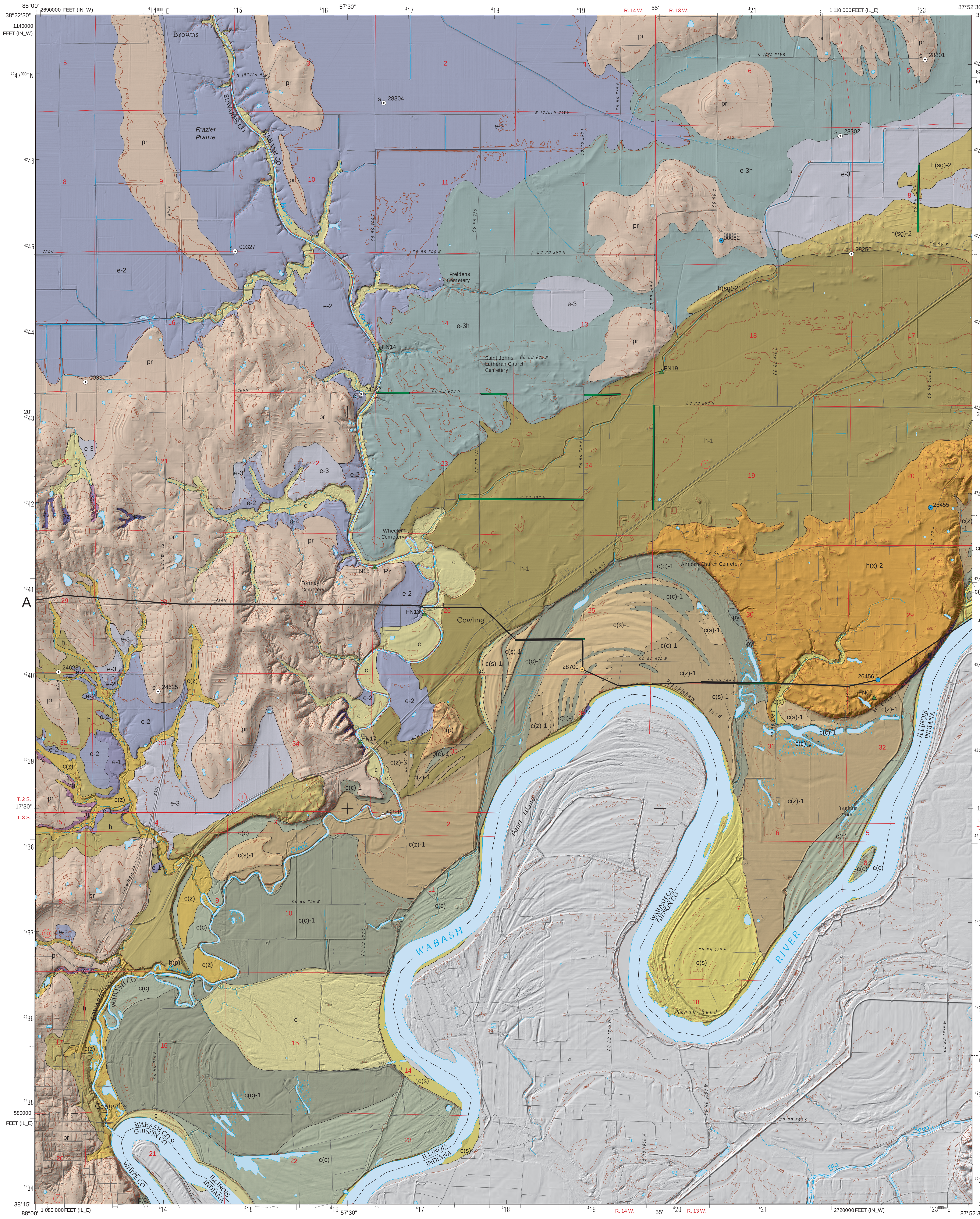
Prairie Research Institute
ILLINOIS STATE GEOLOGICAL SURVEY

Surficial Geology of Grayville Quadrangle
Edwards, Wabash, and White Counties, Illinois

STATEMAP Grayville-SG

Andrew C. Phillips
2012



QUATERNARY DEPOSITS

Description	Unit	Interpretation
HUDSON EPISODE (~12,000 years before present (B.P.) to today)		
Fill or removed earth; mixed silt to gravel	Disturbed ground (cross-section only) dg	**Road fill;** depicted only at bridge cone in cross section A, but occurs at all bridge cones and elevated road beds.
Brown to yellow-brown fine sand, massive to bedded	Peyton Formation py	**Colluvial fan deposits;** where upland gullies drain onto Wabash River floodplain
Dominantly brown to yellow brown silt loam; but including facies of clay loam, sand, and gravel; graded upwards, with bedded coarse facies to massive fine facies massive; less than 20' thick	Cahokia Formation c	**Stream deposits;** including modern inset deposits and older terraced valley fill; mapped in stream valleys tributary to the Wabash River
Gray silty clay loam; massive, includes gley soil	Cahokia Formation (clayey facies) c(c)	**Overbank and meander fill deposits;** distinguished in lower Bonpas Creek and modern Wabash River floodplain
Gray brown silt loam; massive, may include loamy interbeds; slightly weathered, non-calcareous	Cahokia Formation (silty facies) c(z)	**Channel and near-channel deposits;** derived from loessial and till deposits; distinguished in lower Bonpas Creek and its tributaries
Yellow brown fine to medium sand; with fine gravel lenses; laminated to bedded; upper part non-calcareous	Cahokia Formation (sandy facies) c(s)	**Channel deposits of the modern Wabash River and in tributary valleys;** eroding coarse parent materials
Yellow brown to gray brown silt loam to loam; may include silty clay loam and sandy facies; massive to weakly bedded; non-calcareous; up to 10' thick	Cahokia Formation (clayey facies-high terrace) c(c)-1	**Overbank and meander fill deposits of early Hudson Episode;** meandering stream; distinguished in Wabash Valley
Silty clay loam to silty clay; grayish brown to brown; faintly stratified at depth; leached; up to 15 feet thick	Cahokia Formation (silty facies-high terrace) c(z)-1	**Point bar and overbank deposits of early Hudson Episode;** meandering stream; distinguished in Wabash Valley
Yellow brown to gray brown gravelly coarse sand; grading up to medium and fine sand, bedded, calcareous below ~ 5' depth; up to 50' thick	Cahokia Formation (sandy facies-high terrace) c(sg)-1	**Point bar (finer) and channel (coarser) facies of early Hudson Episode;** meandering stream; distinguished in Wabash Valley
WISCONSIN EPISODE (~75,000–12,000 years B.P.)		
Yellow brown to brown silt loam to clay loam; more clay and sand in lower portion, massive but with sandy lenses in lower portion; contains modern solum in upper 2-5', typically non-calcareous, up to 15' thick on uneroded summits, thinning westward	Peoria & Roxana Silts (low terrace) pr	**Loess, capping upland hills and intercalated with upland valley fill (lacustrine) deposits;** forms ridges parallel to Bonpas Creek south of Browns; occurrence a function both of prevailing easterly winds and source in Wabash Valley outwash plains
Gray to olive brown and gray brown silt and silty clay loam; with lenses of silt loam and loam, laminated to bedded, fossiliferous zones, calcareous; up to 60' thick	Equality Formation (cross-section only) e	**Lake sediment;** deposited rapidly in slackwater environment; mapped only in Wabash Valley
Gray silty clay loam and silt loam, laminated; with minor loam and clay interbeds, cumulic soil in upper portions; thickness uncertain	Equality Formation (low terrace) e-1	**Lake sediment;** deposited in slackwater environment; delineated on low sloping terraces below 498'
Yellow brown to olive brown silty clay loam and silt loam; laminated, with minor loam and clay interbeds, cumulic soil in upper portions; thickness uncertain	Equality Formation (middle terrace) e-2	**Lake sediment;** deposited in slackwater environment; delineated on low sloping terraces at about 400'
Gray silty clay loam and silt loam; laminated, with minor loam and clay interbeds, cumulic soil in upper portions; thickness uncertain	Equality Formation (high terrace) e-3	**Lake sediment;** deposited in slackwater environment; delineated on low sloping terraces above ~402'
Brownish clay to fine or gravelly sand in facies relationships; laminated to bedded, cumulic soil in upper portions, up to 25' thick	Equality Formation (high terrace) & Henry Formation Complex e-3h	**Delta built northwestward into slackwater lake from outwash channel during highest glacial floods;** possibly with associated eolian dune formation; overlies more continuous lacustrine or outwash deposits
Gray brown to gray gravel grading up to medium and fine sand; bedded to laminated, calcareous; up to 40' thick	Henry Formation h h(sg)	**Outwash;** forming terraces on the edge of the Wabash Valley near Grayville, up its tributary valleys and buried in the Wabash Valley; in facies with Equality Formation
Brown fine sand to fine sandy loam; massive to bedded	Henry Formation (parkland facies) h(p)	**Eolian sand dunes reworked from other outwash deposits;** forms linear ridges on Henry Formation terraces, although many not delineated, and encapsulates bedrock knob southwest of Cowling
Gray brown to gray fine to medium sand grades up to fine sandy loam and silt loam; lenses of gravelly sand, loam and clay loam; bedded to laminated; calcareous; up to 25' thick	Henry Formation (low terrace) h-1	**Outwash;** no wells characterize the unit in the northern part of its occurrence; overlies older lacustrine and other outwash deposits; forming main overspill sluiceway for Maumee and related glacial outburst floods
Brown gravelly sand, fine sand, and loam; bedded; up to 20' thick	Henry Formation (gravelly sand facies, high terrace) h(sg)-2	**Outwash levee-like deposits formed during highest glacial outburst floods;** related to h-1 and correlated to h(x)-2; overlies slackwater lacustrine deposits
Brown fine sand to fine sandy loam; massive to bedded	Henry Formation (mixed facies, high terrace) h(x)-2	**Brown gravelly sand, fine sand, and loam;** bedded; up to 20' thick
ILLINOIS EPISODE (~190,000 to 130,000 years B.P.)		
Brown loam to clay loam diamicton, less than 10' thick; weathered to oxidized, paleosol may be developed in upper part	Glasford Formation g	**Till;** veneers bedrock hills below Peoria and Roxana Silt Formations

PALEOZOIC BEDROCK

Description	Unit	Interpretation
Sandstone, siltstone, limestone, and shale	Paleozoic bedrock ℙz	**Forms hills in the southwest and northeast;** and isolated knobs, crops out in incised tributary valleys, along Wabash Valley wall near Grayville and McCleary's Bluff, and in parts of Wabash River cutbanks

Data Type

- Outcrop
- Outcrop in field notes (ISGS archives)
- Stratigraphic boring
- Water-well boring
- Engineering boring
- Coal boring
- Other boring, including oil and gas
- Contact
- Inferred contact
- Electrical resistivity profile line
- A—A′ Line of cross section

SG 26211 Labels indicate samples (S) or geophysical log (G). Boring and outcrop labels indicate the county number. Dot indicates boring is to bedrock

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 (2010 US Topo) provided by the United States Geological Survey. Hillshade and contours derived from 2011 IDOT and 2010 FEMA LiDAR source data.

North American Datum of 1983 (NAD 83)
Projection: Transverse Mercator
10,000-foot ticks: Illinois State Plane Coordinate system, west zone (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
SUPPLEMENTARY CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology based on field work by Andrew C. Phillips, 2011–2012.

Digital cartography by Jennifer E. Carrell, Jane E. Johnshoy Domier, and Coy E. Potts, Illinois State Geological Survey. Hillshade by Donald E. Luman.

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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
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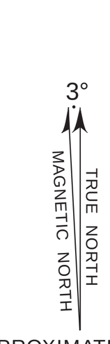
ADJOINING QUADRANGLES
1 Albion North
2 Bone Gap
3 Mount Carmel
4 Albion South
5 Keensburg
6 Crossville
7 New Harmony
8 IN



APPROXIMATE MEAN DECLINATION, 2012

Setting

The surficial geology of the Grayville 7.5' Quadrangle reflects pre-glacial erosion, sediment deposition and additional erosion during the Illinois Episode (~160-130 ka in Illinois) and Wisconsin Episode (~60-16 ka) glaciations, and post-glacial sedimentation by the meandering Wabash River. The Illinois Episode glacier extended beyond the quadrangle, ultimately to the Shawnee Hills in southern Illinois, whereas the Wisconsin Episode glacier terminated about 90 miles to the north. The City of Grayville was built on the tip of a north-south trending bedrock ridge. Isolated bedrock hills protrude from the interfleuves. Hills are capped by a thin (10-15 foot) layer of Quaternary sediment, but the valley fills reach up to 150 feet thick. Landforms on the very low sloping land between the bedrock hills were constructed by proglacial deposition and erosion during the Wisconsin Episode (c.f. Fraser 1983, Fraser and Bleuer 1988, Heinrich 1982). The Wabash Valley features striking meandering river landforms that formed over the past 14 ka.

Important Findings

- Bedrock surface features rough topography. The Bonpas Bedrock Valley (BBV) trends north-south and heads in Richland County, well south of the Wisconsin Episode terminal moraine. A northeast-southwest trending short-headed tributary joins the BBV near Cowling. Although the BBV is deep, the confluence with the Wabash Bedrock Valley is narrow. Bedrock crops out within the Wabash Valley and supports isolated hills.
- Bedrock valleys are filled with stream sediment, dominantly sand and gravel, and slackwater lake sediment, dominantly clay and silt. The sediment appears to be deposited entirely during the Wisconsin Episode.
- The mechanism for deposition of the basal stream sediments is uncertain. The strata appear extend at least several miles north of Browns. Possibly an alluvial fan delta prograded upstream as outwash progressively filled the Wabash Valley.
- The slackwater lake sediments that comprise much of the level land north of Cowling were deposited when outwash from the Wisconsin Episode glacier filled the Wabash Valley. The lake was likely shallow.
- Late in the Wisconsin Episode, glacial meltwater floods overtopped the Wabash Valley walls near Keensburg. The stream sediments prograded into an existing slackwater lake, causing interfingering of the deposits. Outwash terraces are also found within the Wabash Valley and near entrances to tributary valleys.
- The Wabash Valley fill comprises glacial outwash at depth and post-glacial meandering stream deposits in the upper 30 feet. The texture of the fill is highly variable and discontinuous, ranging from clean gravel to clay.

Hazards

The WBSZ is active, although seismic events appear to be unrelated to mapped bedrock faults (R. Bauer, pers. com. 2011). Although most earthquakes here are small, the largest historical earthquake in Illinois (magnitude 5.2) had its epicenter near Mt. Carmel in 2008 and caused significant damage to infrastructure. The occurrence of historic and prehistoric earthquakes is evident from sandblows found in Wabash River cutbanks, including one in S 31 T2S R13W (Munson et al 1996; Mahan and Crone 2008).

The Wabash River is an actively meandering system with large stage variations. Normal annual flooding can fill much of the valley and cause backwater conditions in the tributaries for miles upstream. The meander at Grayville was cut off in 1986, and erosion of cutbanks causes lateral meander migration rates averaging 10-20 ft/yr since 1959. Most of the Wabash Valley and portions of the Bonpas Valley and nearby low sloping uplands lie within flood hazard zones established by FEMA (2011).

Natural Resources

Surficial deposits include important regional aquifers. Several municipal and irrigation water supplies are completed in deep gravel deposits (Henry Formation) in the Wabash Valley Holocene fill. However, the water-bearing unit is lithologically variable, as evident in cross section A. Within a ~1 mi radius of the highly productive well 28264, completed in coarse gravel, only sand providing low supplies has been found by a local driller.

Methods

Subsurface information was obtained from compilations of archived boring records, field notes, and soil surveys (Soil Survey Staff 2006, 2008). In addition, new data were obtained from continuous coring, outcrop studies, geophysical surveying, and study of recent high-resolution elevation maps (FEMA 2012). Locations of water well, geotechnical boring, and petroleum well records used were confirmed with the best available data. The majority of final locations are likely within 25 ft of their actual locations, but the accuracy ranges from 1 to 300 ft. Geophysical surveys by shallow shear wave and earth electrical resistivity methods were used to characterize the two-dimensional extent of buried units as well as the bedrock surface.

Acknowledgements

Sincere thanks to the landowners who allowed access to their properties, to the City of Grayville for its cooperation, Speth Plumbing for discussions on informal knowledge, Wabash County Road Commissioner Jim Kensler for his assistance and advice, assistants Lisa Colville and Johanna Gemperline, the ISGS drill and geophysics teams, and Don Luman.

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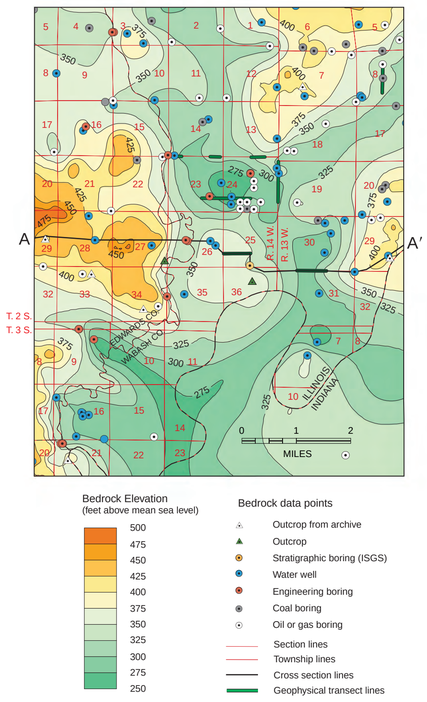
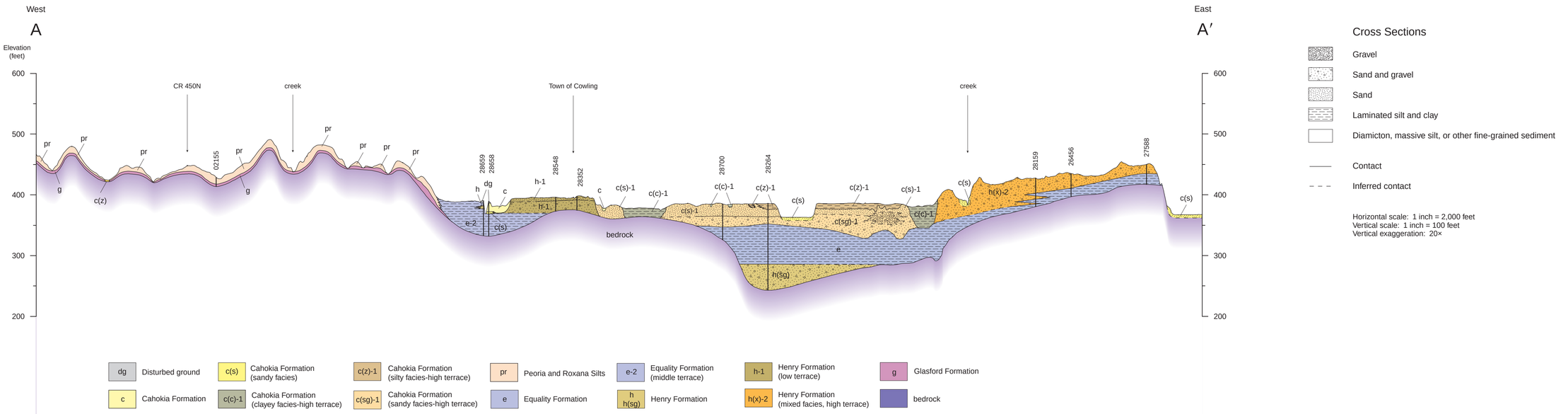


Figure 1 Bedrock Topography of the Grayville Quadrangle. Locations of all borehole and outcrop data that reliably indicate the bedrock surface are shown. The bedrock surface is rugged, with 235' of relief and isolated hills ascending from deep valleys. The Wabash Valley in particular is steeply incised within the Grayville Quadrangle. The Bonpas Creek Valley trends north-south, although the position of its confluence with the Wabash Valley is uncertain because an apparent high below the village of Cowling restricts the confluence to a narrow region east of the valley axis. A short confluent tributary valley trends northeast to southwest. The Bonpas Creek Valley was likely incised during the Illinois or pre-Illinois Episodes, although valley fill associated with those periods has not been found and may have been excavated by interglacial erosion. The short tributary valley apparently contained spillover from the Wabash Valley during Wisconsin Episode glacial flooding. Bedrock is buried by 10-15' of sediment on hill summits, crops out on side slopes and valley bottoms, especially in the southwest, and is buried by up to 160' of sediment in the deepest part of the Bonpas Creek Valley.



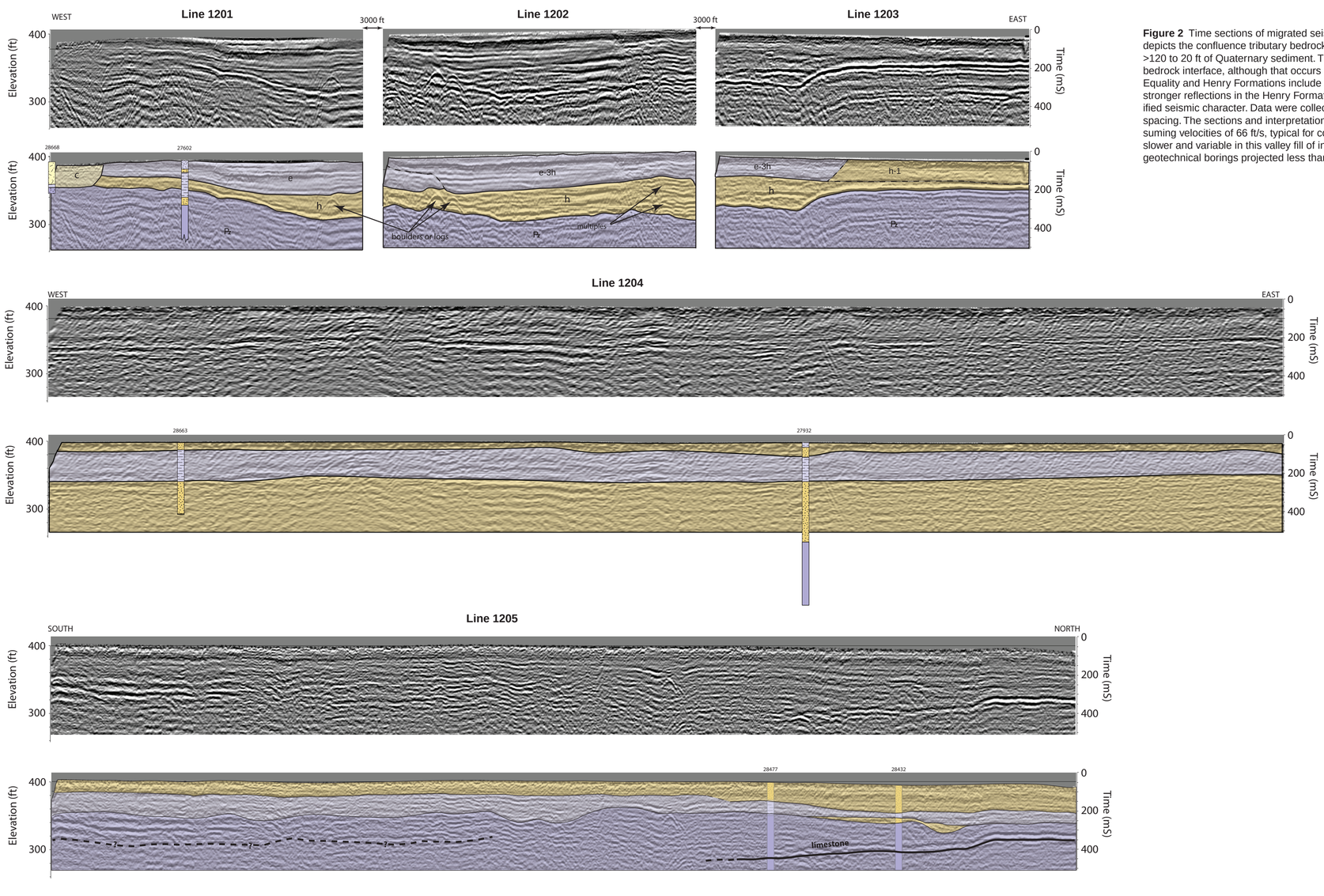


Figure 2 Time sections of migrated seismic shear wave data. The complete suite of sections depicts the confluence tributary bedrock valleys deepening towards the south and west, filled with >120 to 20 ft of Quaternary sediment. The strongest reflections likely represent the sediment-bedrock interface, although that occurs apparently below the time section in Line 1204. Both the Equality and Henry Formations include zones with few and prominent horizontal reflections, the stronger reflections in the Henry Formation. The Cahokia Formation has a chaotic to weakly stratified seismic character. Data were collected along gravel and asphalt roads using 2.5 ft receiver spacing. The sections and interpretations are preliminary. Elevations shown are estimates assuming velocities of 66 ft/s, typical for compacted diamicton in Illinois. Actual velocities are likely slower and variable in this valley fill of interbedded fluvial sands and lacustrine clays. Water and geotechnical borings projected less than 100 ft to the profile lines provide stratigraphic control.