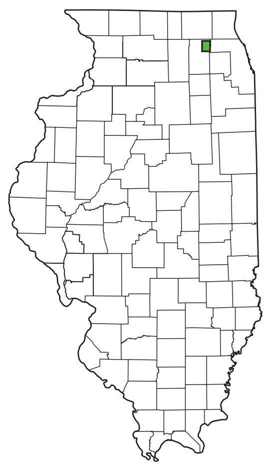
Illinois Geologic Quadrangle Map
IGQ Elgin-SG

Surficial Geology of Elgin Quadrangle

Kane and Cook Counties, Illinois

B. Brandon Curry
2007



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Purpose

Surficial Geology of Elgin Quadrangle, Kane and Cook Counties, Illinois is a map that identifies, describes, and locates near-surface earth materials relevant to many environmental and economic issues. The primary land use in the area is commercial and residential; most of the quadrangle is categorized as "Urban Corridor Area" of Kane County (Kane County Development Department 2004). The Elgin Quadrangle encompasses the growing municipalities of Elgin (94,487, Illinois Census 2000), Carpentersville (30,586), South Elgin (16,100), West Dundee (5,428), Sleepy Hollow (3,553), East Dundee (2,955), and Gilberts (1,279). Groundwater availability and quality are among the most important environmental issues affected by the surficial geology of the Elgin Quadrangle. Important geologic and hydrogeologic conditions include the following:

- In the northeastern portion of the map area, the Valparaiso aquifer (Curry and Seaber 1990) contains groundwater utilized by seven municipal water wells for the villages of Carpentersville and East Dundee. These communities are totally reliant on groundwater from aquifers in the glacial drift. The Village of Carpentersville pumped about 1.1 billion gallons of water from the Valparaiso aquifer in 2003; the Village of East Dundee, a little less than 180 million gallons. The new mapping shows that the Valparaiso aquifer is composed of sand and gravel associated with the Ashmore Tongue of the Henry Formation.

- A segment of the St. Charles Bedrock Valley and the associated St. Charles aquifer (Curry and Seaber 1990) is present in the southeastern part of the mapping area. In 2003, the Village of South Elgin pumped 760 million gallons of groundwater from eight municipal water wells. Of this, 445 million gallons came from wells tapping the St. Charles aquifer in and just south of the Elgin Quadrangle (Scott Meyers, Illinois State Water Survey, personal communication). The remaining groundwater was pumped from bedrock aquifers.

- In 2003, the City of Elgin pumped more than 4.5 billion gallons of shallow groundwater from intake pipes set in alluvium of the Fox River. The intake is located just downstream of where Tyler Creek flows into the Fox River in Sec. 11, T41N, R8E. An additional 377 million gallons of groundwater pumped from bedrock aquifers is mixed with the shallow groundwater to provide Elgin's municipal water supply, a portion of which is sold to Sleepy Hollow and Bartlett.

- Shallow groundwater analysis and protection is under way in association with the study and mitigation of eleven Superfund sites (http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm).

- As of 2006, an underground aggregate mine is planned to open in the southeastern corner of the quadrangle (Sec. 30, T41N, R9E). The expectation is that the mine will yield about 1 million tons per year of Class A dolostone aggregate of the Galena Group. The material will be mined using the room-and-pillar method and will be accessed through inclined shafts through Silurian dolostone and Maquoketa Group shale and dolomite.

Other issues related to the surficial geology include

- flooding, especially along Tyler and Poplar creeks;

- landslides and related groundwater seepage (springs) located along steep slopes along the Fox River;

- development of sub-drift bedrock aggregate resources in the southeastern part of the mapping area; and

- further development of surficial sand and gravel and dolomite aggregate resources.

The surficial map depicts materials encountered below a mantle of weathered, silty soil (loess) within 2 to 4 feet of ground surface. The accompanying cross sections show the vertical distribution of subsurface deposits, including several units that do not appear on the map and are buried by younger glacial drift. Data point location, bedrock topography, and drift thickness maps are also available for the Elgin Quadrangle (Curry 2007a, 2007b, 2007c).

Data Sources

The sources of data used to prepare the surficial geology map and cross sections are shown on the map of *Data Point Locations of Elgin Quadrangle* (Curry 2007c). Of the 349 points used to make the map and cross sections, the most important information includes (1) eleven key stratigraphic borings sampled by the ISGS (five of these reach bedrock and have natural gamma-ray logs; Reed 1975); (2) five descriptions of glacial sediment and bedrock exposed at an abandoned quarry (Prairie Pit no. 93; Secs. 23 and 24, T41N, R8E); (3) 15 geotechnical logs and descriptions of a large excavation for a new dolomite aggregate mine in Sec. 30, T41N, R9E (Patrick Engineering 1988; Gordon Stevens, personal communication, 2004); (4) 18 geotechnical logs and core samples from structural borings for the Spring Hill Mall (Secs. 21 and 22, T42N, R8E); and (5) 71 sample sets of glacial materials collected during the drilling of water wells and test wells. Some sample sets are of high quality, especially those sampled by Layne-Western, Inc., and were helpful for interpreting the complex geology in the northeastern part of the quadrangle. Important additional data include 71 shallow outcrop descriptions and 215 lithologic logs of structural borings for construction sites. The cross sections were improved by including interpretations of selected drillers' lithologic logs from 330 water wells (259 of which penetrated bedrock). The information contained on the logs has been entered into an Oracle database at the Illinois State Geological Survey (ISGS). Additional information, including stratigraphic interpretations, has been stored digitally in an Access database. These data were used to map the glacial sediments in Kane County at a scale of 1:100,000 for the purpose of modeling groundwater availability and flow direction in the glacial drift and shallow bedrock (Dey et al. 2004). The Access database was also the primary source of information used in this study.

The various data sources required different levels of interpretation in order to complete the cross sections and map. The highest-quality data (the key stratigraphic borings, borings with natural gamma-ray logs, and outcrop descriptions) were used to prepare preliminary cross sections. Supplemental data were added, where available, along the lines of cross section. The preliminary cross sections were prepared by downloading these data into RockWorks 2002 software that allowed rapid analysis of preliminary cross sections.

After the preliminary cross sections were completed, boundaries were drawn between map units. The boundaries are based in part on previous investigations (Curry 1998, Wickham et al. 1988) and interpretations of the Kane County soil survey maps (Goddard 1979). In some areas, the elevations of contacts between units on the cross sections were adjusted to reflect the mapped distribution of the lithologic units. The smallest polygons on the map cover about 1 acre and delineate areas of peat and lake sediment.

Natural gamma-ray logs were an integral part of interpreting the glacial succession in cross section. These logs provide a continuous record of the natural radiation emitted from deposits adjacent to the borehole (Bleuer 2004). In this region, clay-rich sediment emits more gamma-rays than do gravelly deposits. The logs, therefore, are useful in differentiating materials suitable for aquifer development from those that will likely not yield water. Several stratigraphic units have characteristic logging "signatures" that aid in the correlation of units from place to place.

Bedrock contacts, shown only in cross section, are based on surface models using data from numerous sample set descriptions available from the ISGS Geological Records Unit collections and selected lithologic logs from private water-well records. These data were supplemented by two groups of geotechnical logs of bedrock cores in the southeastern corner of the Elgin Quadrangle (Patrick Engineering 1988). Another data source was from outcrops of the Ordovician Maquoketa Group and overlying Silurian rocks exposed in quarries in the south-central part of the quadrangle. The surfaces between the basal Silurian dolostone formation and Maquoketa Group and between the Maquoketa and Galena groups were digitally modeled. The inverse-distance-weighted algorithm in the 3-D Analyst extension in ArcGIS 9.0 was used to grid the data at 600-foot spacings.

Materials (Lithostratigraphic Units), Their Classification, and Terminology

Geologists map geologic materials as lithostratigraphic units that have unique physical properties (such as color and grain-size distribution) and occur at a specific level in the succession of sediment layers (see the map legend). For deposits of the last glaciation (Wisconsin Episode), a special distinction is made based on grain size and sorting: deposits composed of similar-sized grains (i.e., well-sorted sediment or poorly graded sediment) are classified with the Mason Group; deposits composed of a poorly sorted mixture of grain sizes (i.e., diamicton) are classified with the Wedron Group (fig. 1; Hansel and Johnson 1996). Regionally important layers of sand and gravel or fine-grained sediment that occur between named lithostratigraphic units of the Wedron Group are classified as stratigraphic tongues, such as the Beverly Tongue of the Henry Formation. Sand and gravel layers that are mappable at 1:24,000, but that do not occur regionally, are referred to as unnamed tongues of the Henry Formation.

"Diamicton" describes a deposit that contains a wide range of grain sizes, usually from clay to boulders. In Illinois, moraines formed by a particular glacial advance commonly are composed of diamicton with a distinctive lithology that contrasts with adjacent moraines formed during a different advance. The lithological characteristics commonly used to differentiate among diamictons include color, moisture content, particle-size distribution of the <2-mm matrix, and clay

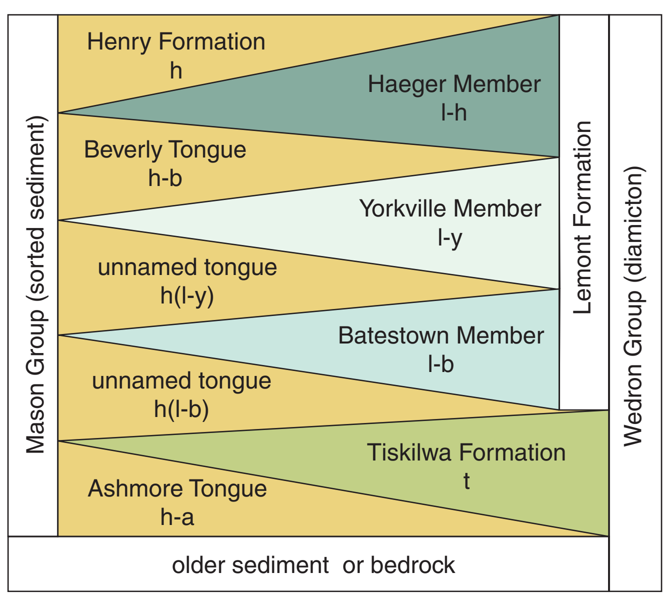

Figure 1 Tonguing relationships among very poorly sorted diamicton units of the Wedron Group and better-sorted sand and gravel units of the Mason Group.

mineral composition (Wickham et al. 1988). Geologists use textural terms such as "loam" and "clay loam" to describe the particle-size distribution of the sediment matrix; the terms are based on the soil texture classification of the U.S. Department of Agriculture (Buol et al. 1980).

Mason Group

Two kinds of materials composed of sorted sediment of the Mason Group are identified on the surficial geology map. The Henry Formation is composed of sand and gravel; the Equality Formation comprises finer-grained deposits of fine sand, silt, and clay. The Henry sand and gravel deposits that occur at or just below ground surface may be important aggregate resources or shallow aquifers. Several stratigraphic subunits, including regionally important "tongues," are recognized as parts of the Henry Formation. The names assigned to the tongues depend on the diamicton unit overlying the sand and gravel (refer to the map legend and figures). The fine-grained deposits of the Equality Formation form important local aquitards that may impede the movement of groundwater.

Wedron Group

Four lithologically distinct diamicton units of the Wedron Group are mapped on the Elgin Quadrangle. These diamicton units are matrix supported, and many of their physical characteristics are distinctive, such as matrix texture (sand-silt-clay percentages), clay mineralogy, color, moisture content, and Atterberg limits (table 1; Wickham et al. 1988, Graese et al. 1988). The units classify as lean clays (CL) in the Unified Soil Classification System (Holtz and Kovacs 1981). The stratigraphic nomenclature follows Willman and Frye (1970) with modifications to the lithologic units of the last glaciation by Hansel and Johnson (1996). The most diagnostic field characteristics of each unit are listed below along with assessments of the units as aquitards:

- Tiskilwa Formation diamicton is reddish brown, hard, thick, uniform, and has a matrix texture of clay loam to loam (Wickham et al. 1988). Thick Tiskilwa Formation diamicton is the most significant drift aquitard in the region.
- Batestown Member (Lemont Formation) diamicton is brown, friable (crumbly) when dry, sandy, and contains abundant interbeds of sand and gravel. On the Elgin Quadrangle, these deposits are leaky aquitards because they are generally thin, weathered, and lithologically heterogeneous.
- Yorkville Member (Lemont Formation) diamicton is gray, very fine-grained, hard, thin, and contains little sand and gravel. The unit contains abundant fractures formed by desiccation and weathering. Like the Batestown Member, the Yorkville unit is a leaky aquitard.
- Haeger Member (Lemont Formation) diamicton is yellowish brown, coarse-grained, and friable and is associated with thick deposits of sand and gravel. The unit is a very leaky aquitard and is typically oxidized and weathered.

Postglacial deposits

The Grayslake Peat (peat and marl) and Cahokia Formation (interbeds of sand and gravel, sand, clayey silt, and peat) are present in areas prone to flooding. The Grayslake Peat occurs in depressions or at the foot of slopes that receive year-round groundwater input. The Cahokia Formation is the alluvium of postglacial streams. Due to the high moisture content and high compressibility, peat, marl, and clayey sediment are not suitable for foundation material and are classified as fat clays

Table 1 Selected physical properties of the most significant stratigraphic units. Mean values are given for most parameters. Hydraulic conductivity values are estimated.

	Stratigraphic unit							
Material	Tiskilwa diamicton (regional)	Tiskilwa diamicton (local)	Batestown diamicton	Yorkville diamicton	Haeger diamicton	Equality silt and clay	Grayslake Peat	Henry sand and gravel
Gravel (%)	7	4	16	10	11	1	2	29
Sand (%)	37	34	43	20	45	8	8	53
Silt (%)	37	33	41	47	37	60	52	32
Clay (%)	26	34	16	33	18	32	40	15
Moisture content (%)	11	12.2	10	14	12	29	112	17
Vertical hydraulic conductivity (cm/sec)[2d, e]	-	10^{-8} to 10^{-9}	10^{-4} to 10^{-5}	10^{-5} to 10^{-6}	10^{-4} to 10^{-5}	10^{-5} to 10^{-6}	-	10^{-2} to 10^{-4}
Liquid limit[1]	-	24	15	25	-	-	-	-
Plastic limit[1]	-	11	12	14	-	-	-	-
Plasticity index[1]	-	13	3	11	-	-	-	-
Reference[2]	a	e	b	b, d	a	c	c	c
Color (fresh)	red-brown	red-brown	brown	gray	gray	gray	dark brown	brown
Unif. Soil Class.[1, 3]	CL	CL	CL	CL	CL	CL, ML	OH	SC, GW
Samples (no.)	283	25	63	428	25	198	10	113

[1] See Holtz and Kovacs (1981).
[2] Reference: a = Curry 1995, b = Curry 1991, c = Graese et al. 1988, d = Kesich 1999, e = Jennings 1985.
[3] Unified Soil Classification: CL = lean clay; ML = lean silt; OH = compressible soil; SC = sand, poorly graded; GW = gravel, well graded.

or organic soils (CH or OH of the Unified Soil Classification System; Holtz and Kovacs 1981). Desiccation of these materials, in places caused by tiling and ditching, may lead to cracking and subsidence.

Geologic Setting

Also known as drift, glacial deposits mantle most of northeastern Illinois. In the Elgin Quadrangle, drift thickness varies from more than 290 feet thick in the west-central part of the map to nil where surface materials have been removed by quarrying in the southeastern part of the map (Curry 2007b). In northeastern Illinois, most near-surface glacial sediment was deposited during the last glaciation (Wisconsin Episode) from about 24,000 to 12,500 radiocarbon years ago (Hansel and Johnson 1992, Curry and Yansa 2004). During this time, the Lake Michigan Lobe of the Laurentide Ice Sheet formed numerous subdued ridges (moraines) with hummocky topography (fig. 2). Meltwater carried and deposited outwash sand and gravel along streams and rivers (fig. 3). Laminated silt and clay were deposited in a variety of sedimentary environments such as ice-walled lakes and slackwater and kettle basins (Curry and Yansa 2004).

On the Elgin Quadrangle, the surficial diamicton units that constitute upland landform-sediment assemblages are typically intercalated with beds of outwash sand and gravel, and lake deposits of mostly finely bedded silt and clay. The steepest hills in this region are kames, glacial landforms primarily composed of sand and gravel and silty sand with faulted, chaotic bedding. These features imply sediment collapse and deposition on a stagnating glacier. The best examples of the chaotic bedding have been observed in kamic hills on the Pingree Grove and Elburn Quadrangles immediately west and southwest of the study area (Grimley and Curry 2001, Grimley 2005). During the initial stages of ice disintegration, meltwater flowed into low-lying areas, forming numerous lakes. Many of the smaller patches of silty lake sediment, mapped as Equality Formation, were deposited at this time. Upland areas were later dissected by meltwater streams, first by local intermorainic streams such as Tyler Creek and later by large-scale floodwaters in the Fox River.

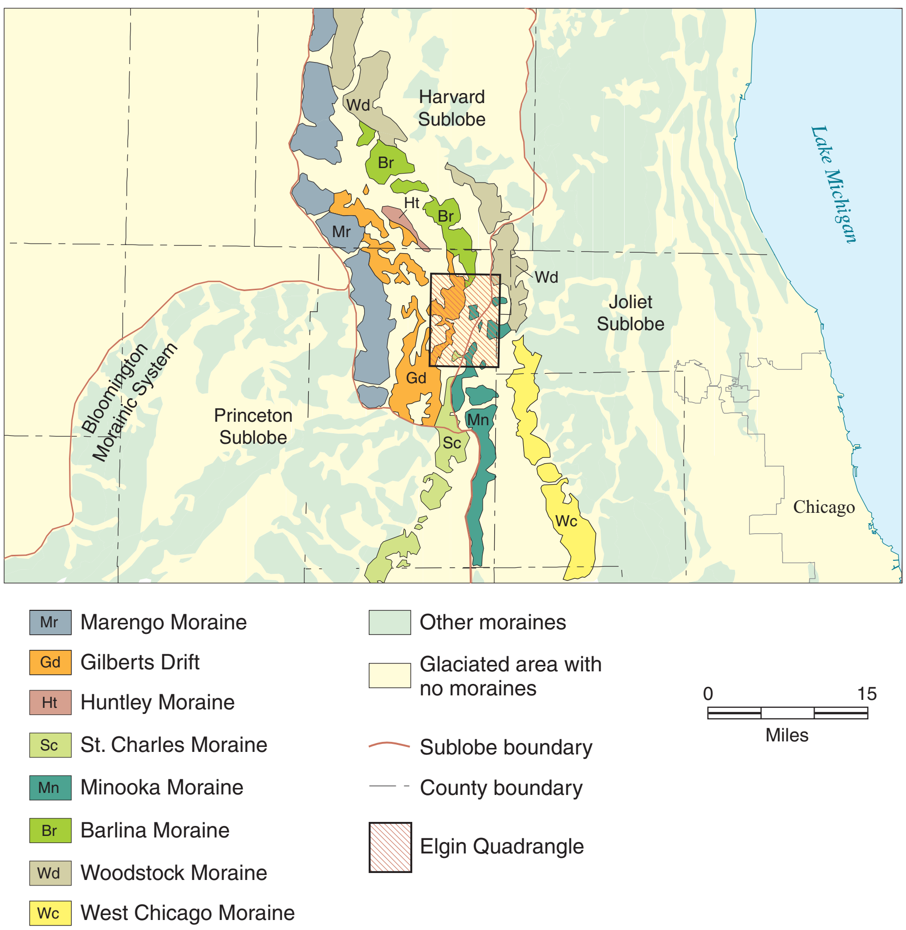

Figure 2 Wisconsin Episode moraines in northeastern Illinois. Moraines were formed near the terminus of glacial ice at various positions of the Lake Michigan Lobe. Glacial ice advanced into Illinois from the Lake Michigan basin. The older moraines of this figure occur generally to the west and the younger moraines to the east. In the area of the last glaciation, the light yellow areas are typically drainageways or plains of outwash, lake sediment, or till. On this map, adapted from Willman and Frye (1970) and Hansel and Johnson (1996), the Elgin Quadrangle is hachured in red.

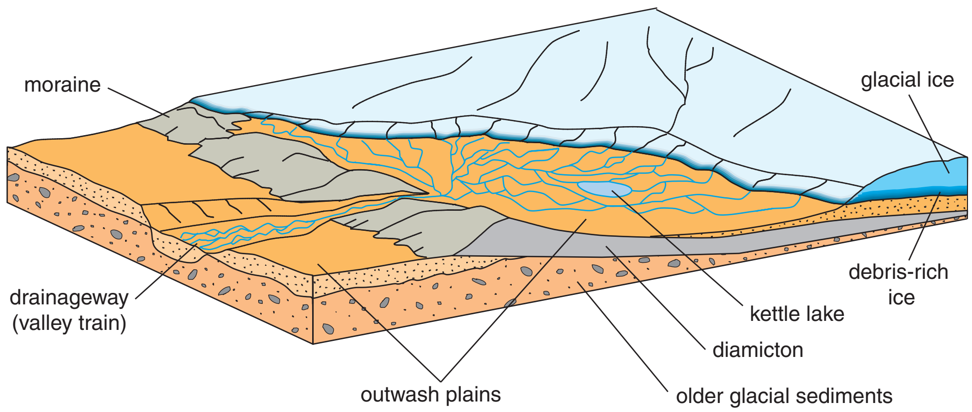

Figure 3 Conceptual model of landform-sediment assemblages associated with the margins of continental glaciers.

Landform-Sediment Assemblages

Landform-sediment assemblages are used to conceptually link deposits and their associated landforms to processes associated with sedimentary environments. The Elgin Quadrangle encompasses several such assemblages related to the juxtaposition of regionally important landforms (Willman and Frye 1970, Hansel and Johnson 1996). Additional landforms identified herein (fig. 4) include, from oldest to youngest: (1) the hummocky topography of the Gilberts Drift, including the prominent kamic hills at the Elgin Country Club and Hillcrest Elementary School, (2) a part of the lake plain of glacial Lake Pingree (Willman and Frye 1970, Grimley 2005), (3) the subtle ice-stagnation topography of the St. Charles and Minooka moraines, the related Otter Creek lowland, and the small outwash plain near the center of the map, (4) the Bluff City kamic area, (5) a small portion of the Woodstock Moraine, (6) outwash plain associated with the West Chicago and Woodstock moraines forming uplands east of the Fox River, (7) prominent terraces formed of valley train outwash along the Fox River, (8) terraces along Tyler and Poplar creeks formed of sediment that was deposited in slackwater lakes, (9) the steep slopes along the Fox River valley, and (10) Holocene floodplain deposits. This section describes the sediment successions of key borings that are representative of the landform-sediment assemblages.

Gilberts Drift

Gilberts Drift is an area of "rough and fresh-looking topography. Morainic hills are intermixed with kames and eskers, and flat lake plains surround many of the hills" (Willman and Frye 1970, p. 109). A continuous core and down-hole natural gamma-ray log from boring 34552 is representative of the glacial succession forming the Gilberts Drift (fig. 5). The natural gamma-ray log, measured in the borehole shortly after its completion, exhibits value ranges and variability characteristic of three kinds of lithologies, including (1) sand and gravel, (2) compact diamicton with few sand lenses, and (3) diamicton with many sand lenses. In this boring, the lowest layer of sand and gravel is interpreted as proglacial outwash sand and gravel associated with the oldest glacial advance of the last glaciation and is classified as the Ashmore Tongue of the Henry Formation. This unit is overlain by two diamicton units with logging characteristics that reflect different levels of sediment variability. Except for a layer of sand and gravel from 136 to 125 feet, the Tiskilwa Formation has a "blocky" (monotonic) signature that varies no more than about 10 counts per second (cps) in any 10-foot section, whereas the Batestown unit has values that range more than 20 cps. The variability of the Batestown unit is attributed to a mélange of sediment types including diamicton, sand and gravel, and faintly laminated silt; the Tiskilwa unit is primarily diamicton (fig. 5). The difference in sediment variability is attributed to changes in the conditions under which the diamicton unit was deposited. The abundant lenses of sand and gravel of the Batestown unit are consistent with formation of the Gilberts Drift under conditions of stagnant ice. The Tiskilwa Formation, however, contains fewer interbeds of sand and gravel, which is consistent with deposition by active glacial ice (Curry et al. 1999).

St. Charles and Minooka Moraines

In the mapping area, the broad, poorly defined northern parts of the St. Charles and Minooka moraines are formed of gray, matrix-supported diamicton interbedded with abundant lenses of sorted sediment of the Yorkville Member (Lemont Formation). In several places, the silty clay diamicton matrix is crudely stratified. These characteristics (sorted sediment, stratified diamicton, and breadth) suggest the moraines were formed under stagnant ice. The core and gamma-ray log from boring 34523 are representative of the materials forming the Minooka Moraine west of the Fox River (fig. 6). Yorkville-related materials constitute the upper 60 feet of the succession and include, from top to bottom, 18 feet of stratified silty clay loam diamicton, 29 feet of sand and gravel, and 13 feet of laminated, clayey diamicton. The lower diamicton layer is interpreted to have been deposited during formation of the St. Charles Moraine. At the Fox River Stone Company, two miles south of the mapping area, fossil Arctic bilberry leaves collected from a layer of sorted sediment correlated to the Yorkville sand and gravel shown in figure 6 were dated at 17,540 ± 130 radiocarbon years (^{14}C-yr) before present (BP) (OxA-W814-13; Curry et al. 1999, Curry and Yansa 2004).

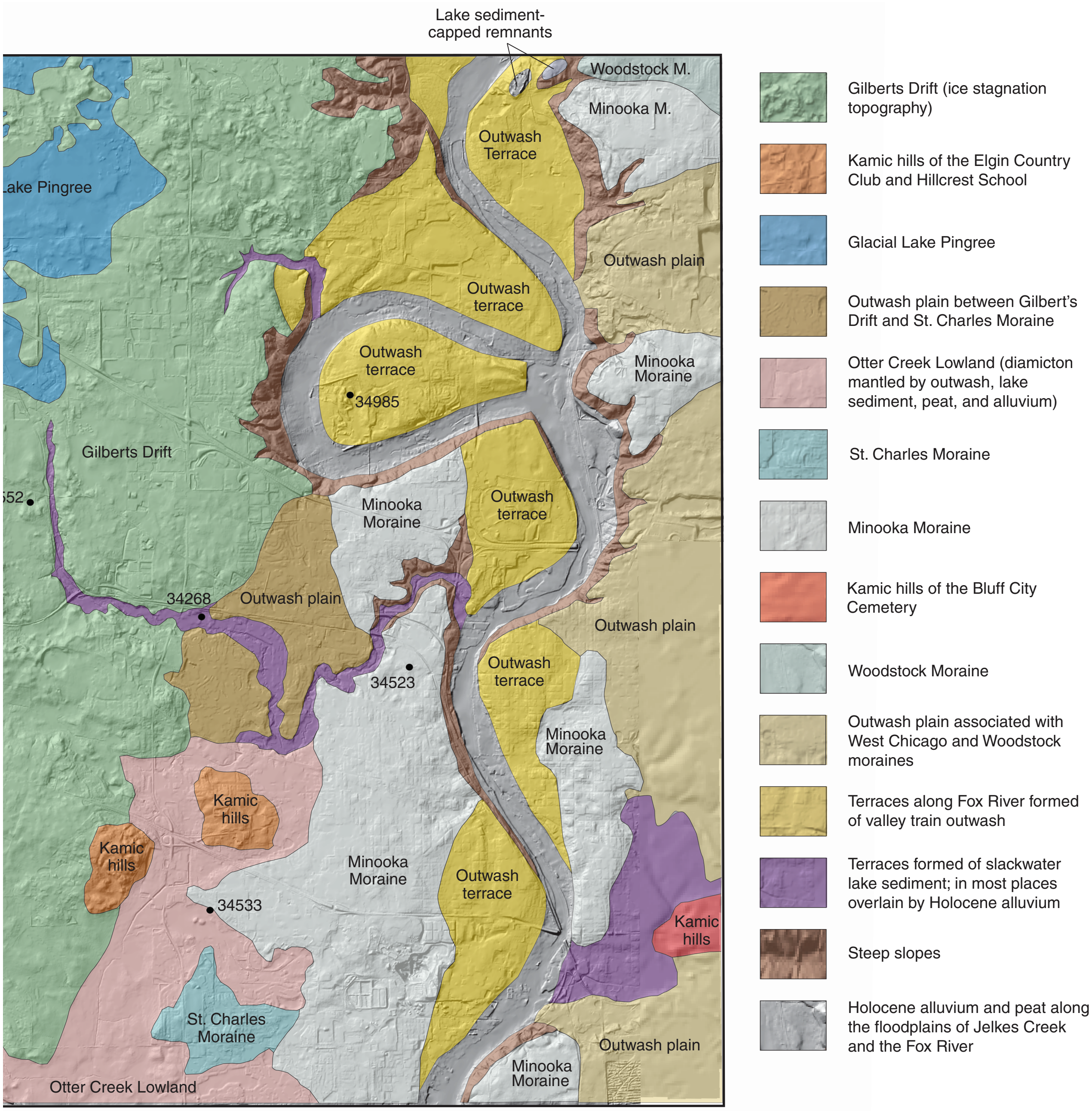

Figure 4 Landscape-sediment assemblages of the Elgin Quadrangle. Formal names include Gilberts Drift, St. Charles Moraine, Minooka Moraine, glacial Lake Pingree (Willman and Frye 1970), and Woodstock Moraine (Johnson and Hansel 1989, Hansel and Johnson 1996). Also shown are the locations of borings shown in figures 5, 6, 7, and 8.

Otter Creek Lowland

Between the St. Charles Moraine and Gilberts Drift is a low area informally named the Otter Creek lowland (fig. 4). Here, the glacial succession includes the Tiskilwa, Batestown, and Yorkville diamicton units mantled by peat, laminated lake sediment, and outwash sand and gravel. The core and gamma-ray log from Boring 34553 are representative of the succession in the Otter Creek lowland. The succession includes 10 feet of surficial sand and gravel (Henry Formation) that was likely deposited during formation of the St. Charles Moraine (fig. 7). Another interesting feature of this boring is the deeply buried organic soil that covered the pre-Wisconsin glacial landscape. The unit is known as the Robein Member of the Roxana Silt (fig. 7), and a sample of wood from it yielded a radiocarbon age of 25,300 ± 360 ^{14}C-yr BP (ISGS-5305). The age is typical of the Robein Member in northeastern Illinois (Curry 1989, Curry and Pavich 1996, Curry et al. 1999). Another layer of deeply buried wood fragments located in the southeastern part of the mapping area (NE SE Sec. 30, T41N, R9E, API no. 34082, Curry 2007c) yielded one of the youngest radiocarbon ages in the region for the Robein Member (24,000 ± 270 ^{14}C-yr BP [ISGS-5632]). The collective radiocarbon ages from the Robein Member discussed here and from fossils discovered in ice-walled lake deposits in the Hampshire Quadrangle (about 10 miles west of Elgin) indicate that the Lake Michigan Lobe covered the

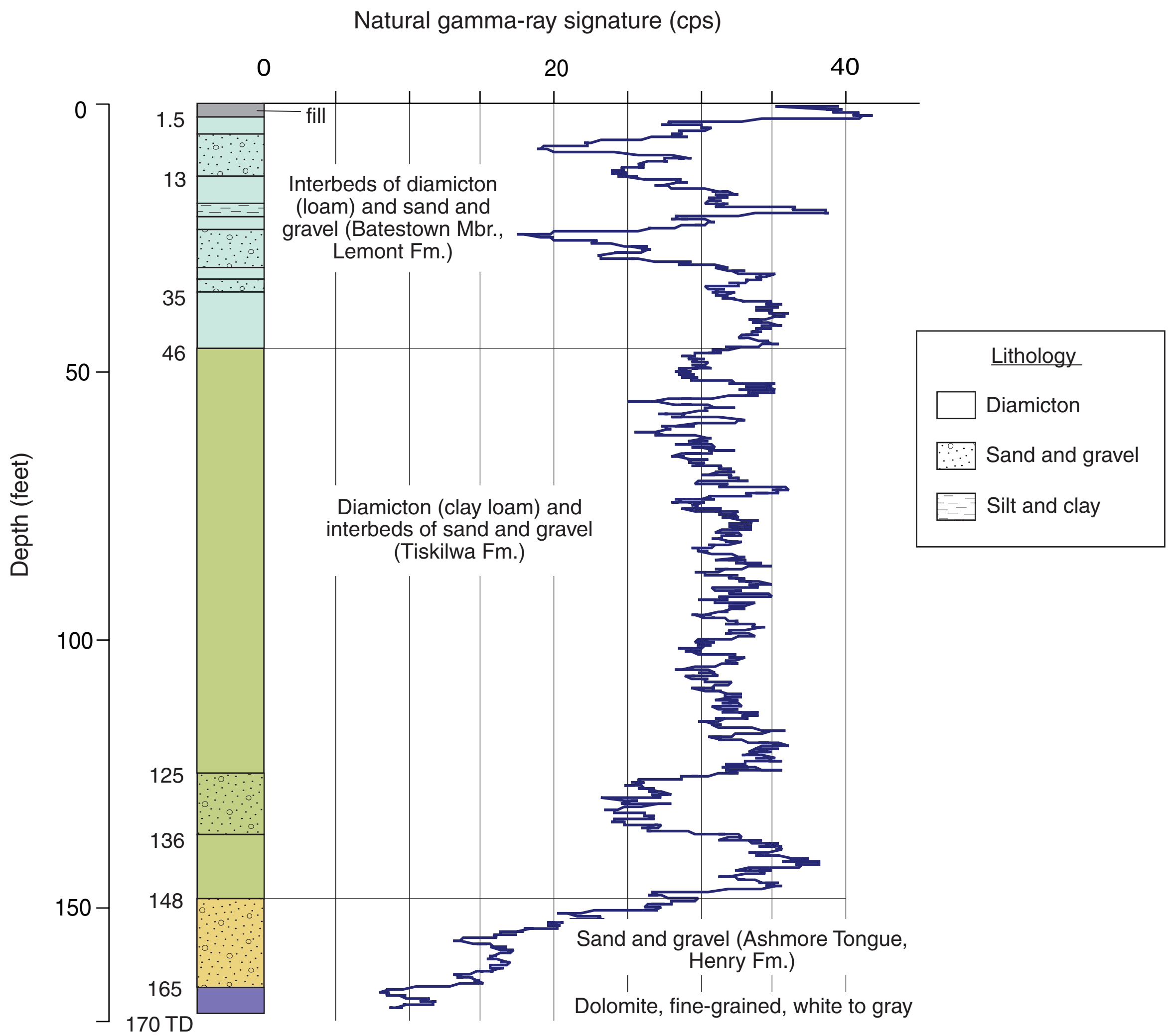

Figure 5 Lithologic and gamma-ray log of boring 34552 (SE SE Sec. 36, T42N, R7E, elevation 880 feet) located near the entrance of Paul Wolff Campground, Burnidge Forest Preserve. This boring is used in cross sections B–B′ and D–D′. A continuous core was sampled at this site.

Elgin Quadrangle from about 24,000 to 17,500 ^{14}C-yr B.P., during the last glaciation (Curry et al. 1999, Curry and Yansa 2004).

Woodstock Moraine

The youngest moraine, the Woodstock Moraine, occurs in the northeastern corner of the mapping area. The Woodstock Moraine is formed of oxidized, sandy diamicton classified to the Haeger Member (Lemont Formation). Several high-quality sample sets suggest that the area covered by diamicton of the Haeger Member is smaller than previously thought (Wickham et al. 1988). Equally surprising is the occurrence at depth of thick, laminated, and fossiliferous lake silts classified as an unnamed tongue of the Henry Formation associated with the Batestown Member (unit h(l-b)) (see wells 35250, 34323, 35251, and 34833 along cross sections A–A′ and F–F′).

Kamic Complexes

Three borings in the southeastern corner of the study area indicate that an area of rolling hills is formed entirely of sand and gravel. Their form and elevation above the surrounding outwash plain (discussed next) suggest that the hills are kames that are possibly related to ice stagnation during formation of either the Minooka or West Chicago moraines. Kamic topography, where it occurs in the Minooka Moraine west of the Fox River, has much less relief than the Bluff City kamic complex (fig. 4).

Outwash Plains and Terraces

Two large areas underlain by surficial outwash occur on the Elgin Quadrangle. The older sand and gravel was largely deposited in an upland outwash plain east of the Fox River, whereas the younger sand and gravel was deposited as a valley train in the Fox River valley (fig. 4; Johnson and Hansel 1989). The younger outwash deposits are inset into the succession of older glacial deposits, including the upland outwash, such that in places the younger outwash is in contact with the older outwash. In general, the sand and gravel associated with the valley train and upland outwash plains thin to the south. Both deposits have been mined for aggregate, including large, active pits east of Route 31 and north

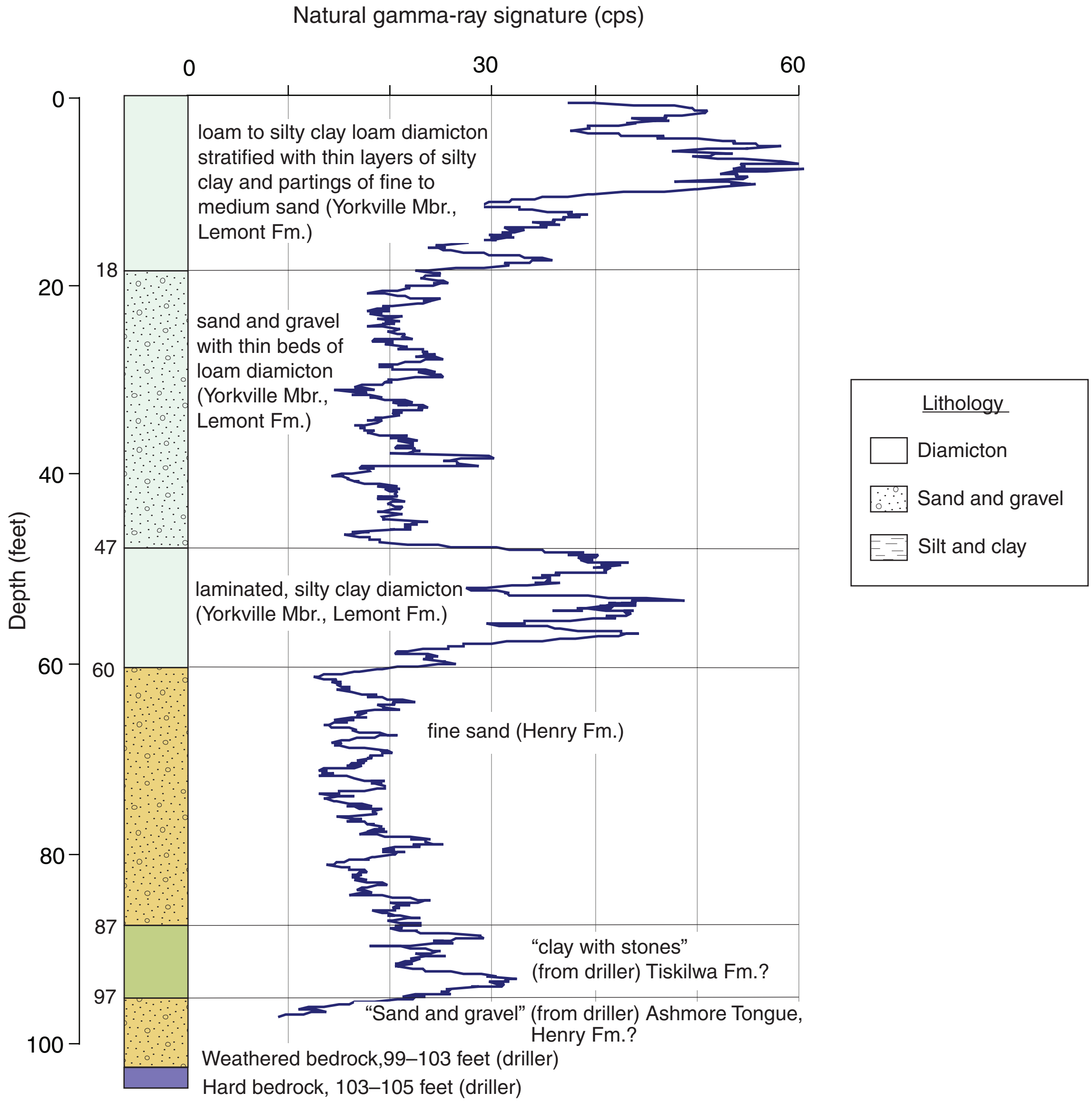

Figure 6 Lithologic and gamma-ray log of boring 34523 (SE NE Sec. 11, T41N, R8E, elevation 798 feet) located in Wing Park, Elgin, Illinois. A continuous core sampled from 0 to 65 feet, and the boring was extended to 100 feet by augering. This boring is used in cross section E–E′.

of Interstate 90 (Hansel et al. 1985) and several abandoned pits in Sleepy Hollow.

The valley train sand and gravel mantles high-level terraces along the Fox River valley on the Crystal Lake and Elgin quadrangles. The terraces are attributed to large floods that resulted from breaching of the Woodstock Moraine by a large, impounded glacial lake. The valley segment of the Fox River that eroded the channel across the moraine is located on the Crystal Lake Quadrangle (Curry 2005). Closely spaced structural borings drilled for Spring Hill Mall in West Dundee reveals that the terrace sand and gravel ranges from about 5 feet to more than 50 feet thick (cross sections H–H′ and I–I′). The thickest sand and gravel deposits are those near the valley wall, suggesting that the greatest erosion took place during the first stages of flooding. Outcrops in a sand and gravel pit in the abandoned meander near Sleepy Hollow (site 34985 in fig. 4) reveal that the sand and gravel contains beds of silt and "till balls." The till balls are rounded fragments of reworked diamicton (mostly of the Tiskilwa Formation) and attest to erosion by the floods that carved the Fox River valley.

Two small erosional remnants of lake sediment capping diamicton of the Yorkville Member are perched 100 feet above the Fox River in Sec. 15, T42N, T8E (fig. 4). The lake sediment, as much as 29 feet thick, is fossiliferous in places and contains abundant ostracode shells. The lake sediment may record ponding during development of the Fox River valley prior to the large floods described.

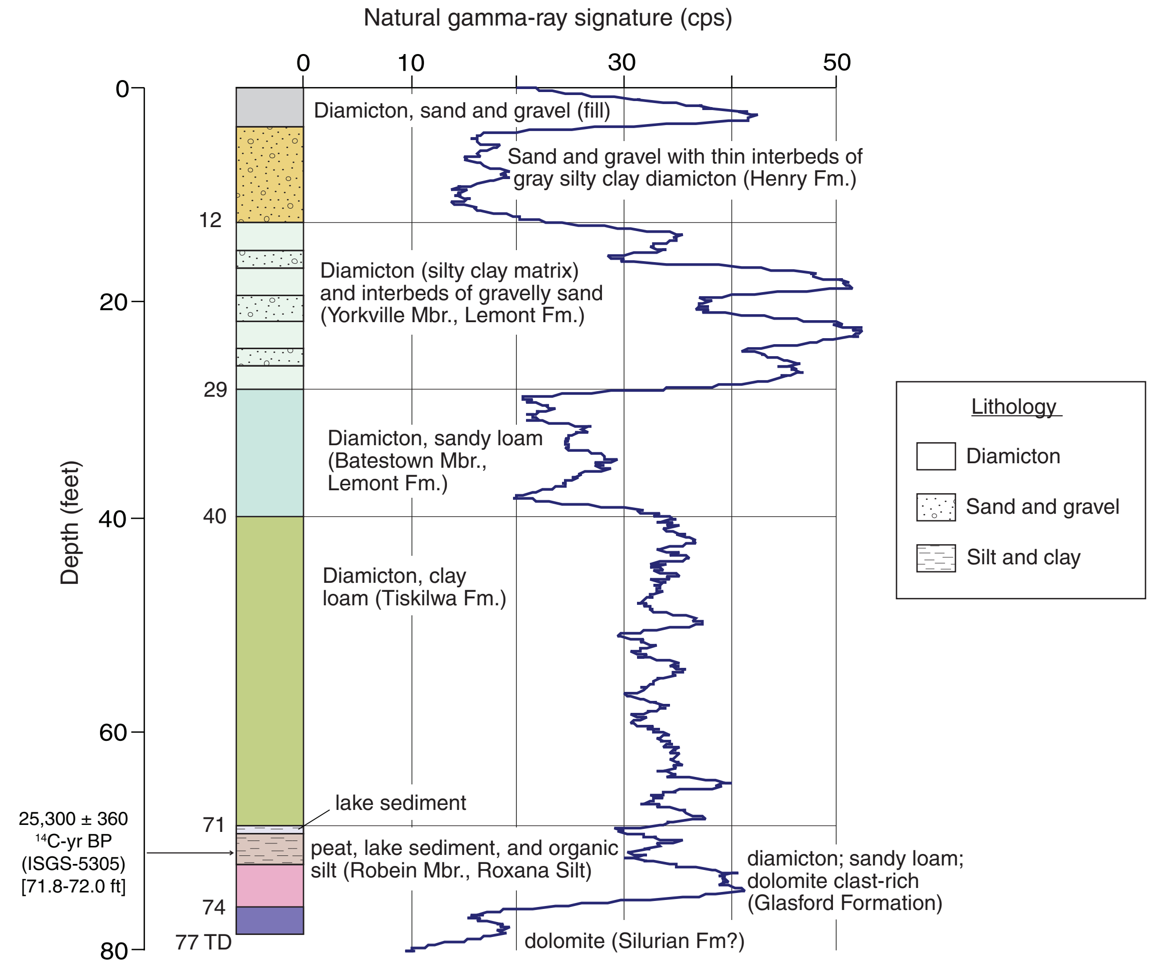

Figure 7 Lithologic and gamma-ray log of boring 34553 (SE NE Sec. 21, T41N, R8E, elevation 807 feet) located in College Park, Elgin, Illinois. This boring was sampled by continuous coring and is used in cross sections C–C′ and E–E′.

Poplar and Tyler Creeks

The valleys of Poplar and Tyler creeks contain remarkable successions of fossiliferous alluvium, lake sediment, and modern alluvium. The core from boring 34268 is representative of the succession in Tyler Creek (fig. 8). Here, at least 7 feet of sandy alluvium of the Cahokia Formation overlies about 45 feet of fossiliferous sandy alluvium and silty lake sediment (fig. 8). The succession of sorted sediment overlies about 8 feet of loamy Batestown diamicton and more than 40 feet of sand and gravel. Fossil spruce needles sampled at depths of 50 and 20 feet yielded radiocarbon ages of 13,980 ± 40 ^{14}C-yr BP (CAMS-81854) and 13,290 ± 70 ^{14}C-yr BP (CAMS-81853), respectively. The alluvium in this core is at elevations ranging from 793 to 765 feet which are consistent with terraces in the Fox River valley. This relationship suggests that the fossiliferous lake sediments were deposited under slackwater conditions. In other words, rapidly accumulating alluvium in the Fox River valley dammed Tyler and Poplar creeks, and the resulting basins accumulated glaciolacustrine silt and clay, including rare, reworked fragments of the local vegetation.

Fox River Floodplain

During post-glacial times, the base of the Fox River was from 17 feet to as much as 27 feet below the present-day elevation of the river bed. The thickest post-glacial alluvium is described in the logs of three geotechnical borings drilled for the Main Street Bridge that connects West and East Dundee. Here, the Fox River flows across 27 feet of sand and gravel. The upper 7 feet are described as "loose, black, and containing abundant shells." Beds of buried peat described in geotechnical borings near the mouth of Poplar Creek further indicate that the bed of the Fox River was incised as much as 17 feet below its present level prior to post-glacial aggradation.

Bedrock

Paleozoic bedrock is shown on the cross sections to a depth of 400 feet MSL. The bedrock units are differentiated because of the recent interest in developing mines for dolomite aggregate. Graese (1991) and Graese et al. (1988) provide an overview of the regional thickness, lithology, age, and environment of deposition for the units shown on the cross sections.

Summary

The Quaternary geology of the Elgin Quadrangle is complex. In some areas, however, the geology is relatively simple, such as at the Spring Hill Mall, where the succession of glacial sediment consists of a thick deposit of Tiskilwa diamicton truncated by a channel filled with outwash sand and gravel (cross sections H–H′ and I–I′). In other areas, such as at the abandoned sand and gravel pit south of the Bluff City Cemetery (cross section G–G′; east side of cross section C–C′), stratigraphic and lithologic units pinch and swell considerably such that borings less than 500 feet apart have different stratigraphic successions. Mapping suggests that although the physical characteristics and succession of units is well understood, their distribution and thickness may not be predictable without closely spaced data. The chief reasons for the lithologic variability are deposition of post-Tiskilwa units under conditions of stagnating ice (which resulted in collapsed features and irregular, wavy, or faulted lithologic contacts), as well as crosscutting relationships of older upland deposits with younger but lower valley train deposits of sand and gravel. Deposits of ponded lake sediment are common to both sedimentary environments; differentiating diamicton from lacustrine deposits is normally not possible without detailed geotechnical logs or sediment descriptions made by geologists. This type of complexity is shown in the northern part of cross section E–E′ where several intervals of lake sediment, intercalated by sand and gravel, occur within 2,000 feet of one another. Another example of complex sediment relationships was revealed in the quarry located in the southern part of the mapping area. The east highwall (fig. 9) revealed thick sand and gravel outwash overlain by fossiliferous lake sediment and silty clay Yorkville diamicton. Just to the north of the photograph location, the succession was completely truncated by yellowish, cobbly gravel composed primarily of dolomite and interpreted as valley train deposits of the high terrace. The photograph was taken on the opposing west highwall, which consisted entirely of Yorkville diamicton except for a 10-foot thick cap of fossiliferous, laminated lake sediment, probably of slackwater origin, and related to damming of a tributary by the aforementioned valley train. These complex geologic relationships, partly shown in cross section C–C′, occur within a 50-acre site!

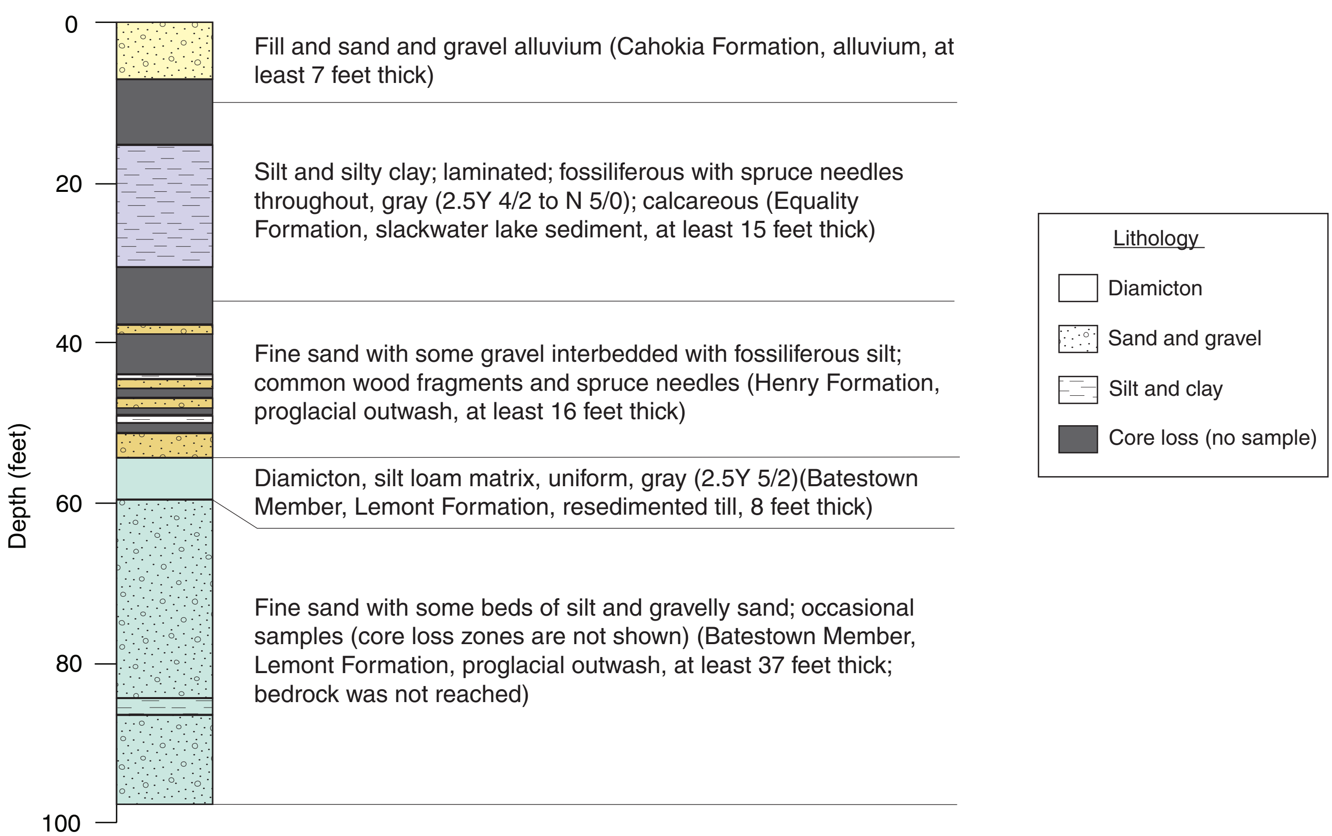

Figure 8 Lithologic log of boring 34268 (NW NW Sec. 9, T41N, R8E, elevation 815 feet) located in the floodplain of Tyler Creek about 150 feet east of the Randall Road bridge, Elgin, Illinois. Core loss zones are indicated in black. Cores were sampled from a depth of 0 to 53 feet; the boring was extended to 97 feet by augering. This boring was not used in a cross section.

Figure 9 Highwall of quarry in South Elgin (Prairie Yard 93; Sec. 23 and 26, T41N, R8E). The lower unit is composed of poorly sorted sand and gravel with interbeds of wood and peat-bearing fine sand. The middle unit is rhythmically bedded silt and fine sand with abundant fingernail clams and ostracodes (*Limnocythere friabilis* and *Cytherissa lacustris*). The upper unit is a silty clay loam with common lenses of sand and gravel correlated to the Yorkville Member of the Lemont Formation. Paleocurrent indicators in the lower unit point to the south-southeast. Dolomite of the Elwood Formation (Silurian) was mined at the quarry. Outcrop descriptions 35117 and 33678 exemplify these deposits (cross section C–C′). Photograph by B.B. Curry.

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