New York State Museum
Mark Schaming, Director

New York State Geological Survey

SURFICIAL GEOLOGY OF THE WESTERLO 7.5-MINUTE QUADRANGLE, ALBANY COUNTY, NEW YORK

prepared by
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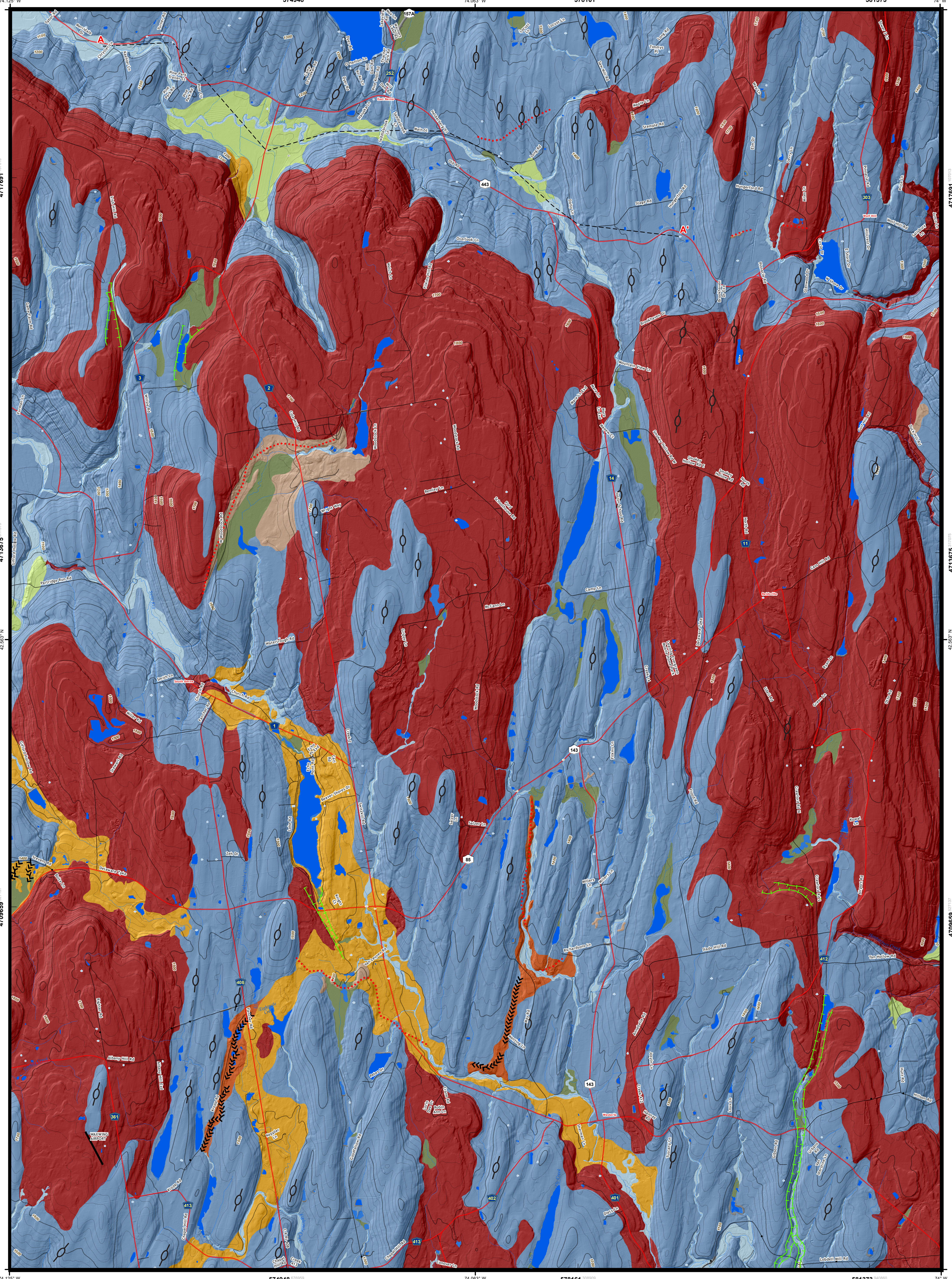
Supported in part by the U.S Geological Survey Cooperative Agreement Number G19AC00249
National Cooperative Geologic Mapping Program (STATEMAP)



Universal Transverse Mercator, Zone 18 N
North American Datum of 1983

Hygrology, and planimetry layers from the New York State DOT Raster Quadrangle separates for Albany County (https://gis.ny.gov/gisdata/inventories/member.cfm?OrganizationID=108).

Geographic data layers from 2019 TIGER/Line shapes for transportation and hydrograpghy (https://www.census.gov/cgi-bin/geo/shapefiles/index.php)

Shaded relief from Capital District 2 m, and NYS 10m DEM lidar data sets (http://gis.ny.gov/elevation/index.cfm)

Magnetic declination from the NOAA online Declination Calculator: http://www.ngdc.noaa.gov/geomag-web/#declination

SCALE 1:24,000

CONTOUR INTERVAL: 10 FEET

Geologic mapping by J. Leone and A. Kozlowski, 2020
Digital data and cartography, J. Leone and K. Backhaus, 2020

UTM GRID AND 2016 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

INTRODUCTION:

The Westerlo 7.5-Minute Quadrangle was mapped as part of the 2019 National Cooperative Geologic Mapping Program funded STATEMAP project (award #G19AC00249). This quadrangle was one of eighteen partial and full quadrangles mapped as part of the Albany County Surficial Geologic mapping project being undertaken by the New York State Geological Survey. This county-wide mapping project started in 2016 and is scheduled to conclude sometime in the early to mid-2020's. The purpose of this map was to identify and delineate various surficial and geologic materials with the intent that this geologic information may serve as a guide to municipalities when making decisions regarding land use, environmental and natural resource considerations across its roughly 55 square mile area.

The Westerlo quadrangle, located in southwest Albany County lies entirely within the boundary of the county. The quadrangle is approximately ten miles southwest of the City of Albany. New York State Routes 85 and 443 run through the quadrangle. The towns of Westerlo, Rensselaerville, Berne, and New Scotland are the main municipalities within the quadrangle. Much of the quadrangle is rural vacant farmland, with the largest residential area being around the hamlet of Westerlo. Other hamlets in the quadrangle include East Berne, South Berne, and Reidsville.

The quadrangle is situated at the northeastern edge of the Allegheny Plateau. This area is also often referred to and the Helderberg Plateau. An elevation of 560 meters (about 538 feet) above mean sea-level is near and old quarry off Woodstock road north of the National Weather Service's Radar tower. The lowest elevation in the quadrangle is 265 meters (869 feet) above mean sea-level, in the Hannacroix Creek as it flows out of the quadrangle to the east on Tan Hollow Road.

The bedrock in the region has been mapped for STATEMAP previously by Charles Ver Straeten (2010) at 1:24,000. Bedrock in the quadrangle is Middle Devonian in age, consisting of Hamilton Group limestones, sandstones, siltstones and shales.

The surficial geologic units in this quadrangle were previously mapped at 1:250,000 scale and were reported to be kame, lacustrine sand, recent deposits (alluvium), till, kame moraines, outwash sand and gravels and lacustrine silt and clays (Cadwell and Dineen, 1987). No higher resolution studies have been conducted in this area until this study.

METHDOLOGY:

To create the surficial geology map of the Westerlo Quadrangle, preliminary field maps were created using the ESRI ArcMap 10.7 software and consisted of all available topographic data (roads, lidar surface terrain and hydrography) to plot all field data on including field stops, bedrock outcrops, and important site information. Surficial soil sampling employed the use of a five-and-a-half-foot hand auger to allow sample below the variably thick organic soil horizon (below the topsoil). Another tool used is an entrenching shovel and pick. This tool was used to remove topsoil and/or eroded sediments from outcrops or exposures to expose fresh sediments for analysis. At each field stop, the coordinates (latitude and longitude in decimal degrees) were taken using a handheld Garmin GPS 66st, descriptive notes on the sediment found, whether a sample and or high-resolution, scaled photo were taken, and the time at which the stop was take were logged into a field notebook (TPK_FN6).

At most of the field sampling sites, a soil sample was taken for grain-size analysis. This employs the use of either one or two processes: dry-sieve or wet-sieve analysis. These processes followed the procedure outlined by Bowles (1978), while only using a seven-tiered sieve stack (#5, #10, #18, #35, #60, #120, #230, and Pan) for both dry- (mechanical) and wet- (hydrometer) sieve analysis. The predominantly cohesive (fine-grain dominant) samples were sorted using the wet-sieve analysis, while the cohesionless (coarse-grain dominant) samples were sorted using the dry-sieve analysis. Sedimentological data from sieve analysis of field samples is available upon request.

The final surficial geologic map, cross-section and elevation maps were produced using the ESRI ArcMap and Adobe Illustrator CS6 programs. The subsur¬face and surface units were compiled using 162 water wells from the New York State Department of Environmental Conservation and 13 engineering bore¬holes by the New York State Department of Transportation. The cross-sections were created in ArcMap using the XActo Cross-section 10 tool developed by Jennifer Carell, formerly of the Illinois Geologic Survey, and then exporting the cross-section into Adobe Illustrator to connect the stratigraphic units.

The surficial geologic map was created by producing polygons to digitize the map in ArcMap and its symbol was colored according to its respective RGB color value in the NYSGS Surficial Geologic Unit Legend. The final map was drafted in Adobe Illustrator and exported as a PDF file.
Geoprobe sampling took place in November of 2020 to further investigate the glacial and non-glacial sediments and stratigraphy of a suspected former glacial lake basin. These cores were examined in the surficial geology labora¬tory at the New York State Museum. Arctic plant macro-fossils were collected and submitted to University of California Irvine for AMS radiocarbon laboratory and the results of these analyses are pending at this time.

RESULTS:

A total of 130 field stops, and observations were made with 106 samples collected for grain size analysis (see appendix), within the quadrangle. Some stops contained more than one sample as they exhibited stratigraphy either in an exposure or at depths with the hand-auger. The final count for lithologies found during field mapping was: 86 stops were diamicton, 20 were bedrock, 17 were sand and gravel, five stops were glaciolacustrine silt, fine sand, and clay, and two stops with fine to coarse sand, also included are two very large exotic boulders. During field mapping one optically stimulated luminescence (OSL) sample was collected in a sand and gravel pit. Two Geoprobe cores (CH2006 and CH2007) at the base of Cole Hill were collected. Arctic plant macro-fossils were found in two medium sand units three meters apart in depth. The surficial geologic units found within the quadrangle are as follows:

Artificial Fill (Af)
This unit is generally composed of coarse/fine, large cement mounds and/or crushed rock anthropogenically transported and used for construction purposes. This material is used in artificial dams, built to retain water, large, and raised roadbeds for bridges as fill within the quadrangle.

Holocene Alluvium (Ha) and Holocene Wetland Deposits (Hw)
Post glacial sediments occupy the low areas or land depression throughout the quadrangle. Ha is associated with fluvial process in creek valleys throughout the quadrangle. This lithology generally consists of stratified silt, sand, and gravel. Hw is associated with low areas and depressions in the highlands of the quadrangle where wetlands form due to poor drainage. This lithology consists of peat, marl, clay or sand in these areas of poor drainage.

Pleistocene Silt and Clay (Plsc)
Stratified, fine-grained sediment consisting of fine sand, silt and clay size particles. Inferred to be deposited in mid shore to deep-water settings of glacial lakes. May include marl, rhythmites, and varves. Plsc is found in the low-lying areas along New York State Route 443 and at the edge of the western edge of the quadrangle on Gifford Hollow Road.

Pleistocene Cobbles to Sand (Pics)
Stratified ice contacted deposits, variable coarse-grained sediment consisting of boulders to sand size particles. Inferred to be deposited along an ice-margin. May include, interbedded coarse lenses of gravel and clast supported diamicton (flow tills). Eskers and some stratified sand and gravels associated with a potential ice margin were found in the south-central portion of the quadrangle at the end of Richardson, May, and Kropp Roads.

Pleistocene Stratified Sand and Gravel (Psg)
Well-sorted and stratified sand and gravel. May include cobbles and boulders. Inferred to be delta, fan or lag deposits in glacial channels or near ice margins. Mostly adjacent to the Pics deposits, sand and gravel deposits are found mainly in the south-central and western portions of the quadrangle.

Pleistocene Diamicton (Pd)
An admixture of unsorted sediment ranging from clay to boulders. Generally, matrix supported, massive and clast rich. Diamicton is widespread throughout the quadrangle, mainly found on the lower lying hilltops and drumlins in the quadrangle.

Pleistocene Diamicton (Pdcs)
An admixture of unsorted sediment ranging from clay to boulders. Generally, clast supported, massive and clast rich. This designation of diamicton has been assigned to poorly sorted sediments along Woodstock Road, small ridges at the end of Van Leuven Road, and a few other similar looking formations in the eastern portion of the quadrangle.

SUMMARY AND DISCUSSION:

The Westerlo Quadrangles two most dominant surficial geologic units are diamicton (interpreted as till) and Devonian-age bedrock. Drumlins and flutes are the dominant landforms on the quadrangle. These streamlined features infer the orientation of ice flow from the Hudson Lobe Ice Sheet through the region. Some valleys contain well-sorted sediments recording the glacial retreat processes that deposited them which in turn helps to understand the natural history of the region.

The Middle Devonian aged Hamilton Group clastic rocks make up the bedrock of the area. Erosionally resistant benches of limestone, siltstone and sand-

SUMMARY AND CONCLUSIONS: Continued...

sandstone punctuate the landscape throughout the quadrangles. Most notable the east to west escarpment that is formed by the Mount Marian in the northern portion of the quadrangle. Bedrock outcrops near the County Highway garage and can be followed into a ravine to the northeast. Moving up in elevation and south on this escarpment is the highest point on the quadrangle. This higher elevation may have been enough to cause divergence in the glacier flow lines splitting the lobe as evidenced by the drumlins in the immediate area curving slightly around it. Exposures of bedrock are not limited to the hilltops. Some notable outcrops were towards the base of drumlins overlain by till. One outcrop in the northeast portion features a section of folded black shale. An area just south of Woodstock Road has deposits of poorly sorted sand, gravel, and some cobbles. This Pdcs might be moraine left behind high on the landscape. Samples collected in the area were poorly sorted sediments with little to no clay and silt. Pdcs is speculated to form a loop moraine off Van Leuven road further south. These moraines could be time equivalent, but more investigation will be needed to answer this question.

The drumlins and flutes are the other dominant feature on the map. These streamlined linear features are oriented roughly north northeast to south southwest across the entire quadrangle recording the movement of the Hudson Lobe of the Laurentide Ice Sheet. Field samples such as collected from road cuts bisecting these features were made up of till. In some cases, the drumlins can be found as isolated glacial sediments over large areas of bedrock. Striations found on bedrock located on Duck Hill Road are oriented the same approximate direction as the streamlined features. Between the streamlined features along May Road and Klopp Road are areas with sand and gravel deposits in the form of eskers. The gravels in these formations were primarily well rounded with some clasts being cobble sized. The southwest section of the quadrangle also contains valleys filled with outwash sands and gravels that extend beyond the quadrangle boundaries.

Glaciolacustrine sediments, specifically at the north end of Cole Hill Road likely represent a temporal proglacial lake that may have existed while the Hudson Lobe was retreating north and east down into the Hudson Valley. Based on present day elevations it is likely that this lake drained to the west into the present-day Schoharie Valley. Rhythmites of clay, silt and fine to medium sands between 4 meters/14 feet and 8 meters/27 feet of the Bore Hole CH2007 yielded Dryas Integrafolia leaves, a plant found in present day sub-arctic to arctic environments, and woody plant material. The boring reached 71 feet (21.6 meters) and did not reach bedrock. Based on nearby water well records bedrock is estimated to be deeper than 100 feet (>30 meters).

The Westerlo Quadrangle has a diverse distribution of surficial geologic sediments. While till and bedrock are the most abundant surface material in the quadrangle, glaciolacustrine, ice contacted sand and gravel deposits and glacial outwash are present in the quadrangle. The position of the outwash and ice contacted sediments in the southern portion of the quadrangle along with the bedrock that has been scoured off throughout much of the quadrangle suggest glacial meltwater was active and deposited sediment while the glaciers were building the small moraines. After the Hudson Lobe began to recede from the escarpment glacial meltwater would have begun filling the isolated basins just to the north. The drainage outlets may have changed over time depending on which pathways opened by melting ice. Further work in the adjacent Rensselaerville Quadrangle will help define the drainage patterns and sequence. AMS radio-carbon dates from the Arctic plant fossils and the OSL sample collected in the Richardson road sand pit will help better understand the timing of these events.

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DESCRIPTION OF MAP UNITS

Holocene

Af — **Artifical Fill (Af)**
Surficial sediment composed of coarse/fine and or crushed rock anthropogenically transported and used for construction purposes.

Ha — **Stratified silt, sand and gravel (Ha)**
Sorted and stratified silt, sand, and gravel, deposited by rivers and streams. May include cobbles and boulders. Inferred as post-glacial alluvium and includes modern channel, over-bank and fan deposits

Hw — **Wetland Deposit (Hw)**
Peat, muck, marl, silt, clay or sand deposited in association with wetland environments. Various sediments can be present at transitional boundaries from one facies to another

Pleistocene

Plsc — **Silt and Clay (Psc)**
Stratified, fine-grained sediment consisting of fine sand, silt and clay size particles. Inferred to be deposited in mid shore to deepwater settings of glacial lakes. May include marl, rythmites, and varves.

Pics — **Cobbles to Sand (Pics)**
Stratified ice contacted deposits, variable coarse-grained sediment consisting of boulders to sand size particles. Inferred to be deposited along an ice-margin. May include, interbedded coarse lenses of gravel and clast supported diamictons (flow tills).

Psg — **Stratified sand and gravel (Psg)**
Well-sorted and stratified sand and gravel. May include cobbles and boulders. Inferred to be delta, fan or lag deposits in glacial channels or near former ice margins.

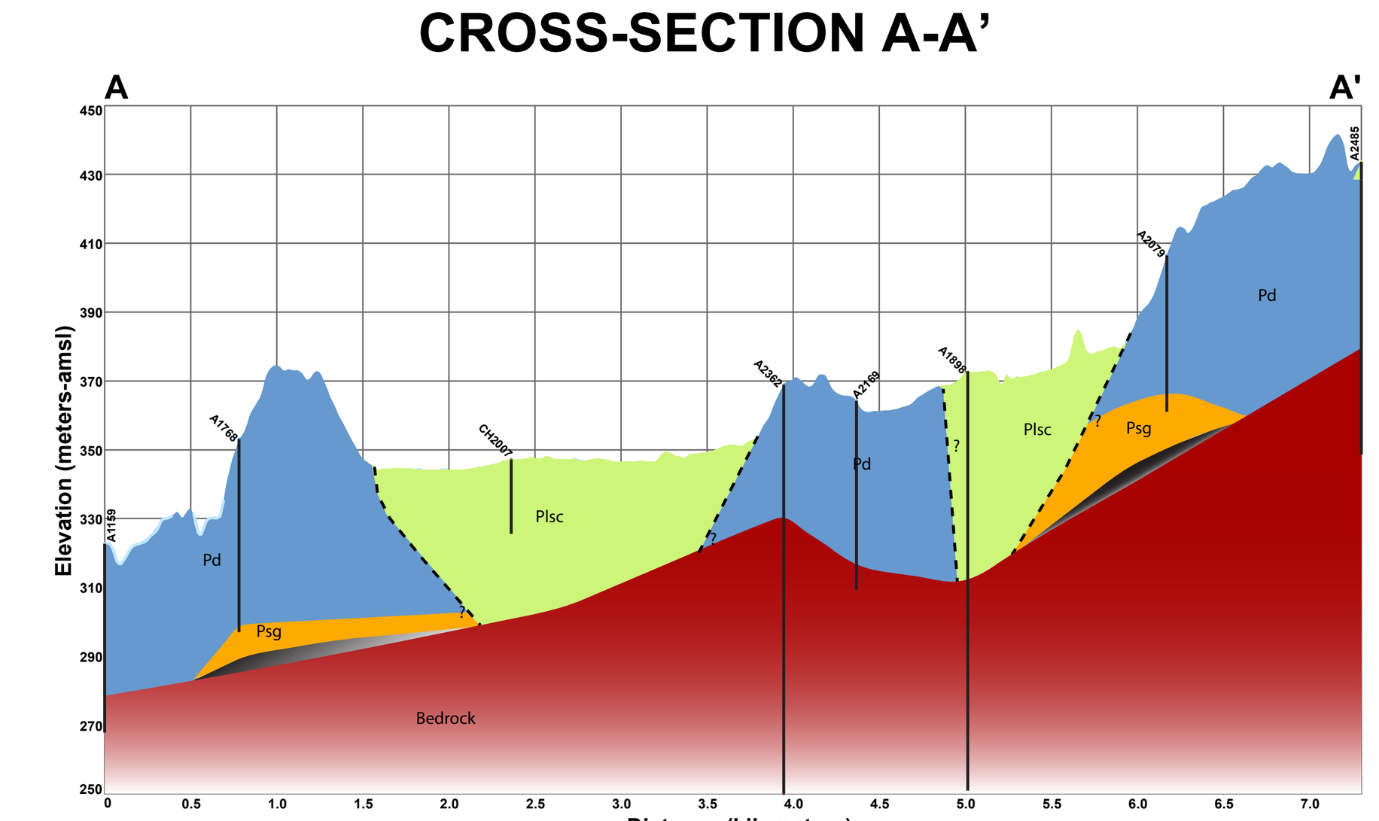
Pd — **Diamicton (Pd)**
An admixture of unsorted sediment ranging from clay to boulders. Generally matrix supported, massive and clast-rich.

Pdcs — **Diamicton (Pdcs)**
An admixture of unsorted sediment ranging from clay to boulders. Generally clast supported, massive and clast-rich.

Pre-Pleistocene

Br — **Bedrock (Br)**
Non-glacially derived, rock, pre-Pleistocene in age. Areas mapped as bedrock may have up to a meter of glacial drift (till, sand, silt) mantling the rock surface in some locations.

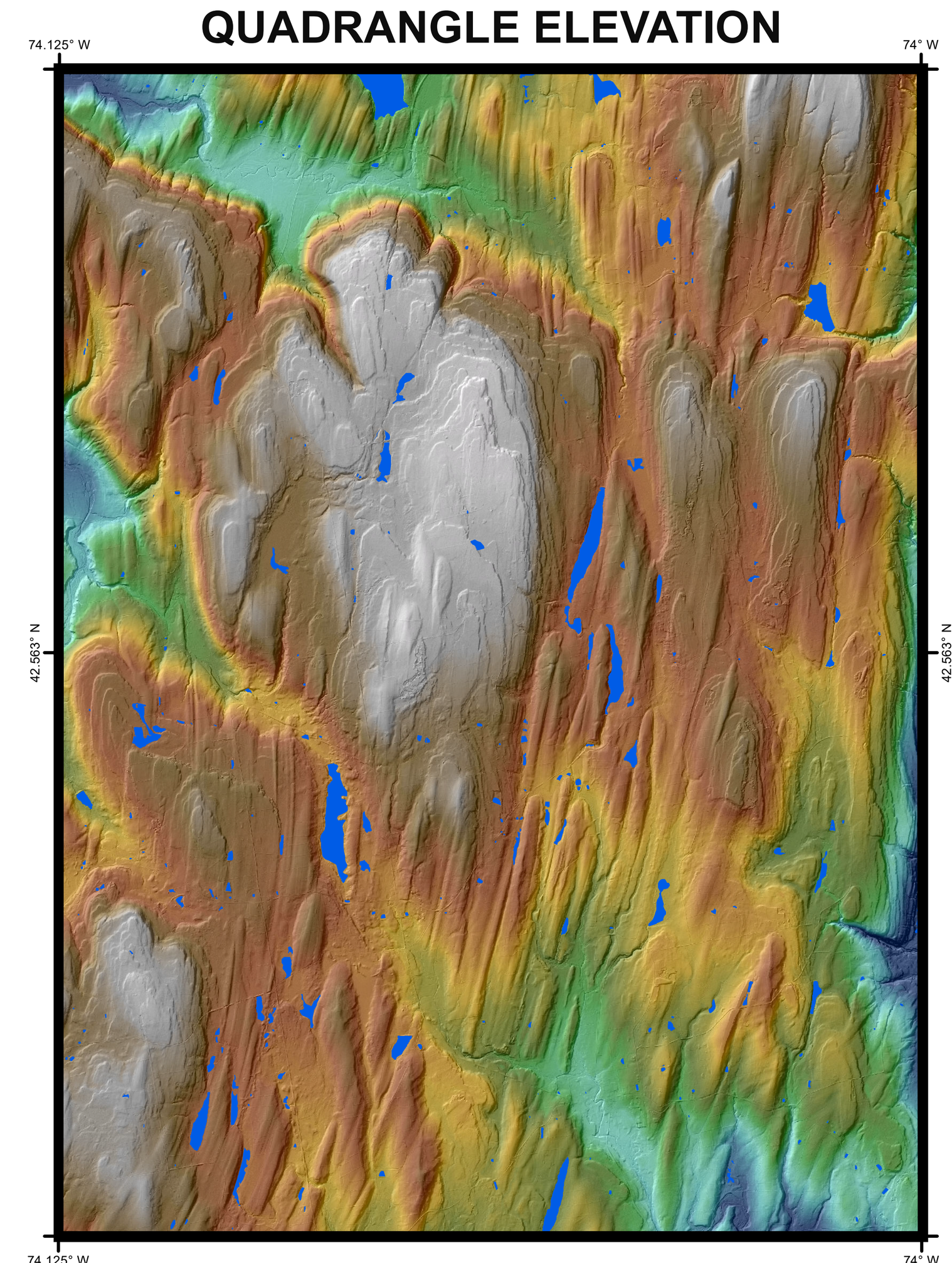
CROSS-SECTION A-A'



SYMBOLS

Streets
Highways
Airport Runway
Water Bodies
Streams
Contours
Cross-Section Line
NYSGS Soil Sample Location
NYSGS Borehole Location
NYSDEC Water Well Location
NYSDOT Boring Location
Drumlins
Eskers
Ice Margin
Meltwater Channels

QUADRANGLE ELEVATION

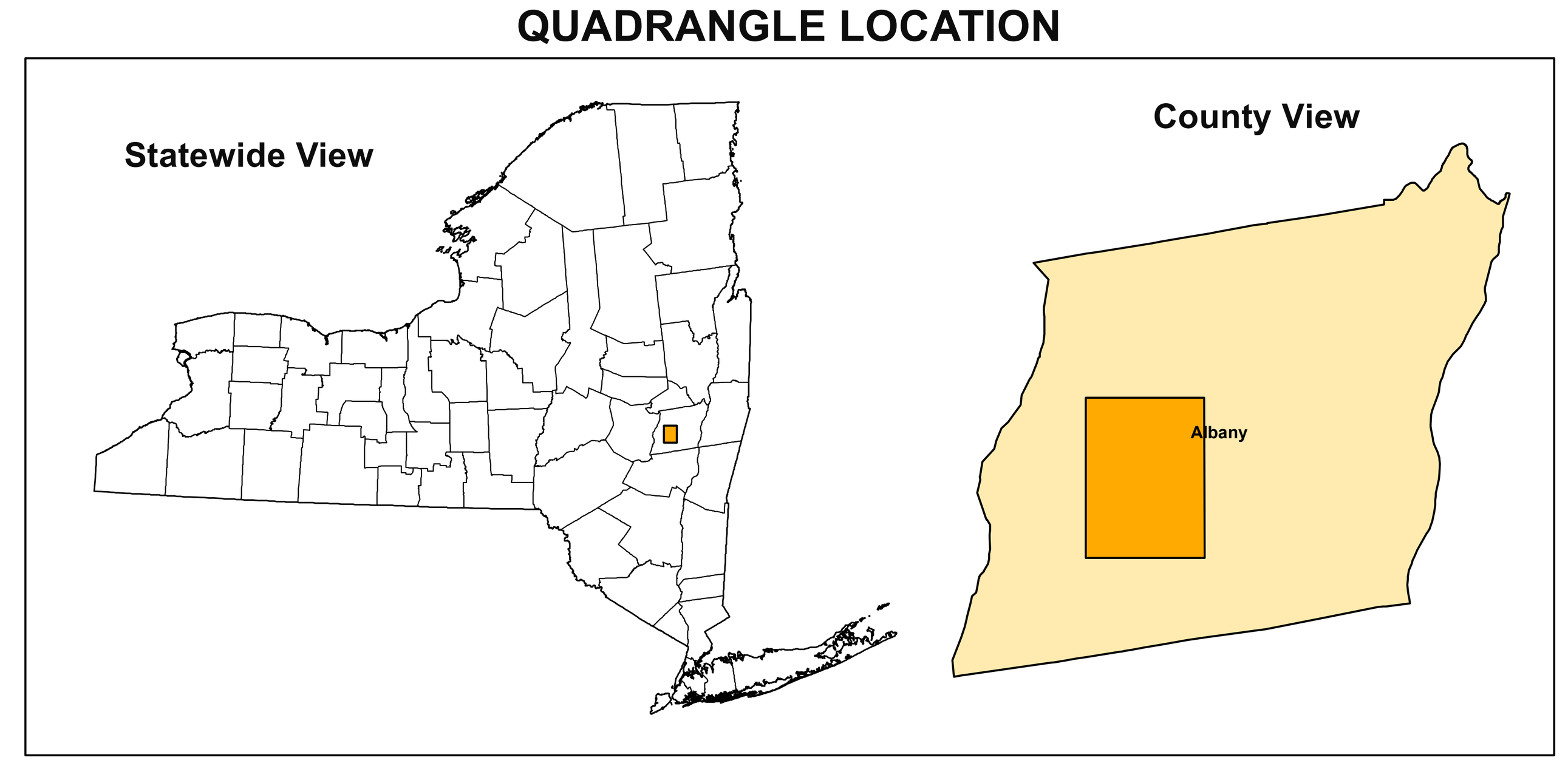


1:75,000 scale; 2x vertical exaggeration

Feet-amsl
860 1830

Shaded relief generated from 2008 Capital District 2m and the 2000 NYS 10m lidar data sets.

QUADRANGLE LOCATION



ADJOINING QUADRANGLES

Gallupville	Altamont	Voorheesville
Rensselaerville	Westerlo	Clarksville
Durham	Greenville	Alcove

NOTICE

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program STATEMAP award number ***G19AC00249*** *in the year 2019.*

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