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Monoclinal Structure and Shallow Faulting of the Reelfoot Scarp As Estimated From Drill Holes With Variable Spacings

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ABSTRACT

The Reelfoot scarp is an east-facing slope on the Mississippi River alluvial plain. It descends eastward about 20 feet across a distance of about 600 feet. The scarp is mainly a monocline. However, a small fault occurs at the foot of the slope, along which there was about 3 feet of graben collapse which subsequently (maybe soon after 1812) filled in with soil washed down the adjacent monoclinal slope. The monoclinal structure was clearly shown by six drill holes spaced about 100 feet apart. A fault was indicated by these same holes, but a fault was not demonstrated by drilling until holes were dilled closer together than 10 feet.

Drilling proceeded in five stages:

1 - Data were obtained from test holes drilled about 500 feet apart in 1944 by the US Corps of Engineers. These were suggestive of the monoclinal structure and suggestive of two faults with estimated maximum throws of 28 (buried) and 18 feet (near surface).

2 - Six test holes were drilled about 100 feet apart. These clearly indicated the monoclinal structure of the scarp with vertical offset of about 15 feet. These holes also were suggestive of the near surface fault at the foot of the scarp

with a maximum throw of 14 feet. These and subsequent monoclinal vertical offset and fault throw measurements are made in silts and clays close to the land surface.

3 - Fourteen hand auger holes were drilled about 25 feet apart in the same line as the 6 drilled in step 2. These certainly proved the monoclinal structure, and showed that the monocline steepens where the fault was indicated at the foot of the topographic slope so that monoclinal offset (about 22 feet) is greater than the descent of the land surface. The fault was shown to be minor, if present (maximum throw of about 2 feet).

4 - Four hand auger holes were drilled 10 feet apart in the same line. These were still suggestive of, but did not demonstrate faulting. They did show that faulting, if present, is still smaller (about 1 foot of throw).

5 - Five hand auger holes were drilled 2½ feet apart, still in the same line. These indicate a graben involving layers as shallow as 4 feet, perhaps redeposited soil washed into a depression where the surface collapsed by faulting after the 1811-12 earthquakes, with about 3½ feet of throw in the graben and 1 foot of throw across the graben.

It is concluded that faulting can be determined by closely spaced holes so shallow that they can be drilled readily by hand augers.

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Introduction

The area of concern in this paper is the "Reelfoot Scarp." The scarp is north-trending and faces eastward. It descends 20 feet from the higher Tiptonville Dome to the lower ground of Reelfoot Lake (Figs. 1, 2, 3). The object of this investigation is to learn how to recognize and interpret possible faults in this earthquake-prone region of the Mississippi River alluvial plain. Because the scarp has long been considered to mark a fault, it drew the writer's interest at the beginning of the New Madrid Study Group* project on the earthquake region. This report is a part of a series of reports by geologists from Vanderbilt University as part of the larger study.

The area is underlain by a one to two hundred-foot thick mass of Holocene alluvium. The upper ten to fifty feet, "the topstratum," is a fine-grained layer of silt and clay with some fine sand, whereas the thicker underlying coarse-grained alluvium, "the substratum," consists of sands and gravels. Upper Eocene sands and clays lie unconformably beneath this alluvium. Results of this study indicate that stratigraphic units within the "topstratum" are relatively continuous and may be correlated between drill holes with spacings that vary from 2½ feet to over

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*The New Madrid Study Group is a confederation of organizations, including state geological surveys and universities, mainly funded by US Nuclear Regulatory Commission and coordinated by Dr. T. C. Buschbach of the Illinois Geological Survey and St. Louis University.

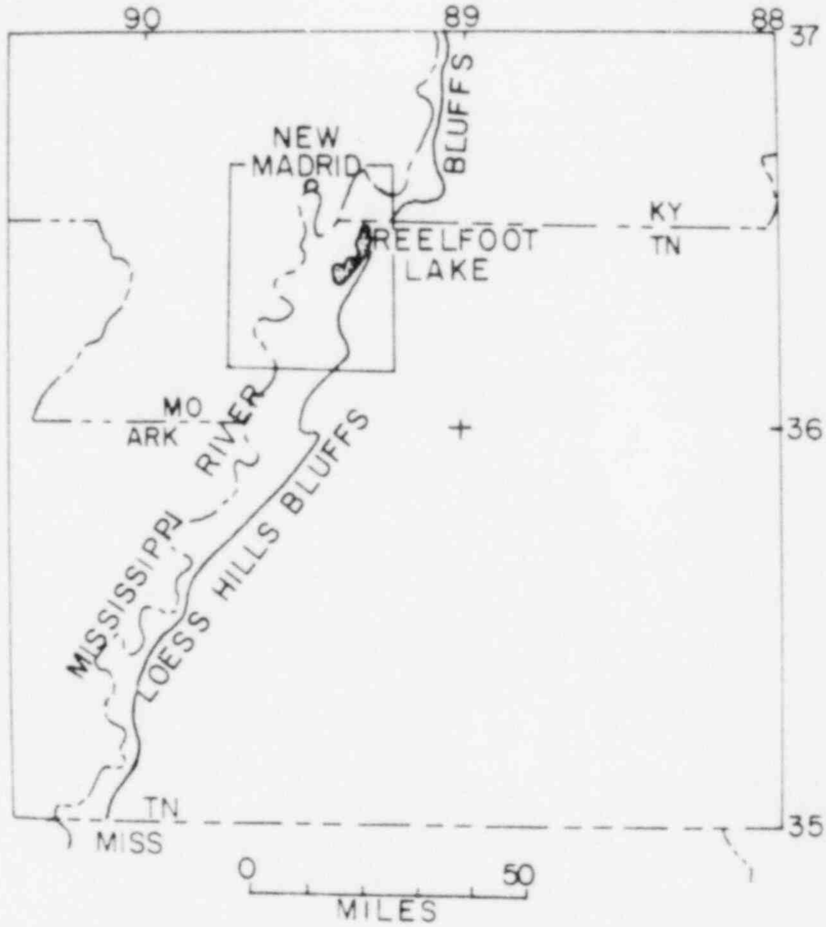


Figure 1 - Location of the study area within the Mississippi Embayment. The Reelfoot Scarp is west of Reelfoot Lake. The rectangle frames the area shown in more detail in Figure 2.

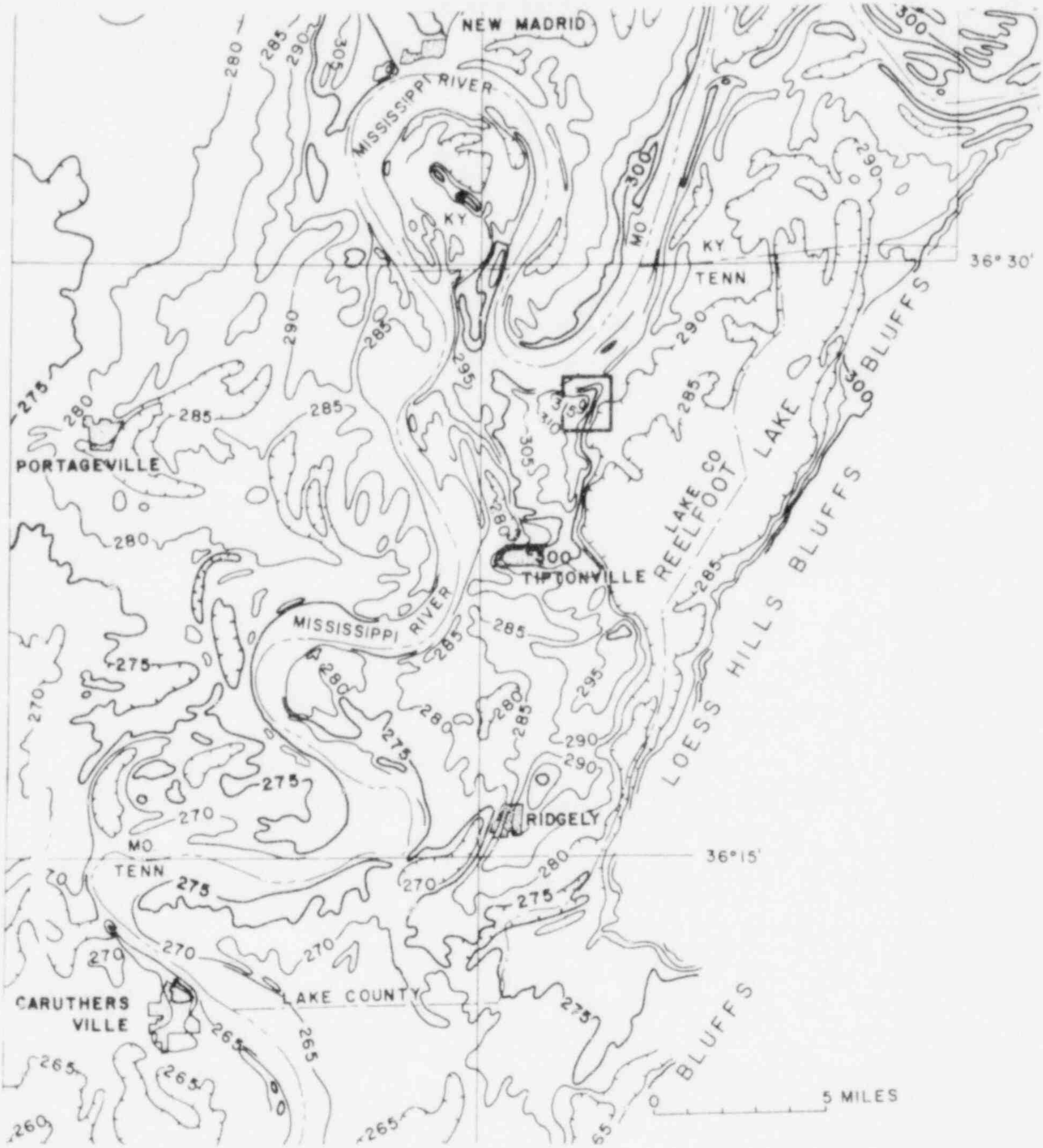


Figure 2 - The location of the study area in northwest Tennessee on the Mississippi River alluvial plain. The small rectangle is shown in greater detail on Figure 3. Contours on this map show the general configuration of the alluvial plain. The Tiptonville dome is the area above 300 feet which extends north from Tiptonville for approximately 5 miles (Map from Stearns, 1979, Fig. 7).

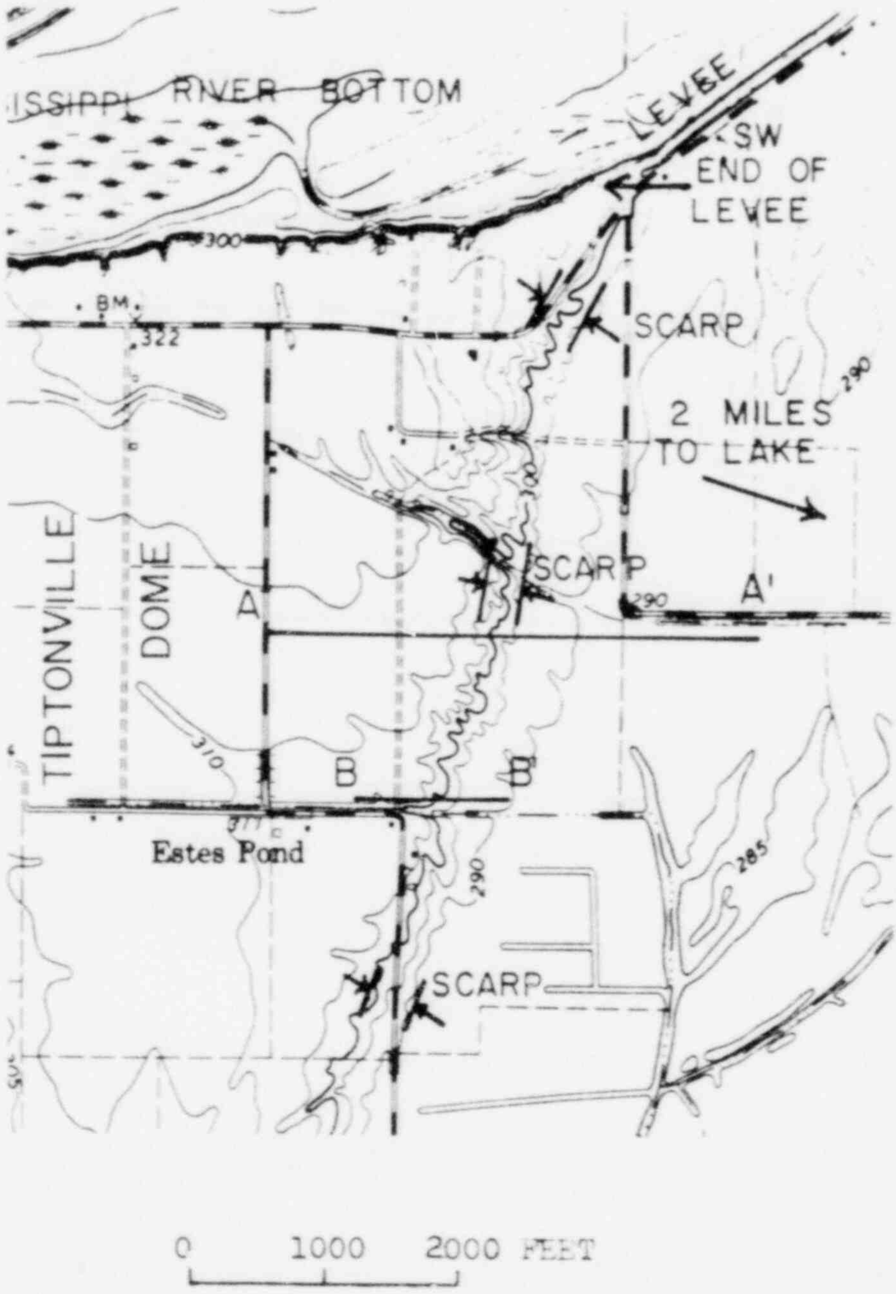


Figure 3 - Area of detailed study near the scarp at the east edge of Tiptonville dome. AA' and BB' are lines of drill holes. High ground to the left (305-320 feet in elevation) is on Tiptonville dome. Low ground to the right (285-290 feet in elevation) is only slightly above Reelfoot Lake.

200 feet.

The data used in this report consists of five sets of increasingly detailed drill hole records. Less detailed data appeared to show faulting at shallow depths. However, as the drill holes became more detailed, faulting was found, but with substantially less throw. This relationship casts doubt on the presence of significant faulting, but minor faulting does in fact exist.

Acknowledgments

The idea that faults are easily interpreted between widely spaced borings, but may become obscure or disappear upon closer drilling was first stated to the writer by Dr. Ellis Krinitzsky of Waterways Experiment Station. The writer has informally thought of this relationship as "Krinitzsky's Law." It was previously thought that inexact stratigraphic correlation could be the problem. but it is not the main factor in this instance as will be shown.

Early stages of this investigation were funded in part by National Science Foundation (Grant EAR 75-17383). All stages were funded by the Nuclear Regulatory Commission (Contract NRC-04-760229).

Most of the drilling was done by students at Vanderbilt University. Tom Haselton, Parrish N. Erwin, Vicki Castro and

Jau-Ping Tsau helped with sampling and logging of the contractor-drilled test holes. Mike Shea, Jau-Ping Tsau, Bob Perry, David McDonald, Bruce Stearns, Chuck Sandacz, Sue Nava, and Sharon Wilson drilled and described hand auger holes. Hospitality and patience of the landowner, Mr. Howard Vaughn, and farm operator, Mr. L. D. Cook, are particularly appreciated. The report has been much improved by critical review of Sue Nava, Sharon Wilson, and Stuart Maher.

Previous Investigations

Drill hole data available prior to this investigation is from the Corps of Engineers, U. S. Army, published by Fisk (1944), Krinitzsky (1950) and Saucier (1964).

Fisk (1944) referred to the scarp as

> "a fault escarpment along which earth movement has taken place during the construction of the alluvial plain surface. . . . the meanders . . . are cut by the escarpment and part of them have been downdropped into the Reelfoot Lake Basin from an elevation of 315 ft. M. S. L. to an elevation of 290 ft. . . . Displacement along the fault has been very recent and perhaps slight movement occurred as recently as 1812. . . . Borings show a displacement of 50 feet in the Tertiary beds underlying the recent alluvium. . . ." (p. 25).

On Fisk's figure 33 a fault is mapped along the scarp on a photo image.

Krinitzsky (1950, p. 6-9 and figure 4) discussed the fault and presented a subsurface cross section. He points out that

> ". . . except in the area of actual borings, the fault is inferred from purely physiographic evidences. . . . The down-dropped block is east of the fault line. Recent sediments have their greatest thickness here, indicating that former courses of the Mississippi River, or of ancestral streams in this area, must have been channeled along the

> fault direction. A northward projection of this fault seems to coincide with a distinct reach of the Modern Mississippi River."

Krinitzsky's cross section shows a single fault that offsets Eocene by about 40 feet and extends to the surface. Near-surface alluvium is not drawn as being offset by this fault. The line of borings used by Krinitzsky is deliberately reinterpreted in this paper to maximize faulting at each level. This does not mean that this writer disagrees with the interpretation of Krinitzsky. Indeed, as the result of more detailed surface drilling, Krinitzsky's drawing of a fault with slight or no offset at the surface will be shown to be justified.

Saucier (1964) mapped the study area, showing in considerable detail the old river channel that crosses the scarp. His cross section shows a fault, but it does not differ from the section presented by Krinitzsky in 1950.

Haselton (1977, unpublished thesis) presented the results of the six test holes drilled as part of this project. His interpretation was that faulting is not present on the scarp; rather, that the scarp is the site of "distributed strain of soil."

This conclusion was essentially verified by Russ, Stearns, and Herd (1978). They mapped an exploratory trench dug across the scarp in 1977. About 100 "offsets" were mapped in the 860-foot trench; most showed slippages of an inch up to a foot.

Only one "major zone of steeply dipping faults . . . displaced beds in excess of 3 m." Mapping of the trench was done after the six Test Wells* had been drilled by Vanderbilt University, but before the more detailed sets of hand auger holes had been drilled for this project.

Current Investigation

This investigation of the scarp by drilling was performed from March, 1977 to May, 1979. Six relatively deep test wells were drilled by a contractor in March and April, 1977. These six holes were located using the earlier USACE test wells and surface earth resistivity measurements as guides. The test wells were logged using a Widco Resistivity, Spontaneous Potential and Gamma Logger. Later, mainly in the summer of 1978, a line of hand auger holes was drilled, also in conjunction with surface earth resistivity measurements. Finally, sets of hand auger holes were drilled between January and May, 1979. Each stage of the investigation was thus progressively more detailed. Each resulted in a lower estimate of throw on the supposed fault than previous stages.

The Corps of Engineers 1944 Test Wells and Process of Fault Interpretation used Herein

Most of the 1944 Corps of Engineers drill holes are on an

*The term "Test Well" will be used in this report to signify deeper contractor-drilled borings. This terminology will serve to distinguish these machine-drilled borings from the hand auger holes subsequently drilled.

east-west line crossing Tiptonville Dome. Eight drill holes, spaced about 500 to 1000 feet apart and located near the scarp are shown in Figure 4, and their lithology plotted and correlated in Figure 5. The drill hole data have been reinterpreted by the writer. The correlation of the alluvium as drawn by Krinitzsky in 1950 is duplicated here. However, using the brown clay as a guide, it is possible to interpret a steeper eastward dip of Eocene strata (Fig. 5) than that presented by Krinitzsky.

Fisk used these test wells to interpret the scarp as the location of a growth fault. He interpreted about 50 feet of throw at depth as measured by Eocene offset, and about 25 feet of offset of an old river channel at the land surface.

The throw of faults inferred from Corps of Engineers test wells are reinterpreted by the writer (Figure 6) using a simple projection technique designed to maximize fault throw. The general technique can be summarized in the following steps:

<u>Given</u>: a line of four or more drill holes with at least one correlatable contact and a suspicion that a fault occurs between borings that have two holes both to the right and left.

1) Draw the correlations between all holes <u>except</u> the pair with the supposed fault between them; and
2) draw the fault as a steep normal fault halfway between the holes at the level of a correlatable contact; then

Figure 4 - Locations of test wells drilled by the US Army Corps of Engineers in 1944 and Vanderbilt University in 1977. H. N. Fisk (1945) used the wells on Line AA' as evidence to interpret faulting along Tiptonville scarp. Six rotary test wells and 23 hand auger holes were drilled in Test Area BB' for this project.

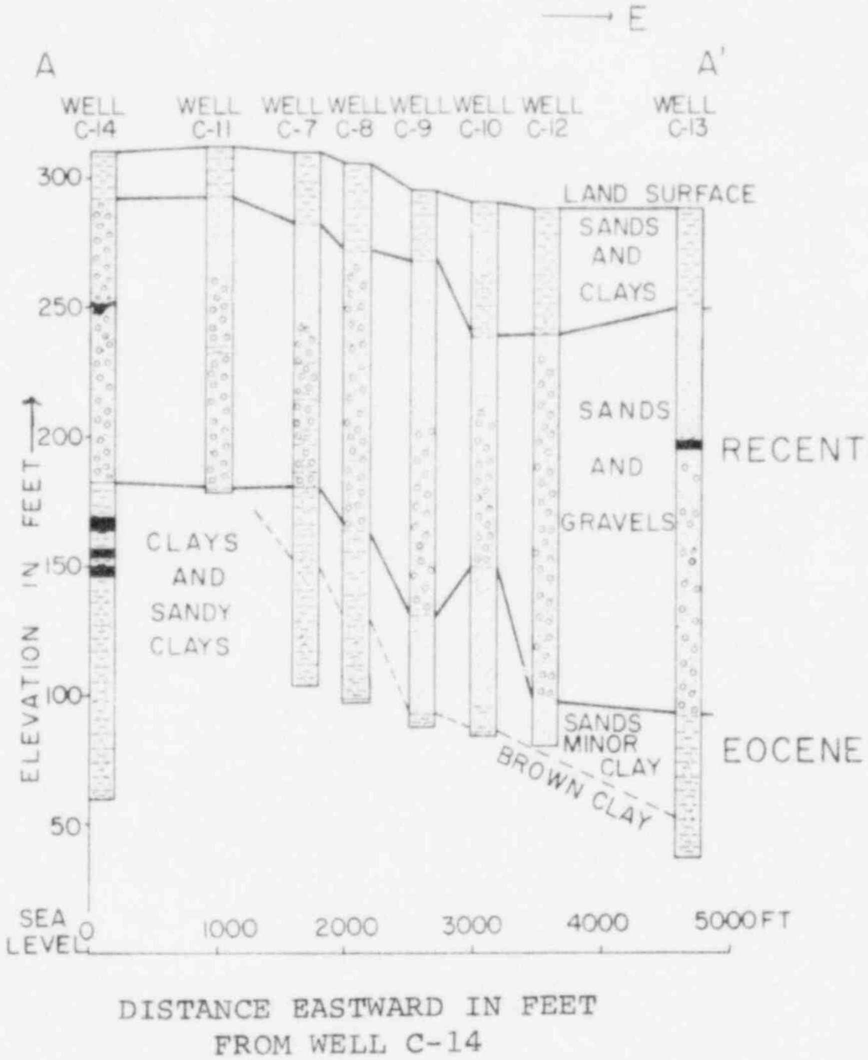
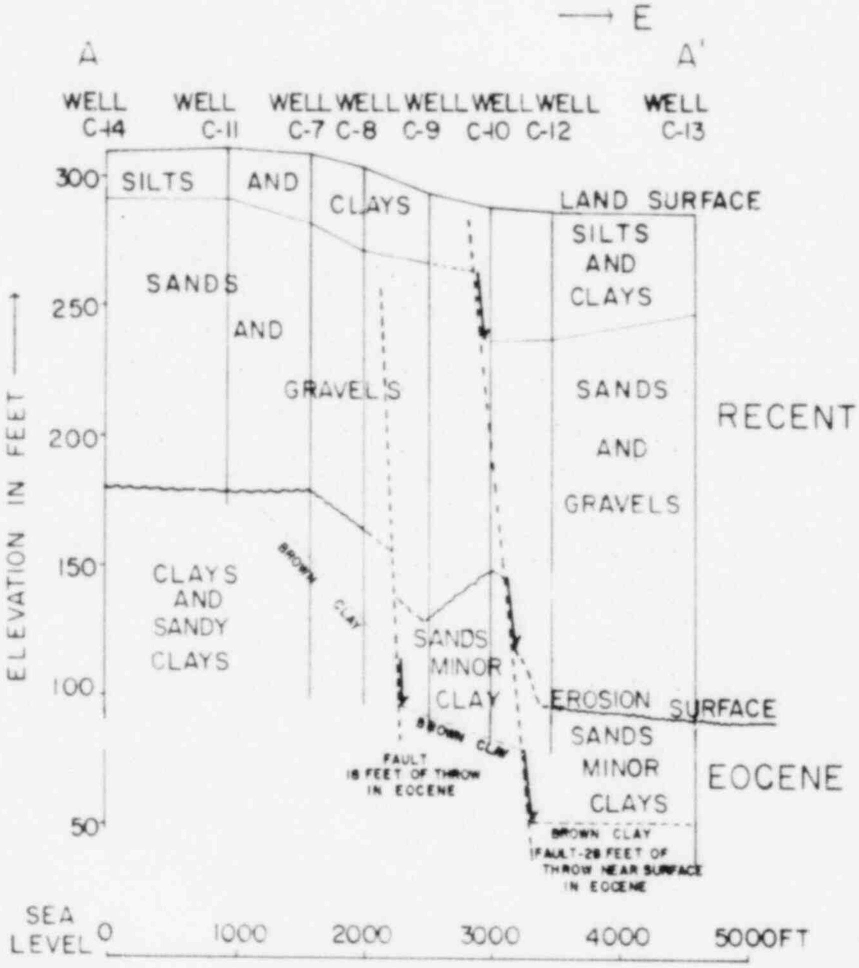


Figure 5 - A lithologic correlation of the 1944 Corps of Engineers test wells of Line AA'. They have been replotted and correlated from drill records by this author. This illustrates the relationship of general "draping" of the topstratum silts and clays with present topography.



DISTANCE EASTWARD IN FEET
FROM WELL C-14

Figure 6 - Fault interpretation of the 1944 Corps of Engineers test wells of Line AA'. This interpretation is made so as to maximize throw on two faults. The left hand fault (between wells 8 and 9) was drawn by Krinitzsky in 1950. It is based mainly on Eocene offset. The right hand fault is based mainly on Holocene offset and a position at the base of the scarp where more detailed test drilling and trenching (Russ et al. 1978) shows faulting.

3) continue the correlations from the two borings left and right of the fault into the undrawn portion to the fault; and finally

4) measure the throw as drawn.

If only one hole is beside the supposed fault, use a flat contact to project from that side. This is likely to maximize the estimated throw.

There are several uncertainties involved with this technique. There may in fact be no fault. Even dip or flat dip of layers may not in fact occur. Grabens may be missed. Therefore, this interpretation is best regarded as part of a process of continued drilling. Intermediate holes are later drilled between holes that may straddle a fault. This is the working method of the investigation herein reported. The Corps of Engineers test wells are regarded as a first step in a continuing investigation in which drill hole spacing is progressively reduced from 1000 ft. to 2½ ft.

The Corps of Engineers section shows two faults. The west fault was drawn by Krinitzsky (1950, Fig. 4). The east fault was added for two reasons. First, the foot of the scarp is the position of likely faulting in holes drilled subsequently as part of this project. Second, a fault zone with a throw of about 10 feet or more was unearthed in the USGS-Vanderbilt trench (Russ et al., 1978) about 500 feet to the north. It is interesting that the offset of the Eocene brown clay and the topstratum silts and clays is nearly identical as constructed. This suggests that the fault has not moved significantly between Eocene and Holocene time. However, a substantial part of the constructed throw near the surface could be the left edge of a clay filled abandoned river channel as was suggested by Krinitzsky (1950). If so, the movement was partly post-Eocene and pre-Holocene and partly Holocene.

The Vanderbilt Contractor-Drilled Test Wells

As a part of this project six test wells were drilled in March, 1977.* These were located about 1500 feet south of the Corps of Engineers test wells on the scarp east of Estes Pond (Figure 4). The locations were selected for easy access, and because considerable earth resistivity data had already been accumulated there. The individual holes were located on the basis of earth resistivity profiles. The general location of the line of wells was selected to give detail across the 500-foot wide scarp. The end drill holes were selected to extend between the positions of the Corps of Engineers Test Wells C-8 and C-10.

Locations of these wells is presented in Figure 7, a lithologic cross section and correlation in Figure 8, and a geophysical log section and correlation in Figures 9 and 10. It was thought that a fault, if present, would most likely be found between wells 1 and 2.

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*Funds for the drilling came from a grant from the National Science Foundation (EAR 75-17383).

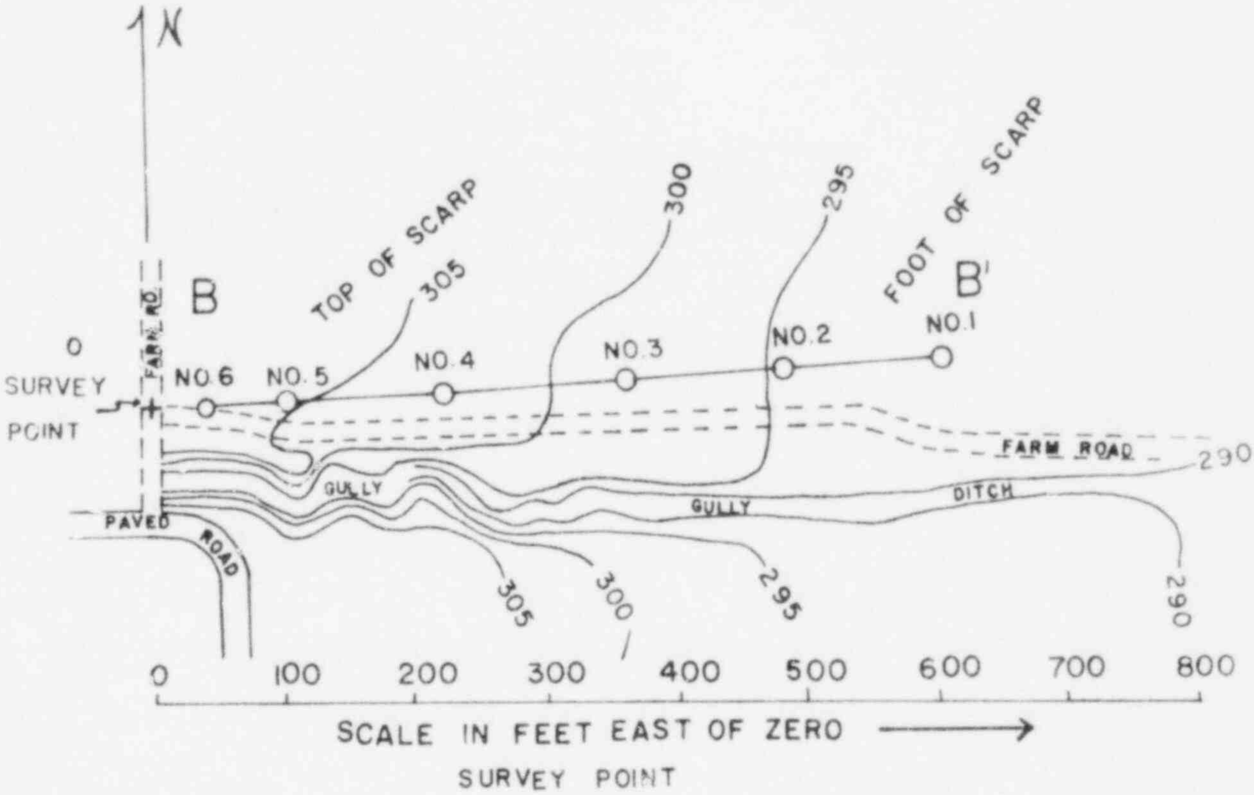

Figure 7 - Location of 6 test wells drilled for this project in April 1977 (Line BB'). These 6 holes cross the scarp in a span corresponding to the positions of USACE test holes C-8 to C-10.

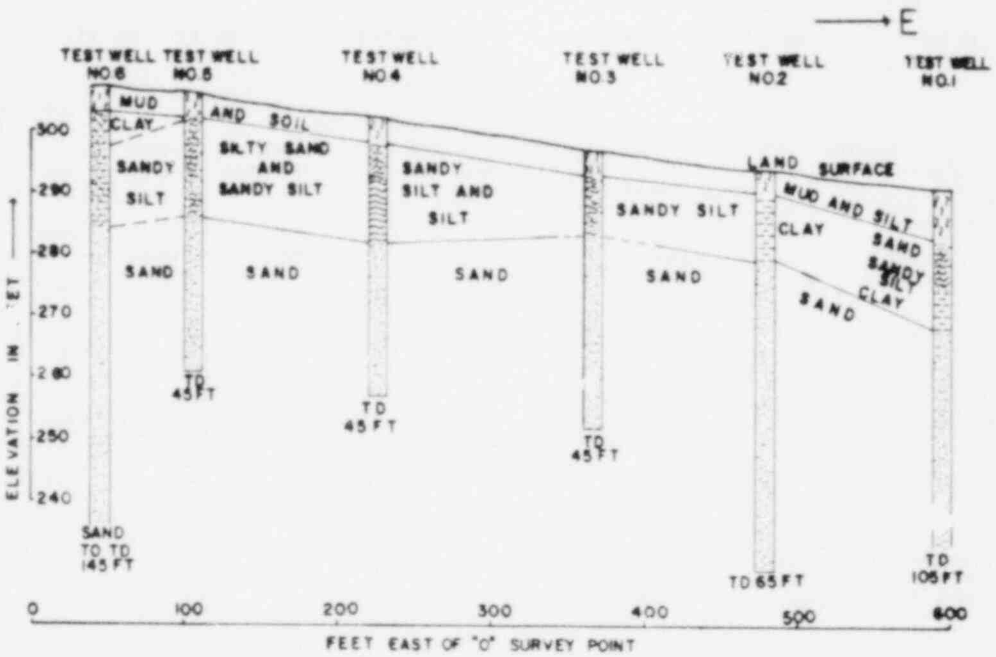

Figure 8 - A correlation of the six 1977 Vanderbilt University test wells based on lithology of circulated samples (BB'). These clearly show the general draping of the topstratum silts to follow the land surface of the scarp. Faulting is believed to occur between Wells No. 1 and No. 2, based on more detailed inv stigations at those points.

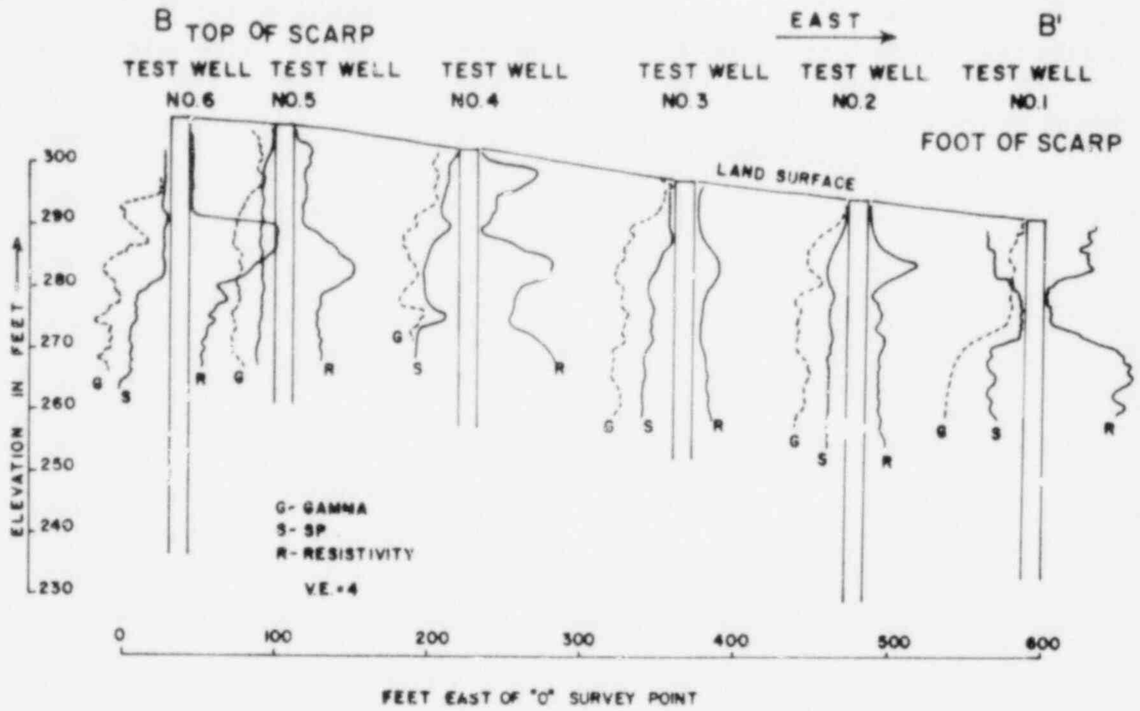

Figure 9 - Electric and gamma logs of the Vanderbilt University test wells. Correlations from these will be shown on Figure 10.

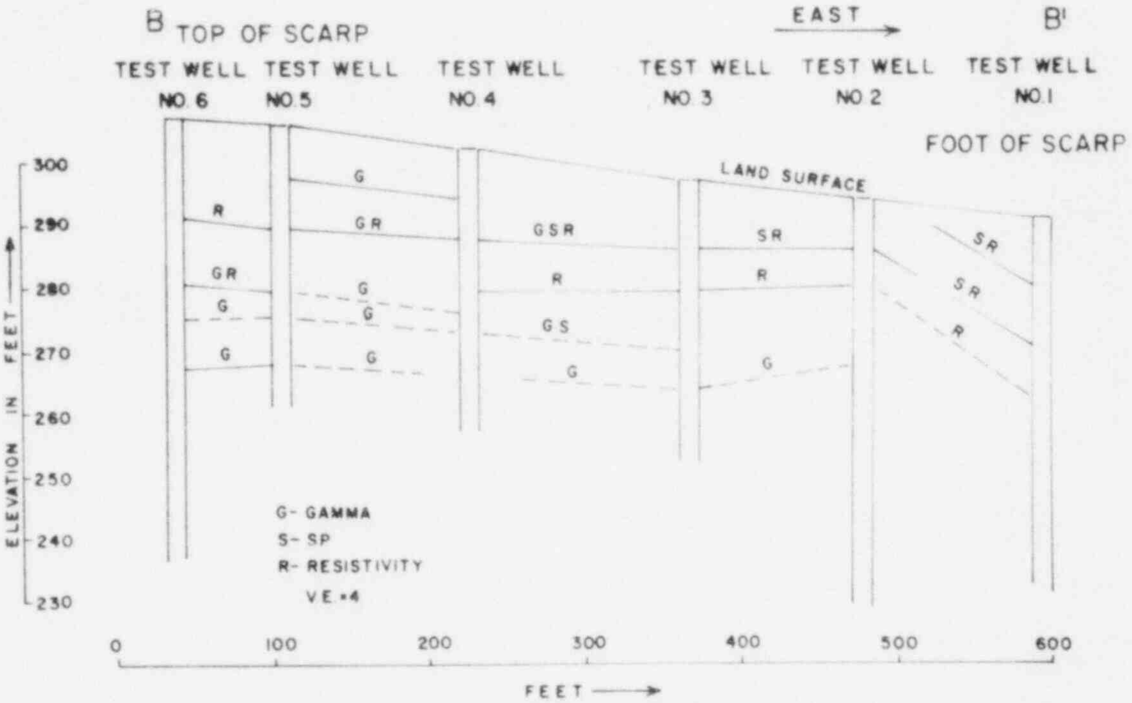

Figure 10 - Geophysical log correlations of the Vanderbilt University test wells. These show trends similar to those indicated by lithology alone (Fig. 8), except that correlations between wells 5 and 6 are more nearly parallel to the land surface and the discordance between wells 1 and 2 is accentuated. It is believed that this correlation is superior to that of Figure 8 because loss of unconsolidated material during the drilling process likely causes considerable errors in estimates of lithology from samples in these holes.

Because earth resistivity surveys indicated faulting close to Test Well no. 1 (Tsau, 1978), the fault was placed closer to Well 1 than to Well 2 in figures 11 and 12.

These wells, which are only about 100 feet apart, showed essentially the same structure that the more widely spaced Corps of Engineers test wells had shown. Topstratum clays and silts descend eastward, approximately paralleling the land surface. Apparently, shallow structure is accurately shown by the shape of the land surface. One exception occurs at the foot of the scarp, where the base of the topstratum clay and the base of the overlying surface silt both drop sharply to the east, a drop more than 10 feet greater than the land surface. This could be normal faulting, the same sense of offset (down on the east side) as the land surface across the scarp, or it could be that the foot of the scarp is the edge of an old stream channel, as was suggested by Krinitzsky in 1950. Subsequent to the drilling of these wells Russ, Herd and Stearns (1978) mapped in detail the main monoclinal structure of the scarp and demonstrated the presence of a fault in a trench.

The system previously described was applied by making a fault interpretation to these wells (Figs. 11 and 12). Lithologic and geophysical correlations were found to not match identically. This was probably caused by error induced when drill cuttings

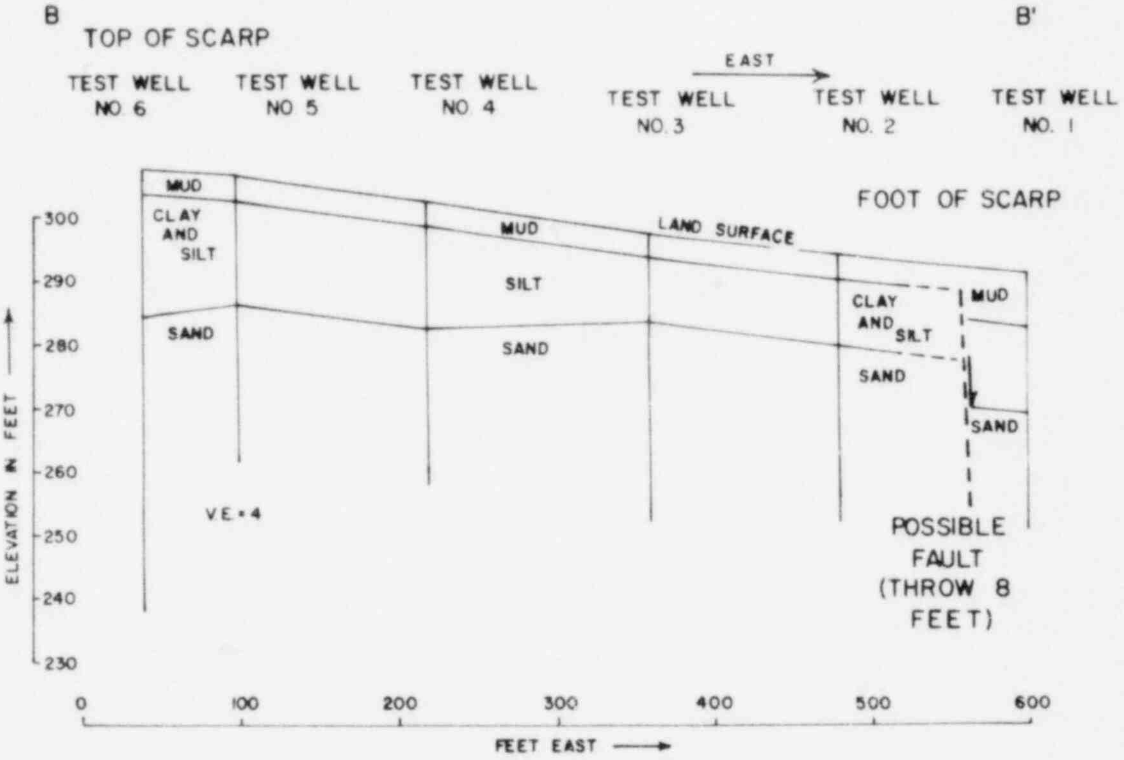

Figure 11 - Fault interpretation of the six 1977 Vanderbilt University test wells (Line BB') based on lithology of circulated samples. The location of the fault was selected from surface resistivity studies.

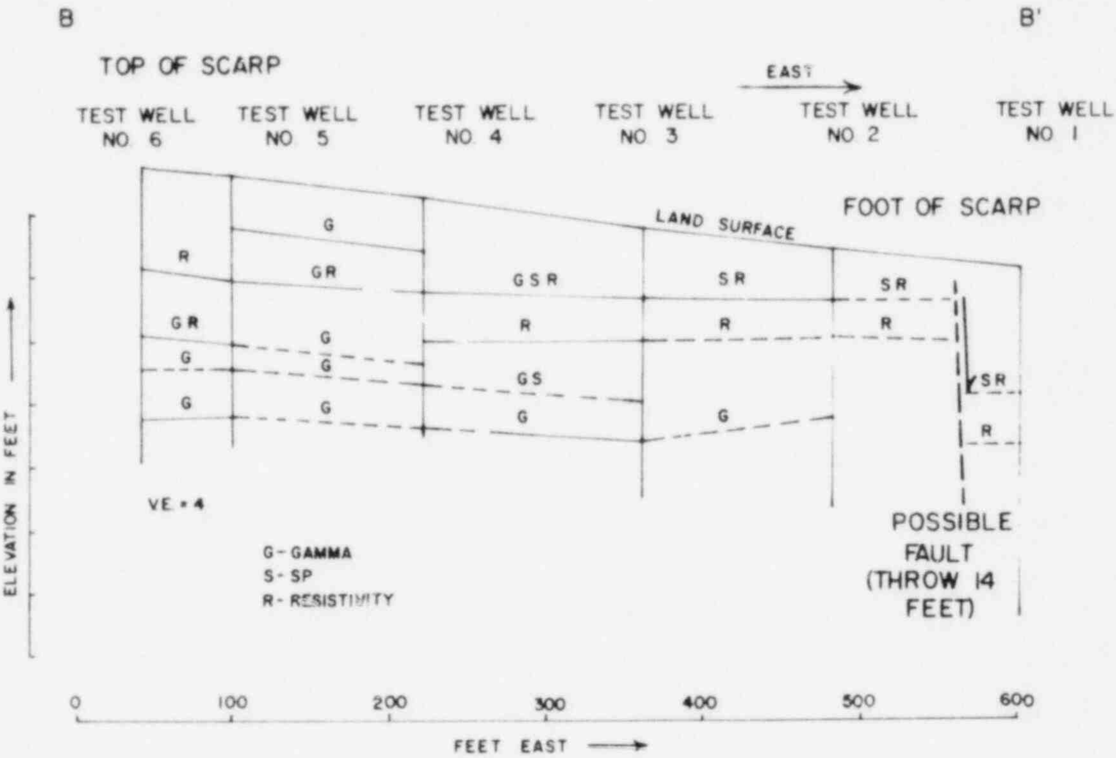

Figure 12 - Fault interpretation of the six 1977 Vanderbilt University test wells (Line BB') based on down hole geophysical log correlations. This is the maximum throw that can be legitimately estimated from the test hole data.

are biased by washing during rotary drilling. Because the data based upon the geophysical logs are believed to be more reliable, the fault interpretation based on geophysical logs is preferred. This produces a throw estimate of 14 feet. This is half of the estimate of 28 feet of throw for the corresponding fault west of Well C-10 in Figure 6.

Shallow Hand Auger Holes

In the summer of 1978, a line of shallow (8-15 feet deep) hand auger holes was drilled on the lower part of the scarp to straddle Test Wells 1, 2, and 3 (Line CC' on Figure 13). These auger holes were drilled in order to demonstrate that the part of the line hypothesized to be unfaulted (between wells 2 and 3) was indeed unfaulted and to see whether the part interpreted as faulted (between wells 1 and 2) was faulted.

Uphill and westward from Well 2 to beyond Well 3 (Figure 14) the closely spaced holes verify that the upper fine-grained layers show no offset and follow the land surface. However, downhill and eastward from Well 2 to Well 1, where a fault was interpreted as being present, the closer-spaced auger holes showed a structural change. However, rather than faulting the slope of the layers merely increases, and layers descend evenly eastward, becoming deeper below the land surface. It would have been justifiable to stop drilling at this point, and interpret the

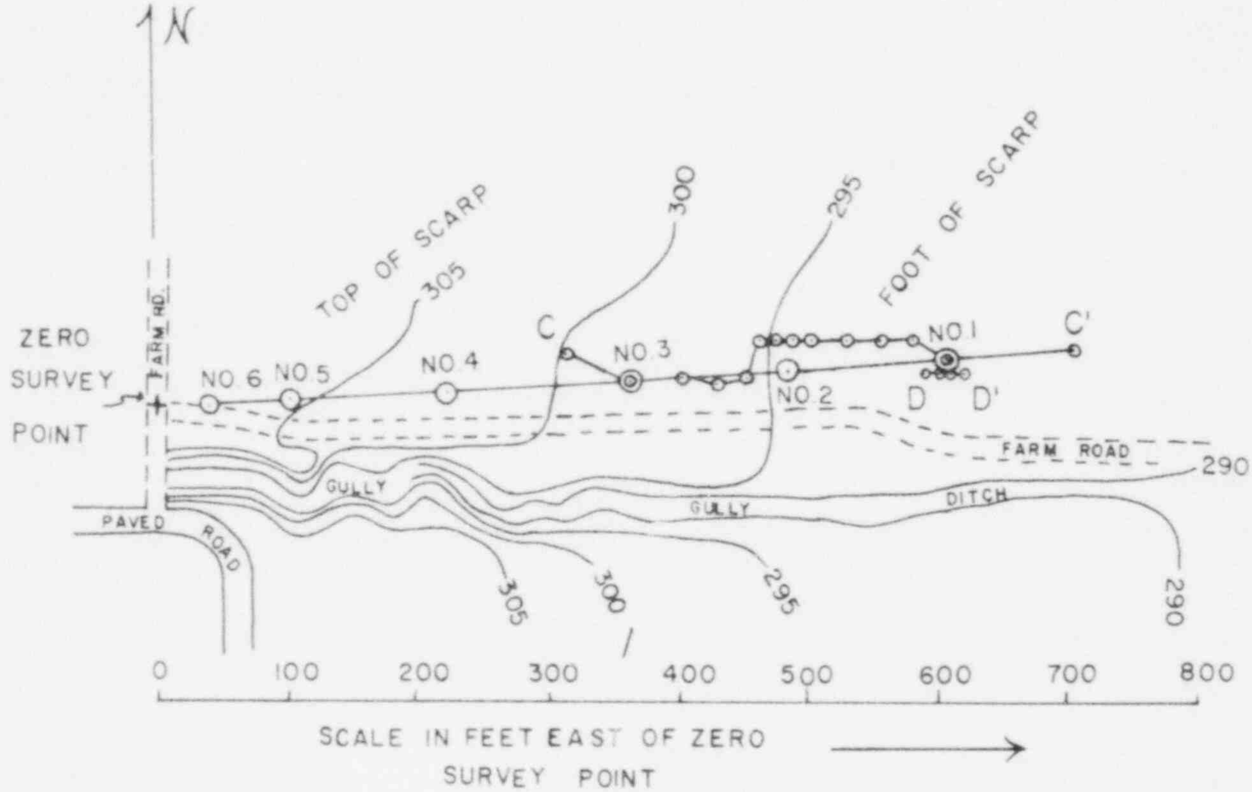

Figure 13 - Locations of hand auger holes in relation to the six 1977 test wells. Line CC' consists of 14 hand auger holes an average of 25 feet apart, two of which nearly coincide with test wells 1 and 3. Line DD' consists of 4 hand auger holes only 10 feet apart drilled on the most likely fault position. Line EE' is not shown on this map. It is 10 feet north of Well No. 1 and only 10 feet long.

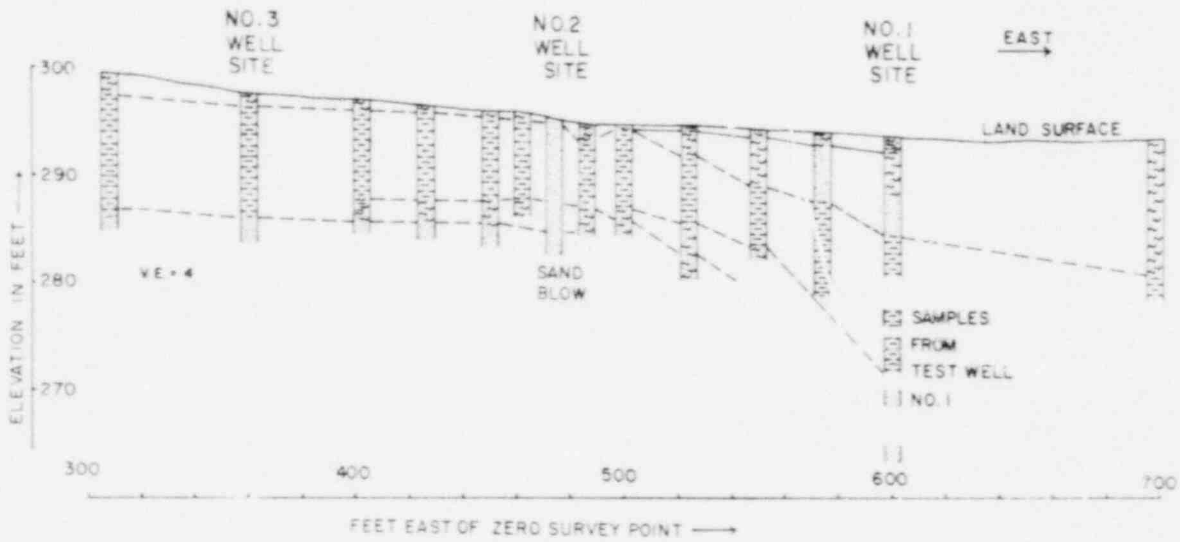

Figure 14 - Lithologic correlation of the 14 hand auger holes of Line CC'.
The parallelism of near surface layers with the land surface is well illustrated by the left hand (west) part of the profile which is well up on the scarp. Near Well No. 1 the layers slope eastward as in the unfaulted stratigraphic correlations of Figures 5, 8, and 10, rather than the fault intrepretations of Figures 11 and 12.

surface structure as unfaulted and completely monoclinal and merely steeper between Test Wells 1 and 2.

However, the 3 auger holes to the west of the auger hole at the Well No. 1 site show a continuous lowering of the silt-clay boundary that does not project into the same boundary in the No. 1 well site. A fault (Figure 15), with from 1½ to 2½ feet of throw, can still be drawn depending on the location of the fault. The closer it is placed to the No. 1 well site the less the throw. Also, earth resistivity surveys (Tsau, 1978) suggested a discontinuity (fault?) at this same position at the front of the scarp in a position similar to the location of a fault in the nearby trench (Russ et al., 1977). Therefore, the writer was loathe to give up the hypothesis that a fault exists even though displacement must be small indeed. Therefore, drilling was tried again at a closer spacing.

Closely-Spaced Hand Auger Holes

In January, 1979 four hand auger holes were drilled 10 feet apart in a line about 10 feet south of the preceding line, straddling the Well No. 1 site (Line DD'). Figure 13 shows the location of these holes, and Figure 16 shows lithologic correlations. If interpreted as faulted (Figure 17), a maximum of about 1-foot of throw can be estimated. As in the preceding cases, the amount of throw depends on fault location. The

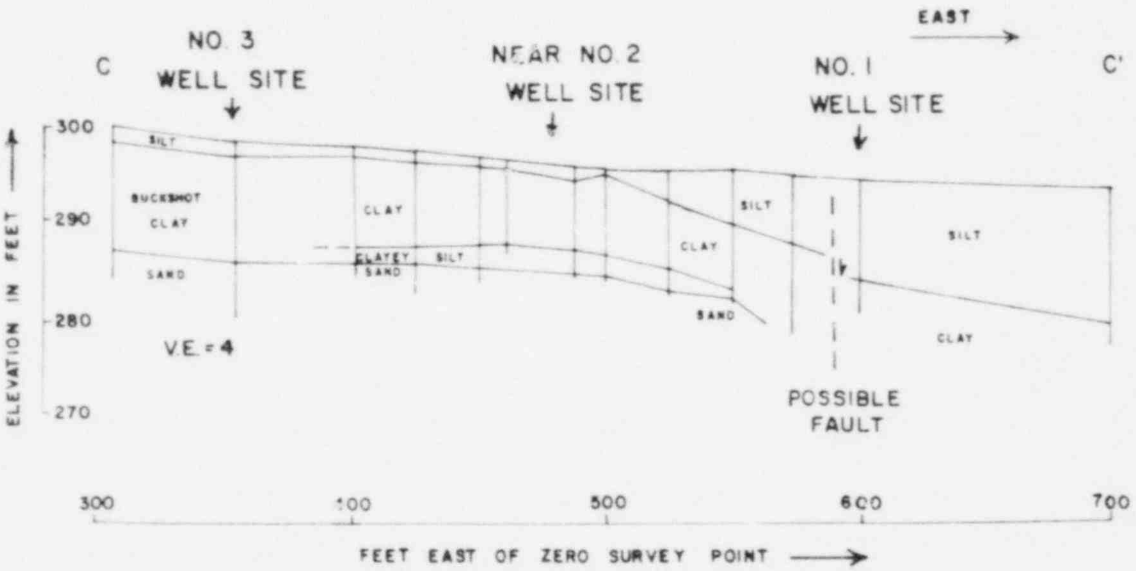

Figure 15 - Fault interpretation of the 14 hand auger holes on Line CC'. The throw estimate is based on projecting the base of the silt to the fault. Note that the estimated throw is sensitive to the fault location. The closer it is to the site of Well No. 1. the less the throw.

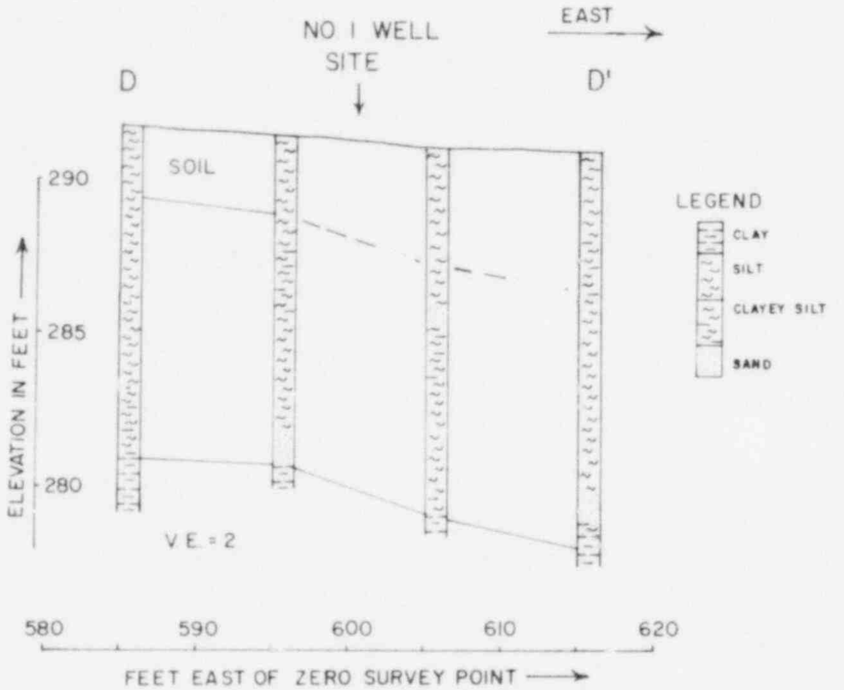

Figure 16 - Lithologic correlation of a line of four hand auger holes 10 feet apart (line DD').

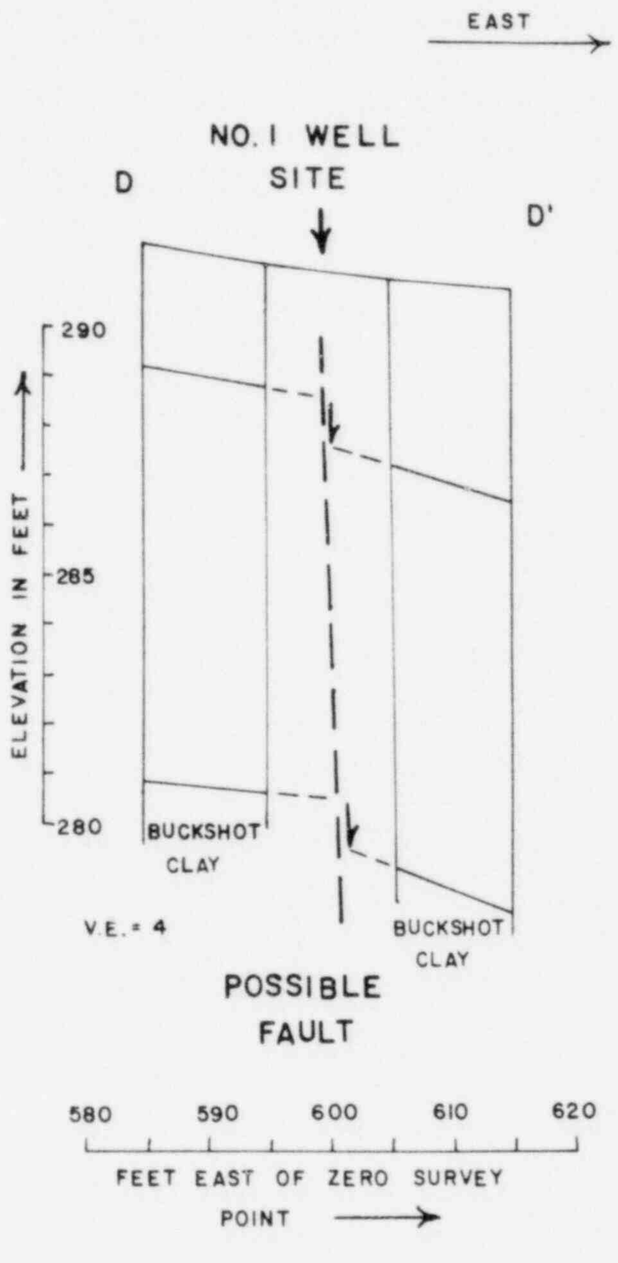

Figure 17 - Fault interpretation of the four hand auger holes on Line DD'. It is possible to draw a fault with about one foot of throw. Note how little this is compared with the 14 feet of throw that could be estimated for wells over 100 feet apart.

farther to the left (west) it is drawn, the less the throw, with the minimum being slightly less than one foot and the maximum being one foot.

The fact that the throw of an inferred fault diminished, further suggests that a fault does not exist. At this point, five cases for five different spacings have been presented; two from the Corps of Engineers Test Wells and three from holes drilled during this project. It was decided that the facts should be determined by even closer drilling or by a relatively short trench; we continued drilling. Unfortunately, we were refused permission to excavate a trench, so even closer drilling was the only alternative.

In May, 1979, a line of holes only 2½ feet apart was drilled. Contacts go down in the middle of the array and then up again (Fig. 18). This can be readily interpreted as a graben (Figure 19) and the fault throw estimates actually increased with decreased spacing. The net offset from one end of the line to the other remains at about a foot and a half, as it was in the preceding case with holes 10 feet apart.

Conclusions

Utility of Drill Holes

Shallow drill holes can be used to determine structure in the study area. Unconsolidated Holocene strata are sufficiently continuous and distinctive to correlate between holes only about

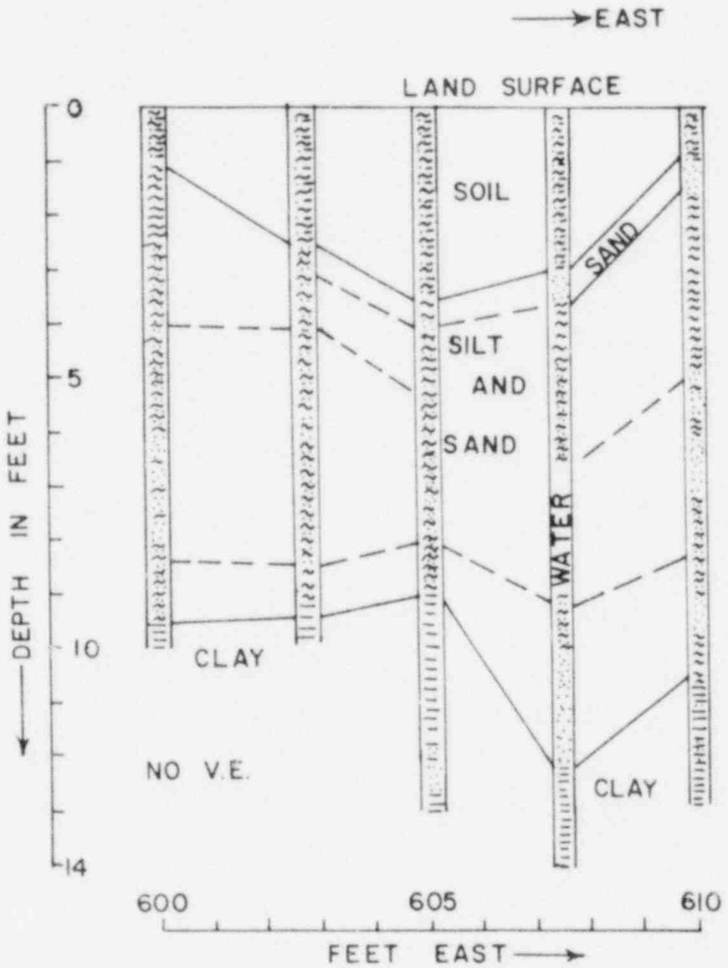

Figure 18 - Lithologic correlation of a line of five hand auger holes 2½ feet apart (Line EE').

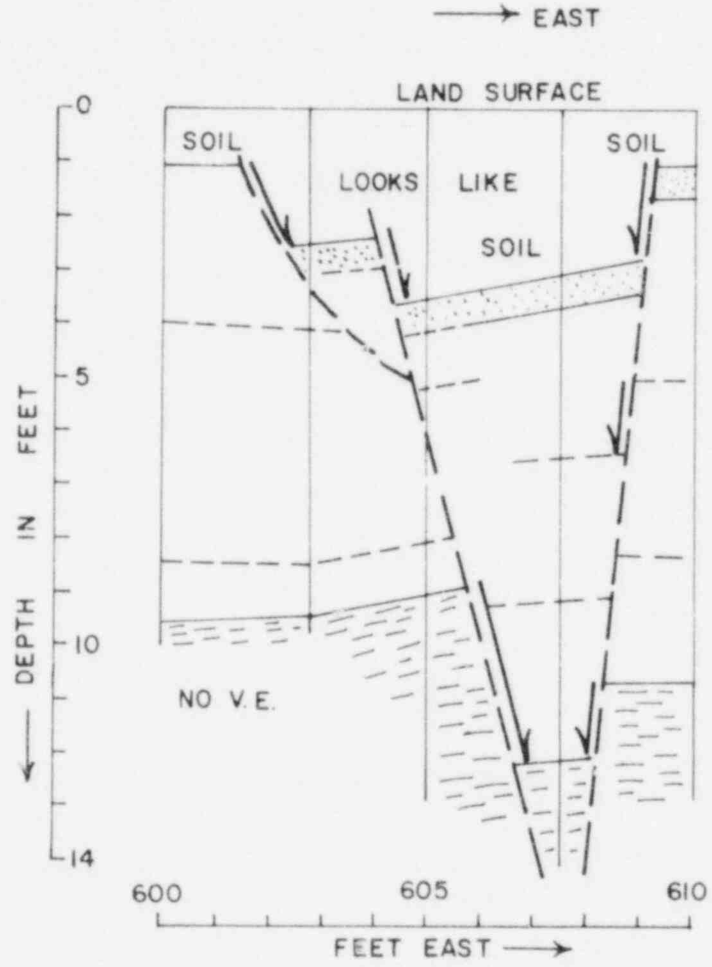

Figure 19 - Fault interpretation of the five hand auger holes on Line EE'. The arrow lengths indicate the estimated dip slip at various positions on the faults.

10 feet deep. Correlations set up with the widely spaced Test Wells (120 feet apart) in the study area were still useable with closer spaced auger holes.

Structure of the Reelfoot Scarp (Figure 20)

A fault occurs at the foot of the scarp with an offset of only about one foot. Its tensional nature is shown by a graben about 5 feet wide, downthrown about 3 feet (Figure 19). This fault, though slight, is likely to be a common feature of the scarp elsewhere, because it occurs in the same position as a fault unearthed by Russ, Stearns and Herd (1978) in the nearby trench having 10 feet or more of throw. The presence of the fault is also especially interesting to the writer, because surface resistivity studies had pinpointed the fault (Tsau, 1978, and report in preparation). The second fault under the top of the scarp is as drawn by Krinitzsky in 1950.

Drilling has also clearly shown that the main structure of Reelfoot Scarp is a monocline (Haselton, 1977). This is also consistent with the relationship mapped in the trench (Russ, Stearns and Herd, 1978). The major monoclinal structure may be approximately dated by radiocarbon dates of gastropod shells from river or stream-laid clays under modern soil in the trench. Those collected by the writer gave ages of 1200 ± 130 and 1595 ± 180 years before the present, so the monoclinal folding has been

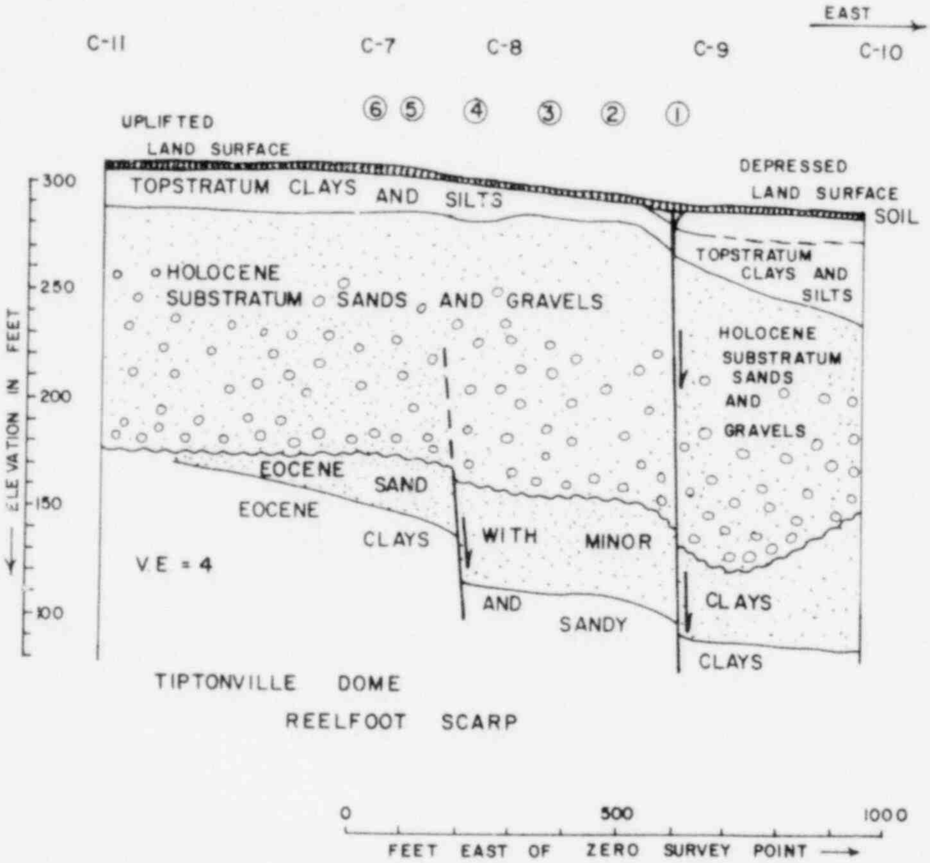

Figure 20 - Shallow structure of the Reelfoot Scarp. The notations C-11, C-7, C-8, C-9 and C-10 are positions of Corps of Engineers wells. The circled numbers mark positions of the Vanderbilt University test wells. These holes are not actually on the same line but are projected together. The closely spaced hand auger holes extend from the circled 3 eastward to the circled 1.

accomplished in the last 1000 to 1800 years. As suggested by Fisk (1944) most movement predated 1812.

Uppermost Displaced Strata

All of the lines of test holes drilled as part of this project indicate offset of layers close to the land surface. In the contractor-drilled Test Wells near surface silt thickens markedly in Well No. 1. Subsequent hand auger holes giving better and more reliable samples all continue to reinforce the hypothesis that the structural effects extend to within 5 feet or less of the land surface. Indeed the line with most detail (Line EE') shows material continuous with the topsoil to fill a graben from 2 to 4 feet below the present land surface.

Time of Faulting

It is interpreted that the graben was a surface depression, perhaps formed by the 1812 earthquake, filled in by soil wash from the scarp immediately to the west.

Relationship of Interpreted Faults to Spacing of Test Holes

Probably because of near surface draping and dragging related to a large fault offset at depth, faulting at the surface is actually quite limited. Because of the likelihood of increasing dip near a fault, spacing of holes is a dominant factor in interpretation. In this particular case, throw estimates varied from 28 feet to less than 1 foot. After some close drilling, faulting would have been denied if it were not for independent information (earth resistivity, trenching).

Table 1 summarizes the steps taken in this study. Successively decreasing estimates of fault throw resulted. Proof of faulting only emerged with a spacing such that complexities of the faulting (graben structure) were penetrated. Drilling alone, therefore, must be closely spaced indeed to demonstrate faulting.

Table 1 - Maximum Throw of Interpreted Faults at Each Stage Compared with Distance between Holes on Tiptonville Scarp, and Working Conclusions

Line, Location of Supposed Fault and Offset Layers	Distance Between Holes	Throw of Fault (Maximum)	Basis for Estimate	Comments and Decisions Before Next Stage
AA' Eocene, Base of Alluvium and base of Topstratum between Wells C-9 and C-12	About 1000 feet	28 feet	Lithology	Near the surface these holes could be interpreted as either faulted or "draped." This is also true for the other fault.
and AA' Eocene and Base Alluvium between Wells C-8 and C-9	About 500 feet	18 feet	Lithology	Closer spaced test holes were drilled as part of the present investigation to further study this structure.
BB' Subsoil and Topstratum between Wells 1 and 2	120 feet	14 feet or 8 feet	E Logs Lithology	Relatively large throw estimate suggests that faulting is real, but only one well east of supposed fault. More information is needed.
CC' Subsoil and Upper part of Topstratum. Close to Well 1	25 feet	About 2 ft.	Lithology	Lesser throw est. suggests no faulting. Could stop now and assert faulting either absent or insignificant (i.e., 2 ft. or less). It was decided to drill to prove the point or not.
DD' Subsoil and Upper part of Topstratum. Close to Well 1	10 feet	About 1 ft.	Lithology	Still lesser throw est. continues to suggest no faulting. Could stop and assert faulting absent or insignificant (i.e., 1 foot or less). Drilling was continued mainly because of surface resistivity info.
EE' Subsoil and Upper part of Topstratum. Close to Well 1	2½ feet	About 3.5 ft. and 1.5 ft. in graben	Lithology	Finally faulting is proved, but so has the insignificance of the offset across the zone been proved.

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The Reelfoot scarp is an east-facing slope on the Mississippi River alluvial plain. It descends eastward about 20 feet across a distance of about 600 feet. The scarp is mainly a monocline. However, a small fault occurs at the foot of the slope, along which there was about 3 feet of graben collapse which subsequently (maybe soon after 1812) filled in with soil washed down the adjacent monoclinal slope. The monoclinal structure was clearly shown by six drill holes spaced about 100 feet apart. A fault was indicated by these same holes, but a fault was not demonstrated by drilling until holes were drilled closer together than 10 feet.

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