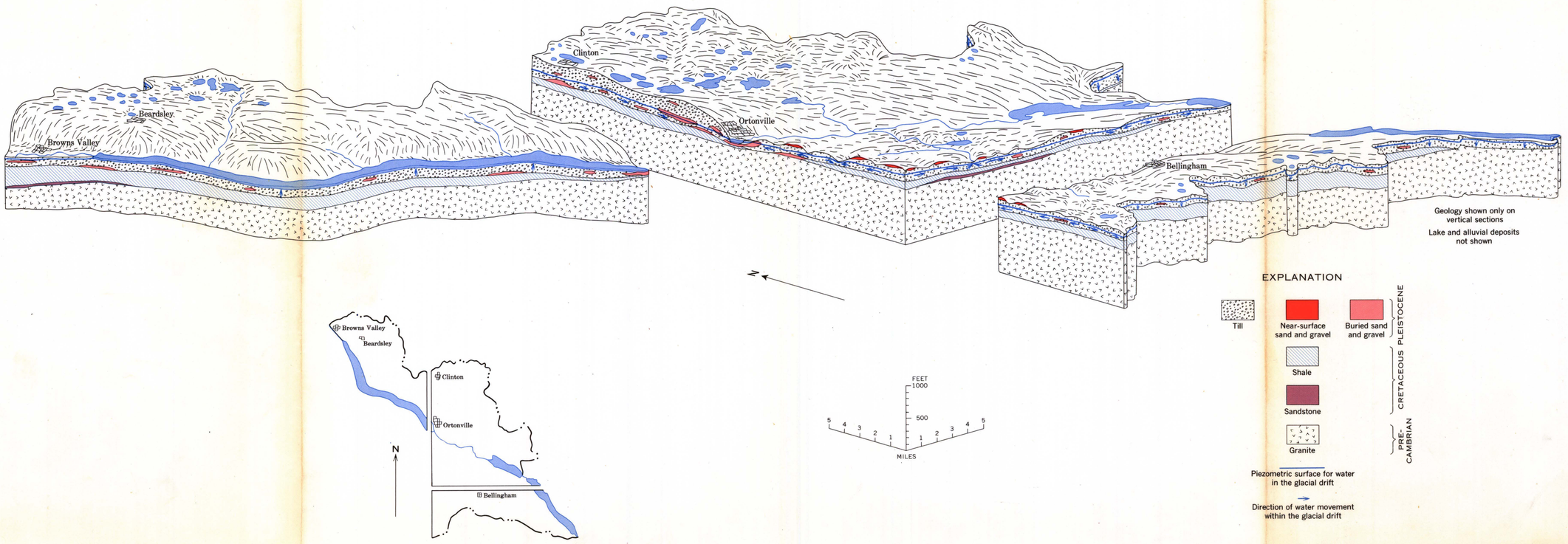
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

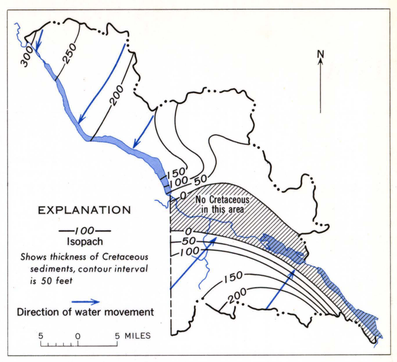
PREPARED IN COOPERATION WITH
THE MINNESOTA DEPARTMENT OF CONSERVATION
DIVISION OF WATERS

HYDROLOGIC INVESTIGATIONS
ATLAS HA-213 (SHEET 1 OF 4)

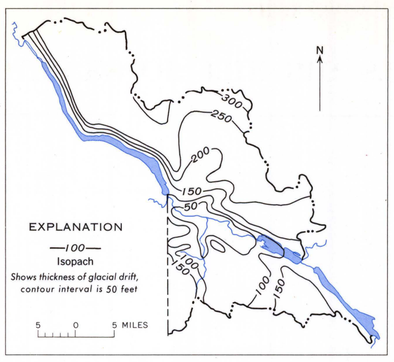
GROUND WATER



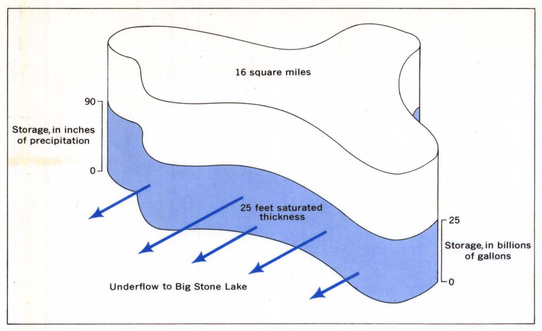
BLOCK DIAGRAM SHOWS CRETACEOUS ROCK AND GLACIAL DRIFT OVERLYING PRECAMBRIAN BEDROCK.—*The three principal aquifers are Cretaceous sandstone, buried sand and gravel, and near-surface sand and gravel*



CRETACEOUS SEDIMENTS.—*Wells tapping Cretaceous sediments are concentrated within the area where these sediments are over 100 feet thick*



GLACIAL DRIFT.—*The probability of a well tapping several aquifers in the drift is greatest where the drift is thickest (See block diagram)*

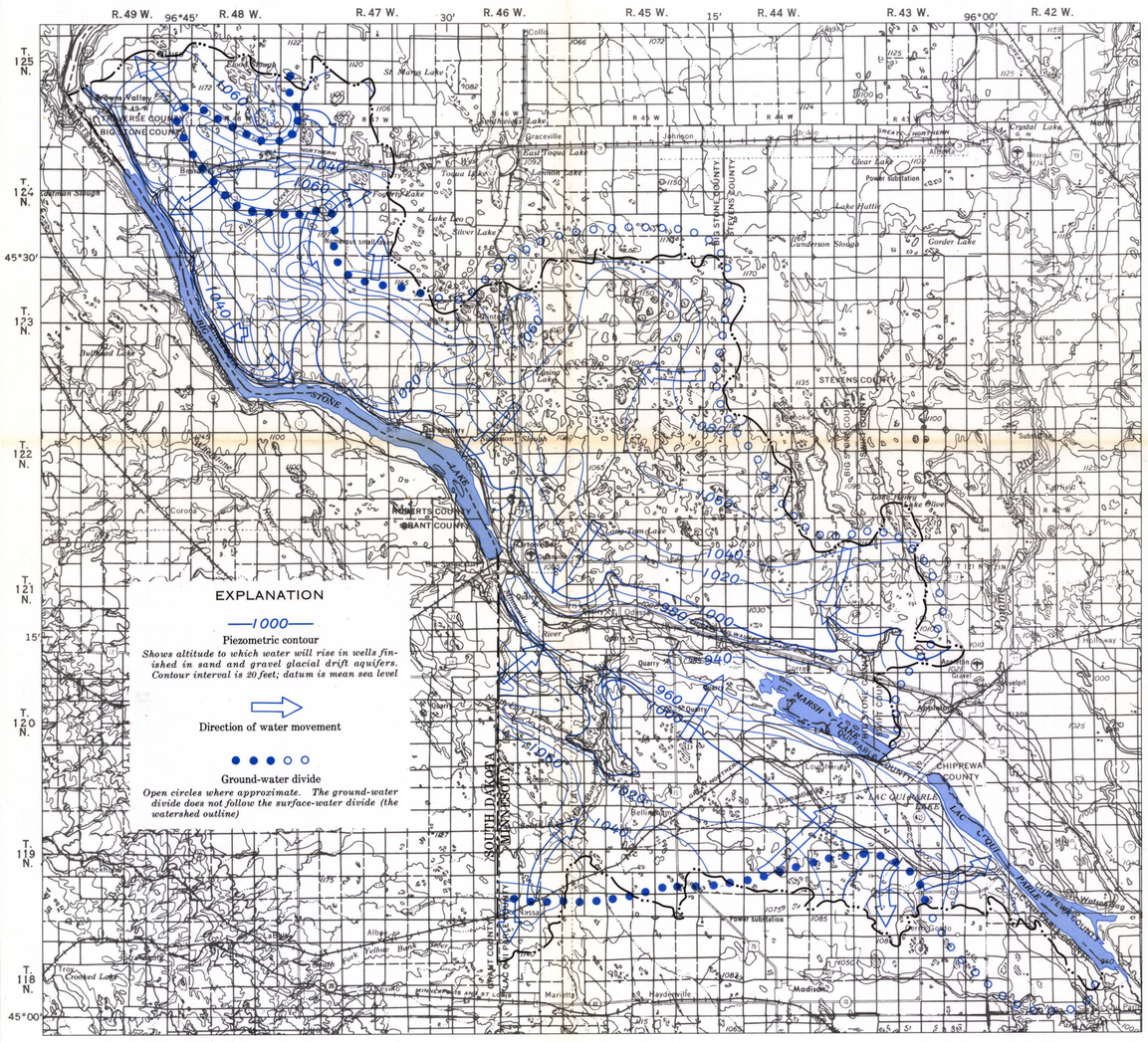


AN EXAMPLE OF THE NEAR-SURFACE SAND AND GRAVEL AQUIFER NEAR BEARDSLEY.—*Using an estimated permeability, it is calculated from Darcy's Law that about one billion gallons of ground water leaves this aquifer each year*

WELL YIELD AND SPECIFIC CAPACITIES INDICATE THE GROUND-WATER POTENTIAL OF THE THREE AQUIFER TYPES.—*Few pumping tests have been conducted in the watershed (See municipal water-supply table)*

Aquifer		Domestic wells (small diameter)		Municipal wells		Industrial or commercial wells
		Range	Average	Range	Average	Range
Near-surface sand and gravel	Yield gpm	3	-----	50–400	220	19–1,200
	Specific capacity (gpm/ft of drawdown)	<1	-----	2–75	30	38–150
	No. of wells	1 well		9 wells		2 wells [1]
Buried sand and gravel	Yield gpm	4–125	15	250–260	255	-----
	Specific capacity (gpm/ft of drawdown)	<1–15	3	13–21	17	-----
	No. of wells	19 wells		2 wells		-----
Cretaceous sandstone and shale	Yield gpm	7–15	11	150	-----	-----
	Specific capacity (gpm/ft of drawdown)	<1–10	2	7	-----	-----
	No. of wells	7 wells		1 well		-----

[1] Wells are at Nassau (19 gpm) and Big Stone Canning Company



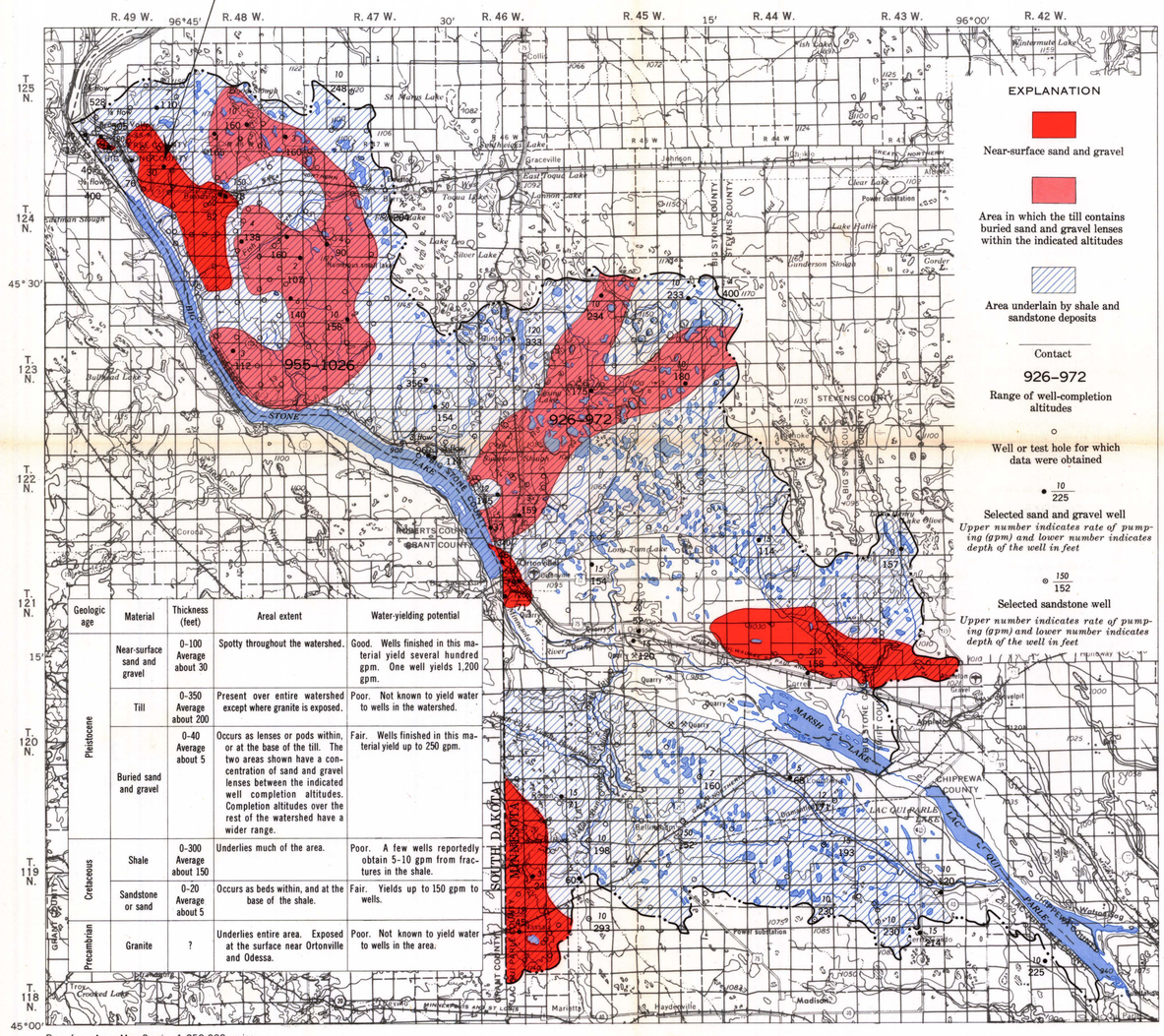
Base from Army Map Service 1:250,000 series:
Milbank, S. Dak., Minn., N. Dak., 1953, and
St Cloud, Minn., 1953

SCALE 1:250 000

5 0 5 10 15 MILES
5 0 5 10 15 KILOMETERS

CONTOUR INTERVAL 50 FEET

GROUND WATER WITHIN GLACIAL DRIFT MOVES TOWARD THE MINNESOTA RIVER AND ITS RESERVOIRS.—*Most of the movement is through low-permeability till. Widely-spaced contours indicate either flat topography or highly-permeable sediments. Evapotranspiration is highest where the piezometric surface is near the land surface*



Geologic age	Material	Thickness (feet)	Areal extent	Water-yielding potential
Pleistocene	Near-surface sand and gravel	0–100 Average about 30	Spotty throughout the watershed.	Good. Wells finished in this material yield several hundred gpm. One well yields 1,200 gpm.
	Till	0–350 Average about 200	Present over entire watershed except where granite is exposed.	Poor. Not known to yield water to wells in the watershed.
	Buried sand and gravel	0–40 Average about 5	Occurs as lenses or pods within, or at the base of the till. The two areas shown have a concentration of sand and gravel lenses between the indicated well completion altitudes. Completion altitudes over the rest of the watershed have a wider range.	Fair. Wells finished in this material yield up to 250 gpm.
Cretaceous	Shale	0–300 Average about 150	Underlies much of the area.	Poor. A few wells reportedly obtain 5–10 gpm from fractures in the shale.
	Sandstone or sand	0–20 Average about 5	Occurs as beds within, and at the base of the shale.	Fair. Yields up to 150 gpm to wells.
Precambrian	Granite	?	Underlies entire area. Exposed at the surface near Ortonville and Odessa.	Poor. Not known to yield water to wells in the area.

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AREAL EXTENT OF AQUIFERS.—*The best aquifers are the near-surface sands and gravels, although moderate quantities of ground water can be obtained from other aquifers almost anywhere within the watershed*

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1966—W65216

WATER RESOURCES OF THE BIG STONE LAKE WATERSHED, WEST-CENTRAL MINNESOTA

By

R. D. Cotter, L. E. Bidwell, E. L. Oakes, and G. H. Hollenstein

1966

For sale by U.S. Geological Survey, $1.50 per set