SURFICIAL GEOLOGY AND GEOLOGIC SECTIONS

(Refer to pl. 2A)

The Salamanca area lies mainly to the south of the glaciated region and is characteristic of the steep, highly dissected Allegheny Plateau physiographic province. Although glaciers generally caused little erosion in the uplands of this area, they had a significant effect in the valleys.

Before glaciation, the preglacial Allegheny River and its tributaries cut deeply into the underlying Devonian shales and sandstones of the Conewango and Conneaut Groups (Rickard and Fisher, 1970). The limited depth-to-bedrock data, together with bedrock depths extrapolated from the adjacent Olean area, indicate that the Allegheny River valley in this area contains approximately 300 feet of unconsolidated sediments. The thickness of these unconsolidated sediments is greatest along the valley axis and decreases near the valley walls and in upstream tributaries. (See pl. 2B.)

Glacial History

The unconsolidated deposits result from at least two glacial advances and retreats in this region. Before glaciation, the Allegheny River flowed northwestward to Lake Erie along the present Conewango Creek valley. When glacial ice (possibly Illinoian or older) advanced from the west, it deposited a terminal moraine about 3.5 miles northwest of Cold Spring that prevented any further flow of the modern Allegheny River to Lake Erie (Calkin and Muller, 1980, p. 2). Blocked by the moraine, the river formed a deep, sinuous lake upstream along the Allegheny Valley and its larger tributaries. Meltwater streams entering this lake deposited the coarser fraction of their sediment load--sand and gravel--as deltas around the periphery of the lake, whereas the finer fractions--silt and clay--were carried out further into the lake to settle out as lake-bottom sediments. As much as 200 feet of silt and clay was deposited in parts of the Allegheny River valley in this manner. Eventually a new channel developed south of this area at Kinzua, Pa., which permanently altered the drainage of the Allegheny River to its present southwestward course into the Ohio River drainage basin. In the lake-draining process, the Allegheny River downcut and eroded away some of the previously deposited lake sediments in the Allegheny River valley.

As the glacial ice receded, sediment-charged meltwater from its terminus deposited long valley trains of outwash sand and gravel in the Allegheny River, Great Valley Creek, Little Valley Creek, and Bucktooth Creek valleys. Frimpter (1974, p. 35) reports that outwash sand and gravel in the Allegheny valley may once have been more than 300 feet thick in places but was subsequently eroded by the Allegheny River.

The outwash deposits in the Allegheny Valley temporarily blocked tributaries not carrying glacial meltwater and thus formed small lakes that became filled with a combination of coarse and fine-grained sediments. This process of advancing continental ice, deposition of outwash, and subsequent erosion occurred at least twice in the Salamanca area and left at least two sequences of glaciofluvial deposits of different ages.

Glacial Deposits

Depositional features associated with the Illinoian ice advance, such as end moraines and remnant outwash terraces, are seen in the Allegheny valley in the western patt of the mapped area (see pl. 2A). Most evidence of earlier glaciation was covered or destroyed by two later Wisconsin glacial advances--during the Altonian substage from the northeast, and during Woodfordian time from the northwest (Muller, 1977). The glacial advance during Altonian time occupied the main tributary valleys in the northeastern part of the map and deposited sediments informally referred to as the Olean drift. Features associated with this advance include the end moraines in the Little Valley Creek and the Great Valley Creek valleys. The glacial advance during Woodfordian time covered the northwestern part of Cattaraugus County and deposited sedimentary features informally called the Kent drift. End moraines and till deposits shown in the northwestern part of the map are associated with this advance. Sediments associated with the Kent drift abut older deposits of Olean drift in the headwaters area of the West Branch Bucktooth Run Creek but these are not differentiated on the map. The remaining area--a roughly triangular wedge that lies mostly south of the Allegheny River in the south-central part of Cattaraugus County--is referred to as the Salamanca reentrant and is the only part of New York State that escaped glaciation entirely (Muller, 1963).

Aquifer System

Most of the valley-train outwash in the Allegheny River valley and its tributaries was probably deposited during Altonian and Woodfordian time. These deposits overlie a thick section of lacustrine silt and clay and form the principal water-table (unconfined) aquifer. The glacial history indicates that a smaller, confined aquifer may underlie the lacustine sediments, but no data are available to substantiate this. The surficial outwash sand and gravel unit generally extends across the full width of the valley floor (see geologic sections), and is generally thickest (approximately 60 feet of saturated thickness) along the valley axis (Frimpter, 1974, p. 35). The surficial aquifer is under water-table (unconfined) conditions but may be semi-confined in places as a result of local variations in aquifer permeability. Properly developed wells tapping the surficial aquifer can be expected to yield hundreds of gallons per minute; several production wells in the Salamanca area, including the municipal water-supply wells, are reportedly capable of producing more than 1,000 gallons per minute. Two major public-supply water systems in the area currently serve a population of approximately 7,000 with a combined average daily pumpage of 1.2 million gallons per day.

SELECTED REFERENCES

Bryant, J. C., 1955, A refinement of the upland glacial drift border in southern Cattaraugus County, New York: Ithaca, N.Y., Cornell University, Ph.D. thesis, 127 p.

Calkin, P. E., and Muller, E. H., 1980, Geologic setting and glacial overview of the upper Cattaraugus basin, southwestern New York, in LaFleur, R. G., ed., 1980, Guidebook, 43rd Annual Reunion, Northeast Friends of the Pleistocene: Springville, N.Y., Friends of the Pleistocene, 69 p.

Frimpter, M. H., 1974, Ground water resource, Allegheny River basin and part of the Lake Erie basin, New York: New York State Department of Environmental Conservation Basin Planning Report ARB-2, 98 p.

Fullerton, D. S., 1980, Preliminary correlation of Post-Erie Interstadial events (16,000-10,000 radiocarbon years before present), central and eastern Great Lakes Region, and Hudson, Champlain, and St. Lawrence lowlands, United States and Canada: U.S. Geological Survey Professional Paper 1089, 52 p.

MacClintock, P., and Apfel, E. T., 1944, Correlation of the drifts of the Salamanca reentrant, New York: Geological Society of America Bulletin, v. 55, no. 10, p. 1143-1164.

Muller, E. H., 1963, Geology of Chautauqua County, New York, Part II, Pleistocene geology: New York State Museum and Science Service, Bulletin 392, 60 p.

_____ 1977, Quaternary geology of New York, Niagara sheet: New York State Museum and Science Service, Map and Chart Series no. 28.

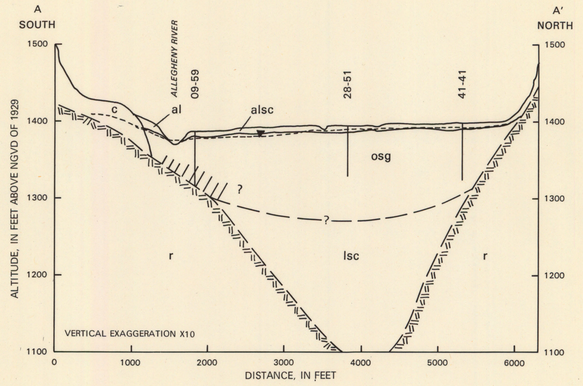
Rickard, L. V., and Fisher, D. W., 1970, Geologic map of New York, Niagara sheet: New York State Museum and Science Service, Map and Chart Series no. 15.

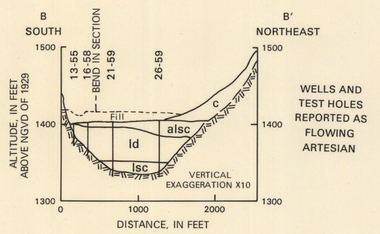
Tesmer, I. H., 1975, Geology of Cattaraugus County, New York: Buffalo Society of Natural Science, Bulletin 27, 105 p.

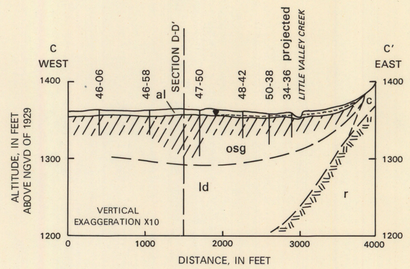
EXPLANATION--PLATES 2A, 2B

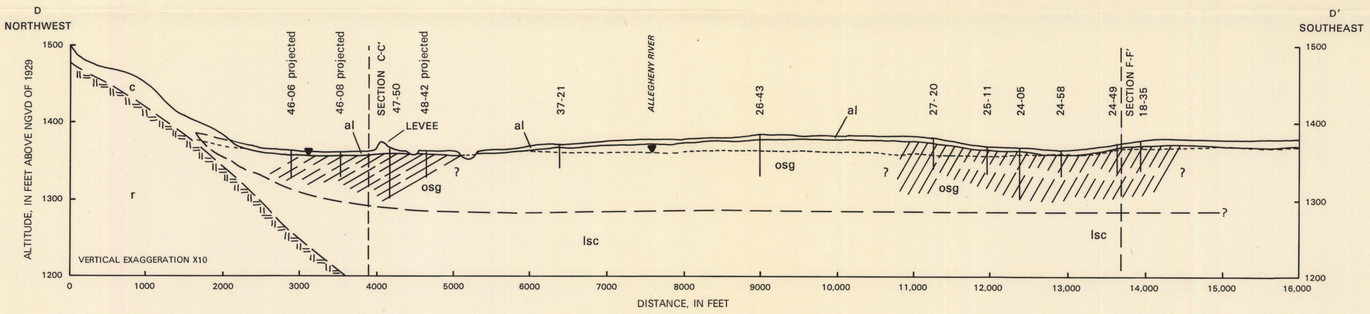
- **alsc** — ALLUVIAL SILT AND CLAY--postglacial river and stream flood-plain deposits consisting predominantly of fine sand, silt, and clay. Low to moderate permeability.
- **al** — ALLUVIAL SILT, SAND, AND GRAVEL--postglacial river and stream flood-plain deposits consisting of silt, sand, and gravel with some clay. Permeablity varies according to size fraction and sorting. Includes alluvial-fan deposits, which are generally more permeable.
- **pm** — PEAT AND MUCK--postglacial organic swamp deposits of generally low permeability; occupies kettlehole depressions in kame sand and gravel.
- **osg** — OUTWASH SAND AND GRAVEL--well-sorted sand and gravel deposited by meltwater streams from glacial ice. Highly permeable in general but may contain less permeable silty or clayey zones. Deposited as outwash terraces and aprons near the receding ice front, and as valley-train outwash by meltwater streams. Outwash subsequently eroded by the Allegheny River appears as prominent terraces. This material forms the principal stratified-drift aquifer in the area.
- **ld** — INTERBEDDED LACUSTRINE-DELTAIC DEPOSITS--deltaic sand and gravel interbedded with and grading into lacustrine sand, silt, and clay. Permeability generally low but may be higher in coarser, well-sorted beds or lenses. These deposits are generally found within small tributary valleys where streams deposited their sediment loads near the margin of the glacial lake that once occupied the present Allegheny River and tributary valleys.
- **lsc** — LACUSTRINE SILT AND CLAY--interbedded silt and clay with occasional lenses of fine sand deposited as bottom sediments in proglacial lakes; generally low permeability. Underlies the surficial outwash aquifer in the Allegheny River valley.
- **t** — TILL--an unsorted mixture of clay, silt, and sand and gravel deposited beneath the ice sheet (lodgment till) or at the edge of the ice sheet (ablation till) during an advance or pause in glacial movement. Deposited as ablation or lodgment till as till shadows against bedrock hillsides, or as ground moraine over bedrock uplands. Permeability generally low.
- **emt** — END-MORAINE TILL--end-moraine deposits of ablation till. Composition ranges from silty clay till to sandy till, including mixtures of poorly sorted gravel and cobbles. Permeability low in general, but is variable due to presence of locally occurring gravel lenses. Marks the furthest extent of glaciation of Altonian and Woodfordian time of the Wisconsin glaciation.
- **c** — COLLUVIAL SOIL--a mixture of mass-wasted and runoff-transported debris at or near the foot of slopes. Deep clayey soils developed from underlying bedrock or washed from upland soils in unglaciated areas. Permeability is typically low.
- **r** — BEDROCK--undifferentiated Devonian siltstone, sandstone, and shales. May underlie thin mantle of soil.
- **w** — OPEN WATER--ponds and lakes. Does not include rivers and streams.
- **al/osg** — MAP-SYMBOL NOTATION--denotes nature of material immediately beneath surficial unit. Surficial-unit symbol is left of slash mark (/); underlying unit symbol is on right. In this example, alluvial silt, sand, and gravel (al) is shown to overlie outwash sand and gravel (osg). Other units may exist at greater depths; stratigraphic relations are shown in the geologic sections.
- GEOLOGIC CONTACT--denotes contact between morphostratigraphic units; dashed where inferred.
- GLACIAL MARGIN--denotes approximate extent of the furthest advance of glacial ice during Altonian and Woodfordian time of Wisconsin glaciation (Bryant, 1955; Muller, 1977). Hachures point toward former glacier.
- ILLINOIAN GLACIAL DEPOSIT--denotes the extent of glacial features associated with the Illinoan glaciation as mapped by Muller (1977). Hachures are on feature side of contact.
- A ⟷ A′ TRACE OF SECTION--trace of geologic section.
- WELL OR TEST HOLE--source of information for construction of geologic section. Identification of well or test hole is given on trace of section on plate 1.
- SILTY OUTWASH SAND AND GRAVEL--shaded areas denote siltier zones of outwash sand and gravel unit, shown on the geologic sections.
- 26-54 — WELL OR TEST HOLE--source of information for construction of geologic sections. Hyphenated number corresponds to seconds of latitude and longitude. (See location and explanation on pl. 1.)
- WATER TABLE--denotes approximate position of the water table within the surficial outwash aquifer. Water-table altitudes are shown on plate 3.

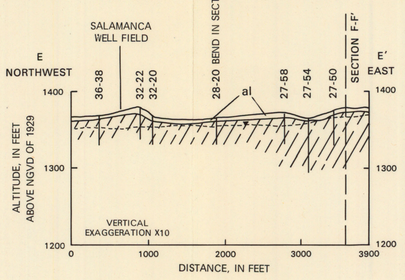
NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Mean Sea Level".

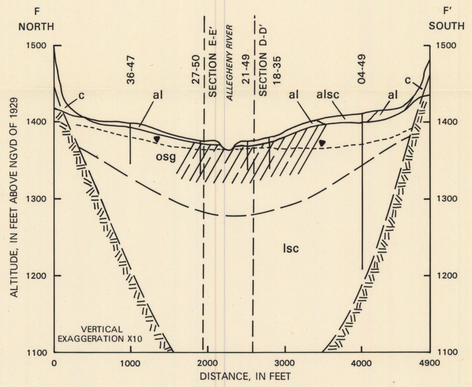












HYDROGEOLOGY OF THE SALAMANCA AREA, CATTARAUGUS COUNTY, NEW YORK

by
Phillip J. Zarriello

GEOLOGIC SECTIONS