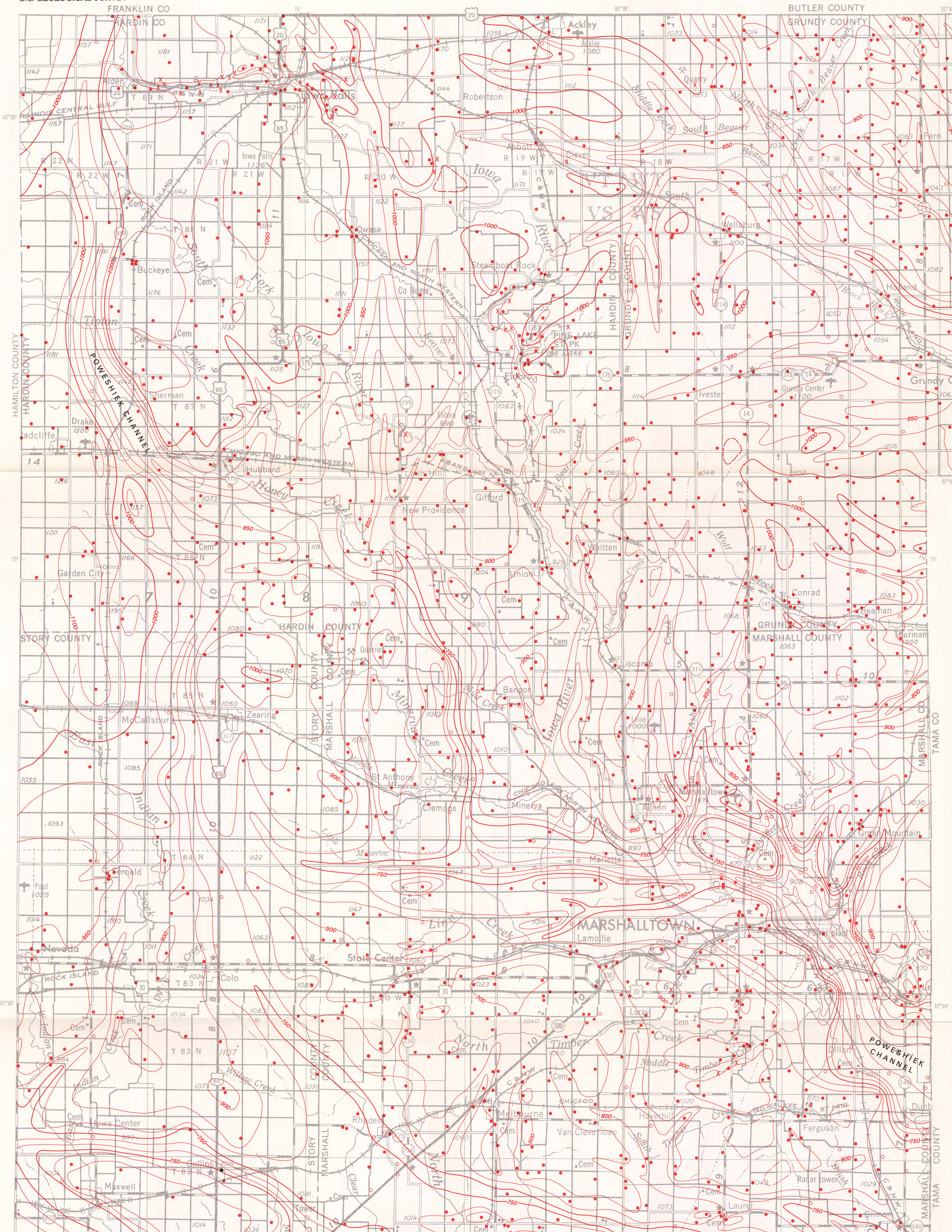
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
IOWA GEOLOGICAL SURVEY

MISCELLANEOUS INVESTIGATION SERIES
MAP I-1609 (EAST HALF)



Base from U.S. Geological Survey 1:250,000 Des Moines, 1954–72; Fort Dodge, Omaha, 1954–74; and Waterloo, 1954–76

APPROXIMATE MEAN DECLINATION, 1985

SCALE 1:125 000

CONTOUR INTERVAL 50 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

BEDROCK TOPOGRAPHY OF CENTRAL IOWA

By
R. E. Hansen
1985

EXPLANATION

Log data
Bedrock penetrated

Log data
Bedrock not penetrated

Published data
Bedrock penetrated

Published data
Bedrock not penetrated

X
Quarry or outcrop

750
Bedrock contour
Shows altitude of bedrock surface. Dashed where approximately located. Contour interval is 50 feet. National Geodetic Vertical Datum of 1929

INTRODUCTION

The bedrock in Iowa (Hershey, 1969) generally is overlain by deposits of glacial drift and alluvium. The drift, comprised of glacial till and glacial outwash, varies in thickness from less than 1 foot to more than 400 feet; the alluvium in central Iowa varies in thickness from less than 1 foot to about 60 feet. The configuration of the bedrock surface is the result of a complex system of ancient drainage courses which were developed during a long period of preglacial erosion and during shorter, but more intense, periods of interglacial erosion. This map, for a 10-county area in central Iowa, is the seventh of a series of 9 reports that will provide statewide coverage of the bedrock surface of Iowa.

METHODS OF INVESTIGATION

Primary control for the map is geological log data and information from quarries and outcrops. Some published well data (Norton and others 1912) are available but most of the well locations given are too general to locate on the map or to assign land-surface altitudes with reasonable accuracy. These data are used principally in areas where primary control is limited and to support the contouring of major features such as bedrock channels. More detailed information about the control data is available in the cooperative files of the Iowa Geological Survey and the U.S. Geological Survey, Iowa City, Iowa.

The accuracy of the map is related to the density of control points; the greater the number of points there are in a given area, the more confidence can be assigned to the contours. In several instances dashed contours are shown where it seems reasonable to continue a ridge or channel but where no control point is available to confirm the contours.

BEDROCK TOPOGRAPHY

The bedrock topography reflects both the lithology of the underlying rock and the erosional history of the bedrock surface. The principal features of the map are the buried channels that traverse the area from northwest to southeast. These channels include the Poweshiek in the northeast, the Skunk in the central, and the Jordan and Beaver (Twenter and Coble, 1965) in the west and the southwest parts of the area. The Poweshiek channel is incised into predominately limestone and dolomite bedrock. The channel walls tend to be fairly steep and the uplands broad and flat. In contrast, the other buried channels are incised into mostly shale, sandstone, and siltstone bedrock with only minor limestone beds. These buried channels in the central and southern parts of the area, are broader with gently sloping walls and the divide areas are more rounded and dissected.

The bedrock surface in the central part of both Boone and Webster Counties, the north central part of Hardin County and the western part of Dallas County illustrate parts of the bedrock surface that have been sculptured primarily by present-day streams. The streams have incised the bedrock uplands and have extended their valleys by headward erosion. Generally, the bedrock-incised valleys tend to be narrow and steep walled.

Occasionally, the present-day streams occupy valleys that are situated over buried channels and relatively broad valleys have developed. Examples are Beaver Creek in Dallas County and South Skunk River in Story County.

USES OF MAP

The bedrock map, when used on conjunction with land-surface altitudes, is a vital tool for studying hydrologic, environmental, and geologic problems.

Hydrology.–The map is an aid in locating supplies of ground water. The areas that are most favorable for the development of ground-water supplies are the buried-bedrock channels and alluvial valleys of present-day streams. In areas that are underlain by shale, the bedrock channels usually are the principal source of potable water for private domestic and stock wells and a few small towns. Although not all channels contain sand and gravel aquifers, the larger, more extensive channels of the map area contain aquifers that supply many farm and rural-domestic needs. Recorded yields generally range from 10 to 30 gallons per minute but yields of 100 to 500 gallons per minute may be possible.

The alluvial deposits, which are as much as 60 feet thick and contain sand and gravel aquifers, will yield from 10 to 40 gallons per minute to individual wells and about 100 gallons per minute in some localities. Large yields for municipal supply have been developed in the alluvial deposits of the larger rivers that cross the area. Because few wells have been completed in the alluvium and information is limited, test drilling will be necessary to determine local conditions, especially when attempting to develop a large supply of water.

The map will help the drilling contractor when planning the construction of a well. By determining the depth to bedrock, the contractor can estimate casing needs and prepare more accurate cost estimates. And, where the unconsolidated overburden is particularly thick, the contractor can be better prepared for any problems attendant to drilling this material.

Other uses for the map are in river-basin hydrology studies and in determining surface-water and ground-water relationships at selected locations.

Environment.–The bedrock information is particularly valuable to state, regional, and local planners concerned with environmental problems such as the location of landfill sites. The thickness of overburden, which can be determined with the aid of this map, is an important factor to consider for the protection of ground-water supplies from potential contamination.

Geology.–The bedrock map shows the location of bedrock highs, which are of interest to quarry operators and to construction engineers concerned with foundation problems. The map also aids in the interpretation of drainage changes caused by glacial advances and in mapping the areal distribution of consolidated rocks.

ACKNOWLEDGMENTS

Particular recognition is made to the present and past members of the Iowa Geological Survey who, during many years, have collected and analyzed drill-hole samples, determined land-surface altitudes, and compiled other information necessary to prepare this map. Further acknowledgment is made to the many well drilling contractors who have voluntarily collected drill cuttings and have provided other well data.

CONVERSION FACTORS

For use of readers who prefer to use metric units, conversion factors for terms used in this report are listed below:

Multiply	By	To obtain
foot	0.3048	meter
mile	1.609	kilometer
gallon per minute	0.0630	liter per second

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

SELECTED REFERENCES

Arey, M. F., 1910, Geology of Grundy County: Iowa Geological Survey Annual Report, V. 20, p. 61–95.
Bain, H. F., 1897, Geology of Polk County: Iowa Geological Survey Annual Report, v. 7, p. 263–412.
Beyer, S. W., 1896, Geology of Boone County: Iowa Geological Survey Annual Report, v. 5, p. 175–239.
——— 1897, Geology of Marshall County: Iowa Geological Survey Annual Report, v. 7, p. 197–262.
——— 1899, Geology of Story County: Iowa Geological Survey Annual Report, v. 9, p. 155–245.
——— 1900, Geology of Hardin County: Iowa Geological Survey Annual Report, v. 10, p. 241–313.
Cagle, J. W., 1973, Bedrock topography of south-central Iowa: U.S. Geological Survey Miscellaneous Geologic Investigations Map I–763.
Hale, W. E., 1955, Geology and ground-water resources of Webster County, Iowa: Iowa Geological Survey Water-Supply Bulletin 4, 257 p.
Hansen, R. E., 1972, Bedrock topography of east-central Iowa: U.S. Geological Survey Miscellaneous Geologic Investigations Map I–717.
——— 1973, Bedrock topography of southeast Iowa: U.S. Geological Survey Miscellaneous Geologic Investigations Map I–808.
——— 1975, Bedrock topography of northeast Iowa: U.S. Geological Survey Miscellaneous Geologic Investigations Map I–933.
——— 1978, Bedrock topography of north-central Iowa: U.S. Geological Survey Miscellaneous Geologic Investigations Map I–1080.
Hershey, H. G., 1969, Geologic map of Iowa: Iowa Geological Survey, scale 1:500,000.
Kay, G. F., and Apfel, E. T., 1929, The pre-Illinoian Pleistocene geology of Iowa: Iowa Geological Survey Annual Report, v. 34, 304 p.
Kay, G. F., and Graham, J. B., 1943, The Illinoian and post-Illinoian Pleistocene geology of Iowa: Iowa Geological Survey Annual Report, v. 38, 262 p.
Lees, J. M., 1935, Additional deep wells: Iowa Geological Survey Annual Report, v. 36, p. 365–419.
Leonard, A. G., 1898, Geology of Dallas County: Iowa Geological Survey Annual Report, v. 8, p. 1–118.
Macbride, T. H., 1910, Geology of Hamilton and Wright counties: Iowa Geological Survey Annual Report, v. 20, p. 97–149.
Norton, W. H., Deep wells of Iowa: Iowa Geological Survey Annual Report, v. 33, p. 9–374.
Norton, W. H., and others, 1912, Underground water resources of Iowa: U.S. Geological Survey Water-Supply Paper 293, p. 670–761.
——— 1912, Underground water resources of Iowa: Iowa Geological Survey Annual Report, v. 21, p. 749–810.
Sendlein, L. V. A., and Gilmore, J. L., 1980, Bedrock topography of southwest Iowa: U.S. Geological Survey Miscellaneous Geologic Investigations Map I–1222.
Twenter, F. R., and Coble, R. W., 1965, The water story in central Iowa: Iowa Geological Survey Water Atlas 1, 89 p.
Wilder, F. A., 1902, Geology of Webster County: Iowa Geological Survey Annual Report, v. 12, p. 63–235.
Williams, I. A., 1905, Geology of Jasper County: Iowa Geological Survey Annual Report, v. 15, p. 277–367.

For sale by Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225