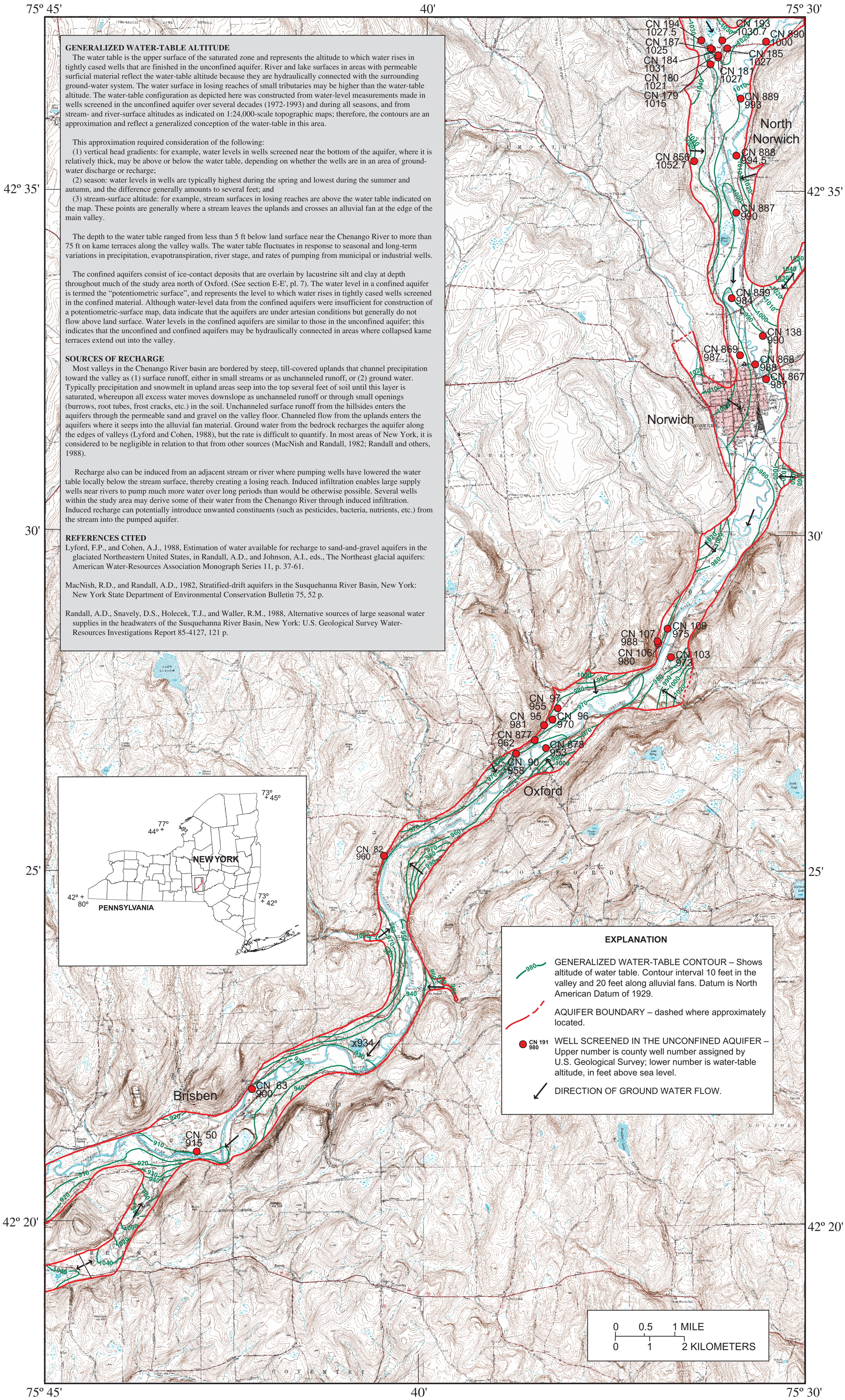

GENERALIZED WATER-TABLE ALTITUDE

The water table is the upper surface of the saturated zone and represents the altitude to which water rises in tightly cased wells that are finished in the unconfined aquifer. River and lake surfaces in areas with permeable surficial material reflect the water-table altitude because they are hydraulically connected with the surrounding ground-water system. The water surface in losing reaches of small tributaries may be higher than the water-table altitude. The water-table configuration as depicted here was constructed from water-level measurements made in wells screened in the unconfined aquifer over several decades (1972-1993) and during all seasons, and from stream- and river-surface altitudes as indicated on 1:24,000-scale topographic maps; therefore, the contours are an approximation and reflect a generalized conception of the water-table in this area.

This approximation required consideration of the following:

(1) vertical head gradients: for example, water levels in wells screened near the bottom of the aquifer, where it is relatively thick, may be above or below the water table, depending on whether the wells are in an area of ground-water discharge or recharge;

(2) season: water levels in wells are typically highest during the spring and lowest during the summer and autumn, and the difference generally amounts to several feet; and

(3) stream-surface altitude: for example, stream surfaces in losing reaches are above the water table indicated on the map. These points are generally where a stream leaves the uplands and crosses an alluvial fan at the edge of the main valley.

The depth to the water table ranged from less than 5 ft below land surface near the Chenango River to more than 75 ft on kame terraces along the valley walls. The water table fluctuates in response to seasonal and long-term variations in precipitation, evapotranspiration, river stage, and rates of pumping from municipal or industrial wells.

The confined aquifers consist of ice-contact deposits that are overlain by lacustrine silt and clay at depth throughout much of the study area north of Oxford. (See section E-E', pl. 7). The water level in a confined aquifer is termed the "potentiometric surface", and represents the level to which water rises in tightly cased wells screened in the confined material. Although water-level data from the confined aquifers were insufficient for construction of a potentiometric-surface map, data indicate that the aquifers are under artesian conditions but generally do not flow above land surface. Water levels in the confined aquifers are similar to those in the unconfined aquifer; this indicates that the unconfined and confined aquifers may be hydraulically connected in areas where collapsed kame terraces extend out into the valley.

SOURCES OF RECHARGE

Most valleys in the Chenango River basin are bordered by steep, till-covered uplands that channel precipitation toward the valley as (1) surface runoff, either in small streams or as unchanneled runoff, or (2) ground water. Typically precipitation and snowmelt in upland areas seep into the top several feet of soil until this layer is saturated, whereupon all excess water moves downslope as unchanneled runoff or through small openings (burrows, root tubes, frost cracks, etc.) in the soil. Unchanneled surface runoff from the hillsides enters the aquifers through the permeable sand and gravel on the valley floor. Channeled flow from the uplands enters the aquifers where it seeps into the alluvial fan material. Ground water from the bedrock recharges the aquifer along the edges of valleys (Lyford and Cohen, 1988), but the rate is difficult to quantify. In most areas of New York, it is considered to be negligible in relation to that from other sources (MacNish and Randall, 1982; Randall and others, 1988).

Recharge also can be induced from an adjacent stream or river where pumping wells have lowered the water table locally below the stream surface, thereby creating a losing reach. Induced infiltration enables large supply wells near rivers to pump much more water over long periods than would be otherwise possible. Several wells within the study area may derive some of their water from the Chenango River through induced infiltration. Induced recharge can potentially introduce unwanted constituents (such as pesticides, bacteria, nutrients, etc.) from the stream into the pumped aquifer.

REFERENCES CITED

Lyford, F.P., and Cohen, A.J., 1988, Estimation of water available for recharge to sand-and-gravel aquifers in the glaciated Northeastern United States, in Randall, A.D., and Johnson, A.I., eds., The Northeast glacial aquifers: American Water-Resources Association Monograph Series 11, p. 37-61.

MacNish, R.D., and Randall, A.D., 1982, Stratified-drift aquifers in the Susquehanna River Basin, New York: New York State Department of Environmental Conservation Bulletin 75, 52 p.

Randall, A.D., Snavely, D.S., Holecek, T.J., and Waller, R.M., 1988, Alternative sources of large seasonal water supplies in the headwaters of the Susquehanna River Basin, New York: U.S. Geological Survey Water-Resources Investigations Report 85-4127, 121 p.

EXPLANATION

980 — GENERALIZED WATER-TABLE CONTOUR – Shows altitude of water table. Contour interval 10 feet in the valley and 20 feet along alluvial fans. Datum is North American Datum of 1929.

AQUIFER BOUNDARY – dashed where approximately located.

CN 191 980 — WELL SCREENED IN THE UNCONFINED AQUIFER – Upper number is county well number assigned by U.S. Geological Survey; lower number is water-table altitude, in feet above sea level.

DIRECTION OF GROUND WATER FLOW.

Base from U.S. Geological Survey
1:24,000 series Digital Raster Graphic topographic maps, from New York State Department of Environmental Conservation image catalog, 2000.
Universal Transverse Mercator, Zone 18, NAD83.

Geohydrology of the Valley-Fill Aquifer in the Norwich-Oxford-Brisben Area, Chenango County, New York

By

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2003

Plate 4 - Generalized Water-Table Altitude

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