Prairie Research Institute
ILLINOIS STATE GEOLOGICAL SURVEY

SURFICIAL GEOLOGY OF TINLEY PARK QUADRANGLE

COOK AND WILL COUNTIES, ILLINOIS

STATEMAP Tinley Park-SG

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2018

QUATERNARY DEPOSITS

HUDSON EPISODE (~14,700 years before present (B.P.) to today)[1]

Description	Unit	Interpretation
Diamicton, sand, gravel, silt, and peat; up to 10 ft thick	Disturbed ground dg	Disturbed land; includes former gravel pits and major areas of construction
Peat, muck, organic silt and clay; interbedded with sand, silt, and clay in some places; up to about 10 ft thick	Grayslake Peat gp	Remains of swamp vegetation deposited in low areas and closed depressions; intertongues in places with alluvium and lacustrine deposits
Sand, silt, and clay; stratified; locally containing beds of sand; generally less than 10 ft thick	Cahokia Formation c	Alluvium in floodplains and channels of modern rivers and streams; alluvial fan deposits in some places
Silt, silty sand and sand; mostly uniform; from 5 to 10 ft thick	Equality Formation (silty facies) e(z)	Glaciolacustrine nearshore sediments; few deposits are slackwater; intertongues with alluvium and outwash
Clay and silt with beds of fine sand; uniform and laminated; locally fossilierous; likely no more than 25 ft thick	(fine facies) e(f)	Glaciolacustrine offshore sediments; deposited in ice-dammed lakes during late-glacial ice retreat and stagnation.

WISCONSIN EPISODE: Michigan Subepisode (~29,000–14,700 years B.P.)

Description	Unit	Interpretation
Sand, typically with little gravel, interbedded with uncommon beds of silt or diamicton; typically less than 20 ft thick	Henry Formation, undifferentiated h	Proglacial outwash along Hickory Creek; deposited in glacial meltwater channels and alluvial fans
Diamicton, silty clay loam to silt loam matrix; uniform to weakly stratified in places, gray (fresh) to brown, yellowish brown, and light gray (weathered); with lenses of sand and gravel; as much as about 60 ft thick	Wadsworth Formation w	Till and debris flow deposits associated with the Tinley Moraine and Valparaiso Morainic System
Diamicton, loam and silt loam matrix; as much as 25 ft thick	Lemont Formation, Haeger Member (cross sections only) l-h	Till and ice-marginal sediment
Sand and gravel; yellowish brown; stratified in places; includes large boulders; as much as 50 ft thick	Beverly Tongue Henry Formation (cross sections only) h-b	Proglacial outwash; outwash deposited in glacial meltwater channels and in alluvial fans; underlies deposits of the Haeger Member
Sand, fine to medium, stratified, very well-sorted; as much as about 35 ft thick	(fine facies) h-b(f)	Medial ice-marginal proglacial deltaic deposits
Sand and gravel, very poorly sorted; typically less than 20 ft thick	(lower unit) h-b	Proximal ice-marginal alluvial deposits.
Diamicton; silty clay, silty clay loam, and clay; gray, oxidizing to yellowish brown; includes layers of sand and gravel, silt, and silty clay; as much as 20 ft thick	Yorkville Member Lemont Formation (cross sections only) l-y	Till, debris flow deposits, and lake sediment

PRE-QUATERNARY DEPOSITS

SILURIAN SYSTEM (440-410 million years B.P.)

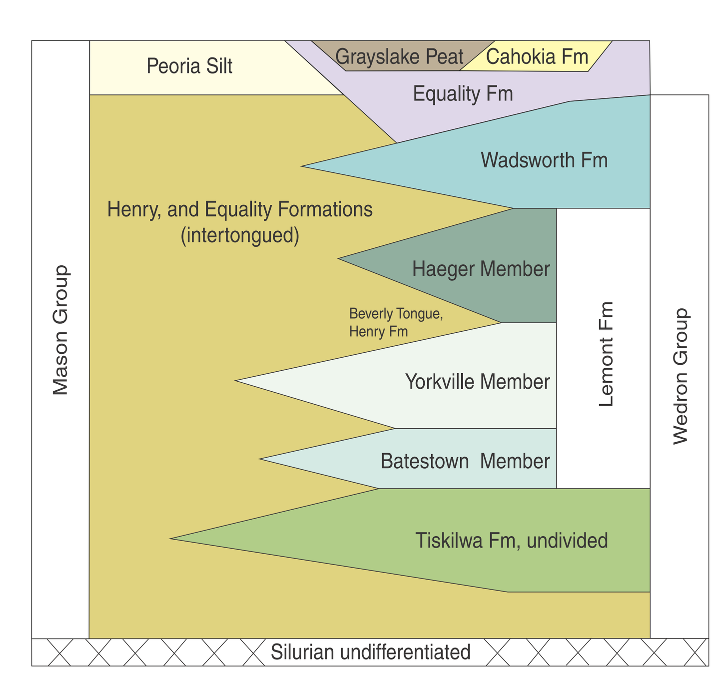
Description	Unit	Interpretation
Dolomite, some shale	Bedrock (Silurian) (cross sections only) S	Dolomitized carbonate bank deposits

[1] The time periods for the Wisconsin and Hudson episodes are reported in calibrated radiocarbon years before present (where "present" is considered to be 1950). We have calibrated our radiocarbon ages with the on-line program Calib 7.1 (Stuiver et al., 2005) using the IntCal13 correction curve (Reimer et al., 2013).

Data Type

Symbol	Meaning
H ▲	Hand auger station
● (yellow)	Stratigraphic boring
● (blue)	Water-well boring
● (red)	Engineering boring
S ⊙ 26211	Labels indicate samples (s). Boring labels indicate the county number. Hand auger labels indicate geologist's field number. Dot indicates boring is to bedrock.
———	Contact
– – – –	Inferred contact
1 — 1′	Electrical resistivity profile line
A — A′	Line of cross section

Note: The county number is a portion of the 12-digit API number on file at the ISGS Geological Records Unit. Most well and boring records are available online from the ISGS Web site.



Startigraphic framework, schematic vertical and intertonguing relationships among the lithostratigraphic units of Will County and environs (Caron and Curry, 2016). The Batestown Member and the Tiskilwa Formation were not identified in the Tinley Park 7.5' Quadrangle.

Base map compiled by Illinois State Geological Survey from digital data (2015 US Topo) provided by the United States Geological Survey. Shaded relief and contours derived from Cook County 2008 and Will County 2014 LiDAR elevation data.

North American Datum of 1983 (NAD 83)
Projection: Transverse Mercator
10,000-foot ticks: Illinois Coordinate System of 1983, east zone
1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

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SCALE 1:24,000
1 1/2 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

BASE MAP CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1988

Geology based on field work by O. Caron and B. Curry, 2017–2018.

Digital cartography by Deette M. Lund and Jennifer E. Carrell, Illinois State Geological Survey.

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This map has not undergone the formal Illinois Geologic Quadrangle map review process. Whether or when this map will be formally reviewed and published depends on the resources and priorities of the ISGS.

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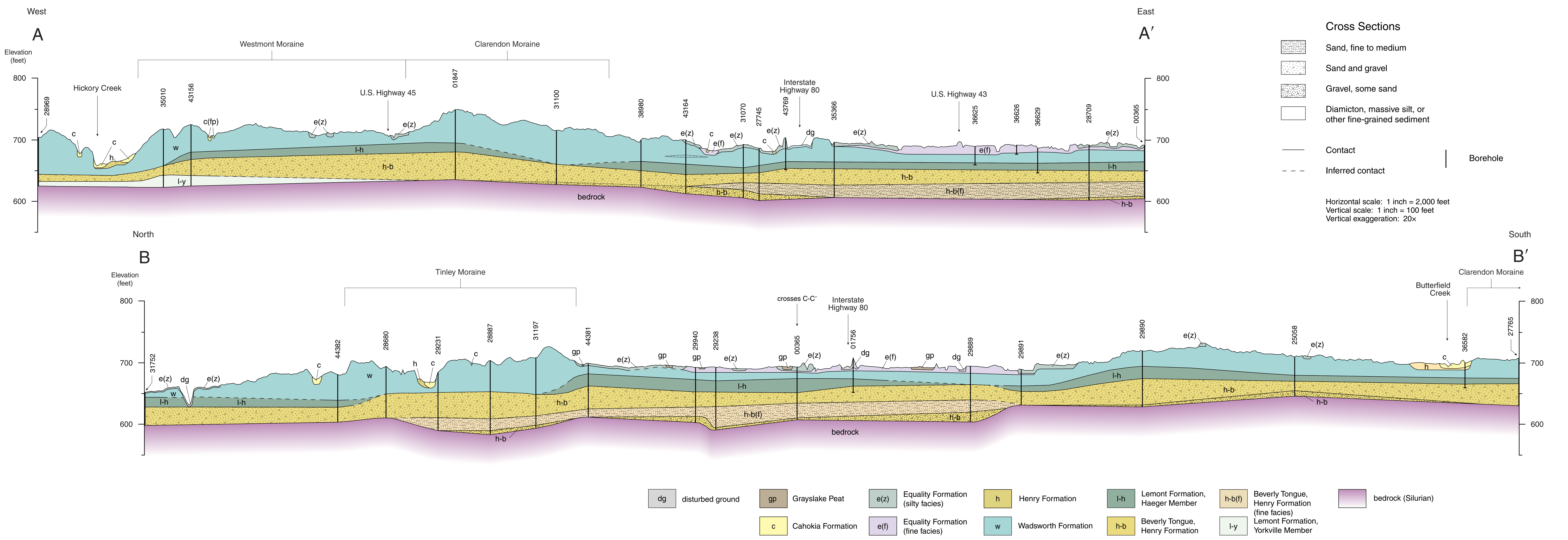
1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Sag Bridge
2 Palos Park
3 Blue Island
4 Mokena
5 Harvey
6 Manhattan
7 Frankfort
8 Steger

3½°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2018

ROAD CLASSIFICATION
Interstate Route
State Route
U.S. Route
Local road



Introduction

The surficial geologic map of the Tinley Park 7.5' Quadrangle is part of a long-term geological mapping project in Will and Cook counties (Caron 2017, Caron, 2016, Caron and Phillips 2015, Curry and Grimley 2001, Curry and Bruegger 2014). This map continues ISGS efforts in northeastern Illinois to map deposits at the land surface and in the subsurface down to bedrock to gain a better understanding of the complex geology left behind by repeated glaciations and associated flooding events. The Tinley Park Quadrangle is located between the Tinley Moraine and the Valparaiso Morainic System, about 35 miles from the southern shore of Lake Michigan and in the southern portion of the City of Chicago (stratigraphic framework, map sheet 1). The largest communities in the area include the cities of Orland Park (56,767; United States Census Bureau, 2010), Tinley Park (56,703), Oak Forest (27,962), and the villages of Frankfort Square (9,276), and Orland Hills (7,149).

Setting

The landscape was constructed during the last glaciation (Wisconsin Episode) between about 29,000 and 14,700 cal yr BP (Curry et al. 2018). Locally, five moraines constitute the Valparaiso Morainic System: the Clarendon, Westmont, Wheaton, West Chicago, and Manhattan moraines (Fig. 1; Willman and Frye 1970). Shallow valleys trending northeast-southwest crosscut the moraines and were likely formed by channeled subglacial meltwater that evolved near the ice margin during downwasting of the ice (Menzies 1995). The discontinuous Westmont Moraine is the oldest upland feature. Formed of diamicton of the Wadsworth Formation, the Clarendon and the Westmont moraines have been dissected by the Hickory Creek and by perched channels that were formed and abandoned during the last deglaciation. Bedrock, comprise of resistant Silurian dolostone, has low relief and dips gently northwestward.

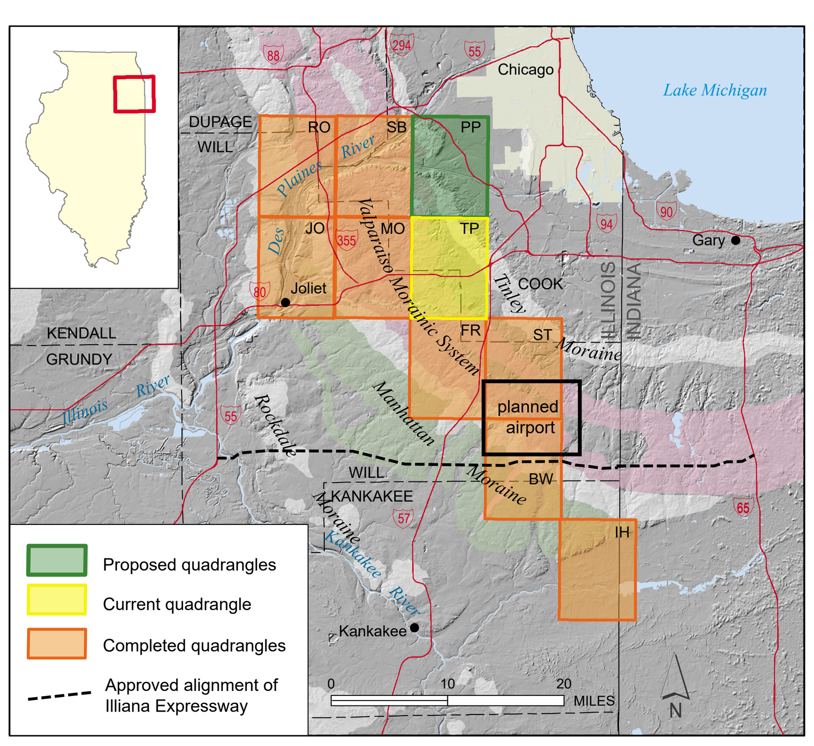


Figure 1 Location map for the Tinley Park Quadrangle in northeastern Illinois. The area includes portions of the Valparaiso Morainic System and the Manhattan Moraine. Moraines modified from Willman and Frye (1970). Dashed lines show approved alignment of the Illiana Expressway corridor, and the black box shows the area of the proposed South Suburban Airport.

Electrical Resitivity Profiles

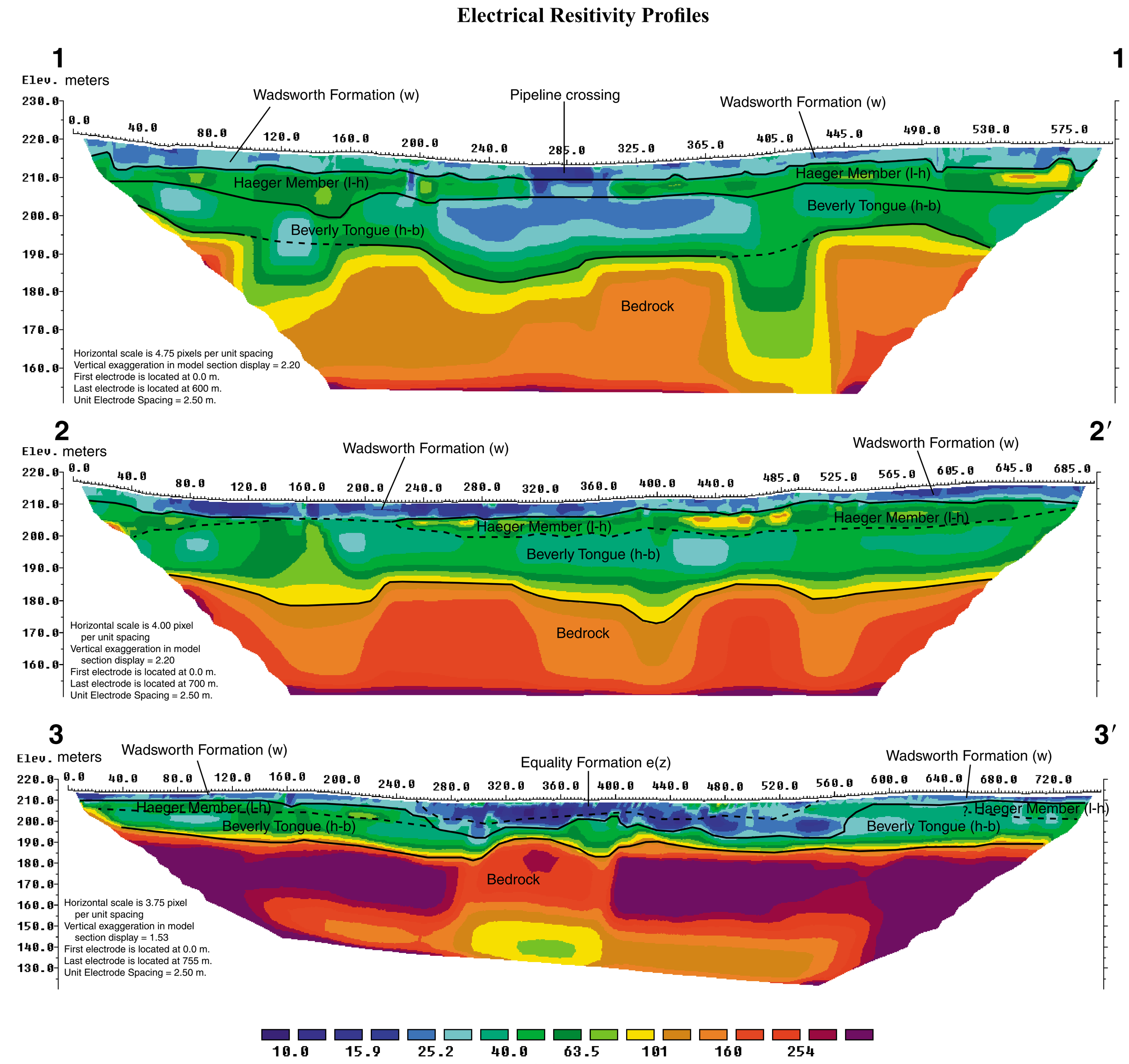


Figure 2 Line 1-1′ and 2-2′, were acquired both in the southern part of the Orland Grasslands Preserve of Cook County (map sheet 1). Profile 1-1′ gradually ascends the rough topography of the Westmont Moraine. Four distinct and one gradational resistivity layers are apparent on this profile: a shallow low-resistivity layer (about 20 ohm-m) overlies a discontinuous moderately high-resistivity layer (101 to 160 ohm-m). These shallow layers are underlain by a second relatively low-resistivity layer (40 to 101 ohm-m) above the high-resistivity bedrock (greater than 160 ohm-m). Although the shallow high-resistivity layer is discontinuous, it can be traced across the entire profile. The boundary between the lower low-resistivity layer and the high-resistivity bedrock is gradational. It is likely that the gradational resistivity is caused by the sand and gravel deposit of the Beverly Tongue (Henry Formation, h-b) on the bedrock. A pipeline crossing rendered uninterpretable data at 285 m. Line 3-3′ was acquired along the trail of the Yankee Woods Preserve (map sheet 1). The shallow low resistivity layer is likely formed of the Wadsworth Formation (w) and Equality Formation e(z). The high-resistivity layer on the north and south end of the profile suggests that sand and gravel of the Beverly Tongue fills the subsurface beneath the north and south end of the profile.

Mapping Methods

The surficial geology map is based in part on interpretation of aerial imagery, LiDAR elevation data, boring records archived at the Illinois State Geological Survey (ISGS), hand auger descriptions, and soil survey maps of Will and Cook counties (Hanson 2004, Calsyn et al. 2012). The soil survey maps detail soil parent materials in the upper five feet, which locally are composed of glacial and post-glacial deposits. Geologic contacts were verified at 44 sites by examining exposures along roads, creeks, and ditches, and by sampling with a hand auger. The subsurface data include detailed studies of 11 stratigraphic test holes including five stratigraphic test holes drilled by the ISGS, 173 water well logs, and 21 bridge and foundation (engineering) borings from the highway departments of Will and Cook counties. Positions of some map boundaries and descriptions of some units were modified based on geotechnical logs and test-hole descriptions, from the field sites, and from other archival data. Locations of the water-well logs and geotechnical borings were confirmed by plat books of land ownership, aerial photography, tax records, and site visits. The records for all data sources are on file at the ISGS Geological Records Unit. We acquired a total of 294 feet of core at three locations using continuous wireline coring. The three wireline cores reached bedrock and the holes were logged by natural gamma-ray methods. Geophysical transects using Earth electrical resistivity (EER) methods were acquired along three lines totaling 1.3 miles within the mapping area (Fig. 2). Thirty-five subsamples from our new cores were analyzed for particle-size distribution using laser diffraction methods (Malvern Mastersizer 3000), and semi-quantitative mineralogy of the < 2 µm fraction using X-ray diffraction methods (Hughes et al., 1994). Finally, elemental analyses by Energy Dispersive X-ray Flurorescence was performed on 50 subsamples of our new sediment cores. The tests were completed at Prairie Research Institute laboratories.

Geology and Surficial Deposits

The glacial stratigraphy of the Tinley Park Quadrangle is dominated by sorted deposits of the Mason Group and glacigenic diamicton of the Wedron Formation (Hansel and Johnson 1996). These units attain thicknesses of more than 150 feet along the Westmont and Clarendon Moraines (Fig. 3 and cross sections A and B). Older units of the Wedron Group (Tiskilwa Formation and Batestown Member, Lemont Formation) are absent.

Bedrock Surface

Silurian-age rocks at the bedrock surface are composed of light gray, fine-grained dolostone. Bedrock highlands in the southwestern portion of the quadrangle descend gently from about 600–625 feet mean sea level (MSL) to 600–575 MSL feet in the northwest (Fig. 4). Silurian rocks are more than 250 feet thick. The surface elevations of water wells, engineering borings, stratigraphic borings, and gamma logs were interpolated from the Will County LiDAR using ESRI's ArcGIS software. Preliminary bedrock surface elevation contours were derived from a surface calculated from an array of bedrock surface elevation points determined by subtracting from ground surface elevations thicknesses of consolidated materials measured from our borings, and logs of water wells, and other observations. A smoothed bedrock surface was created from the contours with ArcGIS' Topo-to-Raster interpolation method. Finally, the contours on the final bedrock topography map were adjusted to honor all of the data points.

Glacial Sediments

The lowermost unit is the Yorkville Member (Lemont Formation; l-y), a gray, fine-textured diamicton that contains lenses of gravel, sand, silt, and clay. It typically ranges from about 15 to 20 feet thick. The Haeger Member (Lemont Formation, l-h) diamicton is yellowish-brown, coarse-grained, friable, and has a high dolomite content. This unit is greater than 25 feet thick in some places. Its extent and thickness are difficult to discern in this region because of limited exposure, but the Haeger Member was clearly identified in in our sediment cores. The Haeger Member overlies the Beverly Tongue of the Henry Formation (h-b). The Beverly Tongue of the Henry Formation is regionally the thickest and most continuous layer of buried sand and gravel. In a buried bedrock valley in the study area, it is as much as 70 feet thick. The lower part of unit is composed in part of very well-sorted, finely stratified fine- to medium-sand (h-b(f)) which contrasts with coarser, more poorly sorted material (h-b). The sand and gravel is overlain by diamicton of ether the Haeger Member of the Lemont Formation (l-h) or Wadsworth Formation (w). The latter unit is composed of gray, texturally variable matrix-supported diamicton, chiefly silt loam, silty clay loam, and loam (cross sections A and B). The heterogeneous lithology is consistent with other observations of the Wadsworth Formation in this region. In the Tinley Park Quadrangle, this unit is greater than 60 feet thick. The genesis of the Wadsworth Formation is interpreted as interstratified clayey till and lacustrine sediment (Hansel and Johnson 1996).

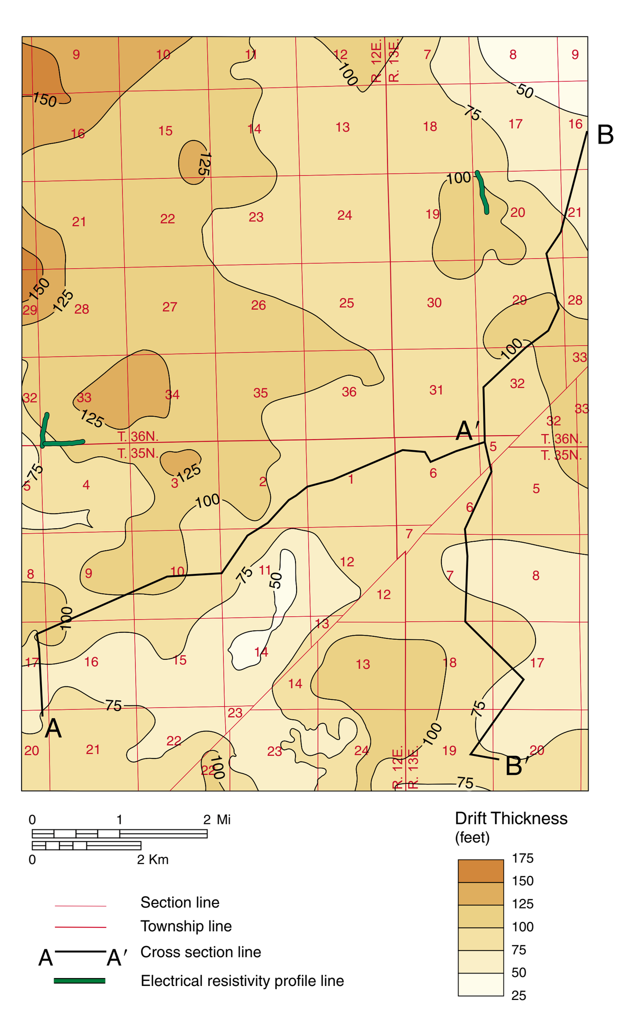


Figure 3 Drift thickness of the Tinley Park Quadrangle. Drift includes all the unconsolidated sediments above bedrock (e.g., till, alluvium, outwash). Map scale is 1:100,000.

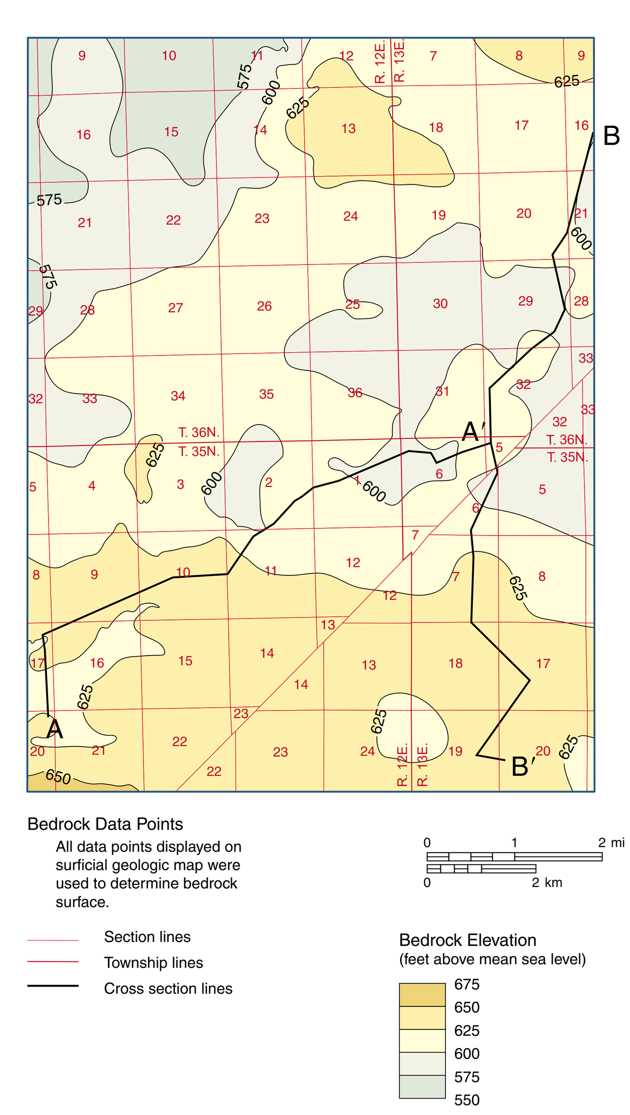


Figure 4 The generalized topography of the bedrock surface of the Tinley Park Quadrangle. All data points on surficial geologic map were used to determine bedrock surface. Map scale is 1:100,000.

Postglacial Sediment

Deposits of silt and clay, peat, sandy gravel, and sand overlie the glacial units, filling the valleys throughout the mapped area as well as many depressions scattered across the uplands. Glacial and post-glacial silt and clay lacustrine sediments are assigned to the Equality Formation. The silty facies of the Equality Formation (e(z)), is composed primarily of silt, silty sand, and fine to medium sand. The deposits are relatively thin (<10 feet thick) and discontinuous. We interpret these deposits to be glaciolacustrine nearshore (littoral) deposits. A fine facies of the Equality Formation (e(f)) is composed of clay and silt with thin, discontinuous beds of fine sand. Generally less than 20 feet thick, this unit was deposited in ice-dammed lakes during late-glacial ice stagnation and retreat. Alluvium comprised of fine-grained floodplain and coarser-grained channel facies are undifferentiated within the Cahokia Formation (c). Bridge boring data indicate that the floodplain facies is generally <10 feet thick, and more typically 15 feet thick. The Grayslake Peat (gp). The unit occurs around many shallow water bodies in the study area, and it also is found in small depressions, and at the toes of some slopes.

Important Findings

- Three glacial diamicton units were identified: The Yorkville and Haeger Members of the Lemont Formation, and the Wadsworth Formation. The uppermost diamicton unit is the Wadsworth Formation which forms the Tinley Moraine and the Valparaiso Morainic System. With its coarser, sandy matrix and brown color, the Haeger unit is readily differentiated from the Wadsworth unit.
- Much of the land surface of this quadrangle is covered by glaciolacustrine sediments of the Equality Formation that were deposited in moraine-dammed lakes during glacial retreat. The lake deposits are generally less than 25 ft thick. The largest of these was named Glacial Lake Tinley (Willman 1971); covering about 8 square miles, deposits of this lake are found in the east-central part of the map.
- The Beverly Tongue, a regionally significant deposit of sand and gravel, was consistently found in the subsurface across the Tinley Park Quadrangle. Many deposits are composed of stratified, fine sand.

Acknowledgements

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