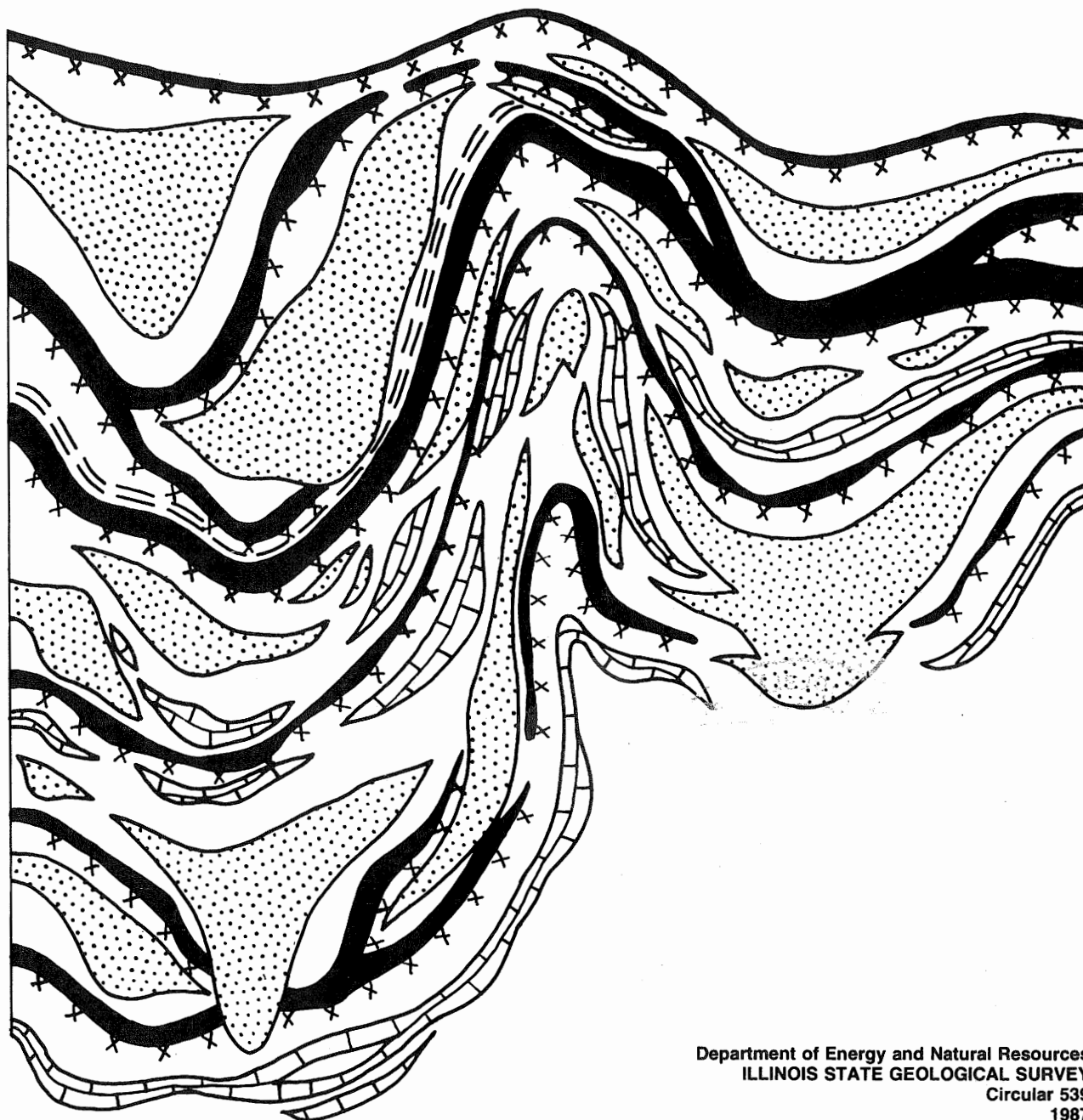


STRATIGRAPHIC CORRELATIONS OF THE SEELYVILLE, DEKOVEN, AND DAVIS COALS OF ILLINOIS, INDIANA, AND WESTERN KENTUCKY

R. J. Jacobson



Cover: Pamella Foster
Graphics: Craig Ronto and Pamella Foster

Jacobson, R. J.

Stratigraphic correlations of the Seelyville, Dekoven, and Davis Coals of Illinois, Indiana, and western Kentucky. — Champaign, IL : Illinois State Geological Survey, 1987.

27 p. : 12 figs., 2 sep. pls. ; 28 cm. — (Illinois State Geological Survey. Circular ; 539)

1. Stratigraphic correlation—Illinois. 2. Stratigraphic correlation—Indiana. 3. Stratigraphic correlation—Kentucky. 4. Geology, Stratigraphic—Pennsylvanian. 5. Seelyville Coal. 6. Dekoven Coal. 7. Davis Coal. I. Title. II. Series.

Printed by authority of the State of Illinois/1987/1500

STRATIGRAPHIC CORRELATIONS OF THE SEELYVILLE, DEKOVEN, AND DAVIS COALS OF ILLINOIS, INDIANA, AND WESTERN KENTUCKY

R. J. Jacobson

Department of Energy and Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
Circular 539
1987

ABSTRACT	1
INTRODUCTION	1
PREVIOUS WORK	1
GEOLOGIC SETTING OF STUDY AREA	4
METHODOLOGY AND DATA UTILIZED IN STUDY	4
REGIONAL STRATIGRAPHY	4
Creal Springs Limestone Member	4
Mt. Rorah Coal Member	6
Stonefort Limestone Member	6
Seahorne Limestone Member and "Seahorne" coal bed	6
Davis Coal Member (Illinois) and Davis (No. 6) coal bed (Kentucky)	9
Dekoven Coal Member (Illinois) or Dekoven (W. Ky. No. 7) coal bed	9
Seelyville Coal Member (Illinois, Indiana)	9
Colchester Coal Member (Illinois, Indiana) or coal bed (Kentucky)	12
Survant Coal Member (Illinois, Indiana) or coal bed (Kentucky)	12
Houchin Creek Coal Member (Illinois, Indiana) or coal bed (Kentucky)	12
BIOSTRATIGRAPHIC DATA: PALYNOLOGY	13
PROPOSAL: A DUAL NOMENCLATURE	13
SUMMARY AND CONCLUSIONS	15
Stratigraphic relationships	15
Recommendations	15
REFERENCES	16
APPENDIXES	19
Listings of all data utilized in constructing seven detailed cross sections for plate 1	

FIGURES

- 1 Principal geologic structures in Illinois Basin Coal Field and location of study area 2
- 2 Generalized stratigraphic column showing key units 5
- 3 Measured section of the Dekoven and Davis Coals in their type area 7
- 4 Typical coal test and electric log, illustrating stratigraphic relationships of the Dekoven and Davis Coals 8
- 5 Electric log from Gallatin County, illustrating splitting of the Dekoven Coal Member into two beds 8
- 6 Electric log and gamma-density log from White County, illustrating widening split in Dekoven Coal Member 8
- 7 Measured section of the Seelyville Coal in its type area 10
- 8 Electric log and gamma-density log from Lawrence County, showing Dekoven and Davis Coal Members in an area where they were mapped as beds of the Seelyville Coal Member 11
- 9 Gamma-density log and electric log showing thinning of parting separating Dekoven and Davis Members, which together constitute the Seelyville Coal in southern Crawford County 11
- 10 Electric log from Vigo County, Indiana, showing parting that separates Dekoven and Davis "benches" of the Seelyville Coal Member 12
- 11 Ranges of important spore taxa found in the Seelyville, Dekoven, and Davis Coal Members 14
- 12 Location of proposed vertical cutoff line separating the coal into the Seelyville or Dekoven-Davis Coals 15

PLATES

- 1 Condensed cross sections illustrating the correlations of the Seelyville, Dekoven, and Davis Coals in the Illinois Basin Coal field
- 2 Location map of detailed cross sections A-A'—G-G'

ACKNOWLEDGMENTS

This report is based upon a Master's thesis completed at the University of Illinois in May, 1985. The author thanks Ralph L. Langenheim, Jr., under whose guidance this study was prepared.

Denver Harper of the Indiana Survey provided several valuable drill hole records from Indiana. Robert J. Reynolds, Senior Geologist of the Amax Coal Company, supplied additional drill hole data and M. E. Hopkins and Sherwood W. Sorrell of the Peabody Coal Company made additional data available. R. A. Peppers of the Illinois State Geological Survey provided valuable comments and information on the palynology of the coals. This help is gratefully acknowledged.

ABSTRACT

The Seelyville, Dekoven, and Davis Coals of Illinois, Indiana, and western Kentucky previously were considered separate coal seams of regional extent in the Illinois Basin Coal Field. Subsurface studies reveal that the Dekoven and Davis Coals are in fact splits of the Seelyville Coal. A series of seven linked cross sections, with an average of one well per mile, along a 170-mile northeasterly trending transect in eastern Illinois, western Indiana, and western Kentucky links the type Seelyville Coal at its type area in west-central Indiana with the Davis (No. 6) and Dekoven (No. 7) coals at their type areas in western Kentucky. Geophysical logs constitute the bulk of data utilized in the cross sections. In its type area, the Seelyville Coal contains several shale partings, one of which is fairly continuous but ranges from less than one inch to more than 20 feet in thickness. South-southwest of the La Salle Anticlinal Belt this parting expands to a more continuous wedge that locally is more than 100 feet thick, separating the Dekoven Coal (above) from the Davis Coal (below) in southeastern Illinois and western Kentucky.

INTRODUCTION

Correlations and stratigraphic relationships of middle Pennsylvanian units that lie above the Colchester Coal in the Illinois Basin are well understood. For most of the economically important coal seams, sufficient data are available for correlations. Relationships of stratigraphic units below the Colchester, however, are not nearly as well established; many correlations are uncertain because of the dearth of good driller's logs and core descriptions and the discontinuous nature of stratigraphic units, especially in Atokan and older rocks. Extensive oil and gas drilling in the Illinois Basin Coal Field has provided numerous geophysical logs mostly well suited for correlation, for strata below the Colchester Coal. Spontaneous potential-resistivity logs are most common, but gamma-density logs have become available from many of the more recent oil tests.

Earlier studies suggested close relationships between the Dekoven and Davis Coals (Spoon Formation of Illinois, Carbondale Formation of western Kentucky) and the Seelyville Coal (Spoon Formation of Illinois, Staunton Formation of Indiana). These coals are the first reliable stratigraphic markers below the Colchester Coal. Studies of the spore floras (Peppers, 1983, personal communication) suggest that the Dekoven and Davis Coals might be equivalent to the Seelyville Coal. Other unpublished studies in the files of the Illinois State Geological Survey (ISGS) (especially some cross sections) also hinted at possible equivalence of these coals. In the official *Handbook of Illinois Stratigraphy* published by the ISGS in 1975, Willman et al. placed the Dekoven and Davis Coals stratigraphically just below the Seelyville

Coal. A systematic study of the rock sequence containing these three coals was obviously needed to resolve such contradictory correlations; numerous geophysical logs of oil tests are now available. In this study, I constructed a series of cross sections, using 276 drill hole records from the extensive files at the Illinois and Indiana Geological Surveys (appendix A). Seven interconnected sections (plate 2) extend over an approximately 170-mile-long transect from western Kentucky, through southeastern and eastern Illinois, to southwestern and west-central Indiana.

The cross sections begin in the type area of the Dekoven and Davis Coals in southeastern Illinois and western Kentucky and trend roughly northeast to the type area of the Seelyville Coal in Clay and Vigo Counties, Indiana. In order to ensure accuracy in correlations, an average of one hole per mile was selected.

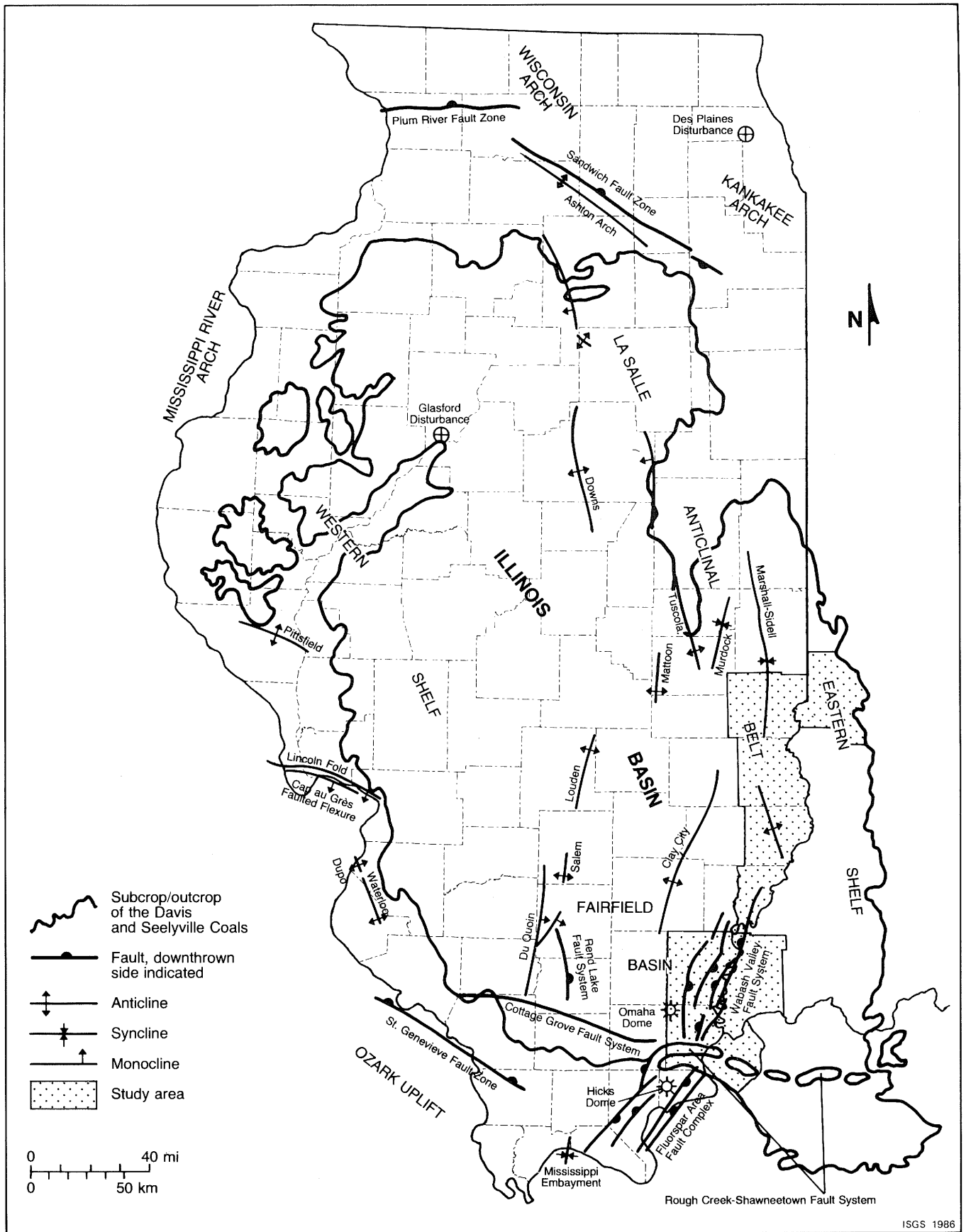
PREVIOUS WORK

Owen (1855) first referred to the Davis and Dekoven Coals respectively as the "Four-foot coal" and the "Three-foot coal" in southeastern Gallatin County, Illinois. One year later the "Four-foot coal" (Owen, 1856) was termed (in western Kentucky) the Davis or the No. 5 coal, and the "Three-foot coal" was referred to as the No. 4.

Fuller and Ashley (1902) gave the name "Rock Creek coal" to the coal that was later named the Seelyville Coal in Dubois and Pike Counties, southwestern Indiana. Ashley (1909) informally used the term Seelyville for a thick coal mined near Seelyville in Vigo County, Indiana. A few years earlier Ashley (1899) had referred to this coal as "Coal III". This latter term prevailed in Indiana nomenclature usage for many years and sometimes was used in Illinois.

Glenn (1912) extensively studied coals in the Tradewater River area of western Kentucky. He revised Owen's numbering of the "Four-foot" and the "Three-foot" coals, changing Owen's No. 4 to No. 7, and Owen's No. 5 to No. 6. Glenn's numbers remain an informal part of the name for these coals. Lee (1916), in an extensive study of the coals in the Shawneetown Quadrangle of Kentucky, again applied the term "Davis" to the "Four-foot" coal of Owen or the No. 6 of Glenn. Although Owen (1856) was the first to use "Davis," he did not state its derivation. Lee, however, indicated that the name referred to the coal mined at the Davis Mine, one-half mile east of Dekoven, Kentucky. He also gave the No. 7 Coal of Glenn (Owen's "Three-foot coal") the name Dekoven coal for Dekoven Station, Union County, Kentucky. According to G. E. Smith (1967), however, he erroneously applied the term Dekoven to the upper of three coals. This upper coal is now correlated with the Colchester Coal of Illinois and Indiana.

Lee (1916) also misspelled the name Dekoven that he selected for the coal. When the coal was named, the name



ISGS 1986

Figure 1 Principal geologic structures in the Illinois Basin Coal Field and location of the study area (after J. Treworgy, 1981); outcrop of the Davis and Seelyville Coals outlines the Illinois Basin Coal Field.

of the town of Dekoven had an upper case "K", but Lee used a lower case "k". Some authors followed Lee's spelling so the error has been perpetuated. Others such as Wanless (1956) and Kosanke (1950) used the correct spelling, "DeKoven," for this coal. Others have added a space before the K because it is capitalized (for example, Willman et al., 1975). Recent usage, however, generally follows the spelling adopted by Lee. For example, Lee's spelling for the town was used on the U.S. Geological Survey's recently issued 7 1/2-minute Dekoven Quadrangle. In discussions I had with Alan D. Williamson of the Kentucky Geological Survey, Lee's error was examined and it was decided that the Kentucky and Illinois Geological Surveys will follow Lee's original spelling using the term Dekoven with lower case k (Williamson, personal communication, 1984).

Cady (1919) erroneously correlated the Dekoven and the Davis Coals of Saline and Gallatin Counties with the locally split Murphysboro Coal in Jackson County, Illinois.

Glenn (1922) recognized the Dekoven (No. 7) and Davis (No. 6) coals in Webster County, Kentucky. Smith (1967), however, showed that the Dekoven coal is absent from most of the county. Instead, Glenn's Dekoven coal was recognized as the "Shulztown" coal, now considered equivalent to the Colchester coal in the subsurface of western Kentucky (Jacobson et al., 1985).

Butts (1925) noted that the interval between the Dekoven and Davis Coals in the Eagle Valley-Shawneetown area of Gallatin and Saline Counties, Illinois, is generally 15 to 55 feet. At this time he accepted Cady's (1919) correlations with the Murphysboro Coal.

Wanless (1931) described the Wiley Coal of the Wiley cyclothem, citing exposures near Wiley in Fulton County, Illinois, and the Greenbush Coal of the Greenbush cyclothem, in Greenbush Township, Warren County, Illinois. Wanless (1939) reported that the Greenbush was equivalent to the Dekoven and the Wiley equivalent to the Davis. He also correlated the Davis and Dekoven Coals with the lower and upper benches of the Rock Creek Coal of Dubois and Pike Counties, Indiana. As mentioned earlier this coal is now known to be equivalent to the Seelyville Coal (Shaver et al., 1970). Kosanke's palynological studies (1950) support Wanless' (1939) correlations between the Dekoven and Greenbush and the Davis and Wiley.

Pullen (1951) noted that the interval between the Dekoven and the Davis Coals generally ranges from 10 to 30 feet in Gallatin County, Illinois. He also was the first to notice that the Dekoven Coal locally splits into two coals in Gallatin County. He observed that the Davis Coal is thicker and generally the more persistent of the Dekoven-Davis "couplet." In the same year Walker et al. (1951) mapped the Davis coal in Henderson County, Kentucky. Cady (1952) recognized the Indiana III Coal in east central Illinois. This coal is now known as the Seelyville.

Cathey (1955) recognized the Dekoven (No. 7) and the Davis (No. 6) coals in the subsurface of the Newburg Quadrangle, Henderson County, Kentucky. G. E. Smith (1967) correlated Cathey's Dekoven coal with the Davis coal, but did not recognize the Dekoven coal. Cathey's (1955) Davis coal is unrecognized elsewhere, but may be equivalent to

the coal below the Seahorne Limestone in Illinois. This coal appears to be equivalent to the No. 5 coal of Kentucky.

Siever, in Wanless (1956), and Kosanke et al. (1960), correlated the Dekoven Coal of Illinois with the Mineral Coal of Missouri. Wanless (1956) added the term "Indiana III" to the nomenclature of eastern Illinois. He also designated a type locality for the Wiley Coal (SW SW of sec. 16, T7N, R2E, Fulton County, Illinois), and a type locality for the Greenbush Coal (sec. 24, T8N, R1W, Warren County, Illinois). In 1957, he described the Greenbush in its type section as being 1 inch or less thick.

W. H. Smith (1957) mapped surface-minable Davis and Dekoven Coals in Illinois in Saline and Gallatin Counties. Smith (1958) noted surface-minable Davis Coal (which he called by Wanless' name, "Wiley") in southwestern Illinois.

Hutchison (1958, 1960) mapped the Seelyville Coal in detail in its type area in the Seelyville and Brazil quadrangles of Vigo and Clay Counties, Indiana.

Winslow (1959) substantiated correlation of the Wiley and the Greenbush Coals with the Davis and the Dekoven Coals respectively on the basis of palynological data. Kosanke et al. (1960) adopted the term, Seelyville Coal Member, for the Indiana III coal equivalent in eastern Illinois.

G. E. Smith (1967), on the basis of subsurface studies, reported that the Dekoven coal was absent east of a north-south line that ran approximately through the west edge of Union County and the northwest corner of Henderson County, western Kentucky. He also noted that the Dekoven coal wedged out eastward because of the presence of a thickening sandstone unit beneath it and above the Davis coal. He thus concluded that earlier geologists had erroneously referred the "Shulztown" or Colchester equivalent to the Dekoven Coal east of this line and that the Davis coal was equivalent to what was called Coal III in southern Indiana. This latter coal is now correlated with the Seelyville Coal.

Peppers (1970) noted many similarities in spore content between the Wiley and Davis Coals, as well as between the Greenbush and Dekoven Coals. Noticeable differences in some taxa, however, were attributed to paleoenvironmental differences of the sort expected over such a widespread geographic area. He also analyzed the spore flora of the Seelyville Coal, but did not make any stratigraphic correlations of the Seelyville with the Dekoven or Davis Coals.

Shaver et al. (1970) formally adopted the name, Seelyville Coal Member, to replace the term, "Coal III", that had been used widely in Indiana since Ashley (1909). The Roman numeral "III" was retained as an informal extension in parentheses at the end of the official name.

Willman et al. (1975) essentially followed Kosanke et al.'s (1960) nomenclature, retaining the Seelyville, Dekoven, and Davis Coal Members in a general stratigraphic summary of the Illinois section.

Smith and Brant (1980) mapped the distribution and thickness of the Davis coal throughout the western Kentucky portion of the Illinois Basin Coal Field. This map was compiled from maps in Kentucky's geologic quadrangle series, as well as from drill hole and outcrop data. The Dekoven coal was not mapped because of its limited extent.

C. G. Treworgy (1981) mapped the distribution and thickness of the Seelyville Coal in a ten-county area of east-central Illinois.

Williams et al. (1982) summarized current stratigraphic nomenclature for western Kentucky as well as listing supporting core data. This study recognized the Dekoven coal (No. 7) and the Davis coal (No. 6).

The Seelyville Coal has been extensively mapped in a series of Indiana County maps (Wier, 1952, 1953; Wier and Stanley, 1953; Hutchison, 1956; Hutchison, 1959, 1964; Wier and Powell, 1967; Powell, 1968; Hutchison, 1971). These maps show the structure, mined-out areas, and subcrops for the Seelyville Coal and other Indiana coals.

Jacobson (1983) reported on the correlation of the Dekoven and Davis Coals with the upper and lower benches of the Seelyville Coal.

GEOLOGIC SETTING OF THE STUDY AREA

The study area is located on the eastern margin of the Illinois Basin (fig. 1). The Rough Creek-Shawneetown Fault System and the Eagle Valley-Moorman Syncline cross the southern portion of the study area in an east-west direction; however, the faulting and folding in these structures occurred during the Permian, or later (Nelson and Lumm, 1984), and thicknesses of the strata examined were not affected by these faults.

In the middle part of the study area the La Salle Anticlinal Belt is represented by a series of northwest trending en echelon folds. Clegg (1965) showed that this fold system was active on an intermittent basis throughout the Pennsylvanian. Strata examined in this study thin over folds and thicken in synclines. Towards the east the studied sequences thin substantially, indicating that the present-day structural shelf was also present during the Pennsylvanian.

METHODOLOGY AND DATA UTILIZED IN STUDY

Because the Dekoven, Davis, and Seelyville Coals are present in most of the study area only in the subsurface, drill hole records from oil and coal tests are the primary means of making correlations. On the basis of drill hole data, seven cross sections were constructed for the eastern part of the Illinois Basin Coal Field (appendix; plates 1 and 2).

Cross section AA' begins at the cropline of the Davis Coal in the Eagle Valley Syncline in Gallatin County, Illinois (plate 2). This area was chosen because it is the reference area for the Dekoven and Davis Coal Members in Illinois. It is roughly 10 miles west of the type area for the Dekoven and Davis coal beds of Kentucky, and correlations of these coals with this area in southeastern Illinois have been established for many years by hundreds of coal test borings and numerous exposures in mines. Section GG' ties AA' to the type area of the Dekoven and Davis coals in Kentucky.

A spacing of one hole per mile was normally employed, but in some cases the spacing was closer. In a few areas (EE' and FF') lack of data forced somewhat wider spacing.

Most of the 276 drill hole records used came from the Geologic Records Unit of the Illinois State Geological Survey. Denver Harper of the Indiana Geological Survey provided

data unavailable in the Illinois Survey files. Amax Coal Company and Peabody Coal Company provided additional drill hole information; these records were especially useful for assessing the accuracy of coal "picks" from electric logs.

Almost 77 percent of the logs were electric logs of the spontaneous potential-resistivity type, 16 percent were either gamma-density or gamma logs, and 7 percent were coal tests and one exposure in a surface mine. The gamma-density logs and the coal tests were particularly important in ascertaining coal horizons selected from the more numerous electric logs.

Plate 1 illustrates condensed versions of the seven detailed cross sections. Because of space limitations, and for ease of viewing, these condensed sections were constructed on the basis of selected logs from original cross sections. Logs were selected to illustrate stratigraphic correlations of the Dekoven and Davis Coals with the Seelyville Coal, as well as relationships with other key beds.

Unless otherwise indicated, all intervals given between coals are the intervals between the tops of the units. Where the interval between the Dekoven and Davis Coals thins to the point that the two coals nearly merge, however, this causes problems in discussion. In these cases the interval between the tops of these coals becomes greater than the actual interval between the base of the Dekoven and the top of the Davis. In the areas where the interval between the base of the Dekoven Coal and the top of the Davis Coal is less than the interval between their tops, I will include this interval also for selected logs.

REGIONAL STRATIGRAPHY

The Pennsylvanian System in the Illinois Basin Coal Field is classified into three groups and seven formations in Illinois (fig. 2). In western Kentucky only four formations are recognized in the same interval of strata (fig. 2). The boundaries of these formations do not coincide with those recognized in Illinois. The same strata in Indiana are classified into three groups and ten formations.

The interval examined in this study is limited to selected key beds a short distance above or below the Seelyville, Dekoven, and Davis Coals. A limestone at the base of this interval probably is equivalent to the Creal Springs Limestone Member of the Spoon Formation in Illinois. The top of the interval is the Houchin Creek Coal of Illinois, Indiana, and western Kentucky.

Creal Springs Limestone Member

A limestone here tentatively correlated with the Creal Springs Limestone Member of Kosanke et al. (1960) occurs near the base of the study interval. This limestone persists over most of the north-south extent of the cross sections (plate 1) constructed in this study. The limestone appears in southeastern Gallatin County, Illinois (sec. AA', plate 1) and extends to northern Crawford County, Illinois (sec. EE', plate 1). The limestone is thickest (locally 10 ft or more) in White County (sec. BB', plate 1 and the southern quarter of sec. CC', plate 1). Here it may consist of as many as three layers of limestone separated by shale. This area of maximum development of

the Creal Springs Limestone corresponds roughly to the deepest area of the basin, the Fairfield Basin. Elsewhere, the Creal Springs Limestone is thinner and locally absent. In the northern part of Crawford County (sec. EE', plate 1), the Creal Springs Limestone pinches out, but it may reappear 20 miles north in Vigo County, Indiana in holes 3 and 4, section FF' (plate 1) where it may be represented by resistivity spikes at a depth of 310 to 320 feet. The area of thin to absent limestone corresponds to the top of the La Salle Anticlinal

Belt, where many Pennsylvanian units thin, become discontinuous, or are absent—possibly reflecting uplift contemporaneous with sedimentation.

Correlation of the Creal Springs Limestone of the study area with the type Creal Springs Limestone is only tentative, but this lower limestone is the first persistent limestone below the limestone herein identified as the Stonefort Limestone Member. Thus it appears in the expected stratigraphic position of the Creal Springs Limestone.

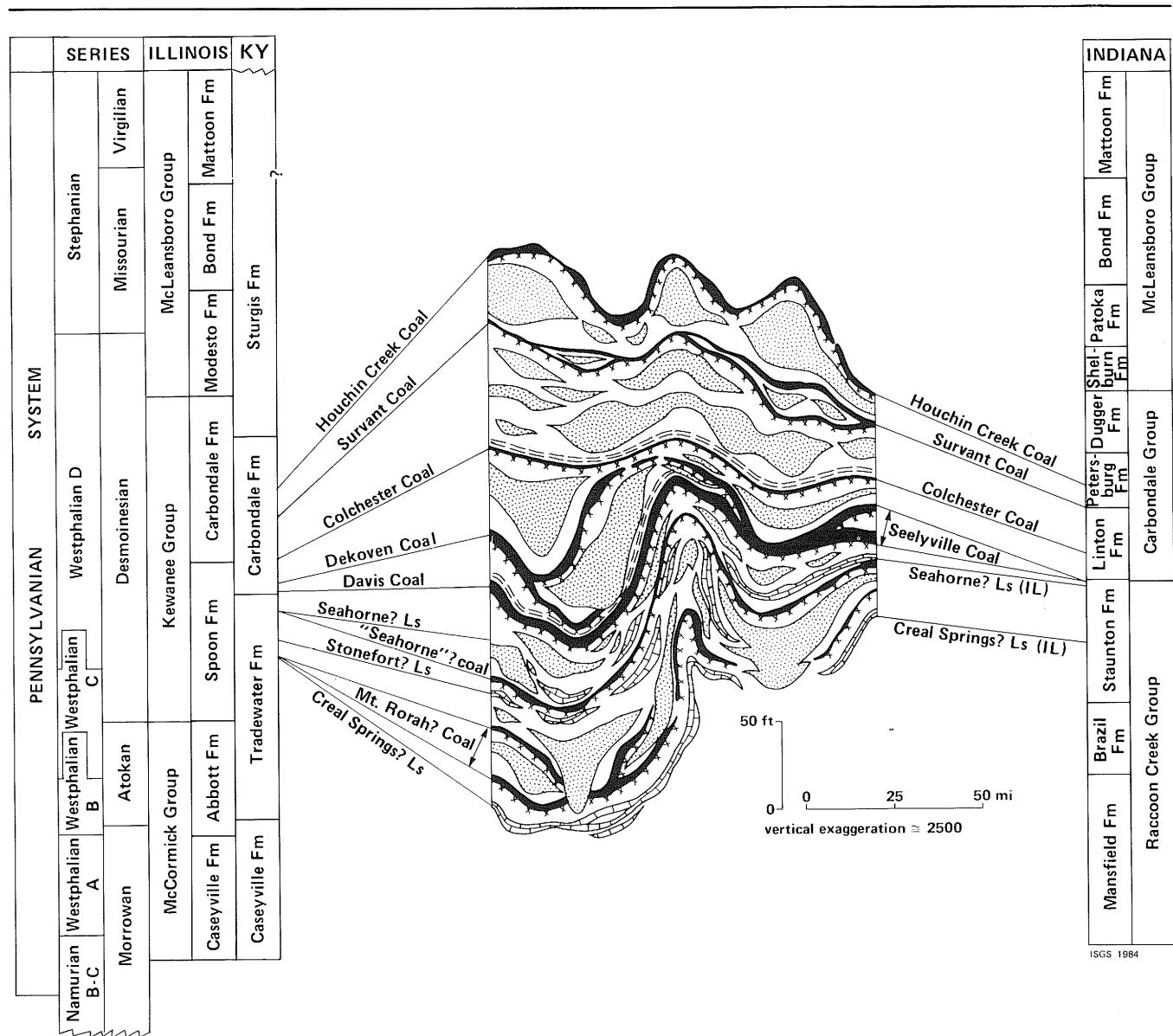


Figure 2 Generalized stratigraphic column showing key units.

Cady et al. (1955) and Potter (1956) tentatively identified this limestone unit as the Stonefort Limestone because it occurs at a similar stratigraphic position as the Stonefort Limestone in its type area; however, the section in the areas they studied is compressed because it is on top of the La Salle Anticlinal Belt. The Creal Springs Limestone actually correlates with a limestone below a limestone in Gallatin and White Counties that some geologists (such as Pullen, 1951) have referred to as the Stonefort Limestone. In White and Gallatin Counties this lower limestone has been correlated to the Curlew Limestone Member in a number of unpublished cross sections in the files. Pullen (1951) also called it the Curlew Limestone. Peppers and Popp (1979), however, showed the Curlew Limestone of Kentucky to be stratigraphically lower than this limestone. Thus, the "Curlew" limestone of southeastern Illinois is most likely the Creal Springs Limestone.

Peppers and Popp (1979) recognized an unnamed limestone in Indiana that they correlated with the Creal Springs Limestone; this appears to be the same limestone herein noted in Vigo County (plate 1). At present an unnamed limestone in west Kentucky is correlated with the Creal Springs Limestone (Peppers and Popp 1979), but is apparently absent in section GG' (plate 1) in Union County, Kentucky. This suggests that the Creal Springs Limestone of the study area and its apparent correlatives in Indiana and Kentucky are widespread over much of this area of the basin.

Mt. Rorah Coal Member

This name (Kosanke et al., 1960) is used for one or two persistent marker beds that are present in most boreholes from eastern Gallatin County, Illinois (sec. AA', plate 1) to northwestern Lawrence County, Illinois (sec. DD', hole 7, plate 1). Where two benches are present they generally are 30 to 50 feet apart, but locally they are as close as 5 feet. These units are generally coal, but in many places such as southeastern Gallatin County (hole 3, sec. AA', plate 1), northeastern White, southwestern Wabash, south-central Lawrence County (holes 3, 8, 17, sec. CC', plate 1), and central Lawrence County (holes 1, 2, 4, sec. DD', plate 1), black shale replaces the coal. The black shales either may be lateral equivalents of the coal, or may be marine roof rock above coal too thin to identify in logs. These two benches are obscured in extreme southwestern Wabash County (holes 5 and 6, sec. CC', plate 1) and further northeast in southwestern Wabash County (holes 7 and 8, sec. CC', plate 1) there is only one layer, mostly black shale. It is not clear if the two layers have merged or if one has pinched out. This single coal bed continues northward from southwestern Wabash County to northwestern Lawrence County (hole 7, sec. DD', plate 1), beyond which this coal is unrecognizable. The units above and below are more persistent however, and in northwestern Lawrence County (holes 2, 5, and 6, sec. EE', plate 1) the coal or black shale just above the Creal Springs Limestone may be this same unit. Beyond northern Lawrence County, the Mt. Rorah Coal is unrecognizable.

As with the other named units below the Davis Coal, the Mt. Rorah Coal in the sections has not been traced to the type area. Also unlike the Creal Springs Limestone, Stonefort

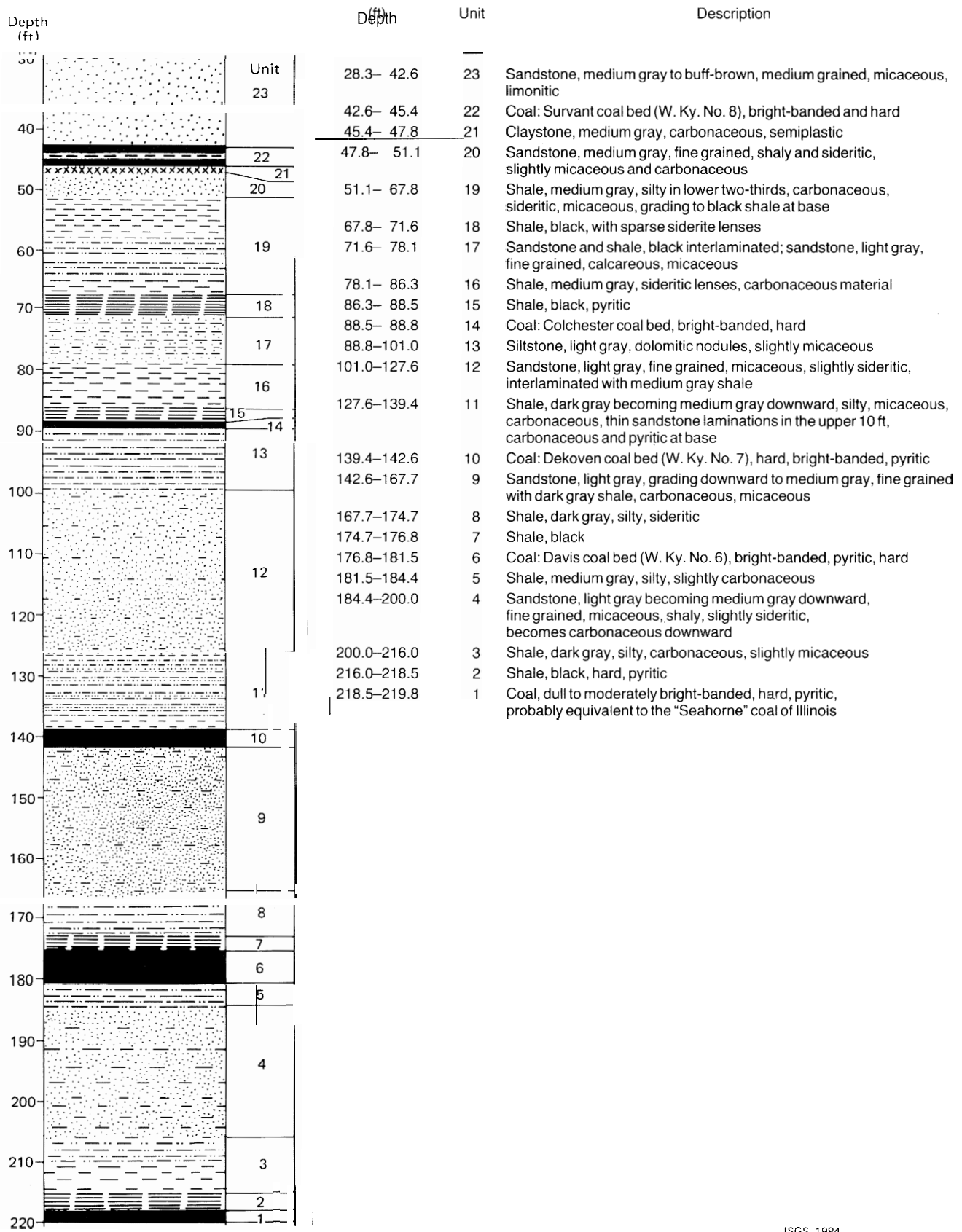
Limestone, "Seahorne" coal, and Seahorne Limestone, this coal unit has not previously been recognized with any certainty away from the type area. Therefore, identification of this coal or coals with the Mt. Rorah Coal is based on its position between other tentatively identified units. It is also possible that the two coals are separate seams because their merger has not been verified directly. The upper bed could be the Wise Ridge Coal Member or a black shale replacing it. This upper bed in northern White County (hole 3, sec. CC', plate 1) is succeeded by a well-developed black shale, and Willman et al. (1975) reported that the Wise Ridge Coal generally has a well-developed black shale roof. Generally, according to these same authors, the Stonefort Limestone directly overlies the Wise Ridge Coal. However, except for well 11 of sec. BB', plate 1, and wells 1 to 3 of sec. CC', plate 1, in northern White County, this upper coal is not closely associated with the Stonefort Limestone. Instead, it is 25 to 75 feet below it in most of the sections from eastern Gallatin to northern White Counties (sec. AA' to BB'). Searight (1979) showed the Mt. Rorah Coal split into two beds separated by 15 to 20 feet of shale in southeastern Illinois. Searight (1979) also indicated that the upper bed is roughly 50 to 75 feet below the Stonefort Limestone. This of course fits well with my assignments of these two coals to the Mt. Rorah Coal. Finally, because there is only one bed of this unit (north of holes 5 and 6, sec. CC', plate 1) in southwestern Wabash County and because it is unclear whether the beds merged or one has pinched out, it is best to consider these two coals as essentially one.

Stonefort Limestone Member

The Stonefort Limestone is a gray to bluish gray, generally dense marine biomicrite that occurs widely in southern and southeastern Illinois. The limestone identified in my cross sections as the Stonefort also has been identified as the Stonefort Limestone in White County, Illinois (Harrison, 1951). Along the trend of my sections (plate 1), the Stonefort Limestone is well developed from eastern Gallatin County (AA') through southwestern Wabash County (sec. CC', hole 6, plate 1). Beyond this point in section CC' the Stonefort Limestone is locally too thin to give a clear response in most of the examined geophysical logs. The Stonefort Limestone reappears in central Lawrence County (hole 2, sec. DD', plate 1) and continues to southern Crawford County (hole 1, sec. EE', plate 1). From this point northward the Stonefort either is absent or too thin to be recognized in the well logs. Peppers and Popp (1979) correlated the Stonefort Limestone with the Silverwood Limestone Member of the Staunton Formation in Indiana. In section GG', which runs into western Kentucky, the Stonefort correlates with a limestone in drill hole 9 of plate 1 (southwestern Union County) that has been called the Beulah Limestone Member by Williams et al. (1982).

Seahorne Limestone Member and "Seahorne" coal bed

A coal bed closely overlain by limestone believed to be the Seahorne Limestone Member is the most persistent marker bed below the Davis Coal. The Seahorne Limestone is quite irregular in thickness and is discontinuous over much of southern Illinois. Much of it is nodular, and it is described by Willman



ISGS 1984

Figure 3 Measured section of the Dekoven and Davis Coals in their type area; data from western Kentucky stratigraphic test hole Gil 15 (Williams et al., 1982 Union County, Carter coordinate location 5-M-18, 1950 FSL, 2100 FWL).

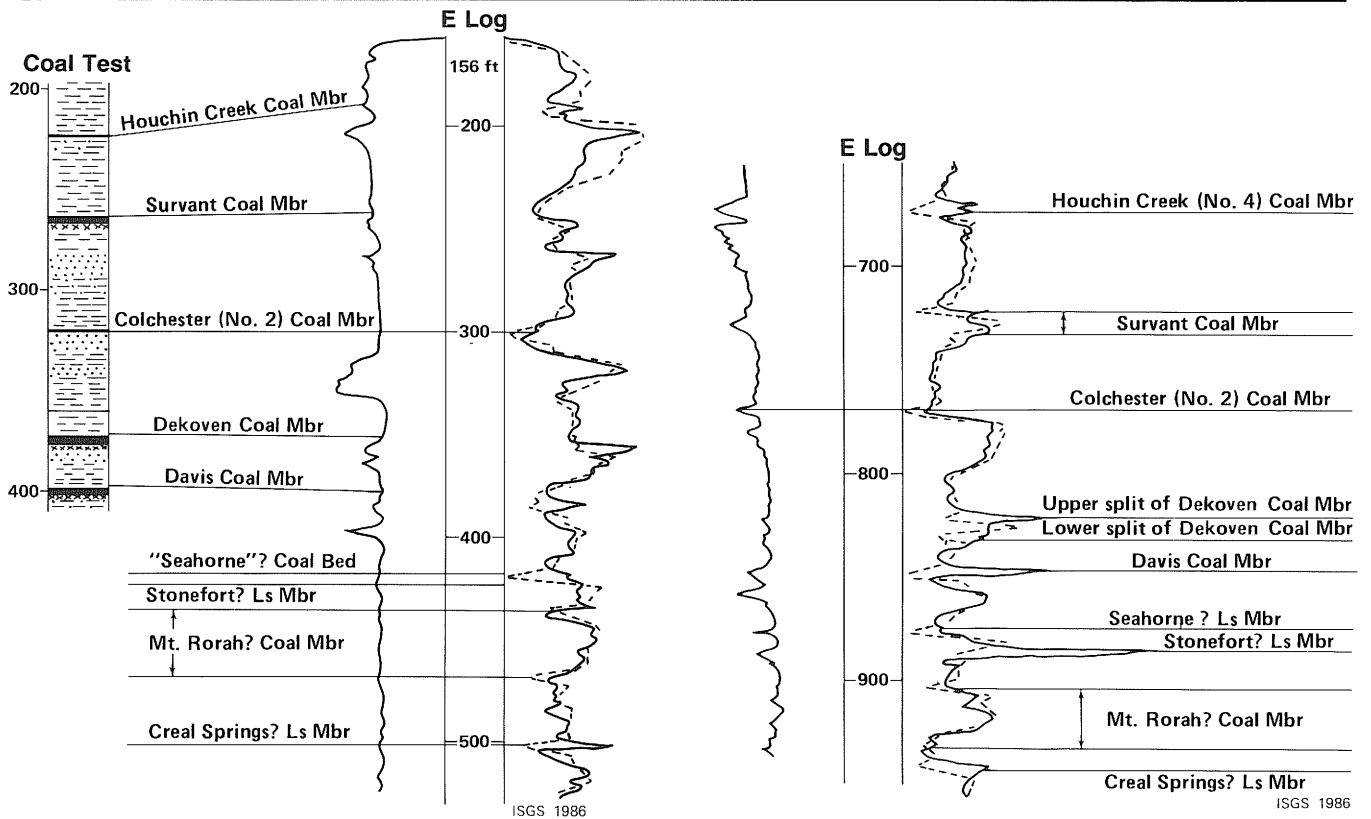


Figure 4 Typical coal test and electric log illustrating the stratigraphic relationships of the Dekoven and Davis Coals.

Figure 5 Electric log from Gallatin County, Illinois, illustrating the splitting of the Dekoven Coal Member into two beds.

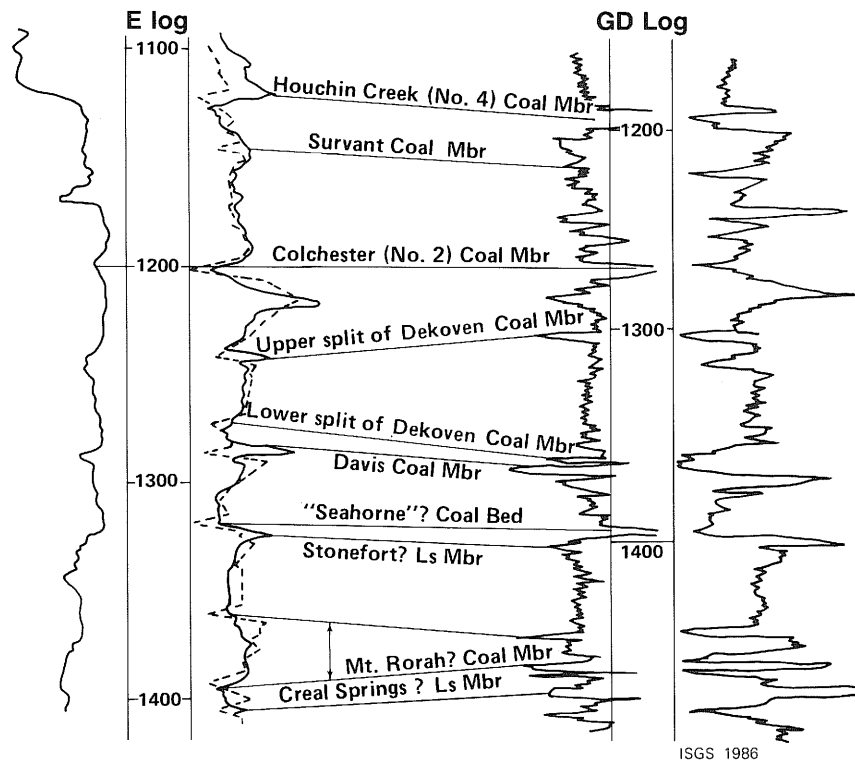


Figure 6 Electric log and gamma-density log from White County, Illinois, illustrating the widening split in the Dekoven Coal Member.

et al., (1975) as conglomeratic and brecciated, containing abundant marine fossils. Searight (1979), however, reports that in some areas it has a nonmarine fauna. The unnamed coal that underlies the Seahorne Limestone is in my sections more persistent than the limestone. I formally call this the "Seahorne" coal because of its close association with the limestone. The "Seahorne" coal bed (Peppers and Popp, 1979) is mostly less than 30 inches thick, but locally more than 3 feet thick. In many places it is difficult, especially from resistivity logs, to determine whether the limestone or the coal—or both—is present. However, from the scattered cores and coal tests and the gamma-density logs, it appears that for much of the length of the sections from eastern Gallatin County (sec. AA', plate 1) to central Lawrence County (sec. DD') the "Seahorne" coal or black shale is present. In some places along this portion of the sections the Seahorne Limestone directly overlies the coal. From the middle of section DD' (plate 1) in Lawrence County, Illinois to the end of Section FF' (plate 1) in Clay County, Indiana the Seahorne Limestone is clearly present; coal also is probably present in southern Crawford County, Illinois as illustrated in hole 2 of section EE' and in western Clay County, Indiana in hole 6 of section FF' (plate 1). However, because the Seahorne Limestone is most readily identifiable on the spontaneous potential-resistivity logs, I have identified only the Seahorne Limestone in these sections; occurrence of the underlying coal is assumed. In southwestern Union County, Kentucky (hole 9, sec. GG', plate 1) the "Seahorne" coal correlates with a coal considered by R. A. Peppers to be the No. 5 coal bed of western Kentucky (unpublished analyses of this core, 1979). In Indiana, Peppers and Popp (1979) did not recognize the Seahorne Limestone and underlying coal, but my sections show that they are a short distance below the Seelyville Coal in its type area.

Davis Coal Member (Illinois) and Davis (No. 6) coal bed (western Kentucky)

The Davis Coal is one of the thickest and most widespread coals below the Colchester Coal in the southern part of the Illinois Basin (fig. 3). This coal averages about 4 feet thick across much of southern Illinois and western Kentucky and it apparently persists over much of the basin. Scattered data indicate its occurrence in southwestern Illinois; in west-central and northwestern Illinois it has been mapped locally and it is currently known as the Wiley Coal Member (Willman et al., 1975; Wanless, 1931). My study shows persistence of the coal onto the eastern shelf area. In the southern part of the basin, this coal is commonly separated from the overlying Dekoven Coal by 10 to 40 feet of clastic rocks (fig. 4). In the eastern part of the basin (i.e., in the shelf area and on top of the La Salle Anticlinal Belt) it corresponds with the lower bench of the Seelyville Coal. It is separated from the upper bench of the Seelyville (the Dekoven Coal) by less than 1 inch to more than 20 feet of clastic rocks (hole 14, sec. CC', northward to the end of sec. FF', plate 1). In the deeper and southern parts of the basin the Davis Coal is generally overlain by black, fissile, shale as much as 6 feet thick. The black shale produces a sharp gamma-ray response, as in central White County (hole 12, sec. AA', plate 1). This shale contains marine fossils, and is sometimes overlain by discontinuous,

nodular, marine limestone. This marine roof rock thins and disappears along the trend of my cross sections as they reach the top of the La Salle Anticlinal Belt.

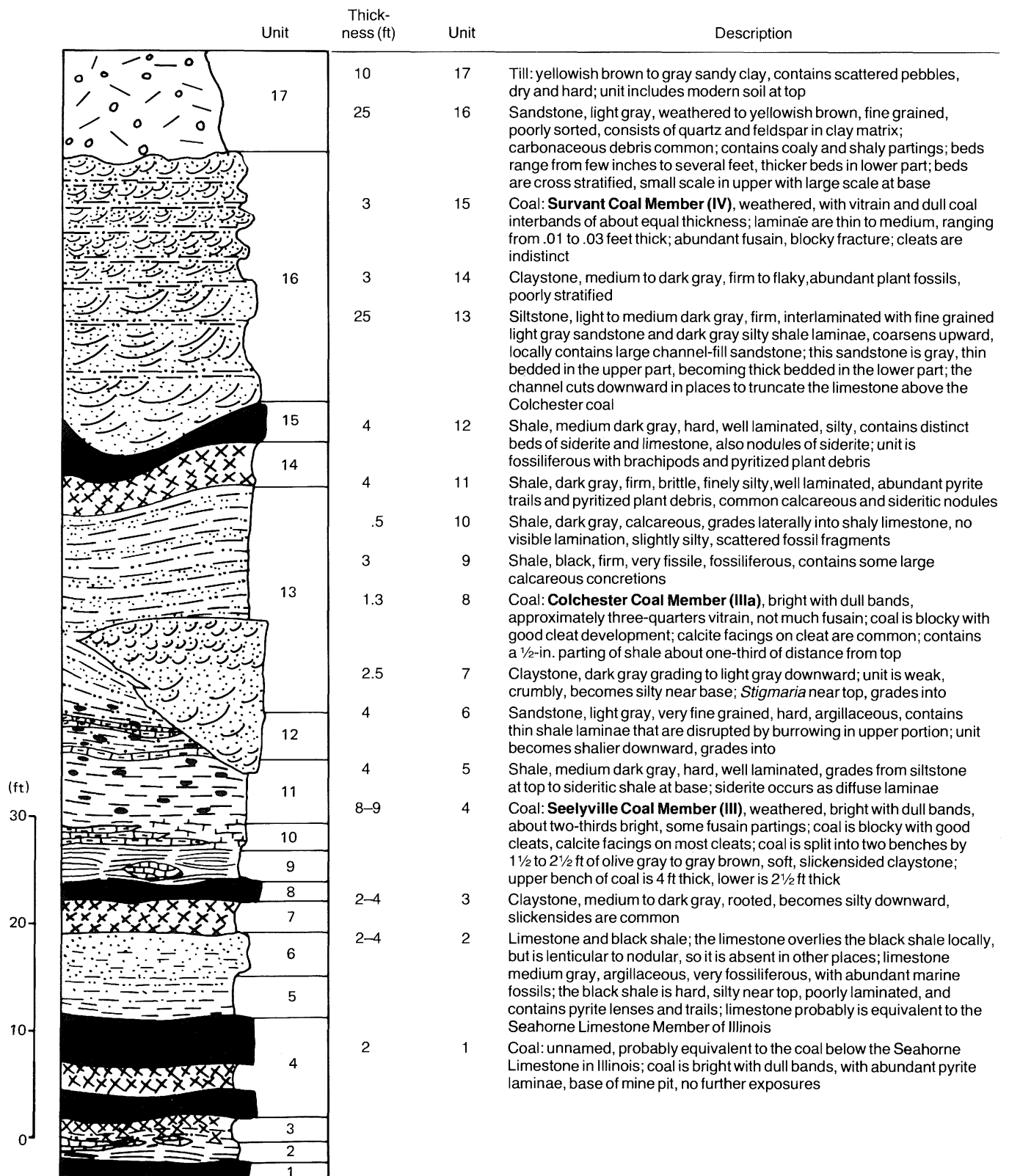
Dekoven Coal Member (Illinois) or Dekoven (W. Ky. No. 7) coal bed

The Dekoven Coal (fig. 3) is widespread throughout the basin, but is less continuous than the Davis. The Dekoven is slightly thinner than the Davis, averaging 3 feet thick in south-central and southeastern Illinois where it has been mapped in detail (Willman et al., 1975; W. H. Smith, 1957). R. A. Peppers (unpublished palynological analyses in Survey files, 1975) identified it in several cores in southwestern Illinois. In the west-central and northwestern part of the basin it is referred to as the Greenbush Coal Member (Willman et al., 1975). In my study the Dekoven Coal was traced into east-central Illinois and west-central Indiana, where it forms the upper bed of the Seelyville Coal Member. Along the north-south trend of sections constructed for this study, the Dekoven appears locally discontinuous but regionally persistent.

The Dekoven splits into two beds in places in southeastern Illinois and western Kentucky (figs. 5 and 6). Where the parting reaches its maximum thickness, the lower bed of the Dekoven Coal is only a few feet above the top of the Davis Coal, but it is still clearly separated from the Davis by the marine black shale. This separation is fairly distinct on gamma logs because of the strong gamma-log response of the black shale (hole 12, sec. AA'; holes 6 and 8, sec. BB', plate 1). This lower split of the Dekoven Coal does not continue north of hole 8 of section BB' in northwestern White County. At this point in the sections the beds begin to climb out of the deep basin (Fairfield) onto the western flank of the La Salle Anticlinal Belt. The upper bed of the split Dekoven Coal persists northward, but is locally discontinuous; eventually it becomes the upper bed of the Seelyville Coal. W. H. Smith (1957) noted that the Dekoven Coal is split by as much as 2½ feet of shale in western Williamson County, Illinois. Peppers and Popp (1979) also reported split Dekoven, and unpublished cross sections of Gallatin County (Clegg) in the ISGS files show splitting of the Dekoven Coal in great detail. Where the Dekoven Coal is split into two beds, however, the interval between the lower bed of the Dekoven Coal and the underlying Davis Coal may decrease to as little as 5 feet. North of where the lower split of Dekoven Coal is absent, as in northern White County (hole 10, sec. BB'), the interval between the upper split of the Dekoven Coal and the Davis Coal is more than 100 feet; much of the interval consists of sandstone and silty sandstone. On top of the La Salle Anticlinal Belt and on the eastern shelf, the upper split of the Dekoven Coal forms the upper bench of the Seelyville Coal. Here the interval between the Dekoven Coal and the Davis Coal ranges from less than 1 inch to more than 2 feet.

Seelyville Coal Member (Illinois, Indiana)

In Indiana (fig. 7) the Seelyville is as much as 11 feet thick, and generally averages 6 feet. The outcrop of this coal has been mapped widely in Indiana and the coal has been extensively mined. In recent mapping, C. G. Treworgy (1981) traced



ISGS 1984

Figure 7 Measured section of the Seelyville Coal in its type area south of Seelyville in Clay County, Indiana; the section is exposed in the highwall of the Amax Coal Company Chinook Surface Mine NE 1/4, Sec. 19, T12N, R12W, Clay County, Indiana (after ISGS mine notes described by Popp, Jacobson, and Cobb).

this coal (ranging in thickness from 3½ to 9 ft) over a 1,900 square mile area of east-central Illinois.

Treworgy recognized the widespread persistence of one of several shale partings in the Seelyville Coal, especially in the southern part of his study area. He also noted that more than 8 feet of shale intervened between the two beds of coal separated by this parting, and that the lower bed of the Seelyville Coal was the thicker of the two. My cross sections, excerpts of which are shown in figs. 8 and 9, confirm this correlation. The lower, thicker coal is the Davis Coal. The

upper bench is equivalent to the Dekoven Coal. The drill holes from southern Lawrence County (holes 16 and 17, sec. CC', fig. 8) are at the southern limits of Treworgy's mapping of the Seelyville; he used them in a series of unpublished cross sections to correlate the Seelyville Coal. Here the Seelyville Coal is clearly separated into two beds correlative with the Davis and Dekoven Coals to the south (holes 1 through 15-CC', sec. AA', BB', plate 1), and northward with the two beds of the Seelyville Coal exposed near the type section at Amax Coal Company's Chinook Mine in Clay

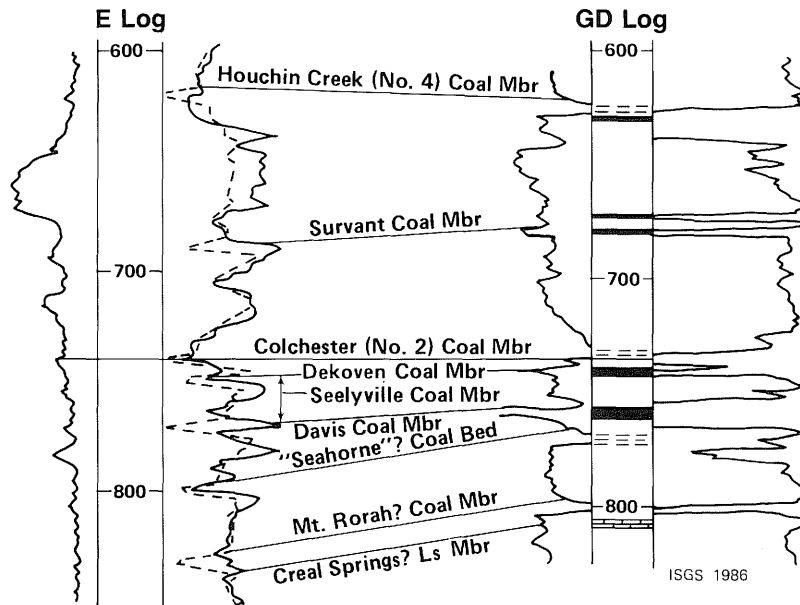


Figure 8 Electric log and gamma-density log from southern Lawrence County, Illinois, showing the Dekoven and Davis Coal Members in an area in which they were mapped as beds of the Seelyville Coal Member by Treworgy (1981).

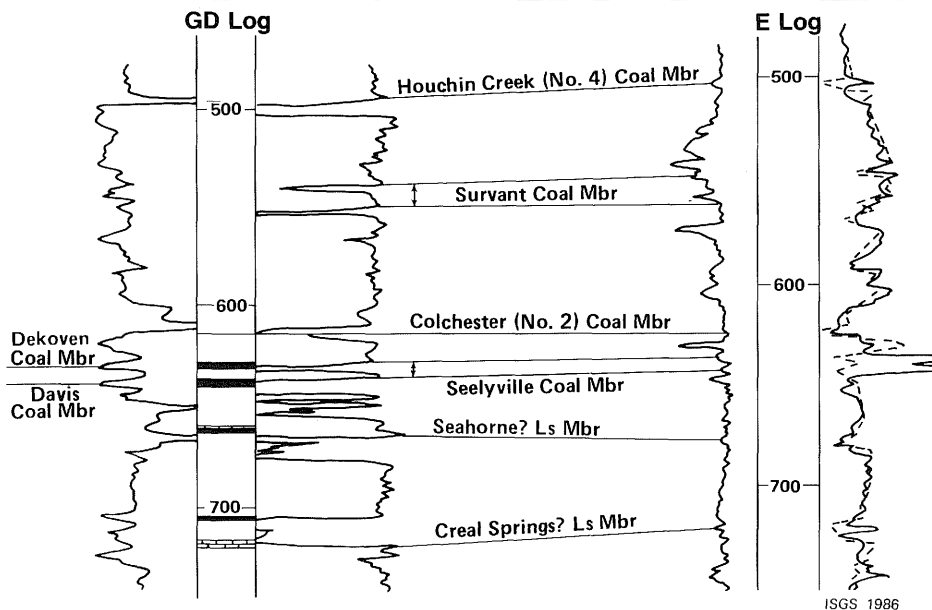


Figure 9 Gamma-density log and electric log showing thinning of the parting separating the Dekoven and Davis Members, which together make up the Seelyville Coal in southern Crawford County, Illinois.

County, Indiana (fig. 7; and hole 6, sec. FF', plate 1). The parting is continuous between central Lawrence County, Illinois, and western Clay County, Indiana (sec. DD', EE' and FF', plate 1; fig. 10), but thins locally. Where thin, the Seelyville Coal appears as one coal on geophysical logs and on some drillers logs from coal-test holes (hole 9 of sec. DD'; holes 4, 7, and 9, sec. EE'; and hole 5, sec. FF', plate 1). Denver Harper of the Indiana Survey has observed this major parting separating the Dekoven and Davis equivalents of the Seelyville Coal throughout Vigo County, Indiana (personal communication, 1984). He has found that this parting is generally less than 1 foot thick in the southern half of Vigo County, but that in the northern half of the county the parting ranges to more than 20 feet thick.

The roof of the Seelyville Coal is generally gray siltstone and shale with some sandstone. Laterally, however, it grades or abruptly changes to massive sandstone thought to be equivalent to the Palzo Sandstone Member of Illinois (Cady 1942).

Colchester Coal Member (Illinois, Indiana) or coal bed (Kentucky)

The Colchester Coal is probably the most continuous marker bed in the Illinois Basin, and its correlation with the Croweburg Coal of Missouri, Kansas, and northeastern Oklahoma is generally accepted. It is very distinctive in electric logs, even when it is only a few inches thick. Generally thin in the study area, it ranges from a fraction of an inch to less than 3 feet thick. It is directly overlain by the black, fissile Mecca Quarry Shale Member and underlain by persistent, well-developed underclay. The combination of thin coal underlying well-developed claystone and overlying black shale causes a very distinctive deep reverse inflection on the normal resistivity curve of spontaneous-potential resistivity logs. This electric log pattern characterizes the Colchester Coal in much of the Illinois Basin, making this widespread unit an excellent marker bed for subsurface correlation. Because it is the most persistent marker bed in the study area, it was chosen as the datum for all the cross sections. In the southern part of the study area (sec. AA', BB', and GG', plate 1) the interval between the Colchester Coal and the underlying Dekoven Coal generally is 40 to 60 feet. This interval, however, expands in the

very southern parts (holes 3 through 9, sec. GG', plate 1) to 80 feet; locally it may thin to 20 feet. Northward (sec. CC', plate 1) it decreases to about 20 feet, and locally to 10 feet. Starting in column 14 of section CC' (plate 1) the interval decreases to 5 to 15 feet. This interval remains thin (plate 1) until section EE' is reached, where it again expands to around 40 feet through column 10 of the same section. From this point onward, however, the interval thins again from 20 to 30 feet. In western Kentucky this coal, which is readily identifiable in the subsurface, probably correlates with the Shultztown coal bed or "S" coal in outcrop. These correlations however, are presently considered tentative by the Kentucky Geological Survey (Jacobson et al., 1985).

Survant Coal Member (Illinois, Indiana) or coal bed (Kentucky)

This coal, which has been informally called the No. 2A coal, has recently been named in southeastern and eastern Illinois, where it is a split coal. The upper bench was formerly known as the Shawneetown Coal (Jacobson et al., 1985). The Survant Coal is split into two benches at many places in Illinois. It extends into western Kentucky, where it was formerly referred to as the Well coal bed (W. Ky, No. 8). The coal is widespread in the eastern and southern parts of the Illinois Basin. It also occurs in the northern and western parts of the basin, where it is currently known as the Lowell Coal Member. In the study area this coal ranges from less than 1 foot to more than 8 feet thick. Over most of the trend of the sections (plate 1) the interval between the Survant and the Colchester is constant, ranging from 50 to 60 feet; however, it starts to thin to around 25 to 30 feet in column 7 of section EE'. From here to the end of section FF' this range remains about the same. The Survant Coal has a persistent shale parting that generally is no more than a few feet thick, but the parting increases to as much as 30 feet thick in northwestern Vigo County, Indiana and in southeastern Illinois (sec. AA', sec. CC', sec. DD', sec. EE', and sec. GG', columns 5-10, column 17, columns 1-3 and 6, columns 1-4 and 7-12, columns 1 and 2, plate 1). This unit is generally overlain by sandstone or gray shale.

Houchin Creek Coal Member (Illinois, Indiana) or coal bed (Kentucky)

This coal seam was first named in Indiana by Fuller and Ashley (1902); it crops out prominently along Houchin Creek in Pike County, Indiana. Jacobson et al. (1985) confirmed the correlation of the Sumnum (No. 4) Coal of Illinois with the Houchin Creek Coal and renamed it the Houchin Creek (No. 4) Coal Member. In western Kentucky this seam was formerly called the Ruff coal bed (No. 8b). This coal is generally thin, but is 4 feet thick in parts of the study area and elsewhere in the basin. It is an excellent marker bed throughout much of the basin. The Houchin Creek Coal is overlain by a thick, fissile black shale, known in Illinois, Missouri, and Kansas as the Excello Shale Member. This black shale is in turn overlain by the laterally persistent but locally discontinuous Hanover Limestone Member in Illinois or by the Stendal Limestone Member in Indiana. The limestone, where present, together with the Houchin Creek Coal, produces a characteristic double-peak pattern (columns 5,6,8,9, and 11, sec.

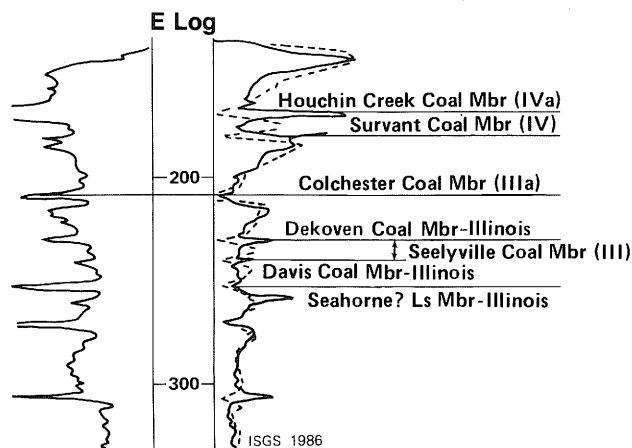


Figure 10 Electric log from Vigo County, Indiana, showing the parting separating the Dekoven and Davis "benches" of the Seelyville Coal Member.

AA'; 1 and 11, sec. BB'; 1,4,8, and 9, sec. CC', and 5 through 6, sec. GG", plate 1) on resistivity curves. Locally, absence of the limestone or merging of the two peaks, however, leaves only one peak on the resistivity curve.

The Houchin Creek Coal occurs some 75 to 120 feet above the Colchester Coal along most of sections GG' and AA' through EE' (plate 1) except in places (parts of sec. BB' and CC') where the interval is as thin as 60 feet. Starting with column 1 of section FF' this interval shrinks on the eastern shelf edge to 40 feet. Along most of these same sections the interval between the top of the Survant Coal and the Houchin Creek Coal is irregular, generally ranging from 25 to 50 feet. Locally, however, this interval expands to more than 50 feet (columns 15 through 17, sec. CC', plate 1) or thins to less than 15 feet (columns 10 to 12, sec. AA'; 3 and 9, sec. CC'; and 3, sec. DD', plate 1). The interval thins on the eastern shelf to less than 15 feet (columns 3 and 4, sec. FF', plate 1).

BIOSTRATIGRAPHIC DATA: PALYNOLOGY

R. A. Peppers (personal communication, 1983) asserts that spore floras of the Dekoven and Davis Coals are distinguishable. On the basis of the palynology of the Dekoven and Seelyville Coals, he feels they are correlative. However, because of the general similarity of spores between the Davis and Dekoven Coals, he believes that the Davis Coal would be indistinguishable from the Seelyville Coal if it had merged with the Dekoven. The Davis Coal generally contains more opaque matter, and spores are less abundant than other macerals in the coal. Peppers (1984) lists the most abundant genera in the three coals; the part of his chart showing the spores and their ranges is reproduced in figure 11. On the basis of this and other studies, the most dominant spores in the three coals are:

1. *Lycospora* (mostly *L. granulata*) (50 to 73%)
2. *Laevigatosporites* (8 to 13%, locally to 25%)
 - (*L. minutus*, 8 to 25%)
 - (*L. globosus*, 10 to 13%)
 - (*L. punctatus*, 8 to 11%)
3. *Calamospora breviradiata* (up to 19%)
4. *Florinites mediapudens* (6 to 15%, rarely to 27%)
5. *Densosporites triangularis* (2 to 15%)
6. *Punctatisporites minutus* (up to 7%)
7. *Vesicaspora wilsonii* (up to 7%)
8. *Triquitrites* (1 to 7%)
9. *Crassispora kosankei* (2 to 5%)
10. *Cappasporites distortus* (5 to 7%)
11. *Thymospora pseudothiessenii* (4 to 12%)

Thymospora pseudothiessenii and *Laevigatosporites minutus* are more abundant in the Dekoven and Seelyville Coals than in the Davis Coal (Peppers, personal communication, 1983). In the Davis Coal, *Calamospora* is more abundant.

Peppers reports that *Schopfites colchesterensis* and *S. dimorphus* have not been found with any certainty below the

Dekoven and Seelyville Coals. However, rare specimens of another species of *Schopfites* occur below the Dekoven Coal (fig. 11). Peppers (1984) has found that *S. colchesterensis* ranges from the Dekoven Coal to the Briar Hill Coal (middle Carbondale Formation, Illinois). Although referred to as *Schopfites* spp. on the chart, Peppers (personal communication, 1983) has concluded that *S. colchesterensis* then reappears again in several late Virgilian coals sampled from a core drilled into a graben in southern Illinois. And finally, in examination of a core from Wabash County, Illinois, Peppers (personal communication, 1983, maceration 2474B) noted one poorly preserved spore tentatively assigned to *Schopfites* in the Davis Coal. He also reported to me that in nearby cores, samples of the Davis Coal (macerations 2475 and 2026A-C) did not yield this spore.

Thus at the present, palynological data do not conflict with my findings that the Dekoven and Davis Coals combine to form the Seelyville Coal. Palynologically these coals are similar, and according to Peppers (personal communication, 1983) cannot be differentiated where they merge to form the Seelyville.

PROPOSAL: A DUAL NOMENCLATURE

Proof that the Davis and Dekoven Coals are splits of the Seelyville Coal creates a problem of dual nomenclature. In the east-central part of the basin (on the eastern shelf and on top of the La Salle Anticlinal Belt) this coal has long been known as the Seelyville Coal. Southward, the separate Davis and Dekoven Coals are firmly established in nomenclature. Should one or more of these names be abandoned, or should all three be retained?

I propose that the dual nomenclature be retained, with the area in which the coal is called Seelyville restricted to the east central part of the Basin and separated by a vertical cutoff (fig. 12) from the Dekoven and Davis in the remainder of the Basin. In the deeper part of the basin, where more than 20 feet of clastic sediments separate the two coal beds, a member including both coals could not correctly be called a "coal." The code of stratigraphic nomenclature (North American Commission on Stratigraphic Nomenclature, 1983) requires that the lithic part of the name indicate the predominant or diagnostic lithology. Thus such a single unit, being mostly shale, would have to be referred to as the Seelyville Shale Member in the southern part of the basin.

On the eastern shelf and on top of the La Salle Anticlinal Belt, coal generally predominates because the split is much thinner. In half the area the split is less than a few inches thick, and it is difficult to distinguish the Dekoven and Davis Coals in the geophysical logs that provide most available subsurface information. So here the coal beds appropriately are treated as a single member.

It is standard stratigraphic practice, and part of the current code of stratigraphic nomenclature, to put arbitrary boundaries, called vertical cutoffs, between units where facies changes require a change in terminology. Future mapping should permit better definition of the line along which the major parting separating the coal begins to "pinch out," leaving essentially "one coal." This line should roughly bound the edge of the deep basin, and approximate the western flank

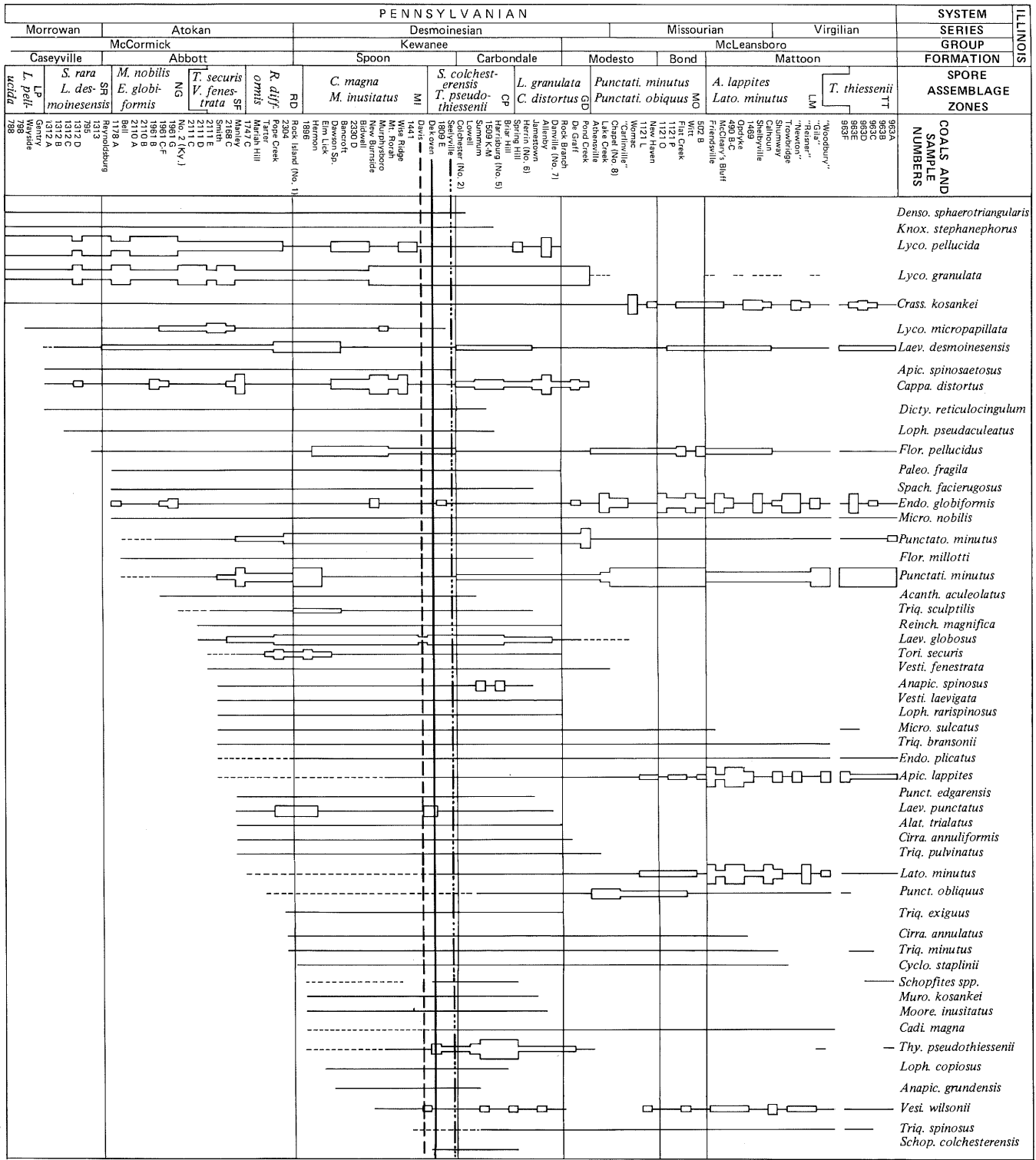


Figure 11 Ranges of important spore taxa found in the Seelyville, Dekoven and Davis Coal Members (from Peppers, 1984).

of the La Salle Anticlinal Belt. This study indicates that outside the deep basin, the coal is essentially a single unit. By priority this unit should be referred to as the Seelyville Coal. In the Fairfield Basin the coal is generally split by a thicker, regionally persistent parting; hence, each split of the coal should be considered a separate unit. In terms of priority, the names Dekoven and Davis should be retained for these two coals.

Until mapping confirms that the western and southern flank of the La Salle is indeed where the Seelyville "ends," I propose that the western and southern boundaries of the area mapped by C. G. Treworgy (1981) be considered the boundary (fig. 12). I recommend extending the southern boundary straight eastward into Indiana, recognizing that further mapping would probably shift the line southeastward along the shelf edge. North and east of this line only the Seelyville Coal Member (Spoon and Staunton Formations, Illinois and Indiana) should be recognized. South and west of this line, the terms Dekoven and Davis Coal Members (Illinois and Indiana) or coal beds (western Kentucky) should be applied.

SUMMARY AND CONCLUSIONS

This study was undertaken to determine the stratigraphic relationships of the Seelyville, Dekoven, and Davis Coals in the eastern part of the Illinois Basin. It is based on examination of 276 datum points, most of which (93%) are represented by subsurface geophysical logs. The remaining 7 percent were mostly coal test core descriptions and a few exposures in surface mines. From these data, a section consisting of seven subsections running roughly north-south to northeast-southwest were constructed. These subsections AA' through GG' were constructed by using an average spacing of one hole per mile.

Stratigraphic relationships

On the basis of this study, the following stratigraphic relationships are proposed.

The Davis Coal This coal is the most persistent of the three, and generally is the thickest. The Davis Coal is equivalent to the lower bench of the Seelyville Coal, not only in its type area in west-central Indiana, but also in east-central Illinois east of the La Salle Anticline. In the Fairfield Basin and Moorman Syncline, off the shelf, and in the La Salle Anticlinal Belt, the coal is characteristically overlain by a black, fissile marine shale that locally is succeeded by lenticular limestone.

The Dekoven Coal This coal is locally discontinuous, but persists regionally. In the southeastern part of the basin the Dekoven Coal is split into two beds separated by a parting of less than 1 foot to as much as 60 feet of shale or sandstone. Where this parting expands, the lower bed of the Dekoven Coal is only a few feet above the Davis Coal and is separated from it by only the marine black shale. The lower bed of the Dekoven Coal disappears on the depositional slope rising toward the top of the La Salle Anticlinal Belt and on the eastern shelf. The upper bench of the Dekoven Coal, though absent in places, continues up the slope and correlates with the upper bench of the Seelyville Coal of east central Illinois and Indiana.

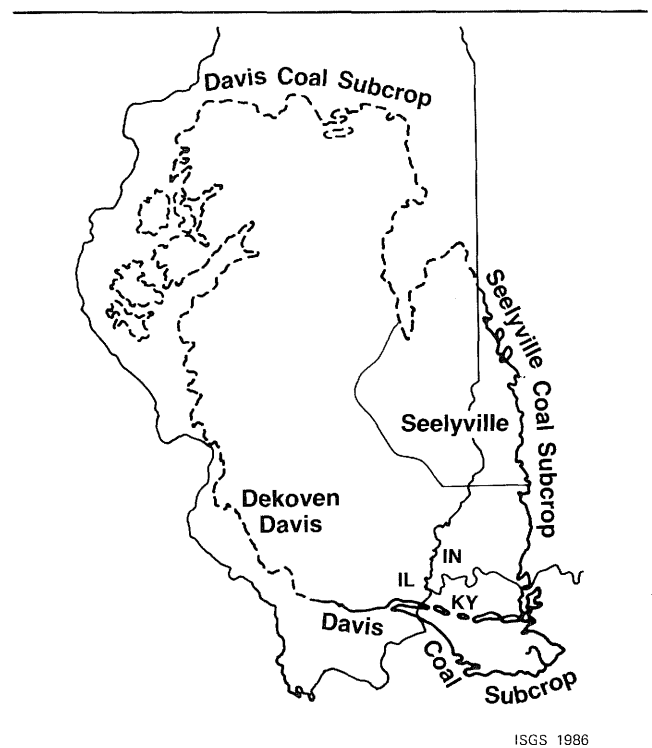


Figure 12 Location of proposed vertical cutoff line separating the coal into the Seelyville or Dekoven-Davis Coals. (Line adapted from boundary of C. G. Treworgy (1981).)

The Seelyville Coal This coal is fairly thick and extensive in east-central Illinois and west-central Indiana. It is split in many places by thin shale partings, one of which is persistent. This latter parting becomes more than 20 feet thick in parts of west-central Indiana and east-central Illinois. Southward, it becomes continuous, remaining as a clastic wedge 20 to 30 feet thick; locally it is as much as 100 feet thick. This parting separates the two benches of the Seelyville Coal, which are known as the Dekoven and Davis Coals in Illinois and Kentucky.

Recommendations

A vertical cutoff is needed to separate the area where the coal is treated as a single unit (the Seelyville Coal) from the area where two units, the Dekoven and Davis Coals, are recognized. Until a more precise boundary can be located, it is herein proposed that the southern and western edge of C. G. Treworgy's (1981) study area on the Seelyville Coal (fig. 12) be recognized as the cutoff.

REFERENCES

- Ashley, G.H., 1899, The coal deposits of Indiana: Indiana Department of Geology and Natural Resources, Annual Report 23, 1573 p.
- Ashley, G.H., 1909, Supplementary report to the report of 1898 on the coal deposits of Indiana: Indiana Department of Geology and Natural Resources, Annual Report 33, 150 p.
- Butts, C., 1925, Geology and mineral resources of the Equality-Shawneetown area (parts of Gallatin and Saline Counties): Illinois State Geological Survey Bulletin 47, 76 p.
- Cady, G.H., 1919, Coal resources of District V (Saline and Gallatin Counties): Illinois State Geological Survey Mining Investigations Bulletin 19, 135 p.
- Cady, G.H., 1942, Analysis of Illinois Coals: U.S. Bureau of Mines Technical Paper 641, p 1-23.
- Cady, G.H., 1952, Minable coal reserves of Illinois: Illinois State Geological Survey Bulletin 78, 138 p.
- Cady, G.H., M.B. Rolley, A. Karstrom, M.A. Parker, and M.E. Hopkins, 1955, Subsurface geology and coal resources of the Pennsylvanian System in Wabash County, Illinois: Illinois State Geological Survey Report of Investigations 183, 24 p.
- Cathey, J.B., Jr., 1955, Geology and mineral resources of the Newburg Quadrangle, Kentucky: Kentucky Geological Survey Bulletin 15, Series 9, 51 p.
- Clegg, K.E., 1965, Subsurface geology and coal resources of the Pennsylvanian System in Clark and Edgar Counties, Illinois: Illinois State Geological Survey Circular 380, 28 p.
- Fuller, M.L., and G.H. Ashley, 1902, Description of the Ditney Quadrangle: U.S. Geological Survey Geological Atlas Folio 84, 8 p.
- Glenn, L.C., 1912, Geology of Webster County: Kentucky Geological Survey Report of Progress for 1910 and 1911, Series 3, p 27.
- Glenn, L.C., 1922, A geological reconnaissance of the Trade-water River region, with special reference to the coal beds: Kentucky Geological Survey Bulletin 17, series 3, 75 p.
- Harrison, J.A., 1951, Subsurface geology and coal resources of the Pennsylvanian System in White County, Illinois: Illinois State Geological Survey Report of Investigations 153, 40 p.
- Hutchison, H.C., 1956, Distribution, structure, and mined areas of coals in Clay County, Indiana: Indiana Geological Survey Preliminary Coal Map No. 6.
- Hutchison, H.C., 1958, Geology and coal deposits of the Seelyville Quadrangle, Vigo County, Indiana: U.S. Geological Survey Coal Investigations Map C 27.
- Hutchison, H.C., 1959, Distribution, structure, and mined areas of coals in Spencer County, Indiana: Indiana Geological Survey Preliminary Coal Map No. 8.
- Hutchison, H.C., 1960, Geology and coal deposits of the Brazil Quadrangle, Indiana: Indiana Geological Survey Bulletin 16, 38 p.
- Hutchison, H.C., 1964, Distribution, structure, and mined areas of coals in Dubois County, Indiana: Indiana Geological Survey Preliminary Coal Map No. 10.
- Hutchison, H.C., 1971, Distribution, structure, and mined areas of coals in Daviess County, Indiana: Indiana Geological Survey Preliminary Coal Map No. 15.
- Jacobson, R.J., 1983, Stratigraphic correlations of Seelyville, De Koven, and Davis Coals (Desmoinesian) of Illinois Basin Coalfield [abs]: American Association of Petroleum Geologists Bulletin, v. 67, p. 1456.
- Jacobson, R.J., C.B. Trask, C.H. Ault, D.D. Carr, H.H. Gray, W.A. Hasenmueller, D. Williams, A.D. Williamson, 1985, Unifying nomenclature in the Pennsylvanian System of the Illinois Basin: Transactions of the Illinois State Academy of Science, v. 78, nos. 1-2, p. 1-11.
- Kosanke, R.M., 1950, Pennsylvanian spores of Illinois and their usage in correlation: Illinois State Geological Survey Bulletin 74, 128 p.
- Kosanke, R.M., J.A. Simon, H.R. Wanless, H.B. Willman, 1960, Classification of the Pennsylvanian strata of Illinois: Illinois State Geological Survey Report of Investigations 214, 84 p.
- Lee, W., 1916, Geology of the Shawneetown Quadrangle in Kentucky: Kentucky Geological Survey Bulletin, Series 4, v. 4, part 2, 73 p.
- Nelson, W.J., and D.K. Lumm, 1984, Structural geology of southeastern Illinois and vicinity: Illinois Geological Survey Contract/Grant Report 1984-2, 127 p.
- North American Commission on Stratigraphic Nomenclature, 1983, North American Stratigraphic Code: American Association of Petroleum Geologists Bulletin, v. 67, no. 5, p. 841-875.
- Owen, D.D., 1855, Geological Report, *in* Report of the President and directors to the stockholders of the Saline Coal and Manufacturing Company: T. Wrightson and Co., Cincinnati, 91 p.
- Owen, D.D., 1856, Report of the geological survey in Kentucky made during the years 1854 and 1855: Kentucky Geological Survey Bulletin, v. I, series 1, 416 p.
- Peppers, R.A., 1970, Correlation and palynology of coals in the Carbondale and Spoon Formations (Pennsylvanian) of the northeastern part of the Illinois Basin: Illinois Geological Survey Bulletin 93, 173 p.
- Peppers, R.A., and J.T. Popp, 1979, Stratigraphy of the lower part of the Pennsylvanian System in southeastern Illinois and adjacent portions of Indiana and Kentucky, *in* Palmer, J.E. and R.R. Dutcher [eds.], Depositional and structural history of the Pennsylvanian System of the Illinois Basin, Part 2, Invited papers: Illinois State Geological Survey Guidebook 15, p. 65-72.
- Peppers, R.A., 1984, Comparison of miospore assemblages in the Pennsylvanian System of the Illinois Basin with those in the upper Carboniferous of western Europe, *in* Sutherland, P.K., and W.L. Manger [eds.], Biostratigraphy, *Compte Rendu*, v. 2, Ninth International Congress of Carboniferous Stratigraphy and Geology, Urbana, Illinois, 1979, p. 483-502.
- Potter, P.E., 1956, Subsurface geology and coal resources of the Pennsylvanian System in Crawford and Lawrence Counties Illinois: Illinois State Geological Survey Report of Investigations 193, 17 p.

- Potter, P.E., 1963, Late Paleozoic sandstones of the Illinois Basin: Illinois State Geological Survey Report of Investigations 217, 92 p.
- Powell, R.L., 1968, Distribution, structure, and mined areas of coals in Parke County, and southern Vermillion County, Indiana: Indiana Geological Survey Preliminary Coal Map No. 13.
- Pullen, M.W., 1951, Gallatin County, *in* Cady G.H. et. al., Subsurface geology and coal resources of the Pennsylvanian System in certain counties of the Illinois Basin: Illinois State Geological Survey Report of Investigations 148, p. 69-95.
- Searight, T.K., 1979, The stratigraphy and sedimentation of the Abbott and lower portion of the Spoon Formations in the outcrop belt of southern Illinois, *in* Palmer, J.E., and Dutcher, R.R. [eds.], Depositional and Structural History of the Pennsylvanian System of the Illinois Basin, Part 2 Invited Papers: Illinois State Geological Survey Guidebook 15, p. 81-86.
- Shaver, R.H., A.M. Burger, G.R. Gates, H.H. Gray, H.C. Hutchison, S.J. Keller, J.B. Patton, C.B. Rexroad, N.M. Smith, W.J. Wayne, and C.E. Wier, 1970, Compendium of rock-unit stratigraphy in Indiana: Indiana Geological Survey Bulletin 43, 229 p.
- Smith, G.E., 1967, Pennsylvanian cross sections in western Kentucky, coals of the lower Carbondale Formation, Part 1: Kentucky Geological Survey Report of Investigations 6, Series X, 14 p.
- Smith, G.E., and R.A. Brant, 1980, West Kentucky coal resources map, No 6 (Davis) isopachous map: Kentucky Geological Survey and Kentucky Institute for Mining and Mineral Research.
- Smith, W.H., 1957, Strippable coal reserves of Illinois, Part 1—Gallatin, Hardin, Johnson, Pope, Saline, and Williamson Counties: Illinois State Geological Survey Circular 228, 39 p.
- Smith, W.H., 1958, Strippable coal reserves of Illinois, Part 2—Jackson, Monroe, Perry, Randolph, and St. Clair Counties: Illinois State Geological Survey Circular 260, 34 p.
- Treworgy, C.G., 1981, The Seelyville Coal: a major unexploited seam in Illinois: Illinois State Geological Survey Illinois Mineral Notes 80, 11 p.
- Treworgy, J.D., 1981, Structural features in Illinois—A compendium: Illinois State Geological Survey Circular 519, 22 p.
- Walker, F.H., R.E. Puryear, and J.B. Cathey Jr., 1951, Geology and mineral resources of the Henderson quadrangle, Kentucky: Kentucky Geological Survey Bulletin 7, series 9, 32 p.
- Wanless, H.R., 1931, Pennsylvanian cycles in Western Illinois: in papers presented at the quarter centennial celebration of the Illinois State Geological Survey: Illinois State Geological Survey Bulletin 60, p. 179-193.
- Wanless, H.R., 1939, Pennsylvanian correlations in the Eastern Interior and Appalachian coal fields: Geological Society of America Special Paper 17, 130 p.
- Wanless, H.R., 1956, Classification of the Pennsylvanian rocks of Illinois as of 1956: Illinois State Geological Survey Circular 217, 14 p.
- Wanless, H.R., 1957, Geology and mineral resources of the Beardstown, Glasford, Havana, and Vermont Quadrangles: Illinois State Geological Survey Bulletin 82, 223 p.
- Wier, C.E., 1952, Distribution, structure, and mined areas of coals in Vigo County, Indiana: Indiana Geological Survey Preliminary Coal Map No. 1.
- Wier, C.E., 1953, Distribution, structure, and mined areas of coals in Sullivan County, Indiana: Indiana Geological Survey Preliminary Coal Map No. 2.
- Wier, C.E., and J.T. Stanley, 1953, Distribution, structure, and mined areas of coals in Pike County, Indiana: Indiana Geological Survey Preliminary Coal Map No. 3.
- Wier, C.E., and R.L. Powell, 1967, Distribution, structure, and mined areas of coals in Knox County, Indiana: Indiana Geological Survey Preliminary Coal Map No. 12.
- Willman, H.B., E. Atherton, T.C. Buschbach, C. Collinson, J.C. Frye, M.E. Hopkins, J.A. Lineback, and J.A. Simon, 1975, Handbook of Illinois stratigraphy: Illinois State Geological Survey Bulletin 95, 261 p.
- Williams, D.A., A.D. Williamson, and J.G. Beard, 1982, Stratigraphic framework of coal-bearing rocks in the Western Kentucky Coal Field: Kentucky Geological Survey Information Circular 8, Series XI, 201 p.
- Winslow, M.R., 1959, Upper Mississippian and Pennsylvanian megaspores and other plant microfossils from Illinois: Illinois State Geological Survey Bulletin 86, 135 p.

APPENDIX A. LISTING OF ALL DATA UTILIZED

County	County Number	Section	Township	Range	Quarter in Section	Surface Elevation	Type of Log**	Company Name	Farm Name
Gallatin	3398	19	10S	9E	NE NE SW	436.3'	CR	Peabody Coal Co.	Eagle Strip
*Gallatin	2091	17	10S	9E	SE SW SW NE	376.4'	CR	Stonefort Coal Corp.	
Gallatin	2167	17	10S	9E	NE NW NW	410.0'	CR	Bransford Mining Corp.	
Gallatin	2081	9	10S	9E	SE SW NE	434.5'	CR	Stonefort Coal Corp.	Logsdon
Gallatin	2119	11	10S	9E	SW SW NE	362.5'	CR	Stonefort Coal Corp.	Richardson
Gallatin	2163	11	10S	9E	NW NW NE	370.0'	CR	Bransford Mining Corp.	
Gallatin	2545	1	10S	9E	SW SE NW	345.0'	CR	Stonefort Coal Corp.	
Gallatin	1152	25	9S	9E	NE NW SW SE	360.0'	CR	Union Colliery	Wiederhold
*Gallatin	1918	25	9S	9E	NE NE SW	368.0'	EL	Lee LaBrot	Myra E. Wiederhold
Gallatin	1059	23	9S	9E	SE SE SE	377.0'	EL	Ashland Oil & Refining Co.	A. Wisehart #1
Gallatin	1128	23	9S	9E	NW NW NE	455.5'	CR	Union Colliery Co.	
Gallatin	2080	13	9S	9E	SE NW SE	422.0'	EL	Waterfloods, Inc.	Logsdon #3
Gallatin	1056	13	9S	9E	SW NE NE	455.0'	EL	Ryan Oil Co.	Thomas Logsdon #
*Gallatin	23857	11	9S	9E	NE NE SW	363.0'	GD	J. D. Turner	Helen W. Peoples #1
Gallatin	2017	1	9S	9E	SE SW SE	365.0'	EL	Sun Oil Co.	L. L. Miller #1-B
Gallatin	1639	1	9S	9E	SW NE NW	358.0'	EL	W. C. McBride, Inc.	Myrtle Crane #2
Gallatin	1575	35	8S	9E	SE SE SE	357.0'	EL	Felmont Oil Corp.	Fannie Drone et al. #1
*Gallatin	1394	35	8S	9E	SE SE NE	381.0'	EL	George S. Engle	Maloney #2
Gallatin	785	25	8S	9E	NW SW SE	373.0'	EL	George S. Engle	Pearl Pohlman
Gallatin	1932	25	8S	9E	NE NE NE	382.0'	EL	W. O. Lucas	Hannah Duffy #1
Gallatin	1801	19	8S	10E	NW SW NE	364.0'	EL	R. O. Wilson, II	John Frey et al.
Gallatin	271	17	8S	10E	SW SW SW	347.0'	EL	Oil Management, Inc.	Egyptian Tie & Timber #A-1
Gallatin	2114	17	8S	10E	SE SE NE	350.0'	EL	National Assoc. Petr. Co.	Gray Estate #1
Gallatin	1729	8	8S	10E	NE SE NE	349.0'	EL	Olen D. Sharp	C. H. Hughs #1
*Gallatin	2605	5	8S	10E	SE NW SW	351.0'	EL	National Assoc. Petr. Co.	Humble Dodge
*Gallatin	2109	6	8S	10E	NE NW NW	370.0'	EL	Q. B. Mitchell	Short #4
Gallatin	1968	31	7S	10E	NW SE SE	370.0'	EL	Slagter Producing Co.	Givens #2
*Gallatin	2975	32	7S	10E	NE NW NW	355.0'	EL	Ray Bianucci	Lightner #1
Gallatin	560	29	7S	10E	SE SE SE	355.0'	EL	Coy Oil Co.	J. W. Bayley et al. #1
*Gallatin	2972	29	7S	10E	NE NW NW	368.0'	EL	Ashland Oil & Refining Co.	Lula Egli #3
Gallatin	3197	20	7S	10E	NW SW SE	424.0'	EL	Kirk Drilling Co.	Dorcie Medlin
Gallatin	2201	21	7S	10E	SE NW NW	350.0'	EL	T. W. George	H. C. Ford Estate
*White	2100	17	7S	10E	NE SE SE	354.0'	EL	Herndon Drlg. Co.	Sparrow #1
White	7040	17	7S	10E	SE NW NW	355.0'	EL	Clark and Clark	Felix W. Arnold
White	7027	7	7S	10E	SE SE NW	366.0'	EL	Clark and Clark	Wilson A. Upchurch
*White	1882	12	7S	9E	NE NE SE	451.0'	EL	Paul J. McIntyre	Mills #1
White	1295	2	7S	9E	NW SE NE	492.0'	EL	Clarence E. Brehm	Dagleg #B-1
White	1062	36	6S	9E	NE SW SW	454.0'	EL	T. Blake Dirkson	Grant #1
White	3019	36	6S	9E	S/2 NE NW	412.0'	EL	Lohmann Johnson Drlg.Co.,Inc.	William Questoll #1
White	6234	25	6S	9E	SW NW SE	398.0'	EL	Eastern Petr. Co.	Lee Edwards #1
White	2059	24	6S	9E	NW NW SE	370.0'	EL	Central Oil Prod.	M. E. Brown #1
White	3907	24	6S	9E	NE NE NW	368.0'	EL	Richard C. Davoust	Della Garrison #1
White	6060	13	6S	9E	SW SE NW	384.0'	EL	Papoose Oil Co.	E. T. Forrester #4A
*White	3006	13	6S	9E	NE NE NW	383.0'	EL	Sinclair Oil & Gas Co.	A. S. Rudolph #19
*White	3366	12	6S	9E	NW SW NE	392.0'	GD&EL	Sinclair Oil & Gas Co.	E. H. Morris #14
White	7611	1	6S	9E	NE SW SE	408.0'	GD&EL	Sinclair Oil & Gas Co.	J. R. Stephens #S-1

IN CONSTRUCTING DETAILED CROSS SECTIONS IN PLATE 1, SECTION AA'

Houchin Creek Coal		Survant Coal		Colchester Coal		De Koven Coal		Lower Split of De Koven Coal		Davis Coal	
Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
--	--	--	--	--	--	45'	391.3'			67'	369.3'
224'	152.4'	265'	111.4'	320'	56.4'	372'	4.4'			393'	-16.6'
255'	155'	294'	116'	347'	63'	403'	7'			425'	-15'
236'	198.5'	280'	154.5'	338'	96.5'	383'	51.5'			408'	26.5
672'	-309.5'	712'	-349.5'	767'	-404.5'	822'	-459.5			846'	-483.5'
660'	-290'	704'	-334'	757'	-387'	807'	-437'			835'	-465'
225'	120'	270'	75'	328'	17'	387'	-42'			405'	-60'
190'	170'	244'	116'	300'	60'	355'	5'			383'	-23'
254'	114'	308'	60'	364'	4'	424'	-56'			450'	-82'
430'	-53'	482'	-105'	545'	-168'	608'	-231'			640'	-263'
408'	46.5'	460'	-4.5'	520'	-64.5'	578'	-122.5'			605'	-149.5'
497'	-75'	548'	-126'	600'	-178'	656'	-234'			686'	-264'
435'	20'	496'	-41'	554'	-99'	610'	-155'			642'	-187'
675'	-312'	733'	-370'	797'	-434'	856'	-493'			886'	-523'
475'	-110'	527'	-162'	586'	-221'	644'	-279'			670'	-305'
506'	-148'	575'	-217'	620'	-262'	686'	-328'			712'	-354'
550'	-193'	592'	-235'	650'	-293'	720'	-363'			747'	-390'
565'	-184'	598'	-217'	661'	-280'	733'	-352'			758'	-377'
615'	-242'	657'	-284'	out		786'	-413'			808'	-435'
550'	-168'	585'	-203'	out		731'	-349'			754'	-372'
526'	-162'	578'	-214'	out		710'	-346'			734'	-370'
500'	-153'	542'	-195'	out		782'	-435'			804'	-457'
525'	-175'	569'	-219'	630'	-280'	705'	-355'			728'	-378'
660'	-311'	694'	-345'	745'	-396'	802'	-453'			828'	-479'
586'	-235'	636'	-285'	681'	-330'	745'	-394'			767'	-416'
672'	-302'	720'	-350'	770'	-400'	820'	-450'	830'	-460'	846'	-476'
635'	-265'	678'	-308'	725'	-355'	783'	-413'	791'	-421'	806'	-436'
--	--	--	--	733'	-378'	790'	-435'	801'	-446'	815'	-460'
615'	-260'	652'	-297'	701'	-346'	762'	-407'	777'	-422'	790'	-435'
700'	-332'	727'	-359'	790'	-422'	832'	-464'	857'	-489'	866'	-498'
762'	-338'	791'	-367'	855'	-431'	897'	-473'	923'	-499'	936'	-512'
690'	-340'	723'	-373'	788'	-438'	838'	-488'	864'	-514'	870'	-520'
720'	-366'	758'	-404'	815'	-461'	859'	-505'	882'	-528'	890'	-536'
788'	-433'	810'	-455'	873'	-518'	903'	-548'	940'	-585'	945'	-590'
864'	-498'	880'	-514'	940'	-574'	976'	-610'	1004'	-638'	1015'	-649'
986'	-535'	1000'	-549'	1060'	-609'	1095'	-644'	1140'	-689'	1147'	-696'
924'	-432'	950'	-458'	997'	-505'	1040'	-548'	1069'	-577'	1075'	-583'
1170'	-716'	1200'	-746'	1246'	-792'	1290'	-836'	--	--	1322'	-868'
1164'	-752'	1193'	-781'	1240'	-828'	1281'	-869'	1312'	-900'	1318'	-906'
1143'	-745'	1172'	-774'	1215'	-817'	1264'	-866'	1294'	-896'	1299'	-901'
850'	-480'	885'	-515'	930'	-560'	975'	-605'	999'	-629'	1004'	-634'
865'	-497'	886'	-518'	968'	-600'	1000'	-632'	1032'	-664'	1038'	-670'
915'	-531'	930'	-546'	1010'	-626'	1037'	-653'	1062'	-678'	1070'	-686'
923'	-540'	937'	-554'	1005'	-622'	1036'	-653'	1068'	-685'	1073'	-690'
942'	-550'	958'	-566'	1025'	-633'	1055'	-663'	1084'	-692'	1090'	-698'
970'	-562'	990'	-582'	1049'	-641'	1083'	-675'	1104'	-696'	1108'	-700'

APPENDIX B. LISTING OF ALL DATA UTILIZED

County	County Number	Section	Township	Range	Quarter in Section	Surface Elevation	Type of Log**	Company Name	Farm Name
*White	2547	36	5S	9E	NW NW SE	459.0'	EL	Athene Development Co.	George Staley #1
White	3342	26	5S	9E	SE SW SE	376.0'	EL	Royal Oil & Gas Corp.	Robert Niekamp #6
White	1716	27	5S	9E	SE SE NW	385.0'	EL	Arrow Drilling Co.	Pershy Howell #1
White	1720	22	5S	9E	SE SE NE	397.0'	EL	Keystone Oil Co.	Emily Moore #1
White	28548	22	5S	9E	SW NE NW	432.0'	GD	Basins Surveys, Inc.	
*White	28436	15	5S	9E	NW SE SW	444.0'	GD	C. E. Brehm Drlg. & Prdg.	William F. Reinwald et al.
*White	5016	16	5S	9E	NE NE NW	463.0'	EL	Mark Twain Oil Prod. Co.	Herbert Huebele #1
White	2853	9	5S	9E	NW NE SE	457.0'	EL	Southern Triangle Oil	Roy Vanaradel #1
White	772	9	5S	9E	SW NW NE	444.0'	EL	Skelly Oil Co.	Mary Ann Gillihan #1
White	2034	8	5S	9E	SE SE NW	430.0'	EL	Paco Petro. Co.	C. Conger #1
White	C-2	8	5S	9E	SE NW NW	398.0'	GD	Amax Coal Co.	Winter #1
White	2393	6	5S	9E	NE NE SE	408.0'	EL	IN Farm Bur. Coop. Assoc.	W. Williams
*White	3072	6	5S	9E	NW NW NW	384.0'	EL	National Assoc. Petro. Co.	Alma Matz
White	7805	36	4S	8E	SW NE NW	385.0'	EL	National Assoc. Petro. Co.	Fred Wicker Est. #1
White	29179	35	4S	8E	NW NW SW	385.0'	G	C. E. Brehm Drlg. & Prdg.	
White	28467	34	4S	8E	NW NE SW	385.0'	EL	R. K. Petro. Corp.	Continental Bank
White	7523	33	4S	8E	NW NW NW	389.0'	EL	C. E. Brehm Drlg. & Prdg. Co.	Herman Williams #1
White	28387	28	4S	8E	N C SE SW	395.0'	EL	Perry Fulk	W. L. Lewis #1
White	28630	27	4S	8E	NE NE SE	361.0'	EL	R. K. Petro. Corp.	Claire Williams #1
White	28670	26	4S	8E	NE SE NW	384.0'	EL	R. K. Petro. Corp.	Rosa Fleck et al. #1
White	29186	26	4S	8E	NW NE SE	396.0'	GD	C. E. Brehm Drlg. & Prdg.	Pearce Estate #1
White	29177	23	4S	8E	NE SE SE	376.0'	G	R. K. Petro.	McKinney et al. #3
White	29178	24	4S	8E	NW NW SW	383.0'	GD	C. E. Brehm Drlg. & Prdg.	Fechtig #A1
*White	7220	24	4S	8E	SW SE SE	380.0'	EL	Shulman Brothers	R. Barbre #1
White	7145	24	4S	8E	SE NW SE	383.0'	EL	Shulman Brothers	Stocke Heirs #1
White	29046	13	4S	8E	NE NW SE	381.0'	GD	C. E. Brehm Drlg. & Prdg.	Crebs #5
White	793	13	4S	8E	NW NE NE	382.0'	EL	Carter Oil Co.	John M. Crebs
*White	28901	12	4S	8E	NE SW NE	421.0'	GD	Ashland Exploration	H. T. Upton
*White	29005	1	4S	8E	SW SW NE	385.0'	EL	R. K. Petro. Corp.	Gray Trust "A" Lse. #2
White	205	36	3S	8E	SE SW NE	388.0'	EL	A. C. Burger et al.	M. Kramer #1
White	1149	25	3S	8E	SE SE SE	422.0'	EL	National Assoc. Petro. Co.	Charles Stahl et al. #1
*White	29416	25	3S	8E	NE NE SE	418.0'	GD	Amax Coal Co.	#C1-31
*White	2564	25	3S	8E	NE NW SW	388.0'	EL	Skiles Oil Corp.	Clarence Blackford #1
White	7182	19	3S	9E	SW SW SW	455.0'	EL	Peake Petro. Co.	Glenn O'Dell #1
*White	3593	20	3S	9E	SW SW SE	432.0'	EL	The Nation Oil Co.	Harry Pollard #1
White	945	21	3S	9E	SE SW SE	392.0'	EL	Texas Co.	J. Hancock Life Ins. Co.#4
White	1848	22	3S	9E	SW NW NW	386.0'	EL	Calvert Drlg., Inc.	E. Granger #1
White	1883	23	3S	9E	SE SE SE	389.0'	EL	Sun Oil Co.	Robert P. Williams #1
White	2148	19	3S	10E	SW SW SE	382.0'	EL	George S. Engle	Casabier #1
*White	2600	19	3S	10E	SE NE SW	377.0'	EL	George S. Engle	Henry Davis et al. #1
White	1024	19	3S	10E	NW NE NW	383.0'	EL	Magnolia Petro. Co.	John A. Puntney #1

APPENDIX C. LISTING OF ALL DATA UTILIZED

County	County Number	Section	Township	Range	Quarter in Section	Surface Elevation	Type of Log**	Company Name	Farm Name
White	1024	19	3S	10E	NW NE NW	383.0'	EL	Magnolia Petroleum	John A. Puntney #1
*White	2681	20	3S	10E	NE SW NE	383.0'	EL	R. K. Petroleum Co.	Annie Robinson et al. #1
White	3226	21	3S	10E	NW NW NE	366.0'	EL	Ralph Halbert	W. F. Ridenour #1
*White	2871	22	3S	10E	NW SE NW	388.0'	EL	Calvin Oil Company	Walter L. Curtis #3
*White	8025	23	3S	10E	SE NE SW	425.0'	GD,EL	Mobil Oil Corp.	West Grayville Unit #16
White	2285	24	3S	10E	NE NW SE	426.0'	EL	National Ass. Petr. Co.	Nellie Hortin #1
*White	3810	19	3S	11E	NW NW NW	416.0'	EL	Coy Oil Co.	Nellie Hortin #1
White	3835	19	3S	14W	SW SW SW	397.0'	EL	Lee G. Miller	Charlie Brechner #1
White	7319	20	3S	14W	SW SW NW	400.0'	EL	Max Reese	Walter Woodham #1
White	3842	20	3S	14W	NW SE NE	411.0'	EL	S. C. Yingling	Clevelin #1
White	583	21	3S	14W	SW NE SW	462.0'	EL	P. E. Tipton	F. Valley Estate #1
Wabash	5702	21	3S	14W	SE SE NE	374.0'	EL	LuBoil	Helm #86
Wabash	4990	22	3S	14W	SE NW NE	370.0'	EL	LuBoil	Helm #65
*Wabash	5011	23	3S	14W	SW NE NW	375.0'	GD,EL	LuBoil	Edith Holm #53x
*Wabash	2264	14	3S	14W	NW SE SW	372.0'	EL	Sohio Petroleum Co.	Updegraff "A" #39
Wabash	4956	15	3S	14W	SE NE SE	377.0'	EL	Coy Oil Inc.	Mary G. Kerwin #13
Wabash	4962	15	3S	14W	NE NW NE	372.0'	EL	Coy Oil Inc.	Dorothy UpDeGraff #1
Wabash	4938	11	3S	14W	SE SE NW	370.0'	EL	Victor R. Gallagher	Wm. Dunn #7
*Wabash	4889	35	2S	14W	NW SW NE	382.0'	EL	V. R. Gallagher	Broster #2
Wabash	2944	36	2S	14W	NW SW NW	379.0'	EL	R. K. Petroleum Corp.	Kurtz #W-7
Wabash	2451	25	2S	14W	SW SE NW	400.0'	EL	Pioneer Oil Co.	Lambert, Nobil Comm. #1
*Wabash	5586	24	2S	14W	NE SE SW	400.0'	GD,EL	Southern Triangle Oil Co.	H. W. Bosecker #2
Wabash	4882	24	2S	14W	NW SE NE	403.0'	EL	National Drilling Co. Inc.	Chas. Raber Comm. #3
Wabash	2294	13	2S	14W	NE SE SE	412.0'	EL	H. Carroll Bagler	D. Guisewitte #1
Wabash	1421	13	2S	14W	NW SW NW	407.0'	EL	Arvin Drilling Co.	Walter Bosecker #1
Wabash	26044	12	2S	14W	SW SW SW	403.8'	CR	Amax Coal Co.	
Wabash	344	12	2S	14W	NW NW SW	403.0'	EL	Bennett Bros.	Henze #1
Wabash	5088	12	2S	14W	NE NE NW	401.0'	EL	National Ass. Petr. Co.	Elizabeth Frese Trust #1
Wabash	4864	1	2S	14W	SW NE SW	410.0'	EL	Geo & Wrather Oil	Martha Brown #12
Wabash	25989	6	2S	13W	SW NE NW	434.0'	CR	Amax Coal co.	Epler
Wabash	5133	6	2S	13W	NW SE NW	413.0'	EL	National Ass. Pet. Co.	Frese-Epler Unit #4
Wabash	4529	5	2S	13W	NE NW NW	479.0'	EL	C. E. Skiles	Ralph Ewald

IN CONSTRUCTING DETAILED CROSS SECTIONS IN PLATE 1, SECTION BB'

Houchin Creek Coal		Survant Coal		Colchester Coal		De Koven Coal		Lower Split of De Koven Coal		Davis Coal	
Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
1058'	-599'	1082'	-623'	1134'	-675'	1162'	-703'	1192'	-733'	1197'	-738'
1037'	-661'			1100'	-724'	1100'	-769'	1193'	-817'	1198'	-822'
1135'	-750'			1202'	-817'	1243'	-858'	1279'	-894'	1283'	-898'
1146'	-749'			1206'	-809'	1244'	-847'	out		1296'	-899'
1208'	-776'	1230'	-798'	1280'	-848'	1308'	-876'	1352'	-920'	1358'	-926'
1238'	-794'	1256'	-812'	1298'	-854'	1337'	-893'	1382'	-938'	1390'	-946'
1065'	-602'	1094'	-631'	1157'	-694'	1182'	-719'	1215'	-752'	1220'	-757'
1054'	-597'			1138'	-681'	1167'	-710'	1213'	-756'	1218'	-761'
1068'	-624'			1154'	-710'	1186'	-742'			1230'	-786'
1066'	-636'	1090'	-660'	1150'	-720'	1178'	-748'	1212'	-782'	1218'	-780'
1052'	-654'	1073'	-675'	1128'	-730'	1162'	-764'	1198'	-800'	1202'	-804'
1085'	-677'	1108'	-700'	1160'	-752'	1193'	-785'	1230'	-822'	1234'	-826'
1052'	-668'	1070'	-686'	1118'	-734'	1160'	-776'	1183'	-799'	1205'	-821'
1120'	-735'	1145'	-760'	1200'	-815'	1236'	-851'	1268'	-883'	1278'	-893'
1138'	-753'			1225'	-840'	1258'	-873'	1286'	-901'	1298'	-913'
1110'	-725'	1137'	-752'	1192'	-807'	1242'	-857'	1272'	-887'	1283'	-898'
1130'	-741'	1154'	-765'	1208'	-819'	1247'	-858'	1280'	-891'	1307'	-918'
1160'	-765'	1187'	-792'	1241'	-846'	1285'	-890'	1308'	-913'	1332'	-937'
1129'	-768'	1156'	-795'	1213'	-852'	1254'	-893'	1282'	-921'	1292'	-931'
1120'	-736'	1150'	-766'	1210'	-826'	1238'	-854'	1263'	-879'	1272'	-888'
1108'	-712'	1132'	-736'	1184'	-788'	1218'	-822'	1240'	-844'	1270'	-874'
1110'	-734'			1180'	-804'	1210'	-834'	1236'	-860'	1260'	-884'
1130'	-747'	1148'	-765'	1198'	-815'	1228'	-845'			1268'	-885'
1125'	-745'	1146'	-766'	1200'	-820'	1240'	-860'	1270'	-890'	1281'	-901'
1128'	-745'	1152'	-769'	1200'	-817'	1238'	-855'	1268'	-885'	1277'	-894'
1142'	-761'	1160'	-779'	1214'	-833'	1259'	-878'	1281'	-900'	1289'	-908'
1120'	-738'	1140'	-758'	1193'	-811'	1237'	-855'	1284'	-902'	1292'	-910'
1190'	-769'			1262'	-841'	1280'	-859'	1345'	-924'	1350'	-929'
1155'	-770'	1184'	-799'	1248'	-863'	1268'	-883'	1327'	-942'	1333'	-948'
1184'	-796'	1212'	-824'	1268'	-880'	1310'	-922'			1363'	-975'
1206'	-784'	1230'	-808'	1288'	-866'	1322'	-900'			1379'	-957'
1200'	-782'	1223'	-805'	1270'	-852'	1302'	-884'	1362'	-944'	1366'	-948'
1172'	-784'	1198'	-810'	1246'	-858'	1296'	-908'	1337'	-949'	1343'	-955'
1210'	-755'	1235'	-780'	1277'	-822'	1308'	-853'			1387'	-932'
1173'	-741'	1195'	-763'	1245'	-813'	1270'	-838'			1366'	-934'
1128'	-736'	1148'	-756'	1200'	-808'	1222'	-830'			1291'	-899'
1114'	-728'	1137'	-751'	1187'	-801'	1218'	-832'			1285'	-899'
1130'	-741'	1156'	-767'	1206'	-817'	1238'	-849'			1308'	-919'
1096'	-714'	1109'	-727'	1156'	-774'	1202'	-820'			1260'	-878'
1098'	-721'	1108'	-731'	1158'	-781'	1202'	-825'			1257'	-880'
1094'	-711'	1118'	-735'	1170'	-787'	1195'	-812'			1265'	-882'

IN CONSTRUCTING DETAILED CROSS SECTIONS IN PLATE 1, SECTION CC'

Houchin Creek Coal		Survant Coal		Colchester Coal		De Koven Coal		Lower Split of De Koven Coal		Davis Coal	
Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
1094'	-711'	1118'	-735'	1170'	-787'	1195'	-812'			1265'	-882'
1077'	-694'	1102'	-719'	1160'	-777'	1178'	-795'			1241'	-858'
1030'	-664'	1040'	-674'	1107'	-741'	1130'	-764'	1165'	-799'	1185'	-819'
1015'	-627'	1031'	-643'	1090'	-702'	1110'	-722'	1172'	-784'	1185'	-797'
1006'	-581'	1048'	-623'	1076'	-651'	1100'	-675'			1164'	-739'
1050'	-624'	1068'	-642'	1124'	-698'	1146'	-720'			1202'	-776'
1048'	-632'			1130'	-714'	out				1196'	-780'
1015'	-618'	1032'	-635'	1097'	-700'	out				1158'	-761'
1008'	-608'	1025'	-625'	1089'	-689'	out				1161'	-761'
992'	-581'			1090'	-679'	out				1142'	-731'
1132'	-670'	1156'	-694'	1205'	-743'	out				1280'	-818'
1013'	-639'	1044'	-670'	1081'	-707'	out				1184'	-810'
943'	-573'	965'	-595'	1011'	-641'	out				1086'	-716'
915'	-540'	946'	-571'	992'	-617'	out				1046'	-671'
924'	-552'	942'	-570'	1005'	-633'	out				1055'	-683'
942'	-565'	958'	-581'	1020'	-643'	out				1085'	-708'
940'	-568'	960'	-588'	1022'	-650'	out				1093'	-721'
910'	-540'	941'	-571'	994'	-624'	out				1075'	-705'
934'	-552'	956'	-574'	1020'	-638'	out				1086'	-704'
907'	-528'	930'	-551'	1000'	-621'	out				1045'	-666'
906'	-506'	928'	-528'	999'	-599'	out				1045'	-645'
910'	-510'			980'	-580'	out				1055'	-655'
910'	-507'			980'	-577'	out				1064'	-661'
940'	-528'			995'	-583'	out				1074'	-662'
946'	-539'			1010'	-603'	out				1082'	-675'
				1010'	-606.2'	out				1077'	-673.2'
953'	-550'			1026'	-623'	out				1093'	-690'
920'	-519'			986'	-585'	out				1069'	-668'
938'	-528'	950'	-540'	1015'	-605'	1034'	-624'			1065'	-655'
				1019'	-585'					1049'	-1049'
920'	-507'	929'	-516'	992'	-579'	1008'	-595'			1030'	-617'
1024'	-545'	1034'	-555'	1088'	-609'	1100'	-621'			1134'	-655'

APPENDIX C. LISTING OF ALL DATA UTILIZED

County	County Number	Section	Township	Range	Quarter in Section	Surface Elevation	Type of Log**	Company Name	Farm Name
*Wabash	4547	5	2S	13W	SW NE NE	411.0'	EL	Skiles Oil Corp.	Joachim B-7
Wabash	4504	4	2S	13W	NW SW NW	411.0'	EL	National Drilling Co. Inc.	A. P. Bump #1
Wabash	2759	4	2S	13W	SE SE SE	402.0'	EL	F. B. Drilling Co.	Bucholz #1
Wabash	5081	9	2S	13W	SW SE NE	420.0'	EL	T. W. George	Bucholz #2
Wabash	5906	10	2S	13W	NW SW SW	418.7'	CR,GD	Amax Coal Co.	
Wabash	5912	10	2S	13W	NW SW NE	412.0'	GD,CR	Amax Coal Co.	
Wabash	4494	3	2S	13W	SE SE SE	410.0'	EL	V. R. Gallagher	Lovellette #1
Wabash	5900	2	2S	13W	NW NW SW	441.0'	CR,GD	Amax Coal Co.	
Wabash	1492	35	1S	13W	SW SW SW	414.0'	EL	Illinois Midcontinent Co.	C. G. Morris #2
Wabash	5799	35	1S	13W	SW NW NW	422.0'	EL	Andy G. Hocking	Hocking-Seiler #4
Wabash	2638	26	1S	13W	NW SE NE	451.0'	EL	Skiles Oil Corp.	Lowell E. Seiler #1
*Wabash	5650	23	1S	13W	NW NE SW	417.0'	EL	South Triangle Oil Co.	Grace Seitz et al. #1
Wabash	4326	23	1S	13W	SW NW NE	437.0'	EL	Gilliam Drilling Co.	Lewis Hockgeiger #1
Wabash	1995	13	1S	13W	NW SW SW	460.0'	EL	Ralph C. Halbert	Ernest Chapman #1
*Wabash	2393	12	1S	13W	SE NE SW	470.0'	EL	Alva C. Davis	C. S. Sharp #1
Wabash	1701	12	1S	13W	NW NW NE	482.0'	EL	Oil Management Inc.	Hudging #1
Wabash	1938	1	1S	13W	SE SW NE	462.0'	EL	Oil Management Inc.	Frank Dardeen #1
Wabash	1818	31	1N	12W	SE NW SW	454.0'	EL	George S. Engle	Aloys Trapp #1
Wabash	26238	30	1N	12W	SW SE SE	423.0'	EL	Jack E. Small	Robert Steckler #2
*Wabash	26345	30	1N	12W	NW NW NE	414.0'	EL	Higgins Oil Co.	William Trapp #1
*Wabash	3707	19	1N	12W	NW SW SE	430.0'	EL	The West Drilling Co.	The West Drilling Co. #1
*Wabash	2455	19	1N	12W	NE NE SE	415.0'	EL	The West Drilling Co.	The West Drilling Co. #3
Wabash	610	20	1N	12W	NW NE SW	414.0'	EL	George S. Engle	Clifton Wood #7
Wabash	2403	20	1N	12W	SE SE NE	413.0'	EL	Fitch Bros. Oil Co.	V. M. Reed #1
Wabash	2516	16	1N	12W	NE SE SE	473.0'	EL	R. W. Kuzmich	Gentry Adams et al. #1
Wabash	2479	16	1N	12W	NE SE SE	439.0'	EL	Triangle Oil Co.	John H. Doare #1
*Wabash	5109	10	1N	12W	SW SW NE	503.0'	EL	Charles E. Carr	Price Heirs #1
Wabash	3242	3	1N	12W	SE SW NW	514.0'	EL	J. S. Young Jr.	Lucy Courter #0-2
Wabash	3243	3	1N	12W	NW SE NW	509.0'	EL	J. S. Young Jr.	Lucy Courter W-1
Wabash	2823	34	2N	12W	NE NE NW	480.0'	EL	Joan Petr. Co.	H. E. Earnest #1
Wabash	412	34	2N	12W	NW NE NE	448.0'	EL	Warren Wright Co.	Mary Hershey #2
Wabash	416	34	2N	12W	SE NE NE	480.0'	EL	M. C. Freeman	Tanguary #3
Wabash	5061	35	2N	12W	NW NE NW	449.0'	EL	Delbert H. Runyon	R. L. Hershey #1
Lawrence	324	26	2N	12W	SE SE SW	451.0'	EL	Gopher Drilg. Co.	R. M. Shaw #1
Lawrence	5240	26	2N	12W	NW NE NE	424.0'	EL	Kelley, Conrad & Kaye	Vanwey-Seibert Comm. #1
Lawrence	260	23	2N	12W	SE SE NW	439.0'	EL	Wm. D. Flynn	Max Spidel #1
*Lawrence	1355	14	2N	12W	SE SE NW	430.0'	EL	Eddie McGuire	City of Mt. Carmel #1
Lawrence	6478	14	2N	12W	C NE NW	430.0'	GD,EL	Mark M. Fleming	City of Mt. Carmel #1CT
Lawrence	7298	11	2N	12W	NW NE SW	442.0'	GD,EL	Joe W. Cook	P. Youn #1
Lawrence	27583	2	2N	12W	SW SE NW	493.0'	GD	Marathon Oil Co.	J. B. Kerr

APPENDIX D. LISTING OF ALL DATA UTILIZED

County	County Number	Section	Township	Range	Quarter in Section	Surface Elevation	Type of Log**	Company Name	Farm Name
Lawrence	27583	2	2N	12W	SW SE NW	493.0'	GD	Marathon Oil Co.	J. B. Kerr JJ-17
*Lawrence	6247	34	3N	12W	NE NE SE SE	498.0'	GD	Marathon Oil Co.	Joseph Gray GG-11
*Lawrence	1475	27	3N	12W	NW NE NE	467.0'	EL	G. O. Chapman & D. E. Buford	Gillespie #7
Lawrence	5925	17	3N	12W	NW NW SW	480.0'	EL	Marathon Oil	W. E. Finley #CC-21
Lawrence	28221	17	3N	12W	C of Sec.	482.0'	GD	Marathon Oil	Thorn Heirs GB-21
*Lawrence	28205	17	3N	12W	NE NE SE NW	466.0'	GD	Marathon Oil	John Diver GB-19
Lawrence	28194	17	3N	12W	SE NE	480.0'	GD	Marathon Oil	Thorn Heirs 62
Lawrence	28217	16	3N	12W	SW SW NW	500.0'	GD	Marathon Oil	Lewis-Gillespie Unit #LB-21
Lawrence	28059	16	3N	12W	SE NW	447.0'	GD	Marathon Oil	R. T. Gillespie #21
Lawrence	853	9	3N	12W	SW SE NW	459.0'	EL	Fox King Oil Corp.	Herth #1
*Lawrence	27925	5	3N	12W	SW NE SE	514.0'	GD	Marathon Oil	W. E. Robins A/C #1 #68
*Lawrence	3732	5	3N	12W	NE NW NW	510.0'	EL	Ohio Oil lco.	McKelfresh #DD-1
Lawrence	28167	32	4N	12W	SE SE	465.0'	GD	Marathon Oil Co.	J. T. Griggs AC/1 #86
Lawrence	27821	32	4N	12W	SE SE NW	509.5'	GD	Marathon Oil	Robert Middagh #34
Lawrence	4704	32	4N	12W	SW SW NE	480.0'	EL	Ohio Oil Co.	J. T. Griggs A/C 1 #50
*Lawrence	28110	29	4N	12W	SW SW	534.0'	GD	Marathon Oil Co.	J. B. Lewis #79
Lawrence	27742	29	4N	12W	NW SW	480.0'	GD	Marathon Oil Co.	J. B. Lewis #78
Lawrence	27781	19	4N	12W	SE SE SE	453.0'	GD	Marathon Oil Co.	G. L. Miller #43
*Lawrence	2954	7	4N	12W	NW SE NW	436.0'	EL	Alva C. Davis Expl. co.	Smith & Heath #1
Lawrence	2964	12	4N	13W	NW NE NE	432.7'	EL	Turner Oil Co.	Hardacre #11
Lawrence	625	36	5N	13W	W C SE SW	429.0'	EL	Nick Ring Co.	Jess Bunyan #1
*Lawrence	2207	36	5N	13W	NE NE SW	437.0'	EL	Jud Noble	Opal UpDike #1
Lawrence	738	36	5N	13W	SE SE NW	495.0'	EL	George & Wrather Oil Co.	UpOike #6
Lawrence	5128	36	5N	13W	N C Line NE	430.0'	EL	George & Wrather Oil Co.	Nuttall #W-29
*Lawrence	1463	25	5N	13W	SW SW NW	437.0'	EL	T. W. George Co.	Hockman #1

IN CONSTRUCTING DETAILED CROSS SECTIONS IN PLATE 1, SECTION CC' (continued)

Houchin Creek Coal		Survant Coal		Colchester Coal		De Koven Coal		Lower Split of De Koven Coal		Davis Coal	
Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
940'	-529'	950'	-539'	1006'	-595'	1022'	-611'			1044'	-633'
940'	-529'	950'	-539'	1006'	-595'	1025'	-614'			1048'	-637'
930'	-528'			1000'	-598'	1014'	-612'			1034'	-632'
924'	-504'	934'	-514'	990'	-570'	1008'	-588'			1030'	-610'
960'	-541.3'			1015'	-596.3'	1034'	-615.3'			1058'	-639.3'
890'	-478'	903'	-491'	976'	-564'	991'	-579'			1010'	-598'
873'	-463'			942'	-532'	960'	-550'			978'	-568'
906'	-465'	915'	-474'	966'	-525'	986'	-545'			1010'	-569'
862'	-448'			956'	-542'	974'	-560'			997'	-583'
880'	-458'	896'	-474'	968'	-546'	979'	-557'			1000'	-578'
885'	-434'	902'	-451'	955'	-504'	965'	-514'			1010'	-559'
886'	-469'	902'	-485'	956'	-539'	969'	-552'			995'	-578'
894'	-457'	911'	-474'	966'	-529'	980'	-543'			1000'	-563'
900'	-440'	916'	-456'	976'	-516'	992'	-532'			1010'	-550'
865'	-395'	908'	-438'	958'	-488'	971'	-501'			998'	-528'
813'	-331'	878'	-396'	934'	-452'	953'	-471'			966'	-484'
797'	-335'	819'	-357'	910'	-448'	922'	-460'			960'	-498'
775'	-321'			880'	-426'					926'	-472'
770'	-347'	790'	-367'	842'	-419'					895'	-472'
762'	-348'	780'	-366'	823'	-409'					888'	-474'
774'	-344'	788'	-358'	836'	-406'					899'	-469'
758'	-343'	790'	-375'	840'	-425'	847'	-432'			883'	-468'
728'	-314'	771'	-357'	827'	-413'	838'	-424'			853'	-439'
735'	-322'	792'	-379'	840'	-427'	852'	-439'			871'	-458'
754'	-281'	818'	-345'	865'	-392'	878'	-405'			898'	-425'
730'	-291'	790'	-351'	835'	-396'	846'	-407'			865'	-426'
780'	-277'	848'	-345'	906'	-403'	915'	-412'			933'	-430'
771'	-257'	845'	-331'	897'	-383'	909'	-395'			929'	-415'
752'	-243'	817'	-308'	867'	-358'	880'	-371'			898'	-389'
750'	-270'	815'	-335'	868'	-388'	880'	-400'			898'	-418'
692'	-244'	760'	-312'	805'	-347'	820'	-372'			835'	-387'
730'	-270'	794'	-334'	843'	-383'	860'	-400'			875'	-415'
694'	-245'	756'	-307'	812'	-363'					843'	-394'
679'	-228'	743'	-292'	793'	-342'	804'	-353'			818'	-367'
630'	-206'	700'	-276'	750'	-326'	760'	-336'			779'	-355'
635'	-196'	700'	-261'	740'	-301'	760'	-321'			780'	-341'
620'	-190'	688'	-258'	740'	-310'	750'	-320'			770'	-340'
599'	-169'	672'	-242'	725'	-295'	730'	-300'			747'	-317'
608'	-156'	670'	-228'	724'	-282'	729'	-287'			750'	-308'
626'	-133'	673'	-180'	733'	-240'	740'	-247'			756'	-263'

IN CONSTRUCTING DETAILED CROSS SECTIONS IN PLATE 1, SECTION DD'

Houchin Creek Coal		Survant Coal		Colchester Coal		De Koven Coal		Lower Split of De Koven Coal		Davis Coal	
Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
626'	-133'	673'	-180'	733'	-240'	740'	-247			756'	-263'
614'	-116'	660'	-162'	730'	-232'					746'	-248'
598'	-131'	648'	-181'	702'	-235'	712'	-245			732'	-265'
708'	-228'			770'	-290'					798'	-318'
654'	-172'	660'	-178'	720'	-238'					760'	-278'
642'	-176'	662'	-196'	716'	-250'	732'	-266			741'	-275'
652'	-172'	670'	-190'	720'	-240'					760'	-280'
682'	-182'	702'	-202'	760'	-260'					796'	-296'
692'	-245'	715'	-268'	768'	-321'					819'	-372'
690'	-231'	727'	-268'	780'	-321'	789'	-330			798'	-339'
608'	-94'	650'	-136'	706'	-192'	716'	-202			724'	-210'
602'	-92'	635'	-125'	687'	-177'	695'	-185			705'	-195'
571'	-106'	605'	-140'	663'	-198'	672'	-207			680'	-215'
595'	-85.5'	618'	-108.5'	676'	-166.5'	684'	-174.5			692'	-182.5'
567'	-87'	596'	-116'	650'	-170'	660'	-180			670'	-190'
614'	-80'	641'	-107'	696'	-162'	710'	-176			725'	-191'
538'	-58'	570'	-90'	614'	-134'	626'	-146			654'	-174'
570'	-117'	580'	-127'	639'	-186'	662'	-209			683'	-230'
570'	-134'			700'	-264'	713'	-277			734'	-298'
550'	-117.3'	578'	-145.3'	666'	-233.3'	679'	-246.3			694'	-261.3'
580'	-151'	613'	-184'	700'	-271'	709'	-280			730'	-301'
600'	-163'			720'	-283'	734'	-297			744'	-307'
598'	-103'	633'	-138'	720'	-225'	733'	-238			739'	-244'
612'	-182'	655'	-225'	720'	-290'	737'	-307			742'	-312'
600'	-163'	667'	-230'	720'	-283'	732'	-285			737'	-300'

APPENDIX E. LISTING OF ALL DATA UTILIZED

County	County Number	Section	Township	Range	Quarter in Section	Surface Elevation	Type of Log**	Company Name	Farm Name
*Crawford	3738	24	5N	13W	NE NW SE	427.0'	EL	Ralph C. Halbert	Mark Smith #1
Crawford	712	24	5N	13W	NE NW NW	430.0'	EL	R. A. Beelendorf	George Waggoner #1
Crawford	3715	13	5N	13W	NE NE NE	485.0'	EL	Perry Folk & W. W. Toler	Dunlap #1
Crawford	206	11	5N	13W	NE NE NE	435.7'	EL	Ashland Oil & Ref.	Shipman #1
Crawford	30031	11	5N	13W	NE NE	438.0'	GD	Russ Randall	Shipman #1
Crawford	1195	1	5N	13W	SE NW SE	447.0'	EL	E. Constantin, Jr.	Haskins No. 0-8
*Crawford	30009	1	5N	13W	NE NW NW	445.0'	GD	Energy Res. of Ind., Inc.	Baldwin Unit 12 Comm. #24
*Crawford	193	1	5N	13W	NE NE NW	440.0'	EL	Skiles Oil Corp.	Frost #P-1
Crawford	30172	36	6N	13W	C SW SW	456.0'	GD	Marathon Oil Co.	E. G. Shipman #1
Crawford	828	36	6N	13W	SW SE NE	450.0'	EL	F. J. Graebel	Shipman #4
Crawford	1163	25	6N	13W	SW SW NE	494.0'	EL	Robert C. Hoss	C. V. Coulter #1
Crawford	1539	24	6N	13W	SW SE SW	506.0'	EL	Grant W. Kine	Smith #1
Crawford	5059	24	6N	13W	SW SW NW	522.0'	EL	Ryan & Sharp	Sears #2
*Crawford	1989	19	6N	12W	NE NE NE	502.0'	EL	Shakespeare Oil Co.	Connett #2
Crawford	2921	8	6N	12W	SW SE NW	505.0'	EL	Kelley, Conrad & Kaye	Heiss #1
Crawford	5746	31	7N	12W	SW NW SW	524.0'	EL	Skiles Oil Corp.	Neidigh Comm. #P-2
Crawford	2953	29	7N	12W	SW NE SW	540.0'	EL	G. C. Schoonmaker	J. S. Kirk #1A
Crawford	316	19	7N	12W	SE SW NE	545.0'	EL	Eastern Petro. Co.	Mullins #1
*Crawford	24782	19	7N	12W	SW NW NE	551.0'	GD	Getty Oil Co.	P. K. Conover K-1
Crawford	30382	8	7N	12W	NE NE SE	570.0'	GD	Marathon Oil Co.	L. M. Guyer #16
Crawford	30400	8	7N	12W	SE SW NE	575.0'	GD	Marathon Oil Co.	Lindsay #36
Crawford	1875	5	7N	12W	SW NE SW	588.0'	EL	Black & Black Oil Co.	R. N. Mann #1
*Crawford	32131	31	8N	12W	NW NE SE	565.0'	GD	Marathon Oil Co.	Martha Williamson
Crawford	30705	30	8N	12W	SE SW SE	556.0'	GD	Russ Randall, Inc.	Smith #1
Crawford	29994	19	8N	12W	NW SW NW	559.0'	GD	Mason Oil Co.	Guyer Brothers
Crawford	31167	17	8N	12W	SW NE NE	565.0'	GD	Ecus Corp.	Edna Kirk #11
*Crawford	446	8	8N	12W	NW SE SW	566.0'	EL	Davis Lambert	W. Holmes #1
Crawford	839	5	8N	12W	NE SE SE	549.0'	EL	D. W. Drake & M. H. Dome	Dome-Elliott #2
Crawford	447	4	8N	12W	NE NW SW	547.0'	EL	James G. Beard	Francis #1
Crawford	610	1	8N	12W	SW SE SE	504.0'	EL	W. W. Toler Corp.	N. Evans #1
*Clark	24459	31	9N	11W	SE SW SE	507.0'	GD	Mapco Prod. Co.	R. Newlin #1
Clark	2423	9	9N	11W	NE NE SE	454.0'	GD	Oilfield Research, Inc.	Neal Bumpus #1
Clark	23985	10	9N	11W	NW NW SE	451.0'	GD	Oilfield Research, Inc.	Irma Manhart #1
Clark	800	34	10N	11W	NW SW NE	456.0'	EL	Great Lakes Carbon Corp.	Margaret Hogue
Clark	778	27	10N	11W	NE NE SW	470.0'	EL	Great Lakes Carbon Corp.	C. Hilbert #1
Clark	776	22	10N	11W	SE NE NE	464.0'	EL	Aberdeen Petr. Corp.	Chas. Hilbert #1
Clark	804	15	10N	11W	NW NE NW	527.0'	EL	Great Lakes Carbon Corp.	Alfred Seidel #1
Clark	1211	10	10N	11W	SE SE NW	468.0'	EL	The First National Petr.	W. Rasher #1
*Clark	774	3	10N	11W	SE SE NW	539.0'	EL	Thomas S. Doran	R. C. Maurer #1
Clark	773	3	10N	11W	NE NE SE	541.0'	EL	J. V. Dunbar	Davidson #2
Clark	858	36	11N	11W	SW SW SW	500.0'	EL	John W. Rudy	Cliff Pine #1
Clark	855	25	11N	11W	SW NW NE SE	538.0'	EL	Ward W. Dayton	Carl Pine #1
*Clark	845	30	11N	10W	SE NE SE	533.0'	EL	Ward W. Dayton	Liffick #2
Clark	843	30	11N	10W	SE SE NE	548.0'	EL	Ward W. Dayton	Hewitt #1-B
*Clark	1213	30	11N	10W	NE SE NE	546.0'	EL	Ward W. Dayton	Hewitt #3-A
Vigo, IN	--	3	11N	10W	SE NE SW	547.0'	EL	S. D. Jarus	Gallington #1

APPENDIX F. LISTING OF ALL DATA UTILIZED

County	County Number	Section	Township	Range	Quarter in Section	Surface Elevation	Type of Log**	Company Name	Farm Name
*Vigo, IN		3	11N	10W	SE NE SW	547.0'	EL	S. D. Jarus	Gallington #1
Vigo, IN		33	12N	10W	NE SW NE	562.0'	EL	F. B. Cline	John Crews #5
*Vigo, IN		26	12N	10W	SW SE SW NE	560.0'	CR	Arthur R. Dungen	Margaret Sparks
Vigo, IN		29	12N	9W	SE NE NW	463.0'	EL	T & H Corp.	H. R. & V. R. Smith
*Vigo, IN		1	11N	9W	NE NE NW	562.0'	EL	T & H Corp.	John C. Beckwith et a.l #1
Vigo, IN		36	12N	9W	SE NE SW	568.0'	EL	T & H Corp.	Theo Bettenbrock
*Vigo, IN		31	12N	8W	NW NW SW	563.0'	EL	T & H Corp.	Morris & Dorothy Blumberg #1
Vigo, IN		32	12N	8W	NW NW SE	572.0'	EL	George Nisbet Co.	Ira Joseph #1
*Vigo, IN		22	12N	8W	SE SE SW	591.0'	CR	Binkley Coal Co.	No. 103
Vigo, IN		22	12N	8W	SW SW NE	597.0'	EL	Oil & Gas Development Corp.	Pyramid Coal #1
Vigo, IN		23	12N	8W	SW SW SE	592.0'	CR	Binkley Coal Co.	#B118
*Clay, IN		19	12N	7W	NE NE	619.0'	EX	Amax Coal Co.	Chinook Mine-West Field

IN CONSTRUCTING DETAILED CROSS SECTIONS IN PLATE 1, SECTION EE'

Houchin Creek Coal		Survant Coal		Colchester Coal		De Koven Coal		Lower Split of De Koven Coal		Davis Coal	
Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
633'	-206'	682'	-255'	740'	-313'	755'	-328'			760'	-333'
662'	-232'			784'	-354'	799'	-369'			805'	-375'
652'	-167'	700'	-215'	754'	-269'	774'	-289'			778'	-293'
592'	-156.3'	640'	-204.3'	703'	-267.3	724'	-288.3'			728'	-292.3'
600'	-162'	646'	-208'	706'	-268'	728'	-290'			732'	-294'
508'	-61'	550'	-103'	618'	-171'	630'	-183'			643'	-196'
496'	-51'	538'	-93'	610'	-165'	628'	-183'			636'	-191'
503'	-63'	545'	-105'	623'	-183'	635'	-195'			640'	-200'
510'	-54'	553'	-97'	630'	-174'	640'	-184'			648'	-192'
542'	-92'	575'	-125'	660'	-210'	668'	-218'			675'	-225'
592'	-98'	630'	-136'	700'	-206'	711'	-217'			716'	-222'
620'	-114'	658'	-152'	720'	-214'	750'	-244'			755'	-249'
650'	-128'	688'	-166'	755'	-233'	788'	-266'			792'	-270'
645'	-143'	675'	-173'	750'	-248'	763'	-261'			766'	-264'
657'	-152'	690'	-185'	760'	-255'	770'	-265'			774'	-269'
608'	-84'	650'	-126'	708'	-184'	726'	-202'			730'	-206'
647'	-107'	680'	-140'	750'	-210'	797'	-257'			800'	-260'
650'	-105'	710'	-165'	753'	-208'	776'	-231'			780'	-235'
668'	-117'	722'	-171'	772'	-221'	788'	-237'			794'	-243'
729'	-159'	780'	-210'	826'	-256'	837'	-267'			842'	-272'
733'	-158'	785'	-210'	838'	-263'	848'	-273'			854'	-279'
725'	-137'	780'	-192'	830'	-242'	843'	-255'			847'	-259'
704'	-139'	758'	-193'	808'	-243'	819'	-254'			825'	-260'
685'	-129'	738'	-182'	786'	-230'	800'	-244'			808'	-252'
				806'	-247'	814'	-255'			823'	-264'
716'	-151'	775'	-210'	815'	-250'	841'	-276'			846'	-281'
708'	-142'	772'	-206'	810'	-244'	838'	-272'			842'	-276'
653'	-104'			745'	-196'	790'	-241'			795'	-246'
648'	-101'	701'	-154'	740'	-193'	778'	-231'			781'	-234'
644'	-140'			738'	-234'	782'	-278'			786'	-282'
632'	-125'			720'	-213'	764'	-257'			768'	-261'
500'	-46'	540'	-86'	573'	-119'	633'	-179'			637'	-183'
525'	-74'	540'	-89'	572'	-121'	632'	-181'			636'	-185'
535'	-79'	586'	-130'	617'	-161'	680'	-224'			684'	-229'
540'	-70'	579'	-109'	602'	-132'	673'	-203'			merged with DeKoven	
512'	-48'	564'	-100'	594'	-130'	652'	-188'			merged	
570'	-43'	618'	-91'	645'	-118'	685'	-158'			merged	
525'	-57'			602'	-134'	636'	-168'			merged	
575'	-36'			678'	-139'	710'	-171'			merged	
575'	-34'			670'	129'	704'	-163'			merged	
477'	-23'			604'	-104'	631'	-131'			634'	-134'
466'	-72'			584'	-46'	615'	-77'			merged	
400'	-133'	464'	-69'	510'	23'	538'	-5'			544'	-11'
395'	-153'	475'	-73'	504'	44'	530'	18'			539'	9'
389'	-157'	474'	-72'	502'	44'	524'	22'			540'	6'
389'	-158'	420'	-127'	480'	67'	500'	47'			517'	30'

IN CONSTRUCTING DETAILED CROSS SECTIONS IN PLATE 1, SECTION FF'

Houchin Creek Coal		Survant Coal		Colchester Coal		De Koven Coal		Lower Split of De Koven Coal		Davis Coal	
Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
389'	158'	420'	127'	480'	67'	500'	47'			517'	30'
330'	232'	425'	137'	446'	116'	484'	78'			490'	72'
356'	204'	389'	171'	441'	119'	479'	81'			487'	73'
188'	275'	221'	242'	260'	203'	282'	181'			292'	171'
166'	396'	180'	382'	210'	352'	230'	332'			240'	322'
150'	418'	163'	405'	192'	376'	216'	352'			227'	341'
186'	377'	199'	364'	230'	333'	255'	308'			265'	298'
110'	462'	134'	438'	167'	405'	215'	357'			merged with DeKoven	
out		87'	504'	120.1'	470.9'	135'	456'			merged	
				110'	487'	140'	457'			merged	
out		73'	519'	109'	483'	121'	471'			merged	
out		20'	599'	60'	559'	77'	542'			85'	534'

APPENDIX G. LISTING OF ALL DATA UTILIZED

County	County Number	Section	Township	Range	Quarter in Section	Surface Elevation	Type of Log**	Company Name	Farm Name
*White	2672	16	7S	10E	NE SW SW	350.0'	EL	V. R. Gallagher	Hayes Heirs #1
White	2957	15	7S	10E	NW SE NW	353.0'	EL	Sam Walker	Frank Harlem et al. #2
White	7041	23	7S	10E	SW SW NW	337.0'	EL	V. R. Gallagher	Stinson #1
White	3403	24	7S	10E	SW SE NE	346.0'	EL	Johnnie S. Carter	Malcon Fuhrer #1
*White	7054	19	7S	11E	NE NE SW	350.0'	G	Sun Oil Co.	Georgia Boetticher #4
White	2023	19	7S	11E	NW SW SE	352.0'	EL	Hiawatha Oil & Gas	Joe Vail #7
White	2458	20	7S	11E	SE NW NW	353.0'	EL	Skiles Oil corp.	Jim Rowe #1
Posey, IN		20	7S	14W	SE SE SE	360.0'	EL	H. Paul Maier	Henry Mann #1
Posey, IN		29	7S	14W	NE SE NE	369.0'	EL	H. Paul Maier	FEE #B-1
Posey, IN		28	7S	14W	SW NW SW	460.0'	EL	H. Paul Maier	Amanta S. Maier #2
*Posey, IN		33	7S	14W	SE NE NW	365.0'	EL	Kendall & Davis Drlg. Co.	Fogas #1
Posey, IN		33	7S	14W	SE SE SE	360.0'	EL	E. F. Morgan Inc.	Phillip Schneider #1
Posey, IN		3	8S	14W	NE SW SW	354.0'	EL	A. J. Slagter	David Hastings #1
Posey, IN		10	8S	14W	SW NW NW	363.0'	EL	William F. Hill	David Hastings #1
*Posey, IN		15	8S	14W	NW NW NW	369.0'	EL	George C. Schoonmaker	Oakland City College #D
Posey, IN		22	8S	14W	NW NE NW	366.0'	EL	Slagter Producing Co.	Bauer Heirs #1
Posey, IN		22	8S	14W	NW SE SW	367.0'	EL	Frank Morrison	Weyerbacher #1
Posey, IN		27	8S	14W		356.0'	EL	Slagter Prod. Co.	Manson Reichert #1
Posey, IN		35	8S	14W	NE NE NW	355.0'	EL	Ralph C. Halbert	Hanshoe #1
*Posey, IN		35	8S	14W	NE SE NE	347.0'	EL	George S. Engle	Elbert #1
Union, KY		19	P	19		362.0'	EL	J. W. Menhall Co.	Davis #1
Union, KY		22	P	19		370.0'	EL	E. F. Wix et al.	Alhorn #1
Union, KY		3	0	19		402.0'	EL	Nat. Ass. Petr. Co.	Clements #1
Union, KY		7	0	19		416.0'	EL	Skiles Oil Corp.	Alvey #1
*Union, KY		7	0	19		431.0'	EL	Magnolia Petroleum Co.	Drury #1
Union, KY		14	0	19		400.0'	EL	Magnolia Petroleum Co.	Hancock #1
Union, KY		25	0	19		377.0'	EL	G. L. Reasor Co.	Richards #1
Union, KY		21	0	18		451.0'	EL	Basin Drilling Co.	Briscoe #1
Union, KY		22	0	18		436.0'	EL	Sun Oil Co.	Robertson #4
*Union, KY		22	0	18		402.0'	EL	Kendall Davis Drlg. Co.	Walker No. 2
Union, KY		3	N	18		404.0'	EL	Mt. Carmel Drlg. Co.	Gill #2
Union, KY		8	N	18		376.0'	EL	S. C. Yingling Oil LCo.	Adamson #1
*Union, KY		5	M	18		414.0'	CR	Kentucky Geol. Survey	GIL 15

IN CONSTRUCTING DETAILED CROSS SECTIONS IN PLATE 1, SECTION GG'

Houchin Creek Coal		Survant Coal		Colchester Coal		De Koven Coal		Lower Split of De Koven Coal		Davis Coal	
Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
700'	-350'	739'	-389'	798'	-448'	843'	-493'	868'	-518'	875'	-525'
738'	-385'	778'	-425'	840'	-487'	882'	-529'	909'	-556'	915'	-562'
638'	-301'	690'	-353'	742'	-405'	809'	-472'	834'	-497'	843'	-506'
612'	-266'	655'	-309'	708'	-362'	810'	-464'	818'	-472'	829'	-483'
595'	-245'	644'	-294'	695'	-345'	782'	-432'	791'	-441'	800'	-450'
591'	-239'	639'	-287'	688'	-336'	778'	-426'	785'	-433'	794'	-442'
602'	-249'	657'	-304'	694'	-341'	788'	-435'	798'	-445'	805'	-452'
641'	-281'	698'	-338'	755'	-395'	800'	-440'	821'	-461'	832'	-472'
623'	-254'	670'	-301'	716'	-347'	784'	-415'	808'	-439'	816'	-447'
608'	-148'	751'	-291'	700'	-240'	770'	-310'	795'	-335'	805'	-345'
568'	-203'	617'	-252'	660'	-295'	772'	-357'	748'	-383'	760'	-395'
560'	-200'	608'	-248'	660'	-300'	718'	-358'	740'	-380'	752'	-392'
548'	-194'	598'	-244'	650'	-296'	720'	-366'	725'	-371'	736'	-382'
694'	-331'	724'	-361'	782'	-419'	838'	-475'	merged		854'	-491'
767'	-398'	810'	-441'	872'	-503'	927'	-558'	--		942'	-573'
827'	-461'	874'	-508'	932'	-566'	1000'	-634'	--		1018'	-652'
820'	-453'	869'	-502'	919'	-552'	990'	-623'	--		1010'	-643'
725'	-369'	766'	-410'	850'	-494'	893'	-537'	--		925'	-569'
640'	-285'	679'	-324'	755'	-400'	820'	-465'	--		836'	-481'
630'	-283'	671'	-324'	747'	-400'	814'	-467'	--		835'	-488'
352'	10'	394'	-32'	455'	-93'	502'	-140'	--		534'	-172'
354'	16'	408'	-38'	448'	-78'	517'	-147'	--		536'	-166'
405'	-3'	445'	-43'	502'	-100'	585'	-183'	--		605'	-203'
385'	31'	425'	-9'	482'	-66'	566'	-150'	--		585'	-169'
375'	56'	412'	19'	470'	-39'	550'	-119'	--		568'	-137'
335'	65'	380'	20'	330'	-40'	515'	-115'	--		534'	-134'
244'	133'	292'	85'	350'	27'	422'	-45'	--		441'	-64'
296'	155'	330'	121'	398'	53'	467'	-16'	--		488'	-37'
222'	214'	265'	171'	330'	106'	390'	46'	--		415'	21'
172'	230'	217'	185'	272'	130'	348'	54'	--		372'	30'
1088'	-684'	1130'	-726'	1210'	-806'	1245'	-841'	1260'	-856'	1305'	-901'
1058'	-682'	1122'	-746'	1184'	-808'	1224'	-848'	--		1292'	-916'
out		42'	372'	88'	326'	139'	275'	--		176'	238'

