UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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WATER-RESOURCES INVESTIGATIONS REPORT 85-4119
PLATE 6--POTENTIOMETRIC SURFACE

## POTENTIOMETRIC SURFACE OF THE BEDROCK AQUIFER

This map shows the approximate altitude and configuration of the potentiometric surface of the principal bedrock aquifer in the Fort Drum area during a typical August. The water-level data used to construct this map were taken from water-level measurements made by the U.S. Geological Survey during well inventories in August 1967 and August 1968.

The potentiometric surface is the pressure surface of a confined (artesian) aquifer and is defined by the level to which water will rise in tightly cased wells that tap it. The principal artesian aquifer in the Fort Drum area consists of the limestone units of (1) the Black River Group, consisting primarily of the Lowville Formation and the Pamelia Formation; (2) the Theresa Formation, a dolomitic sandstone; and (3) the Potsdam Sandstone. Nine of the 12 supply wells that provide water for Fort Drum tap one or more of these units. Three of the wells (7, 11, 12; see pl. 1) obtain water from either the Lowville or Pamelia limestones, and the other six (wells 1, 2, 3, 5, 9, and 10; pl. 1) tap either the Theresa dolomitic sandstone or the underlying Potsdam Sandstone.

The surficial sand aquifer is an important factor in determining the direction of ground-water flow within in the bedrock aquifer. The two aquifers are in direct hydraulic connection in the vicinity of the cantonment area, which allows recharge from the surficial aquifer to the underlying bedrock aquifer. Comparison of water levels in wells screened in the surficial water-table aquifer with those in wells screened in the confined limestone units shows that the water table is 35 to 40 feet above the potentiometric surface in the cantonment area. This area therefore serves as a principal recharge zone for the bedrock aquifer and thus produces a ground-water divide in the potentiometric surface (pl. 5) approximately beneath a similar divide in the water table (pl. 4). The position of this ground-water divide in the bedrock aquifer produces a flow pattern similar to that in the overlying surficial aquifer--northwestward toward the Indian River and southeastward toward the Black River. The general direction of regional ground-water flow in the lower Black River basin, the area south and west of Fort Drum, is southwestward toward the Black River and Lake Ontario (Waller and Ayer, 1975, p. 132).

Periodic observations of water levels during 1967-68 (U.S. Geological Survey, unpublished data, 1969) in the nine military-base supply wells that tap the bedrock aquifer indicate that the natural annual water-level fluctuation is approximately 2.5 feet, with periodic drawdowns of 8 to 9 feet produced by pumping effects. The average annual water-level fluctuation in well 7, which is close to the river (pl. 1), during this period was also 8 to 9 feet (Waller and Ayer, 1975, p. 126). This range is produced by a combination of drawdown due to pumping of nearby base wells and by the seasonally high stage of the nearby Black River. The bedrock aquifer is hydraulically connected to the Black River and discharges ground water to it most of the year. During the spring, however, high river stage can temporarily reverse the ground-water gradient so that the river level is higher than the potentiometric head in the underlying and adjacent bedrock aquifer. When this occurs, the river can act as a source of water to the aquifer in the areas directly bordering the river. High river stage would probably need to be maintained for many months, however, for a significant volume of water to move from the river to the aquifer.

Heavy and continuous pumping of wells 11, 12, or 7, which are close to the Black River, could induce infiltration from the river into the limestone aquifer by lowering the head in the aquifer beneath the riverbed.

The potentiometric surface northwest of the sand plain is above land surface in places so that wells tapping the bedrock aquifer here would probably flow. Well 47-51 (well 10), which flows under static conditions at land surface, is an example.

### REFERENCE CITED

Waller, R. M., and Ayer, G. R., 1975, Water resources of the Black River basin, New York: New York State Department of Environmental Conservation Basin Planning Report BRB-1, p. 132.

INSUFFICIENT DATA

MILITARY RESERVATION BOUNDARY

BIVIDE

WATER TABLE

GROUND

A

A'

B

B'

### EXPLANATION

585 — WELL TAPPING CONFINED (BEDROCK) AQUIFER--number is altitude of potentiometric surface, in feet above sea level in August of 1967 and 1968.

600 — POTENTIOMETRIC-SURFACE CONTOUR--shows approximate altitude of potentiometric surface of the confined (bedrock) aquifer in August 1967 and 1968 under static (nonpumping) conditions. The potentiometric surface is defined by the levels to which water will rise in tightly cased wells which tap the aquifer. Contour interval is 10 feet; short-dashed lines represent 5-foot intermediate contours. Lines dashed where inferred. Datum is sea level.

GROUND-WATER DIVIDE--shows approximate location of local ground-water divide in potentiometric surface.

DIRECTION OF GROUND-WATER FLOW--shows general direction of ground-water flow in bedrock aquifer under static conditions.

Base from New York State Department of Transportation, 1:24,000, series Black River(1980), Deferiet(1980), Antwerp(1980), North Wilna(1980), Natural Bridge(1969), Lake Bonaparte(1968), Natural Dam(1968)

# HYDROGEOLOGY OF THE FORT DRUM AREA, JEFFERSON, LEWIS, AND ST. LAWRENCE COUNTIES, NEW YORK

By
Richard J. Reynolds

POTENTIOMETRIC SURFACE OF THE BEDROCK AQUIFER IN AUGUST AND GENERAL DIRECTION OF GROUND-WATER FLOW

Hydrogeology by R.J. Reynolds (1983)