DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE MINNESOTA GEOLOGICAL SURVEY

GEOPHYSICAL INVESTIGATIONS
MAP GP 100

TOTAL INTENSITY AEROMAGNETIC AND GEOLOGIC MAP OF NORTHERN AITKIN COUNTY MINNESOTA

RELATIVE TO ARBITRARY DATUM

Contour interval 50 & 250 gammas

Flown 1000 feet above surface

1953

SHEET 1 OF 2

Base from Minnesota Department of Highways maps

Aeromagnetic survey 1948 by J. R. Henderson and J. L. Meuschke
Compilation directed by J. L. Meuschke

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.

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EXPLANATION

FORMATIONS

Deerwood iron-formation--the relation of the Deerwood iron-formation and other formations is uncertain and its correlation is not fully understood.

Undifferentiated slate and schist--probably Thomson slate. Northern part of area may be underlain by Virginia slate but the exact relation between the two slates is unknown.

Huronian / Huronian(?) — PRE-CAMBRIAN

Indefinite contact

Drill hole

The stratigraphic classification and nomenclature of this report follow the usage of the Minnesota Geological Survey.

Magnetic contours with flight traverse; dashed contours indicate incomplete or doubtful data; hachured contour encloses area of lower magnetic intensity; 'x' and number denote location and value of measured maximum or minimum intensity within closed contour.

Index map of Minnesota

Area surveyed 1947-1951

An aeromagnetic survey covering an area of approximately 30,000 square miles in north-central Minnesota was made during May and August 1947, May 1948, and September and October 1949 by the U. S. Geological Survey in cooperation with the Minnesota Geological Survey. The purpose of the survey was to delineate the major magnetic trends associated with known iron ore deposits and to indicate areas that may be favorable for additional exploration.

North-south traverses were flown at 1-mile intervals. This spacing was selected to cover as large an area as possible with a minimum of flying. The aeromagnetic information is presented in two forms: as an aeromagnetic map, contoured to a common arbitrary datum, and as magnetic profiles that accompany the map.

The measurements were made with an AN/ASQ-3A airborne magnetometer installed in a Beechcraft AT-11 airplane for the 1947 and 1948 flights and in a Douglas DC-3 for the 1949 flights; the detecting element of the magnetometer was towed about 75 feet below the plane. The elevation of the plane, ranging between 900 and 1,100 feet above the ground, was recorded with a continuous-recording radio altimeter. Aerial photographs were used for pilot guidance during the flights, and the flight path was recorded by a gyrostabilized continuous-strip camera. Positional accuracy of all the surveys after 1947 was increased by use of a gyrostabilized vertical sight.

The geologic and drill-hole information for this map has been provided by G. M. Schwartz, Director of the Minnesota Geological Survey.

Northern Aitkin County is covered with irregular areas of terminal moraine and till plains (Pleistocene) deposited by the Patrician and Keewatin ice sheets. Moraine hills rise as much as 250 feet above the swampy glacial lake plain through which the Mississippi River flows. There are no outcrops of bedrock in the area, as the glacial drift is very thick, probably averaging 200 feet.

In the hope of discovering iron ore deposits in the northeastward extension of the Cuyuna range, numerous holes have been drilled. Most of the drill holes lie in a belt extending in a northeasterly direction diagonally across the area. Decomposed pre-Cambrian rocks or Cretaceous shales and sands are found beneath the drift in some holes. Slate, with well-developed foliation and closely resembling the slate in the outcrops to the northeast in Carlton County, is the predominant rock beneath the drift and Cretaceous rocks. In the area of the magnetic high in T. 49 N., R. 26 W., ferruginous slate and green slate, which resemble some of the formations of the Cuyuna district, are found. Ferruginous rocks were also found in T. 48 N., Rs. 26 and 27 W.

It seems unlikely that any of the anomalies within this map area would be an indication of extensive belts of iron-formation. Care must be taken in the interpretation, however, as some of the Cuyuna iron-bearing formations are almost nonmagnetic.

The cause of the broad anomaly in T. 52 N., R. 25 W., is unknown. Two drill holes on the flanks revealed only slate beneath the drift. There are no known variations in the slate in this area that would account for an anomaly of this size. The shape suggests the possibility of a small stocklike intrusive body.

Note

Aeromagnetic data are obtained and compiled along a continuous line, whereas ground magnetic surveys are made at separate points. Errors within the normal limits of any magnetic measurement may cause slight discrepancies between flight lines in an aeromagnetic map, which would be more obvious than similar discrepancies between points in a ground magnetic map. For this reason as much care should be exercised in evaluating magnetic features that appear as elongations along a single aeromagnetic traverse as in interpreting an anomaly indicated by a single ground station.