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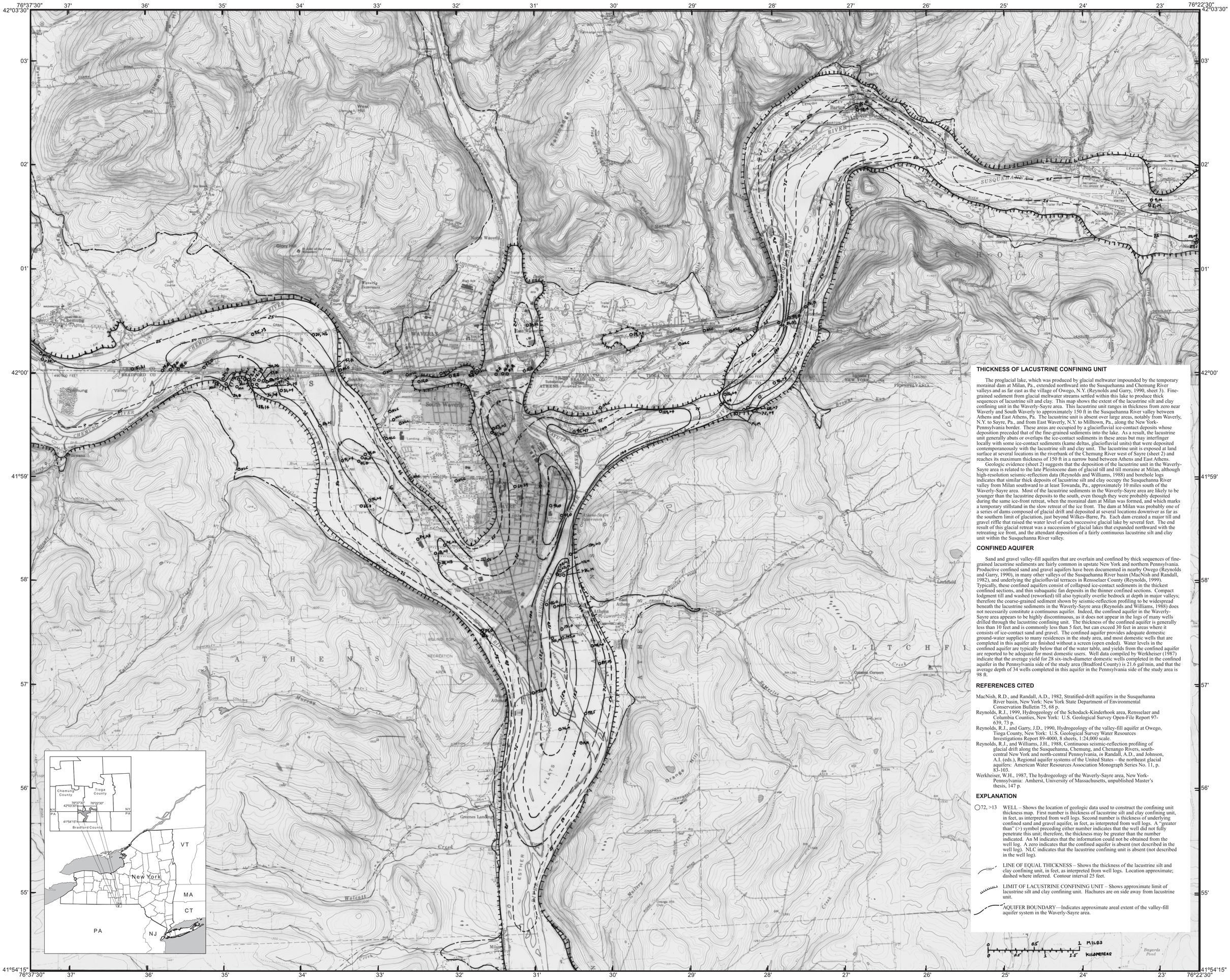
OPEN-FILE REPORT 02-284
THICKNESS OF LACUSTRINE CONFINING UNIT – SHEET 5 of 6
Reynolds, R.J., 2003, Hydrogeology of the Waverly-Sayre area in Tioga and Chemung Counties, New York and Bradford County, Pennsylvania: U.S. Geological Survey Open-File Report 02-284, 6 sheets, 1:24,000 scale.



THICKNESS OF LACUSTRINE CONFINING UNIT

The proglacial lake, which was produced by glacial meltwater impounded by the temporary morainal dam at Milan, Pa., extended northward into the Susquehanna and Chemung River valleys and as far east as the village of Owego, N.Y. (Reynolds and Garry, 1990, sheet 3). Fine-grained sediment from glacial meltwater streams settled within this lake to produce thick sequences of lacustrine silt and clay. This map shows the extent of the lacustrine silt and clay confining unit in the Waverly-Sayre area. This lacustrine unit ranges in thickness from zero near Waverly and South Waverly to approximately 150 ft in the Susquehanna River valley between Athens and East Athens, Pa. The lacustrine unit is absent over large areas, notably from Waverly, N.Y. to Sayre, Pa., and from East Waverly, N.Y. to Milltown, Pa., along the New York-Pennsylvania border. These areas are occupied by a glaciofluvial ice-contact deposits whose deposition preceded that of the fine-grained sediments into the lake. As a result, the lacustrine unit generally abuts or overlaps the ice-contact sediments in these areas but may interfinger locally with some ice-contact sediments (kame deltas, glaciofluvial units) that were deposited contemporaneously with the lacustrine silt and clay unit. The lacustrine unit is exposed at land surface at several locations in the riverbank of the Chemung River west of Sayre (sheet 2) and reaches its maximum thickness of 150 ft in a narrow band between Athens and East Athens.

Geologic evidence (sheet 2) suggests that the deposition of the lacustrine unit in the Waverly-Sayre area is related to the late Pleistocene dam of glacial till and till moraine at Milan, although high-resolution seismic-reflection data (Reynolds and Williams, 1988) and borehole logs indicates that similar thick deposits of lacustrine silt and clay occupy the Susquehanna River valley from Milan southward to at least Towanda, Pa., approximately 10 miles south of the Waverly-Sayre area. Most of the lacustrine sediments in the Waverly-Sayre area are likely to be younger than the lacustrine deposits to the south, even though they were probably deposited during the same ice-front retreat, when the morainal dam at Milan was formed, and which marks a temporary stillstand in the slow retreat of the ice front. The dam at Milan was probably one of a series of dams composed of glacial drift and deposited at several locations downriver as far as the southern limit of glaciation, just beyond Wilkes-Barre, Pa. Each dam created a major till and gravel riffle that raised the water level of each successive glacial lake by several feet. The end result of this glacial retreat was a succession of glacial lakes that expanded northward with the retreating ice front, and the attendant deposition of a fairly continuous lacustrine silt and clay unit within the Susquehanna River valley.

CONFINED AQUIFER

Sand and gravel valley-fill aquifers that are overlain and confined by thick sequences of fine-grained lacustrine sediments are fairly common in upstate New York and northern Pennsylvania. Productive confined sand and gravel aquifers have been documented in nearby Owego (Reynolds and Garry, 1990), in many other valleys of the Susquehanna River basin (MacNish and Randall, 1982), and underlying the glaciofluvial terraces in Rensselaer County (Reynolds, 1999). Typically, these confined aquifers consist of collapsed ice-contact sediments in the thickest confined sections, and thin subaquatic fan deposits in the thinner confined sections. Compact lodgment till and washed (reworked) till also typically overlie bedrock at depth in major valleys; therefore the coarse-grained sediment shown by seismic-reflection profiling to be widespread beneath the lacustrine sediments in the Waverly-Sayre area (Reynolds and Williams, 1988) does not necessarily constitute a continuous aquifer. Indeed, the confined aquifer in the Waverly-Sayre area appears to be highly discontinuous, as it does not appear in the logs of many wells drilled through the lacustrine confining unit. The thickness of the confined aquifer is generally less than 10 feet and is commonly less than 5 feet, but can exceed 30 feet in areas where it consists of ice-contact sand and gravel. The confined aquifer provides adequate domestic ground-water supplies to many residences in the study area, and most domestic wells that are completed in this aquifer are finished without a screen (open ended). Water levels in the confined aquifer are typically below that of the water table, and yields from the confined aquifer are reported to be adequate for most domestic users. Well data compiled by Werkheiser (1987) indicate that the average yield for 28 six-inch-diameter domestic wells completed in the confined aquifer in the Pennsylvania side of the study area (Bradford County) is 21.6 gal/min, and that the average depth of 34 wells completed in this aquifer in the Pennsylvania side of the study area is 98 ft.

REFERENCES CITED

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, 68 p.

Reynolds, R.J., 1999, Hydrogeology of the Schodack-Kinderhook area, Rensselaer and Columbia Counties, New York: U.S. Geological Survey Open-File Report 97-639, 73 p.

Reynolds, R.J., and Garry, J.D., 1990, Hydrogeology of the valley-fill aquifer at Owego, Tioga County, New York: U.S. Geological Survey Water Resources Investigations Report 89-4000, 8 sheets, 1:24,000 scale.

Reynolds, R.J., and Williams, J.H., 1988, Continuous seismic-reflection profiling of glacial drift along the Susquehanna, Chemung, and Chenango Rivers, south-central New York and north-central Pennsylvania, *in* Randall, A.D., and Johnson, A.I. (eds.), Regional aquifer systems of the United States – the northeast glacial aquifers: American Water Resources Association Monograph Series No. 11, p. 83-103.

Werkheiser, W.H., 1987, The hydrogeology of the Waverly-Sayre area, New York-Pennsylvania: Amherst, University of Massachusetts, unpublished Master's thesis, 147 p.

EXPLANATION

○72, >13 WELL – Shows the location of geologic data used to construct the confining unit thickness map. First number is thickness of lacustrine silt and clay confining unit, in feet, as interpreted from well logs. Second number is thickness of underlying confined sand and gravel aquifer, in feet, as interpreted from well logs. A "greater than" (>) symbol preceding either number indicates that the well did not fully penetrate this unit; therefore, the thickness may be greater than the number indicated. An M indicates that the information could not be obtained from the well log. A zero indicates that the confined aquifer is absent (not described in the well log). NLC indicates that the lacustrine confining unit is absent (not described in the well log).

LINE OF EQUAL THICKNESS – Shows the thickness of the lacustrine silt and clay confining unit, in feet, as interpreted from well logs. Location approximate; dashed where inferred. Contour interval 25 feet.

LIMIT OF LACUSTRINE CONFINING UNIT – Shows approximate limit of lacustrine silt and clay confining unit. Hachures are on side away from lacustrine unit.

AQUIFER BOUNDARY—Indicates approximate areal extent of the valley-fill aquifer system in the Waverly-Sayre area.

Base from U.S. Geological Survey
1:24,000 Series: Waverly, NY-PA (1978);
Sayre, PA-NY (1969), Litchfield, PA-NY (1978)
Barton, NY-PA (1976)

HYDROGEOLOGY OF THE WAVERLY–SAYRE AREA IN TIOGA AND CHEMUNG COUNTIES, NEW YORK AND BRADFORD COUNTY, PENNSYLVANIA

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2003

Sheet 5 - Thickness and Extent of the Lacustrine Confining Unit

Hydrogeology by R. J. Reynolds, 2001

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