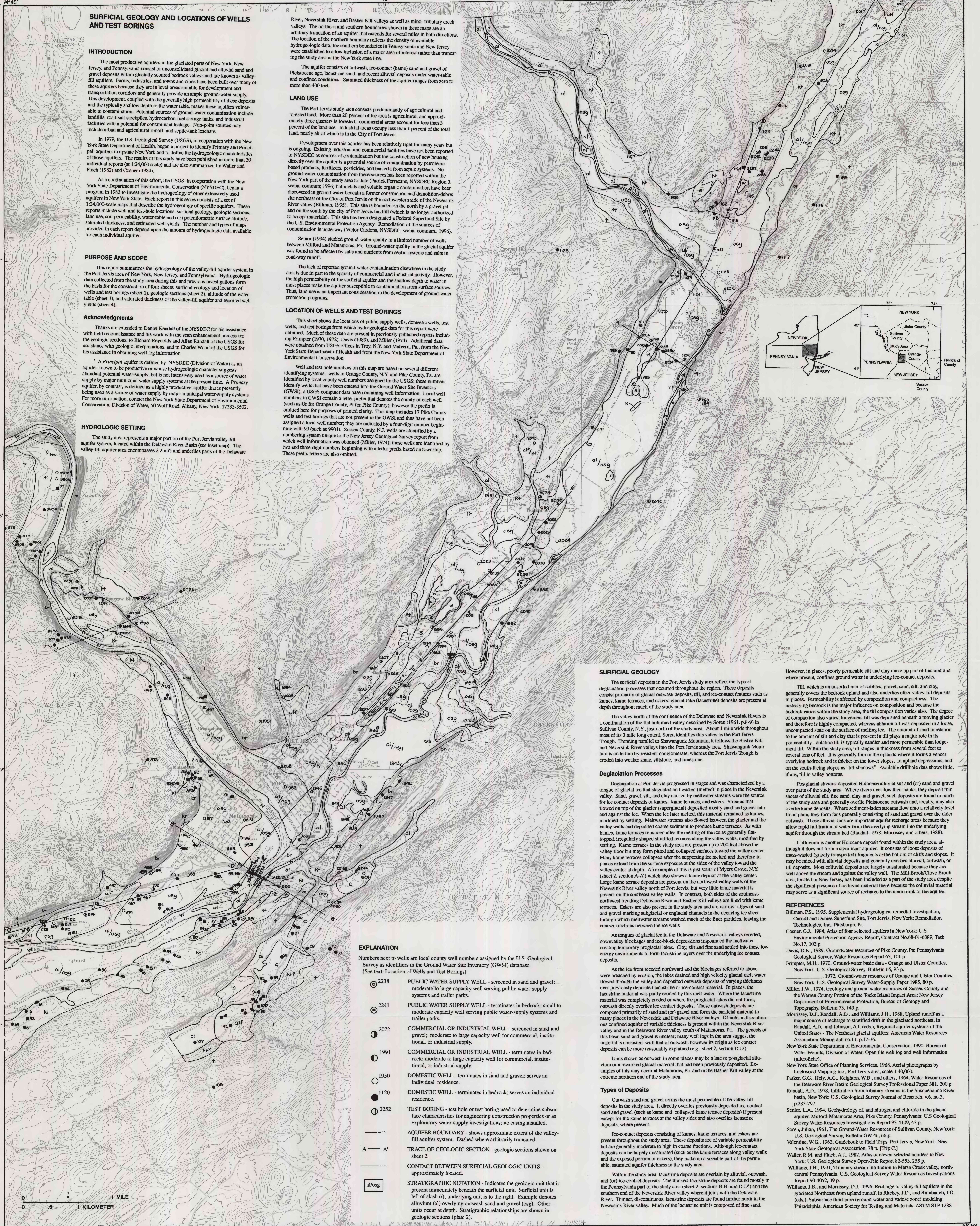

SURFICIAL GEOLOGY AND LOCATIONS OF WELLS AND TEST BORINGS

INTRODUCTION

The most productive aquifers in the glaciated parts of New York, New Jersey, and Pennsylvania consist of unconsolidated glacial and alluvial sand and gravel deposits within glacially scoured bedrock valleys and are known as valley-fill aquifers. Farms, industries, and towns and cities have been built over many of these aquifers because they are in level areas suitable for development and transportation corridors and generally provide an ample ground-water supply. This development, coupled with the generally high permeability of these deposits and the typically shallow depth to the water table, makes these aquifers vulnerable to contamination. Potential sources of ground-water contamination include landfills, road-salt stockpiles, hydrocarbon-fuel storage tanks, and industrial facilities with a potential for contaminant leakage. Non-point sources may include urban and agricultural runoff, and septic-tank leachate.

In 1979, the U.S. Geological Survey (USGS), in cooperation with the New York State Department of Health, began a project to identify Primary and Principal[1] aquifers in upstate New York and to define the hydrogeologic characteristics of those aquifers. The results of this study have been published in more than 20 individual reports (at 1:24,000 scale) and are also summarized by Waller and Finch (1982) and Cosner (1984).

As a continuation of this effort, the USGS, in cooperation with the New York State Department of Environmental Conservation (NYSDEC), began a program in 1983 to investigate the hydrogeology of other extensively used aquifers in New York State. Each report in this series consists of a set of 1:24,000-scale maps that describe the hydrogeology of specific aquifers. These reports include well and test-hole locations, surficial geology, geologic sections, land use, soil permeability, water-table and (or) potentiometric surface altitude, saturated thickness, and estimated well yields. The number and types of maps provided in each report depend upon the amount of hydrogeologic data available for each individual aquifer.

PURPOSE AND SCOPE

This report summarizes the hydrogeology of the valley-fill aquifer system in the Port Jervis area of New York, New Jersey, and Pennsylvania. Hydrogeologic data collected from the study area during this and previous investigations form the basis for the construction of four sheets: surficial geology and location of wells and test borings (sheet 1), geologic sections (sheet 2), altitude of the water table (sheet 3), and saturated thickness of the valley-fill aquifer and reported well yields (sheet 4).

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[1] A *Principal* aquifer is defined by NYSDEC (Division of Water) as an aquifer known to be productive or whose hydrogeologic character suggests abundant potential water-supply, but is not intensively used as a source of water supply by major municipal water supply systems at the present time. A *Primary* aquifer, by contrast, is defined as a highly productive aquifer that is presently being used as a source of water supply by major municipal water-supply systems. For more information, contact the New York State Department of Environmental Conservation, Division of Water, 50 Wolf Road, Albany, New York, 12233-3502.

HYDROLOGIC SETTING

The study area represents a major portion of the Port Jervis valley-fill aquifer system, located within the Delaware River Basin (see inset map). The valley-fill aquifer area encompasses 2.2 mi2 and underlies parts of the Delaware River, Neversink River, and Basher Kill valleys as well as minor tributary creek valleys. The northern and southern boundaries shown in these maps are an arbitrary truncation of an aquifer that extends for several miles in both directions. The location of the northern boundary reflects the density of available hydrogeologic data; the southern boundaries in Pennsylvania and New Jersey were established to allow inclusion of a major area of interest rather than truncating the study area at the New York state line.

The aquifer consists of outwash, ice-contact (kame) sand and gravel of Pleistocene age, lacustrine sand, and recent alluvial deposits under water-table and confined conditions. Saturated thickness of the aquifer ranges from zero to more than 400 feet.

LAND USE

The Port Jervis study area consists predominantly of agricultural and forested land. More than 20 percent of the area is agricultural, and approximately three quarters is forested; commercial areas account for less than 3 percent of the land use. Industrial areas occupy less than 1 percent of the total land, nearly all of which is in the City of Port Jervis.

Development over this aquifer has been relatively light for many years but is ongoing. Existing industrial and commercial facilities have not been reported to NYSDEC as sources of contamination but the construction of new housing directly over the aquifer is a potential source of contamination by petroleum-based products, fertilizers, pesticides, and bacteria from septic systems. No ground-water contamination from these sources has been reported within the New York part of the study area to date (Patrick Ferracane, NYSDEC Region 3, verbal commun; 1996) but metals and volatile organic contamination have been discovered in ground water beneath a former construction and demolition-debris site northeast of the City of Port Jervis on the northwestern side of the Neversink River valley (Billman, 1995). This site is bounded on the north by a gravel pit and on the south by the city of Port Jervis landfill (which is no longer authorized to accept materials). This site has been designated a Federal Superfund Site by the U.S. Environmental Protection Agency. Remediation of the sources of contamination is underway (Victor Cardona, NYSDEC, verbal commun., 1996).

Senior (1994) studied ground-water quality in a limited number of wells between Milford and Matamoras, Pa. Ground-water quality in the glacial aquifer was found to be affected by salts and nutrients from septic systems and salts in road-way runoff.

The lack of reported ground-water contamination elsewhere in the study area is due in part to the sparsity of commercial and industrial activity. However, the high permeability of the surficial aquifer and the shallow depth to water in most places make the aquifer susceptible to contamination from surface sources. Thus, land use is an important consideration in the development of ground-water protection programs.

LOCATION OF WELLS AND TEST BORINGS

This sheet shows the locations of public supply wells, domestic wells, test wells, and test borings from which hydrogeologic data for this report were obtained. Much of these data are present in previously published reports including Frimpter (1970, 1972), Davis (1989), and Miller (1974). Additional data were obtained from USGS offices in Troy, N.Y. and Malvern, Pa., from the New York State Department of Health and from the New York State Department of Environmental Conservation.

Well and test hole numbers on this map are based on several different identifying systems: wells in Orange County, N.Y. and Pike County, Pa. are identified by local county well numbers assigned by the USGS; these numbers identify wells that have been entered into the Ground Water Site Inventory (GWSI), a USGS computer data base containing well information. Local well numbers in GWSI contain a letter prefix that denotes the county of each well (such as Or for Orange County, Pi for Pike County), however the prefix is omitted here for purposes of printed clarity. This map includes 17 Pike County wells and test borings that are not present in the GWSI and thus have not been assigned a local well number; they are indicated by a four-digit number beginning with 99 (such as 9901). Sussex County, N.J. wells are identified by a numbering system unique to the New Jersey Geological Survey report from which well information was obtained (Miller, 1974); these wells are identified by two and three-digit numbers beginning with a letter prefix based on township. These prefix letters are also omitted.

EXPLANATION

Numbers next to wells are local county well numbers assigned by the U.S. Geological Survey as identifiers in the Ground Water Site Inventory (GWSI) database. [See text: Location of Wells and Test Borings]

◎ 2238	PUBLIC WATER SUPPLY WELL - screened in sand and gravel; moderate to large capacity well serving public water-supply systems and trailer parks.
⊙ 2241	PUBLIC WATER SUPPLY WELL - terminates in bedrock; small to moderate capacity well serving public water-supply systems and trailer parks.
◑ 2072	COMMERCIAL OR INDUSTRIAL WELL - screened in sand and gravel; moderate to large capacity well for commercial, institutional, or industrial supply.
◐ 1991	COMMERCIAL OR INDUSTRIAL WELL - terminates in bedrock; moderate to large capacity well for commercial, institutional, or industrial supply.
○ 1950	DOMESTIC WELL - terminates in sand and gravel; serves an individual residence.
● 1120	DOMESTIC WELL - terminates in bedrock; serves an individual residence.
⦶ 2252	TEST BORING - test hole or test boring used to determine subsurface characteristics for engineering construction properties or as exploratory water-supply investigations; no casing installed.
—— - -	AQUIFER BOUNDARY - shows approximate extent of the valley-fill aquifer system. Dashed where arbitrarily truncated.
A —— A'	TRACE OF GEOLOGIC SECTION - geologic sections shown on sheet 2.
————	CONTACT BETWEEN SURFICIAL GEOLOGIC UNITS - approximately located.
al/osg	STRATIGRAPHIC NOTATION - Indicates the geologic unit that is present immediately beneath the surficial unit. Surficial unit is left of slash (/); underlying unit is to the right. Example denotes alluvium (al) overlying outwash sand and gravel (osg). Other units occur at depth. Stratigraphic relationships are shown in geologic sections (plate 2).

SURFICIAL GEOLOGY

The surficial deposits in the Port Jervis study area reflect the type of deglaciation processes that occurred throughout the region. These deposits consist primarily of glacial outwash deposits, till, and ice-contact features such as kames, kame terraces, and eskers; glacial-lake (lacustrine) deposits are present at depth throughout much of the study area.

The valley north of the confluence of the Delaware and Neversink Rivers is a continuation of the flat bottomed valley described by Soren (1961, p.8-9) in Sullivan County, N.Y., just north of the study area. About 1 mile wide throughout most of its 3 mile long extent, Soren identifies this valley as the Port Jervis Trough. Trending parallel to Shawangunk Mountain, it follows the Basher Kill and Neversink River valleys into the Port Jervis study area. Shawangunk Mountain is underlain by resistent conglomerate, whereas the Port Jervis Trough is eroded into weaker shale, siltstone, and limestone.

Deglaciation Processes

Deglaciation at Port Jervis progressed in stages and was characterized by a tongue of glacial ice that stagnated and wasted (melted) in place in the Neversink valley. Sand, gravel, silt, and clay carried by meltwater streams were the source for ice contact deposits of kames, kame terraces, and eskers. Streams that flowed on top of the glacier (superglacial) deposited mostly sand and gravel into and against the ice. When the ice later melted, this material remained as kames, modified by settling. Meltwater streams also flowed between the glacier and the valley walls and deposited coarse sediment to produce kame terraces. As with kames, kame terraces remained after the melting of the ice as generally flat-topped, irregularly shaped stratified terraces along the valley walls, modified by settling. Kame terraces in the study area are present up to 200 feet above the valley floor but may form pitted and collapsed surfaces toward the valley center. Many kame terraces collapsed after the supporting ice melted and therefore in places extend from the surface exposure at the sides of the valley toward the valley center at depth. An example of this is just south of Myers Grove, N.Y. (sheet 2, section A-A') which also shows a kame deposit at the valley center. Large kame terrace deposits are present on the northwest valley walls of the Neversink River valley north of Port Jervis, but very little kame material is present on the southeast valley walls. In contrast, both sides of the southeast-northwest trending Delaware River and Basher Kill valleys are lined with kame terraces. Eskers are also present in the study area and are narrow ridges of sand and gravel marking subglacial or englacial channels in the decaying ice sheet through which meltwater streams washed much of the finer particles, leaving the coarser fractions between the ice walls

As tongues of glacial ice in the Delaware and Neversink valleys receded, downvalley blockages and ice-block depressions impounded the meltwater creating temporary proglacial lakes. Clay, silt and fine sand settled into these low energy environments to form lacustrine layers over the underlying ice contact deposits.

As the ice front receded northward and the blockages referred to above were breached by erosion, the lakes drained and high velocity glacial melt water flowed through the valley and deposited outwash deposits of varying thickness over previously deposited lacustrine or ice-contact material. In places, the lacustrine material was partly eroded by this melt water. Where the lacustrine material was completely eroded or where the proglacial lakes did not form, outwash directly overlies ice contact deposits. These outwash deposits are composed primarily of sand and (or) gravel and form the surficial material in many places in the Neversink and Delaware River valleys. Of note, a discontinuous confined aquifer of variable thickness is present within the Neversink River valley and in the Delaware River valley south of Matamoras, Pa. The genesis of this basal sand and gravel is unclear; many well logs in the area suggest the material is consistent with that of outwash, however its origin as ice contact deposits can be more reasonably explained (e.g., sheet 2, section D-D').

Units shown as outwash in some places may be a late or postglacial alluvium or a reworked glacial material that had been previously deposited. Examples of this may occur at Matamoras, Pa. and in the Basher Kill valley at the extreme northern end of the study area.

Types of Deposits

Outwash sand and gravel forms the most permeable of the valley-fill deposits in the study area. It directly overlies previously deposited ice-contact sand and gravel (such as kame and collapsed kame terrace deposits) if present except for the kame terraces at the valley sides and also overlies lacustrine deposits, where present.

Ice-contact deposits consisting of kames, kame terraces, and eskers are present throughout the study area. These deposits are of variable permeability but are generally moderate to high in coarse fractions. Although ice-contact deposits can be largely unsaturated (such as the kame terraces along valley walls and the exposed portion of eskers), they make up a sizeable part of the permeable, saturated aquifer thickness in the study area.

Within the study area, lacustrine deposits are overlain by alluvial, outwash, and (or) ice-contact deposits. The thickest lacustrine deposits are found mostly in the Pennsylvania part of the study area (sheet 2, sections B-B' and D-D') and the southern end of the Neversink River valley where it joins with the Delaware River. Thinner, discontinuous, lacustrine deposits are found further north in the Neversink River valley. Much of the lacustrine unit is composed of fine sand. However, in places, poorly permeable silt and clay make up part of this unit and where present, confines ground water in underlying ice-contact deposits.

Till, which is an unsorted mix of cobbles, gravel, sand, silt, and clay, generally covers the bedrock upland and also underlies other valley-fill deposits in places. Permeability is affected by composition and compactness. The underlying bedrock is the major influence on composition and because the bedrock varies within the study area, the till composition varies also. The degree of compaction also varies; lodgement till was deposited beneath a moving glacier and therefore is highly compacted, whereas ablation till was deposited in a loose, uncompacted state on the surface of melting ice. The amount of sand in relation to the amount of silt and clay that is present in till plays a major role in its permeability - ablation till is typically sandier and more permeable than lodgement till. Within the study area, till ranges in thickness from several feet to several tens of feet. It is generally thin in the uplands where it forms a veneer overlying bedrock and is thicker on the lower slopes, in upland depressions, and on the south-facing slopes as "till-shadows". Available drillhole data shows little, if any, till in valley bottoms.

Postglacial streams deposited Holocene alluvial silt and (or) sand and gravel over parts of the study area. Where rivers overflow their banks, they deposit thin sheets of alluvial silt, fine sand, clay, and gravel; such deposits are found in much of the study area and generally overlie Pleistocene outwash and, locally, may also overlie kame deposits. Where sediment-laden streams flow onto a relatively level flood plain, they form fans generally consisting of sand and gravel over the older outwash. These alluvial fans are important aquifer recharge areas because they allow rapid infiltration of water from the overlying stream into the underlying aquifer through the stream bed (Randall, 1978; Morrissey and others, 1988).

Colluvium is another Holocene deposit found within the study area, although it does not form a significant aquifer. It consists of loose deposits of mass-wasted (gravity transported) fragments at the bottom of cliffs and slopes. It may be mixed with alluvial deposits and generally overlies alluvial, outwash, or till deposits. Most colluvial deposits are largely unsaturated because they are well above the stream and against the valley wall. The Mill Brook/Clove Brook area, located in New Jersey, has been included as a part of the study area despite the significant presence of colluvial material there because the colluvial material may serve as a significant source of recharge to the main trunk of the aquifer.

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HYDROGEOLOGY OF THE PORT JERVIS AREA, IN ORANGE COUNTY, NEW YORK; PIKE COUNTY, PENNSYLVANIA; AND SUSSEX COUNTY, NEW JERSEY

By
James D. Garry