U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

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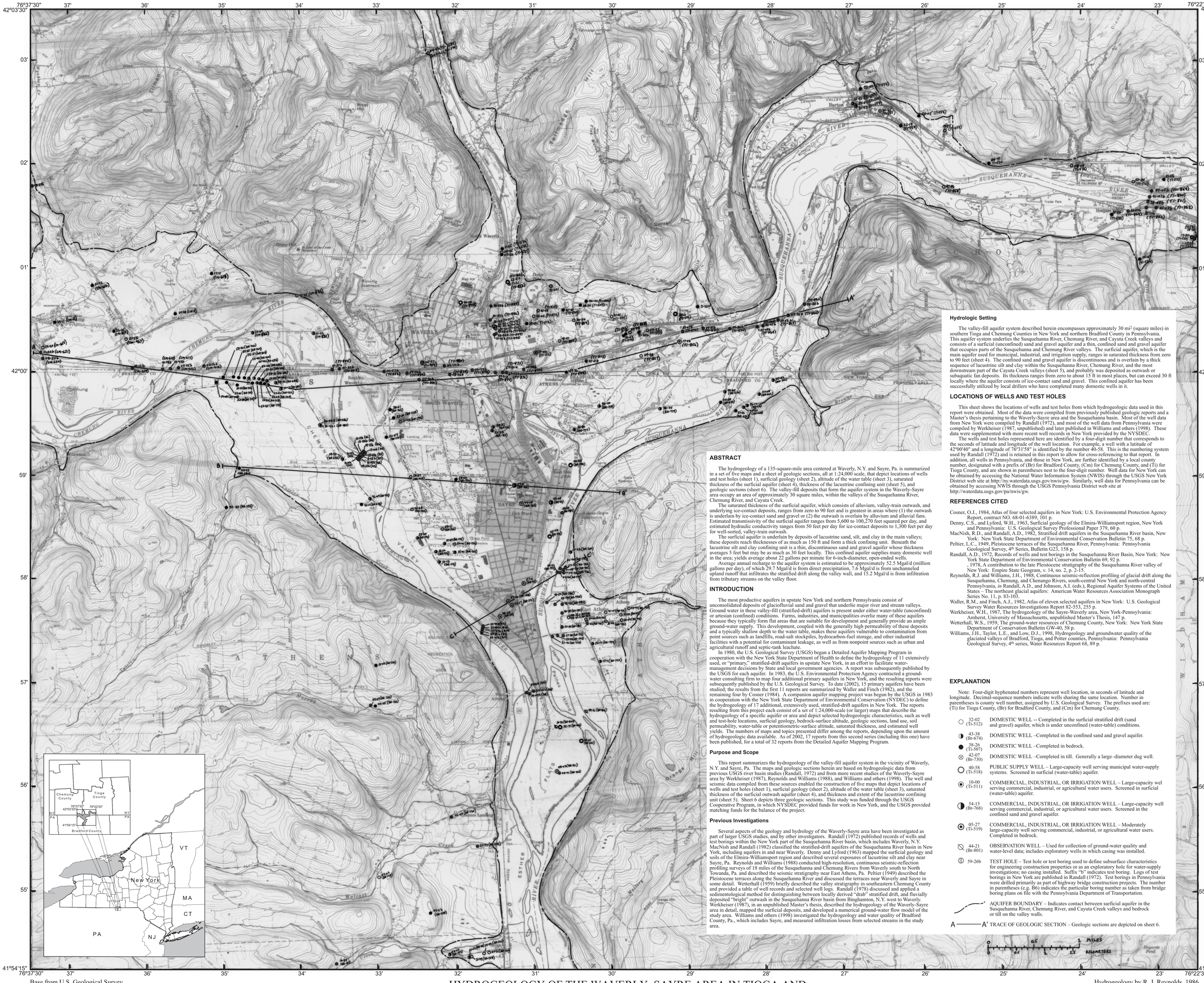
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

OPEN-FILE REPORT 02-284
LOCATION OF WELLS AND TEST HOLES - SHEET 1 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.



ABSTRACT

The hydrogeology of a 135-square-mile area centered at Waverly, N.Y. and Sayre, Pa. is summarized in a set of five maps and a sheet of geologic sections, all at 1:24,000 scale, that depict locations of wells and test holes (sheet 1), surficial geology (sheet 2), altitude of the water table (sheet 3), saturated thickness of the surficial aquifer (sheet 4), thickness of the lacustrine confining unit (sheet 5), and geologic sections (sheet 6). The valley-fill deposits that form the aquifer system in the Waverly-Sayre area occupy an area of approximately 30 square miles, within the valleys of the Susquehanna River, Chemung River, and Cayuta Creek.

The saturated thickness of the surficial aquifer, which consists of alluvium, valley-train outwash, and underlying ice-contact deposits, ranges from zero to 90 feet and is greatest in areas where (1) the outwash is underlain by ice-contact sand and gravel or (2) the outwash is overlain by alluvium and alluvial fans. Estimated transmissivity of the surficial aquifer ranges from 5,600 to 100,270 feet squared per day, and estimated hydraulic conductivity ranges from 50 feet per day for ice-contact deposits to 1,300 feet per day for well-sorted, valley-train outwash.

The surficial aquifer is underlain by deposits of lacustrine sand, silt, and clay in the main valleys; these deposits reach thicknesses of as much as 150 ft and form a thick confining unit. Beneath the lacustrine silt and clay confining unit is a thin, discontinuous sand and gravel aquifer whose thickness averages 5 feet but may be as much as 30 feet locally. This confined aquifer supplies many domestic well in the area; yields average about 22 gallons per minute for 6-inch-diameter, open-ended wells.

Average annual recharge to the aquifer system is estimated to be approximately 52.5 Mgal/d (million gallons per day), of which 29.7 Mgal/d is from direct precipitation, 7.6 Mgal/d is from unchanneled upland runoff that infiltrates the stratified drift along the valley wall, and 15.2 Mgal/d is from infiltration from tributary streams on the valley floor.

INTRODUCTION

The most productive aquifers in upstate New York and northern Pennsylvania consist of unconsolidated deposits of glaciofluvial sand and gravel that underlie major river and stream valleys. Ground water in these valley-fill (stratified-drift) aquifers is present under either water-table (unconfined) or artesian (confined) conditions. Farms, industries, and municipalities overlie many of these aquifers because they typically form flat areas that are suitable for development and generally provide an ample ground-water supply. This development, coupled with the generally high permeability of these deposits and a typically shallow depth to the water table, makes these aquifers vulnerable to contamination from point sources such as landfills, road-salt stockpiles, hydrocarbon-fuel storage, and other industrial facilities with a potential for contaminant leakage, as well as from nonpoint sources such as urban and agricultural runoff and septic-tank leachate.

In 1980, the U.S. Geological Survey (USGS) began a Detailed Aquifer Mapping Program in cooperation with the New York State Department of Health to define the hydrogeology of 11 extensively used, or "primary," stratified-drift aquifers in upstate New York, in an effort to facilitate water-management decisions by State and local government agencies. A report was subsequently published by the USGS for each aquifer. In 1983, the U.S. Environmental Protection Agency contracted a ground-water consulting firm to map four additional primary aquifers in New York, and the resulting reports were subsequently published by the U.S. Geological Survey. To date (2002), 15 primary aquifers have been studied; the results from the first 11 reports are summarized by Waller and Finch (1982), and the remaining four by Cosner (1984). A companion aquifer mapping project was begun by the USGS in 1983 in cooperation with the New York State Department of Environmental Conservation (NYDEC) to define the hydrogeology of 17 additional, extensively used, stratified-drift aquifers in New York. The reports resulting from this project each consist of a set of 1:24,000-scale (or larger) maps that describe the hydrogeology of a specific aquifer or area and depict selected hydrogeologic characteristics, such as well and test-hole locations, surficial geology, bedrock-surface altitude, geologic sections, land use, soil permeability, water-table or potentiometric-surface altitude, saturated thickness, and estimated well yields. The numbers of maps and topics presented differ among the reports, depending upon the amount of hydrogeologic data available. As of 2002, 17 reports from this second series (including this one) have been published, for a total of 32 reports from the Detailed Aquifer Mapping Program.

Purpose and Scope

This report summarizes the hydrogeology of the valley-fill aquifer system in the vicinity of Waverly, N.Y. and Sayre, Pa. The maps and geologic sections herein are based on hydrogeologic data from previous USGS river basin studies (Randall, 1972) and from more recent studies of the Waverly-Sayre area by Werkheiser (1987), Reynolds and Williams (1988), and Williams and others (1998). The well and seismic data compiled from these sources enabled the construction of five maps that depict locations of wells and test holes (sheet 1), surficial geology (sheet 2), altitude of the water table (sheet 3), saturated thickness of the surficial outwash aquifer (sheet 4), and thickness and extent of the lacustrine confining unit (sheet 5). Sheet 6 depicts three geologic sections. This study was funded through the USGS Cooperative Program, in which NYSDEC provided funds for work in New York, and the USGS provided matching funds for the balance of the project.

Previous Investigations

Several aspects of the geology and hydrology of the Waverly-Sayre area have been investigated as part of larger USGS studies, and by other investigators. Randall (1972) published records of wells and test borings within the New York part of the Susquehanna River basin, which includes Waverly, N.Y. MacNish and Randall (1982) classified the stratified-drift aquifers of the Susquehanna River basin in New York, including aquifers in and near Waverly. Denny and Lyford (1963) mapped the surficial geology and soils of the Elmira-Williamsport region and described several exposures of lacustrine silt and clay near Sayre, Pa. Reynolds and Williams (1988) conducted high-resolution, continuous seismic-reflection profiling surveys of 18 miles of the Susquehanna and Chemung Rivers from Waverly south to North Towanda, Pa. and described the seismic stratigraphy near East Athens, Pa. Peltier (1949) described the Pleistocene terraces along the Susquehanna River and discussed the terraces near Waverly and Sayre in some detail. Wetterhall (1959) briefly described the valley stratigraphy in southeastern Chemung County and provided a table of well records and selected well logs. Randall (1978) discussed and applied a sedimentological method for distinguishing between locally derived "drab" stratified drift, and fluvially deposited "bright" outwash in the Susquehanna River basin from Binghamton, N.Y. west to Waverly. Werkheiser (1987), in an unpublished Master's thesis, described the hydrogeology of the Waverly-Sayre area in detail, mapped the surficial deposits, and developed a numerical ground-water flow model of the study area. Williams and others (1998) investigated the hydrogeology and water quality of Bradford County, Pa., which includes Sayre, and measured infiltration losses from selected streams in the study area.

Hydrologic Setting

The valley-fill aquifer system described herein encompasses approximately 30 mi² (square miles) in southern Tioga and Chemung Counties in New York and northern Bradford County in Pennsylvania. This aquifer system underlies the Susquehanna River, Chemung River, and Cayuta Creek valleys and consists of a surficial (unconfined) sand and gravel aquifer and a thin, confined sand and gravel aquifer that occupies parts of the Susquehanna and Chemung River valleys. The surficial aquifer, which is the main aquifer used for municipal, industrial, and irrigation supply, ranges in saturated thickness from zero to 90 feet (sheet 4). The confined sand and gravel aquifer is discontinuous and is overlain by a thick sequence of lacustrine silt and clay within the Susquehanna River, Chemung River, and the most downstream part of the Cayuta Creek valleys (sheet 5), and probably was deposited as outwash or subaquatic fan deposits. Its thickness ranges from zero to about 15 ft in most places, but can exceed 30 ft locally where the aquifer consists of ice-contact sand and gravel. This confined aquifer has been successfully utilized by local drillers who have completed many domestic wells in it.

LOCATIONS OF WELLS AND TEST HOLES

This sheet shows the locations of wells and test holes from which hydrogeologic data used in this report were obtained. Most of the data were compiled from previously published geologic reports and a Master's thesis pertaining to the Waverly-Sayre area and the Susquehanna basin. Most of the well data from New York were compiled by Randall (1972), and most of the well data from Pennsylvania were compiled by Werkheiser (1987, unpublished) and later published in Williams and others (1998). These data were supplemented with more recent well records in New York provided by the NYSDEC.

The wells and test holes represented here are identified by a four-digit number that corresponds to the seconds of latitude and longitude of the well location. For example, a well with a latitude of 42°00'40" and a longitude of 76°31'58" is identified by the number 40-58. This is the numbering system used by Randall (1972) and is retained in this report to allow for cross-referencing to that report. In addition, all wells in Pennsylvania, and those in New York, are further identified by a local county number, designated with a prefix of (Br) for Bradford County, (Cm) for Chemung County, and (Ti) for Tioga County, and are shown in parentheses nest to the four-digit number. Well data for New York can be obtained by accessing the National Water Information System (NWIS) through the USGS New York District web site at http://ny.waterdata.usgs.gov/nwis/gw. Similarly, well data for Pennsylvania can be obtained by accessing NWIS through the USGS Pennsylvania District web site at http://waterdata.usgs.gov/pa/nwis/gw.

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EXPLANATION

Note: Four-digit hyphenated numbers represent well location, in seconds of latitude and longitude. Decimal-sequence numbers indicate wells sharing the same location. Number in parentheses is county well number, assigned by U.S. Geological Survey. The prefixes used are: (Ti) for Tioga County, (Br) for Bradford County, and (Cm) for Chemung County.

32-02 (Ti-512)	DOMESTIC WELL -- Completed in the surficial stratified drift (sand and gravel) aquifer, which is under unconfined (water-table) conditions.
43-38 (Br-674)	DOMESTIC WELL –Completed in the confined sand and gravel aquifer.
38-26 (Ti-507)	DOMESTIC WELL –Completed in bedrock.
42-07 (Br-730)	DOMESTIC WELL –Completed in till. Generally a large–diameter dug well.
40-58 (Ti-518)	PUBLIC SUPPLY WELL – Large-capacity well serving municipal water-supply systems. Screened in surficial (water-table) aquifer.
10-00 (Ti-511)	COMMERCIAL, INDUSTRIAL, OR IRRIGATION WELL – Large-capacity wel serving commercial, industrial, or agricultural water users. Screened in surficial (water-table) aquifer.
54-15 (Br-768)	COMMERCIAL, INDUSTRIAL, OR IRRIGATION WELL – Large-capacity well serving commercial, industrial, or agricultural water users. Screened in the confined sand and gravel aquifer.
05-27 (Ti-519)	COMMERCIAL, INDUSTRIAL, OR IRRIGATION WELL – Moderately large-capacity well serving commercial, industrial, or agricultural water users. Completed in bedrock.
44-21 (Br-801)	OBSERVATION WELL – Used for collection of ground-water quality and water-level data; includes exploratory wells in which casing was installed.
59-26b	TEST HOLE – Test hole or test boring used to define subsurface characteristics for engineering construction properties or as an exploratory hole for water-supply investigations; no casing installed. Suffix "b" indicates test boring. Logs of test borings in New York are published in Randall (1972). Test borings in Pennsylvania were drilled primarily as part of highway bridge construction projects. The number in parentheses (e.g. B6) indicates the particular boring number as taken from bridge boring plans on file with the Pennsylvania Department of Transportation.
	AQUIFER BOUNDARY – Indicates contact between surficial aquifer in the Susquehanna River, Chemung River, and Cayuta Creek valleys and bedrock or till on the valley walls.
A ——— A'	TRACE OF GEOLOGIC SECTION – Geologic sections are depicted on sheet 6.

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

By
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2003

Sheet 1 - Location of Wells and Test Holes

Hydrogeology by R. J. Reynolds, 1986

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