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SURFICIAL GEOLOGY OF THE CLEVELAND NORTH 30 X 60 MINUTE QUADRANGLE

DRAFT

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Map SG-2 CLEVELAND NORTH
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INTRODUCTION

This map provides a three-dimensional framework of the area's surficial geology and depicts four important aspects of surficial geology:

1) the geologic deposits, indicated by letters which represent the major lithologies;
2) the thickness of the individual deposits, indicated by numbers and modifiers;
3) the lateral extent of the deposits, indicated by map-unit area boundaries;
4) the vertical sequence of deposits, shown by the stack of symbols within each map-unit area.

In effect, each stack represents a generalized cross section for each area.

Letters represent geologic deposits (lithologic units) and are described in detail below. Lithologic units may be a single lithology such as sand (S) or clay (C), or a combination of related lithologies that are found in specific depositional environments, such as sand and gravel (SG) or ice-contact deposits (IC). The bottom symbol in each stack indicates the bedrock lithologies that underlie the surficial deposits. The detailed lithologic unit descriptions below summarize:

1) geologic characteristics such as range of textures, bedding, and age;
2) engineering properties or concerns attributed to the unit;
3) depositional environment;
4) geomorphology or geomorphic location;
5) geographic location within the map area, if pertinent.

Numbers (without modifiers) that follow the lithology designator represent the average thickness of a lithologic unit in tens of feet (for example, 3 represents 30 feet). If no number is present, the average thickness is assumed to be 1 (10 feet). These unmodified numbers correspond to a thickness range centered on the specified value, but may vary up to 50 percent. For example, T4 indicates the average thickness of till in a map-unit area is 40 feet, but thickness may vary from 20 to 60 feet.

Modifiers provide additional thickness and distribution information:

1) Parentheses indicate that a unit has a patchy or discontinuous distribution and is missing in portions of that map-unit area. For example, (T2) indicates that till with an average thickness of 20 feet is present in only part of that map-unit area.

2) A minus sign following a number indicates the maximum thickness for that unit in areas such as a buried valley or ridge. Thickness decreases from the specified value, commonly near the center of the map-unit area, to the thickness of the same lithologic unit and vertical position specified in an adjacent map-unit area. For example, an SG9- map-unit area adjacent to an SG3 area indicates a sand and gravel unit having a maximum thickness of 90 feet that thins to an average of 30 feet at the edge of the map-unit area. If the material is not present in an adjacent area, it decreases to zero at that boundary.

These letters, numbers, and **modifiers** are arranged in stacks that depict the vertical sequence of lithologic units for a given map-unit area. A single stack of symbols occurs in each map-unit area and applies only to the volume of sediments within that particular map-unit area. **Figure 1** illustrates mapping conventions.

The small scale of this reconnaissance map generalizes the great local variability within surficial deposits. That variability is explained in the lithologic unit descriptions and by the use of thickness ranges. Some areas and lithologies are too small to delineate at 1:100,000 scale and have been included in adjacent areas. This map should serve only as a regional predictive guide to the area's surficial geology and not as a replacement for subsurface borings and geophysical studies required for site-specific characterizations.

DATA SOURCES

Data were collected from numerous sources (see References). The concentration of data was greatest near the surface and decreased with depth. County soil survey maps, which described the top 5 feet of surficial materials, provided an initial guide to map-unit areas. These areas were modified through interpretation of local geomorphic settings and other data which indicated change of deposits at depth, such as Ohio Department of Natural Resources water-well logs, Ohio Department of Transportation and Ohio EPA test-boring logs, theses, and published or unpublished geologic reports, maps, and field notes. These data also provided the basis for lithologic unit descriptions, which summarize, as accurately as possible, recognized associations of genetically related materials. The total thickness of surficial deposits was calculated from Division of Geological Survey open-file bedrock-topography maps, which are available for each 7.5-minute quadrangle in the map area. The bedrock units were summarized from Division of Geological Survey bedrock-geology maps, also available for each 7.5-minute quadrangle. Land-surface topography shown on the basemap was prepared largely from data derived from the U.S. Geological Survey's National Elevation Dataset (30 meter grid spacing).

LITHOLOGIC UNIT DESCRIPTIONS

SURFICIAL UNITS

m — Made land. Large areas of cut and fill such as dams, landfills, and urban areas; may include reclaimed strip mine areas. May be underlain by bedrock or other lithologic units.

a — Alluvium, Holocene age. Includes a wide variety of textures from silt and clay to boulders; commonly includes organic material; generally not compact; rarely greater than 20 feet thick. Found in floodplains of modern streams throughout entire map area. Mapped only where areal extent and thickness are significant.

O — Organic deposits, Holocene age. Muck and peat, may contain clay at depth. Generally less than 10 feet thick. Formed in undrained depressions. Organic deposits too small to map at this scale are indicated by an asterisk [*] and are underlain by material shown in surrounding map-unit area. Occurs on outwash trains, ice-contact areas, and hummocky moraine in the southern map areas.

C — Clay, Wisconsinan age. Massive to laminated; may contain interbedded silt and fine sand. Laminated clay commonly contains silt or sand partings. Distributed in southern map area as terrace and lowland surface deposits.

CG — Complexly interbedded deposits of clay, silt, sand, gravel, and till in deeper parts of buried valleys, unspecified age. Unit identified from well logs; data insufficient for more detailed differentiation or age assignment. Present in southern map area.

IC — Ice-contact deposits, Wisconsinan age. Highly variable deposits of poorly sorted gravel and sand; silt, clay, and till lenses common; may be partially covered or surrounded by till. Deposited directly from stagnant ice as kame or esker landforms. Found in southern map area, commonly associated with deep buried valleys.

L — Silt, Wisconsinan age. Massive or laminated; commonly contains thin sand partings. May contain localized clay, sand, or gravel layers. Clay content commonly increases with depth. Found in southern map area in lowland surface deposits and terraces.

LC — Silt and clay, Wisconsinan age. Laminated to interbedded, may contain thin fine sand or gravel layers. Found in northern map area in terraces along the Chagrin River, and as thick, deltaic deposits of high, proglacial predecessors of Lake Erie.

S — Sand, Wisconsinan age. Contains minor amounts of disseminated gravel or thin lenses of silt or gravel; grains well to moderately sorted, moderately to well rounded; finely stratified to massive, may be cross bedded; locally may contain organic material. In deep buried valleys, may be older than Wisconsinan age. Found in association with the deltaic deposits and nearshore dune and beach ridge deposits of high, proglacial predecessors of Lake Erie.

SG — Sand and gravel, generally Wisconsinan age. Intermixed and interbedded sand and gravel commonly containing thin, discontinuous layers of silt, clay, and till; grains well to moderately sorted, moderately to well rounded; finely stratified to massive, may be cross bedded; locally may contain organic material. In deep buried valleys, may be older than Wisconsinan age. Present as widespread fluvial deposits in terraces and buried valleys, and high-energy beach ridge deposits of proglacial predecessors of Lake Erie.

TG — Clayey to silty till, low carbonate content, Wisconsinan age. May contain silt, sand and gravel lenses. Joints/fractures common. At depth includes a pebbly basal unit as well as unspecified till units of various lithologies. Common surface till on lake plain in northern map area; bounded to south by Lake Escarpment Moraine.

TE — Clay loamy till, low carbonate content, Wisconsinan age. Till contains silt, sand, and gravel lenses. Joints/fractures common. Older low carbonate till units may also be present at surface and at depth. Common unit in Glaciated Appalachian Plateau.

T — Till, undifferentiated in subsurface, unspecified age. Unit designated where insufficient data prohibits designating other till units. Separated from overlying till units by its greater density ("hardpan") or intervening non-till units. Designated throughout map area beneath 10 to 70 feet of surface till and other units.

BEDROCK UNITS

P — Sandstone, shale, siltstone, claystone, limestone, and coal bedrock, Pennsylvanian age. Includes associated colluvium. Sandstone nonbedded to massive, may be conglomeratic in basal portion. Interbeds of shale, sandstone, siltstone, clay, coal, and limestone common in upper portion of unit. Common horizontal and vertical changes of rock types. Stratigraphic names: Pottsville and Allegheny Groups. Surface unit in southern map area.

Ss — Sandstone bedrock, Pennsylvanian age. Includes associated colluvium. Sandstone nonbedded to massive, medium to coarse grained with abundant rounded quartz pebbles and granules; porous; weakly cemented; quartz-pebble conglomerate may be present in basal portion. Stratigraphic name: Sharon Sandstone of the Pottsville Group. Surface unit in southern map area.

SSh — Sandstone and shale bedrock, Mississippian age. Includes associated colluvium. Interbedded shale, siltstone, and sandstone with common vertical and horizontal changes. Stratigraphic names: Logan and Cuyahoga Formations. Most common bedrock unit in southern map area.

Sh — Shale bedrock, Devonian age. Includes associated colluvium. Black to brown, silty, organic-rich, hard, fissile shale, and overlying gray to greenish-gray, soft, clay shale. Stratigraphic name: Ohio Shale. Found landward of Lake Erie shoreline.

EXPLANATION

Sand and gravel pit. Pit bottom generally underlain by unconsolidated lithologic units of surrounding polygon(s). May contain reclaimed areas.

Quarry, mine, or strip mine; floored in bedrock; may contain reclaimed areas

* Small area of organic deposits

Boundary between map-unit areas having different uppermost continuous lithologies; underlying lithologies may or may not differ

Boundary between map-unit areas having the same uppermost continuous lithology but different thickness or different underlying lithologies

Note: Boundary types reflect the relationships among uppermost continuous lithologies only, not patchy, discontinuous lithologies (in parentheses).

KEY TO LITHOLOGIC COLORS*

Surficial Units

- m — Made land, larger pits, quarries, or mines
- a — Alluvium
- O — Organic deposits
- C — Clay, Wisconsinan age
- IC — Ice contact deposits, Wisconsinan age
- L — Silt, Wisconsinan age
- LC — Silt and clay, Wisconsinan age
- S — Sand, Wisconsinan age
- SG — Sand and gravel, Wisconsinan age
- TE — Clayey to loamy till, low carbonate content, Wisconsinan age
- TG — Clayey to silty till, low carbonate content, Wisconsinan age

Bedrock Units

- P — Sandstone, shale, siltstone, claystone, limestone, and coal bedrock, and associated colluvium, Pennsylvanian age
- Ss — Sandstone bedrock, Pennsylvanian age
- SSh — Sandstone and shale bedrock, and associated colluvium, Mississippian age
- Sh — Shale bedrock and associated colluvium, Devonian age

* The colors on this map depict the uppermost continuous unit and are intended to assist in visualizing the geology of the area. Discontinuous units (in parentheses) and subsurface-only units are excluded in colors assignments.

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Base map derived from Ohio Department of Transportation data sets.
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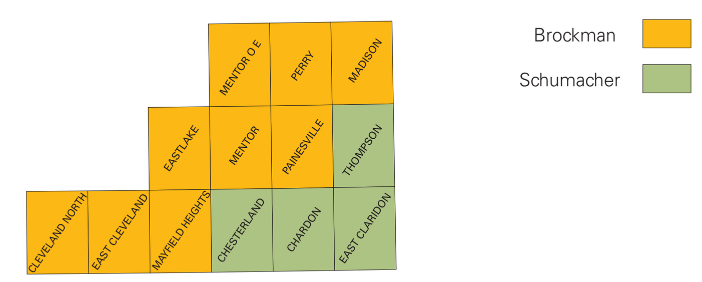


Mapping responsibility and index to 7.5-minute (1:24,000 scale) quadrangles in the Cleveland North 30 x 60 minute quadrangle. Mapping completed in 2005.

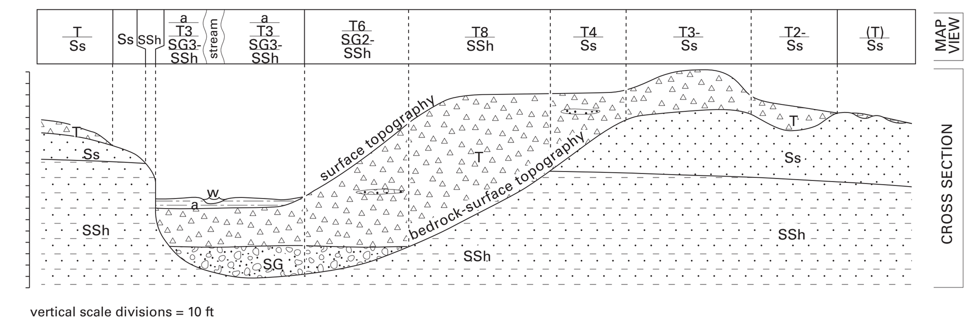
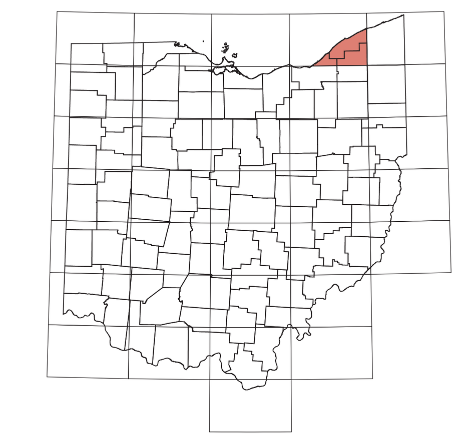
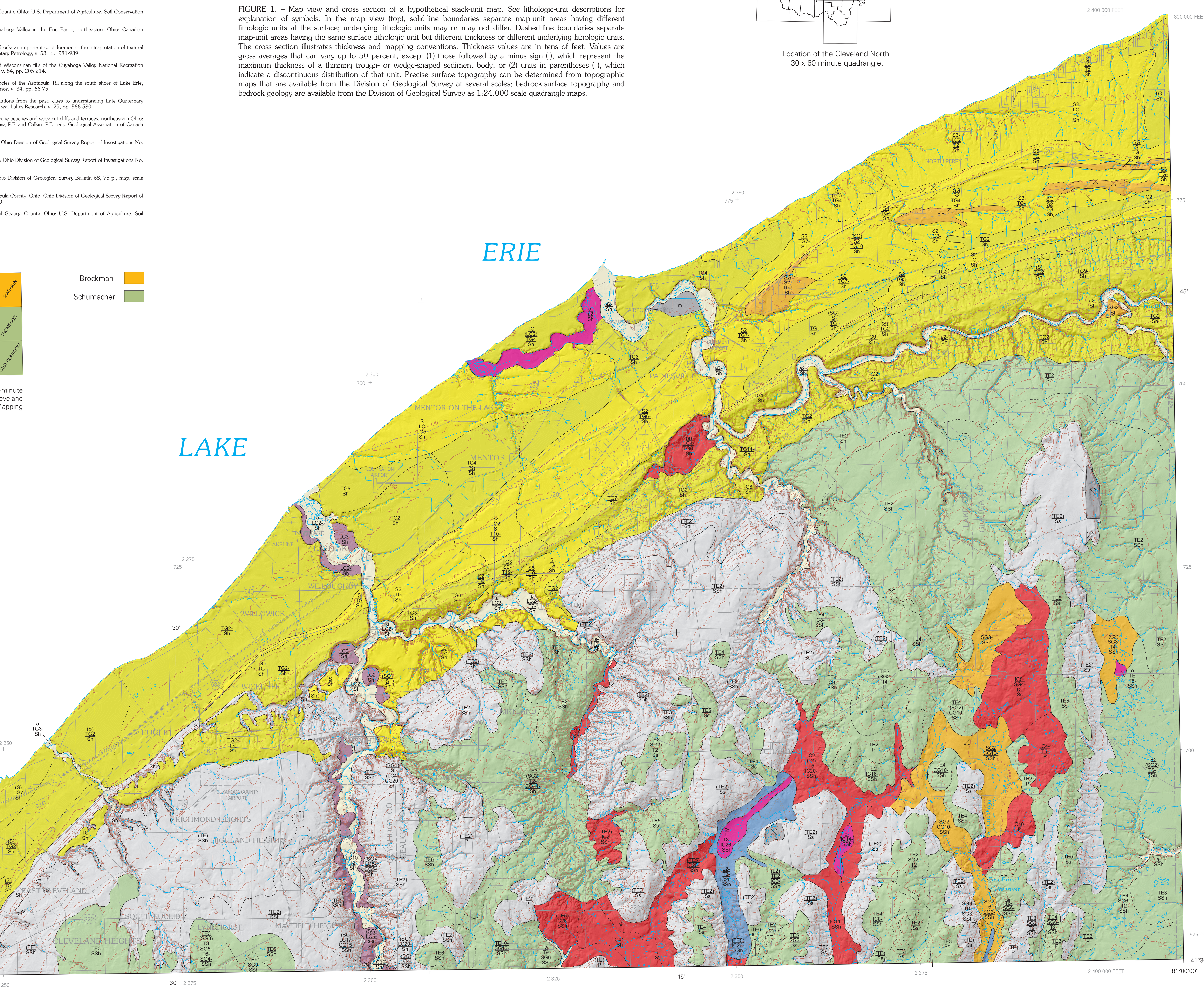


FIGURE 1. – Map view and cross section of a hypothetical stack-unit map. See lithologic-unit descriptions for explanation of symbols. In the map view (top), solid-line boundaries separate map-unit areas having different lithologic units at the surface; underlying lithologic units may or may not differ. Dashed-line boundaries separate map-unit areas having the same surface lithologic unit but different thickness or different underlying lithologic units. The cross section illustrates thickness and mapping conventions. Thickness values are in tens of feet. Values are gross averages that can vary up to 50 percent, except (1) those followed by a minus sign (-), which represent the maximum thickness of a thinning trough- or wedge-shaped sediment body, or (2) units in parentheses ( ), which indicate a discontinuous distribution of that unit. Precise surface topography can be determined from topographic maps that are available from the Division of Geological Survey at several scales; bedrock-surface topography and bedrock geology are available from the Division of Geological Survey as 1:24,000 scale quadrangle maps.



Location of the Cleveland North 30 x 60 minute quadrangle.



SCALE 1:100 000

Contours and elevations in meters

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