Prepared in cooperation with the U.S. Geological Survey,
Dallas L. Peck, Director, under the Cooperative
Geologic Mapping Program (COGEOMAP)

Illinois Department of Energy and Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
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Geologic Map of the
CREAL SPRINGS QUADRANGLE, ILLINOIS
IGQ-4

GEOLOGIC MAP OF THE CREAL SPRINGS QUADRANGLE, ILLINOIS

C. Brian Trask and Russell J. Jacobson
1990

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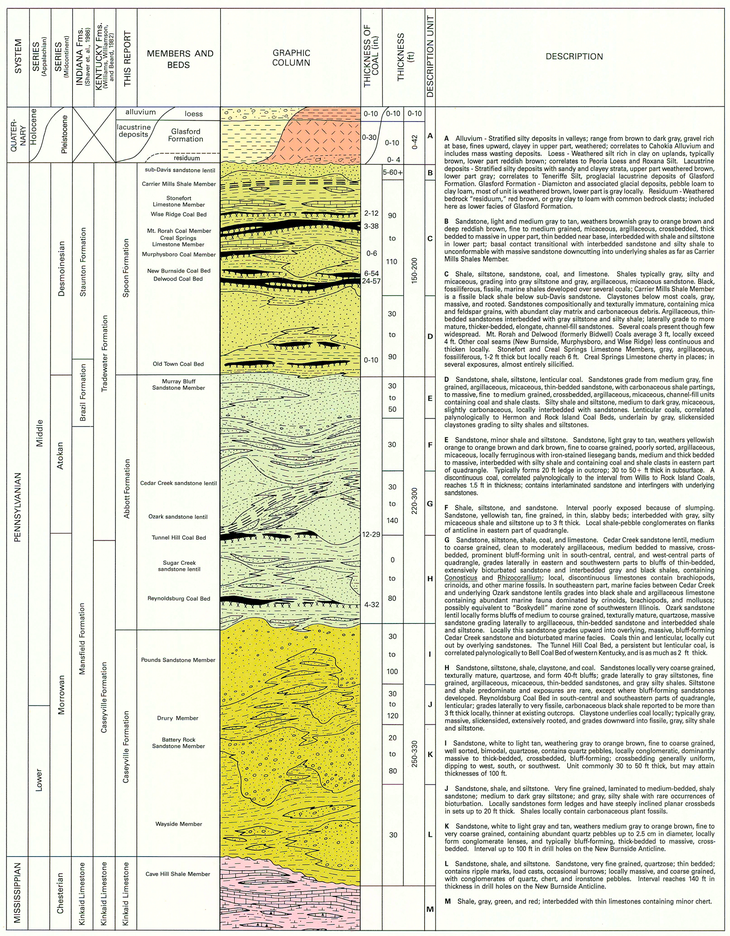

DESCRIPTION

A Alluvium - Stratified silty deposits in valleys; range from brown to dark gray, gravel rich at base, fines upward, clayey in upper part, weathered; correlates to Cahokia Alluvium and includes mass wasting deposits. Loess - Weathered silt rich in clay on uplands, typically brown, lower part reddish brown; correlates to Peoria Loess and Roxana Silt. Lacustrine deposits - Stratified silty deposits with sandy and clayey strata, upper part weathered brown, lower part gray; correlates to Teneriffe Silt, proglacial lacustrine deposits of Glasford Formation. Glasford Formation - Diamicton and associated glacial deposits, pebble loam to clay loam, most of unit is weathered brown, lower part is gray locally. Residuum - Weathered bedrock "residuum," red brown, or gray clay to loam with common bedrock clasts; included here as lower facies of Glasford Formation.

B Sandstone, light and medium gray to tan, weathers brownish gray to orange brown and deep reddish brown, fine to medium grained, micaceous, argillaceous, crossbedded, thick bedded to massive in upper part, thin bedded near base, interbedded with shale and siltstone in lower part; basal contact transitional with interbedded sandstone and silty shale to unconformable with massive sandstone downcutting into underlying shales as far as Carrier Mills Shales Member.

C Shale, siltstone, sandstone, coal, and limestone. Shales typically gray, silty and micaceous, grading into gray siltstone and gray, argillaceous, micaceous sandstone. Black, fossiliferous, fissile, marine shales developed over several coals; Carrier Mills Shale Member is a fissile black shale below sub-Davis sandstone. Claystones below most coals, gray, massive, and rooted. Sandstones compositionally and texturally immature, containing mica and feldspar grains, with abundant clay matrix and carbonaceous debris. Argillaceous, thin-bedded sandstones interbedded with gray siltstone and silty shale; laterally grade to more mature, thicker-bedded, elongate, channel-fill sandstones. Several coals present though few widespread. Mt. Rorah and Delwood (formerly Bidwell) Coals average 3 ft, locally exceed 4 ft. Other coal seams (New Burnside, Murphysboro, and Wise Ridge) less continuous and thicken locally. Stonefort and Creal Springs Limestone Members, gray, argillaceous, fossiliferous, 1-2 ft thick but locally reach 8 ft. Creal Springs Limestone cherty in places; in several exposures, almost entirely silicified.

D Sandstone, shale, siltstone, lenticular coal. Sandstones grade from medium gray, fine grained, argillaceous, micaceous, thin-bedded sandstone, with carbonaceous shale partings, to massive, fine to medium grained, crossbedded, argillaceous, micaceous, channel-fill units containing coal and shale clasts. Silty shale and siltstone, medium to dark gray, micaceous, slightly carbonaceous, locally interbedded with sandstones. Lenticular coals, correlated palynologically to Hermon and Rock Island Coal Beds, underlain by gray, slickensided claystones grading to silty shales and siltstones.

E Sandstone, minor shale and siltstone. Sandstone, light gray to tan, weathers yellowish orange to orange brown and dark brown, fine to coarse grained, poorly sorted, argillaceous, micaceous, locally ferruginous with iron-stained liesegang bands, medium and thick bedded to massive, interbedded with silty shale and containing coal and shale clasts in eastern part of quadrangle. Typically forms 20 ft ledge in outcrop; 30 to 50 + ft thick in subsurface. A discontinuous coal, correlated palynologically to the interval from Willis to Rock Island Coals, reaches 1.5 ft in thickness; contains interlaminated sandstone and interlingers with underlying sandstones.

F Shale, siltstone, and sandstone. Interval poorly exposed because of slumping. Sandstone, yellowish tan, fine grained, in thin, slabby beds; interbedded with gray, silty micaceous shale and siltstone up to 3 ft thick. Local shale-pebble conglomerates on flanks of anticline in eastern part of quadrangle.

G Sandstone, siltstone, shale, coal, and limestone. Cedar Creek sandstone lentil, medium to coarse grained, clean to moderately argillaceous, medium bedded to massive, cross-bedded, prominent bluff-forming unit in south-central, central, and west-central parts of quadrangle, grades laterally in eastern and southwestern parts to bluffs of thin-bedded, extensively bioturbated sandstone and interbedded gray and black shales, containing Conostichus and Rhizocorallium; local, discontinuous limestones contain brachiopods, crinoids, and other marine fossils. In southeastern part, marine facies between Cedar Creek and underlying Ozark sandstone lentils grades into black shale and argillaceous limestone containing abundant marine fauna dominated by crinoids, brachiopods, and molluscs; possibly equivalent to "Bookshelf" marine zone of southwestern Illinois. Ozark sandstone lentil locally forms bluffs of medium to course grained, texturally mature, quartzose, massive sandstone grading laterally to argillaceous, thin-bedded sandstone and interbedded shale and siltstone. Locally this sandstone grades upward into overlying, massive, bluff-forming Cedar Creek sandstone and bioturbated marine facies. Coals thin and lenticular, locally cut out by overlying sandstones. The Tunnel Hill Coal Bed, a persistent but lenticular coal, is correlated palynologically to Bell Coal Bed of western Kentucky, and is as much as 2 ft thick.

H Sandstone, siltstone, shale, claystone, and coal. Sandstones locally very coarse grained, texturally mature, quartzose, and form 40-ft bluffs; grade laterally to gray siltstones, fine grained, argillaceous, micaceous, thin-bedded sandstones, and gray silty shales. Siltstone and shale predominate and exposures are rare, except where bluff-forming sandstone developed. Reynoldsburg Coal Bed in south-central and southeastern parts of quadrangle, lenticular; grades laterally to very fissile, carbonaceous black shale reported to be more than 3 ft thick locally, thinner at existing outcrops. Claystone underlies coal locally; typically gray, massive, slickensided, extensively rooted, and grades downward into fissile, gray, silty shale and siltstone.

I Sandstone, white to light tan, weathering gray to orange brown, fine to coarse grained, well sorted, bimodal, quartzose, contains quartz pebbles, locally conglomeratic, dominantly massive to thick-bedded, crossbedded, bluff-forming; crossbedding generally uniform, dipping to west, south, or southwest. Unit commonly 30 to 50 ft thick, but may attain thicknesses of 100 ft.

J Sandstone, shale, and siltstone. Very fine grained, laminated to medium-bedded, shaly sandstone; medium to dark gray siltstone; and gray, silty shale with rare occurrences of bioturbation. Locally sandstones form ledges and have steeply inclined planar crossbeds in sets up to 20 ft thick. Shales locally contain carbonaceous plant fossils.

K Sandstone, white to light gray and tan, weathers medium gray to orange brown, fine to very coarse grained, containing abundant quartz pebbles up to 2.5 cm in diameter, locally form conglomerate lenses, and typically bluff-forming, thick-bedded to massive, cross-bedded. Interval up to 100 ft in drill holes on the New Burnside Anticline.

L Sandstone, shale, and siltstone. Sandstone, very fine grained, quartzose; thin bedded; contains ripple marks, load casts, occasional burrows; locally massive, and coarse grained, with conglomerates of quartz, chert, and ironstone pebbles. Interval reaches 140 ft in thickness in drill holes on the New Burnside Anticline.

M Shale, gray, green, and red; interbedded with thin limestones containing minor chert.

STRUCTURAL GEOLOGY

The Creal Springs Quadrangle is located on the southern edge of the Illinois Basin. In the northern part of the quadrangle, strata dip at 5° or less to the north and northeast. The New Burnside Anticline traverses northeast-southwest through the center of the quadrangle. It is an asymmetrical anticline with the steep limb on the northwest side. Near New Burnside, maximum dips are 35° to the northwest and 25° to the southeast. West of Parker, the anticline turns more southerly and both limbs become less steep as it flattens out northwest of Tunnel Hill. The anticline is offset by four high angle, dip-slip faults. These faults are believed to be high-angle reverse faults because of the intense deformation of the strata in and near the fault plane. Bedding along the fault southeast of New Burnside dips as steeply as 63°. Small-scale overturned bedding occurs on the northwestern side of the structure near the eastern edge of the map (center of west line, SW ¼ of SW ¼ of SE ¼ of Section 3, T.11S., R.4E.) beyond the mapped extent but on the strike of this fault.

The McCormick Anticline, passing south of the quadrangle, is reflected by the northward and northwestward dip of the strata along the southern edge of the map.

The orientation of Little Cache Creek in the southwestern corner of the quadrangle is related to a graben in that area. Less resistant Abbott strata have been offset downward against more resistant Caseyville and Abbott sandstones that form bluffs paralleling both sides of the stream. Dragfolding is present along a fault that crosses Larkin Creek south of Lake of Egypt (SE ¼ of Section 15, T.11S., R.3E.). This fault lines up with, and has displacement similar to that of the western bounding fault of the graben. It also is west of a syncline that may be related to the graben.

Small northwest-trending faults in the northeastern part of the quadrangle are mapped on the basis of abrupt changes in elevations of coal and limestone beds. Although the fault planes are not exposed, we believe that these faults are high-angle, normal faults. Claystone dikes in nearby coal mines may be related to these faults. Mineral springs in the village of Creal Springs may be structurally controlled. Abnormally high calcium, magnesium, chloride, and sulfate contents (Bartow, et al., 1909) suggest a source at depth (within Pennsylvanian and Mississippian rocks) rather than in the glacial till where the springs occur.

ECONOMIC GEOLOGY

Coal. Six coal beds have been mined in the past. The Reynoldsburg Coal was mined along Cedar Creek in the southeastern part of the quadrangle, where it was reported to be as thick as 3 ft. Small surface mines operated during the 1930s (according to a local farmer) and two larger surface mines worked the coal more recently. Herod Mining Company mined coal west of Reynoldsburg along tributaries to Cedar Creek (SE ¼ of Section 32, T.11S., R.4E.). Farther west (SE ¼ of Section 31, T.11S., R.4E.), Energy Exploration, Inc., mined Reynoldsburg Coal from the Ozark Mine. This coal ranges in thickness from 0.3 to 2.7 ft. Drill-hole data suggest that the deposit is lenticular.

Holly Mining Corp. mined the Tunnel Hill Coal at the head of Cedar Creek (NW ¼ of NW ¼ of Section 6, T.12S., R.4E.). This coal also crops out in the headwaters of Sugar Creek and in the water gap south of Parker; the coal is not shown on the map in these locations because of space limitations. Russel A. Peppers (personal communication) describes the coal as palynologically similar to the Bell Coal in western Kentucky. Exposed Tunnel Hill Coal ranges from 1.0 to 2.4 ft in thickness; drill-hole data suggest that it is discontinuous.

The Delwood, New Burnside, and Murphysboro (?) Coals were mined west of New Burnside. Delwood and New Burnside Coals have also been extracted in the headwaters of Grassy Creek. Delwood Coal was mined on the southeastern side of Wise Ridge. Prospect pits in the New Burnside Coal occur in the headwaters of Brushy Creek, where the coal ranges in thickness from 0.5 to 4.5 ft. The Delwood Coal is persistent and may be present over broad areas in the northeastern quarter of the quadrangle. There it is 2.0 to 4.75 ft thick and contains a persistent middle claystone parting.

Mt. Rorah Coal was mined in the SW ¼ of the NW ¼ of Section 33, the SW ¼ of Section 28, and along tributaries to Brushy Creek in Section 29, T.10S., R.4E. Prospect pits in the Mt. Rorah Coal occur around knolls in the NW ¼ of Section 5 and NE ¼ of Section 6, T.11S., R.4E. This coal is persistent and may underlie major portions of T.10S., R.4E., in the Williamson County part of the map. It is 0.25 to 3.2 ft thick and, like the Delwood Coal, contains a persistent middle claystone parting.

Oil and Gas. Eleven known oil and gas test holes have been drilled in the Creal Springs quadrangle; all were dry. Eight of these were drilled on or near the New Burnside structure. These test holes penetrated strata as deep as Mississippian St. Louis Limestone (Valmeyeran Series). Work by Bostick and Damberger (1971) and Damberger (1974) indicates that coals near the surface are of high-volatile A bituminous rank; this suggests that the likelihood of oil decreases with depth. Thus "dry" gas would be the hydrocarbon more likely to be encountered with increasing depth.

Petroliferous black shale occurs at the stratigraphic horizon of the Reynoldsburg Coal along Ozark Creek (Section 27, T.11S., R.4E.). Barrett (1922) reported 37 to 45 gallons of "crude tar" per ton of shale and indicated that it was being mined for local use in cooking and heating. Barrett also reported occurrences of the shale in Sections 34 and 35, T.11S., R.4E.

Building Stone. Sandstone was quarried on the southern side of Sugar Creek east of Creal Springs (SE ¼ of SE ¼ of Section 25, T.10S., R.3E.). This sandstone, which occurs between the New Burnside Coal and the Creal Springs Limestone, is lenticular but present throughout the northeastern part of the quadrangle.

Limestones mapped in this quadrangle are probably too thin to be of economic interest. Sand and gravel occur in stream valleys in small quantities, mainly in inaccessible areas.

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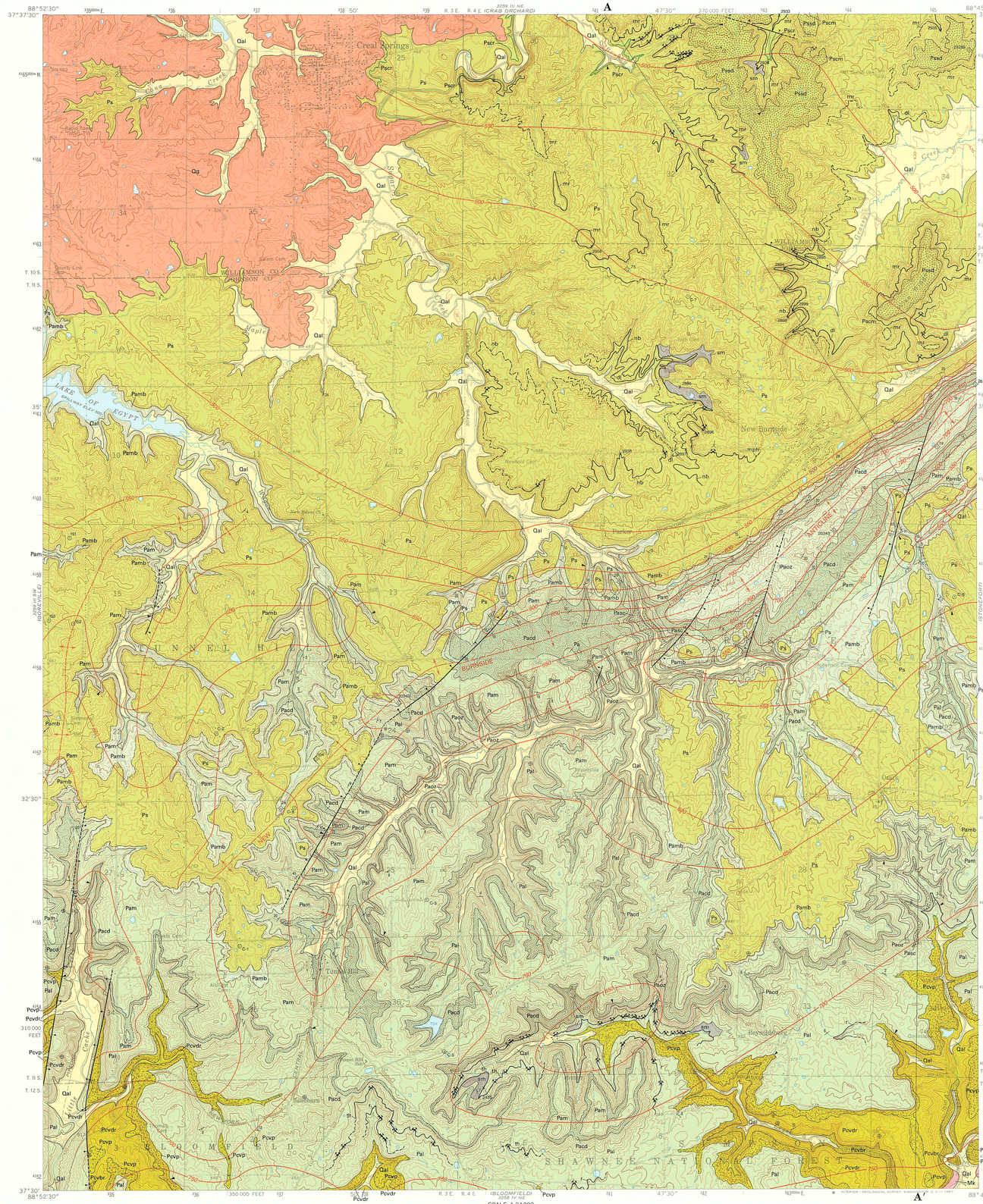

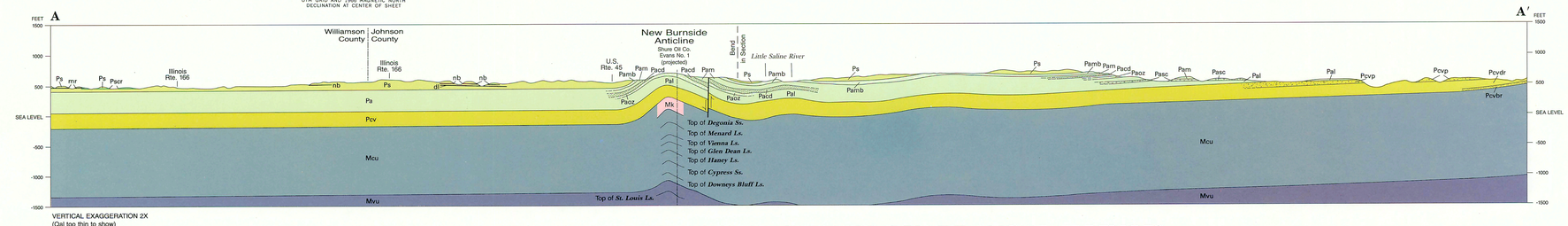

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EXPLANATION

QUATERNARY

Pleistocene and Holocene

- Qal — **Alluvial deposits; may be underlain by lacustrine deposit.**
- Qg — **Glasford Formation**

PENNSYLVANIAN

Desmoinesian

Spoon Formation
- Psed, ***sub-Davis sandstone lentil***
- Pscm, ***Carrier Mills Shale Member***
- mr, ***Mt. Rorah Coal Member***
- Pscr, ***Creal Springs Limestone Member***
- mph, ***Murphysboro Coal Member***
- nb, ***New Burnside Coal Bed***
- dl, ***Delwood Coal Bed***

Atokan

Abbott Formation
- Pamb, ***Murray Bluff Sandstone Member***
- Pam, ***middle Abbott***
- Pacd, ***Cedar Creek sandstone lentil***
- Pal, ***lower Abbott***
- Paoz, ***Ozark sandstone lentil***
- th, ***Tunnel Hill Coal Bed***
- Pasc, ***Sugar Creek sandstone lentil***
- r, ***Reynoldsburg Coal Bed***

Morrowan

Caseyville Formation
- Pcvp, ***Pounds Sandstone Member***
- Pcvdr, ***Drury Member***
- Pcvbr, ***Battery Rock Sandstone Member***
- Pcvws, ***Wayside Member***

MISSISSIPPIAN

Chesterian
- Mk — **Kinkaid Limestone**

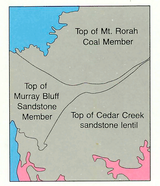
Following units shown on cross section only. Formations indicated where known from drill-hole data.
- Mcu — **Chesterian undifferentiated**

Valmeyeran
- Mvu — **Valmeyerian undifferentiated**

LINE SYMBOLS: Dashed where inferred; dotted where concealed
- Contact
- Coal bed
- Fault: bar and ball on downthrown side.
- Anticline
- Syncline
- A — A′ — Line of cross section
- 600 — Structure contour (see index map below)

SYMBOLS
- Strike and dip of bed
- Horizontal bed
- Abandoned mine prospect pit and small surface mine
- Abandoned coal adit
- 2935 — Coal exposure with ISGS coal maceration and palynological analysis
- Outcrop of special note, shown where contact, map unit, or fault was well exposed at time of mapping
- sm — Surface-mined area

DRILL HOLES FROM WHICH SUBSURFACE DATA WERE OBTAINED
- C-7 — ISGS cored test hole
- 28 — Oil test hole, with ISGS county number
- 151 — Water well, with ISGS county number



Index map showing different horizons used for structure contours. Blue indicates insufficient data and pink indicates where top of Cedar Creek sandstone lentil was projected from top of Pounds Sandstone Member. Contour interval 50 ft.