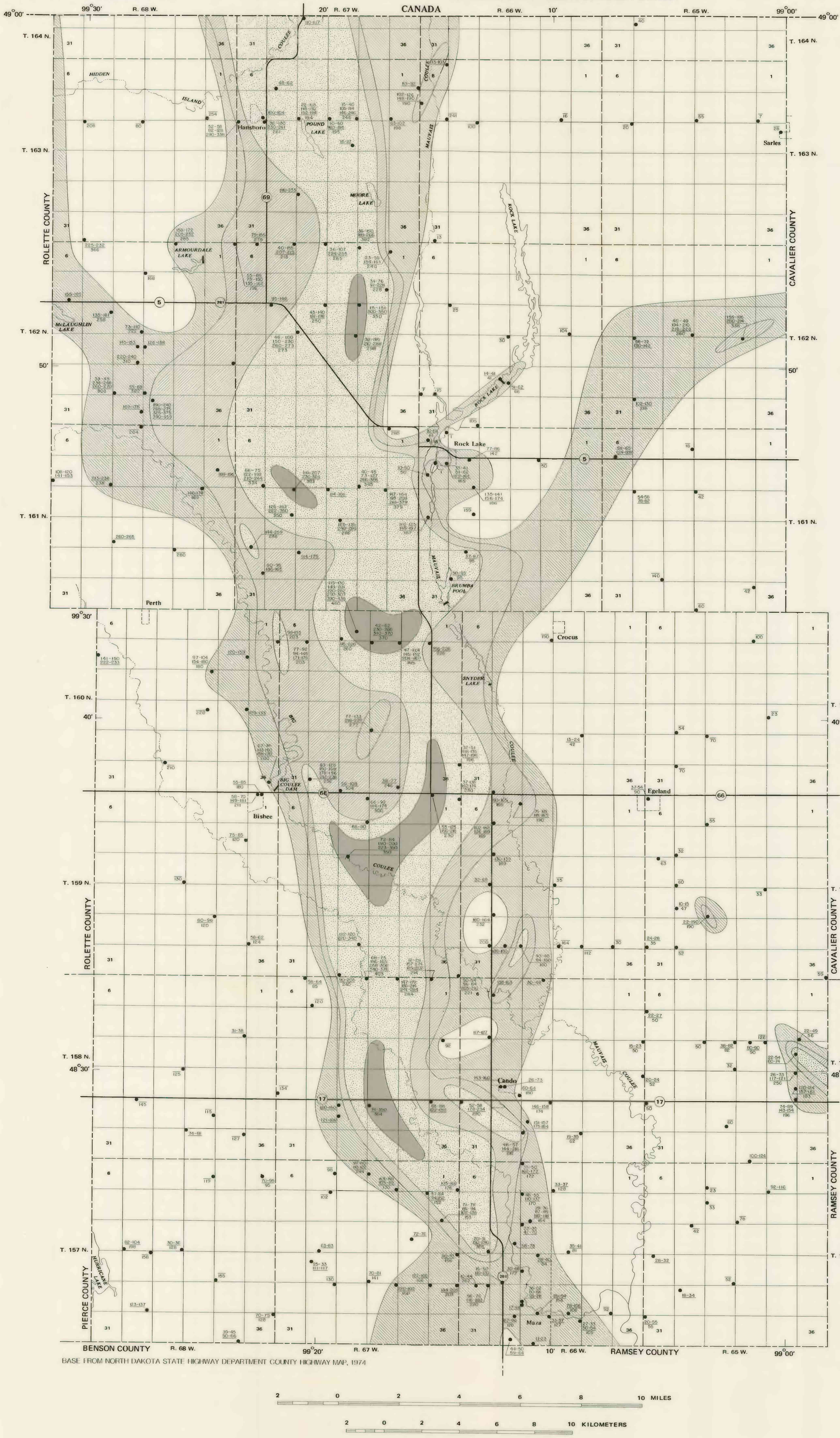
PREPARED IN COOPERATION WITH THE
NORTH DAKOTA STATE WATER COMMISSION,
THE
NORTH DAKOTA GEOLOGICAL SURVEY
AND THE
TOWNER COUNTY WATER MANAGEMENT DISTRICT

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN-FILE REPORT 82-767



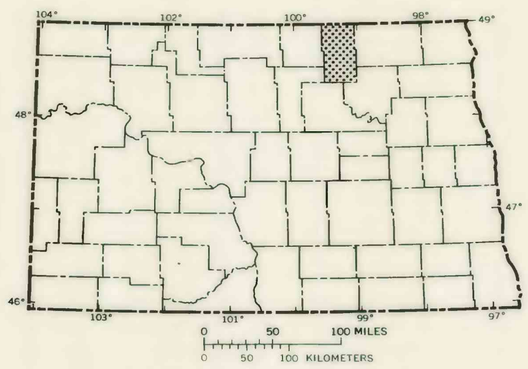
EXPLANATION

ESTIMATED POTENTIAL WELL YIELDS,
IN GALLONS PER MINUTE
(LITERS PER SECOND)

- 1000 to 1500 (63 to 95)
- 500 to 1000 (32 to 63)
- 250 to 500 (16 to 32)
- 50 to 250 (3.2 to 16)
- 0 to 50 (0 to 3.2)
- YIELD BOUNDARY

SELECTED TEST-HOLE AND WELL DATA

102-130 / 216 TEST HOLE OR WELL—Upper numbers are depth to top and base of glacial-drift aquifer, in feet below land surface. Lower number is depth to bedrock, in feet below land surface. Absence of lower number indicates that the test hole or well did not completely penetrate the glacial drift



LOCATION OF STUDY AREA

SELECTED FACTORS FOR CONVERTING INCH-POUND UNITS TO THE INTERNATIONAL SYSTEM (SI) OF UNITS

A dual system of measurements—inch-pound units and the International System (SI) of units—is given in this report. SI is an organized system of units adopted by the 11th General Conference of Weights and Measures in 1960. Selected factors for converting inch-pound units to SI units are given below.

Multiply inch-pound unit	By	To obtain SI unit
Foot	0.3048	meter
Foot per day (ft/d)	0.3048	meter per day (m/d)
Gallon per minute (gal/min)	0.06309	liter per second (L/s)
Mile (mi)	1.609	kilometer (km)
Square mile (mi^2)	2.590	square kilometer (km^2)

INTRODUCTION

This preliminary map is the first product of the ground-water resources study of Towner County, which has an area of 1,049 mi^2 (2,717 km^2) in north-central North Dakota (see location map). The study is part of a statewide program to determine the location, extent, chemical quality, and hydrologic characteristics of the ground-water reservoirs (aquifers) in North Dakota. The study was made by the U.S. Geological Survey in cooperation with the North Dakota State Water Commission, the North Dakota Geological Survey, and the Towner County Water Management District.

Many sources of data have been used in the preparation of the ground-water availability map. A well inventory provided data on depth, construction, and yields of private and public wells. Test drilling and construction of observation wells by the North Dakota State Water Commission as well as production wells constructed by commercial well drillers provided data regarding the thickness, areal extent, and hydrologic characteristics of the aquifers.

Potential well yields shown on the availability map were estimated using the thickness and hydraulic conductivity (permeability) of the aquifers determined at each test hole or well site, and data from aquifer tests. Generally the yield of a well is proportional to the hydraulic conductivity, thickness, and areal extent of the aquifer. If the aquifer is narrow (less than 0.6 mi or 1 km), as in the instance of a channel deposit in a surficial or buried valley, well yield per unit of drawdown may decrease significantly as pumping continues unless a stream, lake, or other source of recharge is intercepted by the cone of depression created by the pumping. Such sources of recharge may be depleted if withdrawals exceed inflow to the source of recharge.

OCCURRENCE AND POTENTIAL YIELD OF AQUIFERS

Aquifers in Towner County occur in both glacial drift and underlying or adjacent bedrock formations. However, this availability map shows only the approximate extent and potential yields of the glacial-drift aquifers.

Towner County is almost entirely covered by glacial drift. The glacial drift consists of till and glacioaqueous deposits.

Till is an unsorted, unstratified mixture of clay, silt, sand, gravel, cobbles, and boulders deposited directly by glaciers. The hydraulic conductivity of the till generally is less than 5 ft/d (1.5 m/d). The till is not a significant aquifer.

Glacioaqueous deposits are sorted and stratified deposits of silt, sand, and gravel that were deposited by the combined action of glaciers and streams. The sand and gravel deposits commonly have relatively large hydraulic conductivities and form the principal aquifers in the county. The aquifers may be either confined or unconfined. Wells developed in these aquifers generally will yield more than 50 gal/min (3 L/s), and in places as much as 1,500 gal/min (95 L/s). It is not uncommon for two or more aquifers to be interlayered with confining beds of till, clay, or silt.

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

SELECTED REFERENCES

Bluemle, J. P., 1977, The face of North Dakota, the geologic story: North Dakota Geological Survey, Educational Series 11, pl. 1.

Kahil, A. A., 1965, Ground-water survey of the Rock Lake area, Towner County, North Dakota: North Dakota State Water Commission, North Dakota Ground-Water Studies no. 63, 32 p.

Simpson, H. E., 1929, Geology and ground-water resources of North Dakota: U.S. Geological Survey Water-Supply Paper 598, p. 236-240.

PRELIMINARY MAP SHOWING AVAILABILITY OF WATER FROM GLACIAL-DRIFT AQUIFERS IN TOWNER COUNTY, NORTH-CENTRAL NORTH DAKOTA

BY

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