

EXPLANATION

- ESTIMATED WELL YIELDS,
IN GALLONS PER MINUTE
(LITERS PER SECOND)
- 501 to 1000 (32 to 63)
 - 251 to 1000 (16 to 63)
 - 251 to 500 (16 to 32)
 - 51 to 250 (3.2 to 16)
 - 0 to 50 (0 to 3.2)
- SELECTED TEST-HOLE AND WELL DATA

TEST HOLE OR WELL—Upper numbers are top and base of aquifer depth interval in glacial drift in feet below land surface. Number in parentheses is aggregate thickness of sand or gravel. Sand and gravel thicknesses of less than 5 feet (1.5 meters) not shown. Lower number, if present, is depth to consolidated rock in feet below land surface.

YIELD BOUNDARY—Dashed where approximately located

LOCATION OF BURIED VALLEY

INTRODUCTION

This investigation is part of a statewide program to determine the location, extent, and hydrologic characteristics of the major ground-water reservoirs (aquifers) in North Dakota.

The investigation was made cooperatively by the U.S. Geological Survey, North Dakota State Water Commission, North Dakota Geological Survey, Ransom County Water Management District, and Sargent County Water Management District.

This preliminary availability map is a product of the study of Ransom and Sargent Counties (see location map). A well inventory (Armstrong, 1979) provided data on depth, construction, and productivity of private and public wells. Test drilling by the North Dakota State Water Commission, Federal agencies, and commercial well drillers provided information regarding the thickness and the grain size of materials in the aquifers. Potential well yields were estimated from the thickness and hydraulic conductivity of the water-bearing materials logged at each test hole and from aquifer tests. Generally the yield of a well is proportional to the hydraulic conductivity, thickness, and areal extent of the aquifer, and available drawdown. If the width of an aquifer is limited, as in the case of channel deposits in surficial or buried valleys, well yields per unit of drawdown may decrease significantly as pumping continues, unless a stream, lake, or other source of water is intercepted by the cone of pumping influence.

OCCURRENCE AND POTENTIAL YIELD OF AQUIFERS

Aquifers occur both in glacial drift and in underlying bedrock formations in Ransom and Sargent Counties. However, the availability map shows only the extent of potential yields from the glacial-drift aquifers.

Glacial drift, which covers most of Ransom and Sargent Counties, is missing locally in the Sheyenne River valley but is as much as 400 feet (124 meters) thick in sec. 22, T. 130 N., R. 58 W. The drift may be divided into two types—till and glacioaqueous deposits. Till is a nonsorted mixture of clay, silt, sand, gravel, cobbles, and boulders deposited directly by glaciers. It has a low hydraulic conductivity and generally will yield only small quantities of ground water to wells. Glacioaqueous deposits are sorted and stratified deposits of silt, sand, and gravel. The sand and gravel deposits commonly have high hydraulic conductivities and form the principal aquifers in the two counties.

Glacioaqueous aquifers have been classified by their mode of deposition, such as buried-valley aquifers and surficial aquifers, which consist of outwash, deltaic, and/or lake deposits.

Buried-valley aquifers in Ransom and Sargent Counties consist of glaciofluvial materials that were deposited within valleys that were incised in older glacial drift and/or bedrock. These aquifers were then buried by younger drift. Where the valleys are deep and the glacial drift is thick, two or more saturated sand and/or gravel layers may be interbedded with, and confined by, layers of till and/or silt and clay. Many of the confining beds are local, and sand and gravel deposits that are separated in one place may merge and be hydraulically connected in another. In areas of optimum development these aquifers may yield as much as 1,000 gal/min [gallons per minute; 63 L/s (liters per second)] to wells.

Shallow aquifers in eastern Ransom County and in the southwestern part of Sargent County are predominantly deltaic deposits, but include some lake or outwash deposits. The aquifer materials range from silt to fine gravel. Shallow aquifers in western and south-central Ransom County and northwestern and northeastern Sargent County are outwash deposits composed of sand, gravel, and silt. Maximum well yields from the deltaic and outwash aquifers may be as much as 1,500 gal/min (93 L/s), however, sustained yields generally are less than 1,000 gal/min (63 L/s).

Thin glaciofluvial sand and gravel deposits buried within the glacial drift are common; however, most are too small to be shown on the map. These deposits generally yield enough water for average farm use and some of the larger deposits may yield as much as 500 gal/min (32 L/s) for a short time. Most sustained yields probably are less than 10 gal/min (0.6 L/s) because recharge to the aquifers and the quantity of storage in the aquifers are limited.

The availability map should be used with the understanding that the estimated yields are for wells that are properly screened and developed and fully penetrate the aquifer. The map is designed as a guide to the location of major aquifers and not to locate specific wells. Few aquifers are so uniform in their water-bearing properties that production wells may be drilled in them without preliminary test drilling. If the map is used with an understanding of its limitations, it will be useful in the future development of the ground-water resources of the area.

SELECTED REFERENCES

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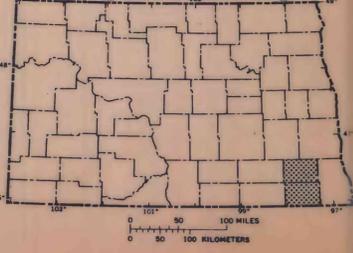
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PRELIMINARY MAP SHOWING AVAILABILITY OF GROUND WATER FROM GLACIAL-DRIFT AQUIFERS IN RANSOM AND SARGENT COUNTIES, SOUTHEASTERN NORTH DAKOTA

By
CLARENCE A. ARMSTRONG