NUREG/CR-2914

Correlation of Lignite Beds for Fault Identification in the Mississippi Embayment Area of Western Kentucky

Prepared by J. C. Cobb, D. A. Williams

Kentucky Geological Survey

Prepared for
U.S. Nuclear Regulatory
Commission

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**Prepared for
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PREFACE

This report is a final report of work performed by the Kentucky Geological Survey during fiscal year 1981 under U.S. Nuclear Regulatory Commission contract number NRC 04-76-321. Work performed under this contract prior to 1981 is incorporated in a final report to U.S.N.R.C. by H. R. Schwalb entitled "Paleozoic geology of the New Madrid area."

ABSTRACT

Data from four drill holes and other subsurface data were compiled to analyze for possible offset on a suspected fault near an earthquake epicenter in the New Madrid seismotectonic area of western Kentucky. The drill holes penetrated unconsolidated Eocene and younger sediments of the Mississippi Embayment. These holes were located along an east to west line that intersected the northeast trending lineament of the suspected fault.

Lignite was encountered in each of the drill holes. Correlation of lignitic layers, geophysical logs, and drill cuttings suggests that the lignite was deposited on a gently rolling, westward-dipping surface. This surface dips westward at approximately 23 feet per mile. The underlying Wilcox Formation is reported to dip westward at 23 feet per mile.

No evidence was found to support the presence of offset on the suspected fault, but the inability to correlate the lignitic deposits unequivocally made it impossible to rule out the possibility of a fault. Furthermore, the similarity between the dip of the Wilcox Formation and the dip of the lignite horizon suggests no offset along the line of the drill holes. Five possibilities about the occurrence of a fault in the area investigated are: (1) no offset due to faulting exists, (2) the suspected fault was not intersected by the line of drill holes presented in this report, (3) the presence of unconsolidated deposits may have dampened effects of faulting, (4) offset due to faulting exists but is too small to detect, and (5) offset on the lineament occur only to the south and died out before reaching the study area.

INTRODUCTION

Structure mapping based on seismic-reflection profiling and earthquake-epicenter plotting in the Jackson Purchase region of western Kentucky indicates lineaments, faults, and earthquake epicenters in deposits of the Mississippi Embayment. New Madrid seismic activity has been linked to these structures which have been reactivated through geologic time (Zoback and others, 1980). These structures are within the New Madrid seismotectonic area, an area known to have experienced one of the major earthquakes of North America during historic time. Information about these structures is important for evaluating seismic risk in the region.

Data from four drill holes and other subsurface data were compiled to analyze a suspected fault near an earthquake epicenter in Carlisle County, Kentucky. The purpose of the drilling was to detect offset from faulting in unconsolidated strata of Eocene age and younger. The target for drilling was lignitic strata thought to have the greatest likelihood of good correlation from one borehole to another.

The area of study was selected from existing subsurface information and a map of lineaments, faults, and epicenters by Heyl and McKeown (1978). Important factors in choosing the drill sites were (1) existence of subsurface information for the area, (2) proximity to a mapped lineament suspected as a fault, (3) proximity to a mapped epicenter, (4) surface elevation adequate to penetrate lignitic marker horizons, and (5) access to drill sites.

The four drill sites were located along Kentucky Highway 80 between Milburn and Arlington in Carlisle County. Figure 1 shows the location of the study area and the drill sites. Arlington is only 12 miles from the axis of the Mississippi Embayment, 32 miles from New Madrid, Missouri, and 144 miles south of St. Louis, Missouri. The area of study is in the Milburn and Arlington quadrangles (Olive, 1976, and Swanson, 1977).

GEOLOGY OF THE STUDY AREA

The Jackson Purchase region of Kentucky contains Upper Cretaceous and younger deposits of the Mississippi Embayment. The Mississippi Embayment is a southward-plunging trough whose axis approximately coincides with the course of the Mississippi River between Kentucky and Missouri (Olive, 1980). The deposits of the Mississippi Embayment are predominantly clastic continental sediments with minor amounts of marine sediments.

Figure 1. Location map and sites of holes drilled for this investigation.

The near-surface deposits of the study area have been mapped by Swanson (1977) on the Milburn geologic quadrangle map. The geology of the Mississippi Embayment in the Jackson Purchase region of Kentucky is described by Olive (1980).

The near-surface deposits have been described by Swanson (1977) as recent alluvium, loess, and continental deposits from 0 to 60 feet thick of Pliocene(?) and Pleistocene age. The Eocene-age Jackson and Claiborne Formations are often undifferentiated, predominantly clastic alluvial sediments up to 300 feet thick. The Claiborne Formation contains lignite deposits up to several feet thick that overlie a commercially important clay deposit. A generalized stratigraphic section of Cretaceous and younger sediments of the Mississippi Embayment is shown in Figure 2.

The commercial clay deposit is 15 to 20 feet thick and capped by a lignite deposit several feet thick. The clay deposit is extensive and has been mined at several locations in the Milburn quadrangle. During this drilling project an active clay pit was producing 4½ miles east-northeast of drill site 1. The clay deposit in the active surface mine was capped by lignite with a cumulative thickness of 7 feet.

The lignite-clay sequence was targeted as a datum by which offset from faulting might be recognized because (1) the clay was deposited in a widespread lacustrine environment that formed a relatively flat, correlatable surface, and (2) the lignite accumulated on this flat surface, preserving the regional depositional slope.

The structural and tectonic setting of the region has been discussed by several authors. Heyl and McKeown (1978) compiled geological and

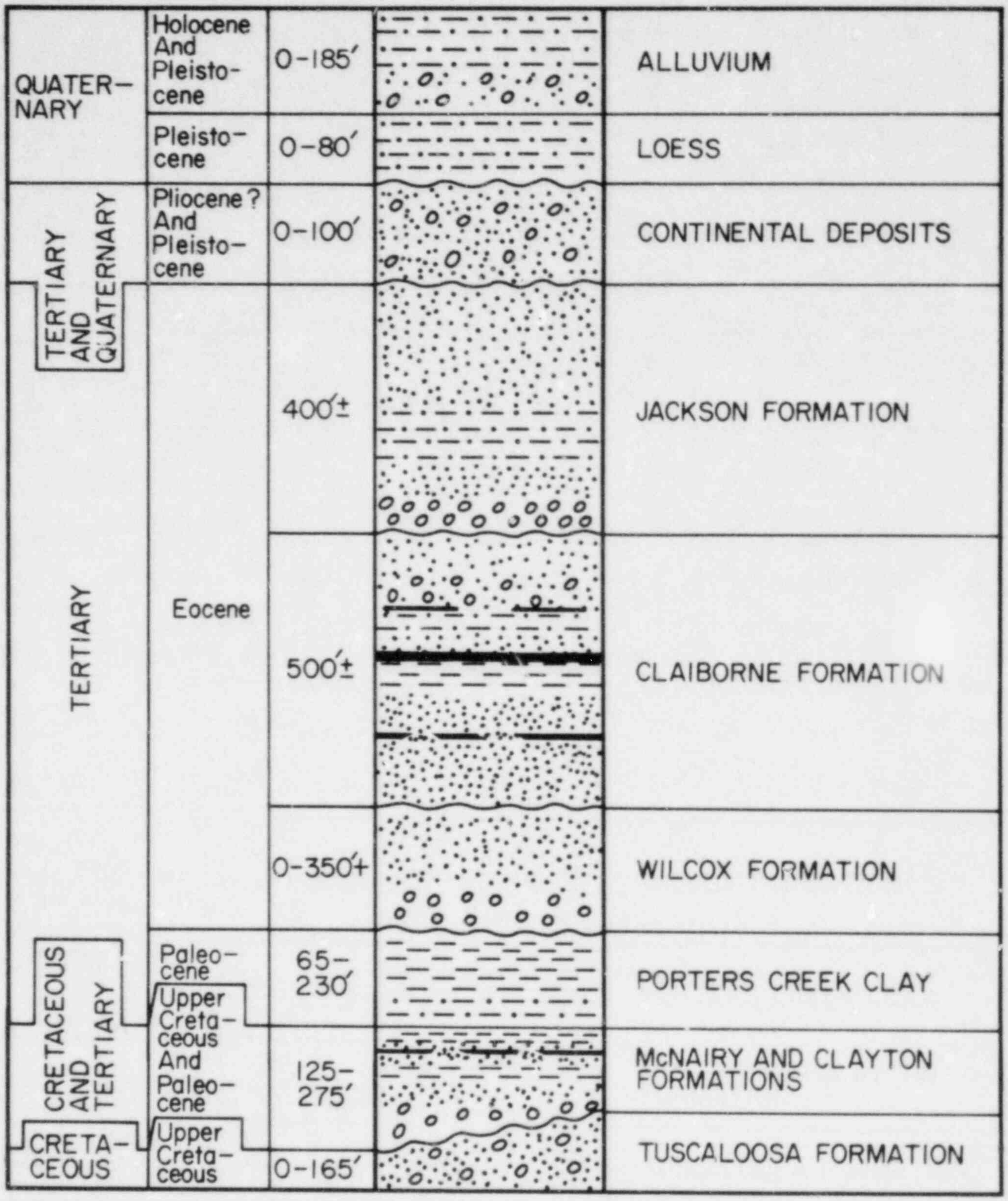


Figure 2. Generalized stratigraphic section of the Mississippi Embayment in the study area.

seismological data that are relevant to the assessment of seismic hazards in the Mississippi Embayment and made a seismotectonic map of the central Mississippi Valley. They also compiled a list of selected references to structures and tectonics in the upper Mississippi Embayment. Locations of earthquake epicenters, lineaments, and faults used in the present study were taken from Heyl and McKeown (1978). Figure 3 is taken from Heyl and McKeown (1978) and shows the major tectonic and structural features of the Mississippi Embayment in the study area. Also shown is the mapped lineament of the suspected fault and the traverse A-D, which is composed of data from holes drilled for this project and other subsurface data collected for this project.

Zoback and others (1981) linked New Madrid seismics to specific structural features. However, their investigations also showed that the identification of faults in the Mississippi Embayment is difficult because of the unconsolidated nature of the Tertiary sediments and younger deposits overlying the Tertiary sediments.

Several of Zoback and others' (1981) findings in the Mississippi Embayment are of immediate importance to this investigation. They are: (1) seismic profiles show numerous vertical offsets and abrupt flexures, (2) vertical offsets on these faults have from 5 to 80 meters (16 to 262 feet) of displacement, (3) the strike of major faults in N 40° E, (4) deformation has occurred in the Cenozoic, and (5) and the sense of movement on faults has changed through time.

Approach

Certain limited areas of Carlisle County, Kentucky are underlain by lignite deposits traceable for several miles. The method for assessing

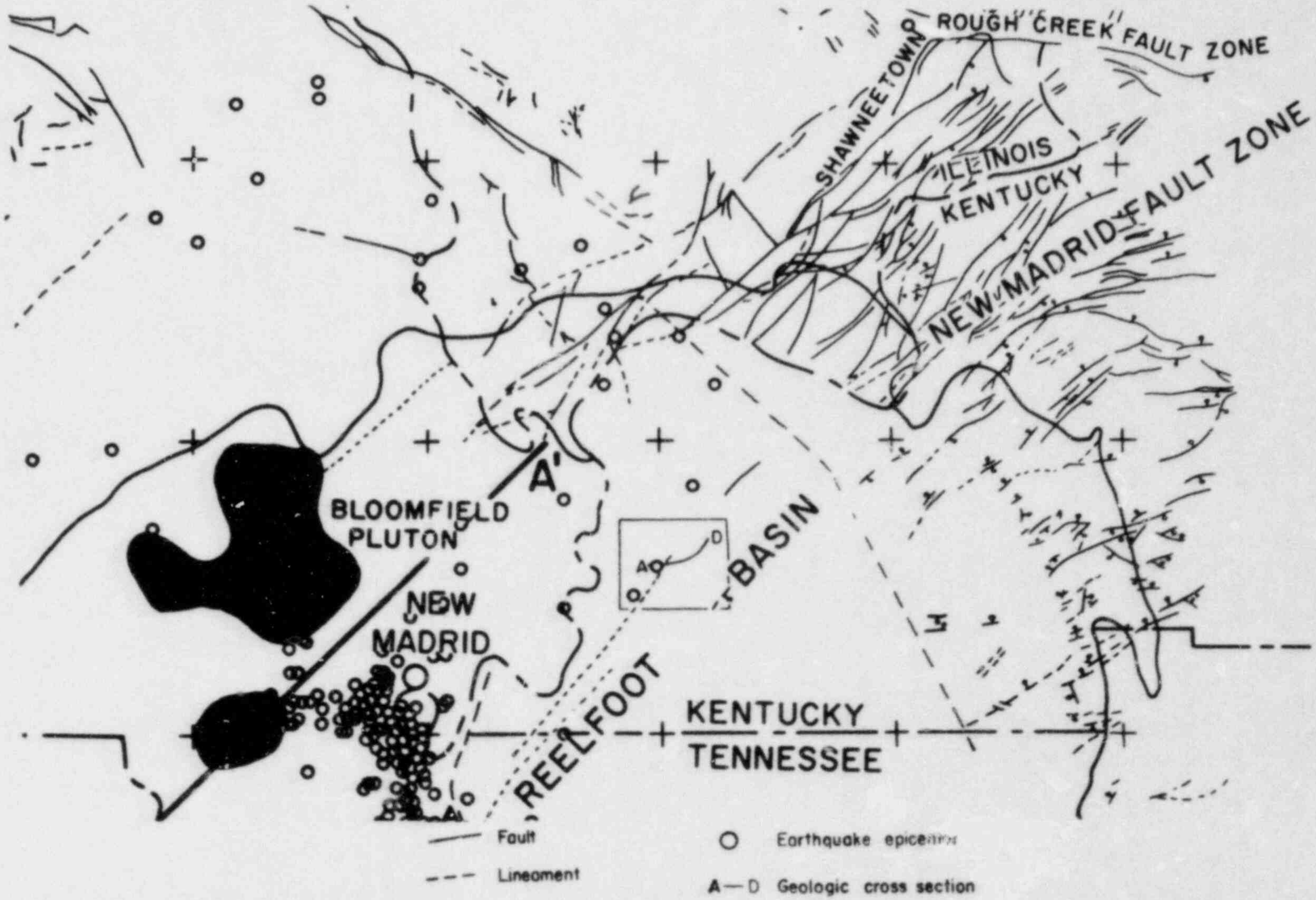


Figure 3. Tectonic map for the study area showing the lineament targeted in this investigation (after, Heyl and McKeown, 1978) and the location of the geologic cross section A to D.

offset on the suspected fault selected for this study was to drill several boreholes along a line that crossed the mapped lineament of the suspected fault. Correlation of the geophysical logs and lignitic horizons would then be used to indicate the presence or absence of offset due to faulting.

Existing subsurface information suggested that a lignite deposit was traceable for 3.5 miles on the east side of the suspected fault and 2.0 miles on the west side of the suspected fault. Furthermore, the lignite bed on the west side of the suspected fault was 130 feet lower in elevation than the lignite bed on the east side. This condition would be consistent with a normal fault displacement down to the west, which is consistent with the structural framework of the Mississippi Embayment. The drill sites for this study were located so that the lignite could be traced from one side of the suspected fault to the other and the normal-fault hypothesis could be investigated.

Methods

Four holes were drilled within about 2 miles to depths of 126 feet, 141 feet, 210 feet, and 221 feet. Rotary drilling with bits of 6¼ inch-diameter surface and 4 3/4 inch-diameter completion were used. A bentonitic drilling fluid (Agua-Gel) was used for rotary circulation to stabilize boreholes and facilitate collection of cuttings. Surface casing 6 inches in diameter was used to stabilize the upper part of the boreholes. Even with the use of drilling mud and surface casing, borehole stability was a constant problem becuase of the unconsolidated nature of the deposits penetrated. Gas was encountered at 106 feet in drill hole 2. Circulation was temporarily lost during drilling in drill holes 2, 3, and 4. Circulation was reestablished in each hole; however, circulation in drill hole 4 was lost before all the geophysical logs were run. All boreholes were cemented from bottom to top, and sites were cleaned when tests were completed.

Drill cuttings were described by the site geologist at regular intervals. Seven, 2-foot, split-spoon samples were taken. The lithologs and descriptions of the cuttings and split-spoon samples are given in Appendix I. Attempts were made to run geophysical logs in each borehole. The geophysical logs run were SP (spontaneous potential), resistivity (single point), gamma ray, and density (gamma-gamma density). A problem of borehole instability in drill hole 4 prevented a complete suite of logs from being run in that hole. Only SP and resistivity were completed for drill hole 4.

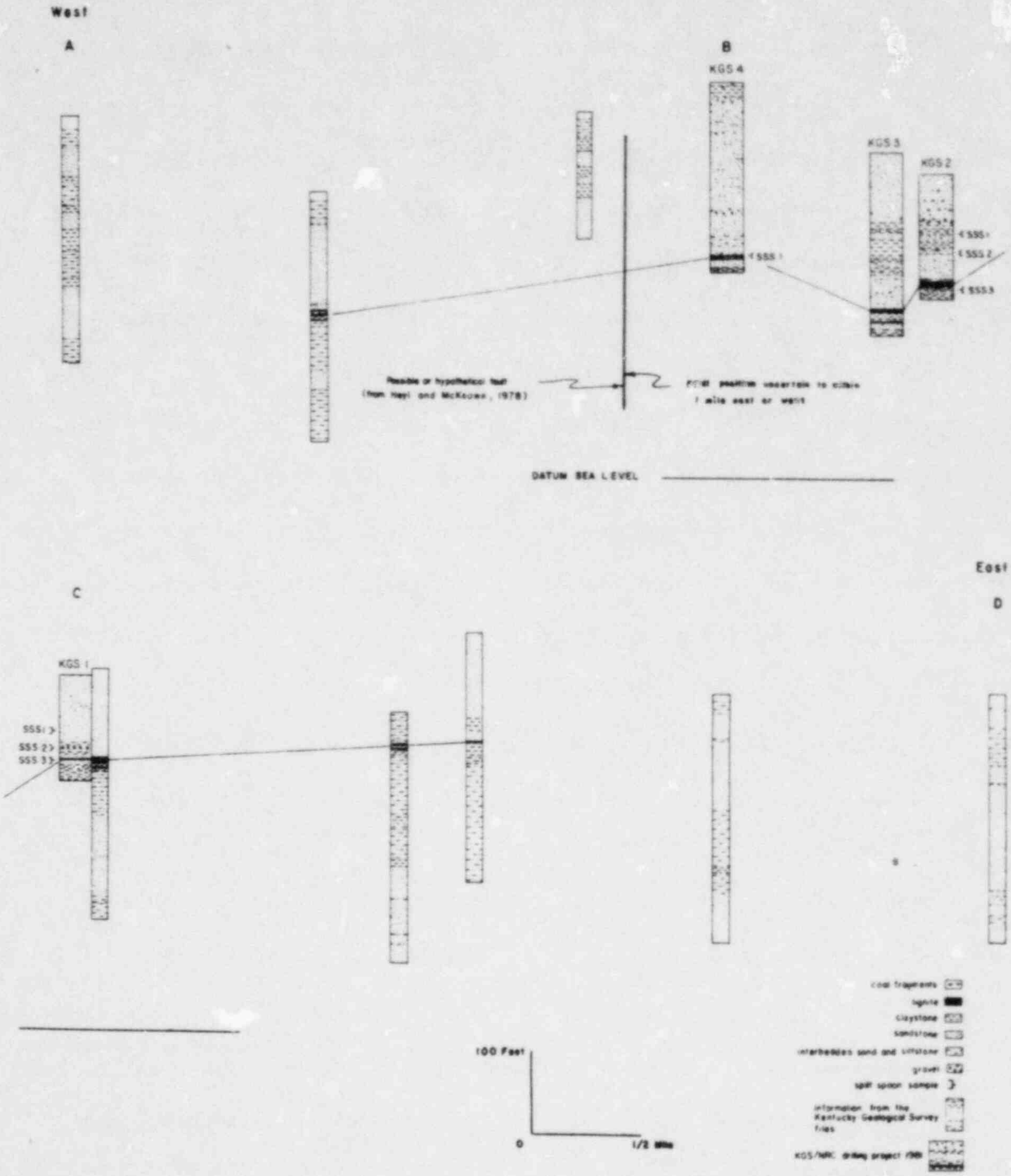
The geophysical logs of particular value were the electric logs (SP and resistivity) and the gamma ray log. The density log was of less importance because irregularities in the borehole diameter had a larger effect on the density response than did the lithologies penetrated. The geophysical logs for the four boreholes are given in Appendix II.

RESULTS

The results of the drilling and of the compiled subsurface data are shown in the east-west cross section A-D in Figure 4. The location of this cross section in shown in Figure 3. The position of the lineament is inferred from Heyl and McKeown (1978). The position of the lineament is only generally located and it should be assumed to be as much as 1 mile off on either side of its position on the cross section. The datum for this cross section is elevation above sea level. The correlation line is drawn on the lignite-clay sequence. The sequence of lignite over clay is the most recognizable horizon in the subsurface of this area.

FIGURE 4. EAST TO WEST CROSS SECTION IN TERTIARY SEDIMENTS

OF THE REELFOOT BASIN, MILBURN QUADRANGLE, CARLISLE COUNTY, KENTUCKY



The line along which the drill sites were located is perpendicular to depositional strike of the deposits of the Mississippi Embayment. This alignment is considered important because it is nearly parallel to the maximum slope to the depositional surface. The slope of the Wilcox Formation, upon which the lignite-bearing Claiborne sediments were deposited, is 23 feet per mile (Olive, 1980). The difference in elevation of the lignite-clay horizon (correlated on the cross section) is 130 feet across the 5.5 miles where the lignite can be correlated. This gives a regional slope of 23 feet per mile for the lignite-clay horizon, which is the same as the underlying Wilcox Formation.

The lignite-clay horizon is correlated through the mapped lineament (segment A-B of the cross section), and there is no abrupt change in its slope. This fact, together with the similarity between the dips of the formations (23 feet per mile), suggests that no offset exists on the mapped lineament. It is unfortunate that the western most hole on the cross section is only a few feet short of penetrating the projected horizon of the clay-lignite sequence. Had this hole been only 10 to 20 feet deeper it would have aided greatly in verifying the reliability of projecting the slope of the lignite-clay horizon.

The segment of the cross section from B to C incorporates the holes drilled for this project. The irregularity in the lignite-clay sequence in this segment probably reflects the irregularity in the original depositional surface and subsequent differential compaction.

Finally, the segment C to D shows the lignite-clay sequence to be absent in the easternmost two holes. It is likely that Pleistocene and recent erosion removed the lignite from the easternmost area. An eastward projection of the lignite-clay horizon comes to an elevation high enough in those holes to be within the post-Jackson continental and alluvial deposits. Therefore, its removal by erosion is suspected.

CONCLUSIONS

The results of this investigation do not unequivocally prove the presence or absence of offset along a mapped lineament near the site of an earthquake epicenter. It does apparently show the usefulness of correlating certain lignite horizons in order to demonstrate regional depositional slopes. The lignite-clay sequence used in this study is the best stratigraphic marker in the near-surface part of the geologic section for the purposes of assessing major structures. What is not known is how much dampening of the effects of faulting is caused by the unconsolidated nature of the sediments.

Lignite was encountered in each drill hole. Correlation of lignitic layers, geophysical logs, and drill cuttings suggests that the lignite was deposited on a gently rolling, westward-dipping surface. This surface dips westward at approximately 23 feet per mile. The underlying Wilcox Formation is reported to dip westward at 23 feet per mile.

While no evidence was found to support the presence of offset on the suspected fault, the inability to correlate the lignitic deposits unequivocally made it impossible to rule out the possibility of a fault. Furthermore, the similarity between the dip of the Wilcox Formation and the dip of the lignite horizon suggests no offset along the line of the drill holes. Five possibilities about the occurrence of a fault in the area investigated are: (1) no offset due to faulting exists, (2) the suspected fault was not intersected by the line of drill holes presented in this report, (3) the presence of unconsolidated deposits may have dampened effects of faulting, (4) offset due to faulting exists but is too small to detect, and (5) offset on the lineament occurs only to the south and has died out before reaching the study area.

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We wish to give special thanks to Dr. John D. Kiefer, Assistant State Geologist for Kentucky, who coordinated the drilling phase of the project and without whose expertise the drilling would not have been possible. We also wish to thank driller Tony Morford, who expertly guided the drilling to a successful conclusion. The authors are indebted to Richard Smath for his drafting and preparation of the illustrations.

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APPENDIX I: DESCRIPTIONS OF CUTTINGS AND SPLIT-SPOON SAMPLES

NRC - Lignite Series
Drill Hole 1
Sample Descriptions
Carter coordinate location 13-D-7, 2100' SL x 2550' EL
Milburn Quad. Comm. 8/25/81 Comp. 8/28/81
Carlisle Co., Ky., Elev. 416' Alt.

Geologist: David Williams

0 - 62		Loose sand, fine- to medium-grained, with some chert, clay
62 - 64		Split Spoon Sample #1
	2.0'	Sand, fine- to medium-grained, well sorted, rounded to subangular. No apparent primary bedding features. Color is reddish brown except in 3" band approximately 6" from top, where color is light gray.
64 - 86		Rock bit. No samples
86 - 88		Split Spoon Sample #2
	0.3'	Gravel, angular, rust-brown iron stain, pebble composition; medium- to coarse-grained sandstone, largest pebble 0.1', probably iron-cemented sandstone band
	0.2'	Clay, silty, gold to brown
	0.2'	Clay, gray, with red streaks, very plastic
	1.3'	Sand, white, sugary texture, fine-grained, sorted
88 - 100		Rock bit. No samples
100 - 101.75		Split Spoon Sample #3
	1.50	Lignitic clay, black
	0.50	Sandstone, white, very fine-grained, clean
101.75 - 126.6		Rock bit. No samples
126.6 T.D.		Clay, green, very plastic

Geophysical Logs:

Electric

Natural Gamma

Gamma Density

NRC - Lignite Series
Drill Hole 2
Sample Descriptions
Carter coordinate location 14-D-7, 1910' FSL x 2620' FWL
Milburn Quad. Comm. 9/3/81 Comp. 9/5/81
Carlisle Co., Ky., Elev. 360'

Geologist: David Williams

0 - 31		Sand and mud, sand, medium to lower coarse grained, subangular, with chert
31 - 32		Gravel bed (driller)
32 - 41		Sand and mud, as above
41 - 42		Gravel bed, pea-size quartz and chert, angular
42 - 50		Sand and clay, sand medium to lower coarse grained, angular to subangular; clay, medium-grained
50 - 54		Gravel, pea-size, angular to sub-rounded quartz and chert, with sand, medium- to coarse-grained
54 - 57		Clay, light-olive gray
57 - 58		Gravel, as above
58 - 62		Clay, light-gray
62 - 68.5		As above
68.5 - 70.5		Split Spoon Sample #1
	1.50'	Silt, light-gray, argillaceous, gradational basal contact
	0.50'	Clay, light-gray
70.5 - 80.0		Sand, upper medium to lower coarse grained, angular
80 - 82		Clay, light-gray (driller top)
82 - 87		Clay, as above
87 - 91.9		Sand, medium- to coarse-grained, angular, coal fragment
91.9 - 93.9		Split Spoon Sample #2
	0.50'	Sand, silt to upper fine, light-gray, subangular

NRC - Lignite Series
Drill Hole 2
Sample Descriptions
Carter coordinate location 14-D-7, 1910' FSL x 2620' FWL
Milburn Quad. Comm. 9/3/81 Comp. 9/5/81
Carlisle Co., Ky., Elev. 360'

		1.10'	As above, iron staining demarking crossbeds, contains carbonaceous material
		0.40'	Clay, light-gray
93.9	- 99		Sand, light-gray, fine-grained, angular to subangular
99	- 101		Sand, medium- to coarse-grained, angular to subrounded, with clay, light-gray
101	- 106		Sand, coarse, with some very coarse grains
106	- 109		Sand, medium- to coarse-grained, subangular, with dark grains
109	- 121		As above, contains some clay, some lignitic material
121	- 126		Sand, medium- to coarse-grained, subangular
126	- 130		As above, with lignite chips
130	- 133.1		Clay, medium-gray, lignite chips abundant (lignite on drill bit)
133.1	- 135.1		Split spoon Sample #3
		1.02'	Clay, grayish-brown, sharp basal contact
		0.93'	Clay, light-gray, with dark-gray, irregular-shaped patches (burrows?)
135.1	- 136.9		Sand and clay; clay, medium-gray to pink; sand, medium-grained to very coarse, limonite nodules
136.9	- 141.2	T.D.	135 - 137.4 Very hard drilling. Clay, medium- to dark-gray

Geophysical Logs:

Electric

Natural Gamma

Gamma Density

NRC - Lignite Series
Drill Hole 3
Sample Descriptions
Carter coordinate location 14-D-7, 1750' FSL x 2620' FWL
Milburn Quad. Comm. 8/29/81 Comp. 9/2/81
Carlisle Co., Ky., Elev. 385'

Geologist: David Williams

0 - 73	Sand, loose, medium- to coarse-grained, subangular to rounded
73 - 80	As above, iron staining
80 - 83	As above
83 - 88	Clay, light-yellowish-brown, cohesive
88 - 90	Sand, as above
90 - 92	Clay, as above
92 - 100	Sand, as above, no iron staining
100 - 120	Clay, light-brown
120 - 124	Sand, fine, medium-grained, subangular to rounded
124 - 126	Clay, light-gray, with streaks of pink clay, cohesive
126 - 137	Sand, fine- to medium-grained, rounded, with clay, light-gray, cohesive
137 - 140	Clay, red, cohesive, slower drilling
140 - 145	Clay and sand; clay, light-gray and red; sand, medium-grained, subangular to subrounded
145 - 150	Clay and sand; sand, as above; clay, light-gray and red
150 - 153	Sand, light-gray, subangular to subrounded, angular dark-gray chert fragment, medium-grained. Some grains rust-coated
153 - 155	As above
155 - 160	Sand, white, subangular to rounded, angular chert fragment, upper medium to lower coarse
160 - 165	Sand with clay; sand, as above; clay, light-gray

NRC - Lignite Series
Drill Hole 3
Sample Descriptions
Carter coordinate location 14-D-7, 1750' FSL x 2620' FWL
Milburn Quad. Comm. 8/29/81 Comp. 9/2/81
Carlisle Co., Ky., Elev. 385'

165	- 170		Sand, medium-grained, subangular to subrounded, with pink to red clay and white clay
170	- 175		Sand, very fine to upper coarse, angular to subangular, with clay, white, some rust-coated grains
175	- 180		Sand, as above
180	- 185		As above
185	- 190		As above, with lignite chips(?)
190	- 195		As above, with clay, white
195	- 205		Sandstone, medium- to coarse-grained, subangular to subrounded, with lignite chips and white clay
205	- 210	T.D.	As above, no lignite

Geophysical logs:

Electric

Natural Gamma

Gamma Density

NRC - Lignite Series
Drill Hole 4
Sample Descriptions
Carter coordinate location 6-D-7, 650' FSL x 1390' FEL
Milburn Quad. Comm. 9/8/81 Comp. 9/10/81
Carlisle Co., Ky., Elev. 460'

Geologist: David Williams

0 - 6.5	Clay, reddish-brown, and gravel, reddish-brown
6.5 - 11.5	Clay, as above, with sand
11.5 - 16.5	As above
16.5 - 21.5	Sand, medium- to coarse-grained, brown, argillaceous
21.5 - 26.5	Sand, fine- to coarse-grained, some pea-size gravel, angular to rounded
26.5 - 31.5	As above
31.5 - 36.5	As above, no gravel
36.5 - 41.5	Sand, fine- to medium-grained, with some coarse-grained, subangular
41.5 - 46.5	Sand, medium- to coarse-grained, angular to subangular, driller reports clay
46.5 - 51.5	As above, with light-gray clay
51.5 - 56.5	As above
56.5 - 61.5	Sand, medium- to coarse-grained with pebbles, angular
61.5 - 66.5	Sand, as above. Driller reports clay
66.5 - 71.5	As above, with clay, light-gray
71.5 - 76.5	Sand, upper fine- to medium-grained, with some coarse, rounded grains; sand subangular, with clay, light-gray
76.5 - 8[illegible]	Sand, medium-grained, subangular to subrounded
81.5 - 86.5	Sand, medium- to coarse-grained, subangular to subrounded, with white clay
86.5 - 91.5	As above
91.5 - 96.5	Sand, fine- to medium-grained, subangular to subrounded, with white clay

NRC - Lignite Series
Drill Hole 4
Sample Descriptions
Carter coordinate location 6-D-7, 650' FSL x 1390' FEL
Milburn Quad. Comm. 9/8/81 Comp. 9/10/81
Carlisle Co., Ky., Elev. 460'

96.5 - 101.5	Sand, medium- to coarse-grained, subrounded to angular; gas? Hole produces gas from this point down.
101:5 - 106.5	Sand, as above, with white clay, some gas(?)
106.5 - 111.5	Sand, medium- to coarse-grained, subangular to subrounded, iron staining; clay, light-gray to red
111.5 - 116.5	Sand, medium-grained, subrounded
116.5 - 121.5	Sand, fine- to medium-grained, subrounded, with white argillacecus siltstone
121.5 - 126.5	As above
126.5 - 131.5	As above, with clay, white, and some red
131.5 - 136.5	Sand, medium-grained, angular to subangular, with silt
136.5 - 141.5	Sand, fine- to medium-grained, subangular to rounded, with silt; less silt than in 131.5 - 136.5.
141.5 - 146.5	AS above, less silt
146.5 - 151.5	Sand, medium-grained, rarely coarse-grained, subangular to rounded
151.5 - 156.5	Sand, as above, with rare coal fragments
156.5 - 161.5	Sand, medium- to coarse-grained, angular to subrounded, with sparse pea-size pebbles
161.5 - 166.5	Sand, upper fine, lower coarse grained, angular to subrounded
166.5 - 171.5	As above
171.5 - 176.5	Sand, fine- to medium-grained, subangular to rounded, with clay, white and red
176.5 - 181.5	As above
181.5 - 186.5	Sand and clay; sand, upper fine to coarse, predominantly medium-grained, subangular to subrounded; clay, white and red (Driller- clay at 184' to 186.3 ft)

NRC - Lignite Series
Drill Hole 4
Sample Descriptions
Carter coordinate location 6-D-7, 650' FSL x 1390' FEL
Milburn Quad. Comm 9/8/81 Comp. 9/10/81
Carlisle Co., Ky., Elev. 460'

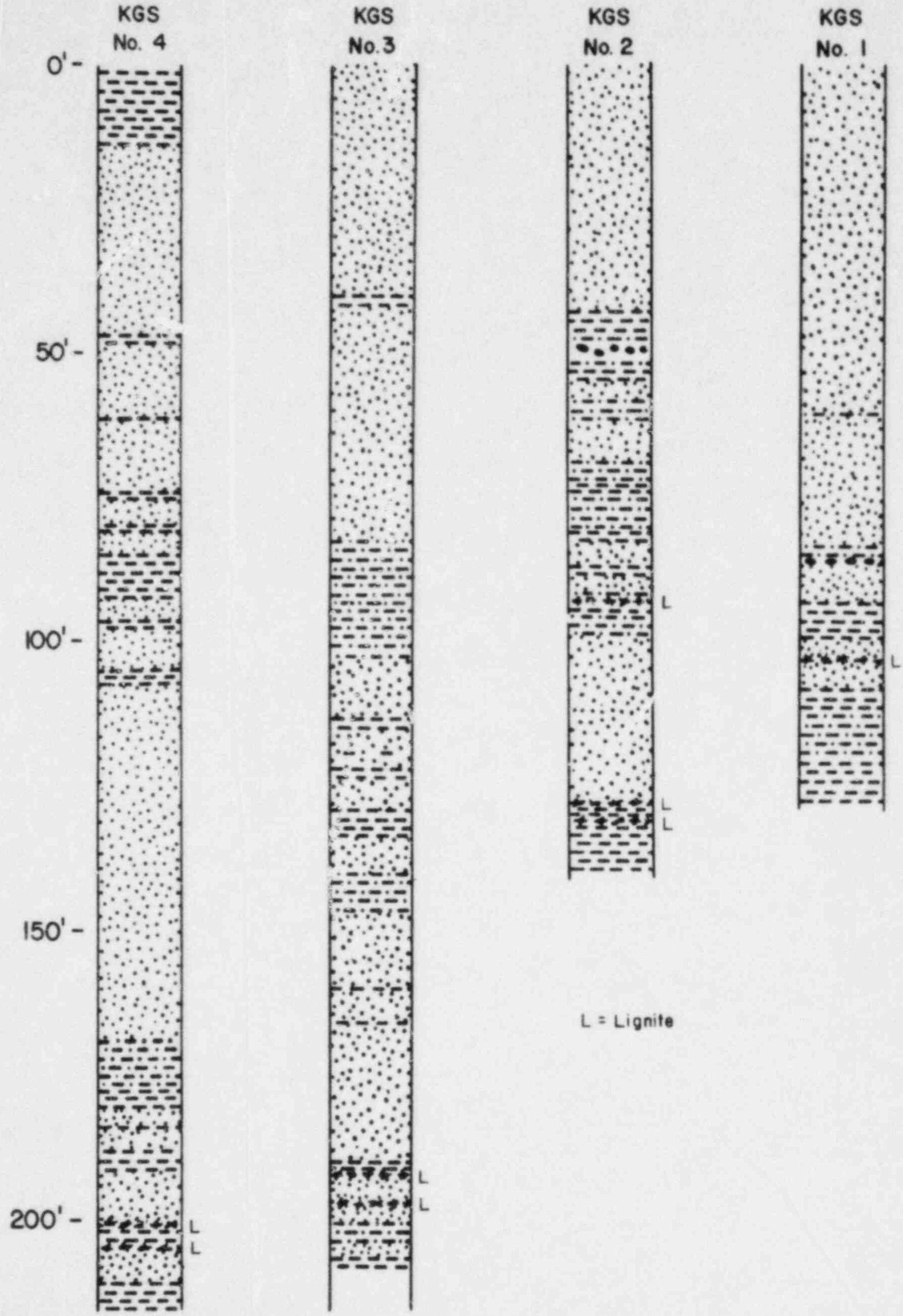
186.5 - 191.5		As above, with silt
191.5 - 196.5		Sand, medium-grained, subangular to rounded. Left sandy clay at 192 ft.
196.5 - 201.5		Sand, fine- to medium-grained, subrounded. Iron nodules (hard drilling), some white clay
201.5 - 205.0		Sand, as above, with lignitic clay, mud darker
205.0 - 208.5		Lignitic clay and sand, fine- to medium-grained, subangular to subrounded
208.5 - 210.5		Split Spoon Sample #1
	0.97'	Lignitic clay, dark-brown to light-brown where clay predominates
	1.03	Clay, light-gray, darker and lignitic at top, rooted at top
210.5 - 211.5		Sand, medium- to coarse-grained, subrounded
211.5 - 216.5		Sand, fine- to medium-grained, subangular to rounded
216.5 - 221.5	T.D.	As above. Clay, light-gray on bit

Logs:

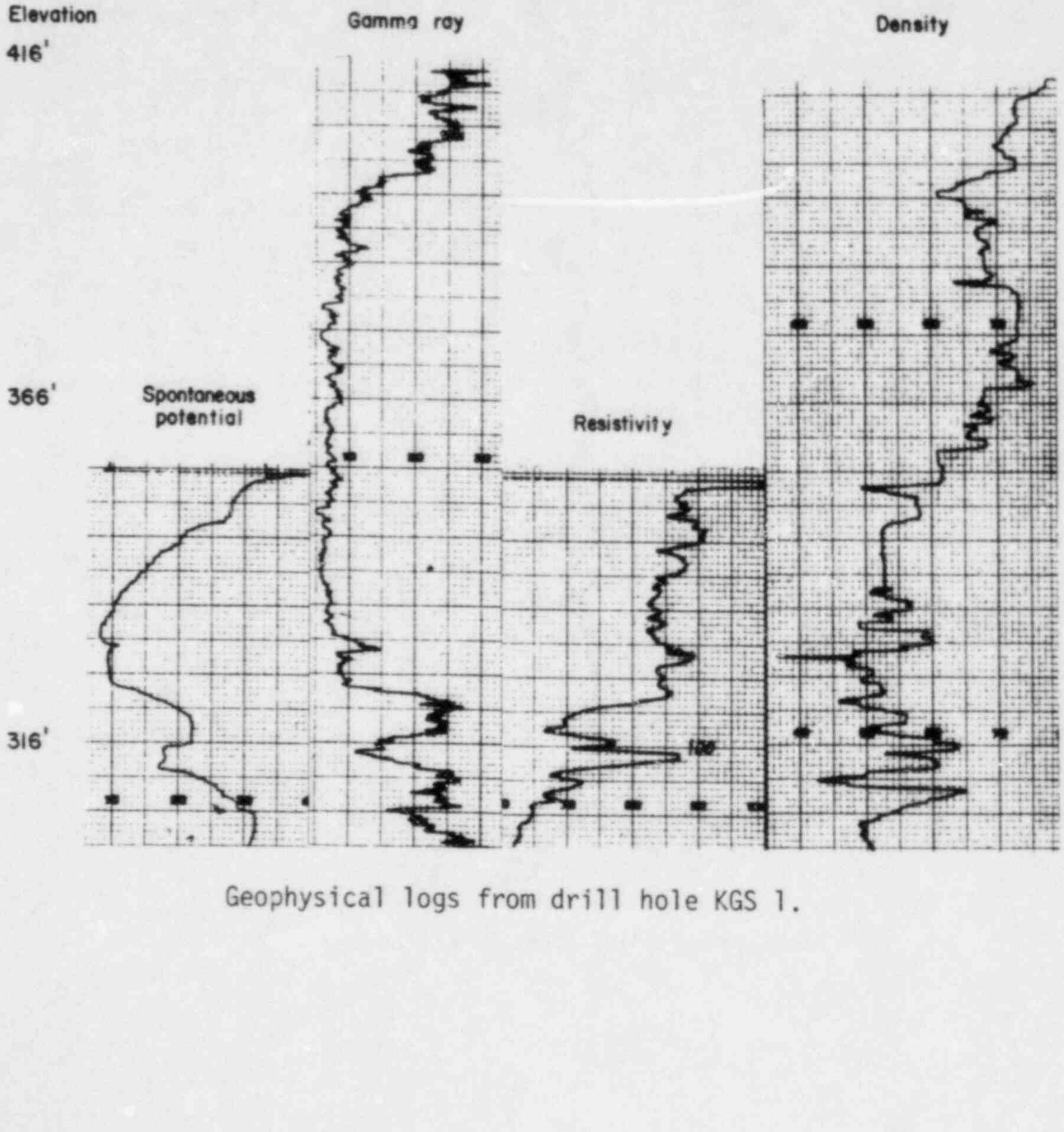
Electric

Gamma tool not working. Hole bridged, could not get density log down.

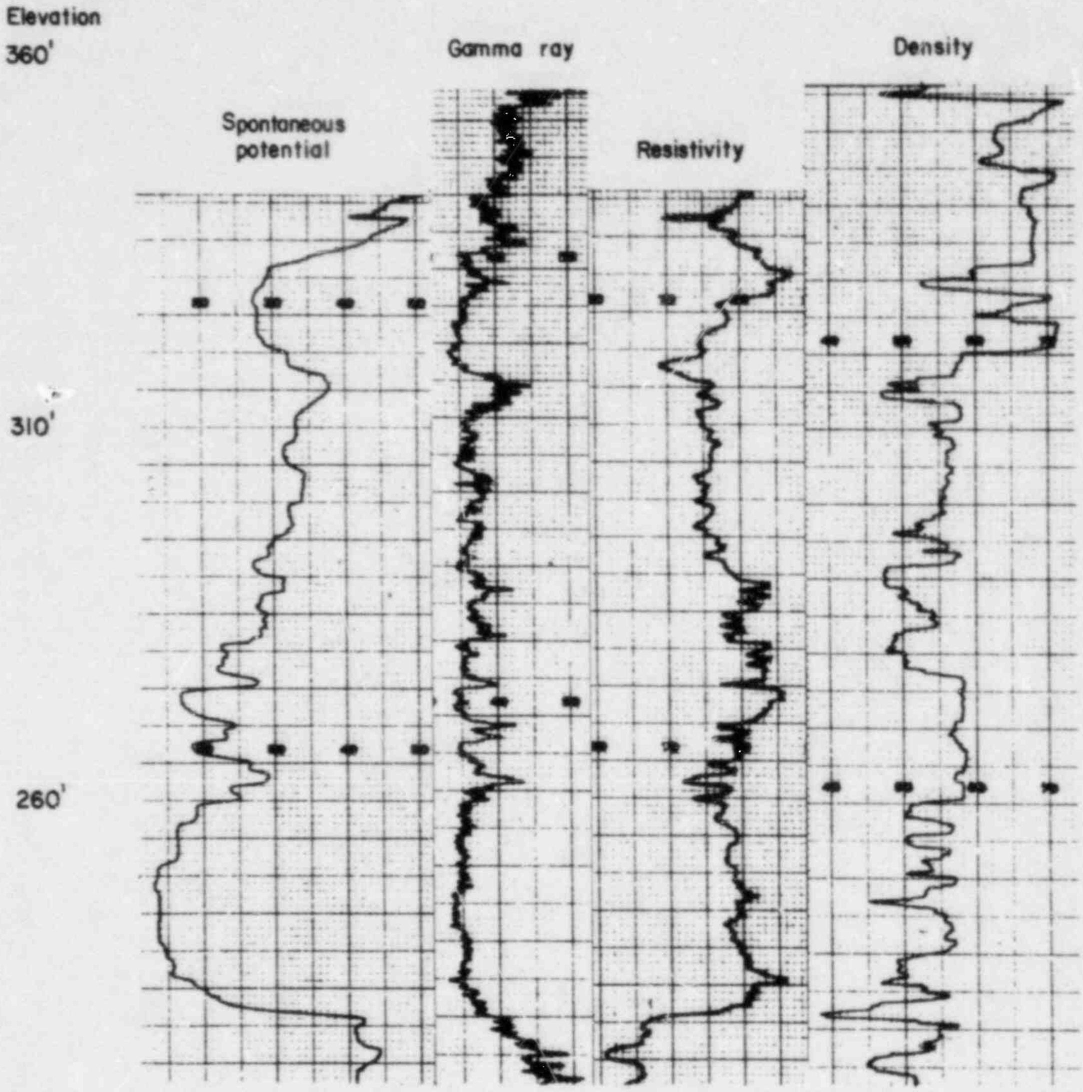
APPENDIX II: LITHOLOGS OF DRILLED HOLES


KGS No. 4
KGS No.3
KGS No. 2
KGS No. 1
0'-
50'-
100'-
150'-
200'-
L
L = Lignite

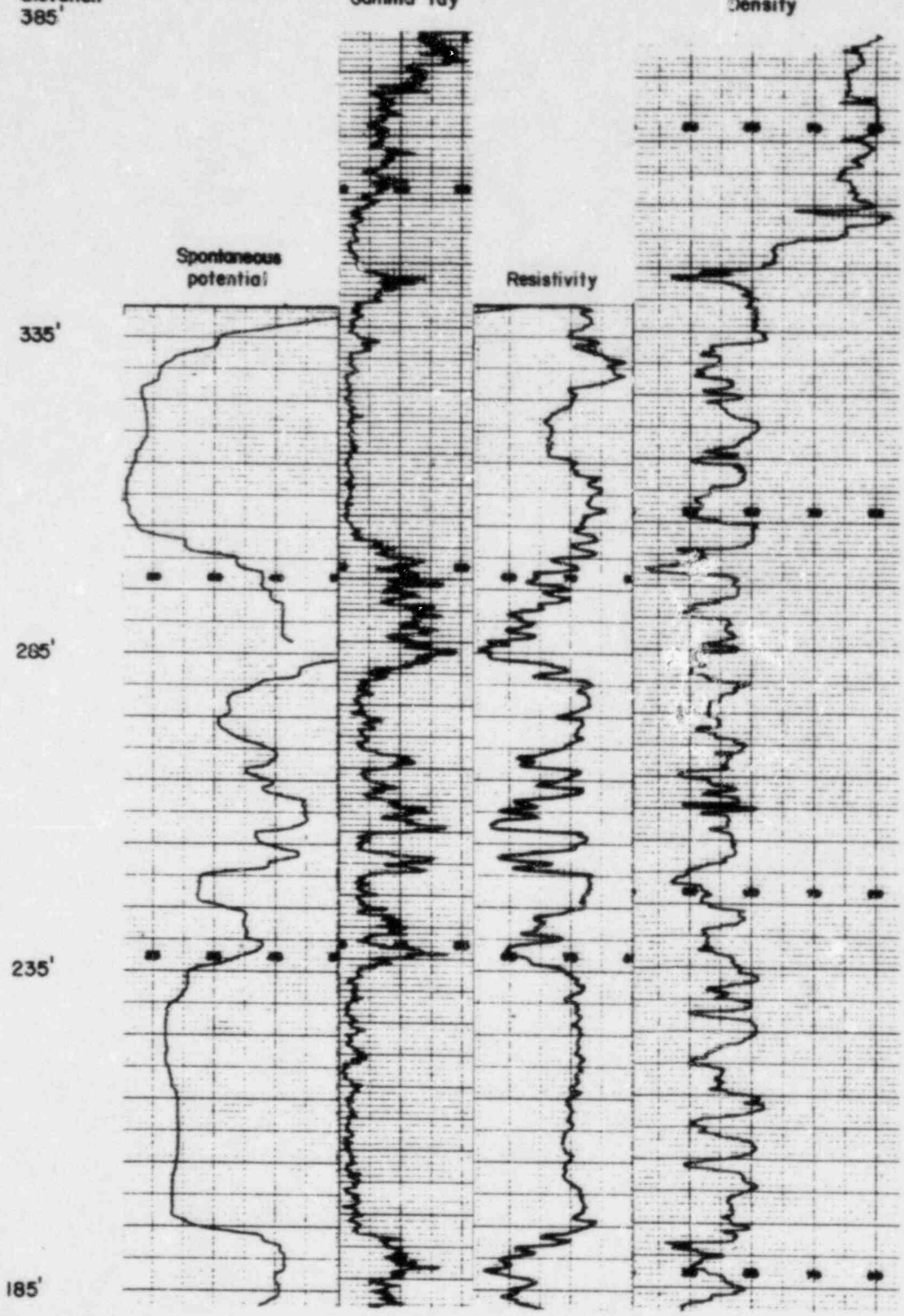
APPENDIX III: GEOPHYSICAL LOGS FROM DRILLED HOLES



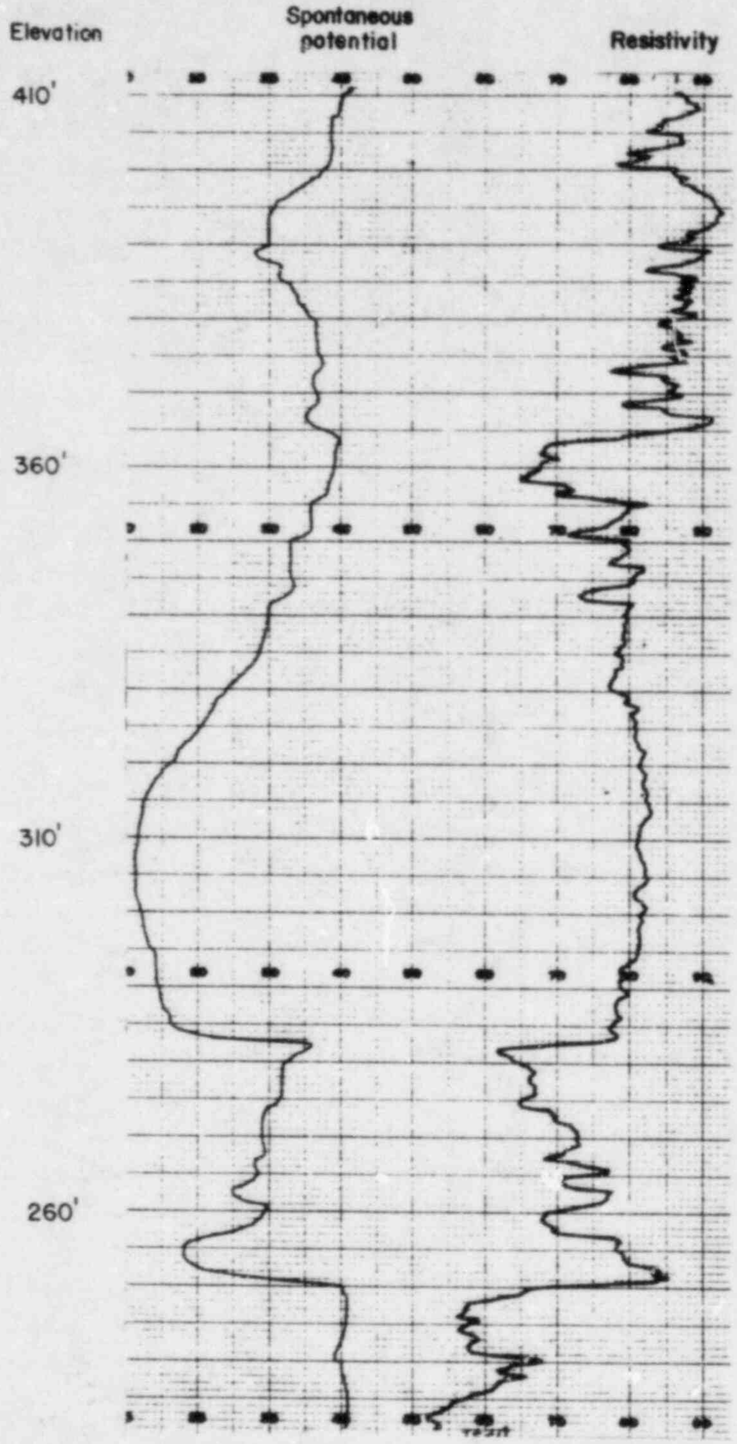
Geophysical logs from drill hole KGS 1.



Geophysical logs from drill hole KGS 2.



Geophysical logs from drill hole KGS 3.



Geophysical logs from drill hole KGS 4.

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16. ABSTRACT (200 words or less)

This is the final report of geologic and geophysical investigations of faulting in western Kentucky. Structure mapping based on seismic-reflection profiling and earthquake plotting in the Jackson Purchase Region of western Kentucky indicated lineaments, faults, and earthquake epicenters in the deposits of the Mississippi Embayment. New Madrid seismic activity has been linked to these structures which have been reactivated through geologic time (Zoback and others, 1980). The area of study was selected based on existence of information, proximity to lineaments, proximity to epicenter, adequate penetration to lignite beds and access to drill sites. The report includes an interpretation of the relationship of faulting in the western Kentucky study area to the regional structure and tectonics associated with New Madrid Fault Zone.

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