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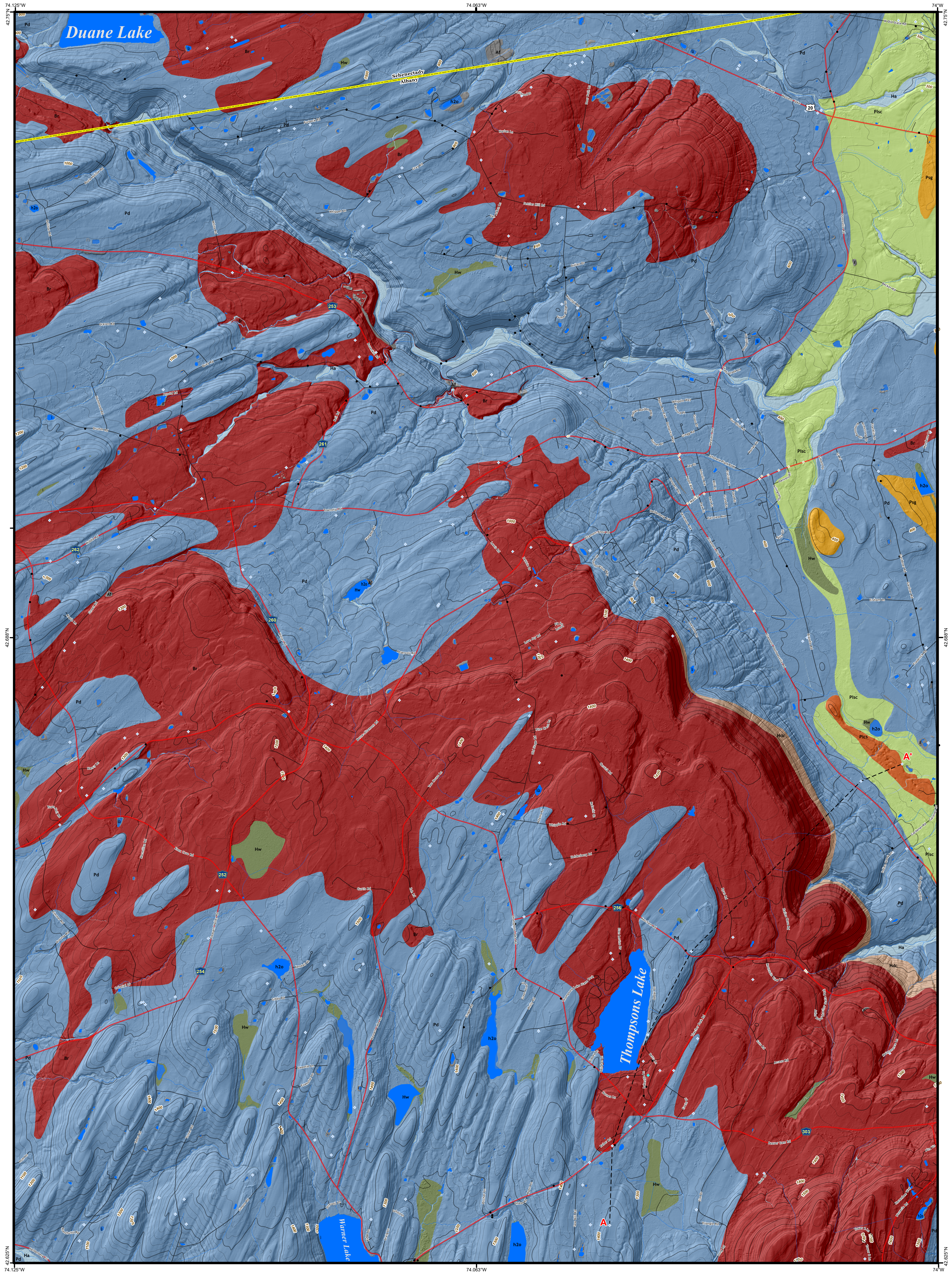


Universal Transverse Mercator, Zone 18 N North American Datum of 1983

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

Geographic data layers from 2022 TIGER/Line shapes for transportation and hydrography (https://www.census.gov/cgi-bin/geo/shapefiles/index.php)

Shaded relief from the 2019 FEMA 1m 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

KILOMETERS

METERS

MILES

FEET

CONTOUR INTERVAL: 10 FEET

Geologic mapping by S. Grasing, J. Leone and A. Kozlowski, 2016-23
Digital data and cartography, S. Grasing and K. Backhaus, 2023-24

UTM GRID AND 2023 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SURFICIAL GEOLOGY OF THE ALTAMONT 7.5-MINUTE QUADRANGLE, ALBANY AND SCHENECTADY COUNTIES, NEW YORK

prepared by
Sean P. Grasing and Karl J. Backhaus

Supported in part by the U.S Geological Survey's
National Cooperative Geologic Mapping Program STATEMAP Award Number G16AC00293

INTRODUCTION:

The Altamont 7.5-Minute Quadrangle was mapped as part of the National Cooperative Geologic Mapping Program's Great Lakes Geologic Mapping Coalition projects in 2015, supported by award #G16AC00293. This quadrangle is one of 18 that have been mapped under the Albany County Surficial Geologic Mapping Project, which the NYSGS initiated in 2015 and aims to conclude in the early 2020s. The purpose of this map is to identify and delineate various surficial and geologic materials with the intent to inform and guide municipalities in land-use, environmental, and natural resource decisions across its approximately 54-square-mile area.

The mapping area is situated between the Catskill Mountains and Hudson-Mohawk Valley Lowlands in New York State. The Altamont Quadrangle extends across two counties encompassing the southern border of Schenectady County and the northern border of Albany County. The Village of Altamont, along with the towns of Berne, Knox, and New Scotland are the primary municipalities in the Altamont quadrangle. John Boyd Thacher and Thompsons Lake State Parks, along with the Winn and Wolf Hill Preserves, are located within the quadrangle.

The Altamont Quadrangle is a part of the Catskill Mountains and Hudson-Mohawk Valley Lowlands physiographic provinces and features an escarpment as well as lowlands. Below the escarpment, one can find glacial lake deposits that were formed during the period of Lake Albany, along with some sand deposits that were formed afterwards under aeolian conditions. The uplands region encompasses the Helderberg Escarpment, a bedrock escarpment that has a slight south-southwest dip (Ver Straeten and others, 2013). This escarpment extends diagonally across the quadrangle, from the southeastern corner to the northwestern corner. The elevation within the entire quadrangle ranges widely, with the lowest elevations lying at 283 feet above mean sea level (feet-amsl; 86 meters-amsl) near West Old State Road and the highest elevation at 1,819 feet-amsl (554 meters-amsl) on top of Mount Helderberg. Prominent bodies of water in the quadrangle are Thompson Lake, Duane Lake, Warner Lake, and the Altamont Reservoir. The Bozenkill Creek flows through the middle of the quadrangle.

The bedrock of the Altamont Quadrangle is composed solely of sedimentary rocks, including limestone, shale, mudstone, and sandstone (Ver Straeten and others, 2013). These rocks range in age from Late Ordovician to Late Devonian. Until it reaches the escarpment, the Hudson-Mohawk Valley in the lowlands of the quadrangle is primarily characterized by the Late Ordovician Schenectady Formation. At the escarpment the valley contacts the Helderberg Group, which includes the Manlius, Rondout, Coeymans, Kalkberg, New Scotland, and Becraft Formations. On the top of the escarpment there are outcrops of the Oriskany, Esopus, Schoharie, Onondaga, and Union Springs Formations, as well as the Marcellus Subgroup.

The surficial geologic units in this quadrangle were previously mapped at a scale of 1:250,000 and were identified as outwash sand and gravel, swamp deposits, alluvium, kame, till, rock, and lacustrine sand and deltas (Cadwell et al., 1991).

METHODOLOGY:

Preliminary field maps of the Altamont Quadrangle were generated as an initial step using ESRI ArcMap software. These maps incorporated all available topographic data, including roads, lidar surface terrain, and hydrography, and served as a base for plotting field data. Field data comprised field stops, bedrock outcrops, and other important site information. A five-and-a-half-foot hand auger was used to enable surficial sampling below the variably thick organic soil horizon, which is situated beneath the topsoil. An entrenching shovel and pick were also used to remove topsoil and/or eroded sediments from outcrops or exposures, thereby exposing fresh sediment for analysis. At each field stop, meticulous details were logged into a field notebook including: coordinates captured by a Garmin GPS 66st, descriptive notes on the sediment encountered, the names of samples taken, the time of the stop, and any high-resolution photographs taken.

At most of the field sampling sites, soil samples were collected for grain-size analysis. This involved either dry-sieve or wet-sieve analysis. Both methods followed the procedure outlined by Bowles (1978), but utilized a seven-tiered sieve stack (#5, #10, #18, #35, #60, #120, #230, and Pan) for both dry (mechanical) and wet (hydrometer) sieve analysis. Predominantly cohesive samples, which are fine-grain dominant, were analyzed using wet-sieve methods, while cohesionless samples, which are coarse-grain dominant, were analyzed using dry-sieve methods.

The final surficial geologic map, along with cross sections and elevation maps, was generated using ESRI ArcMap and Adobe Illustrator CS6 software. Cross sections were initially created in ArcMap utilizing the XActo Cross Section 10 Tool. These cross sections were then exported to Adobe Illustrator for the correlation of stratigraphic units. The surficial geologic map was developed by scanning mylar sheets that had been drafted based on the geologic field maps. Polygons were then created by digitizing these scanned maps in ArcMap and color-coding them to represent the surficial geologic units within the quadrangle. The final map was assembled in Adobe Illustrator and exported as a PDF file.

RESULTS:

A total of 141 field stops were conducted in the quadrangle, from which 100 samples were collected for grain-size analysis. Multiple samples were obtained from stops where stratigraphy was observed either on the surface or at depths that could be reached using a hand auger. The lithologies discovered during field sampling included: 97 were diamicton, exposed 35 were bedrock, four were sand, three were glaciolacustrine silt and clay and two were sand and gravel. The surficial geologic units identified within the quadrangle are as follows:

Artificial Fill (Af)
This unit generally consists of coarse-to-fine materials such as large cement mounds and crushed rock, which have been transported anthropogenically for construction purposes. These materials are commonly used in large artificial dams designed to retain water, elevated roadbeds, bridge abutments, quarries and large mill facilities within the quadrangle that are raised above the surface.

Holocene Alluvium (Ha) and Holocene Wetland Deposits (Hw)
Post-glacial sediments are found in low-lying areas or land depressions throughout the quadrangle. Holocene alluvium is associated with fluvial processes in creek valleys across the area and primarily consists of stratified silt, sand, and gravel. Holocene wetland deposits occur in low areas and depressions in the highlands of the quadrangle, where wetlands form due to limited drainage capacity. The lithology in these areas generally comprises peat, marl, clay, or sand.

Diamict Colluvium (Hdc)
Unsorted and unstratified deposit of gravel, sand, silt, clay, with boulders/cobbles possible. Described as a mass-wasting deposit at the base of steep hillslopes and cliffs as a part of a slump or hillslope failure. Located in minuscule-sized deposits along Bozenkill Creek and large slopes along the Helderberg Escarpment.

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 deepwater settings of glacial lakes. May include marl, rythmites, and varves. Located in the lowlands of Altamont quadrangle.

Pleistocene Sand (Ps)
Well-sorted and stratified sand is deposited through fluvial, lacustrine, or aeolian processes. These are inferred to be deposits associated with distal glacial environments. Observations indicate that these well-sorted sand deposits often overlie coarser sand and gravel deposits (Psg), likely because of a decrease in depositional energy or potential aeolian activity. Located in the northeastern corner of the Altamont quadrangle, along with loess deposits.

Pleistocene Sand and Gravel (Psg)
Characterized by well-sorted and stratified sand and gravel, this unit is believed to have been deposited by glacial meltwater at or very near the glacier's edge. It is often found at elevations several meters higher than the floors of present-day river valleys. Located in the lowlands of Altamont quadrangle.

Pleistocene Cobbles to Sand (Pics)
Stratified ice-contact deposits; variable coarse-grained sediment consisting of boulders to sand size particles. Inferred to be deposited with stagnant ice in the form of sand and gravel hummocks. Found in the lowlands of the Altamont quadrangle.

Pleistocene Diamicton (Pd)
This unit consists of a heterogeneous mixture of sediment grains, ranging in size from clay to boulders. In this quadrangle all diamicton is interpreted to be glacial till, which is sediment deposited directly beneath a glacier. The diamictons are predominantly located on top of the escarpment, where they are mostly clast-supported, and can form rather thick deposits here and in the Bozenkill Creek Valley.

SUMMARY AND CONCLUSIONS:

The surficial geology in the Altamont Quadrangle is characterized by five distinct informal regions: the lowlands, Settles Hill, the Bozenkill Creek Valley, the Helderberg Escarpment, and the uplands.

The lowlands define the region east of the Helderberg Escarpment. Starting from Altamont, this zone travels south on NY 156 and north on NY 397 and is located to the east of either route. Starting from Altamont, this zone travels south on NY 156 and north on NY 397 and is located to the east of either route. There are glaciolacustrine (Plsc) deposits from glacial Lake Albany on the sides of US 20, Becker Road, and NY 146. These sediments are matrix-supported with no visible clasts, often mottled (red- and gray-colored spots) or gray, dry, and stiff. Loess and sand (Ps) deposits are located on West Old State Road in the north-easternmost corner of the quadrangle. These deposits are well-sorted, either sand or silt dominated, and yellowish-brown. Sand and gravel (Psg) deposits are found around Gardner Road. They are matrix-supported and include pebbles and cobbles that are sub-rounded to well-rounded. Diamicton (Pd) deposits are commonplace as well in the lowlands. Their characteristics vary but are all poorly sorted. Pebbles and boulders within are typically very angular to rounded. North of NY 156, Gardner Road passes over ice-contact sand and gravel deposits (Pics) which consist of poorly sorted, sub-rounded to rounded sand and gravel with cobbles.

Settles Hill is north of the Bozenkill Creek, which Settles Hill Road and Furbeck Road follow. The hill has only diamicton (Pd) deposits. The southern portion of the hill has thicker deposits of diamicton while the entire northern section of the hill has shallow deposits even as you move towards the west. Although there are shallow deposits on Gray Road, which runs to the south. This suggests that the valley was eroded and then filled in the past. On top of Settles Hill there are a few drumlins and streamlined features that have a bearing ranging from 240 to 250 degrees. This suggests that the glacier flowed toward the Mohawk Valley and potentially belonged to either the Mohawk or Janesville-Cobleskill ice streams (Kozlowski, Backhaus, Frieman, Leone, and Feranec, 2023). Settles Hill has different flow directions compared to the drumlins and streamlined features in the upland section of the quadrangle's southern region.

SUMMARY AND CONCLUSIONS: Continued...

The Bozenkill Creek includes two units: diamicton (Pd), and Holocene alluvium (Ha). The Holocene alluvium is deposited by the Bozenkill Creek itself and is in the center of the valley. Diamicton deposits are found on the northern and southern slopes of the creek. The thickness of the northern deposits exceeds that of the southern deposits. This could be due to the south-westward direction of glacial flow in the region, as indicated by the orientation of nearby drumlins. This flow direction could have created an environment to deposit sediments on the northern slopes, where immense diamicton deposits were collected, while the southern slopes received shallower deposits. Nearby wells offer more evidence of a large diamicton deposit. Three wells to the north display drift thicknesses ranging from 100 feet-amsl to 300 feet-amsl, while southern wells contain shallow diamicton deposits with thicknesses ranging from 0 to 50 feet. The exposed cobbles and boulders in the diamictons of the Bozenkill Creek exhibit a varied lithology, including a few crystalline rocks that are rounded to well-rounded. The Bozenkill Gorge was partially incised by high-volume, possibly catastrophic, discharge from escaping meltwater from glacial Lake Delanson in the Schoharie Valley (Kozlowski et al., 2024).

The diamictons here have distinct lithologies compared to those on the Helderberg Escarpment. Bozenkill Creek bears distinct marks of being sculpted by glacial activity and ancient stream erosion, as evidenced by the eroded bedrock and thick diamicton deposits.

The Helderberg Escarpment is the central region of the quadrangle, which encompasses a vast area of bedrock running diagonally across the middle of the map. In this area, bedrock is prominent, and the surficial material is thin, ranging from 0 to 10 feet. The thin veneer of diamictons that lie on top are clast-supported with local cobbles originating from the Helderberg Escarpment itself, typically very angular to sub-rounded. The diamictons (Pd) here progressively cover the bedrock in a southerly direction away from the escarpment. Diamict colluvium (Hdc) deposits form the talus slopes along the escarpment.

Transitioning to the upland portion of the quadrangle south of the escarpment, the diamictons become thicker and drumlins become a common sight. The drumlins and streamlined features have a bearing of south to southwest, an indicator that the glacier flow path climbed right over the escarpment at almost a 90-degree angle of approach. The drumlins closer to the escarpment (which have an estimated bearing of 225 degrees) are perpendicular to the cliffs. To the south, the drumlins change bearing, with the drumlins located around NY 157A having an estimated bearing of around 190 degrees. Meanwhile, the drumlins located around Tabor Road have an estimated bearing of around 205 degrees. The bearings of the drumlins here show the glacier's pathway to be towards the Catskills Mountains in the south, while the drumlins in the western portion of the quadrangle show the glacier flowing towards the Schoharie Valley. This shift is expected because this area is where the Westerlo and Schoharie ice streams diverged (Kozlowski et al,. 2023).

REFERENCES:

Bowles, J.E., 1978, Engineering Properties of Soils and Their Measurement: McGraw Hill Book Company, New York, Second Ed., 213 p.

Cadwell, D.H., and Dineen, R.J., 1991, Surficial Geologic Map of New York, Hudson-Mohawk Sheet. New York State Museum, Map and Chart Series No. 40, Scale 1:250,000

Kozlowski, A.L., Backhaus, K.J., Frieman, R.A., Leone, J.R.., Feranec, R.S., 2023, Quaternary Glaciations of the Great Lakes Region: Progress in Understanding Sediments, Landforms, Chronology, and Landscape Evolution through Space and Time, Geological Society of America Abstracts with Programs. Vol. 55, No. 6, doi: 10.1130/abs/2023AM-395940

Kozlowski, A. L., Backhaus, K.J., Feranec, Robert, 2024, Drainage From GlacialLake Delanson and Structurally Controlled Metlwater Routing in Eastern New York State, Session T-10 Glacial Geology and Geomorphology of Northeastern North America: Current Gaps and Future Directions, Geological Society of America Abstracts with Programs. Vol. 56, No. 1, doi: 10.1130/abs/2024NE-397808

Ver Straeten, C.A., Stander E. and Engel, T.D., 2013, Bedrock Geology of the Altamont Quadrangle, Albany and Schenectady Counties, New York. New York State Museum, Map and Chart Series, No. 62, Scale 1:24,000

DESCRIPTION OF MAP UNITS

Holocene

Af — **Artifical Fill (Af)**
This unit is generally composed consists of coarse/-to-fine, materials such as large cement mounds and/or crushed rock , which have been transported 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.

Hdc — **Diamict Colluvium (Hdc)**
Unsorted and unstratified deposit of gravel, sand, silt, clay, with boulders/cobbles possible. Described as a mass-wasting deposit at the base of steep hillslopes and cliffs as part of a slump or hillslope failure.

Pleistocene

Plsc — **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 deepwater settings of glacial lakes. May include marl, rythmites, and varves.

Ps — **Stratified Sand (Ps)**
Well-sorted and stratified sand, deposited by fluvial, lacustrine or eolian processes. Inferred as deposits associated with distal glacial environments.

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.

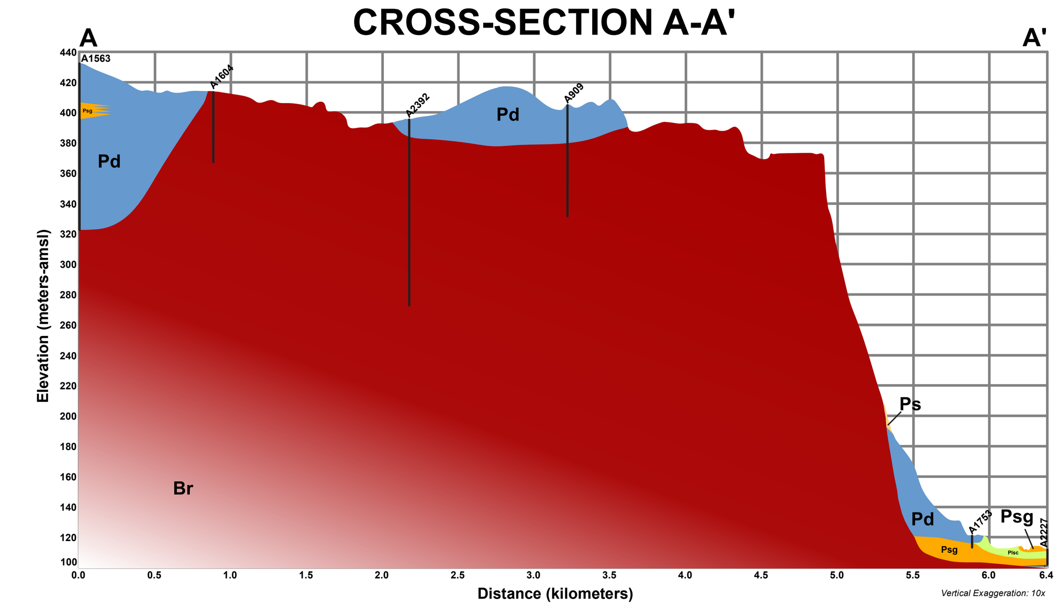
Pics — **Cobbles to Sand (Pics)**
Stratified, ice contact deposits, variable coarse-grained sediment consisting of boulders to sand size particles. Inferred to be deposited along an ice margin. May include, interbedded coarse lenses of gravel and clast-supported diamicton (flow till).

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

Pre-Pleistocene

Br — **Bedrock (Br)**
Non-glacially derived, hard rock, pre-pleistocene in age. May be covered up to a meter in diamicton, sand and gravel, or sand and clay in areas marked as Br.

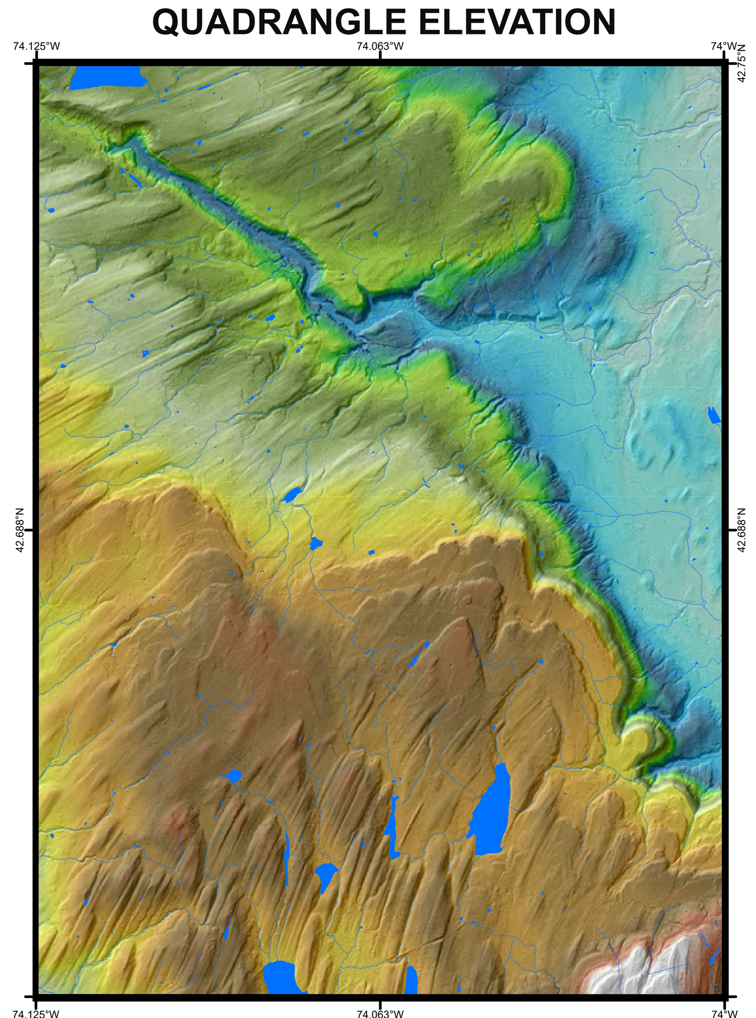
CROSS-SECTION A-A'



SYMBOLS

Street
Highway
Railroad
County Line
Water Body
Stream
Contour
Cross-Section Line
NYSGS Soil Sample Location
NYSDEC Water Well Location
NYSDOT Boring Location
Drumlin

QUADRANGLE ELEVATION

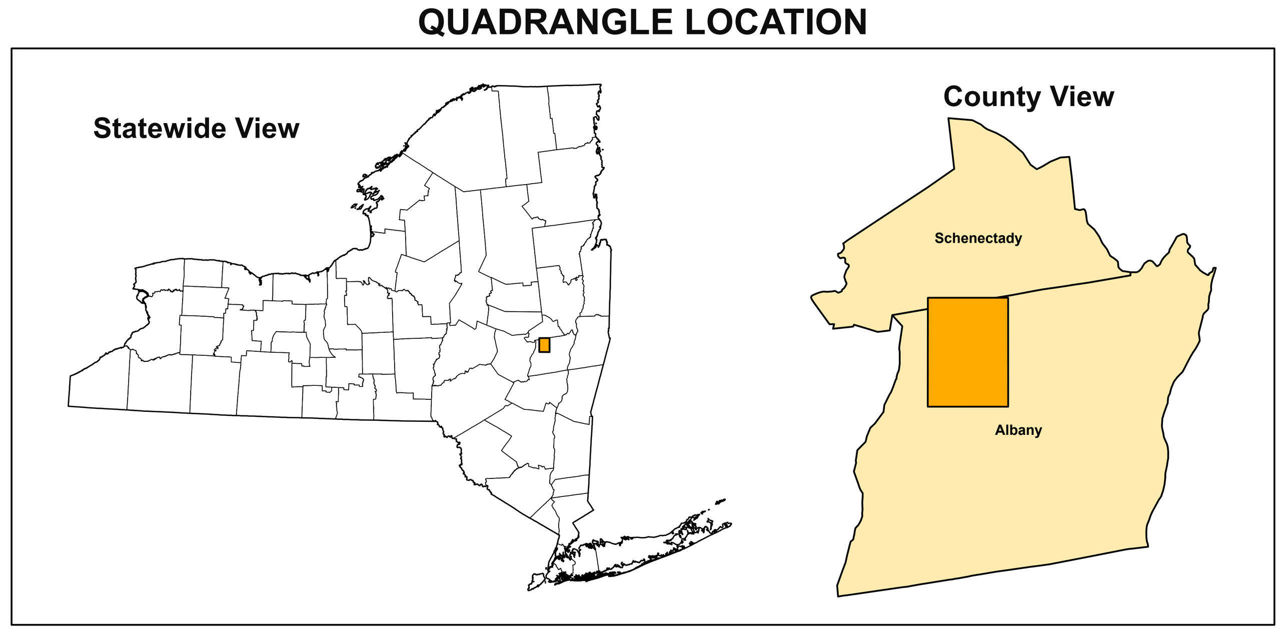


1:75,000 scale; 2x vertical exaggeration

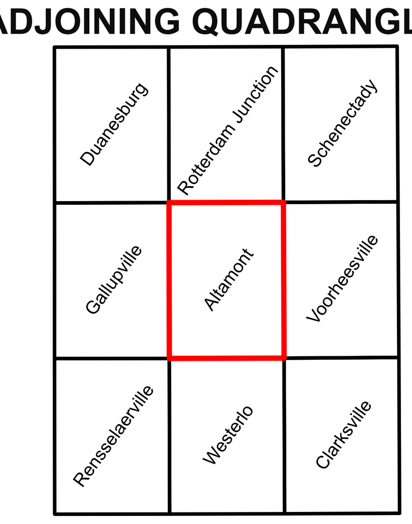
Feet-amsl
355 1450

Shaded relief generated from 2019 FEMA 1-meter lidar data set.

QUADRANGLE LOCATION



ADJOINING QUADRANGLES



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2024

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