SURFICIAL GEOLOGY OF HARVEY QUADRANGLE
COOK COUNTY, ILLINOIS

Prairie Research Institute
ILLINOIS STATE GEOLOGICAL SURVEY

STATEMAP Harvey-SG

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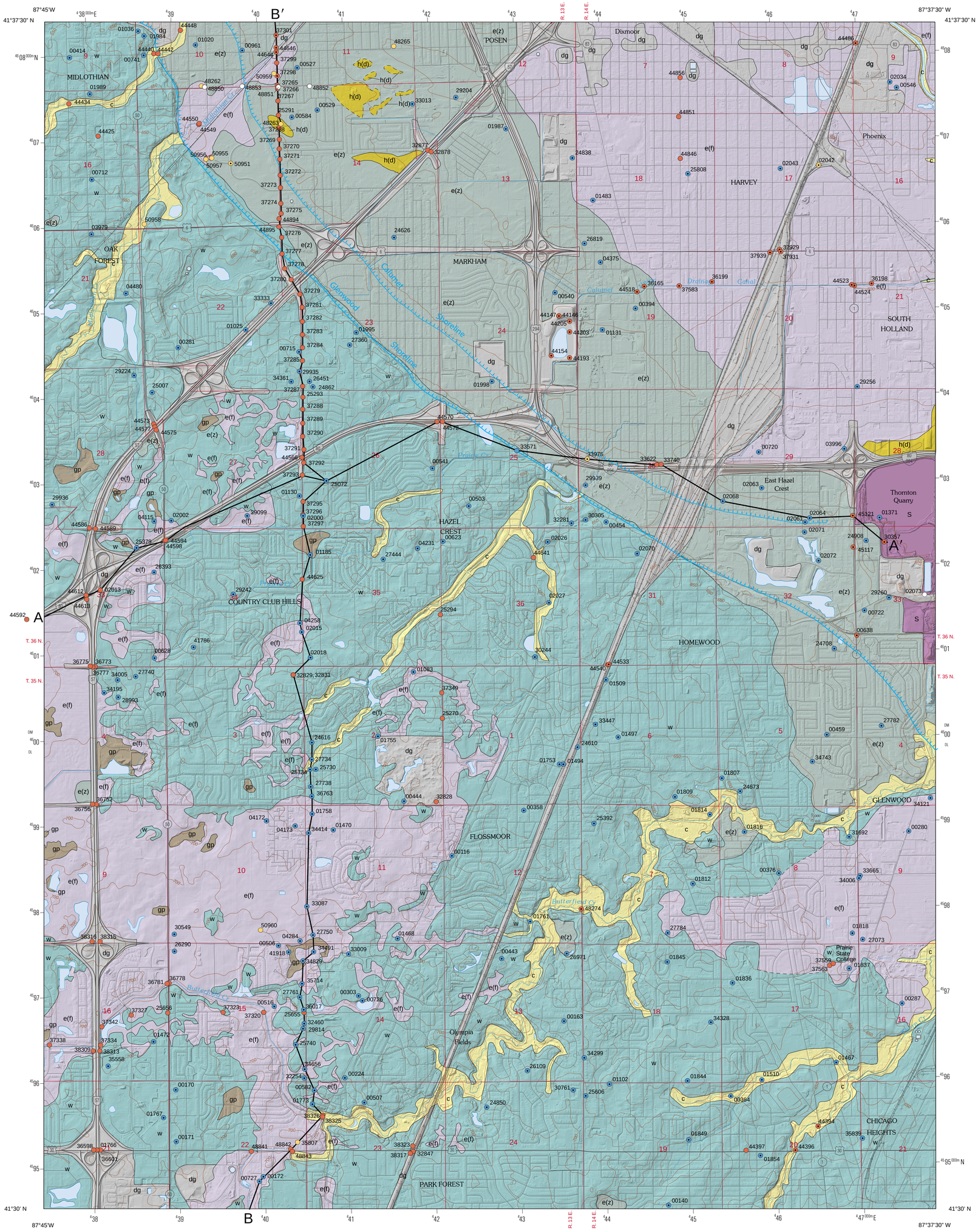
2020



QUATERNARY DEPOSITS

Description	Unit	Interpretation
HUDSON EPISODE (~14,700 years before present (B.P.) to today)[1]		
Diamicton, sand, gravel, silt or blocky fragments of dolomite (pea gravel to boulders) up to 40 feet thick	Disturbed ground: dg	**Disturbed land**; includes major highway embankments, other construction and debris-strewn quarried areas
Peat, muck, organic silt and clay; interbedded with sand, silt, and clay in some places; up to about 15 feet thick	Grayslake Peat: gp	**Organic debris** deposited in depressions; intertongues with the Equality and Cahokia Formations
Sand, silt, and clay; stratified; locally containing beds of sand; generally less than 15 feet thick	Cahokia Formation: c	**Alluvium in floodplains and channels** of modern rivers and streams; alluvial fan deposits in some places
late WISCONSIN and HUDSON EPISODES (~17,600 years B.P. to today)[1]		
Sand, fine to medium, well-sorted, stratified, gravelly in places, silty in others, less than 20 feet thick	Henry Formation (Dolton facies): h(d)	**Littoral sands**; deposited in ancient Lake Chicago
Clay and silt; uniform and laminated; as much as 30 feet thick	Equality Formation (fine facies): e(f)	**Lake sediment** few deposits are slackwater; intertongues with alluvium of Cahokia Formation or Henry Formation. Unit e(f) is a fine-grained facies, deposited under quiet, typically off-shore conditions; unit e(z) is a coarser, lithologically heterogeneous facies that was deposited in higher-energy environments.
Silt and clay (laminated) and silty fine sand (stratified); as much as 50 feet thick	(silty facies): e(z)	
WISCONSIN EPISODE: Michigan Subepisode (~29,000–17,600 years B.P.)[1]		
Diamicton, loam to silty clay loam; uniform to vaguely stratified in places, gray (fresh) to brown, yellowish brown, and light gray (weathered); with lenses of sand and gravel; as much as 75 feet thick	Wadsworth Formation: w	**Till and debris flow deposits**; associated with the Tinley Moraine
Diamicton, loam and silt loam; gray, oxidizing to yellowish brown; includes layers of sand and gravel, silt, and silty clay; as much as 15 ft thick	Lemont Formation, Haeger Member (cross sections only): l-h	**Till and ice-marginal sediment**
Sand, fine to medium-grained, some gravel, stratified in places; as much as 50 ft thick	Beverly Tongue Henry Formation (cross sections only): h-b	**Proglacial deltaic and fluvial 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 25 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.)		
Dolomite, some shale	Bedrock (Silurian): S	**Dolomitized carbonate bank deposits**

[1]The time periods for the Wisconsin Episode and the Hudson Episode are reported as calibrated radiocarbon years and can be directly compared to calendar years before 1950 (Stuiver et al. 2015).

Data Type

- Stratigraphic boring
- Water-well boring
- Engineering boring
- Cone Penetration Testing - Hydraulic Penetration Tool
- 26211 — Boring labels indicate the county number. Dot indicates boring is to bedrock.
- Contact
- Inferred contact
- paleoshorelines of glacial Lake Chicago, triangles point offshore
- 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.

Base map compiled by Illinois State Geological Survey from digital data (2018 US Topo) provided by the United States Geological Survey. Shaded relief and contours from LiDAR elevation data provided by Cook County (2018).

North American Datum of 1983 (NAD 83)
Projection: Transverse Mercator
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 and data compilation by B. Curry, A. Phillips, E. Huggett, 2020; D. Grimley 2019-2020.

Digital cartography by Deette Lund, Emily Bunse and Katie Mandera, 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.

The Illinois State Geological Survey and the University of Illinois make no guarantee, expressed or implied, regarding the correctness of the interpretations presented in this document and accept no liability for the consequences of decisions made by others on the basis of the information presented here. The geologic interpretations are based on data that may vary with respect to the accuracy of geographic location, the type and quantity of data available at each location, and the scientific and technical qualifications of the data sources. Maps or cross sections in this document are not meant to be enlarged.

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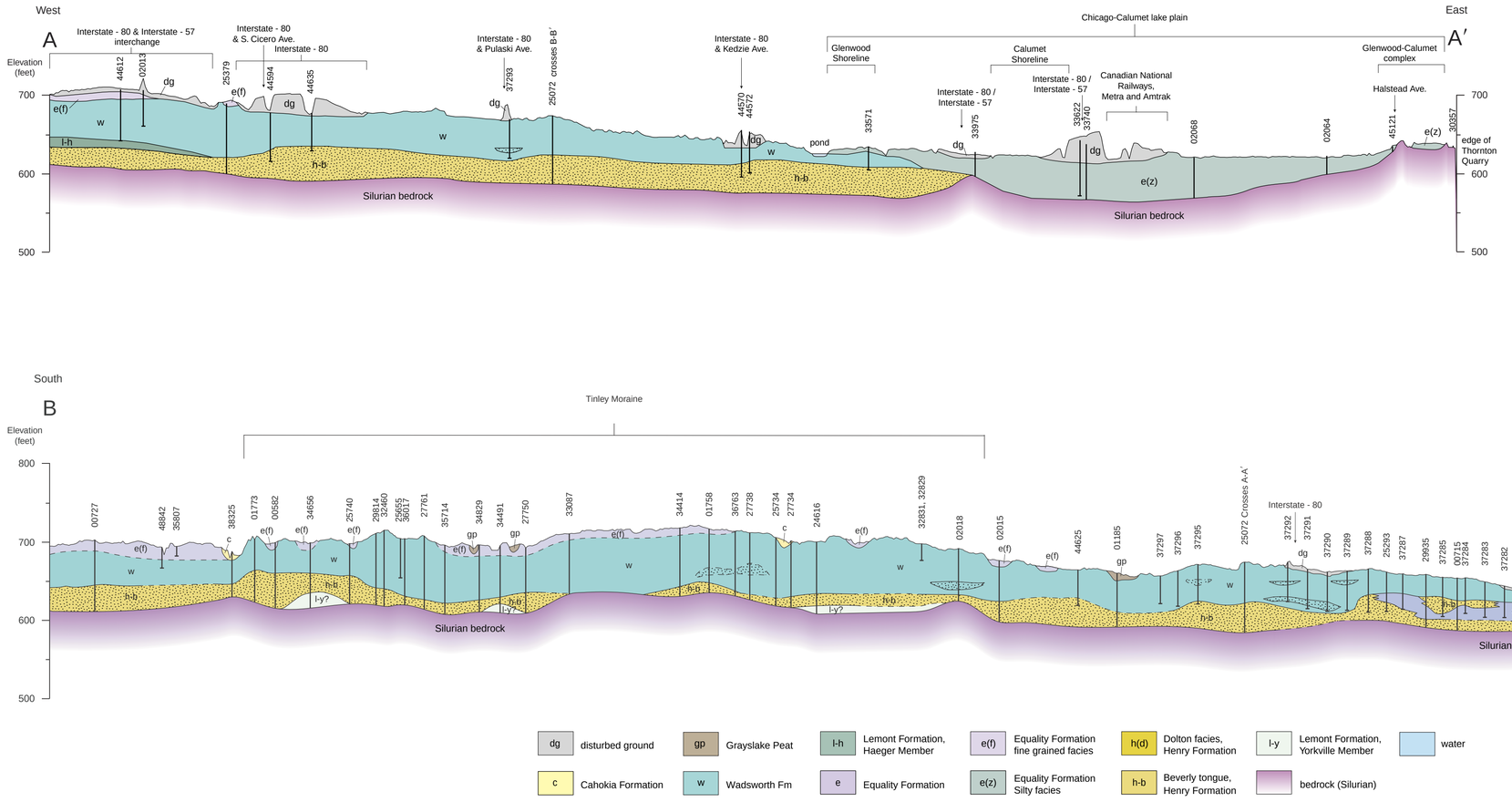
1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Palos Park
2 Blue Island
3 Lake Calumet
4 Tinley Park
5 Calumet City
6 Frankfort
7 Steger
8 Dyer

APPROXIMATE MEAN DECLINATION, 2019

ROAD CLASSIFICATION

Interstate Route — State Route
U.S. Route — Local road



Cross Sections

Sand

Lithologies as described in stratigraphic legend on map sheet 1

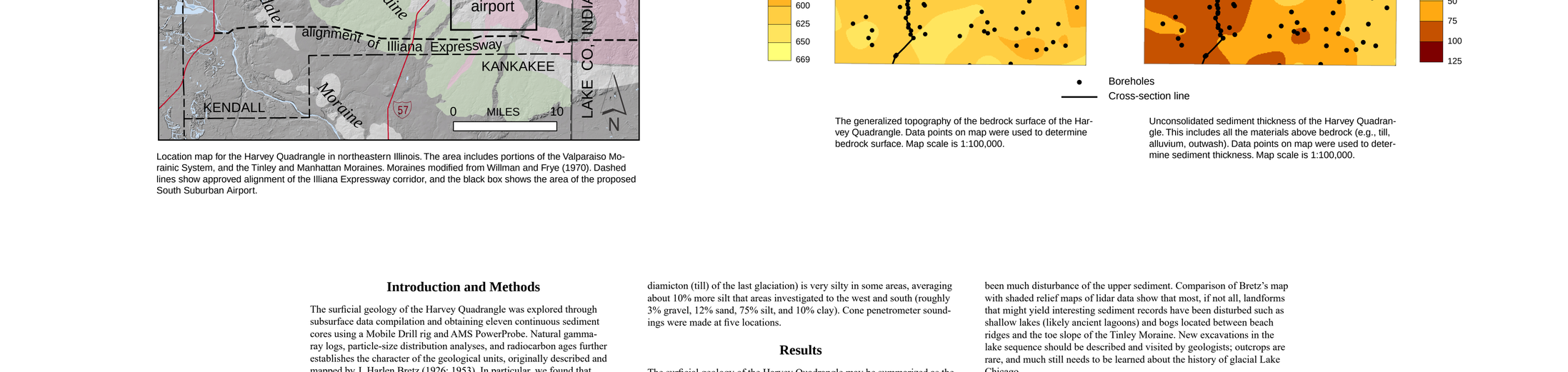
Contact

Borehole

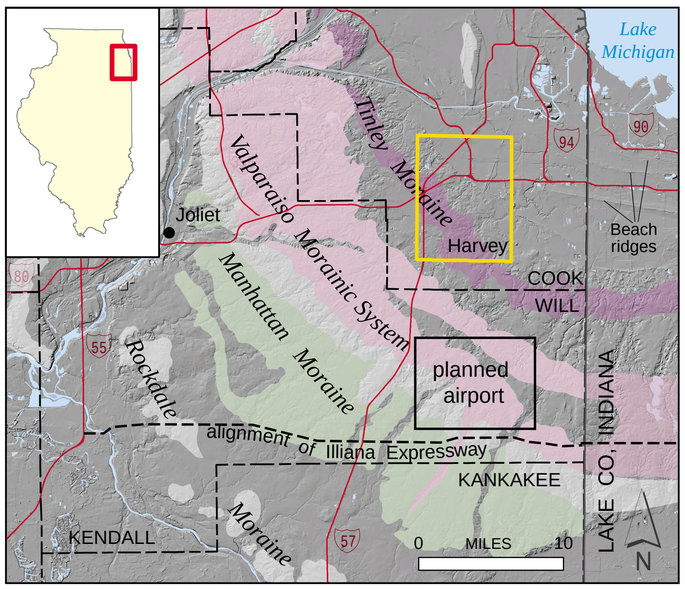
Approxiamte contact

Inferred contact

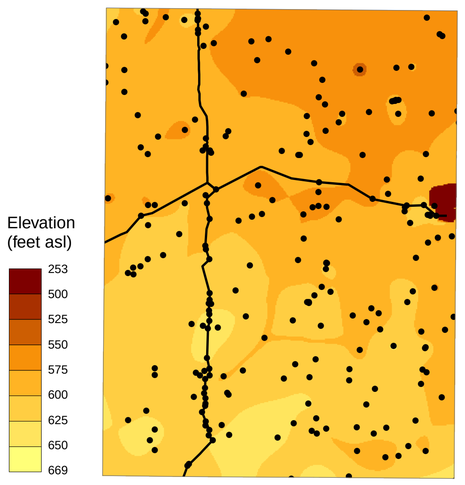
Horizontal scale: 1 inch = 2,000 feet
Vertical scale: 1 inch = 100 feet
Vertical exaggeration: 20×

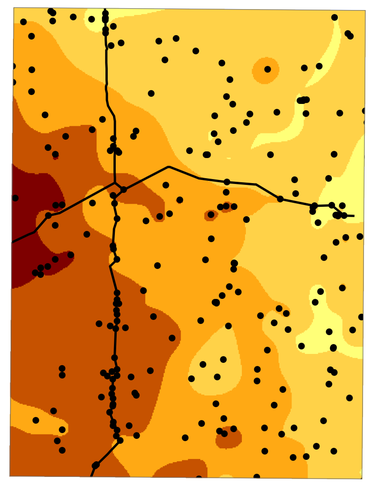


dg disturbed ground
gp Grayslake Peat
l-h Lemont Formation, Haeger Member
e(f) Equality Formation fine grained facies
h(d) Dolton facies, Henry Formation
l-y Lemont Formation, Yorkville Member
water
c Cahokia Formation
w Wadsworth Fm
e Equality Formation
e(z) Equality Formation Silty facies
h-b Beverly tongue, Henry Formation
bedrock (Silurian)



Location map for the Harvey Quadrangle in northeastern Illinois. The area includes portions of the Valparaiso Morainic System, and the Tinley and Manhattan Moraines. 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.





Boreholes
Cross-section line

The generalized topography of the bedrock surface of the Harvey Quadrangle. Data points on map were used to determine bedrock surface. Map scale is 1:100,000.

Unconsolidated sediment thickness of the Harvey Quadrangle. This includes all the materials above bedrock (e.g., till, alluvium, outwash). Data points on map were used to determine sediment thickness. Map scale is 1:100,000.

Introduction and Methods

The surficial geology of the Harvey Quadrangle was explored through subsurface data compilation and obtaining eleven continuous sediment cores using a Mobile Drill rig and AMS PowerProbe. Natural gamma-ray logs, particle-size distribution analyses, and radiocarbon ages further establishes the character of the geological units, originally described and mapped by J. Harlen Bretz (1926; 1953). In particular, we found that beach deposits originally mapped by Bretz in 1926 have largely been mined or reconfigured due to nearly 100 years of urban expansion. Our sediment cores reveal that the sediment comprising the Lake Chicago plain covering the northeastern portion of the map are largely composed of stratified silt, less medium-to-fine sand, and little clay (< 10%). One core revealed a shallow layer of tundra plant fossils in laminated silty sediment that yielded a radiocarbon ages of 14,425 +/- 45 ^{14}C yr B.P. (17,590 cal yr B.P.) and 14,195 +/- 45 ^{14}C yr B.P. (17,240 cal yr B.P.). Both ages are older than any previously dated organic material associated with glacial Lake Chicago; the earlier estimate was about 17,000 cal yr B.P. (Curry et al. 2018). Other radiocarbon ages obtained from this study include three ages > 35,000 ^{14}C yr B.P. from laminated silty sand that were likely reworked from a pre-last glacial organics, which, where in situ, are part of the Farmdale Geosol. The radiocarbon ages include 31,260 +/- 620; 35,740 +/- 620 and 39,540 +/- 85 years before present which converts to 35,630, 40,800 and 43,060 calibrated years before present, respectively. Particle-size analyses indicate that the Wadsworth Formation (glacigenic diamicton (till) of the last glaciation) is very silty in some areas, averaging about 10% more silt that areas investigated to the west and south (roughly 3% gravel, 12% sand, 75% silt, and 10% clay). Cone penetrometer soundings were made at five locations.

Results

The surficial geology of the Harvey Quadrangle may be summarized as the deposits of matrix-supported (silty loam texture) diamicton of the Wadsworth Formation forming the Tinley Moraine, a prominent feature in the southwestern half of the map. The diamicton overlies older deposits, most prominently, the Beverly Tongue of the Henry Formation, a prominent unit comprised of sorted sediment that is in general suitable for shallow wells (most wells, however, obtain their water from the bedrock; newer homes receive water from Lake Michigan). These sediments rest on more than 400 ft of Silurian dolostone mined at the Thornton Quarry. The latter is a famous source of Chicago's aggregate in the 19th and 20th centuries, and today are used for flood retention. The dolostone at Thornton Quarry comprised an erosionally resistant reef structure which explains the round shape surficial dolostone, most of which is now quarried or buried by mining debris. The Tinley Moraine is the youngest direct glacial landform on the Harvey Quadrangle. The moraine was eroded on its east side along the shores of glacial Lake Chicago, a precursor of Lake Michigan. As might be suspected, surficial deposits forming the former lake plain, particularly in lower and more clayey areas, are susceptible to flooding, and there has been much disturbance of the upper sediment. Comparison of Bretz's map with shaded relief maps of lidar data show that most, if not all, landforms that might yield interesting sediment records have been disturbed such as shallow lakes (likely ancient lagoons) and bogs located between beach ridges and the toe slope of the Tinley Moraine. New excavations in the lake sequence should be described and visited by geologists; outcrops are rare, and much still needs to be learned about the history of glacial Lake Chicago.

References

Bretz, J.H. (1939). Surficial Geology Maps from Bulletin 65: Geology of the Chicago Region: Part I, General, Illinois State Geological Survey. 24 maps, 1:24,000.

Bretz, J.H. (1955). Geology of the Chicago Region, Part II - The Pleistocene. Illinois State Geological Survey Bulletin 65, 132 p.

Curry, B.B., Bruegger, A.R., and Conroy, J.L., 2018, Highstands and overflow history of glacial Lake Chicago and downstream impacts on Gulf of Mexico δ18O values, Geology 46: 667-670.