PLUS Illustrations in Appendix A and B

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

PRELIMINARY REPORT

TRACE ELEMENTS INVESTIGATIONS

RICEMAN AND ADJACENT COUNTIES, TENN.

by

Kenneth G. Brill Jr., John M. Nelson
and Chilton E. Prouty

February 1945

Trace Elements Investigations - Report No. 8

SECRET

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TRACE ELEMENTS INVESTIGATIONS

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ABSTRACT

Investigation of uranium-bearing strata was undertaken in Hickman and adjacent counties in west-central Tennessee during the summer and fall of 1944. This area was selected as a result of preliminary tests which showed that it contained appreciable quantities of uranium.

The strata which contain the radioactive elements are the Chattanooga shale and the Maury glauconitic member of the Ridgetop shale.

More than 880 channel samples from 106 localities were collected and tested. Field testing for radioactivity was done by means of a portable Geiger-Mueller counter. More than 135 of those samples were tested chemically and more than 210 retested by gamma ray count in the laboratories of the Geological Survey.

Six localities in the area contain the following estimated tonnages of uranium-bearing rock:

Minimum grade in percent equivalent uranium	Percent uranium	Millions of short tons
0.013	0.007	41
0.012	0.006	115
0.011	0.006	411

Each tonnage figure is based on three or more feet of continuous stratigraphic section.

It is presumed on the basis of the determinations that much of the difference between the percent equivalent uranium and the percent uranium may be accounted for by the presence of thorium.

INTRODUCTION

The investigation of trace elements in Tennessee was carried out by a Geological Survey field party during the summer and fall of 1944. The purpose of the investigation was to determine the uranium content of sedimentary rock units of the region and to learn their thickness and distribution.

This report deals with a region covering Hickman, Perry, Humphreys, Lewis, Maury, and Williamson counties, and parts of Wayne, Hardin, Decatur, Benton, and Davidson counties, Tennessee (Plate1). The region has up to 500 feet of relief and the uranium-bearing strata are exposed along the sides and floors of the deeper valleys. The strata are overlain by several hundred feet of younger sediment.

The investigation was started by Archibald L. Slaughter, Kenneth G. Brill, Jr., and Joseph F. Reninger in May and carried on by Brill, John M. Nelson, and Chilton E. Prouty from June to December.

FIELD METHODS

Sampling

The soil, loose rock, weathered rock, and surface coatings were removed by pick and shovel from the outcrops to be sampled and the rock was brushed clean. A series of channel samples weighing 3 to 4 pounds each were cut from the base of the Hardin sandstone member of the Chattanooga shale through the black shale to the top of the Maury member of the Ridgetop shale. Where no change in lithology was noted and the sandstone bed was thin the lowest channel sample, starting at the base of the Hardin sandstone, extended up to the top of the sandstone. Where the Hardin sandstone changed in lithology from its base upwards, a channel sample of each lithologic type was cut from the rock. Where the Hardin sandstone was several feet thick and of apparently uniform lithologic character it was divided arbitrarily into two or more units, and

each unit of 1 to 5 feet thickness was sampled separately (see columnar sections, Appendi B). The same system of sampling was continued upwards through the Chattanooga shale and Maury glauconitic member of the Ridgetop shale. In areas of strong radioactivity, the rocks were sampled every mile or two if exposed; and in areas of low radioactivity the rocks were sampled about 10 miles apart.

Counter procedure

A. Measurement of radioactivity: Gamma rays are emitted from rocks containing radioactive elements in direct proportion to the amount and kind of radioactive element in the rock. If the rock contains a family of radioactive elements such as uranium in equilibrium with its disintegration products, the number of gamma rays emitted in a given time interval is directly proportional to the amount of uranium in the rock. If the rock contains several families of radioactive elements such as those of uranium, thorium, and potassium in equilibrium with their respective disintegration products, the number of gamma rays emitted gives no indication of the relative amounts of different radioactive elements present.

A Geiger-Mueller counter may be used to determine the amount of radioactivity in a rock sample. The counter registers gamma ray emission by means of "clicks" in the headphones. The number of "clicks" is proportional to the number of gamma rays emitted by the sample. The following formula may be used to calculate the uranium content of an unknown sample, the gamma ray emission of which has been compared with that of a sample of known uranium content.

$$\frac{\text{Number of clicks received from a sample of known uranium content in 30 minutes.}}{\text{Known percent uranium in standardized sample.}} = \frac{\text{Number of clicks received from rock sample in 30 minutes.}}{\text{Unknown percent equivalent uranium in rock sample.}}$$

A concrete example:

387 clicks received from sample of known uranium content in 30 minutes.	41 clicks received from rock sample in 30 minutes.
0.171 percent uranium.	X percent equivalent uranium.

Solving for X, the unknown sample has a radioactivity equal to that of a standard sample containing 0.018 percent uranium and can be expressed as 0.018 percent equivalent uranium.

B. Geiger-Mueller counter: A portable Geiger-Mueller counter, equipped with headphones, was used in the field office. When the counter tube is placed in a sample container filled with a radioactive sample, the gamma rays emitted by the sample register "clicks" in the headphones. The number of "clicks" is a measure of the radioactivity of the sample.

Cosmic rays and local radioactivity also cause "clicks" in the headphones. These random "clicks" are called "background". To determine the true count for a sample, the background count must be subtracted from the sample count.

The following methods of counting sample and background were used in an effort to obtain the maximum accuracy in a minimum of counting time:

1. Two ten-minute sample counts alternating with ten-minute background counts. This method proved best for the instrument at hand.

Sample Number	Back-ground	Samp.	Bgd.	Samp.	Bgd.	Avg. Bgd.	Avg. Samp.	True Count
2-37	22	26	19	30	13	18	28	10

2. Three five-minute sample counts alternating with five-minute background counts.

Sample Number	Back-ground	Samp.	B.	S.	B.	S.	B.	Avg. Bgd.	Avg. Samp.	True Count
19-160	4	8	2	7	1	11	6	3.2	817	5.6

For each sample the true count is converted into percent equivalent uranium by applying the formula indicated above. In both methods of counting the

average background was subtracted from the sample count.

The optimum counting time depends on the potency of the radioactive sample. Slightly radioactive samples need longer counting times than highly radioactive samples to obtain the same percentage of accuracy.

C. Accuracy of field office radioactivity measurements: The accuracy of field office gamma ray measurements of radioactivity cannot be determined with assurance by application of probable error formula because of the unknown magnitude of several systematic errors. However, some indication of their reliability may be obtained by comparing the field office measurements with carefully controlled and relatively accurate measurements of the same samples in the Washington, D. C. laboratory. A direct comparison of 114 samples whose radioactivity was measured by gamma ray counts in both the field office and the Washington laboratory is shown in Figure 1 (A). The number of samples having the equivalent uranium values indicated by the two coordinates is printed in each square. Thus Figure 1 (A), three samples run in the laboratory had an equivalent uranium content of 0.014 percent and two of these measured in the field office had an equivalent uranium content of 0.015 percent and one measured in the field office had an equivalent uranium content of 0.010 percent.

Figure 1 (A) shows that as the percent equivalent uranium measured in the laboratory increases, the average percent equivalent uranium measured in the field office for each laboratory value also increases. For example: Three samples have a percent equivalent uranium content of 0.001 as measured in the laboratory and the average of the field office measurements for the same three samples is 0.0007. Three samples having laboratory values of 0.014 have average field office values of 0.0133. Also for the 114 samples, the average of the field office values is 93 percent of the average of the laboratory values. This comparison

suggests that the average of large numbers of field office measurements of radioactivity approach closely the values determined in the laboratory.

Although the average field office value is close to the laboratory value, individual field office values are considerably less accurate and deviate as much as 0.009 from the diagonal line representing perfect accordance of field office and laboratory counts. The average deviation (the sum of the individual sample deviations divided by 114) of the 114 samples from the diagonal line is 0.0033. The larger part of the average deviation of 0.0033 must be attributed to errors in the field office counts. The largest of the field office errors is caused by the small number of gamma rays registered by the relatively insensitive portable Geiger-Mueller counter in the short counting time. Application of the probable error formula used by Meher[1/] to the number of counts obtained from a sample containing 0.009 percent equivalent uranium plus the number of background counts, shows a computed probable error of $\pm$ 0.0027 percent equivalent uranium. Since an average deviation is approximately $\frac{100}{67}$ X probable error, (see any standard text on probable error), the computed average deviation would be about 0.0031 percent equivalent uranium for a sample of 0.009 percent equivalent uranium and the small difference may be attributed to the following: (1) Battery drain during the day decreased the sensitivity of the portable counter as much as 60 percent. This error was mostly compensated for by running a standard sample for one half hour at the start and end of each day and at noon. From the decreasing number of clicks registered three times during the day, a curve was constructed which was then used to give the approximate instrument sensitivity at any time during the day. (2) The crushed rock samples were measured volumetrically by filling the sample cut and were not weighed. (3) Background counts were made with the counting tube in an

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1/ Strong, John, et. al., Procedures in experimental physics, p. 300, New York, Prentice-Hall, 1944.

unshielded position and these background counts were subtracted from the sample count obtained when the tube was shielded by the metal sample cup and sample. (4) The sensitivity of the Geiger-Mueller tube decreases with increase in temperature.

CHEMICAL ANALYSES

Table 1 is a comparison of the results of chemical analyses of uranium and laboratory and field gamma ray counts expressed as equivalent uranium.

Figure 1 (B) shows a comparison between the results of chemical analyses of uranium and laboratory gamma ray counts for 135 samples. The number of samples having uranium values indicated by the two coordinates is printed in each square. Thus in Figure 1 (B), three samples tested for radioactivity in the laboratory had a value of 0.004 percent equivalent uranium. Chemical analyses showed that two of these samples had a uranium content of 0.002 percent and that one had a uranium content of 0.004 percent.

Fewer sample values are shown in Figure 1 (A) than in Figure 1 (B) because the field office counts of the first 500 samples are inaccurate and have not been plotted on Figure 1 (A).

The results of the chemical analyses average about 53 percent of the laboratory gamma ray counts. Chemical analyses are for uranium alone, but the gamma ray counts included the effects of any thorium, potassium, or other radioactive elements that may be present in a sample.

Presumably a large part of the discrepancies between chemical analyses and laboratory counts of the more highly radioactive samples are due to the presence of thorium and its disintegration products.

To date spectrographic determinations for elements other than uranium have been made on eight samples. No thorium was found in samples 12-95 and 24-211 (Table 2). Six samples, 56-456, 457, 458, 459, 460 and 52-498 contain ThO_2

in quantities less than 0.008 percent. The exact percentage of ThO_2 is not known because the spectrogram does not show a satisfactory line for thorium in quantities less than 0.008 percent.

In calibrating a gamma ray counter Russell[2] established a ratio between the radioactivity of uranium, radium, thorium, and potassium. If the gamma ray counter at hand has characteristics similar to those of Russell's instrument, the ratio should remain about the same.

It is possible to compute the amount of radioactivity of potassium in percent equivalent uranium. The K_2O content of sample 12-95 (Table 2) is 3.78 percent. The factor of 0.83 is used to convert K_2O into K. It is assumed[2] that 0.00035 gram of uranium has about the same amount of gamma ray activity as one gram of potassium. A typical sample (12-95) has about 3.1 percent potassium. Thus potassium contributes 0.001 percent of the total radioactivity of the sample.

Assuming that Russell's ratio may be applied to this problem and assuming that the radioactive elements in the sample are in equilibrium with the other members of the same family, it is possible to compute the amount of radioactivity contributed by thorium.

The factor of 0.88 is used to convert ThO_2 to Th. It is assumed[2] that 0.8 gram of uranium in equilibrium with its disintegration products will produce about the same amount of gamma ray activity as one gram of thorium. Based on this assumption a sample which contains 0.008 percent thorium will have a gamma ray activity of 0.007 percent equivalent uranium. Thus the thorium in 56-456,457,458,459,460 and 63-498 contributes less than 0.007 percent equivalent uranium to the total radioactivity of the sample.

2/ Russell, W. L. The total gamma ray activity of sedimentary rocks as indicated by Geiger counter determinations: Geophysics, vol. 9, no. 2, p. 185, 1944.

GEOLOGIC STRUCTURE

The region lies on the west flank of the Nashville Dome. The pre-Chattanooga formations dip toward the west at a low angle. The uranium-bearing strata are essentially flat-lying and rest on successively younger beds toward the west across the region. A few normal faults occur in the eastern part of the area. No relationship was noted between geologic structure and radioactivity.

STRATIGRAPHY

The Chattanooga shale and Maury glauconitic member of the Ridgetop shale contain radioactive elements in appreciable quantities. A generalized section of sedimentary rocks exposed in the region is shown in Table 3.

Chattanooga shale

Hardin sandstone member: The Hardin sandstone is the basal member of the Chattanooga shale and is present nearly everywhere in the area (Plate 2). Where the overlying black shale member of the Chattanooga is absent, the Maury glauconitic member of the Ridgetop shale may rest on the Hardin sandstone. In the type section in Hardin County and in northern Wayne County and southern Perry County, the Hardin sandstone is a very fine-grained, quartzose sandstone with a calcareous cement. It is slightly phosphatic and weathers tan or brown. In this fine-grained, calcareous facies it thickens southward from about 2 feet near Linden to 15 feet in central Hardin County.

In northern Perry County, Hickman, Lewis, and Maury counties, the Hardin sandstone is a fine-grained to medium-grained, quartzose sandstone. It is black and pyritic, and contains pellets of phosphate, which are locally so abundant that the Hardin is truly a phosphatic rock. In this facies it is known as

the "blue rock", and where the phosphate content is high, it has been mined. In this phosphatic facies the Hardin ranges in thickness from less than one inch to 6 feet.

The fine-grained calcareous facies averages about 0.001 percent and the dark, phosphatic medium-grained facies about 0.003 percent uranium.

The Hardin sandstone rests on a former erosion surface. In Maury County and eastern Hickman County it overlies rocks of Ordovician age (Appendix A, samples X-1, X-2). In western Hickman County, Perry, Wayne, and Lewis counties, it overlies rocks of Silurian age. In Hardin, Benton, Humphreys, and northern Decatur counties, it overlies rocks of Devonian age (Appendix A, samples X-7, X-8, X-18, X-19, X-21). The rocks beneath the Hardin sandstone show negligible radioactivity and do not seem to be related in any way to the amount of radioactivity of the Hardin.

Black shale member: The black shale which overlies the Hardin sandstone is laminated, hard carbonaceous shale. It has a strong, petroliferous odor when fractured. On weathered surfaces the shale is fissile and bedding planes are covered with iron oxide and iron sulphate. Where deeply weathered, the shale becomes brown clay. A few inches at the base is commonly silty and pyritic. One or more thin beds of dark phosphatic sandstone occur in the lower two feet of the black shale in western Hickman County and Perry county. The black shale member ranges from 28 feet in thickness in the northern part of the area to a knife edge in southern Hickman County and Lewis County. The black shale member contains much sand and silt in Hardin and western Wayne counties.

The black shale member of the Chattanooga is the most consistently radioactive stratigraphic unit in the region. It probably averages about 0.004 percent uranium. Minable widths average no more than 0.007 percent uranium.

Ridgetop shale

Maury glauconitic member: The Maury glauconitic member consists of green, glauconitic shale which in some localities is sandy. It contains black, "kidney-shaped", phosphatic nodules that range from 0.2 to 2.0 feet in longest dimension. In some localities phosphatic material is present not only in nodules but also as a thin bed. The nodules constitute from 10 to 90 percent of the volume of the member. The Maury is present everywhere in the area, but it rarely exceeds 1.5 feet and averages about 0.6 feet in thickness.

The nodules show radioactivity up to 0.012 percent uranium and average about 0.008 percent. The green shale is less radioactive; including the nodules, it averages only about 0.003 percent. For the purpose of this report the Maury member is the least important of the three stratigraphic units because it is thin and averages low in radioactivity.

The main mass of the Ridgetop shale, which overlies the Maury member, is dark-gray or dark-blue and calcareous and it is only slightly radioactive. It is present throughout the region except between Centerville and Columbia where the Fort Payne chert rests on the Maury member.

Fort Payne chert

Where the main mass of the Ridgetop shale is absent the massive Fort Payne chert overlies the Maury glauconitic member. The chert shows little or no radioactivity (Appendix A, Sample X-6).

CONCLUSIONS

Areal distribution of uranium-bearing strata: The uranium-bearing strata are thin or covered in the northern part of the region; thin or absent in the southeastern and eastern part; and covered in the western part (Plate 3).

The iso-radioactivity map (Plate 4) indicates the average content of equivalent uranium in the Chattanooga shale and Maury glauconitic member for each locality. Iso-activity lines connect points of equal equivalent uranium. Iso-activity lines are based on 42 points rather than the entire 106 localities that were sampled. Those omitted were tested before the instrument was calibrated for changing sensitivity, and it is probable that most of the uncalibrated tests are inaccurate.

The iso-radioactivity map shows that localities a few miles apart may differ in uranium content. Plate 2 shows that individual beds of a single section differ in uranium content over a wide area. The best continuous three feet of stratigraphic section for the Chattanooga shale and Maury glauconitic member (Appendix A) does not follow any particular horizon in the strata, but may be at the top of the section in one locality and the middle in another. The uranium content differs considerably in strata that look much alike.

Thin beds may differ somewhat in radioactivity within a few feet horizontally. Three channel samples were taken below ground water level in an abandoned adit of the Tennessee Phosphate Company 5 miles southeast of Centerville. Here the black shale of the Chattanooga is 1.4 feet thick and the Hardin sandstone member about 2 feet thick. The black shale was sampled in two units and the upper 0.8 foot of the sandstone as one unit. The results of gamma ray measurements in the Washington laboratory are tabulated below.

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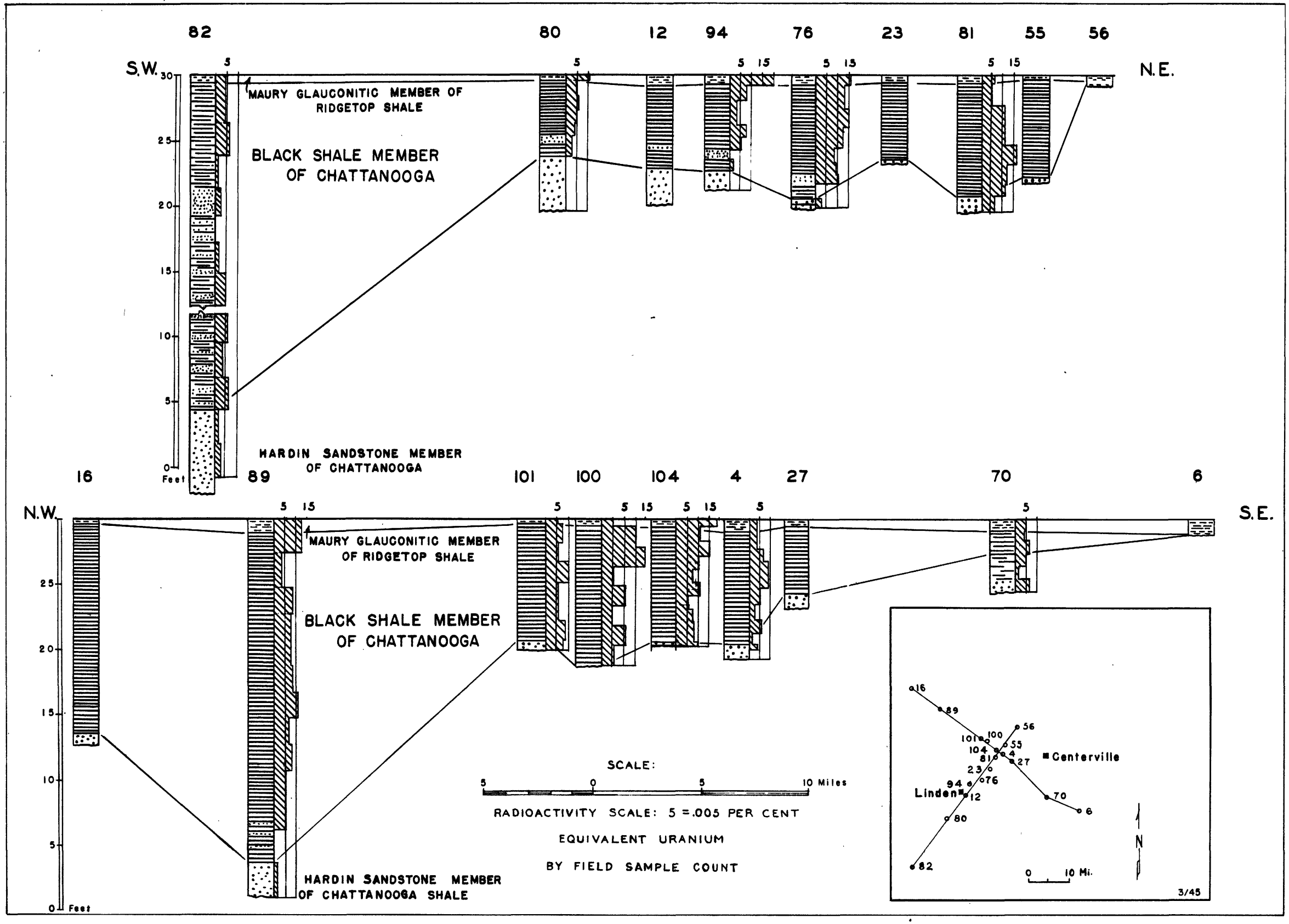
STRATEGIC MINERALS INVESTIGATIONS
PRELIMINARY MAP PLATE 2



CORRELATION OF COLUMNAR SECTIONS

Formation and thickness in feet.	Channel 51A, 60 feet in from entrance	Channel, 50 feet in from 51A	Channel, 100 feet north of 51A
shale 0.6	*0.016±0.0008	0.011±0.0007	0.017±0.0009
" 0.8	0.009±0.0007	0.013±0.0008	0.009±0.0006
sandstone 0.8	0.008±0.0005	0.007±0.0004	0.006±0.0005

*All figures in percent equivalent uranium.

This comparison of unweathered sections shows that the uranium content of thin beds differs laterally in short distances; however a bed which is relatively high in radioactivity in one section will also be high in nearby sections.

Geologic control of uranium-bearing strata: Thickness of the strata of the units and grain-size exert some control over the amount of radioactivity. The Hardin sandstone tends to be more radioactive where thinner. It is also more radioactive where it is black or blue than where it is weathered brown and thus differs from the black shale of the Chattanooga (see below). The fine-grained, calcareous facies of the Hardin sandstone, present in the southwestern part of the area, is low in radioactivity.

The black shale of the Chattanooga tends to be less radioactive where it is sandy and silty. Where the black shale is more than 12 feet thick, the lower part is silty or contains beds of sandstone. In such sections the lower part of the shale is usually low in radioactivity. In thicker sections of black shale the strongest radioactivity is somewhere between the middle and top of the section. In Wayne and Hardin counties, where nearly all of the black shale is silty, it averages only 0.003 percent equivalent uranium.

Beers[3/] reports that in the Antrim shale, an upper Devonian black shale in Michigan, the amount of radioactivity is inversely proportional to grain-size

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3/ Beers, R. E., Radioactivity and organic content of some Paleozoic shales: Am. Assoc. Petroleum Geologists Bull., vol. 29, no. 1, pp. 1-22, 1945.

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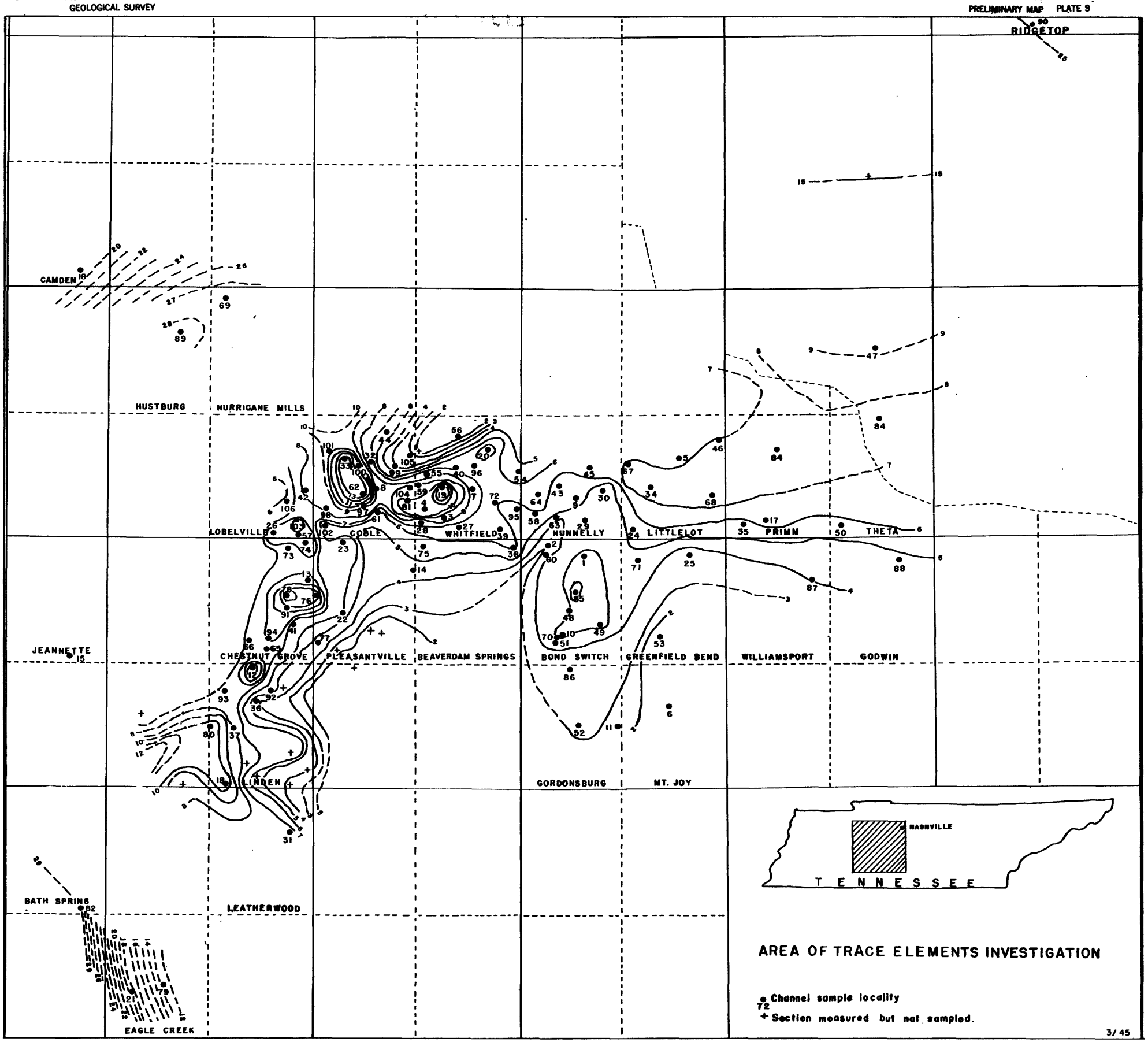
STRATEGIC MINERALS INVESTIGATIONS
PRELIMINARY MAP PLATE 9

ISOPACH MAP OF CHATTANOOGA SHALE AND MAURY GLAUCONITIC MEMBER OF RIDGETOP SHALE



SCALE:

5 0 5 10 15 20 Miles

at interval 1 foot

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Weathering of the black shale appears not to affect the radioactivity appreciably. In a road cut near Linden two adjacent beds of black shale were sampled at three nearby points.

Thickness	Shale (hard and apparently unweathered)	Horizontal distance between samples 66 feet	Shale (slightly weathered)	Hor. dist. between samples 11 feet	Shale (deeply weathered to clay)
1.2 ft.	0.012*		0.010		0.011
1.2 ft.	0.010		0.010		0.009

* (All figures in percent equivalent uranium by laboratory count).

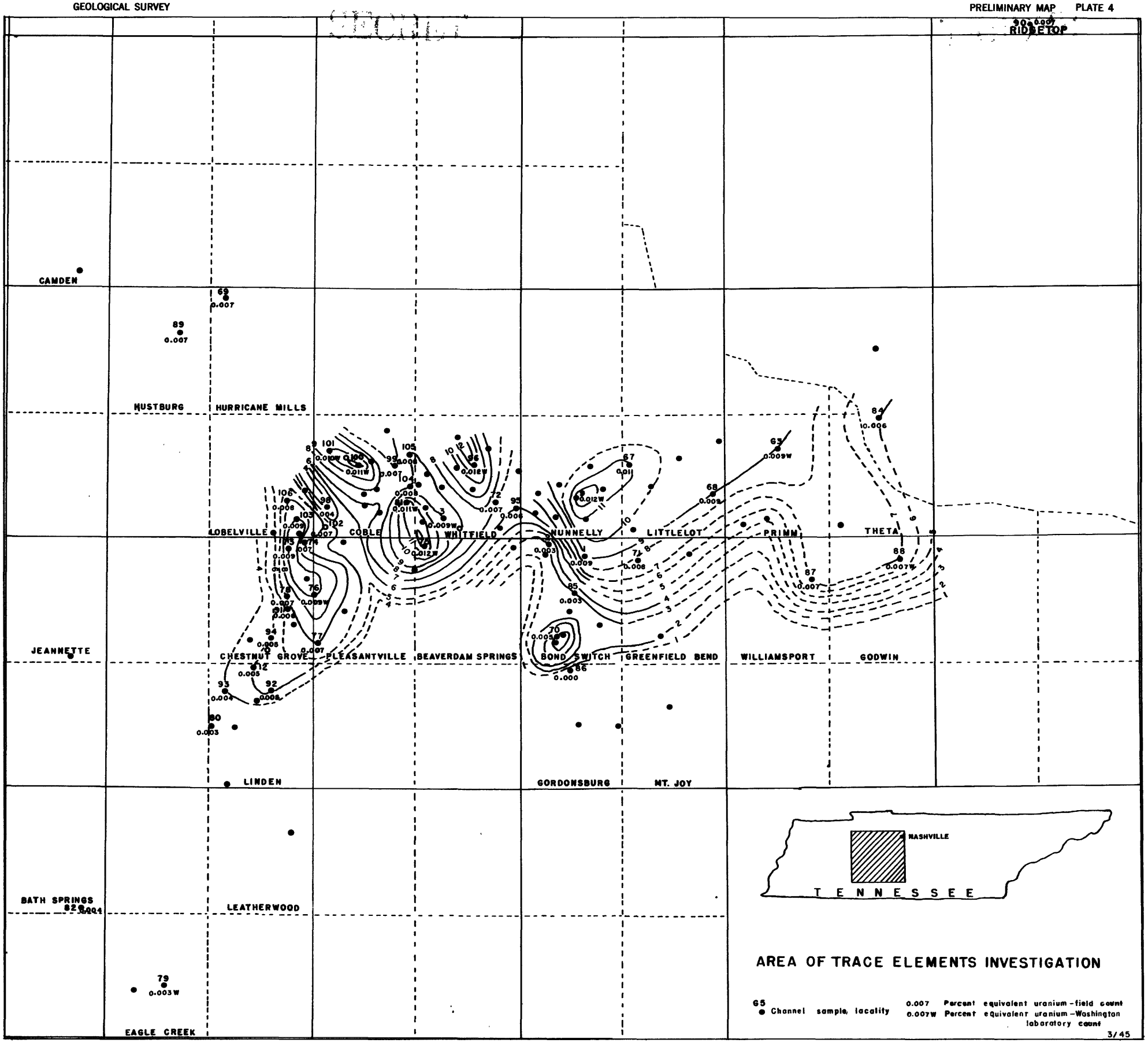
Laboratory count of solid hydrocarbon (K-22) from a fossil tree trunk indicates 0.052 percent equivalent uranium. This is the most highly radioactive sample obtained in the region and it suggests that the uranium is associated with the organic material in the Chattanooga shale. Beers[3] also finds that radioactivity is proportional to amount of organic matter in the Antrim shale.

Numerous qualitative field tests seem to indicate that amount of radioactivity is inversely proportional to the content of disseminated phosphate in the black shale; however, phosphatic nodules in the Chattanooga shale and Maury glauconitic member show strong radioactivity. Furthermore little relationship was observed between the amount of radioactivity and the amount of pellet phosphate in the Hardin.

ESTIMATE OF TONNAGE

Six areas in the region contain minable thicknesses of relatively high grade uranium-bearing rock. These areas, shaded on Plate 5, are at and around localities 1,9,12,66,69,75,81,90,100. They are underlain by at least 3 feet of black shale, which has an equivalent uranium content of 0.011 percent or higher. The equivalent uranium content for the black shale at these localities is shown in the columnar sections (Appendix B).

3/ op. cit.



ISO-RADIOACTIVITY MAP OF COMBINED THICKNESS OF CHATTANOOGA SHALE AND MAURY GLAUCONITIC MEMBER OF RIDGETOP SHALE

Scale: 5 0 5 10 15 20 Miles

SECRET

For example the columnar section for locality 1 (Appendix B) shows that Sample 4 has an equivalent uranium content of 0.012 percent and a thickness of 1.4 feet, and that Sample 5 has an equivalent uranium content of 0.013 percent and a thickness of 2.0 feet. Thus 3.4 feet of continuous stratigraphic section has an average grade of approximately 0.013 percent and a minimum grade of 0.012 percent equivalent uranium.

The boundaries of the shaded areas on Plate 8 are drawn arbitrarily where the grade of the uranium-bearing strata drops below 0.011 percent equivalent uranium or where the thickness of these high-grade strata drops below three feet. With the information at hand the boundaries are as accurate as possible. Lateral changes in grade may increase or decrease the size of the high-grade areas.

Tonnage figures given on Table 4, are computed from high-grade rock at and around localities 1,9,12,66,69,75,81,90,96,100.

Tonnage is estimated on three minimum grades, 0.011,0.012,0.013 percent equivalent uranium. A minimum grade of 0.011 percent equivalent uranium means that all samples used in computing tonnage figures contain 0.011 or higher percent equivalent uranium. All grade figures for equivalent uranium used in computing tonnage figures are based on gamma ray counts made in the Washington laboratory. The uranium content determined chemically averages about 53 percent equivalent uranium.

SUMMARY

1. The black, fissile shale in the upper part of thicker sections shows strongest and most consistent radioactivity.
2. Beds of minable thickness in the black shale do not exceed 0.007 percent uranium.

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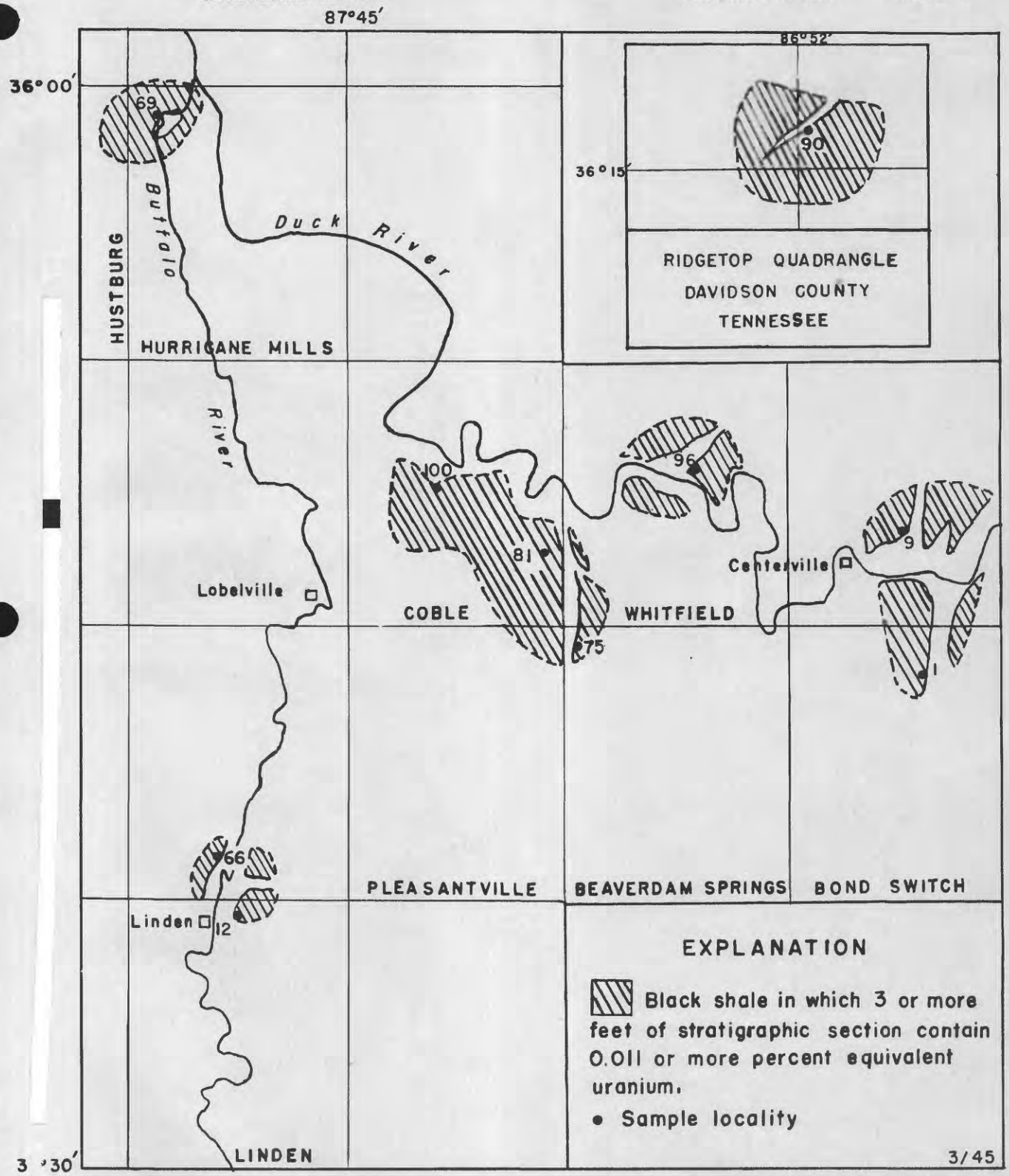
STRATEGIC MINERALS INVESTIGATIONS
PRELIMINARY MAP PLATE 5



AREAS UNDERLAIN BY HIGH GRADE URANIUM-BEARING BLACK SHALE

5 0 5 10 Miles

3. Phosphatic nodules in the Maury glauconitic member contain up to 0.012 percent uranium but occur in a zone about 0.6 feet thick.

4. The phosphatic Hardin sandstone member is variable in radioactivity. The dark, phosphatic medium-grained facies averages about 0.004 percent uranium.

5. With the exception of the Hardin sandstone, Chattanooga black shale and Maury glauconitic member, no stratigraphic units with appreciable radioactivity were found in the area.

RECOMMENDATIONS

1. Should further prospecting be undertaken lateral changes in grade should be expected. Channel sampling and core drilling will limit the areas of higher grade uranium-bearing rock.

2. The northern part of the area seems most promising for future prospecting. Although much of this part of the area is covered by younger sediments, the uranium-bearing strata are thick near the mouths of the Duck and Buffalo rivers and in western Davidson County.

TABLE 1

List of samples analyzed for uranium

Sample No.	Percent uranium determined by chemical analysis	Percent equivalent uranium determined by gamma ray counts of crushed sample	
		Laboratory count	Field count
4-20	0.006	0.012	0.005
4-22	0.005	0.016	0.005
4-23	0.007	0.013	0.008
4-24	0.007	0.014	0.009
4-25	0.004	0.011	0.007
4-28	0.007	0.015	0.011
4-29	0.005	0.014	0.009
5-37	0.005	0.011	0.004
5-38	0.005	0.012	0.005
5-39	0.007	0.011	0.006
5-40	0.008	0.013	0.004
7-46		0.012	0.007
7-47		0.014	0.004
7-49		0.012	0.006
7-50	0.008	0.015	0.008
7-51		0.013	0.008
8-55	0.007	0.010	0.010
8-56	0.006	0.012	0.008
8-57	0.004	0.011	0.008
8-58	0.004	0.013	0.008
8-59	0.005	0.012	0.007
8-60	0.006	0.012	0.009
8-62	0.006	0.011	0.005
8-63	0.008	0.014	0.007
8-64	0.015	0.025	0.015
9-69	0.005	0.005	0.009
9-70	0.006	0.012	0.006
9-71	0.006	0.013	0.004
9-72	0.009	0.013	0.005
9-73	0.010	0.018	0.007
9-75	0.006	0.010	0.008
10-77	0.008	0.015	0.008
10-83	0.006	0.009	0.008
12-91	0.003	0.003	0.004
12-94	0.007	0.010	0.004
12-95	0.008	0.012	0.010
12-96	0.005	0.011	0.012
12-97	0.007	0.012	0.007
12-111	0.010	0.016	0.008
14-115	0.006	0.010	0.004
14-116	0.006	0.010	0.008
14-117	0.004	0.007	0.004
14-118		0.020	0.014
15-130	0.012	0.020	0.013
15-134	0.002	0.002	0.006
16-135	0.002	0.004	0.005
24-206		0.006	0.006

TABLE 1 (con't)

Sample No.	Percent uranium determined by chemical analysis	Percent equivalent uranium determined by gamma ray counts of crushed sample	
		Laboratory count	Field count
24-208		0.017	0.006
24-209		0.010	0.006
24-211		0.015	0.006
24-212		0.011	0.004
28-290	0.011	0.017	0.011
33-291	0.004	0.011	0.006
36-314	0.009	0.012	0.006
39-338	0.004	0.012	0.006
41-350	0.003	0.011	0.004
41-352	0.006	0.012	0.004
44-375	0.004	0.012	0.008
45-381	0.006	0.012	0.011
51-423	0.003	0.009	0.007
51-424	0.006	0.010	0.006
55-450		0.010	0.005
57-456	0.005	0.007	0.005
57-457	0.007	0.008	0.004
57-458	0.006	0.009	0.006
57-459	0.007	0.009	0.006
57-460	0.004	0.012	0.010
58-465	0.006	0.011	0.011
58-467	0.006	0.010	0.008
58-469		0.008	0.005
59-472		0.010	0.008
59-479	0.005	0.010	0.010
59-480	0.005	0.011	0.011
59-481		0.009	0.005
60-482		0.009	0.007
60-483		0.008	0.008
60-485		0.013	0.008
61-489		0.007	0.006
62-498	0.004	0.007	0.000
64-514		0.006	0.004
64-515		0.009	0.005
64-517	0.003	0.010	0.008
64-519		0.015	0.006
64-520		0.007	0.006
65-523		0.011	0.007
65-525		0.013	0.008
65-527	0.004	0.012	0.007
65-528		0.009	0.008
65-531		0.010	0.004
66-532	0.005	0.010	0.011
66-533	0.006	0.012	0.011
66-534	0.004	0.012	0.007
66-535		0.012	0.005

TABLE 1 (con't)

Sample No.	Percent uranium determined by chemical analysis	Percent equivalent uranium determined by gamma ray counts of crushed sample	
		Laboratory count	Field count
67-538		0.010	0.010*
67-539		0.009	0.007*
67-541	0.004	0.013	0.011*
67-542	0.007	0.014	0.015*
68-544	0.011	0.006	0.009*
68-545		0.008	0.005*
68-546		0.012	0.008*
68-547		0.014	0.015*
68-549		0.009	0.011*
69-556		0.010	0.009*
69-559	0.005	0.010	0.010*
69-560	0.006	0.008	0.015*
69-561	0.006	0.009	0.015*
69-562	0.005	0.010	0.008*
69-563	0.004	0.013	0.010*
69-564		0.013	0.022*
70-566	0.004	0.004	0.007*
70-568		0.006	0.005*
70-569		0.013	0.007*
71-574	0.006	0.007	0.013*
71-575		0.013	0.009*
72-579	0.005	0.006	0.011*
72-582	0.007	0.008	0.015*
73-585		0.006	0.009*
73-586		0.006	0.015*
73-590		0.011	0.008*
73-592	0.006	0.011	0.021*
74-594		0.010	0.011*
74-595	0.007	0.010	0.010*
74-596	0.008	0.010	0.006*
75-600		0.008	0.010*
75-601	0.006	0.010	0.016*
75-602	0.006	0.012	0.015*
75-603	0.008	0.013	0.015*
75-604	0.005	0.011	0.007*
75-605	0.007	0.013	0.015*
75-606		0.012	0.015*
76-607		0.004	0.003*
76-608		0.004	0.000*
76-609	0.007	0.009	0.011*
76-610	0.007	0.010	0.010*
76-611	0.007	0.010	0.009*
76-612	0.006	0.010	0.012*
76-613	0.007	0.011	0.015*
76-614	0.006	0.010	0.014*

* Field sample counts corrected for changes in instrument sensitivity.

TABLE 1 (con't)

Sample No.	Percent uranium determined by chemical analysis	Percent equivalent uranium determined by gamma ray counts of crushed sample	
		Laboratory count	Field count
76-615	0.004	0.006	0.016*
78-624	0.002	0.008	0.008*
79-633		0.003	0.001*
79-634		0.002	0.002*
79-635		0.001	0.000*
79-636		0.002	0.003*
79-637		0.001	0.002*
79-638		0.002	0.004*
79-639		0.004	0.004*
79-640	0.004	0.009	0.004*
79-641	0.005	0.009	0.004*
81-652	0.008	0.010	0.006*
81-653	0.006	0.012	0.011*
81-654	0.006	0.011	0.012*
81-655	0.006	0.013	0.016*
81-656	0.007	0.011	0.011*
81-657	0.006	0.012	0.011*
81-658	0.008	0.011	0.005*
81-659		0.008	0.008*
83-673		0.006	0.004*
83-674		0.007	0.004*
83-675	0.006	0.011	0.010*
83-676	0.006	0.010	0.008*
83-677	0.006	0.012	0.009*
83-678	0.006	0.010	0.004*
83-679	0.006	0.008	0.002*
83-680		0.007	0.003*
88-707		0.008	0.001*
88-708	0.007	0.012	0.008*
88-709	0.005	0.010	0.003*
88-810	0.004	0.010	0.004*
88-711		0.004	0.000*
88-712		0.004	0.000*
90-727		0.003	0.005*
90-728		0.002	0.000*
90-729		0.003	0.000*
90-730		0.001	0.000*
90-731		0.003	0.005*
90-732		0.008	0.002*
90-733		0.005	0.000*
90-734		0.004	0.002*
90-735	0.006	0.012	0.007*
90-736	0.007	0.011	0.010*
90-737	0.006	0.011	0.011*
90-738	0.006	0.011	0.011*
90-739	0.005	0.012	0.005*

* Field sample counts corrected for changes in instrument sensitivity.

TABLE 1 (con't)

Sample	Percent uranium determined by chemical analysis	Percent equivalent uranium determined by gamma ray counts of crushed sample	
		Laboratory count	Field count
90-740		0.004	0.003*
96-780	0.004	0.007	0.017*
96-781	0.008	0.012	0.012*
96-782	0.008	0.012	0.015*
96-783	0.008	0.013	0.004*
96-784	0.007	0.012	0.003*
96-785	0.009	0.015	0.022*
96-786	0.005	0.011	0.003*
100-812		0.006	0.005*
100-813	0.004	0.011	0.011*
100-814	0.005	0.011	0.004*
100-815	0.006	0.014	0.010*
100-816	0.007	0.011	0.005*
100-817	0.008	0.013	0.020*
100-818	0.005	0.012	0.015*
100-819		0.005	0.005*
101-820		0.007	0.008*
101-821	0.007	0.012	0.009*
101-822	0.006	0.010	0.006*
101-823	0.007	0.010	0.006*
101-824	0.007	0.010	0.010*
101-825	0.006	0.010	0.006*
101-826	0.007	0.010	0.008*
101-827		0.006	0.006*

* Field sample counts corrected for changes in instrument sensitivity.

TABLE 2

Chemical analysis* of black shale sample 12-95, Linden, Tennessee

SiO_2	52.15
Al_2O_3	11.26
Fe_2O_3	9.60
MgO	0.87
CaO	0.10
Na_2O	0.73
K_2O	3.78
H_2O	0.83
H_2O^+ a/	18.86
TiO_2	0.64
CO_2	0.10
S	1.77
V_2O_3	0.024
MnO	0.02
BaO	0.05
Rare earths	0.035
MoO_3	0.05 b/
Cr_2O_3	0.01 b/
U_3O_8	0.009
	100.89
Less O = S	0.66
	100.23

* Analysis made in Section of Chemistry and Physics, Geological Survey, J. G. Fairchild, analyst.
a/ Includes organic material
b/ Determined by P. S. Grimaldi

Qualitative spectrographic determinations

	Sample 12-95	Sample 24-211
0.X%	Titanium, sodium, calcium.	Titanium, calcium, vanadium, phosphate, sodium.
0.0X%	Vanadium, barium, manganese chromium, lead, molybdenum, yttrium, zirconium, lithium, rubidium.	Barium, manganese, nickel, lead, molybdenum, yttrium, zirconium, lithium, rubidium, arsenic ?
0.00X%	Nickel, cobalt, tin, copper beryllium, boron, ytterbium.	Chromium, tin, copper, silver beryllium, boron, cobalt, lanthanum, ytterbium.
Not found	Phosphate, zinc, silver, arsenic, lanthanum, bismuth, antimony, germanium, thallium, indium, rhenium, thorium, cadmium, tantalum, columbium, tungsten.	Zinc, bismuth, antimony, germanium, indium, thallium, rhenium, thorium, cadmium, tantalum, columbium, tungsten.

TABLE 3

Generalized section of sedimentary rocks exposed in Hickman and adjacent counties, Tennessee

Mississippian

St. Louis limestone

Warsaw limestone

Fort Payne chert

Ridgetop shale

Maury glauconitic member

Mississippian or Devonian

Chattanooga shale

Black shale member

Hardin sandstone member

Devonian limestone and novaculite

Silurian limestone and shale

Ordovician limestone and shale.

TABLE 4

ESTIMATE OF TONNAGE

Locality	Minimum grade in percent equivalent uranium a/	Average percent equivalent uranium	Approximate percent uranium b/	Average thickness in feet	Short tons c/
9	0.013	0.014	0.007	3.0	24,000,000
1-9	0.012	0.013	0.006	3.7	56,000,000
1-9	0.011	0.012	0.006	3.7	56,000,000
12-66	0.011	0.012	0.006	3.0	10,000,000
69	0.013	0.013	0.007	3.0	17,000,000
69	0.012	0.012	0.006	3.4	9,000,000
69	0.011	0.012	0.006	3.4	9,000,000
75-81	0.011	0.012	0.006	5.5	116,000,000
90	0.012	0.012	0.006	3.3	4,000,000
90	0.011	0.011	0.006	6.5	183,000,000
96	0.012	0.013	0.006	3.7	37,000,000
96	0.011	0.013	0.006	3.7	37,000,000
100	0.012	0.013	0.006	3.0	9,000,000

a/ Washington laboratory gamma ray counts.
b/ Figures arrived at by taking 53 percent of laboratory count.
c/ 15 cubic feet to the ton.

Total tonnage:

Locality	Minimum grade in percent equivalent uranium			
	0.013	0.012	0.011	
1-9	24	56	56	millions of short tons.
12			10	do
69	17	9	9	do
75-81-100		9	116	do
90		4	183	do
96	—	37	37	do
Total	41	115	411	do

APPENDIX A

Channel sample localities

The results of field and laboratory counts are expressed as equivalent uranium; chemical analyses in percent of actual uranium.

The choice of the best three feet of stratigraphic section is governed by the average values obtained by field sample counts, and where available laboratory counts.

* Field sample values marked with an asterisk have been corrected for changes in sensitivity of the instrument.

Unless otherwise stated quadrangles refer to planimetric maps (scale 1/24,000) published by the U. S. Dept. of the Interior, Geological Survey, and the Tennessee Valley Authority in 1936.

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 1, BOND SWITCH QUADRANGLE. At spring on north side of road down Grimmett Hill on the west side of Swan Creek. Section is about 0.5 mile west of Raleigh Methodist Church, Hickman County, Tenn.	8.5		0.015	
Locality 2, BOND SWITCH QUADRANGLE. Just inside old phosphate adit on north side of hollow. Adit is 100 feet west of where bed goes under creek. Adit is about 0.3 mile east of Meridian plant on Indian Creek, Hickman County, Tenn.	3.2		0.003	
Locality 3, WHITFIELD QUADRANGLE. In road-cut on north side of Tenn. Highway 50 in the valley of Beaverdam Creek. Section is 1.4 miles northwest of Settle Point School and 0.5 mile east of the mouth of Prism Hollow, Hickman County, Tenn.	6.6		0.009	

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 4. WHITFIELD QUADRANGLE. At mouth of small hollow on north side of Tenn. Highway 50, 0.3 mile southeast of the former town of Whitfield, Hickman County, Tenn.	10.3	0.008		0.006
Locality 5. LITTLELOT QUADRANGLE. On north side of Peter Cave Hollow (a tributary of Hassell Creek) 1500 feet north of Hassell Creek road, Hickman County, Tenn.	6.9	0.005		0.007
Locality 6. MT. JOY QUADRANGLE. In road-cut in front of farmhouse on north side of Tenn. Highway 99 on east side of McClannahan Hill. Section 1.6 miles (airline) southwest of Hampshire, Maury County, Tenn.	1.2	0.000		
Locality 7. WHITFIELD QUADRANGLE. In road-cut on north side of Trace Creek 0.5 mile west of the mouth of the creek, Hickman County, Tenn.	9.0	0.007		
Locality 8. COBLE QUADRANGLE. At waterfall in small hollow on north side of Spicewood Hollow. Section about 500 feet north of Spicewood Hollow road. Section about 0.5 mile southeast of Wolf Creek Church, Hickman County, Tenn.	8.5	0.008		
Locality 9. HUMMELL QUADRANGLE. In road-cut on north side of Tenn. Highway 100, 1.8 miles northeast of Centerville, Hickman County, Tenn.	5.4	0.005	0.014	0.008
Locality 10. BOND SWITCH QUADRANGLE. In road-cut on west side of Sunrise-Cordonsburg road 2 miles south of Sunrise, Hickman County, Tenn.	5.2	0.004		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U		
		Field	Lab.	Chem.
Locality 11, GORDONSBURG QUADRANGLE. On both sides of Langford Branch about 0.4 mile east of Swan Creek road. Section is about 2.5 miles east of Gordonsburg, Lewis County, Tenn.	2.8	0.000		
Locality 12, LINDEN QUADRANGLE. In south bank of road-cut on Tenn. Highway 100, 1000 feet east of highway bridge across Buffalo River, which is just northeast of Linden, Perry County, Tenn.	10.1	0.011	0.012	0.007
Locality 13, CHESTNUT GROVE QUADRANGLE. In road-cut on north side of road north of Cane Creek. Section lies on spur between Reason and Hinson Hollows. It is about 500 feet west of the mouth of Hinson Hollow, Perry County, Tenn.	8.8	0.005		
Locality 14, PLEASANTVILLE QUADRANGLE. In the bank of Sulphur Fork about 200 feet west of road down Sulphur Fork. Section 2.9 miles north of Beaverdam Springs, Hickman County, Tenn.	4.5	0.006	0.009	0.006
Locality 15, JEANNETTE QUADRANGLE. On west bank of Tennessee River about 80 feet above a dirt road which runs under toll bridge. Section is about 700 feet north of west end of bridge and about 1 mile north of Perryville, Decatur County, Tenn.	10.7	0.004		
Locality 16, CAMDEN QUADRANGLE. On north side of U. S. Highway 70 at the western approach to toll bridge over Tennessee River. Section is 4 miles (by road) east of Camden, Benton County, Tenn.	19.3	0.006	0.004	0.002
Locality 17, PRIMM QUADRANGLE. At waterfall beside road in a tributary of Leipers Creek. Section is 2.5 miles (by road) southwest of Kinderhook, Maury County, Tenn.	6.2	0.001		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 18, LINDEN QUADRANGLE. In ditch on east side of road along Woods Branch. Section is about 0.5 mile southwest of the junction of the Woods Branch road and Tenn. Highway 13, which is about 8 miles (airline) south of Linden, Perry County, Tenn.	10.4	0.003		
Locality 19, WHITFIELD QUADRANGLE. At water fall in Skull Creek about 1600 feet above the mouth of the creek and about 1.65 miles southeast of Love Bend Cemetery, Hickman County, Tenn.	14.7	0.005		
Locality 20, WHITFIELD QUADRANGLE. On the south bank of Piney River just east of the bridge at the mouth of Dodd Hollow, Hickman County, Tenn.	8.1	0.004		
Locality 21, EAGLE CREEK QUADRANGLE. In road-cut on the south side of U. S. Highway 64 on the west side of Davidson Hill. Section is 3.7 miles east of Olive Hill and is in Wayne County, Tenn.	17.0	0.001		
Locality 22, PLEASANTVILLE QUADRANGLE. In road-cut on north side of Cane Creek road 0.9 mile northwest of Pleasantville School, Hickman County, Tenn.	6.0	0.004		
Locality 23, PLEASANTVILLE QUADRANGLE. At spring above unimproved road on the northeast side of Russell Creek. Section is about 0.6 mile southeast of the mouth of Beckie Hollow, Hickman County, Tenn.	6.6	0.006		
Locality 24, LITTLELOT QUADRANGLE. At forks in road in Fogg Hollow, Tottys Bend, Hickman County, Tenn.	8.9	0.005		
Locality 26, GREENFIELD BEND QUADRANGLE. Road-cut on north side of Tenn. Highway 50, 1.3 miles west of Shady Grove, Hickman County, Tenn.	3.3	0.002		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 26, LOBELVILLE QUADRANGLE. In road-cut on north side of Tenn. Highway 13 at the mouth of Ike Hollow 2.0 miles (by road) south of Lobelville, Perry County, Tenn.	8.8	0.002		
Locality 27, WHITFIELD QUADRANGLE. In bluff on the south side of Beaverdam Creek 2000 feet west of the road along Joe Branch, Hickman County, Tenn.	6.7	0.003		
Locality 28, WHITFIELD QUADRANGLE. In road-cut on west side of Sulphur Fork. Section is 0.5 mile southwest of the road junction at the mouth of Sulphur Fork, Hickman County, Tenn.	7.8	0.003		
Locality 29, BUSHELLY QUADRANGLE. At dry "waterfall" in small hollow on east side of private road to E. C. Baker farm (first farm west of the mouth of Swan Creek). Section is 0.1 mile north of Dr. Edsard's north gate, Hickman County, Tenn.	4.5	0.003		
Locality 30, BUSHELLY QUADRANGLE. At seep on the east side of Persimmon Creek 0.1 mile north of farmhouse at the right-angle bend in the Persimmon Creek road, which is 0.7 mile north of Graytown, Hickman County, Tenn.	4.2	0.003		
Locality 31, LEATHERWOOD QUADRANGLE. In road-cut on east side of Tenn. Highway 13, 0.1 mile north of Buffalo River bridge, Wayne County, Tenn.	7.8	0.000		
Locality 32, COBLE QUADRANGLE. In creek bottom in hollow on the west side of the road into Horseshoe Bend (Duck River). Section is about 0.3 mile by road from the road fork at the base of the Bend, Hickman County, Tenn.	7.5	0.002		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 33, COMLY QUADRANGLE. In south bank of creek in Blackwell Hollow. Section just across creek from Blackwell Cemetery, Hickman County, Tenn.	13.0	0.005		
Locality 34, LITTLELOT QUADRANGLE. In bank on south side of Stairsteps Hollow 0.25 mile (airline) due east of Duck River, Hickman County, Tenn.	7.9	0.003		
Locality 35, PRIMM QUADRANGLE. At west end of the "long tunnel" 0.5 mile north of the old dryer, which is on the Dry Fork of Leatherwood Creek, Maury County, Tenn.	5.4	0.003		
Locality 36, LINDEN QUADRANGLE. In road-cut on north side of Tenn. Highway 20, 1.5 miles east of the junction of Highways 13 and 20, which is 1 mile south of Linden, Perry County, Tenn.	4.0	0.003		
Locality 37, LINDEN QUADRANGLE. At waterfall in small hollow 0.2 mile southwest of a farmhouse, which is on the west side of Tenn. Highway 13, 4.0 miles south of Linden, Perry County, Tenn.	8.0	0.003		
Locality 38, BEAVERDAM SPRINGS QUADRANGLE. In cliff on south side of waterfall in Bear Creek. Section is about 50 feet north of switchback in road as it leaves the upper end of Bear Creek Valley, Hickman County, Tenn.	6.1	0.003		
Locality 39, WHITFIELD QUADRANGLE. At seep on south side of Fisher (?) Hollow (first hollow south of Mayberry Hollow). Section is about 0.3 mile southeast of ford across Duck River, Hickman County, Tenn.	6.3	0.003		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 40, WHITFIELD QUADRANGLE. At waterfall just east of the road that turns from Edwards' farm to the flood plain of the Duck River. Section in a small hollow just east of Panther Branch, Hickman County, Tenn.	6.8	0.003		
Locality 41, CHESTNUT GROVE QUADRANGLE. At waterfall in tributary on north side of Brush Creek. Section is about 1300 feet north of farmhouse which is on the Brush Creek road. The farm is about 0.8 mile west of bridge where Tenn. Highway 100 crosses Brush Creek, Perry County, Tenn.	6.6	0.005		
Locality 42, LOBELVILLE QUADRANGLE. In cliff in small hollow behind farmhouse which is 400 feet east of a big spring at the mouth of Greer Hollow, Perry County, Tenn.	8.7	0.002		
Locality 43, BUNNELLY QUADRANGLE. In road-cut on the West Fork of Defeated Creek. Section is 0.7 mile northwest of the confluence of the East and West forks of Defeated Creek, Hickman County, Tenn.	5.5	0.002		
Locality 44, COBLE QUADRANGLE. On west side of Happy Hollow just above creek level 0.6 mile northeast of old sawmill, which is as forks of the hollow, Hickman County, Tenn.	6.8	0.006		
Locality 45, BUNNELLY QUADRANGLE. In cliff just above creek level on the east side of Haley Creek 0.6 mile (airline) northeast of the Haley Creek School, Hickman County, Tenn.	6.1	0.007		
Locality 46, LITTLELOT QUADRANGLE. At dry "waterfall" in a gully on the west side of Ash Hollow about 1400 feet north of the Lick Creek road, Hickman County, Tenn.	7.3	0.004		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 47, COLUMBIA QUADRANGLE. (U.S.G.S. Scale 1/125,000). On west side of hollow which lies on the east side of the South Harpeth River. Section is about 1 mile (by road) south of Fernvale, Williamson County, Tenn.	9.1	0.005		
Locality 48, BOND SWITCH QUADRANGLE. At seep on south side of Copperas Branch 0.2 mile due west of the Sunrise-Gordonsburg road, Hickman County, Tenn.	4.9	0.004		
Locality 49, BOND SWITCH QUADRANGLE. In cliff on south bank of Fall Branch 2.3 miles east of road bridge across Swan Creek. Bridge is 0.6 miles east of Sunrise, Hickman County, Tenn.	5.3	0.002		
Locality 50, TENTA QUADRANGLE. At small spring on Mrs. Mattie Petty property on Gaskill Branch. Section 4.1 miles (by road) northeast of Santa Fe, Maury County, Tenn.	5.1	0.003		
Locality 51, BOND SWITCH QUADRANGLE. On south wall of adit 20 feet in from entrance in Tennessee Phosphate Mine, which is a few hundred feet west of the Sunrise - Gordonsburg road and 0.5 mile northwest of the road bridge over Swan Creek at the mouth of Coleman Hollow, Hickman County, Tenn.	3.6	0.004		
Locality 52, GORDONSBURG QUADRANGLE. In adit a few hundred feet west of old foundation (dryer), which is just west of Smokey Hollow branch in Gordonsburg, Lewis County, Tenn.	3.1	0.001		
Locality 53, GREENFIELD BEND QUADRANGLE. At falls near old water wheel in Scott Branch 0.4 mile south of Shoboss Cemetery, Maury County, Tenn.	0.4	0.000		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 54, WHITFIELD QUADRANGLE. At spring in small tributary on north side of Quillen Hollow. Section is about 0.6 mile east of the Duck River, Hickman County, Tenn.	8.1	0.004		
Locality 55, WHITFIELD QUADRANGLE. In cliff on east side of Anderson Hollow 300 feet southeast of Lone Bend School. Hickman County, Tenn.	7.9	0.004		
Locality 56, WHITFIELD QUADRANGLE. In road-cut on east side of Taylor Creek 50 feet south of spring house, which is 0.2 mile northeast of Witherspoon Cemetery, Hickman County, Tenn.	1.1	0.000		
Locality 57, LOBELVILLE QUADRANGLE. On the east side of Lobelville-Cane Creek road on the north side of McCoy Hill, 0.3 mile south of Mill Bridge over Buffalo River, Perry County, Tenn.	8.5	0.007	0.010	0.006
Locality 58, [illegible] QUADRANGLE. In gully between creek and tracks about 500 feet west of NC & St. L. RR. trestle just west of Centerville, Hickman County, Tenn.	6.0	0.007		
Locality 59, WHITFIELD QUADRANGLE. In cliff overlooking Duck River at the west end of Lovett Island. Section is about 0.5 mile southeast of Beaverdam Bridge (over Duck River), Hickman County, Tenn.	9.7	0.008		
Locality 60, BEND SWITCH QUADRANGLE. At mouth of adit on south side of small hollow on Walker and Nixon property. Hollow is on east side of Indian Creek 3.5 miles south of Centerville, Hickman County, Tenn.	4.0	0.005		

SECRET

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U		
		Field	Lab.	Chem.
Locality 61, COBLE QUADRANGLE. Just above creek level on north side of the first hollow below Sam Harper's house on the west side of the East Fork of Wolf Creek, Hickman County, Tenn.	5.5	0.002		
Locality 62, COBLE QUADRANGLE. In gully above cave (in Silurian limestone) on the west side of the middle Fork of Wolf Creek. Section is about 500 feet south of Parker farm house, Hickman County, Tenn.	13.1	0.002		
Locality 63, BUSHELLY QUADRANGLE. In ditch on the east side of the road to the town spring. Section is 0.15 mile east of the water tower and 0.6 mile southeast of the Centerville Court House, Hickman County, Tenn.	3.7	0.003		
Locality 64, BUSHELLY QUADRANGLE. Between road and creek below the waterfall at Hickman Spring 1.4 miles (airline) northeast of Centerville, Hickman County, Tenn.	6.3	0.006		
Locality 65, CHESTNUT GROVE QUADRANGLE. In creek bottom just west of and below road. Section is in the first large hollow on the north side above the mouth of Coon Creek. Section is 0.5 mile (road) northeast of the Tenn. Highway 100 bridge over Coon Creek, Perry County, Tenn.	7.9	0.006		
Locality 66, CHESTNUT GROVE QUADRANGLE. In waterfall in tributary on the south side of Rainey Hollow 0.3 mile northwest of Rainey Spring, which is just west of Tenn. Highway 13 about 3 miles north of Linden, Perry County, Tenn.	7.8	0.009	0.012	0.005

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 67, LITTLELOT QUADRANGLE. On the south side of Cannon Hollow (at the ruins of a still) in the mouth of a phosphate adit. Section is about 0.4 mile east of Morgan Creek on J. B. Walker property, Hickman County, Tenn.	7.4	0.011*		
Locality 68, LITTLELOT QUADRANGLE. In ditch on east side of road, which follows a tributary on the south side of Fort Cooper Creek. Section is 0.1 mile (airline) northeast of Ft. Cooper School, Hickman County, Tenn.	8.5	0.011*		
Locality 69, HURRICANE MILLS QUADRANGLE. In small hollow, which contains a quarry in the Chattanooga shale. Section is about 1000 feet north of "The Whirl" of Buffalo River, which is 4 miles north of Bakerville, Humphreys County, Tenn.	27.7	0.010*	0.013	
Locality 70, BOND SWITCH QUADRANGLE. On the south side of the first hollow south of Hedrick Hollow. Section is about 0.1 mile west of the Sunrise-Gordonsburg road. Section lies about half way between localities 10 and 51, Hickman County, Tenn.	5.5	0.005*		
Locality 71, GREENFIELD BEND QUADRANGLE. Two feet above creek level on the east side of Willis Branch, behind farm, which is near head of Branch. Section about 2.0 miles (by road) south of Tenn. Highway 50, Hickman County, Tenn.	4.5	0.010*		
Locality 72, WHITFIELD QUADRANGLE. At waterfall in Hollow on the west side of the base of Council Bend (Duck River). Section is 0.33 miles (airline) due north of Mt. Carmel School, Hickman County, Tenn.	6.0	0.007*		
Locality 73, CHESTNUT GROVE QUADRANGLE. In cut on west side of road which runs up Burns Ridge from Jones Hollow. Section is 0.3 miles (by road) west of Bates Spring, Perry County, Tenn.	7.2	0.011*		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 74, CHESTNUT GROVE QUADRANGLE. Below waterfall just south of pig-sty in small hollow on the south side of Lagoon Branch. Hollow is on the opposite side of Lagoon Branch from the mouth of Apple Orchard Hollow 2.7 miles (by road) southeast of Lobelville, Perry County, Tenn.	8.7	0.010*	0.010	
Locality 75, BEAVERDAM SPRINGS QUADRANGLE. Just above creek level on west side of small hollow, which has a former sawmill site. Hollow is on the east side of Sulphur Fork about 1.6 miles (by road) south of the road junction at the mouth of Sulphur Fork, Hickman County, Tenn.	5.6	0.015*	0.012	
Locality 76, PLEASANTVILLE QUADRANGLE. In stream bed on Chandler Branch just north of second farmhouse up the branch. Section is about 0.35 miles south of the ford across Cane Creek, which is just west of Enon Church, Perry County, Tenn.	10.1	0.015*	0.011	0.007
Locality 77, PLEASANTVILLE QUADRANGLE. At waterfall in small hollow on the east side of Tenn. Highway 100, 0.2 mile north of Qualls & Westbrook Store, which is on Brush Creek, Perry County, Tenn.	4.3	0.010*		
Locality 78, CHESTNUT GROVE QUADRANGLE. In creek bottom in the first hollow north of Barham Hollow. Section is about 0.4 mile (airline) east of the Buffalo River and 1.5 miles (airline) southeast of Beardstown, Perry County, Tenn.	11.1	0.009*		
Locality 79, EAGLE CREEK QUADRANGLE. On the south side of a tributary of Hutton Hollow. The tributary is the first one on the east side above the mouth of Hutton Hollow. Section is about 1.3 miles (airline) southeast of Davidson Store, Wayne County, Tenn.	12.1	0.004*	0.005	

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 80, LINDEN QUADRANGLE. In cut on west side of Bethel-Horner road, where road enters the valley of Cedar Creek. Section about 4.0 miles (airline) southwest of Linden, Perry County, Tenn.	10.2	0.006*		
Locality 81, COBLE QUADRANGLE. On west side of Hunion Hollow road (10 feet above road level) about 500 feet southwest of Blowing Spring. Section about 0.3 mile (airline) northwest of Coble, Hickman County, Tenn.	10.4	0.014*	0.012	0.006
Locality 82, BATH SPRINGS QUADRANGLE. In road-cut on Gravel Pit Ridge on Clifton-Saltillo road. About 3.0 miles west of Clifton. Section in Hardin County, Tenn.	29.6+	0.006*		
Locality 83, PRIMM QUADRANGLE. In gully on north side of Lick Creek just below the mouth of Porter Branch. Section is nearly on Maury-Williamson County line, about 165 miles (airline) west of Whitecak, Maury County, Tenn.	7.9	0.009	0.011	
Locality 84, COLUMBIA QUADRANGLE. (U.S.G.S. scale 1/125,000) at west end of road-cut on south side of Garrison Creek. Section is 2.0 miles (road) west of the confluence of Garrison Creek and Leipers Fork, which is 1.5 miles southwest of Hillsboro, Williamson County Tenn.	7.3	0.009*		
Locality 85, BOND SWITCH QUADRANGLE. 40 feet underground in an abandoned phosphate mine on E. C. Perry property. Section is located on "The Phosphate Road" 1 mile northeast of Sunrise and 0.5 mile southeast of Campground Church, Hickman County, Tenn.	6.4	0.005*		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 86, GORDONSBURG QUADRANGLE. At spring in small hollow on the north side of Dry Creek 0.8 mile (by road) east of bridge where Dry Creek road crosses Swan Creek. Section is about 1.0 mile east of Salem, Lewis County, Tenn.	3.2	0.000*		
Locality 87, WILLIAMSPORT QUADRANGLE. In ditch on north side of ridge road which runs along divide between Snow Creek and Duck River. Section opposite the mouth of Mingo Branch (tributary of Snow Creek) Maury County, Tenn.	3.7	0.008*		
Locality 88, GODWIN QUADRANGLE. Cut on east side of road up a small hollow which is tributary to Hurricane Branch. Section lies on the divide between Hurricane Branch and Sycamore Branch and is 2.5 miles (airline) northeast of Mowd, Maury County, Tenn.	5.0	0.006*	0.011	
Locality 89, HUSTBURG QUADRANGLE. On east side of abandoned road at the edge of the high-water line of the Duck River. Section is 1.5 miles north of Sycamore Landing (on the Tennessee River), Humphreys County, Tenn.	28.9	0.011*		
Locality 90, RIDGETOP QUADRANGLE. (U.S.G.S. scale 1/125,000) in cliff along a small tributary of the Dry Fork of Whites Creek. 0.2 mile south of G. B. Carney farmhouse, Whites Creek P. O., Davidson County, Tenn.	25.3	0.008*	0.012	0.006
Locality 91, CHESTNUT GROVE QUADRANGLE. At spring on north side of Rocky Hollow at the northeast end of the uppermost field in the hollow. Section is 1 mile (airline) northeast of the mouth of Brush Creek, Perry County, Tenn.	9.9	0.009*		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 92, LINDEN QUADRANGLE. On south side of Barber Hollow, which drains into Jack Branch, a tributary to Short Creek. Section is 1.4 miles (by tote road) southeast of the mouth of Jack Branch, Perry County, Tenn.	6.2	0.005*		
Locality 93, LINDEN QUADRANGLE. Below waterfall in tributary of Squirrel Hollow. Section is 0.25 miles east of triangulation station "Linden", and 1.6 miles southeast of the town of Linden, Perry County, Tenn.	7.0	0.006*		
Locality 94, CHESTNUT GROVE QUADRANGLE. At spring on the north side of the first hollow north of Shelton Hollow. Section is near the east end of cleared land 0.7 mile (airline) east of the Buffalo River, Perry County, Tenn.	8.7	0.008*		
Locality 95, WHITFIELD QUADRANGLE. Under waterfall in tributary on the south side of Walker Hollow (Mayberry property) .35 miles due north of the west end of Oakmont Cemetery, Hickman County, Tenn.	5.9	0.006*		
Locality 96, WHITFIELD QUADRANGLE. In creek bottom on north side of road on J. Hickman property. Section is on the divide between Piney and Duck rivers 0.5 mile northeast of the mouth of Piney River, Hickman County, Tenn.	6.7	0.010*	0.013	
Locality 97, COBLE QUADRANGLE. Just above creek level on the east side of the Middle Fork of Wolf Creek about 0.15 mile south of the last farmhouse (abandoned) up the creek, Hickman County, Tenn.	9.5	0.011*		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 98. COBLE QUADRANGLE. Section at creek level on the east side of Coble Hollow about 0.8 mile (by road) north of the Russell Creek road, Perry County, Tenn.	8.6	0.009*		
Locality 99. COBLE QUADRANGLE. In stream bed in small hollow about 500 feet west of main road into Wright Bend of the Duck River. Section is 0.83 mile (airline) northeast of Flowers Cemetery, Hickman County, Tenn.	4.0	0.007*		
Locality 100. COBLE QUADRANGLE. At waterfall about 0.15 mile southwest of the Duck River in a small hollow which is a tributary on the west side of Rocky Branch, Hickman County, Tenn.	11.0	0.017*	0.013	
Locality 101. COBLE QUADRANGLE. At spring on the east side of Pigpen Hollow about 800 feet south of Duck River. Section is about 0.6 mile (airline) west of Alexander Cave, Perry County, Tenn.	9.9	0.008*	0.011	
Locality 102. COBLE QUADRANGLE. Just above logging road on the west side of large sinkhole, which is just above last farmhouse in Marr Hollow (Russell Creek), Perry County, Tenn.	5.4	0.011*		
Locality 103. LOBELVILLE QUADRANGLE. In gully on timbered hillside west of Buffalo River. Section is about 0.65 miles southeast of Gilmore Bridge and 0.85 miles northeast of Lobelville, Perry County, Tenn.	9.7	0.009*		

	Total thickness sampled in feet	Percent uranium of best continuous 3 feet Equivalent U Field	Lab.	Chem.
Locality 104, COBLE QUADRANGLE. In bluff on the west side of Beaverdam Creek 0.1 mile southeast of Russell Cemetery, which is 1.3 miles due north of Coble, Hickman County, Tenn.	9.5	0.012*		
Locality 105, COBLE QUADRANGLE. At seep on north side of the first hollow south of Mule Hollow on the west side of Little Piney Creek, Hickman County, Tenn.	3.6	0.010*		
Locality 106, LOBELVILLE QUADRANGLE. At small spring on hillside behind farmhouse. Section is 0.25 mile (airline) west of Hester Cemetery and 1.2 miles (airline) north of Lobelville, Perry County, Tenn.	6.0	0.010*		

Grab samples

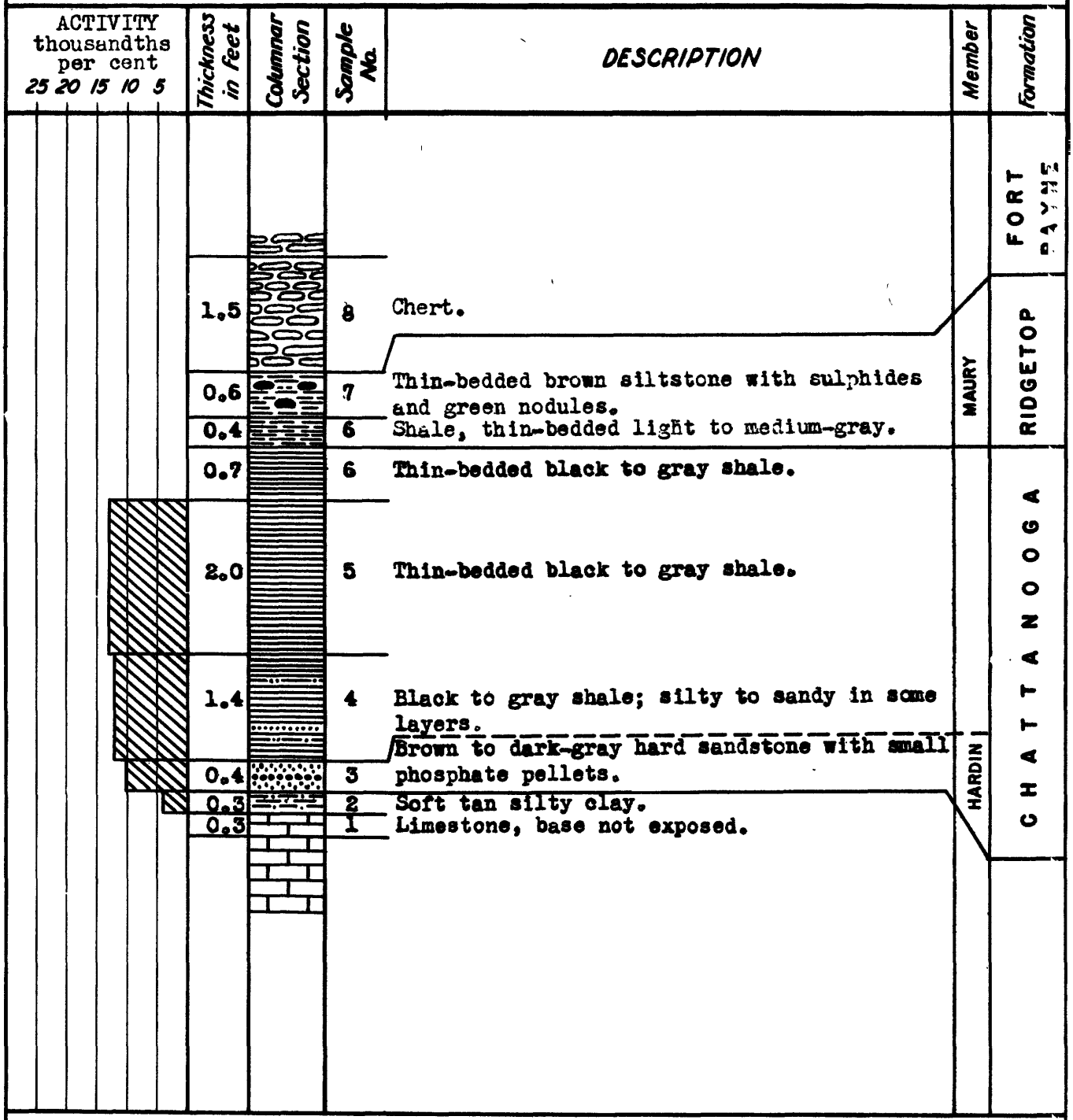
Sample	Description	Locality	Percent equivalent uranium	
			Field	Laboratory
K-0	Whitish efflorescence from Hardin sandstone outcrop	East side Highway 100, ½ mile south of Centerville, Tenn.	0.005	0.005
K-1	Brown phosphate	Perky's mine, Fieldar Hollow, Hickman County, Tenn.	0.000	
K-2	Leipers limestone (Ordovician) underlying K-1	Same locality as K-1	0.000	
K-3	Quartz vein (2 inches wide) in Chattanooga shale	Road-cut on north side Swan Creek Bridge, 2.5 miles south of Sunrise, Hickman County, Tenn.	0.002	
K-6	"Cobalt-manganese" vein in Fort Payne chert	Widow Arnold property, East Fork of Wolf Creek, Hickman County, Tenn.	0.001	
K-7	White phosphate from Devonian chert	Abandoned mine on Wildorf Branch, Tom Creek, Perry County, Tenn.	0.000	
K-8	Quall limestone (Devonian)	At town spring in Linden, Perry County, Tenn.	0.000	
K-18	Harriman novaculite of Hardin sandstone (weathered sample)	West bank of Tennessee River, 1 mile north of Perryville, Decatur County, Tenn.	0.002	
K-19	Harriman novaculite unweathered (Devonian)	North side Tenn. Highway 20, ½ mile west of highway bridge over Tennessee River, Decatur County, Tenn.	0.003	
K-21	Decaturville chert (Devonian)	Grandview Landing on Tennessee River, Hardin County, Tenn.	0.001	
K-22	Hydrocarbon from a fossil tree trunk in top of Hardin sandstone	On the east side of the Middle Fork of Wolf Creek about 1.5 miles above its mouth, Hickman County, Tenn.	0.030	0.052

APPENDIX B

United States Department of the Interior
Geological Survey

SECRET

SAMPLE LOCATION 1, BOND SWITCH QUADRANGLE, HICKMAN COUNTY, TENNESSEE



EXPLANATION

Equivalent uranium content by gamma-ray count in field office

Equivalent uranium content by gamma-ray count in laboratory

Uranium content by chemical analysis

SCALE

0 2 4 6

Feet

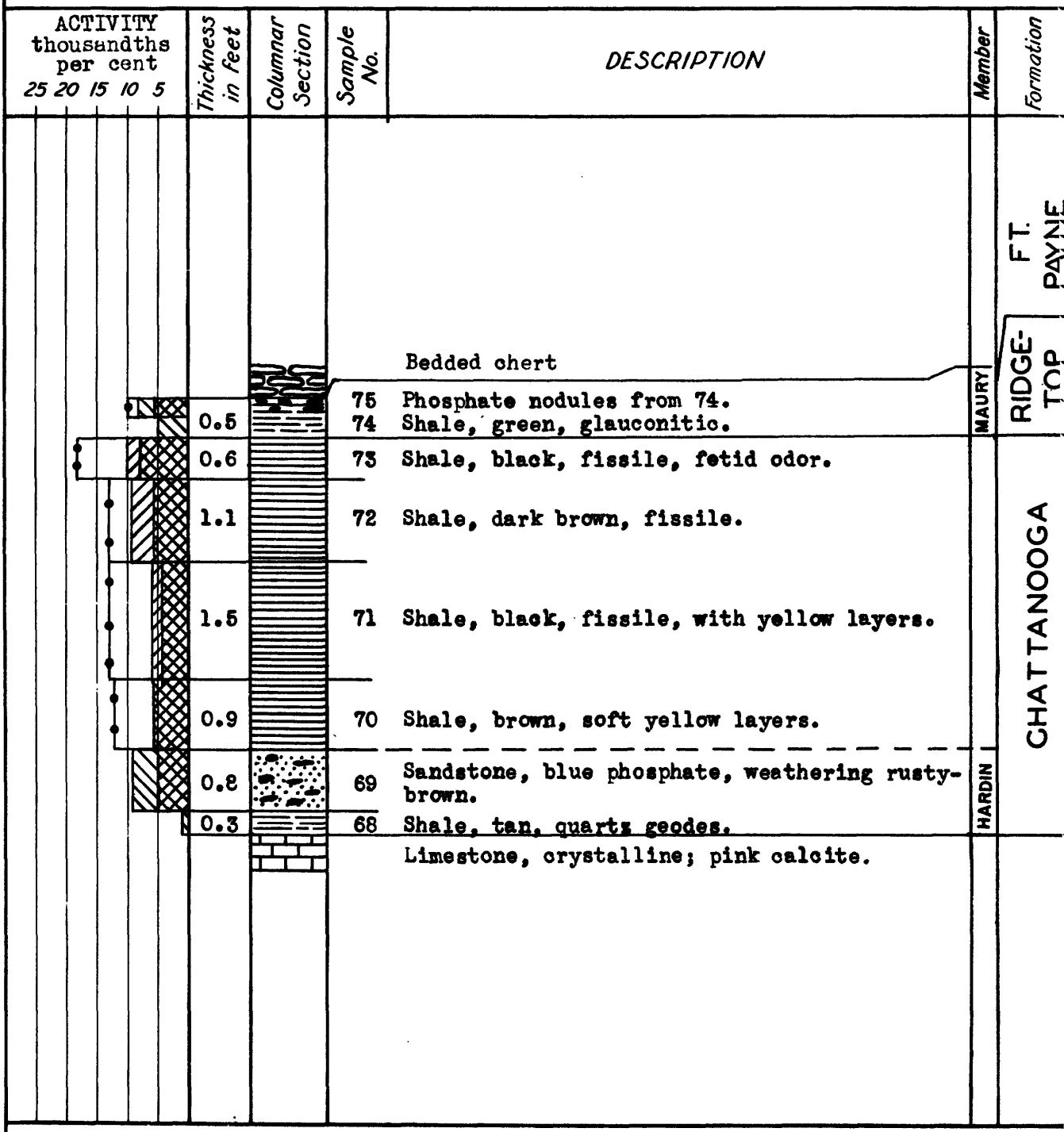
Measured and sampled by

W.W. Rubey, and R.A. Lawrence

10/29/43

SECRET

SAMPLE LOCATION 9, NUNNELLY QUADRANGLE, HICKMAN COUNTY, TENN.



EXPLANATION

Equivalent uranium content by gamma-ray count in field office

Equivalent uranium content by gamma-ray count in laboratory

Uranium content by chemical analysis

SCALE

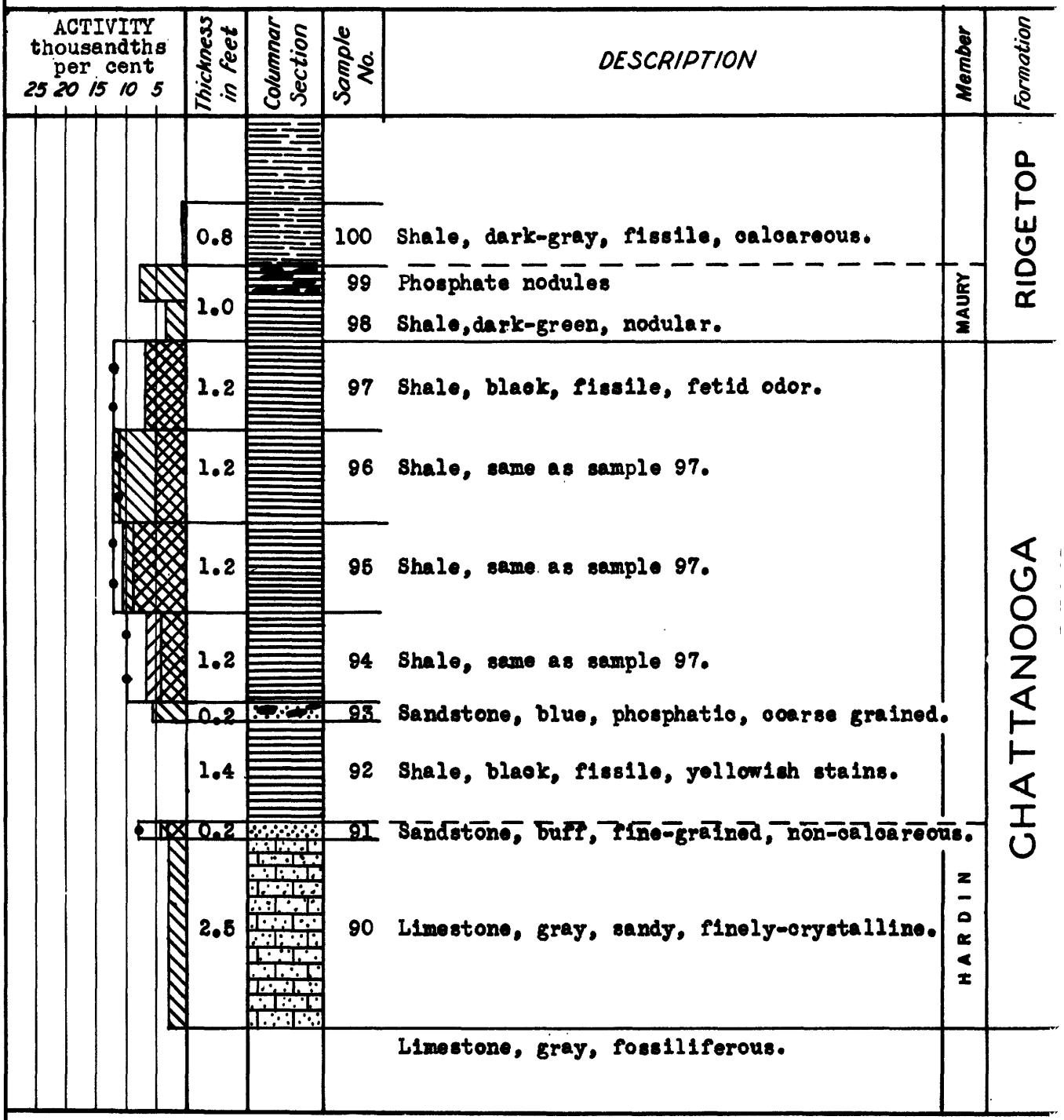
0 2 4 6

Feet

Measured and sampled by
A.L. Slaughter and K.G. Brill, Jr.
6/8/44

United States Department of the Interior
Geological Survey

SAMPLE LOCATION 12, LINDEN QUADRANGLE, PERRY COUNTY, TENN.



EXPLANATION

Equivalent uranium content by gamma-ray count in field office

Equivalent uranium content by gamma-ray count in laboratory

Uranium content by chemical analysis

SCALE

0 2 4 6

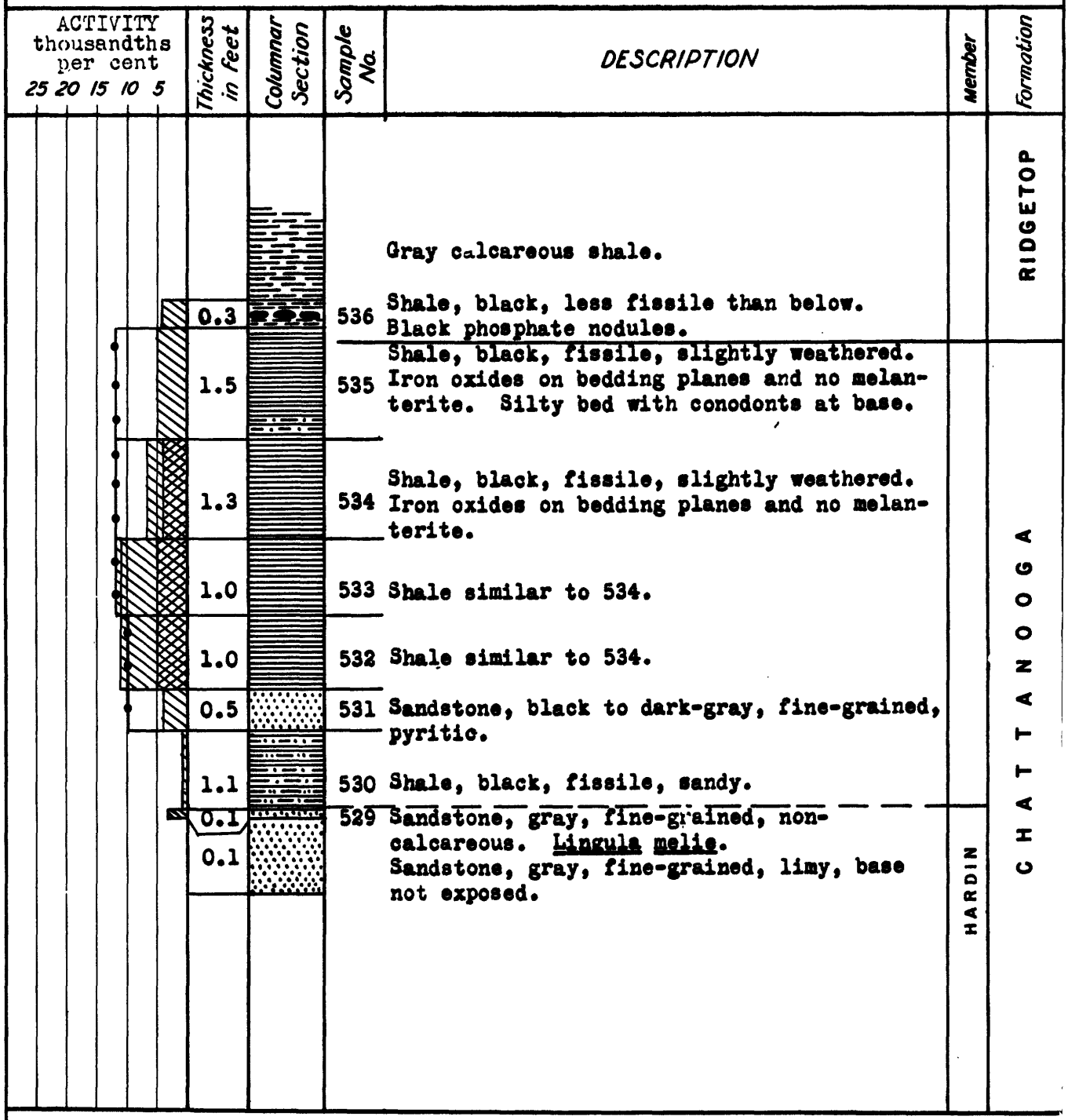
Feet

Measured and sampled by
A.L Slaughter and K.G. Brill, Jr.
June 11, 1944

Geological Survey

SECRET

SAMPLE LOCATION 66, CHESTNUT GROVE QUADRANGLE, PERRY COUNTY, TENNESSEE



EXPLANATION

Equivalent uranium content by gamma-ray count in field office

Equivalent uranium content by gamma-ray count in laboratory

Uranium content by chemical analysis

SCALE

0 2 4 6 Feet

Measured and sampled by

K.G. Brill, Jr., and C.E. Prouty,

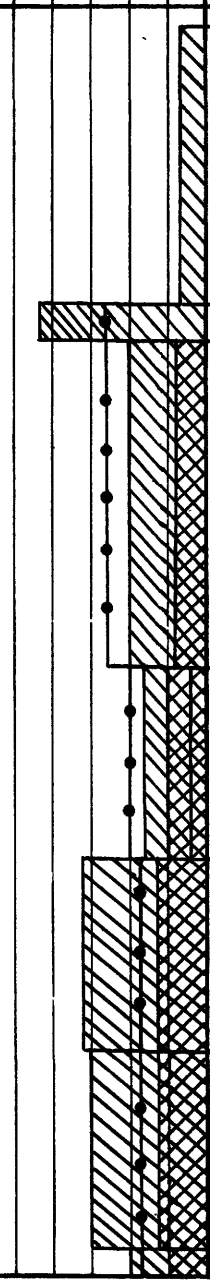
9/14/44

108471

United States Department of the Interior
Geological Survey

SECRET

SAMPLE LOCATION 69, HURRICANE MILLS QUADRANGLE, HUMPHREYS COUNTY, TENN.



Thickness in Feet	Columnar Section	Sample No.	DESCRIPTION	Member	Formation
2.9		565	Shale, light-gray, glauconitic near center; dark-gray, with phosphate nodules, at top.	MAURY	RIDGETOP
0.4		564	Shale, phosphatic layer with small nodules.		
3.4		563	Shale, black, fissile, weathered more than below.		CHATTANOOGA
2.0		562	Shale, black, fissile, melanterite coatings, some beds weathered soft.		
2.0		561	Shale, black, fissile, melanterite coatings.		
2.0		560	Shale, black, weathers gray; fissile, hard melanterite coatings.		
			Section continued on next page.		

EXPLANATION

Equivalent uranium content by gamma-ray count in field office

Equivalent uranium content by gamma-ray count in laboratory

Uranium content by chemical analysis

SCALE

0 2 4 6

Feet

Measured and sampled by
K.G.Brill, Jr. & C.E. Prouty
9/16/44

100471

SAMPLE LOCATION 69 (CONT.)

ACTIVITY thousandths per cent (25 20 15 10 5)	Thickness in feet	Columnar Section	Sample No.	DESCRIPTION	Member	Formation
	2.0		559	Shale, black, fissile, melanterite coatings, 0.5' band of yellow shale near middle.		CHATTANOOGA
	2.0		558	Shale, black, fissile, melanterite coatings, some beds weathered soft.		
	2.0		557	Shale, black, fissile.		
	2.0		556	Shale, black, fissile, Lingula melie near base of interval.		
	2.0		555	Shale, black, fissile, hard, with a few lenses of fine-grained quartz sandstone and pyrite nodules.		
	0.2		554	Shale, black, fissile, hard.		
	2.0		553	Shale, black, fissile, silty; few beds of sandstone in lower 0.2'		
	1.0		552	Sandstone, fine-grained, yellowish-brown, top 0.1' dark-gray, coarser grained. Bottom of section covered.	HARDIN	

EXPLANATION

- Equivalent uranium content by gamma-ray count in field office
- Equivalent uranium content by gamma-ray count in laboratory
- Uranium content by chemical analysis

SCALE

0 2 4 6

Feet

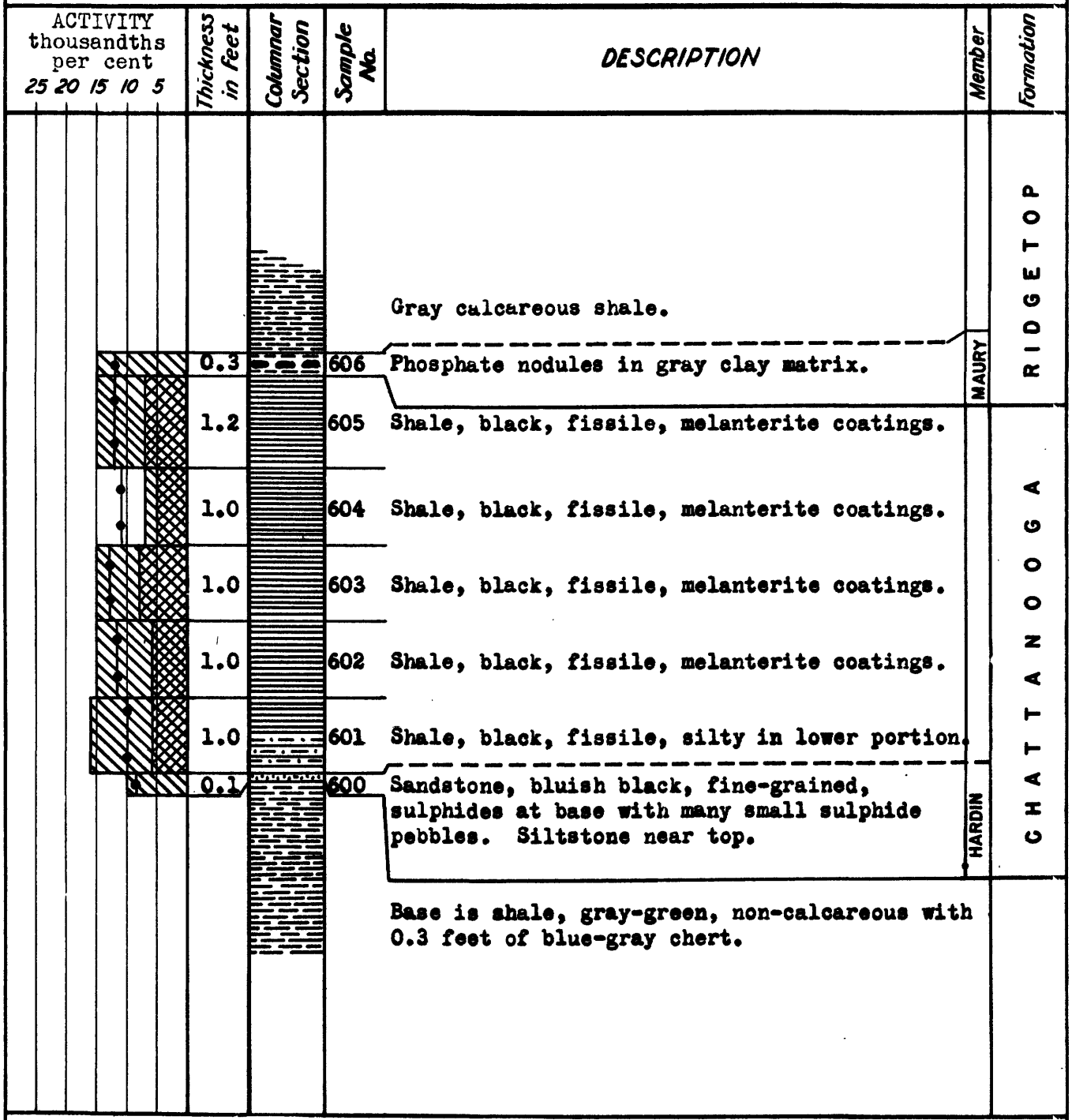
Measured and sampled by
K.G. Brill, Jr. & C.E. Prouty
9/16/44

106471

United States Department of the Interior
Geological Survey

SECRET

SAMPLE LOCATION 75, BEAVERDAM SPRINGS QUADRANGLE,
HICKMAN COUNTY, TENNESSEE.



EXPLANATION

Equivalent uranium content by gamma-ray count in field office

Equivalent uranium content by gamma-ray count in laboratory

Uranium content by chemical analysis

SCALE

0 2 4 6

Feet

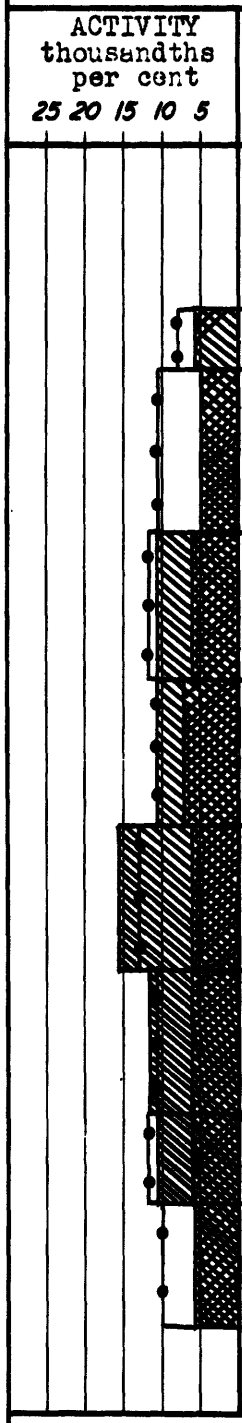
Measured and sampled by

K.G. Brill, Jr., and C. E. Prouty

9/26/44

United States Department of the Interior
Geological Survey

SAMPLE LOCATION 81, COBLE QUADRANGLE, HICKMAN COUNTY, TENNESSEE



Thickness in feet	Sample No.	DESCRIPTION	Member	Formation
		Gray calcareous shale.		RIDGETOP
0.6	659	Shale, dark-gray matrix enclosing many geodes and phosphate nodules.	MAURY	
1.7	658	Shale, black, fissile, melanterite, slightly weathered.		CHATTANOOGA
1.5	657	Shale, black, fissile, melanterite.		
1.5	656	Shale, black, fissile, melanterite. Offset 7 feet southwest.		
1.5	655	Shale, black, fissile, hard except for a few soft black weathered beds, melanterite coatings.		
1.5	654	Shale, black, fissile, hard, melanterite coatings.		
0.9	653	Shale, black, fissile, hard, melanterite coatings, slightly weathered.		
1.2	652	Sandstone, black but weathers brown, fine to medium-grained, Top 0.1 feet siltstone. Stringers of bituminous material.	HARDIN	

EXPLANATION

Equivalent uranium content by gamma-ray count in field office

Equivalent uranium content by gamma-ray count in laboratory

Uranium content by chemical analysis

SCALE

0 2 4 6

Feet

Measured and sampled by

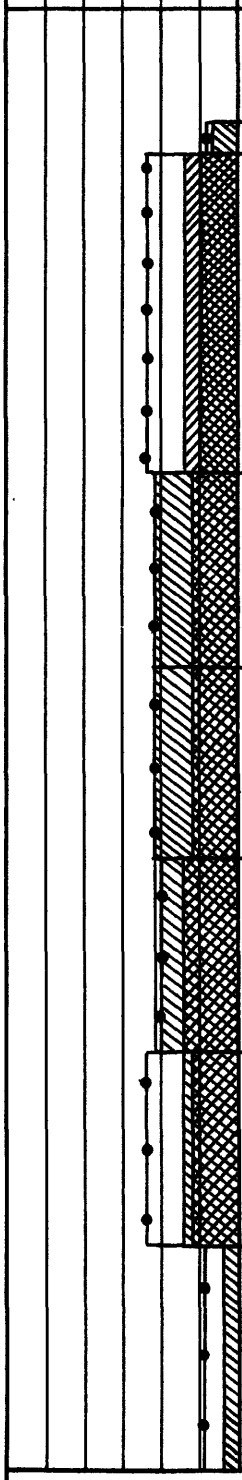
K.G. Brill, Jr. and J.M.Nelson

10/9/44

108471

United States Department of the Interior
Geological Survey

SAMPLE LOCATION 90, DAVIDSON COUNTY, TENNESSEE



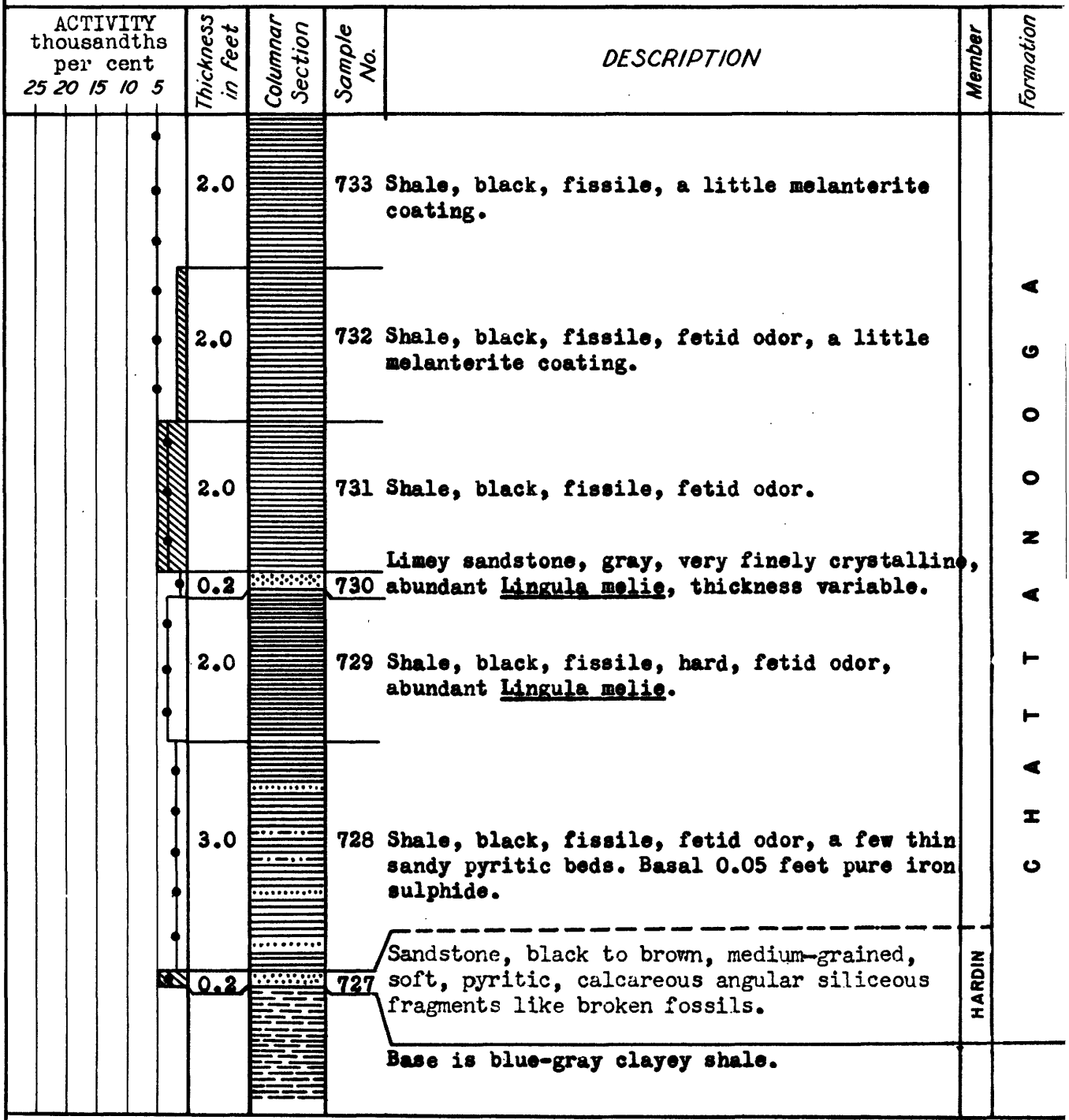
Thickness in Feet	Sample No.	DESCRIPTION	Member	Formation
		Gray calcareous shale.		
0.3	740	Shale, green, glauconitic, phosphate nodules.	MAURY	RIDGETOP
3.3	739	Shale, black, fissile, fetid odor.		CHATTANOOGA
2.0	738	Shale, black, fissile, fetid odor.		
2.0	737	Shale, black, fissile, fetid odor.		
2.0	736	Shale, black, fissile, fetid odor.		
		Offset 20 feet east.		
2.0	735	Shale, black, fissile, sandstone at base. Strongly weathered.		
		Offset 20 feet east.		
2.3	734	Shale, black, fissile, easily broken, damp, several thin beds of limey sandstone with abundant Lingula melie.		

Section continued on next page

United States Department of the Interior
Geological Survey

SECRET

SAMPLE LOCATION 90, continued.



EXPLANATION

Equivalent uranium content by gamma-ray count in field office

Equivalent uranium content by gamma-ray count in laboratory

Uranium content by chemical analysis

SCALE

0 2 4 6

Feet

Measured and sampled by

K.G. Brill, Jr., and C.E. Prouty

10/19/44

100471

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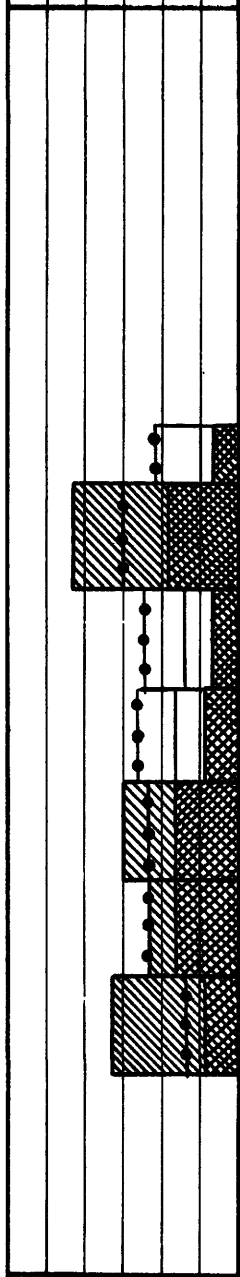
SECRET

SAMPLE LOCATION 96, WHITFIELD QUADRANGLE, HICKMAN COUNTY, TENNESSEE



Thickness in feet	Sample No.	DESCRIPTION	Member	Formation
		Chert		FORT PAYNE
1.3		Gray calcareous shale.		RIDGETOP
0.6	786	Green, glauconitic shale with phosphate nodules.	MAURY	
1.1	785	Shale, black, fissile, fetid odor, iron oxide coatings.		CHATTANOOGA
1.0	784	Shale, black, fissile, fetid odor, iron oxide coatings.		
1.0	783	Shale, black, fissile, fetid odor, iron oxide coatings.		
1.0	782	Shale, black, fissile, fetid odor, iron oxide coatings.		
1.0	781	Shale, black, fissile, fetid odor, iron oxide coatings.		
1.0	780	Shale, black, fissile, fetid odor, iron oxide coatings.	HARDIN	
		Sandstone, greenish-black, fine-grained, pyritic.		
		Base is gray mudstone.		

EXPLANATION

Equivalent uranium content by gamma-ray count in field office

Equivalent uranium content by gamma-ray count in laboratory

Uranium content by chemical analysis

SCALE

0 2 4 6

Feet

Measured and sampled by

K. G. Brill, Jr., and C. E. Prouty

10/26/44

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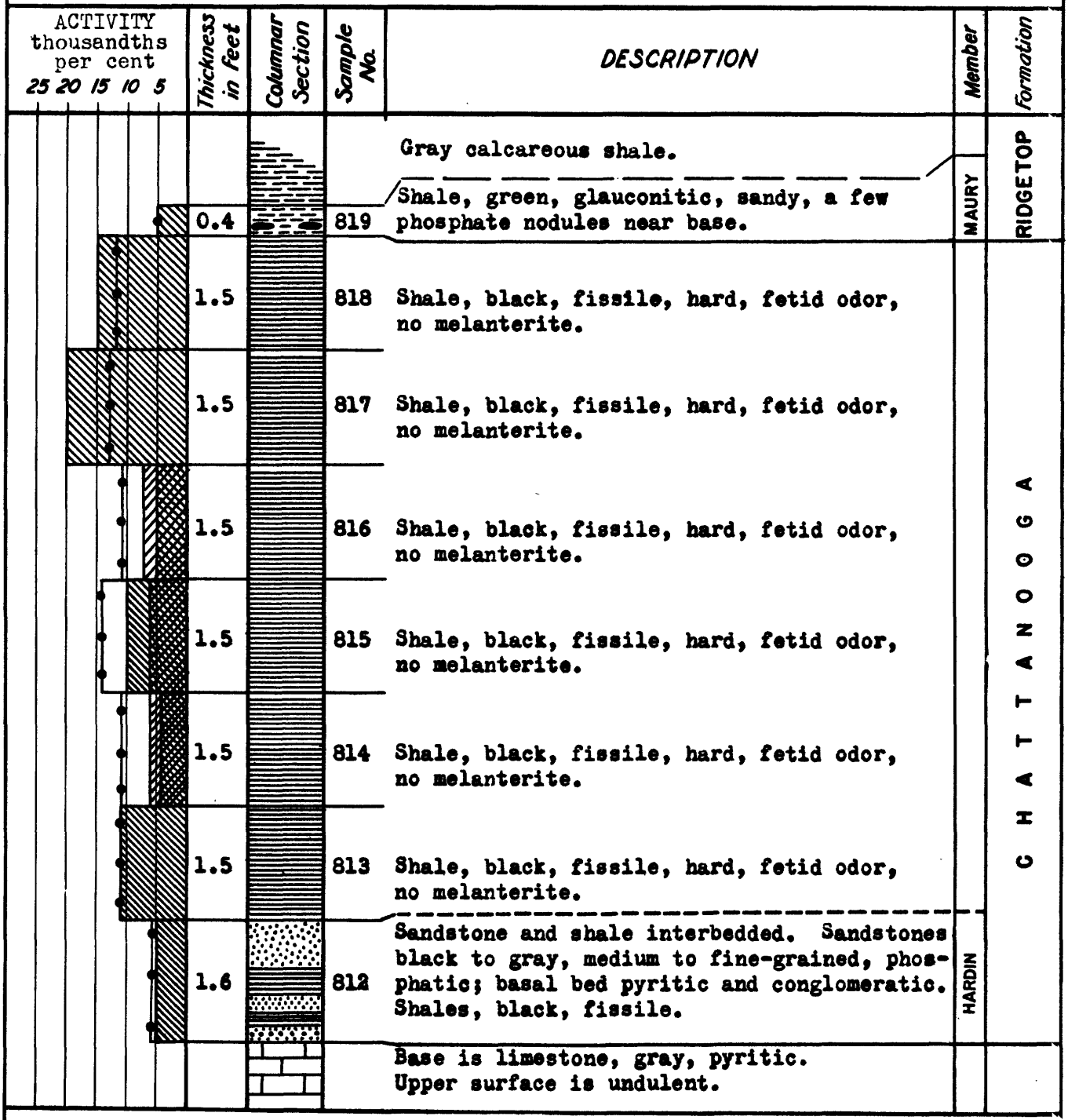
United States Department of the Interior
Geological Survey

SAMPLE LOCATION 100, COBLE QUADRANGLE, HICKMAN COUNTY, TENNESSEE



EXPLANATION

Equivalent uranium content by gamma-ray count in field office

Equivalent uranium content by gamma-ray count in laboratory

Uranium content by chemical analysis

SCALE

0 2 4 6

Feet Feet

Measured and sampled by

K.G. Brill, Jr., and C.E. Prouty

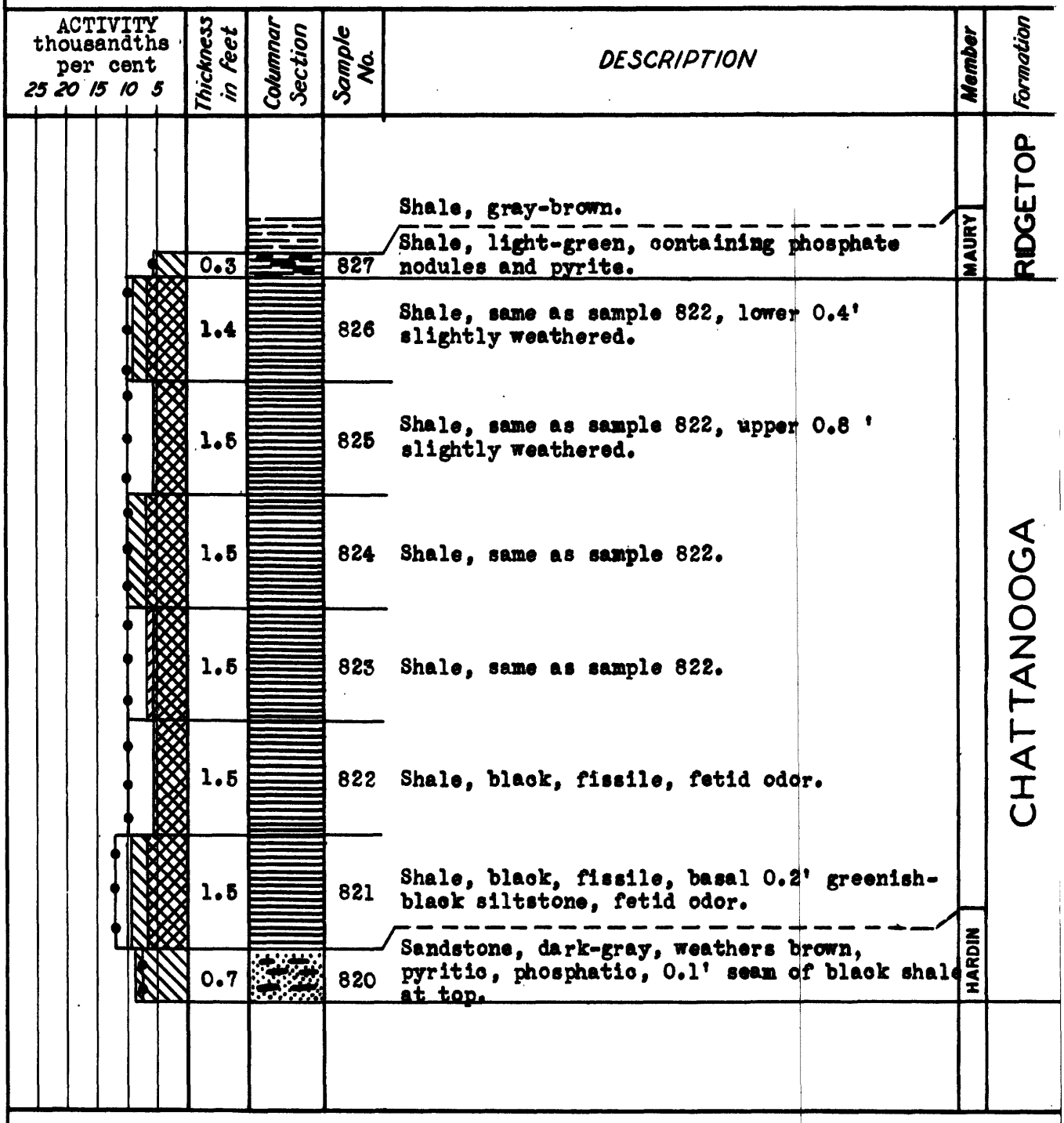
11/2/44

108471

United States Department of the Interior
Geological Survey

SECRET

SAMPLE LOCATION 101, COBLE QUADRANGLE, PERRY COUNTY, TENN.



EXPLANATION

Equivalent uranium content by gamma-ray count in field office

Equivalent uranium content by gamma-ray count in laboratory

Uranium content by chemical analysis

SCALE

0 2 4 6

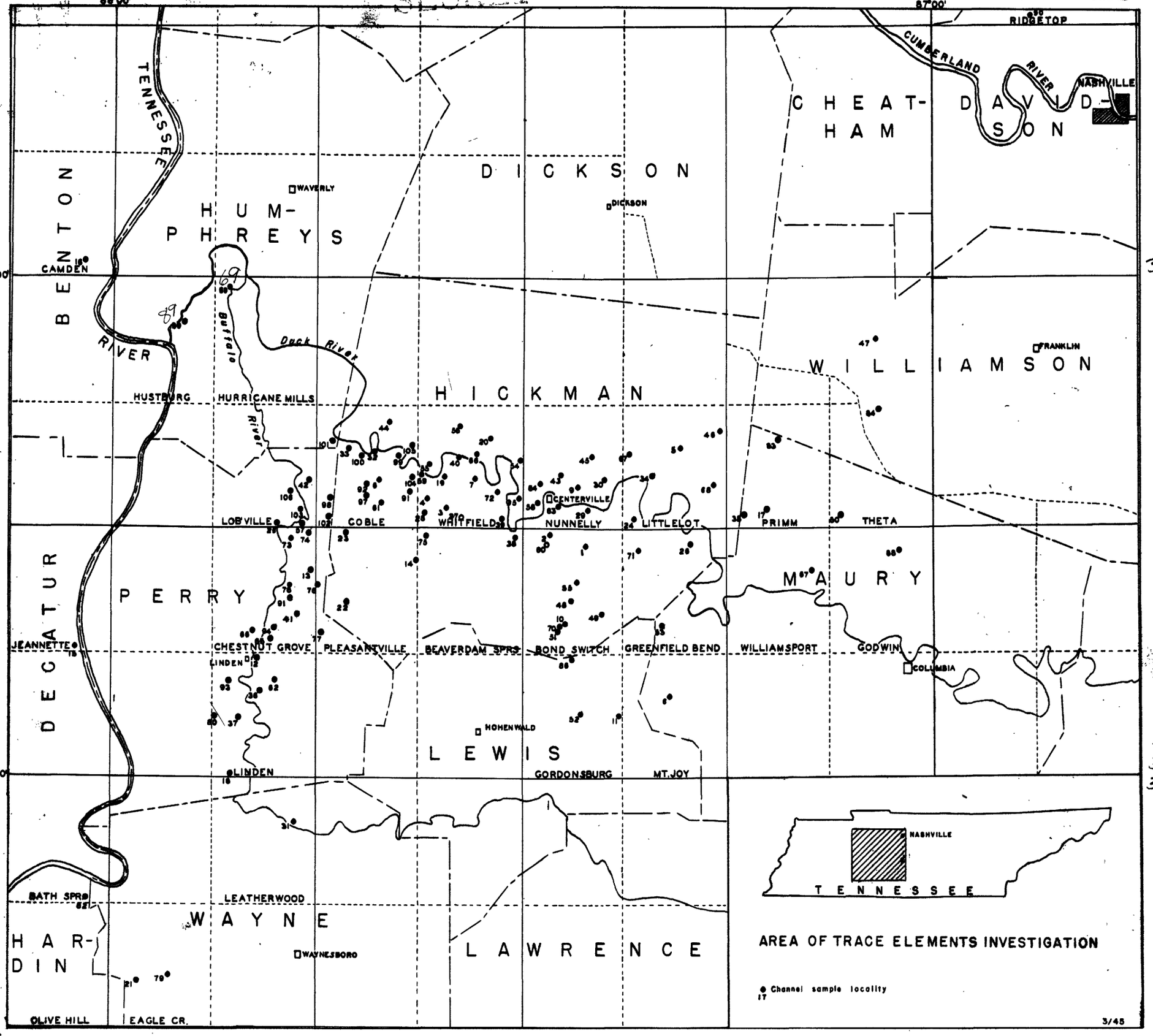
Feet

Measured and sampled by
K.G. Brill, Jr & J.M. Nelson
11/3/44

100471

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STRATEGIC MINERALS INVESTIGATIONS
PRELIMINARY MAP PLATE 1



INDEX MAP SHOWING CHANNEL SAMPLE LOCALITIES

SCALE:
5 0 5 10 15 20 Miles

SECRET

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