST FAULT--Sawteeth on upper plate

NORMAL FAULT--Approximately located. U, upthrown side; D, downthrown side

FAULT ZONE, LINEAMENT, OR TREND--Arrows, where shown, indicate relative horizontal movement

STRUCTURE CONTOUR--Shows altitude of the top of the Lakota Formation and equivalent rocks. Hachures indicate depression contour. Contour intervals 500 and 1000 feet. National Geodetic Vertical Datum of 1929

CONTROL POINT--Location of oil or gas test well

Base from U.S. Geological Survey
State base map, 1968

Scale 1:1 000 000

0 10 20 30 40 MILES
0 10 20 30 40 KILOMETERS

Geologic contacts from Ross, Andrews, and Witkind (1955). Structural features from Dobbin and Erdmann (1955)

INTERIOR--GEOLOGICAL SURVEY, RESTON, VIRGINIA--1983

MAP SHOWING ALTITUDE OF THE TOP OF THE LAKOTA FORMATION AND EQUIVALENT ROCKS, MONTANA

by
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1982

Helena, Montana