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National Uranium Resource Evaluation

AERIAL GAMMA RAY AND MAGNETIC SURVEY
TUPELO QUADRANGLE
MISSISSIPPI, ALABAMA AND TENNESSEE

FINAL REPORT

EG&G GEOMETRICS
Sunnyvale, California 94086

September 1980

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PREPARED FOR U.S. DEPARTMENT OF ENERGY
Assistant Secretary for Resource Applications
Grand Junction Office, Colorado

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ABSTRACT

The Tupelo quadrangle covers a region immediately east of the Mississippi River flood plain in the northernmost Gulf Coastal Physiographic Province. Sediments of Tertiary and Paleozoic basins shoal eastward. Tertiary exposures dominate the western half of the quadrangle. Cretaceous strata are exposed over most of the eastern half.

A search of available literature revealed no known uranium deposits.

A total of eighty-six (86) uranium anomalies were detected and were discussed briefly in this report. Few were considered significant, and most appear to relate to some cultural feature.

Magnetic data appears, for the most part, to be in agreement with existing structural interpretations of the region.

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INTRODUCTION

General

The Tupelo quadrangle covers a 7,800 square miles area in northeastern Mississippi, northwestern Alabama, and southwestern Tennessee (see Figure 2).

The geologic map used in the interpretation was compiled by Martel Laboratories in 1980. Map unit descriptions, found in Appendix C, were taken directly from the Martel map legend. Supplementary geologic information was taken from Fairbridge (ed.) 1975, Cohee and others (1962), and Antoine and others (1974). Cultural and physiographic information was taken from the 1:250,000 scale Tupelo topographic map (1970 version).

Radiometric and magnetic data from the Tupelo quadrangle were acquired in July of 1980 and processed in August and September. A detailed summary of data acquisition, processing, interpretation and presentation methods is contained in Appendix A. Appendix B contains a flight summary report for the Tupelo quadrangle.

Physiography

The Tupelo quadrangle covers a region immediately east of the Mississippi River flood plain at the north end of the Gulf Coastal Physiographic Province. The western half and most of the northern edge of the quadrangle is drained by tributaries of the Mississippi River. The southeastern quadrant lies within the watershed of the Tombigbee river, part of a river system that drains directly into the Gulf of Mexico. The extreme northeastern corner is drained by the Tennessee River, which flows northward and ultimately joins the Ohio River.

The region grades gradually eastward and northward from low-lying plains to more rugged mountainous areas.

Elevations range from below 200 feet in the westernmost plains areas, to 806 feet atop Woodall Mountain in the northeastern corner.

The region is moderately developed culturally. The largest town in the area is Tupelo, with a population of 10,900. The region contains a loose grid of highways and railroads. Interstate 55 strikes southward along the extreme west edge of the quadrangle, but intersects few towns in the quadrangle.

GEOLOGY

Structure

The western half of the quadrangle lies within the northern end of the

Mississippi Embayment (see Figure 2). Cenozoic sediments are over 1,500 feet thick along the west edge, and gradually shoal to the east until Cretaceous rocks are exposed in the center of the quadrangle. Cretaceous sediments are also present in the Mississippi Embayment, though their thickness is not specified on the map by Cohee and others (1962). The Mesozoic section thins to the east and north so that underlying Mississippian sediments are exposed in the extreme north-eastern corner.

The Paleozoic strata define other structures than the overlying Mesozoic/Cenozoic section. The quadrangle overlies a region intermediate between the Black Warrior and Arkoma Basins. Sediment thickness shoals gradually to the northeast from over 10,000 feet at the extreme southwestern corner. The basins are abruptly terminated to the southwest of the quadrangle by the Ouachita Tectonic Zone.

Some fault activity in the Paleozoic section may have occurred in the past (as mapped by Cohee and others, 1962) but no faults have any surficial expression as mapped by Martel.

Surface Geology

As mapped by Martel Laboratories, Tertiary exposures dominate the western half of the quadrangle, and Cretaceous rocks cover most of the eastern half. In fact, extensive mapped Quaternary cover in the Blytheville quadrangle to the north result in significant geologic boundary faults between the two maps. Due to the difference in data sources used to compile the two maps, some doubt is cast on the validity of the Tupelo map (though it is largely a matter of interpretation). The following description, based upon the Tupelo map, must be viewed with some caution.

Mapped Quaternary materials occur as loess deposits on the western edge of the quadrangle, and account for 10 percent of the exposed surface.

Tertiary rocks are mapped in the western central portion of the quadrangle, and consist of sands and clays that are occasionally glauconitic, lignitic, or calcareous. A sandy limestone unit is present at the base of the Tertiary (Clayton Formation lower member - Paleocene). Altogether, the Tertiary section covers 45 percent of the quadrangle as mapped.

Cretaceous rocks cover slightly more than 40 percent of the surface, and are limited to the eastern half of the quadrangle. A wide variety of lithologies are present in these rocks. The youngest units are predominately chalk with minor amounts of clays, sands and limestones. Older units are primarily sands and clays that are glauconitic or occasionally calcareous. The lowest Cretaceous unit contains some gravels (Tuscaloosa Formation).

Paleozoic strata, exposed in the northeastern corner, covers less than

5 percent of the surface. Only Mississippian age materials are present as mapped, and the dominant lithologic unit is limestone. Some shale, sandstone, and coal are locally present.

Uranium

According to available sources, there are no known uranium deposits in the Tupelo quadrangle. The Devonian Chattanooga Shale, which has been the subject of a number of studies as a potential source of uranium, may have some surficial exposure in the extreme northeastern corner. None was mapped by Martel Laboratories as occurring there.

INTERPRETATION OF GEOPHYSICAL DATA

Radiometric Data

A total of 86 groups of uranium (Bi214) samples meet the minimum statistical requirements, set forth in the data interpretation section of Appendix A, used to define anomalies. These are displayed, along with all other anomalous sample points and pertinent data, on Figure 3. The anomalies are summarized in a table in Appendix G. The potassium, uranium, thorium, and ratio pseudo-contour maps, which reflect radiometric responses for the entire quadrangle, are found in Appendix H. Discussion of the abundances of potassium, uranium, and thorium are in terms of apparent equivalent percent and apparent equivalent ppm. These equivalent units are derived from scaling of counts per second data by the sensitivities calculated for the detection system. They do not directly correspond to real geochemical data.

The average concentrations of the three radioactive elements are extremely low in the Tupelo quadrangle. The average uranium concentration is 2.4 ppmeU. Potassium and thorium have average concentrations of 0.6 percent and 6.6 ppmeT respectively. In general, higher concentrations of the elements are found in rock units in the eastern half of the quadrangle.

Highest average uranium concentrations are found in map unit KM (Cretaceous Mooreville Chalk) at 3.5 ppmeU. Peak uranium concentrations are found in map unit KD (Cretaceous Demopolis Chalk) at 6.1 ppmeU. Highest average and peak potassium concentrations occur in map unit QS (Quaternary loess) at 1.0 and 1.4 percent respectively. Map unit KM contains the highest average thorium concentration (9.0 ppmeT), but the peak thorium concentration (17.4 ppmeT) is found in map unit KC (Cretaceous Coffee Sand).

It is apparent from examination of the pseudo-contour maps and the profiles (Appendices D and H) that some of the lines have uniformly higher uranium concentrations than those of adjacent lines. Lower calculated BiAir corrections applied to these lines suggest that changes in the amount of airborne Bi214 both above and below the air-

craft may have affected the measured ground response (see list in Appendix G).

Anomalies are found throughout the quadrangle, but concentrate in areas of cultural activity and along the lines with the lower BiAir correction. The peak concentrations of these anomalies range as high as 5.5 ppmeU in anomaly 78. Though the uranium concentrations exceed 5.0 ppmeU in several anomalies (anomalies 75-78), all show clear correlation with some cultural feature (such as roads, railroads, pipelines, etc).

The clear association with culture and weather, coupled with the largely low uranium concentrations suggest that none of the anomalies represent significant concentrations of naturally occurring uranium. The region in the vicinity of anomalies 75 through 78 (west of Corinth) may merit further investigation.

Magnetic Data

The magnetic field pseudo-contour map appears in Appendix H.

The structural picture is basically one of deep sedimentary deposits that shoal to the east, and overlie Precambrian basement materials.

Magnetic data are dominated by low to moderate gradients. Frequencies and amplitudes increase slightly to the east. In some areas isolated bodies and northeasterly-trending linear features are suggested that may be lithologic and/or structural in origin.

URANIUM ANOMALY/ INTERPRETATION MAP

TUPELO QUADRANGLE
U.S. DEPARTMENT OF ENERGY

APPROXIMATE SCALE 1:500,000

EXPLANATION

- - CITY OR TOWN
- - URANIUM SAMPLE MEETING FOLLOWING CRITERIA:
 - (1) $1.0 \leq U \leq \infty$
 - (2) $-1.0 \leq T \leq \infty$
 - (3) $1.0 \leq U/T \leq \infty$
- IN STANDARD DEVIATION UNITS,
EACH SQUARE REPRESENTS 1 STANDARD DEVIATION.
- - URANIUM ANOMALY:
A SINGLE SAMPLE OF 3 OR MORE STANDARD
DEVIATIONS OR GROUP OF ADJOINING SAMPLES
WHICH TOGETHER TOTAL 4 OR MORE STANDARD
DEVIATIONS, $4.0 \leq \text{sum} \leq \infty$, WITH AT LEAST ONE
SAMPLE OF 2 OR MORE STANDARD DEVIATIONS.

SURVEY AND
COMPILED BY:

EG&G GEOMETRICS

Figure 3 - Uranium Anomaly/Interpretation Map - Tupelo Quadrangle

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**APPENDIX A - Data Acquisition, Processing, and
Interpretation Methods**

INTRODUCTION

General

Under the U.S. Department of Energy's (DoE), National Uranium Resource Evaluation (NURE) Program, geoMetrics, Inc., conducted a high sensitivity airborne radiometric and magnetic survey. The data collection and processing were conducted under requirements set forth in Bendix Field Engineering Corporation specification 1200-C, dated February, 1979. The objectives of the (DoE)/NURE program, of which this project is a small part, may be summarized as follows:

"To develop and compile geologic and other information with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States." (DoE)

As an integral part of the DoE/NURE Program, the National Airborne Radiometric Program is designed to provide cost effective, semiquantitative reconnaissance radio element distribution information to aid in the assessment of regional distribution of uraniferous materials within the United States.

All Airborne data collected by geoMetrics during the course of this project were done so utilizing a Beechcraft B65 Queen Air Airplane (U.S. Registry No. N827Q). The Queen Air used 3584 cubic inches of NaI crystal and a high sensitivity proton magnetometer (0.25 gamma).

Each report contains a detailed geologic summary, interpretation report, reduced scale copies of all maps and profiles, histograms, and statistical tables for each quadrangle contained within the project. In addition, each report contains an appendix detailing the survey description, specifications, data collection and processing methods, and interpretation methods.

All data processing, statistical analyses, and interpretation were performed at the geoMetrics computer facility, Sunnyvale, California. After processing, the corrected data were statistically evaluated to define those areas which were radiometrically anomalous relative to other areas within each computer map unit. Standard deviation maps and radiometric and magnetic profile data were first evaluated individually and then integrated into a final interpretation map for each NTMS quadrangle.

Corrected profiles of all radiometric variables (total count, potassium, uranium, thorium, uranium/thorium, uranium/potassium, and thorium

potassium, ratios), magnetic data, radar altimeter data, barometric altimeter data, air temperature, and airborne bismuth contributions are presented as profiles in this report. Single record and averaged data are presented on microfiche in report. These data are given at 1.0 second sample intervals, corrected for Compton Scatter, referenced to 400 foot mean terrain clearance as Standard Temperature and Pressure and corrected for atmospheric bismuth. Digital magnetic tapes are available containing raw spectral data, single record data, magnetic data, and statistical analysis results.

OPERATIONS

PRODUCTION SUMMARY

For the forty three quadrangles a total of 63,748 line miles, excluding reflights and overlaps and missing data, were flown by the Queen Air. The production summary presented below and the detailed daily production in Appendix B describes a portion of the total project.

Prior to the start of the survey operations, the airplane was calibrated at the DoE test pads and Dynamic Test Range in April, 1980. Requirements for system calibrations are listed in the 1250-A specifications from BFEC.

Throughout the course of the overall project, the average ground speed maintained by the Queen Air was 140 mph.

Nearly 100% of the data collected were within the specification limits of 200-700 feet. Several deviations over short distances were required to meet military regulations, FAA safety requirements, and to ensure that livestock were not endangered due to low flying aircraft. A sample altitude statistical distribution is shown in Figure I.

DATA COLLECTION PROCEDURES

Operating Parameters/Sampling Procedures

This survey was conducted using data collection parameters summarized below:

1. Data sampling was performed by a time-base system using 1.0 second sample intervals. All sensor data with analog output were digitally sampled at each scan based upon the clock timing rate of 1.0 seconds. The data so collected are the instantaneous values of the altimeter, temperature, pressure, and magnetometer parameters determined at the time of the data scan, but represent a count time of 1.0 seconds for the gamma ray spectrometer data.
2. The airplane's objective ground speed was 140 mph and was not exceeded unless dictated by safety.
3. The airplane's downward looking crystal volume was 3,072 cubic inches providing an objective V/V (crystal volume in cubic inches divided by ground speed in miles per hour) of 22.0 at 140 m.p.h.
4. The upward looking crystal volume was 512 cubic inches.

NUMBER OF OCCURRENCES

FIGURE I
 Typical Radar Altimeter
 Statistical Summary
 Histogram for Single
 Flight Line

Navigation/Flight Path Recovery

For all of the quadrangles, profiles were flown east-west at 6 mile (9.6 km) spacing. North-south tie lines were flown at 18 mile (28.8 km) spacing.

Navigation was accomplished using visual navigation techniques. Flight lines were drawn on 1:250,000 quadrangles and the pilot/navigator utilized these maps to provide visual navigation features.

Simultaneously, a 35 mm tracking camera was used to record actual flight position. This camera's fiducial numbering system was directly synchronized to the digital recording system such that a one-to-one correlation between position and data could be made. Upon completion of a data collection flight, the 35 mm film was processed and actual flight path positions located on the appropriate scale map sheets.

Infield System Calibration

Due to the complex nature of both the system and the required data interpretation, much emphasis was placed on infield calibration of the data collection system. The objective of this calibration was to ensure continuous high quality of the data collected. The daily calibration procedures used are summarized below:

A. Pre Flight

1. Use cesium sources (same positioning on crystals every day), peak each Photomultiplier tube/crystal using the digital split-window detector of the GR-800. Then using thallium sources, repeat the tuning of the individual crystals.
2. Run full cesium spectrum on analog recorder for both down and up looking crystals. Calculate the cesium resolution (see sample in Figure II). Run spectrum out past the K40 peak on down crystals for evaluation of system tuning.
3. Finally run a full thorium analog spectrum of the down crystals and check for centering of K40 and Tl208 peaks in spectrum.
4. Repeat 1-3 until system is within contract specifications.

B. During Flight

1. Fly test line at survey altitude (400 ft), for approximately five miles, prior to production data collection (record both analog and digital).
2. Prior to production data collection, the above data are evaluated to ensure +20% limits on total count compared to average of all test flights from that base of operations.

DATA COLLECTION SYSTEM

3. During production data collection, monitor radon analog data for unusual increases. Visually correlate these with temperature and barometric pressure.
4. Upon completion of production data collection, reflow test line at survey altitude (400 ft). Record both analog and digital.

C. Post Flight

1. Verify test line total count within 20% of average for all test lines at that base of operations.
2. Using cesium sources (same position as pre-flight), run full cesium spectrum for both down and up crystals (allow it to record through the K40 peak in the down crystals). Repeat the procedure using thallium sources and examine the Tl208 window.
3. Calculate the resolution of down and up crystal pack.
4. Determine shift, if any, in Tl208 peak position.

Field Digital Data Verification

At the completion of each flight, the raw digital data tapes were checked for data quality and completeness on geoMetrics' G-725. The G-725 system is a totally portable mini computer (and peripherals) consisting of; an Interdata 516, two 9 track tape drives, a CRT, a line printer, and two floppy discs. Any digital problems encountered were immediately evaluated by the electronics operator and data man, thus assuring optimum data quality. In addition, histogram information for each measured variable was generated. Thus a summary display of altitude, etc., is available for immediate evaluation.

AIRCRAFT

The aircraft used for this survey was a Beechcraft Queen Air Model 65, U.S. Registry Number N827Q. This aircraft, being a medium twin engine aircraft, possesses overall performance and safety features which makes it ideal for low level, fixed-winged airborne geophysical survey work within areas of up to moderately rough topographic relief. It can carry the adequate payload at the necessary lower constant airspeeds and still maintain a wide envelope of safety, all while operating economically. Performance data for the Queen Air Model 65 in its present survey configuration are give below:

Maximum Aircraft Gross Weight	7,700 lbs.
Aircraft Empty (dry)	4,640 lbs.
Max. useful load including fuel	<u>3,060 lbs.</u>
Geophysical Package	1,110 lbs.
Navigation Eqpt. & Extra Avionics	125 lbs.
Main Fuel Tanks	528 lbs.
Aux. Fuel Tanks	864 lbs.
Pilot	175 lbs.
Electronics Operator	<u>175 lbs.</u>
Total	<u>2,977 lbs.</u>

Minimum Control Speed	95 MPH	*IAS at	Gross Weight
Safe Single Engine Speed	105 MPH	IAS at	Gross Weight
Rate of climb both engines	1,300	*FPM at	Gross Weight
Rate of climb single engine	210	FPM at	Gross Weight

*IAS = Indicated Air Speed

*FPM = Feet Per Minute

Avgas consumption = 36 U.S. gallons [216 lbs] per hour [at 75% power]
Endurance at 36 gallons [216 lbs.] per hour 75% power = 6 hrs. 6 mins.
Range of cruise at 75% power with 45 min. reserve = 1,200 miles

Cruise configuration stalling speed at Gross Weight [7700 lbs] at 0°
Bank = 80 MPH IAS at 45° Bank = 95 MPH IAS

Electronics

The major components of the airborne data collection system are summarized below (shown schematically in Figure III):

1. Gamma Ray Spectrometer, geoMetrics GR-800, utilizing a dual 256 channel capability to provide spectral data in the 0.4 to 3.0 MeV range for both the downward looking and the upward looking crystal packages and coverage in the 3.0 to 6.0 MeV range for cosmic background.
2. Crystal Detector, geoMetrics Model DET-3072/512R consisting of 3072 cubic inches in the downward looking configuration and 512 cubic inches appropriately shielded in an upward looking configuration.
3. A geoMetrics Digital Data Acquisition System, Model G-714 with "read-after-write" data verification, recording the following on magnetic tape:
 - a. 512 channels of gamma ray spectrometer data
 - b. Total magnetic intensity
 - c. Fiducial number from data system/camera
 - d. Manually inserted information, i.e. date, survey area, and flight line number
 - e. Altitude from radar altimeter and barometric altimeter (by analog-to-digital conversion)
 - f. Time in days, hours, minutes and seconds
 - g. Outside air temperature
4. Magnetometer, geoMetrics Airborne Model G-803, capable of 0.125 gamma sensitivity, but operated at 0.25 gamma sensitivity.
5. Radar Altimeter, Bonzer Model Mark 10 with recording output and display operating over an altitude range of 0 to 2,500 feet.
6. Rosemont Barometric Altimeter with recording output and display.
7. Recording Thermometer for monitoring outside air temperature.
8. Tracking Camera. Automax 35 mm framing camera with wide angle lens and 10 character fiducial/line number display to provide flight path recovery data.

FIGURE III

9. Analog Recorder geoMetrics (MARS 6) to record the following data:

- a. Bi214 using a window about the 1.76 MeV peak from the downward looking system.
- b. Bi air background from the upward looking system.
- c. Magnetometer
- d. Radar Altitude
- e. Total count for downward looking system (0.4 to 3.0 MeV)
- f. Barometric Altitude
- g. Time markers

10. HP 7155 single channel analog recorder during pre and post flight calibrations, this recorder is used to plot a full analog spectra for both the down and up crystal systems via the GR-800. Thus, a hard copy record of the data used for resolution, drift, etc., checks are available at all times. This approach provides instant verification of system parameters (refer to Figure II).

SYSTEM CALIBRATION

AIRCRAFT AND COSMIC BACKGROUND

Full spectral data are collected at five (5) altitudes over water (14,000 feet, 12,000 feet; 10,000 feet; 8,000 feet and 6,000 feet) in an area where the existence of no airborne Bi214 can be assured (off shore over the Pacific Ocean). This results in separate spectra as shown schematically in Figure 10. We define $S(12,000)$ to be the spectra at 12,000 feet from 0.4 MeV to 3.0 MeV with $S(8,000)$ the same spectra at a lower altitude (8,000) and $C_i(h)$ the total count between 3.0 and 6.0 MeV at respective altitudes. Since the aircraft background is constant, the difference between any two altitudes separated sufficiently - typically, 2,000 feet - yields the cosmic spectral curve shape as shown schematically in Figure VI. Thus

$$S(12,000) - S(8,000) = \Delta S$$

and

$$\sum C_{12}(h_i) - \sum C_8(h_i) = \Delta C$$

This cosmic spectral curve is scaled back to 12,000 feet as follows:

$$\frac{C_{12}(h_i)}{\Delta C} \times \Delta S = \Delta C(12,000) \text{ the Cosmic Spectrum (shape and magnitude at 12,000 feet)}$$

The aircraft background is derived as follows:

$$S(12,000) - C(12,000) = A/C \text{ Background}$$

Since data were collected at five altitudes, this procedure was repeated for each combination of altitudes and results averaged. Typical aircraft and cosmic spectra are shown in Figures V, AND VI respectively.

SYSTEM CONSTANTS

System constants were determined by occupation of the DoE Walker Field Test Pads. (See Ward, 1978, and Stromswold, 1978, for complete descriptions of the building and monitoring of the pads). The five test pads contained varying concentrations of K, U, and T as presented by BFEC:

FIGURE IV. - Multiple altitude spectra schematic

<u>PAD</u>	<u>K</u>	<u>U</u>	<u>I</u>
Matrix	1.45%	2.19 ppm	6.26 ppm
K	5.14%	5.09 ppm	8.48 ppm
U	2.03%	30.29 ppm	9.19 ppm
T	2.01%	5.14 ppm	45.33 ppm
Mixed	4.11%	20.39 ppm	17.52 ppm

Since the measurements were taken over a relatively short time period (a few hours), it was assumed that the matrix pad measurements contain not only the effects of the matrix pad itself, but also aircraft background (which is a constant), cosmic background (constant over the time period of interest), and all other local background (e.g. BiAir, etc.) effects. (The matrix pad is constructed with only the basic concrete mix without the additional elemental minerals). Thus, by subtracting the matrix pad count rates from the count rates in the four pads, we have eliminated aircraft and cosmic background and BiAir effects for the four pads. The pad concentrations are then modified in a similar fashion by the subtraction of the matrix pad concentrations. The differential concentrations in the pads are given in the table below.

<u>PAD</u>	<u>K</u>	<u>U</u>	<u>I</u>
K-Matrix	3.7%	2.9 ppm	2.2 ppm
U-Matrix	0.6%	28.5 ppm	2.9 ppm
T-Matrix	0.6%	3.0 ppm	39.0 ppm
Mixed-Matrix	2.7%	18.8 ppm	11.3 ppm

Considering the above, we can define a functional relationship between the differential concentrations and the residual count rates which will provide a method of determining the calibration constants for the spectrometer system. These calibration constants are the six (6) stripping coefficients which account for the interactions occurring between the elemental channels in the system (Compton scatter coefficients, etc.).

On the basis of an ideal situation, one would anticipate that some of these interactions should be negligible. This is not totally the case, since we are dealing with a system which has less than infinite resolving power (i.e. the energies are smeared to some extent).

DERIVED AIRCRAFT BACKGROUND SPECTRUM FROM PACIFIC OCEAN DATA
DOWNWARD-LOOKING CRYSTAL SPECTRUM FOR LINE AC BGD, DATED 072577

TC (0-0 MEV) 184.07 TC (0.4-3.0 MEV) 141.17 COSMIC (3-6 MEV) 0.00
U (1.12 MEV) 9.91 K (1.46 MEV) 14.54 U (1.76 MEV) 4.38 T (2.62 MEV) 4.20

AIRCRAFT BACKGROUND
ROTARY WING AIRCRAFT
DOWNWARD LOOKING CRYSTAL
2048 CUBIC INCHES
DATE: 25 JULY 1977

CH	0	(0.000 MEV)	0.000	CPS	X
CH	1	(0.012 MEV)	0.000	CPS	X
CH	2	(0.024 MEV)	0.000	CPS	X
CH	3	(0.036 MEV)	0.000	CPS	X
CH	4	(0.047 MEV)	0.000	CPS	X
CH	5	(0.059 MEV)	0.000	CPS	X
CH	6	(0.071 MEV)	0.000	CPS	X
CH	7	(0.083 MEV)	0.000	CPS	X
CH	8	(0.095 MEV)	0.000	CPS	X
CH	9	(0.106 MEV)	0.000	CPS	X
CH	10	(0.118 MEV)	0.000	CPS	X
CH	11	(0.130 MEV)	0.000	CPS	X
CH	12	(0.142 MEV)	0.000	CPS	X
CH	13	(0.154 MEV)	0.000	CPS	X
CH	14	(0.165 MEV)	0.000	CPS	X
CH	15	(0.177 MEV)	0.000	CPS	X
CH	16	(0.189 MEV)	0.000	CPS	X
CH	17	(0.201 MEV)	0.000	CPS	X
CH	18	(0.213 MEV)	-0.055	CPS	X
CH	19	(0.225 MEV)	-0.050	CPS	X
CH	20	(0.236 MEV)	0.000	CPS	X
CH	21	(0.248 MEV)	1.401	CPS	XXXX
CH	22	(0.260 MEV)	3.700	CPS	XXXXXXXXXXXX
CH	23	(0.272 MEV)	4.580	CPS	XXXXXXXXXXXX
CH	24	(0.284 MEV)	4.324	CPS	XXXXXXXXXXXX
CH	25	(0.295 MEV)	3.748	CPS	XXXXXXXXXXXX
CH	26	(0.307 MEV)	3.897	CPS	XXXXXXXXXXXX
CH	27	(0.319 MEV)	3.818	CPS	XXXXXXXXXXXX
CH	28	(0.331 MEV)	4.236	CPS	XXXXXXXXXXXX
CH	29	(0.343 MEV)	3.433	CPS	XXXXXXXXXXXX
CH	30	(0.355 MEV)	2.986	CPS	XXXXXXXXXXXX
CH	31	(0.366 MEV)	2.559	CPS	XXXXXXXXXXXX
CH	32	(0.378 MEV)	2.269	CPS	XXXXXXXXXXXX
CH	33	(0.390 MEV)	2.100	CPS	XXXXXXXXXXXX
CH	34	(0.402 MEV)	2.081	CPS	XXXXXXXX TOTAL COUNT
CH	35	(0.414 MEV)	2.121	CPS	XXXXXXXXXXXX
CH	36	(0.426 MEV)	2.114	CPS	XXXXXXXXXXXX
CH	37	(0.437 MEV)	1.976	CPS	XXXXXXXXXXXX
CH	38	(0.449 MEV)	2.200	CPS	XXXXXXXXXXXX
CH	39	(0.461 MEV)	2.180	CPS	XXXXXXXXXXXX
CH	40	(0.473 MEV)	2.226	CPS	XXXXXXXXXXXX
CH	41	(0.485 MEV)	1.983	CPS	XXXXXXXXXXXX
CH	42	(0.496 MEV)	2.155	CPS	XXXXXXXXXXXX
CH	43	(0.508 MEV)	2.158	CPS	XXXXXXXXXXXX
CH	44	(0.520 MEV)	2.267	CPS	XXXXXXXXXXXX
CH	45	(0.532 MEV)	2.117	CPS	XXXXXXXXXXXX
CH	46	(0.544 MEV)	1.997	CPS	XXXXXXXXXXXX
CH	47	(0.556 MEV)	2.447	CPS	XXXXXXXXXXXX
CH	48	(0.567 MEV)	2.540	CPS	XXXXXXXXXXXX
CH	49	(0.579 MEV)	2.586	CPS	XXXXXXXXXXXX
CH	50	(0.591 MEV)	2.708	CPS	XXXXXXXXXXXX
CH	51	(0.603 MEV)	2.481	CPS	XXXXXXXXXXXX
CH	52	(0.615 MEV)	2.372	CPS	XXXXXXXXXXXX
CH	53	(0.626 MEV)	1.866	CPS	XXXXXXXXXXXX
CH	54	(0.638 MEV)	1.682	CPS	XXXXXXXXXXXX
CH	55	(0.650 MEV)	1.661	CPS	XXXXXXXXXXXX
CH	56	(0.662 MEV)	1.488	CPS	XXXXXXXXXXXX
CH	57	(0.674 MEV)	1.474	CPS	XXXXXXXXXXXX
CH	58	(0.686 MEV)	1.447	CPS	XXXXXXXXXXXX
CH	59	(0.697 MEV)	1.431	CPS	XXXXXXXXXXXX
CH	60	(0.709 MEV)	1.476	CPS	XXXXXXXXXXXX
CH	61	(0.721 MEV)	1.463	CPS	XXXXXXXXXXXX
CH	62	(0.733 MEV)	1.467	CPS	XXXXXXXXXXXX
CH	63	(0.745 MEV)	1.579	CPS	XXXXXXXXXXXX
CH	64	(0.756 MEV)	1.497	CPS	XXXXXXXXXXXX
CH	65	(0.768 MEV)	1.548	CPS	XXXXXXXXXXXX
CH	66	(0.780 MEV)	1.421	CPS	XXXXXXXXXXXX
CH	67	(0.792 MEV)	1.282	CPS	XXXXXXXXXXXX
CH	68	(0.804 MEV)	1.155	CPS	XXXXXXXXXXXX
CH	69	(0.816 MEV)	1.246	CPS	XXXXXXXXXXXX
CH	70	(0.828 MEV)	1.245	CPS	XXXXXXXXXXXX
CH	71	(0.840 MEV)	1.161	CPS	XXXXXXXXXXXX
CH	72	(0.851 MEV)	1.253	CPS	XXXXXXXXXXXX
CH	73	(0.863 MEV)	1.231	CPS	XXXXXXXXXXXX
CH	74	(0.875 MEV)	1.425	CPS	XXXXXXXXXXXX
CH	75	(0.887 MEV)	1.452	CPS	XXXXXXXXXXXX
CH	76	(0.898 MEV)	1.543	CPS	XXXXXXXXXXXX
CH	77	(0.910 MEV)	1.444	CPS	XXXXXXXXXXXX
CH	78	(0.922 MEV)	1.364	CPS	XXXXXXXXXXXX
CH	79	(0.934 MEV)	1.289	CPS	XXXXXXXXXXXX
CH	80	(0.946 MEV)	1.150	CPS	XXXXXXXXXXXX
CH	81	(0.957 MEV)	1.144	CPS	XXXXXXXXXXXX
CH	82	(0.969 MEV)	1.005	CPS	XXXXXXXXXXXX
CH	83	(0.981 MEV)	1.061	CPS	XXXXXXXXXXXX
CH	84	(0.993 MEV)	0.841	CPS	XXXXXXXXXXXX
CH	85	(1.005 MEV)	0.919	CPS	XXXXXXXXXXXX
CH	86	(1.017 MEV)	0.822	CPS	XXXX
CH	87	(1.028 MEV)	0.816	CPS	XXXX
CH	88	(1.040 MEV)	0.853	CPS	XXXX
CH	89	(1.052 MEV)	0.901	CPS	XXXX BISMUTH 214
CH	90	(1.064 MEV)	0.822	CPS	XXXX
CH	91	(1.076 MEV)	0.867	CPS	XXXX
CH	92	(1.087 MEV)	0.968	CPS	XXXX
CH	93	(1.099 MEV)	0.851	CPS	XXXX
CH	94	(1.111 MEV)	0.906	CPS	XXXX
CH	95	(1.123 MEV)	0.847	CPS	XXXX
CH	96	(1.135 MEV)	0.861	CPS	XXXX
CH	97	(1.147 MEV)	0.808	CPS	XXXX
CH	98	(1.158 MEV)	0.727	CPS	XXXX
CH	99	(1.170 MEV)	0.751	CPS	XXXX
CH	100	(1.182 MEV)	0.697	CPS	XXXX BISMUTH 214
CH	101	(1.194 MEV)	0.663	CPS	XXXX
CH	102	(1.206 MEV)	0.657	CPS	XXXX
CH	103	(1.217 MEV)	0.633	CPS	XXXX
CH	104	(1.229 MEV)	0.719	CPS	XXXX
CH	105	(1.241 MEV)	0.671	CPS	XXXX
CH	106	(1.253 MEV)	0.475	CPS	XX
CH	107	(1.265 MEV)	0.601	CPS	XXXX
CH	108	(1.277 MEV)	0.661	CPS	XXXX
CH	109	(1.288 MEV)	0.669	CPS	XXXX
CH	110	(1.300 MEV)	0.696	CPS	XXXX
CH	111	(1.312 MEV)	0.630	CPS	XXXX
CH	112	(1.324 MEV)	0.652	CPS	XXXX
CH	113	(1.336 MEV)	0.644	CPS	XXXX
CH	114	(1.347 MEV)	0.652	CPS	XXXX
CH	115	(1.359 MEV)	0.791	CPS	XXXX
CH	116	(1.371 MEV)	0.787	CPS	XXXX POTASSIUM 40
CH	117	(1.383 MEV)	0.834	CPS	XXXX
CH	118	(1.395 MEV)	0.984	CPS	XXXX
CH	119	(1.407 MEV)	1.072	CPS	XXXX
CH	120	(1.418 MEV)	1.184	CPS	XXXX
CH	121	(1.430 MEV)	1.088	CPS	XXXX
CH	122	(1.442 MEV)	1.210	CPS	XXXX
CH	123	(1.454 MEV)	1.231	CPS	XXXX
CH	124	(1.466 MEV)	1.207	CPS	XXXX
CH	125	(1.477 MEV)	0.995	CPS	XXXX
CH	126	(1.489 MEV)	0.987	CPS	XXXX
CH	127	(1.501 MEV)	0.884	CPS	XXXX
CH	128	(1.513 MEV)	0.835	CPS	XXXX
CH	129	(1.525 MEV)	0.515	CPS	XXXX
CH	130	(1.537 MEV)	0.488	CPS	XX
CH	131	(1.549 MEV)	0.409	CPS	XX
CH	132	(1.560 MEV)	0.369	CPS	XX POTASSIUM 40
CH	133	(1.572 MEV)	0.330	CPS	XX
CH	134	(1.584 MEV)	0.438	CPS	XX
CH	135	(1.596 MEV)	0.318	CPS	XX
CH	136	(1.608 MEV)	0.259	CPS	XX
CH	137	(1.619 MEV)	0.259	CPS	XX
CH	138	(1.631 MEV)	0.353	CPS	XX
CH	139	(1.643 MEV)	0.323	CPS	XX
CH	140	(1.655 MEV)	0.332	CPS	XX
CH	141	(1.667 MEV)	0.326	CPS	XX BISMUTH 214
CH	142	(1.678 MEV)	0.267	CPS	XX
CH	143	(1.690 MEV)	0.275	CPS	XX
CH	144	(1.702 MEV)	0.246	CPS	XX
CH	145	(1.714 MEV)	0.347	CPS	XX
CH	146	(1.726 MEV)	0.352	CPS	XX
CH	147	(1.738 MEV)	0.293	CPS	XX
CH	148	(1.749 MEV)	0.359	CPS	XX
CH	149	(1.761 MEV)	0.270	CPS	XX
CH	150	(1.773 MEV)	0.334	CPS	XX
CH	151	(1.785 MEV)	0.245	CPS	XX
CH	152	(1.797 MEV)	0.265	CPS	XX
CH	153	(1.809 MEV)	0.174	CPS	XX
CH	154	(1.820 MEV)	0.228	CPS	XX
CH	155	(1.832 MEV)	0.188	CPS	XX
CH	156	(1.844 MEV)	0.115	CPS	X
CH	157	(1.856 MEV)	0.084	CPS	X BISMUTH 214
CH	158	(1.868 MEV)	0.147	CPS	X
CH	159	(1.879 MEV)	0.147	CPS	X
CH	160	(1.891 MEV)	0.139	CPS	X
CH	161	(1.903 MEV)	0.109	CPS	X
CH	162	(1.915 MEV)	0.091	CPS	X
CH	163	(1.927 MEV)	0.151	CPS	X
CH	164	(1.938 MEV)	0.098	CPS	X
CH	165	(1.950 MEV)	0.136	CPS	X
CH	166	(1.962 MEV)	0.157	CPS	X
CH	167	(1.974 MEV)	0.119	CPS	X
CH	168	(1.986 MEV)	0.109	CPS	X
CH	169	(1.998 MEV)	0.113	CPS	X
CH	170	(2.009 MEV)	0.106	CPS	X
CH	171	(2.021 MEV)	0.147	CPS	X
CH	172	(2.033 MEV)	0.137	CPS	X
CH	173	(2.045 MEV)	0.171	CPS	XX
CH	174	(2.057 MEV)	0.154	CPS	X
CH	175	(2.068 MEV)	0.198	CPS	X
CH	176	(2.080 MEV)	0.162	CPS	X
CH	177	(2.092 MEV)	0.104	CPS	X
CH	178	(2.104 MEV)	0.147	CPS	X
CH	179	(2.116 MEV)	0.137	CPS	X
CH	180	(2.128 MEV)	0.119	CPS	X
CH	181	(2.139 MEV)	0.169	CPS	XX
CH	182	(2.151 MEV)	0.148	CPS	X
CH	183	(2.163 MEV)	0.101	CPS	X
CH	184	(2.175 MEV)	0.114	CPS	X
CH	185	(2.187 MEV)	0.088	CPS	X
CH	186	(2.199 MEV)	0.101	CPS	X
CH	187	(2.210 MEV)	0.095	CPS	X
CH	188	(2.222 MEV)	0.130	CPS	X
CH	189	(2.234 MEV)	0.117	CPS	X
CH	190	(2.246 MEV)	0.113	CPS	X
CH	191	(2.258 MEV)	0.116	CPS	X
CH	192	(2.269 MEV)	0.088	CPS	X
CH	193	(2.281 MEV)	0.097	CPS	X
CH	194	(2.293 MEV)	0.095	CPS	X
CH	195	(2.305 MEV)	0.087	CPS	X
CH	196	(2.317 MEV)	0.059	CPS	X
CH	197	(2.329 MEV)	0.015	CPS	X
CH	198	(2.340 MEV)	0.041	CPS	X
CH	199	(2.352 MEV)	0.070	CPS	X
CH	200	(2.364 MEV)	0.087	CPS	X
CH	201	(2.376 MEV)	0.085	CPS	X
CH	202	(2.388 MEV)	0.084	CPS	X
CH	203	(2.399 MEV)	0.064	CPS	X
CH	204	(2.411 MEV)	0.123	CPS	X
CH	205	(2.423 MEV)	0.076	CPS	X
CH	206	(2.435 MEV)	0.116	CPS	X
CH	207	(2.447 MEV)	0.147	CPS	X
CH	208	(2.459 MEV)	0.108	CPS	X
CH	209	(2.470 MEV)	0.120	CPS	X
CH	210	(2.482 MEV)	0.092	CPS	X
CH	211	(2.494 MEV)	0.127	CPS	X
CH	212	(2.506 MEV)	0.169	CPS	XX
CH	213	(2.518 MEV)	0.206	CPS	XX
CH	214	(2.529 MEV)	0.262	CPS	XX
CH	215	(2.541 MEV)	0.184	CPS	XX
CH	216	(2.553 MEV)	0.205	CPS	XX
CH	217	(2.565 MEV)	0.195	CPS	XX
CH	218	(2.577 MEV)	0.173	CPS	XX
CH	219	(2.589 MEV)	0.201	CPS	XX
CH	220	(2.600 MEV)	0.329	CPS	XX
CH	221	(2.612 MEV)	0.232	CPS	XX
CH	222	(2.624 MEV)	0.187	CPS	XX
CH	223	(2.636 MEV)	0.171	CPS	XX
CH	224	(2.648 MEV)	0.177	CPS	XX
CH	225	(2.660 MEV)	0.099	CPS	XX
CH	226	(2.671 MEV)	0.122	CPS	X
CH	227	(2.683 MEV)	0.124	CPS	X
CH	228	(2.695 MEV)	0.131	CPS	X
CH	229	(2.707 MEV)	0.090	CPS	X
CH	230	(2.719 MEV)	0.067	CPS	X
CH	231	(2.730 MEV)	0.015	CPS	X
CH	232	(2.742 MEV)	-0.026	CPS	X
CH	233	(2.			

COSMIC SPECTRUM
ROTARY WING AIRCRAFT
DOWNWARD LOOKING CRYSTAL
2048 CUBIC INCHES
DATE: 25 JULY 1977

Thus, energy peaks within a spectrum of a given element are Gaussian shaped rather than pure line spectra. Additionally, we are dealing with finite spectral windows, multiple peaked spectra, and pulse pileup; all tend to couple each window's response to the other.

Keeping in mind that we are dealing with the count rates corresponding to the concentrations presented in the last table, we define the following:

KC_i = uncorrected system count rate for the K channel

UC_i = uncorrected system count rate for the U channel

TC_i = uncorrected system count rate for the T channel

K_i = the percent differential concentration of potassium

U_i = ppm differential concentration of uranium

T_i = ppm differential concentration of thorium

where "i" refers to the ith pad.

We also define the following:

ζ_{kk} = sensitivity of KC_i to concentrations of K_i

ζ_{ku} = sensitivity of KC_i to concentrations of U_i

ζ_{kt} = sensitivity of KC_i to concentrations of T_i

ζ_{uk} = sensitivity of UC_i to concentrations of K_i

ζ_{uu} = sensitivity of UC_i to concentrations of U_i

ζ_{ut} = sensitivity of UC_i to concentrations of T_i

ζ_{tk} = sensitivity of TC_i to concentrations of K_i

ζ_{tu} = sensitivity of TC_i to concentrations of U_i

ζ_{tt} = sensitivity of TC_i to concentrations of T_i

Using the above definitions, we now construct the functional relationship by means of the following nine (9) equations in sets of three (3) per pad.

$$\text{K pad} \quad KC_k = \zeta_{kk}K + \zeta_{ku}U + \zeta_{kt}T$$

$$UC_k = \zeta_{uk}K + \zeta_{uu}U + \zeta_{ut}T$$

$$TC_k = \zeta_{tk}K + \zeta_{tu}U + \zeta_{tt}T$$

$$\text{U pad} \quad KC_u = \zeta_{kk}K + \zeta_{ku}U + \zeta_{kt}T$$

$$UC_u = \zeta_{uk}K + \zeta_{uu}U + \zeta_{ut}T$$

$$TC_u = \zeta_{tk}K + \zeta_{tu}U + \zeta_{tt}T$$

$$\text{T pad} \quad KC_t = \zeta_{kk}K + \zeta_{ku}U + \zeta_{kt}T$$

$$UC_t = \zeta_{uk}K + \zeta_{uu}U + \zeta_{ut}T$$

$$TC_t = \zeta_{tk}K + \zeta_{tu}U + \zeta_{tt}T$$

Separating these equations into consistent groups, we get for the uncorrected count rates in the K channel

$$(K \text{ pad}) \quad KC_k = \zeta_{kk}K_k + \zeta_{ku}U_k + \zeta_{kt}T_k$$

$$(U \text{ pad}) \quad KC_u = \zeta_{kk}K_u + \zeta_{ku}U_u + \zeta_{kt}T_u$$

$$(T \text{ pad}) \quad KC_t = \zeta_{kk}K_t + \zeta_{ku}U_t + \zeta_{kt}T_t$$

The equations can be expressed in matrix notation

$$\begin{bmatrix} KC_k \\ KC_u \\ KC_t \end{bmatrix} = \begin{bmatrix} K_k & U_k & T_k \\ K_u & U_u & T_u \\ K_t & U_t & T_t \end{bmatrix} \cdot \begin{bmatrix} \zeta_{kk} \\ \zeta_{ku} \\ \zeta_{kt} \end{bmatrix}$$

Where the k, u and t subscripts represent the K, U and T pads.

In a similar manner we can write two other matrix equations for UC_i and TC_i respectively.

$$\begin{bmatrix} UC_k \\ UC_u \\ UC_t \end{bmatrix} = \begin{bmatrix} K_k & U_k & T_k \\ K_u & U_u & T_u \\ K_t & U_t & T_t \end{bmatrix} \cdot \begin{bmatrix} \zeta_{uk} \\ \zeta_{uu} \\ \zeta_{ut} \end{bmatrix}$$

$$\begin{bmatrix} TC_k \\ TC_u \\ TC_t \end{bmatrix} = \begin{bmatrix} K_k & U_k & T_k \\ K_u & U_u & T_u \\ K_t & U_t & T_t \end{bmatrix} \cdot \begin{bmatrix} \zeta_{tk} \\ \zeta_{tu} \\ \zeta_{tt} \end{bmatrix}$$

Collecting the above, these equations can be expressed in matrix form as

$$\begin{bmatrix} KC_k & UC_k & TC_k \\ KC_u & UC_u & TC_u \\ KC_t & UC_t & TC_t \end{bmatrix} = \begin{bmatrix} K_t & U_k & T_k \\ K_u & U_u & T_u \\ K_t & U_t & T_t \end{bmatrix} \cdot \begin{bmatrix} \zeta_{kk} & \zeta_{uk} & \zeta_{tk} \\ \zeta_{ku} & \zeta_{uu} & \zeta_{tu} \\ \zeta_{kt} & \zeta_{ut} & \zeta_{tt} \end{bmatrix}$$

or

$$\bar{A} = \bar{B} \cdot \bar{\zeta}$$

where $\bar{A}$ is the residual count rate matrix, $\bar{B}$ is the matrix of the known differential concentrations and $\bar{\zeta}$ the sensitivity matrix.

Rearranging the above equations we have

$$\bar{B} = \bar{A} \cdot \bar{\zeta}^{-1}$$

We now define

$$\bar{\zeta}^{-1} = \bar{\Delta}$$

Eliminating $\bar{\zeta}$, we get

$$\bar{B} = \bar{A} \cdot \bar{\Delta}$$

We can now solve for $\bar{\Delta}$ by matrix inversion.

Therefore, the differential concentrations in the mixed pad can be derived from the k,u,t pads to check the computed $\bar{\Delta}$.

$$\begin{bmatrix} K_m \\ U_m \\ T_m \end{bmatrix} = \begin{bmatrix} \Delta_{kk} & \Delta_{ku} & \Delta_{kt} \\ \Delta_{uk} & \Delta_{uu} & \Delta_{ut} \\ \Delta_{tk} & \Delta_{tu} & \Delta_{tt} \end{bmatrix} \cdot \begin{bmatrix} KC_m \\ UC_m \\ TC_m \end{bmatrix}$$

where the subscript m refers to the mixed pad. Expanding this in algebraic form we obtain the following set of equations:

$$K_m = \Delta_{kk}(KC_m) + \frac{\Delta_{ku}UC_m}{\Delta_{kk}} + \frac{\Delta_{kt}TC_m}{\Delta_{kk}}$$

$$U_m = \Delta_{uu}(UC_m) + \frac{\Delta_{ut}TC_m}{\Delta_{kk}} + \frac{\Delta_{uk}KC_m}{\Delta_{uu}}$$

$$T_m = \Delta_{tt}(TC_m) + \frac{\Delta_{tu}UC_m}{\Delta_{tt}} + \frac{\Delta_{tk}KC_m}{\Delta_{tt}}$$

The terms in parentheses in the above 3 equations are the "corrected stripped count rates" for the system, and the stripping coefficients are as follows:

$$S_{ku} = \frac{\Delta_{ku}}{\Delta_{kk}} \quad (\text{effect of uranium on potassium})$$

$$S_{kt} = \frac{\Delta_{kt}}{\Delta_{kk}} \quad (\text{effect of thorium on potassium})$$

$$S_{ut} = \frac{\Delta_{ut}}{\Delta_{uu}} \quad (\text{effect of thorium on uranium})$$

$$S_{uk} = \frac{\Delta_{uk}}{\Delta_{uu}} \quad (\text{effect of potassium on uranium})$$

$$S_{tu} = \frac{\Delta_{tu}}{\Delta_{tt}} \quad (\text{effect of uranium on thorium})$$

$$S_{tk} = \frac{\Delta_{tk}}{\Delta_{tt}} \quad (\text{effect of potassium on thorium})$$

These stripping coefficients are defined in terms of S_{ij} in order to eliminate confusion with α , β , and γ , which are sometimes defined slightly differently.

ATMOSPHERIC RADON CORRECTION

Consider the crystal configuration shown below:

Let 1 and 2 designate the down and up crystal respectively. The down crystal sees radiation rates of I_1 composed of the air signal I_a and the ground signal I_g plus aircraft and cosmic background.

$$\text{Therefore } I_1 = I_g + I_a + A_1 + C_1$$

Similarly, the up crystal sees the air signal and ground signal (both somewhat attenuated) plus an aircraft and cosmic background.

$$\text{Therefore } I_2 = \ell I_g + m I_a + A_2 + C_2$$

Where m is the response to the air signal and ℓ is the % of the ground signal getting through to the up detector.

Using the test pad data, the factor ℓ can be determined. Consider the two previous equations. When we subtract the matrix pad data from the K, U, and T pad data, we have essentially set A_1 , A_2 , C_1 , and C_2 and I_a equal to zero.

$$\begin{aligned} \text{Therefore } I_1 &= I_g \\ I_2 &= \ell I_g \\ &= \left(\frac{I_2}{I_1} \right) \end{aligned}$$

Instead of using the count rates we can use the resultant sensitivities $1/\Delta_{uu}$ to determine ℓ for the elemental channel U.

$$= \frac{1/\Delta_{uu} \text{ (up)}}{1/\Delta_{uu} \text{ (down)}}$$

It should be noted that due to "shine around" (since the shielding is not an infinite plane, the upward looking crystal responds to the surrounding terrain) on the test pads, as altitude increases, should decrease, thus $\ell = f(h)$.

Only the factor m remains to be determined. This unfortunately cannot be determined from test pad data. It can however be determined by flying over water (e.g. use of the Lake Mead over-water data).

Consider the equations for I_1 and I_2 again

$$I_1 = I_g + I_a + A_1 + C_1$$

$$I_2 = \ell I_g + m I_a + A_2 + C_2$$

Over water $I_g = 0$

We have A_1 , A_2 , C_1 , and C_2 defined.

Removing the aircraft and cosmic background from the over water data and we are left with

$$I_1 = I_a$$

$$I_2 = m I_a$$

Since m is the shielding factor response to the air signal, we should have an air signal to "shield". Thus m is best determined if there is radon present.

Both up and down counting rates are corrected for aircraft and cosmic background and so we can solve the following two equations for I_a .

$$I_1 = I_g + I_a$$

$$I_2 = \ell I_g + m I_a$$

$$m I_a = I_2 - \ell I_g$$

$$\text{but } I_g = I_1 - I_a$$

$$\text{then } I_a (m - \ell) = I_2 - \ell I_1$$

$$\text{or } I_a = \frac{I_2 - \ell I_1}{m - \ell} = \text{Bi Air}$$

and I_a is then the Bi Air contribution from the surrounding air. This is then subtracted from the down looking U count resulting in corrected data.

DATA PROCESSING

DATA PREPARATION

The following sections summarize the techniques used for reduction and processing of the airborne data collected by geoMetrics.

Field Tape Verification and Edit

The field data tapes containing the airborne data are read on a computer to verify the recording and data quality. Data recovery is essentially 100% from the field tapes. During this phase, statistics are generated summarizing all the variables recorded for each flight line. Simultaneously, the spectral peaks are evaluated for shifts using a centroid calculation and the particular window's peak channel. The data are also checked for correct scan lengths and proper justification of data fields within each scan and live time calculations are made. During this process, the desired window data fields are extracted from each spectrum and rewritten as a reformatted copy tape. (Portions of this operation were performed in the field using the G-725 field computer system.)

The reformatted raw data for each flight line (with aborted or unnecessary flight line data edited out) are then checked for consistency, data spikes, gradients, etc. Every correction suggested by the computer is evaluated by the data processing personnel prior to implementation. Upon completion of the phase, the data on the output tape are "clean" and ready for subsequent correction of the radiometrics and tying of the magnetics.

Flight Line Location

A single frame 35 mm camera is used for obtaining position recovery information. The photo locations are spotted or transferred to a suitable base map and are digitized. The fiducial numbers of the spotted points along each line are entered during the digitizing process. A computer program is used to check the consistency of these data using calculated intersections from tie line to tie line and from traverse to traverse. This program allows easy detection of entry errors as well as potential flight path recovery errors.

A computer program then calculates the map location for each intersection and the beginning and end of each line based on the fiducial numbers and the control line/tie grid. A computer plot is made of these locations to check against the field plot and correct editing

information. These flight lines are then overlain on the geologic base map and each map unit is digitized such that each sample falls within a single unit. This resulting location information is then merged with the geophysical data using the fiducial numbers as common reference.

RADIOMETRIC DATA REDUCTION

Reduction of the raw window data was carried out utilizing system calibration constants as derived from high altitude over water flights, Lake Mead Dynamic Test Range, and the Walker Field Test Pads. The data reduction sequence used is summarized in Figure VII. Processing of the data was performed using the window energies given below:

Total count - 0.4 to 3.0 MeV

K - 1.37 to 1.57 MeV

U - 1.66 to 1.87 MeV (downward looking system)

U_{up} - 1.04 to 1.21 MeV and 1.65 to 2.42 MeV (upward looking system)

T - 2.41 to 2.81 MeV

Cosmic - 3 to 6 MeV (downward and upward looking system)

Aircraft and Cosmic background for the Queen Air over these windows are as follows:

		<u>QUEEN AIR</u>	
		Aircraft	Cosmic*
TC	(cps)	152.04	2.3833
K	(cps)	16.06	0.1322
U _{dn}	(cps)	6.50	0.1098
U _{up}	(cps)	3.17	0.5540
T	(cps)	3.42	0.1503

*Cosmic background values are in cps per 1.0 cps in the 3-6 MeV window.

DATA PROCESSING FLOW DIAGRAM

FIGURE VII

Compton corrections to the down data were made using the following constants:

<u>S_{ij}</u>	<u>QUEEN AIR</u>
S _{ku}	0.8437
S _{kt}	0.1584
S _{ut}	0.2703
S _{uk}	0.0
S _{tu}	0.05614
S _{tk}	0.0

The ij subscripts represent the influence of the jth window on the ith window.

All parameters except for S_{ut} are considered constants. S_{ut} was considered an altitude dependent parameter utilizing the following expression (after Grasty, 1975).

$$S_{ut} = S_{ut_0} + 0.0076h, \text{ where } h \text{ is the altitude in hundreds of feet.}$$

Altitude attenuation coefficients used are defined as follows:

ALTITUDE ATTENUATION COEFFICIENTS

		<u>QUEEN AIR</u>
TC	(per foot)	0.002011
K	(per foot)	0.002740
U	(per foot)	0.002479
T	(per foot)	0.002048

All radiometric data presented in the strip charts have been normalized to 400 feet mean terrain clearance at STP using the expression:

$$\exp - u_i \frac{273.15}{760} \times \frac{P}{T} (h - 400)$$

where h is the height in feet, u_i is the appropriate altitude attenuation coefficient, P is in mm of Hg, and T is in degrees Kelvin. In cases where the altitude exceeds 1,000 feet, the correction coefficients were limited to the 1,000 foot value.

Bi Air calculations are made using the following expressions:

$$U_{up} = (R_{us} + \frac{C'_{uk}}{C'_{uu}} R_{ks} + \frac{C'_{ut}}{C'_{uu}} R_{ts}) \ell$$

$$Bi_{Air} = \frac{\quad}{m - \ell}$$

Where U_{up} = count rate from upward detectors

ℓ = crystal coupling constant

m = crystal geometric factor

C'_{uk}, C'_{ut}, C'_{uu} = stripping coefficients relating down data to up data

R_{us} = stripped uranium count rate - down system

R_{ks} = stripped potassium count rate - down system

R_{ts} = stripped thorium count rate - down system

The numerical values for the constants ℓ, m, C'_{uk}, and C'_{uu} are given below:

	<u>QUEEN AIR</u>
ℓ	0.1101
m	0.596
C' _{uk}	.00947
C' _{uu}	.07136
C' _{ut}	.04636
μℓ	-0.000032
μm	-0.000192

μ_l & μ_m are altitude dependent as follows:

$$l = l_0 - \mu_l \times h, \text{ where } h \text{ is in feet}$$

$$m = m_0 - \mu_m \times h, \text{ where } h \text{ is in feet}$$

These Bi Air data are filtered and the filtered results are then removed on a point by point basis from the corrected uranium window data.

The window data are then evaluated for statistical adequacy prior to altitude correction to ensure they are significant within the context of the anticipated errors in count statistics.

Statistical Adequacy Test

The statistical adequacy test is made to determine whether the corrected data sample is sufficiently greater than the "noise" to represent the "signal" of interest.

We can define three separate criteria for detection thresholds (ref. Currie, Analytical Chemistry, Volume 40, No. 3, March 1968) of which only one is directly applicable to our case; this is the "critical level". This is the level at which the decision is made that a signal is "detected". We thus define this critical level as that level at which the data are statistically adequate.

Setting the actual levels in counts per second, "a priori" for each elemental window is difficult at best since the full effect of all parameters affecting the counts is not known to a sufficient degree of certainty. If the corrections to the data are a significant portion of the count rate, most of the error (exclusive of systematic errors due to electronics, etc.) in the corrected data can be ascribed to random errors within the applied corrections. The corrections are basically the results of counting radioactive decay products (gamma rays) and are therefore assumed to follow the classical Poisson distribution. The following assumptions concerning these corrections are:

1. In the best case, the error in each correction is additive.
2. The sum of these corrections also follows a Poisson distribution.
3. The uncertainty in the correction itself is equal to the square root of the correction applied.
4. This uncertainty is directly reflected in the corrected single record count rate.

With these assumptions in mind, the criterion for determining the statistical adequacy of a given data sample is defined as follows:

"If a corrected single record data sample exceeds 1.5 times the square root of the summed correction applied to that data sample, then that data sample is statistically adequate."

Since any calculation using statistically inadequate data (such as ratios) is also inadequate, the adequacy of each element of the single sample record data is tested prior to the calculation. This is done during the course of the processing by retaining all corrections applied to each data sample and determining its adequacy as explained above.

Not only are the results of this statistical adequacy test used to insure that calculated ratios will be meaningful but they are also utilized to determine the optimum interval over which the data should be averaged (e.g. 5 seconds or 7 seconds, etc.) to improve the overall data statistical adequacy. In the case of this project, the resulting averaging sample interval was 7 seconds.

Conversion to Equivalent ppm and Percent

At this point the data are single record corrected samples in units of counts per second. These data are then converted to equivalent ppm (parts per million) uranium, thorium and percent potassium. The conversion factors are the sensitivities derived from the Lake Mead Dynamic Test Range data at 400 feet mean terrain clearance.

<u>Radioelement</u>	<u>Equivalent Percent/ppm</u>	<u>Queen Air Counts/Second</u>
K	1%K	91.5
U	1 ppmeu	10.4
T	1 ppmeT	6.4

DATA PRESENTATION

MAGNETIC DATA REDUCTION

The magnetic data reduction processes are: correction for diurnal variation, tying to a common magnetic datum, and subtraction of the regional magnetic field as defined by the International Geomagnetic Reference Field (IGRF). During data acquisition, the magnetic field is monitored by a ground-based diurnal magnetometer that samples every four seconds at a sensitivity of one-quarter gamma. These data are recorded on magnetic tape along with the time for synchronization with the airborne data.

The diurnal data are edited to keep only samples taken during flight time and remove spikes and man-made magnetic events. After editing, these data are displayed in profile form to ensure that all corrections necessary have been made. Next, the data are synchronized in time with the airborne data, interpolated, and subtracted from the airborne magnetic data.

The diurnally corrected magnetic data are then processed by a tying program that compares the magnetic differences at intersections of flight lines and tie lines. This program calculates individual magnetic field biases for each flight tie line based on tie line intersections. This allows miss-ties to be minimized throughout the survey. These biases usually represent, after diurnal correction, systematic magnetic changes caused by such things as heading error, changes in location of the ground-based magnetometer, or changes in the airborne equipment. The biases are manually evaluated and selectively applied.

General

The majority of the data products are presented in this report. These include the uranium anomaly/interpretation maps and pseudo-contour maps of potassium, uranium, thorium, and magnetic data which are integrated as part of the text in the interpretation section. In addition to these data, this report contains data presented in the form of radiometric profiles, flight path recovery maps, standard deviation maps, and histograms. Microfiche data are contained in the back cover of each report. Data tapes are available separately.

Radiometric Profiles

Stacked profiles were prepared from the averaged data for each traverse and tie line. These stacked profiles, plotted at a linear scale of 1:250,000, contain the following parameters: corrected Total Count, percent potassium, equivalent ppm uranium, equivalent ppm thorium, eU/eT, eU/%K, and eT/%K ratios, equivalent ppm Bi Air, radar altimeter, and magnetometer data. Each of the stacked profile sheets contains a plot of the flight path superimposed on a geologic strip map. Included along these profiles are the fiducial numbers which correspond to flight path position as displayed on the flight path recovery maps. Each of the stacked profiles represents the data contained on the specific flight line within the boundaries of the specified NTMS Quadrangle sheet.

Radiometric traces on the stacked profiles contain an indicator showing those data which are statistically inadequate. These statistically inadequate data are marked by a small vertical tick at the sample location. The altitude profile has been limited in display to 1,000 feet. A dashed line at the 700 foot level is presented to show those data which do not meet the altitude specifications. The vertical scale of each variable remains constant on all stacked profiles. When overranging occurs, the trace is stepped and the step labeled showing the actual value. A pictorial representation of such a stepping profile is shown in Figure VIII. At the end of each stacked profile, a statistical summary of the minimum value, maximum value, mean, and standard deviation for that variable is presented.

This report contains an equivalent set of stacked profiles for each quadrangle, photographically reduced to an approximate scale of 1:500,000.

MAGNETIC PROFILES

A set of profiles containing the magnetic data (corrected, with IGRF removed), barometric altimeter data, radar altimeter data, diurnal monitor data, and temperature data are available at a linear scale of 1:250,000. Each of the stacked profiles contains a plot of the flight path superimposed on the geology over which the aircraft flew. Reduced scale (1:500,000) copies of these are presented in of this report.

FIGURE VIII Plotter Step Value Labeling

FLIGHT PATH MAPS

For each of the NTMS quadrangle sheets covered by this survey, a flight path position map is available at a scale of 1:250,000. The actual flight path has been superimposed on the geologic quadrangle maps. Flight lines and tie lines are annotated along with fiducial numbers of located positions. Reduced scale (1:500,000) copies of these can be found in this report.

STANDARD DEVIATION MAPS

Gamma ray standard deviation maps have been prepared for each NTMS quadrangle included in this survey. The six maps generated represent the following parameters: percent potassium, equivalent ppm uranium, equivalent ppm thorium, and eU/eT, eU/%K and eT/%K ratios. The data contained in each map represent only those data which are considered statistically adequate. This automatically excludes all data collected over water or data which falls outside of altitude specifications (i.e. altitude greater than 700 and less than 200 feet). The symbolism of each of the six maps is identical. The center of each circle represents the central averaged sample since the data had been averaged over a 7 second interval. The small boxes adjacent to each of the circles represents one standard deviation from the mean for that specific data sample. In order to determine whether the data shown are represented by positive or negative standard deviations, consider each map with north pointing away from the viewer. For east/west lines (traverse lines) positive standard deviations lie above or to the north of the traverse line with negative standard deviation below or to the south. On the north/south lines (tie lines) positive standard deviations are to the left of the viewer (west) with negative standard deviations to the right (east).

These maps were generated at a scale of 1:250,000 for each NTMS sheet and in addition, are presented in each report at a reduced scale of approximately 1:500,000.

HISTOGRAMS

Computer generated histograms, showing the equivalent ppm and percent distributions for the three gamma ray emitters and their ratios measured and calculated as a function of computer map unit are presented in this report (See Figure IX). Information contained on these histograms includes the standard deviation as calculated about the arithmetic mean (or median), and the total number of samples from which the statistics were derived.

FIGURE IX Sample Computer Map Unit Histogram

DATA LISTINGS

Single record reduced and averaged record (statistical analysis) data listings have been prepared on microfiche. The microfiche are contained in each report. Each of the single record and averaged record data listings are presented for the data contained in a single quadrangle. The data contained in the single record data listings are summarized below:

1. Fiducial number
2. System/Quality (SAKUT) - The first digit identifies the system used to collect the sample. The remaining digits define the results of statistical adequacy testing for altitude, potassium, uranium, and thorium. A value of 0 indicated that the data are statistically adequate. A value of 1 indicates that the data are statistically inadequate. All data collected in excess of 700 feet and less than 200 feet are considered statistically inadequate.
3. Time - time presented in hours, minutes, and seconds
4. Altitude - altitude presented in feet above terrain
5. LAT/LONG - Latitude and Longitude presented in terms of decimal degrees
6. Magnetic field expressed in residual gammas
7. Geology - code representing geologic units
8. %K, eU, eT - percent potassium, equivalent ppm of uranium and thorium
9. eU/eTH, eU/%K, eTH/%K - calculated ratios of the three parameters
10. Total count - corrected total count data (0.4 to 3.0 MeV)
11. COS - downward looking cosmic count rate in the 3-6 MeV channel
12. Uair - atmospheric Bi-214 equivalent ppm
13. Temperature - outside air temperature in degrees centigrade
14. Press - barometric pressure in mm of mercury

The averaged record (statistical analysis) data listings are summarized below:

1. Fiducial number
2. System/Quality (SAKUT) - The first digit identifies the system used to collect the sample. The remaining digits define the results of statistical adequacy testing for altitude, potassium, uranium, and thorium. A value of 0 indicated that the data are statistically adequate. A value of 1 indicates that the data are statistically inadequate. All data collected in excess of 700 feet and less than 200 feet are considered statistically inadequate.
3. LAT/LONG - Latitude and longitude presented in terms of decimal degrees
4. Magnetic field expressed in residual gammas
5. Geology - code representing geologic formations
6. %K, eU, eT - percent potassium, equivalent ppm of uranium and thorium data and the number of (+) standard deviations from the mean
7. eU/eTh, eU/%K, eTh/%K - calculated ratios of the three parameters, and the number of (+) standard deviations from the mean
8. Total count - corrected total count data (0.4 to 3.0 MeV)
9. COS - downward looking cosmic count rate in the 3-6 MeV channel
10. Uair - atmospheric Bi-214 in equivalent ppm

DATA TAPES

Data tape files have been generated for each of the 1:250,000 NTMS quadrangle sheets. The tapes are IBM compatible and recorded on 9 track EBCDIC at 800 bpi. Five separate types of data tapes are presented: raw spectral data tapes, single record reduced data tapes, statistical analysis tapes, magnetic data tapes and a statistical analysis summary tape. Detailed descriptions of the data tape formats follow this discussion.

DATA INTERPRETATION METHODS

General

The stated objective of the NURE Program is the evaluation of the uranium potential of the United States. In support of this goal, high sensitivity airborne radiometric and magnetic surveys have been implemented to obtain reconnaissance information pertaining to regional distribution of uraniferous materials. Within this context, data interpretation has been oriented toward regional detection and description of anomalously high concentrations of uranium.

By far the most significant natural sources of gamma radiation in the geologic environment are the radioactive decay series of potassium 40 (K40), thorium 232 (Th232) and uranium 238 (U238) of which 0.7% is uranium 235. Potassium 40 is the largest contributor to natural radioactivity, accounting for nearly 98%, as it is the most abundant gamma ray emitter-.012% of all potassium in nature. (Refer to GSA Memoir 97 for abundances of uranium, thorium, and potassium).

Potassium 40 is directly identified by the airborne spectrometer from a single clear peak at 1.46 mev (million electron volts) in its gamma ray spectrum. However, thorium 232 and uranium 238 do not have any clear, distinct peaks at sufficiently high energies to allow direct detection from airborne systems. Instead, daughter products which do have distinct peaks are measured as representing the abundance of the parent element. For thorium 232, the daughter nuclide thallium 208 (Tl208) has a distinct peak at 2.62 mev while uranium 238 has a daughter, bismuth 214 (Bi214) possessing a clear peak at 1.76 mev (see Figure 7 for a composite decay series spectrum). Consequently the fundamental assumption implicit to airborne uranium and thorium measurements is that the measured daughter products are in radioactive equilibrium - the number of atoms of disintegrating daughter nuclides are equal to the number being formed (see Adams and Gasparini, 1970).

An airborne gamma ray measurement is the sum of photons counted during a specified time interval from a multitude of gamma ray sources which include the three geologic emitters that are being sought plus other interfering sources. These others include, but are not limited to higher energy cosmic rays, aircraft and instruments, contributions from overlapping decay series and airborne radon 222. (See Burson, 1974 and McSharry, 1973 for a more complete discussion of airborne radiometric measurements, and Radiometric Data Reduction in this volume for a complete description of data correction procedures).

When correlating ground data (geochemical, geological, etc.) with the corrected data derived from raw airborne measurements, the interpreter must remember what an individual airborne gamma ray sample physically measures. First, the terrestrial component of the gamma radiation measured by the airborne detector emanated primarily from the upper 18 inches of material on the earth's surface (Gregory and

Horwood, 1963). The airborne measurement cannot "see" any deeper into the underlying rock material and is essentially a measurement of the soil's or exposed (weathered) rock's radioactivity. Secondly, since each airborne sample is an accumulation of gamma rays measured on a moving platform over a fixed period of time, the individual sample represents a large areal extent of surficial material. For this survey, with specifications of 400 feet mean terrain clearance and an average ground speed of 140 miles per hour, a one second sample corresponds to an oval approximately 750 feet long by 600 feet wide (assuming an infinite, uniformly distributed source). Accordingly, averaged samples represent tremendous volumes of surficial materials.

Methodology

As described previously, the gamma ray data were located by computer map units, histograms were produced and statistical analyses performed. The basic unit for interpretation then is the averaged sample and its attendant deviations about a particular map unit's mean.

The uranium anomaly/interpretation map displays each individual averaged sample that meets the following criteria:

1. The averaged uranium sample must be greater than or equal to 1 standard deviation above its map unit mean.
2. The sample must have a U/T ratio greater than or equal to 1 standard deviation above its unit mean.
3. Each U/T ratio defined in (2) must have a corresponding thorium value lying at least greater than minus one (-1) standard deviation below the mean. If the thorium sample is less than one standard deviation below the mean, the U/T ratio is considered questionable.

All the possible anomalies displayed on the map are then examined for clusters, trends, and comparisons with all other available data.

Minimum requirements in the subsequent interpretation discussions of each quadrangle for anomalies listed in the uranium anomaly summary are defined as follows:

Two (2) consecutive averaged U samples lying two or more standard deviations above the mean or three (3) consecutive averaged U samples, two of which are one (1) or more standard deviations and the third of which is two (2) or more standard deviations above the mean.

Statistical anomalies which meet the above criteria can result from several factors or circumstances including: (1) true concentration of uraniferous minerals, (2) differential surface cover (soils and/or

vegetation) within a lithologic unit, (3) local weather conditions such as rain and snow, (4) extreme facies variation within a mapped unit, and (5) differential weathering of rocks within mapped units. Obviously an averaged sample which lies on the boundary between two map units is not truly reflecting either one, but is rather an average of both. Thus, for two markedly different units, such a sample would be anomalous relative to one of the units and not be a true indication of radioactive differences within the unit.

The percent potassium, equivalent ppm thorium and uranium, the three ratios and residual magnetic data were plotted as separate pseudo-contour maps and overlain on the geologic base map and standard deviation maps. Regional trends of each variable and average values could thus be easily and quickly determined and compared with the associated geological, magnetic, and statistical trends. Only the long wavelengths within each variable would show any line-to-line continuity on the pseudo-contour maps and thus, only regional trends will appear.

Each quadrangle's stacked profiles were also overlain on the corresponding geologic and standard deviation maps and anomaly map to further delineate trends and to allow a more detailed analysis of individual anomalies. Since the interpretation was concentrated on detection of anomalous uranium, subtle trends present in the potassium and thorium channels and ratios were only examined in a cursory manner. Even during such a brief examination of the profiles, it was evident that the spectrometer system was highly sensitive to changes in surface materials even in areas of low counting rates such as glacial drift. Thus radiometrics have a real potential for performing general surficial mapping "geochemical analysis" on a geologic unit (or soils) basis in addition to merely radioactive mineral "anomaly hunting".

TAPE FORMATS

SINGLE RECORD REDUCED DATA TAPE

REFERENCE: Paragraphs 4.7.6 and 6.1.6, BFEC 1200-C

The Single Record Tape is an unlabeled, nine track, 800 BPI, NRZI. All data are recorded as EBCDIC characters. Each tape contains but one file of format, header, data, and trailer records for no more than one quadrangle. The tape is divided into 6900-character blocks containing the following information.

Block 1 - Format Data

This block contains 6768 characters in 94 consecutive lines of 72 characters containing the following literal description.

02 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)

SINGLE RECORD REDUCED DATA TAPE

FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)

ITEM	FORMAT	DESCRIPTION
1.	A40	QUADRANGLE NAME AS PROJECT IDENTIFICATION
2.	A20	NAME OF SUBCONTRACTOR
3.	I4	APPROXIMATE DATE OF SURVEY (MONTH, YEAR)
4.	I1	NUMBER OF AERIAL SYSTEMS USED TO COLLECT DATA FOR THIS QUADRANGLE
5.	I1	AERIAL SYSTEM IDENTIFICATION CODE FOR FIRST SYSTEM
6.	A20	AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER FOR FIRST SYSTEM
7.	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE IN CPS PER PERCENT K
8.	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL URANIUM (BI-214) TO ONE DECIMAL PLACE IN CPS PER PPM EQUIVALENT U
9.	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE IN CPS PER PPM EQUIVALENT TH

ITEM	FORMAT	DESCRIPTION
13	I3	NUMBER OF CHANNELS (0-3 MEV) IN 4PI SYSTEM FOR FIRST AERIAL SYSTEM
14	I3	NUMBER OF CHANNELS (0-3 MEV) IN 2PI SYSTEM FOR FIRST AERIAL SYSTEM
15-24	(SAME)	REPEAT OF ITEMS 5-14 FOR SECOND AERIAL SYSTEM
*	*	*
*	*	*
*	*	*
85-94	(SAME)	REPEAT OF ITEMS 5-14 FOR NINTH AERIAL SYSTEM
95	I3	NUMBER OF FLIGHT LINES ON THIS TAPE
96	I4	FIRST FLIGHT LINE NUMBER ON THIS TAPE
97	I6	FIRST RECORD NUMBER OF FIRST FLIGHT LINE
98	I3	JULIAN DATE (DAY OF YEAR) FIRST FLIGHT-LINE DATA WAS COLLECTED
99-101	I4,I6,I3	REPEAT OF ITEMS 96-98 FOR SECOND FLIGHT LINE ON THIS TAPE
*	*	*
*	*	*
*	*	*
390-392	I4,I6,I3	REPEAT OF ITEMS 96-98 FOR 99th FLIGHT LINE ON THIS TAPE

FORMAT FOR SINGLE RECORD REDUCED DATA RECORD (THIRD THRU LAST BLOCK)

ITEM	FORMAT	DESCRIPTION
1	I1	AERIAL SYSTEM IDENTIFICATION CODE
2	I4	FLIGHT LINE NUMBER
3	I6	RECORD IDENTIFICATION NUMBER
4	I6	GMT TIME OF DAY (HHMMSS)
5	F8.4	LATITUDE TO FOUR DECIMAL PLACES IN DEGREES
6	F8.4	LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES
7	F6.1	TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS
8	F7.1	RESIDUAL (IGRF REMOVED) MAGNETIC FIELD INTENSITY TO ONE DECIMAL PLACE IN GAMMAS
9	A8	SURFACE GEOLOGIC MAP UNIT CODE
10	I4	QUALITY FLAG CODES
11	F6.1	APPARENT CONCENTRATION OF TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
14	F4.1	UNCERTAINTY IN TERRESTRIAL URANIUM TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
15	F6.1	APPARENT CONCENTRATION OF TERRESTRIAL THORIUM (TL 208) TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
16	F4.1	UNCERTAINTY IN TERRESTRIAL THORIUM TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
17	F6.1	URANIUM-TO-THORIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
18	F6.1	URANIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PERCENT K
19	F5.1	THORIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH PER PERCENT K

ITEM	FORMAT	DESCRIPTION
20	F8.1	GROSS GAMMA (0.4-3.0 MEV) COUNT RATE TO ONE DECIMAL PLACE IN COUNTS PER SECOND
21	F6.1	UNCERTAINTY IN GROSS GAMMA COUNT RATE TO ONE DECIMAL PLACE IN COUNTS PER SECOND
22	F5.1	ATMOSPHERIC BI-214 4PI CORRECTION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
23	F4.1	UNCERTAINTY IN ATMOSPHERIC BI-214 4PI CORRECTION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
24	F4.1	OUTSIDE AIR TEMPERATURE TO ONE DECIMAL PLACE IN DEGREES CELSIUS
25	F5.1	OUTSIDE AIR PRESSURE TO ONE DECIMAL PLACE IN MMHG

This description serves to identify the format of data on subsequent blocks on the tape. The remaining 132 characters on this block are blanks.

Block 2 - Single Record Reduced Identification Data

The second block contains the identifier information for the data contained in subsequent blocks. The identification information is written according to the format description in the first half of the first block. The remaining 4978 characters on this block are blanks.

Block 3 - Single Record Reduced Data

These blocks contain data written according to the format description in the second half of the first block. There will be 50 logical records per physical block. As of August 1979, the method for determining uncertainties specified in the data blocks remains undefined, and those values are filled with 9's under format control.

STATISTICAL ANALYSIS TAPE

REFERENCE: Paragraphs 4.7.7 and 6.1.6, BFEC 1200-C

The statistical analysis data tape is an unlabeled, nine track, 800 BPI, NRZI. All data is recorded as EBCDIC characters. The block length is 8000 characters long. Each tape contains one file of data for no more than one quadrangle.

Block 1 - Format Description Data

The first physical block on this tape contains a format description for data on subsequent blocks. The first 7560 characters on this block contains 105 lines of 72 characters exactly as written below:

03 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)

STATISTICAL ANALYSIS DATA TAPE

FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)

ITEM	FORMAT	DESCRIPTION
1	A40	QUADRANGLE NAME AS PROJECT IDENTIFICATION
2	A20	NAME OF SUBCONTRACTOR
3	I4	APPROXIMATE DATE OF SURVEY (MONTH, YEAR)
4	I1	NUMBER OF AERIAL SYSTEMS USED TO COLLECT DATA FOR THIS QUADRANGLE
5	I1	AERIAL SYSTEM IDENTIFICATION CODE FOR FIRST SYSTEM
6	A20	AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER FOR FIRST SYSTEM
7	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE IN CPS PER PERCENT K
8	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL URANIUM (BI-214) TO ONE DECIMAL PLACE IN CPS PER PPM EQUIVALENT U
9	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE IN CPS PER PPM EQUIVALENT TH
10	I6	BLANK FIELD (99999)
11	F6.3	4PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL PLACES IN SECONDS FOR FIRST SYSTEM
12	F6.3	2PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL PLACES IN SECONDS FOR FIRST SYSTEM
13	I3	NUMBER OF CHANNELS (0-3 MEV) IN 4PI SYSTEM FOR FIRST AERIAL SYSTEM
14	I3	NUMBER OF CHANNELS (0-3 MEV) IN 2PI SYSTEM FOR FIRST AERIAL SYSTEM

ITEM	FORMAT	DESCRIPTION
15-24	(SAME)	REPEAT OF ITEMS 5-14 FOR SECOND AERIAL SYSTEM
*	*	*
*	*	*
*	*	*
85-94	(SAME)	REPEAT OF ITEMS 5-14 FOR NINTH AERIAL SYSTEM
95	I3	NUMBER OF FLIGHT LINES ON THIS TAPE
96	I4	FIRST FLIGHT LINE NUMBER ON THIS TAPE
97	I6	FIRST RECORD NUMBER OF FIRST FLIGHT LINE
98	I3	JULIAN DATE (DAY OF YEAR) FIRST FLIGHT-LINE DATA WAS COLLECTED
99-101	I4,I6,I3	REPEAT OF ITEMS 96-98 FOR SECOND FLIGHT LINE ON THIS TAPE
*	*	*
*	*	*
*	*	*
390-392	I4,I6,I3	REPEAT OF ITEMS 96-98 FOR 99th FLIGHT LINE ON THIS TAPE

FORMAT FOR STATISTICAL ANALYSIS DATA RECORD (THIRD THRU LAST BLOCK)

ITEM	FORMAT	DESCRIPTION
1	I1	AERIAL SYSTEM IDENTIFICATION CODE
2	I4	FLIGHT LINE NUMBER
3	I6	RECORD IDENTIFICATION NUMBER
4	I6	GMT TIME OF DAY (HHMMSS)
5	F8.4	LATITUDE TO FOUR DECIMAL PLACES IN DEGREES
6	F8.4	LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES
7	F6.1	TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS
8	F7.1	RESIDUAL (IGRF Removed) MAGNETIC FIELD INTENSITY TO ONE DECIMAL PLACE IN GAMMAS
9	A8	SURFACE GEOLOGIC MAP UNIT CODE
10	I4	QUALITY FLAG CODES
11	F6.1	APPARENT CONCENTRATION OF TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE IN PERCENT K
12	F4.1	UNCERTAINTY IN TERRESTRIAL POTASSIUM TO ONE DECIMAL PLACE IN PERCENT K
13	F5.1	POTASSIUM STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED
14	F6.1	AVERAGED CONCENTRATION OF TERRESTRIAL URANIUM (BI-214) TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
15	F4.1	UNCERTAINTY IN TERRESTRIAL URANIUM TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
16	F5.1	URANIUM STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED
17	F6.1	AVERAGED CONCENTRATION OF TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
18	F4.1	UNCERTAINTY IN TERRESTRIAL THORIUM TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
19	F5.1	THORIUM STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRIACALLY SIGNED.

ITEM	FORMAT	DESCRIPTION
20	F8.1	GROSS GAMMA (0.4-3.0 MEV) COUNT RATE TO ONE DECIMAL PLACE IN COUNTS PER SECOND
21	F6.1	UNCERTAINTY IN GROSS GAMMA COUNT RATE TO ONE DECIMAL PLACE IN COUNTS PER SECOND
22	F5.1	ATMOSPHERIC BI-214 4PI CORRECTION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
23	F4.1	UNCERTAINTY IN ATMOSPHERIC BI-214 4PI CORRECTION TO ONE DEICMAL PLACE IN PPM EQUIVALENT U
24	F4.1	AVERAGED URANIUM-TO-THORIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
25	F5.1	URANIUM-TO-THORIUM RATIO STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED
26	F6.1	AVERAGED URANIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PERCENT K
27	F5.1	THORIUM-TO-POTASSIUM RATIO STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED
D8	F6.1	AVERAGED THORIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH PER PERCENT K
29	F5.1	THORIUM-TO-POTASSIUM RATIO STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED

The remaining 440 characters in this block are blanks.

Block 2 - Statistical Analysis Identification Data

The second block contains the identifier information for the data contained in subsequent blocks according to the format specification in the first part of Block 1. The final 6078 characters on this block are blanks.

Block 3 - Statistical Analysis Data

Ihe third and subsequent blocks contain statistical analysis data in the format specified by the second part of the Block 1. Fifty logical records are allowed per block. The method for determining uncertainty values shown, as of August 1979, remains undefined. These values are filled with 9's under format control.

MAGNETIC DATA TAPE

REFERENCE: Paragraphs 4.7.8 and 6.1.6, BFEC 1200-C

The Magentic Data Tape is an unlabeled, nine track, 800 BPI, NRZI. All data are recorded as EBCDIC characters. Each tape contains data for no more than one quadrangle and are divided into 8000-character blocks as described below.

Block 1 - Tape Format Description

The first block contains 3384 characters of format information in exactly the following format:

04 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)

MAGNETIC DATA TAPE

FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)

ITEM	FORMAT	DESCRIPTION
1	A40	QUADRANGLE NAME AS PROJECT IDENTIFICATION
2	A20	NAME OF SUBCONTRACTOR
3	I4	APPROXIMATE DATE OF SURVEY (MONTH., YEAR
4	I3	NUMBER OF FLIGHT LINES ON THIS TAPE
5	I4	FIRST FLIGHT LINE ON THIS TAPE
6	I6	FIRST RECORD NUMBER OF FIRST FLIGHT LINE
7	I3	JULIAN DATE (DAY OF YEAR) FIRST FLIGHT-LINE DATA WAS COLLECTED
8	F8.4	LATITUDE OF GROUND BASE STATION TO FOUR DECIMAL PLACES IN DEGREES FOR FIRST FLIGHT LINE
9	F8.4	LONGITUDE OF GROUND BASE STATION TO FOUR DECIMAL PLACES IN DEGREES FOR FIRST FLIGHT LINE
10-14	(SAME)	REPEAT OF ITEMS 5-9 FOR SECOND FLIGHT LINE ON THIS TAPE
*	*	*
*	*	*
*	*	*
495-499	(SAME)	REPEAT OF ITEMS 5-9 FOR 99th FLIGHT LINE ON THIS TAPE

FORMAT FOR MAGNETIC DATA RECORD (THIRD THRU LAST BLOCK)

ITEM	FORMAT	DESCRIPTION
1	I1	AERIAL SYSTEM IDENTIFICATION CODE
2	I4	FLIGHT LINE NUMBER
3	I6	RECORD IDENTIFICATION NUMBER
4	I6	GMT TIME OF DAY (HHMMSS)
5	F8.4	LATITUDE TO FOUR DECIMAL PLACES IN DEGREES

ITEM	FORMAT	DESCRIPTION
6	F8.4	LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES
7	F6.1	TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS
8	F5.1	OUTSIDE AIR PRESSURE TO ONE DECIMAL PLACE IN MMHG
9	A8	SURFACE GEOLOGIC MAP UNIT CODE
10	F7.1	TOTAL MAGNETIC FIELD INTENSITY TO ONE DECIMAL PLACE IN GAMMAS
11	F7.1	RESIDUAL (IGRF REMOVED) MAGNETIC FIELD INTENSITY TO ONE DECIMAL PLACE IN GAMMAS
12	F7.1	DIURNAL MAGNETIC INTENSITY VARIATION TO ONE DECIMAL PLACE IN GAMMAS
13	F7.1	MAGNETIC DEPTH-TO-BASEMENT TO ONE DECIMAL PLACE IN METERS (IF REQUIRED)

The remaining 4616 characters in this block are blanks.

Block 2 - Magnetic Tape Identification Data

This block contains information about the data in subsequent blocks organized according to the format specification in the first half of Block 1.

Block 3 - Magnetic Data

This block and subsequent block contains magnetic data for the quadrangle organized according to the format specifications in the second half of Block 1. There will be 100 logical records per physical block.

STATISTIC ANALYSIS SUMMARY TAPE

REFERENCE: Paragraphs 4.7.9, BFEC 1200-C

The statistical analysis summary tape is an unlabeled, nine track, 800 BPI, NRZI. All data is recorded as EBCDIC characters. The block length is 700 characters long. Each tape contains one file of data for no more than one quadrangle.

Block 1 - Format Description Data

The first physical block on this tape contains a format description for data on subsequent blocks. The first 4320 characters on this block contains 60 lines of 72 characters exactly as written below:

05 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODE)

STATISTICAL ANALYSIS SUMMARY TAPE (OR FILE)

FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)

ITEM	FORMAT	DESCRIPTION
1	A40	QUADRANGLE NAME AS PROJECT IDENTIFICATION
2	A20	NAME OF SUBCONTRACTOR
3	I4	APPROXIMATE DATE OF SURVEY (MONTH, YEAR)
4	I6	NUMBER OF GEOLOGIC MAP UNITS USED FOR THIS QUADRANGLE

FORMAT FOR STATISTICAL ANALYSIS SUMMARY DATA RECORD (THIRD THRU LAST BLOCK)

ITEM	FORMAT	DESCRIPTION
1	A8	SURFACE GEOLOGIC MAP UNIT IDENTIFYING CODE
2	I6	TOTAL RECORDS FOR GEOLOGIC MAP UNIT
3	I6	NUMBER OF POTASSIUM RECORDS COMPUTED FOR GEOLOGIC UNIT
4	F6.1	POTASSIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PERCENT K
5	F6.1	POTASSIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PERCENT K
6	A3	POTASSIUM CONCENTRATION DISTRIBUTION CODE
7	I6	NUMBER OF URANIUM RECORDS COMPUTED FOR GEOLOGIC UNIT
8	F6.1	URANIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
9	F6.1	URANIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
10	A3	URANIUM CONCENTRATION DISTRIBUTION CODE
11	I6	NUMBER OF THORIUM RECORDS COMPUTED FOR GEOLOGIC UNIT
12	F6.1	THORIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
13	F6.1	THORIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
14	A3	THORIUM CONCENTRATION DISTRIBUTION CODE
15	I6	NUMBER OF URANIUM-TO-THORIUM RATIO RECORDS COMPUTED FOR GEOLOGIC UNIT

16	F6.1	URANIUM-TO-THORIUM RATIO MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT U PER PPM EQUIVALENT TH
17	F6.1	URANIUM-TO-THORIUM RATIO STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
18	A3	URANIUM-TO-THORIUM RATIO DISTRIBUTION CODE
19	I6	NUMBER OF URANIUM-TO-POTASSIUM RATIO RECORDS COMPUTED FOR GEOLOGIC UNIT
20	F6.1	URANIUM -TO-POTASSIUM RATIO MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PERCENT K
21	F6.1	URANIUM-TO-POTASSIUM RATIO STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PERCENT K
22	A3	URANIUM-TO-POTASSIUM RATIO DISTRIBUTION CODE
23	I6	NUMBER OF THORIUM-TO-POTASSIUM RATIO RECORDS COMPUTED FOR GEOLOGIC UNIT
24	F6.1	THORIUM-TO-POTASSIUM RATIO MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH PER PERCENT K
25	F6.1	THORIUM-TO-POTASSIUM RATIO STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH PER PERCENT K
26	A3	THORIUM-TO-POTASSIUM RATIO DISTRIBUTION CODE

The remaining 2680 characters on this block shall be blanks.

Block 2 - Statistical Analysis Identification Data

The second block contains the identifier information for the data contained in subsequent blocks according to the format specification in the first part of Block 1. The final 6930 characters on this block are blanks.

Block 3 - Statistical Analysis Summary Data

The third and subsequent blocks contain statistical analysis data in the format specified by the second part of the Block 1. Fifty logical records are allowed per block.

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APPENDIX B - Flight Summary

APPENDIX B

DAILY PRODUCTION SUMMARY - JULY, 1980

NASHVILLE, COLUMBIA, BLYTHEVILLE, AND TUPELO QUADRANGLES

QUEEN AIR N9AG

7-16-80	Set up Base - Jackson, Tennessee
7-17-80	904 miles Blytheville, Columbia
7-18-80	666 miles Nashville
7-19-80	822 miles Blytheville, Tupelo
7-20-80	804 miles Columbia, Nashville
7-21 to 7-22-80	Nil production - weather
7-23-80	904 miles Blytheville, Columbia
7-24-80	898 miles Blytheville, Columbia, Nashville
7-25-80	764 miles Blytheville, Tupelo
7-26-80	684 miles Tupelo
7-27-80	883 miles Nashville, Blytheville, Columbia, Tupelo

Total for the above period - 7,329 miles as recorded by the flight crew.

Total miles for the included quadrangles:

Nashville	1,812
Columbia	1,834
Blytheville	1,834
Tupelo	1,849

APPENDIX C - Flight Path and Geologic Map

TUPELO

FLIGHT LINE SPACING 8.0 MILES
FLIGHT ALTITUDE 400 FEET AMT
FLOW AND LUMPED 1980

LOCATION DIAGRAM

MISSOURI NI 1512	KENTUCKY NI 1611 NI 1612
ARKANSAS NI 1513 NI 1514 NI 1515	TENNESSEE NI 1613 NI 1614 NI 1615
MISSISSIPPI NI 1516 NI 1517 NI 1518 NI 1519 NI 1520	ALABAMA NI 1616 NI 1617 NI 1618 NI 1619 NI 1620
LOUISIANA NI 1521 NI 1522 NI 1523 NI 1524 NI 1525	MISSISSIPPI NI 1621 NI 1622 NI 1623 NI 1624 NI 1625

FLIGHT PATH RECOVERY

MISSISSIPPI / FLORIDA PROJECT

U. S. DEPARTMENT OF ENERGY

SURVEY AND
COMPILED BY:

EG&G GEOMETRICS

GEOLOGIC MAP EXPLANATION
TUPELO QUADRANGLE
(from Martel Laboratories, 1980)

ERA	SEDIMENTARY ROCKS		EPOCH	PERIOD	
CENOZOIC	Qal	ALLUVIUM: HOLOCENE ALLUVIAL DEPOSITS	HOLOCENE	QUATERNARY	
	Qt	PLEISTOCENE TERRACE DEPOSITS, UNDIFFERENTIATED			PLEISTOCENE
	Qs	LOESS: YELLOWISH-BROWN MASSIVE SILT BED			
	Tek	KOSCIUSKO FORMATION: IRREGULARLY BEDDED SAND, CLAY AND QUARTZITE	TERTIARY		
	Tezw	ZILPHA AND WINONA FORMATIONS, UNDIFFERENTIATED: ZILPHA FORMATION (CHOCOLATE-COLORED CLAY WITH SOME GLAUCONITIC CLAY); WINONA FORMATION (HIGHLY GLAUCONITIC, SLIGHTLY CLAYEY, FINE SAND)		EOCENE	
	Tet	TALLAHATA FORMATION AND NESHOBVA SAND, UNDIFFERENTIATED: TALLAHATA FORMATION (MOSTLY SAND, CLAY AND CLAYSTONE); NESHOBVA SAND (GLAUCONITIC COARSE SAND)			
	Tew	WILCOX FORMATION: IRREGULARLY BEDDED FINE TO COARSE SAND, LIGNITIC CLAY, AND LIGNITE		PALEOCENE	
	Tpan	NAHEOLA FORMATION: MICACEOUS FINE TO COARSE-GRAINED SAND, KAOLIN AND BAUXITIC CLAY			
	Tpap	PORTERS CREEK FORMATION: DARK GRAY CLAY			
	Tpac	CLAYTON FORMATION: UPPER MEMBER (GREENISH-GRAY, COARSELY GLAUCONITIC, SANDY CLAY, AND MARL); LOWER MEMBER (CRYSTALLINE SANDY LIMESTONE AND LOOSE SAND)			
MESOZOIC	Kp	PRAIRIE BLUFF CHALK AND OWL CREEK FORMATION, UNDIFFERENTIATED: PRAIRIE BLUFF CHALK (CHALK, SANDY CHALK, AND CALCAREOUS CLAY); OWL CREEK FORMATION (BLUE GLAUCONITIC SANDY CLAY)	CRETACEOUS		
	Kr	RIPLEY FORMATION, UNDIFFERENTIATED: GRAY TO GREENISH-GRAY, GLAUCONITIC FINE SAND, CLAY AND SANDY LIMESTONE			
	Krm	RIPLEY FORMATION – MCNAIRY SAND MEMBER: RED AND WHITE CROSS-BEDDED, MICACEOUS SAND, AND WHITE SANDY CLAY			
	Kd	DEMOPOLIS CHALK: CHALK AND MARLY CHALK			
	Km	MOOREVILLE CHALK, UNDIFFERENTIATED: MARLY CHALK AND CALCAREOUS CLAY			
	Kc	COFFEE SAND: LIGHT-GRAY, CROSS-BEDDED TO MASSIVE, GLAUCONITIC SAND, SANDY CLAY, AND CALCAREOUS SANDSTONE			
	Ke	EUTAW FORMATION, UNDIFFERENTIATED: GLAUCONITIC SAND AND CLAY			
	Ket	EUTAW FORMATION – TOMBIGBEE SAND MEMBER: GLAUCONITIC FINE SAND			
	Kt	TUSCALOOSA FORMATION: IRREGULARLY BEDDED SAND, CLAY AND GRAVEL			
	PALEOZOIC	Mc		CHESTER GROUP: SANDSTONE, SHALE AND LIMESTONE	MISSISSIPPIAN
M		MISSISSIPPIAN SEDIMENTARY ROCKS, UNDIFFERENTIATED: MOSTLY LIMESTONE, CHERT AND SHALE			
Mp		POTTSVILLE FORMATION: SHALE AND SANDSTONE WITH COAL BEDS			
Mb		BANGOR LIMESTONE: BLUE, COARSELY CRYSTALLINE OR OOLITIC LIMESTONE			
Mgs		GASPER FORMATION, BETHEL SANDSTONE AND ST. GENEVIEVE LIMESTONE: GASPER FORMATION (OOLITIC LIMESTONE AND MARL); BETHEL SANDSTONE (SHALY SANDSTONE); BETHEL SANDSTONE (SHALY SANDSTONE); ST. GENEVIEVE LIMESTONE (MOSTLY LIGHT GRAY OOLITIC LIMESTONE, WITH SOME MARL)			
Mfs		FLOYD SHALE: MOSTLY BLACK OR GREEN SHALE			

APPENDIX D - Profiles

LINE 820
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80201

LINE 830
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80201

LINE 840
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80201

LINE 850
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80201

BARO PRESSURE
MM HG
MIN 724.0
MAX 746.0
MEAN 733.3
STD DEV 2.383

AIR TEMPERATURE
DEG C
MIN 31.00
MAX 33.00
MEAN 31.68
STD DEV 2.889

RESIDUAL MAG
GAMMAS
MIN -508.3
MAX -527.3
MEAN -527.3
STD DEV 168.6

DIURNAL
GAMMAS
MIN 5400.7
MAX 5401.2
MEAN 5400.9
STD DEV 0.5

RADAR ALTMTR
FEET
MIN 260.2
MAX 290.8
MEAN 290.8
STD DEV 38.66

LINE 860
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80201

LINE 870
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80201

LINE 880
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80208

BARO PRESSURE
MM HG
MIN 724.2
MAX 747.6
MEAN 732.6
STD DEV 2.607

AIR TEMPERATURE
DEG C
MIN 25.00
MAX 31.00
MEAN 28.28
STD DEV 1.525

RESIDUAL MAG
GAMMAS
MIN -842.6
MAX 16.61
MEAN -477.8
STD DEV 202.5

DIURNAL
GAMMAS
MIN 54027
MAX 54035
MEAN 54021
STD DEV 9.185

RADAR ALTMTR
FEET
MIN 285.2
MAX 572.3
MEAN 391.1
STD DEV 40.63

LINE 880

LINE 890
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80208

LINE 900
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80208

BARO PRESSURE
MM HG
MIN 722.1
MAX 743.2
MEAN 731.6
STD DEV 2.372

AIR TEMPERATURE
DEG C
MIN 27.00
MAX 30.00
MEAN 28.18
STD DEV .5463

RESIDUAL MAG
GAMMAS
MIN -833.8
MAX -234.5
MEAN -497.4
STD DEV 157.0

DIURNAL
GAMMAS
MIN 54014
MAX 54026
MEAN 54016
STD DEV 5.491

RADAR ALTMTR
FEET
MIN 269.7
MAX 305.6
MEAN 287.3
STD DEV 38.69

LINE 910
TUPELO QUADRANGLE - NTYS NI 16-4
DATA ACQUIRED 80208

BARO PRESSURE
MM HG
MIN 722.6
MAX 746.8
MEAN 731.3
STD DEV 2.348

AIR TEMPERATURE
DEG C
MIN 26.00
MAX 29.00
MEAN 27.39
STD DEV .9780

RESIDUAL MAG
GAMMAS
MIN -925.2
MAX -52.67
MEAN -462.9
STD DEV 230.4

DIURNAL
GAMMAS
MIN 54012
MAX 54021
MEAN 54010
STD DEV 6.164

RADAR ALTMTR
FEET
MIN 277.0
MAX 550.6
MEAN 391.8
STD DEV 39.29

LINE 910

LINE 920
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80208

LINE 1070
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80209

LINE 1060
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80209

LINE 1050
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80201

LINE 1040
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80207

LINE 1030
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80207

LINE 1020
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80207

LINE 1010
TUPELO QUADRANGLE - NTMS NI 16-4
80207

LINE 820
TUPELO QUADRANGLE - NIMS NI 16-4
DATA ACQUIRED 80201

LINE 830
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80201

LINE 840
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80201

LINE 850
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 30201

LINE 870
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80201

TL/K	
MIN	.0000
MAX	41.15
MEAN	12.56
STD DEV	5.917

BI/K	
MIN	.0000
MAX	15.79
MEAN	4.984
STD DEV	2.310

BI/TL	
MIN	.0000
MAX	1.321
MEAN	.3908
STD DEV	.1104

TOTAL COUNTS CTS/SEC	
MIN	153.1
MAX	12012
MEAN	1412
STD DEV	359.3

POTASSIUM 40 PERCENT	
MIN	.0980
MAX	1.275
MEAN	.6170
STD DEV	.2365

BISMUTH 214 EQ. PPM	
MIN	.5979
MAX	4.358
MEAN	2.840
STD DEV	.6089

THALLIUM 208 EQ. PPM	
MIN	.6312
MAX	12.50
MEAN	7.952
STD DEV	1.739

BI AIR CORR EQ. PPM	
MIN	.2092
MAX	1.334
MEAN	.6434
STD DEV	.2334

RESID MAG GAMMAS	
MIN	-968.7
MAX	8.602
MEAN	-455.5
STD DEV	232.8

RADAR ALTHTR FEET	
MIN	300.8
MAX	538.7
MEAN	403.4
STD DEV	40.04

LINE 880
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80208

LINE 890
TUPELO QUADRANGLE - NIMS NI 16-4
DATA ACQUIRED 80208

LINE 900
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80208

LINE 1020
TUPELO QUADRANGLE - NTMS NI 16-4
DATA ACQUIRED 80207

LINE 1050

LINE 1070
TUPELO QUADRANGLE - NTMS NI 16-4
80209BI AIR CORR
EQ. PPMRESID MFG
EQ. PPMRADAR ALTIMETER
FEETTHALLIUM 208
EQ. PPMBISMUTH 214
EQ. PPMPOTASSIUM 40
PERCENTTOTAL COUNTS
CTS/SEC

BI/TL

BI/K

TL/K

RADAR ALTIMETER
FEET
MIN 280.7
MAX 558.1
MEAN 393.4
STD DEV 52.45RESID MAG
GAMMAS
MIN -806.7
MAX -72.39
MEAN -367.2
STD DEV 224.1BI AIR CORR
EQ. PPM
MIN .8262
MAX 1.313
MEAN 1.051
STD DEV .1128THALLIUM 208
EQ. PPM
MIN 9558
MAX 6.693
MEAN 4.348
STD DEV .9883BISMUTH 214
EQ. PPM
MIN 7186
MAX 3.556
MEAN 2.264
STD DEV .4022POTASSIUM 40
PERCENT
MIN .1114
MAX .9487
MEAN .3469
STD DEV .1004TOTAL COUNTS
CTS/SEC
MIN 243.0
MAX 1491
MEAN 1082
STD DEV 160.0BI/TL
MIN .0000
MAX 1.522
MEAN .5345
STD DEV .1476BI/K
MIN .0000
MAX 19.99
MEAN 6.674
STD DEV 2.316TL/K
MIN .0000
MAX 36.22
MEAN 12.98
STD DEV 3.999

APPENDIX E - Standard Deviation Maps

TUPELO

SCALE 1:500,000

○ - DATA STATISTICALLY ADEQUATE
 BLANK - DATA STATISTICALLY INADEQUATE
 - 1 σ ABOUT MEASURE OF CENTRAL TENDENCY
 NOTE: ON E-W LINES, +σ TO NORTH, -σ TO SOUTH.
 ON N-S LINES, +σ TO WEST, -σ TO EAST.

LOCATION DIAGRAM

POTASSIUM STANDARD DEVIATION MAP

MISSISSIPPI / FLORIDA PROJECT

U. S. DEPARTMENT OF ENERGY

TUPELO

SCALE 1:500,000

NOTE: ON E-W LINES, +σ TO NORTH, -σ TO SOUTH.
ON N-S LINES, +σ TO WEST, -σ TO EAST.

SURVEY AND
COMPILED BY:

EG&G GEOMETRICS

LOCATION DIAGRAM

URANIUM STANDARD DEVIATION MAP

MISSISSIPPI / FLORIDA PROJECT

U. S. DEPARTMENT OF ENERGY

TUPELO

SCALE 1:500,000

○ - DATA STATISTICALLY ADEQUATE
 ● - DATA STATISTICALLY INADEQUATE
 - 1 σ ABOUT MEASURE OF CENTRAL TENDENCY
 NOTE: ON E-W LINES, +σ TO NORTH, -σ TO SOUTH.
 ON N-S LINES, +σ TO WEST, -σ TO EAST.

SURVEY AND
 COMPILATION BY:

EG&G GEOMETRICS

LOCATION DIAGRAM

URANIUM/THORIUM STANDARD DEVIATION MAP

MISSISSIPPI / FLORIDA PROJECT

U. S. DEPARTMENT OF ENERGY

TUPELO

SCALE 1:500,000

NOTE:
ON E-W LINES, +σ TO NORTH, -σ TO SOUTH.
ON N-S LINES, +σ TO WEST, -σ TO EAST.

THORIUM/POTASSIUM STANDARD DEVIATION MAP

MISSISSIPPI / FLORIDA PROJECT

U. S. DEPARTMENT OF ENERGY

SURVEY AND
COMPILATION BY:

EG&G GEOMETRICS

TUPELO

SCALE 1:500,000

○ - DATA STATISTICALLY ADEQUATE
 BLANK - DATA STATISTICALLY INADEQUATE
 ■ - 1 σ ABOUT MEASURE OF CENTRAL TENDENCY
 NOTE: ON E-W LINES, +σ TO NORTH, -σ TO SOUTH.
 ON N-S LINES, +σ TO WEST, -σ TO EAST.

LOCATION DIAGRAM

URANIUM/POTASSIUM STANDARD DEVIATION MAP

MISSISSIPPI / FLORIDA PROJECT

U. S. DEPARTMENT OF ENERGY

SURVEY AND
 COMPILED BY:

EG&G GEOMETRICS

TUPELO

SCALE 1:500,000

NOTE:
 ON E-W LINES, +σ TO NORTH, -σ TO SOUTH.
 ON N-S LINES, +σ TO WEST, -σ TO EAST.

THORIUM STANDARD DEVIATION MAP

MISSISSIPPI / FLORIDA PROJECT

U. S. DEPARTMENT OF ENERGY

SURVEY AND
COMPILED BY:

EG&G GEOMETRICS

**APPENDIX F - Histograms and Map Unit Conversion
Table**

NTMS NI 16-4 TUPELO

MAP UNIT : KRM TOTAL NUMBER OF SAMPLES 978

THORIUM

URANIUM

POTASSIUM

U/K

U/TH

TH/K

TUPELO QUADRANGLE

Computer Map Unit Symbol Conversion Table

<u>Computer Map Unit Symbol</u>	<u>Geologic Map Unit Symbol</u>
* QAL	Qal
* QT	Qt
QS	Qs
TEK	Tek
TEZW	Tezw
TET	Tet
TEW	Tew
TPAN	Tpan
TPAP	TPap
TPAC	Tpac
KP	Kp
KR	Kr
KRM	Krm
KD	Kd
KM	Km
KC	Kc
KE	Ke
KET	Ket
KT	Kt
MC	Mc
M	M
MP	Mp
MB	Mb
MGS	Mgs
MFS	Mfs
UNONS	unlabeled units

NOTES:

On the following pages, histograms for each computer map unit are included in the same order as they appear on the above list.

Geologic descriptions of the original geologic map units are in Appendix A.

Areas over water or cultural features were assigned separate map unit symbols and were removed from the data block during processing.

* A statistical analysis was not performed due to an inadequate number of samples. Therefore, there are no histograms for units marked in this way.

APPENDIX G - Uranium Anomaly Summary and
Statistical Tables

ANOMALY SUMMARY TABLE
ANOMALY FLIGHT COMPUTER MAP UNIT AND NO.
ANOMALOUS SAMPLES IN UNIT

1	WC	820	QS	/ 4	/ 0
2	WC	820	QS	/ 4TEK	/ 1
3	WC	820	TEK	/ 3	/ 0
4	WC	820	TEK	/ 1TET	/ 5
5	WC	820	TET	/ 1	/ 0
6	WC	820	TEW	/ 4	/ 0
7	WC	820	TEW	/ 3	/ 0
8	WC	820	TEW	/ 3	/ 0
9	WC	820	TPAP	/ 3	/ 0
10	WC	820	TPAP	/ 2TPAC	/ 1
11	WC	820	KD	/ 3	/ 0
12	WC	820	KM	/ 5	/ 0
13	WC	820	KE	/11	/ 0
14	WC	820	KE	/ 3	/ 0
15	WC	830	QS	/ 4	/ 0
16	WC	830	QS	/ 7	/ 0
17	WC	830	QS	/ 4	/ 0
18	WC	830	TET	/ 3	/ 0
19	WC	830	TET	/ 7	/ 0
20	WC	830	TET	/ 2	/ 0
21	WC	830	TEW	/ 3	/ 0
22	WC	830	TEW	/ 6	/ 0
23	WC	830	TEW	/ 4	/ 0
24	WC	830	TEW	/ 6	/ 0
25	WC	830	KT	/ 3	/ 0
26	WC	840	QS	/ 4	/ 0
27	WC	840	QS	/ 1	/ 0
28	WC	840	TEK	/10	/ 0
29	WC	840	TET	/ 4	/ 0
30	WC	840	TEW	/11	/ 0
31	WC	840	KE	/ 1	/ 0
32	WC	840	KE	/ 2	/ 0
33	WC	850	QS	/ 4	/ 0
34	WC	850	QS	/ 5	/ 0
35	WC	850	QS	/ 7TEK	/ 2
36	WC	850	TEK	/ 3	/ 0
37	WC	850	TEK	/ 7	/ 0
38	WC	850	TET	/ 6	/ 0
39	WC	850	TEW	/ 5	/ 0
40	WC	850	TEW	/ 3	/ 0
41	WC	850	TEW	/ 2	/ 0
42	WC	850	TEW	/ 1TPAP	/ 2
43	WC	850	TPAP	/ 6TPAC	/ 1
44	WC	850	TPAC	/ 2KP	/ 1
45	WC	850	KC	/ 2	/ 0
46	WC	850	KET	/ 1	/ 0
47	WC	850	KE	/ 1KT	/ 1
48	WC	860	QS	/ 6	/ 0
49	WC	860	TET	/ 3	/ 0
50	WC	860	TET	/ 3	/ 0

PEAK PPM	NUMBER OF SAMPLES WITH A STANDARD DEVIATION OF :						
	1	2	3	4	5	6	7 GT7
3.4	3	1	0	0	0	0	0
3.5	4	1	0	0	0	0	0
3.1	2	1	0	0	0	0	0
3.6	1	4	1	0	0	0	0
3.6	0	0	1	0	0	0	0
3.5	0	4	0	0	0	0	0
3.3	2	1	0	0	0	0	0
3.3	2	1	0	0	0	0	0
3.9	1	2	0	0	0	0	0
3.7	1	2	0	0	0	0	0
4.4	2	1	0	0	0	0	0
4.8	1	3	1	0	0	0	0
3.6	2	5	4	0	0	0	0
3.1	1	2	0	0	0	0	0
3.7	3	1	0	0	0	0	0
4.0	2	4	1	0	0	0	0
3.6	3	1	0	0	0	0	0
3.4	1	2	0	0	0	0	0
3.7	0	5	2	0	0	0	0
3.2	0	2	0	0	0	0	0
3.3	2	1	0	0	0	0	0
3.4	4	2	0	0	0	0	0
3.5	3	1	0	0	0	0	0
3.5	4	2	0	0	0	0	0
2.9	2	1	0	0	0	0	0
3.8	1	3	0	0	0	0	0
3.9	0	0	1	0	0	0	0
3.8	3	6	1	0	0	0	0
3.0	3	1	0	0	0	0	0
4.1	9	1	1	0	0	0	0
3.7	0	0	1	0	0	0	0
3.2	0	2	0	0	0	0	0
3.6	2	2	0	0	0	0	0
3.6	3	2	0	0	0	0	0
4.2	5	2	2	0	0	0	0
3.6	0	2	1	0	0	0	0
3.2	6	1	0	0	0	0	0
2.9	5	1	0	0	0	0	0
3.6	1	4	0	0	0	0	0
3.3	1	2	0	0	0	0	0
3.3	0	2	0	0	0	0	0
3.4	2	1	0	0	0	0	0
3.9	2	5	0	0	0	0	0
3.3	0	3	0	0	0	0	0
4.4	1	0	1	0	0	0	0
4.7	0	0	1	0	0	0	0
3.0	0	2	0	0	0	0	0
3.5	3	3	0	0	0	0	0
3.4	1	2	0	0	0	0	0
3.6	0	2	1	0	0	0	0

ANOMALY SUMMARY TABLE
ANOMALY FLIGHT COMPUTER MAP UNIT AND NO.
ANOMALOUS SAMPLES IN UNIT

51	WC	860	TET	/ 3	/ 0
52	WC	860	TET	/ 2TEK	/ 1
53	WC	860	TPAP	/ 1TPAC	/ 2
54	WC	860	TPAC	/ 4	/ 0
55	WC	860	KE	/ 1	/ 0
56	WC	860	KE	/ 1	/ 0
57	WC	870	QS	/ 6	/ 0
58	WC	870	QS	/ 3	/ 0
59	WC	870	QS	/ 2TEK	/ 7
60	WC	870	TEK	/ 4	/ 0
61	WC	870	TET	/ 3	/ 0
62	WC	870	TET	/ 3TEK	/ 1
63	WC	870	TET	/ 3	/ 0
64	WC	870	TET	/ 5	/ 0
65	WC	870	TET	/ 4	/ 0
66	WC	870	TET	/ 3	/ 0
67	WC	870	TPAP	/ 4	/ 0
68	WC	870	KP	/ 1	/ 0
69	WC	870	KC	/ 4	/ 0
70	WC	870	KE	/ 2	/ 0
71	C	880	KC	/ 1	/ 0
72	C	880	KC	/ 1	/ 0
73	C	910	KET	/ 1KE	/ 1
74	C	930	KRM	/ 4	/ 0
75	C	930	KR	/ 4	/ 0
76	C	930	KD	/ 1	/ 0
77	C	930	KR	/ 1	/ 0
78	C	930	KD	/ 6	/ 0
79	C	1010	QS	/ 4	/ 0
80	C	1010	QS	/ 3	/ 0
81	C	1020	TET	/ 2	/ 0
82	WC	1050	KC	/ 5	/ 0
83	WC	1050	KR	/ 1	/ 0
84	WC	1050	KRM	/ 3	/ 0
85	WC	1070	KT	/ 4	/ 0
86	WC	1070	MB	/ 4UNONS	/ 4

PEAK PPM	NUMBER OF SAMPLES WITH A STANDARD DEVIATION OF :						
	1	2	3	4	5	6	7 GT7
3.2	1	2	0	0	0	0	0
3.3	1	2	0	0	0	0	0
3.6	1	2	0	0	0	0	0
3.9	1	2	1	0	0	0	0
3.5	0	0	1	0	0	0	0
3.5	0	0	1	0	0	0	0
3.7	0	6	0	0	0	0	0
4.0	0	2	1	0	0	0	0
3.4	5	4	0	0	0	0	0
3.1	3	1	0	0	0	0	0
3.2	1	2	0	0	0	0	0
3.8	0	2	2	0	0	0	0
2.9	2	1	0	0	0	0	0
3.6	3	1	1	0	0	0	0
3.9	0	3	1	0	0	0	0
3.1	1	2	0	0	0	0	0
3.5	2	2	0	0	0	0	0
3.5	0	0	1	0	0	0	0
4.2	3	1	0	0	0	0	0
3.5	0	1	1	0	0	0	0
4.9	0	0	1	0	0	0	0
4.4	0	0	1	0	0	0	0
3.9	1	0	0	1	0	0	0
3.7	1	3	0	0	0	0	0
5.0	1	2	1	0	0	0	0
5.0	0	0	1	0	0	0	0
5.4	0	0	0	1	0	0	0
5.5	4	1	1	0	0	0	0
3.4	3	1	0	0	0	0	0
4.0	1	1	1	0	0	0	0
3.6	0	1	1	0	0	0	0
4.0	3	2	0	0	0	0	0
4.4	0	0	1	0	0	0	0
4.3	0	1	2	0	0	0	0
2.9	3	1	0	0	0	0	0
3.5	5	3	0	0	0	0	0

NOTES: M INDICATES THAT THE ANOMALY LIES OVER
A URANIUM MINE OR PROSPECT.

C INDICATES THAT THE ANOMALY LIES OVER A CULTURAL FEATURE.

W INDICATES POSSIBLE INTERFERENCE BY WEATHER PHENOMENA.

			MAP UNIT		QS				
			-3	-2	-1	0	+1	+2	+3
POTASIMUM	DIST	NORMAL	0. 5657	0. 7124	0. 8591	1. 0058	1. 1525	1. 2992	1. 4459
URANIUM	DIST	NORMAL	1. 0491	1. 5604	2. 0717	2. 5830	3. 0943	3. 6056	4. 1169
THORIUM	DIST	NORMAL	3. 9597	4. 9709	5. 9821	6. 9933	8. 0045	9. 0157	10. 0269
U/K	DIST	NORMAL	0. 8613	1. 4439	2. 0265	2. 6091	3. 1917	3. 7743	4. 3569
U/TH	DIST	NORMAL	0. 1669	0. 2353	0. 3037	0. 3721	0. 4405	0. 5089	0. 5773
TH/K	DIST	NORMAL	4. 5955	5. 4000	6. 2045	7. 0090	7. 8135	8. 6180	9. 4225

			MAP UNIT		TEK				
			-3	-2	-1	0	+1	+2	+3
POTASIMUM	DIST	NORMAL	0. 3397	0. 5153	0. 6909	0. 8665	1. 0421	1. 2177	1. 3933
URANIUM	DIST	NORMAL	0. 7525	1. 2637	1. 7749	2. 2861	2. 7973	3. 3085	3. 8197
THORIUM	DIST	NORMAL	3. 3128	4. 3186	5. 3244	6. 3302	7. 3360	8. 3418	9. 3476
U/K	DIST	NORMAL	0. 6644	1. 3479	2. 0314	2. 7149	3. 3984	4. 0819	4. 7654
U/TH	DIST	NORMAL	0. 1386	0. 2139	0. 2892	0. 3645	0. 4398	0. 5151	0. 5904
TH/K	DIST	NORMAL	4. 1133	5. 2277	6. 3421	7. 4565	8. 5709	9. 6853	10. 7997

			MAP UNIT		TEZW				
			-3	-2	-1	0	+1	+2	+3
POTASIMUM	DIST	NORMAL	0. 2354	0. 3511	0. 4668	0. 5825	0. 6982	0. 8139	0. 9296
URANIUM	DIST	NORMAL	1. 2406	1. 5964	1. 9522	2. 3080	2. 6638	3. 0196	3. 3754
THORIUM	DIST	NORMAL	2. 4741	3. 3220	4. 1699	5. 0178	5. 8657	6. 7136	7. 5615
U/K	DIST	NORMAL	1. 7031	2. 4968	3. 2905	4. 0842	4. 8779	5. 6716	6. 4653
U/TH	DIST	NORMAL	0. 2551	0. 3261	0. 3971	0. 4681	0. 5391	0. 6101	0. 6811
TH/K	DIST	NORMAL	6. 3782	7. 1573	7. 9364	8. 7155	9. 4946	10. 2737	11. 0528

			MAP UNIT		TET				
			-3	-2	-1	0	+1	+2	+3
POTASIMUM	DIST	NORMAL	0. 0708	0. 2839	0. 4970	0. 7101	0. 9232	1. 1363	1. 3494
URANIUM	DIST	NORMAL	0. 5396	1. 0695	1. 5994	2. 1293	2. 6592	3. 1891	3. 7190
THORIUM	DIST	NORMAL	2. 3164	3. 4874	4. 6584	5. 8294	7. 0004	8. 1714	9. 3424
U/K	DIST	NORMAL	0. 1190	1. 1506	2. 1822	3. 2138	4. 2454	5. 2770	6. 3086
U/TH	DIST	NORMAL	0. 1300	0. 2100	0. 2900	0. 3700	0. 4500	0. 5300	0. 6100
TH/K	DIST	NORMAL	2. 7456	4. 7226	6. 6996	8. 6766	10. 6536	12. 6306	14. 6076

			MAP UNIT		TEW				
			-3	-2	-1	0	+1	+2	+3
POTASIMUM	DIST	NORMAL	0. 1824	0. 3429	0. 5034	0. 6639	0. 8244	0. 9849	1. 1454
URANIUM	DIST	NORMAL	0. 5987	1. 1554	1. 7121	2. 2688	2. 8255	3. 3822	3. 9389
THORIUM	DIST	NORMAL	2. 7702	3. 7923	4. 8144	5. 8365	6. 8586	7. 8807	8. 9028
U/K	DIST	NORMAL	0. 5354	1. 5332	2. 5310	3. 5288	4. 5266	5. 5244	6. 5222
U/TH	DIST	NORMAL	0. 1467	0. 2275	0. 3083	0. 3891	0. 4699	0. 5507	0. 6315
TH/K	DIST	NORMAL	3. 5949	5. 4346	7. 2743	9. 1140	10. 9537	12. 7934	14. 6331

			MAP UNIT TPAN						
			-3	-2	-1	0	+1	+2	+3
POTASIUM	DIST	NORMAL	0. 1499	0. 3357	0. 5215	0. 7073	0. 8931	1. 0789	1. 2647
URANIUM	DIST	NORMAL	1. 3242	1. 7329	2. 1416	2. 5503	2. 9590	3. 3677	3. 7764
THORIUM	DIST	NORMAL	3. 2226	4. 2000	5. 1774	6. 1548	7. 1322	8. 1096	9. 0870
U/K	DIST	NORMAL	1. 4102	2. 1929	2. 9756	3. 7583	4. 5410	5. 3237	6. 1064
U/TH	DIST	NORMAL	0. 2247	0. 2895	0. 3543	0. 4191	0. 4839	0. 5487	0. 6135
TH/K	DIST	NORMAL	4. 8051	6. 1997	7. 5943	8. 9889	10. 3835	11. 7781	13. 1727

			MAP UNIT		TPAP				
			-3	-2	-1	0	+1	+2	+3
POTASIUM	DIST	NORMAL	0. 2653	0. 4031	0. 5409	0. 6787	0. 8165	0. 9543	1. 0921
URANIUM	DIST	NORMAL	0. 8153	1. 4020	1. 9887	2. 5754	3. 1621	3. 7488	4. 3355
THORIUM	DIST	NORMAL	3. 6194	4. 8191	6. 0188	7. 2185	8. 4182	9. 6179	10. 8176
U/K	DIST	NORMAL	0. 1003	1. 3875	2. 6747	3. 9619	5. 2491	6. 5363	7. 8235
U/TH	DIST	NORMAL	0. 1382	0. 2120	0. 2858	0. 3596	0. 4334	0. 5072	0. 5810
TH/K	DIST	NORMAL	4. 1653	6. 4211	8. 6769	10. 9327	13. 1885	15. 4443	17. 7001

			MAP UNIT		TPAC				
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0.1886	0.3439	0.4992	0.6545	0.8098	0.9651	1.1204
URANIUM	DIST	NORMAL	0.9635	1.4597	1.9559	2.4521	2.9483	3.4445	3.9407
THORIUM	DIST	NORMAL	3.4649	4.6787	5.8925	7.1063	8.3201	9.5339	10.7477
U/K	DIST	NORMAL	-0.2134	1.1804	2.5742	3.9680	5.3618	6.7556	8.1494
U/TH	DIST	NORMAL	0.1404	0.2102	0.2800	0.3498	0.4196	0.4894	0.5592
TH/K	DIST	NORMAL	3.4349	6.0471	8.6593	11.2715	13.8837	16.4959	19.1081

			MAP UNIT KP						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0. 2053	0. 3498	0. 4943	0. 6388	0. 7833	0. 9278	1. 0723
URANIUM	DIST	NORMAL	1. 1066	1. 5269	1. 9472	2. 3675	2. 7878	3. 2081	3. 6284
THORIUM	DIST	NORMAL	3. 1390	4. 4329	5. 7268	7. 0207	8. 3146	9. 6085	10. 9024
U/K	DIST	NORMAL	0. 3340	1. 5259	2. 7178	3. 9097	5. 1016	6. 2935	7. 4854
U/TH	DIST	NORMAL	0. 0699	0. 1628	0. 2557	0. 3486	0. 4415	0. 5344	0. 6273
TH/K	DIST	NORMAL	5. 2003	7. 2161	9. 2319	11. 2477	13. 2635	15. 2793	17. 2951

			MAP UNIT KR						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0.2584	0.3804	0.5024	0.6244	0.7464	0.8684	0.9904
URANIUM	DIST	NORMAL	0.7872	1.4407	2.0942	2.7477	3.4012	4.0547	4.7082
THORIUM	DIST	NORMAL	2.4256	4.3373	6.2490	8.1607	10.0724	11.9841	13.8958
U/K	DIST	NORMAL	0.4548	1.8235	3.1922	4.5609	5.9296	7.2983	8.6670
U/TH	DIST	NORMAL	0.0962	0.1792	0.2622	0.3452	0.4282	0.5112	0.5942
TH/K	DIST	NORMAL	3.5653	6.8247	10.0841	13.3435	16.6029	19.8623	23.1217

			MAP UNIT KRM						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0. 1684	0. 2936	0. 4188	0. 5440	0. 6692	0. 7944	0. 9196
URANIUM	DIST	NORMAL	0. 6946	1. 2445	1. 7944	2. 3443	2. 8942	3. 4441	3. 9940
THORIUM	DIST	NORMAL	1. 8117	3. 3465	4. 8813	6. 4161	7. 9509	9. 4857	11. 0205
U/K	DIST	NORMAL	0. 3934	1. 7642	3. 1350	4. 5058	5. 8766	7. 2474	8. 6182
U/TH	DIST	NORMAL	0. 0985	0. 1910	0. 2835	0. 3760	0. 4685	0. 5610	0. 6535
TH/K	DIST	NORMAL	4. 1457	6. 7825	9. 4193	12. 0561	14. 6929	17. 3297	19. 9665

			MAP UNIT KD						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0. 1795	0. 3112	0. 4429	0. 5746	0. 7063	0. 8380	0. 9697
URANIUM	DIST	NORMAL	1. 4022	2. 0452	2. 6882	3. 3312	3. 9742	4. 6172	5. 2602
THORIUM	DIST	NORMAL	5. 2245	6. 3524	7. 4803	8. 6082	9. 7361	10. 8640	11. 9919
U/K	DIST	NORMAL	0. 1188	2. 1226	4. 1264	6. 1302	8. 1340	10. 1378	12. 1416
U/TH	DIST	NORMAL	0. 1379	0. 2220	0. 3061	0. 3902	0. 4743	0. 5584	0. 6425
TH/K	DIST	NORMAL	2. 2659	6. 7794	11. 2929	15. 8064	20. 3199	24. 8334	29. 3469

			MAP UNIT KM						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0. 0018	0. 2042	0. 4066	0. 6090	0. 8114	1. 0138	1. 2162
URANIUM	DIST	NORMAL	2. 1290	2. 5813	3. 0336	3. 4859	3. 9382	4. 3905	4. 8428
THORIUM	DIST	NORMAL	6. 2158	7. 1452	8. 0746	9. 0040	9. 9334	10. 8628	11. 7922
U/K	DIST	NORMAL	0. 3117	2. 3065	4. 3013	6. 2961	8. 2909	10. 2857	12. 2805
U/TH	DIST	NORMAL	0. 2103	0. 2703	0. 3303	0. 3903	0. 4503	0. 5103	0. 5703
TH/K	DIST	NORMAL	-0. 5521	5. 1363	10. 8247	16. 5131	22. 2015	27. 8899	33. 5783

			MAP UNIT KC						
			-3	-2	-1	0	+1	+2	+3
POTASIUM	DIST	NORMAL	0. 0617	0. 1954	0. 3291	0. 4628	0. 5965	0. 7302	0. 8639
URANIUM	DIST	NORMAL	0. 3835	1. 1110	1. 8385	2. 5660	3. 2935	4. 0210	4. 7485
THORIUM	DIST	NORMAL	1. 2398	3. 2448	5. 2498	7. 2548	9. 2598	11. 2648	13. 2698
U/K	DIST	NORMAL	0. 4087	2. 2006	3. 9925	5. 7844	7. 5763	9. 3682	11. 1601
U/TH	DIST	NORMAL	0. 1651	0. 2297	0. 2943	0. 3589	0. 4235	0. 4881	0. 5527
TH/K	DIST	NORMAL	2. 4083	7. 0243	11. 6403	16. 2563	20. 8723	25. 4883	30. 1043

			MAP UNIT KE						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0. 0652	0. 1732	0. 2812	0. 3892	0. 4972	0. 6052	0. 7132
URANIUM	DIST	NORMAL	0. 7000	1. 1940	1. 6880	2. 1820	2. 6760	3. 1700	3. 6640
THORIUM	DIST	NORMAL	2. 5275	3. 7092	4. 8909	6. 0726	7. 2543	8. 4360	9. 6177
U/K	DIST	NORMAL	0. 0843	2. 0421	3. 9999	5. 9577	7. 9155	9. 8733	11. 8311
U/TH	DIST	NORMAL	0. 1622	0. 2291	0. 2960	0. 3629	0. 4298	0. 4967	0. 5636
TH/K	DIST	NORMAL	2. 5938	7. 2164	11. 8390	16. 4616	21. 0842	25. 7068	30. 3294

			MAP UNIT KET						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0. 0891	0. 2325	0. 3759	0. 5193	0. 6627	0. 8061	0. 9495
URANIUM	DIST	NORMAL	0. 5276	1. 2679	2. 0082	2. 7485	3. 4888	4. 2291	4. 9694
THORIUM	DIST	NORMAL	2. 3315	4. 1714	6. 0113	7. 8512	9. 6911	11. 5310	13. 3709
U/K	DIST	NORMAL	1. 1150	2. 5714	4. 0278	5. 4842	6. 9406	8. 3970	9. 8534
U/TH	DIST	NORMAL	0. 1681	0. 2295	0. 2909	0. 3523	0. 4137	0. 4751	0. 5365
TH/K	DIST	NORMAL	4. 1356	7. 9792	11. 8228	15. 6664	19. 5100	23. 3536	27. 1972

			MAP UNIT KT						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0. 0637	0. 1566	0. 2495	0. 3424	0. 4353	0. 5282	0. 6211
URANIUM	DIST	NORMAL	0. 8921	1. 3289	1. 7657	2. 2025	2. 6393	3. 0761	3. 5129
THORIUM	DIST	NORMAL	1. 7849	2. 9194	4. 0539	5. 1884	6. 3229	7. 4574	8. 5919
U/K	DIST	NORMAL	0. 0258	2. 3112	4. 5966	6. 8820	9. 1674	11. 4528	13. 7382
U/TH	DIST	NORMAL	0. 1252	0. 2292	0. 3332	0. 4372	0. 5412	0. 6452	0. 7492
TH/K	DIST	NORMAL	2. 1191	6. 7273	11. 3355	15. 9437	20. 5519	25. 1601	29. 7683

			MAP UNIT MC						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0. 0557	0. 1711	0. 2865	0. 4019	0. 5173	0. 6327	0. 7481
URANIUM	DIST	NORMAL	0. 5126	0. 8567	1. 2008	1. 5449	1. 8890	2. 2331	2. 5772
THORIUM	DIST	NORMAL	1. 8228	2. 8380	3. 8532	4. 8684	5. 8836	6. 8988	7. 9140
U/K	DIST	NORMAL	0. 7841	1. 8633	2. 9425	4. 0217	5. 1009	6. 1801	7. 2593
U/TH	DIST	NORMAL	0. 1271	0. 1924	0. 2577	0. 3230	0. 3883	0. 4536	0. 5189
TH/K	DIST	NORMAL	5. 4070	7. 7734	10. 1398	12. 5062	14. 8726	17. 2390	19. 6054

			MAP UNIT M						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0. 1254	0. 1960	0. 2666	0. 3372	0. 4078	0. 4784	0. 5490
URANIUM	DIST	NORMAL	0. 4496	0. 9232	1. 3968	1. 8704	2. 3440	2. 8176	3. 2912
THORIUM	DIST	NORMAL	1. 6622	2. 3397	3. 0172	3. 6947	4. 3722	5. 0497	5. 7272
U/K	DIST	NORMAL	0. 8308	2. 4488	4. 0668	5. 6848	7. 3028	8. 9208	10. 5388
U/TH	DIST	NORMAL	0. 0387	0. 1969	0. 3551	0. 5133	0. 6715	0. 8297	0. 9879
TH/K	DIST	NORMAL	3. 0258	5. 8370	8. 6482	11. 4594	14. 2706	17. 0818	19. 8930

			MAP UNIT MP						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	0. 1056	0. 1736	0. 2416	0. 3096	0. 3776	0. 4456	0. 5136
URANIUM	DIST	NORMAL	1. 1580	1. 4913	1. 8246	2. 1579	2. 4912	2. 8245	3. 1578
THORIUM	DIST	NORMAL	2. 3661	3. 2061	4. 0461	4. 8861	5. 7261	6. 5661	7. 4061
U/K	DIST	NORMAL	2. 0072	3. 7581	5. 5090	7. 2599	9. 0108	10. 7617	12. 5126
U/TH	DIST	NORMAL	0. 2375	0. 3078	0. 3781	0. 4484	0. 5187	0. 5890	0. 6593
TH/K	DIST	NORMAL	6. 5339	9. 7821	13. 0303	16. 2785	19. 5267	22. 7749	26. 0231

			MAP UNIT MB						
			-3	-2	-1	0	+1	+2	+3
POTASium	DIST	NORMAL	-0. 0308	0. 1094	0. 2496	0. 3898	0. 5300	0. 6702	0. 8104
URANIUM	DIST	NORMAL	0. 4308	1. 0611	1. 6914	2. 3217	2. 9520	3. 5823	4. 2126
THORIUM	DIST	NORMAL	1. 2671	2. 4491	3. 6311	4. 8131	5. 9951	7. 1771	8. 3591
U/K	DIST	NORMAL	-0. 0643	2. 1173	4. 2989	6. 4805	8. 6621	10. 8437	13. 0253
U/TH	DIST	NORMAL	0. 1063	0. 2361	0. 3659	0. 4957	0. 6255	0. 7553	0. 8851
TH/K	DIST	NORMAL	4. 2747	7. 1983	10. 1219	13. 0455	15. 9691	18. 8927	21. 8163

		MAP UNIT MGS						
		-3	-2	-1	0	+1	+2	+3
POTASIMUM	DIST NORMAL	0. 2364	0. 2883	0. 3402	0. 3921	0. 4440	0. 4959	0. 5478
URANIUM	DIST NORMAL	0. 8929	1. 2583	1. 6237	1. 9891	2. 3545	2. 7199	3. 0853
THORIUM	DIST NORMAL	2. 8796	3. 1173	3. 3550	3. 5927	3. 8304	4. 0681	4. 3058
U/K	DIST NORMAL	1. 1505	2. 4948	3. 8391	5. 1834	6. 5277	7. 8720	9. 2163
U/TH	DIST NORMAL	0. 2376	0. 3437	0. 4498	0. 5559	0. 6620	0. 7681	0. 8742
TH/K	DIST NORMAL	5. 0790	6. 4940	7. 9090	9. 3240	10. 7390	12. 1540	13. 5690

		MAP UNIT MFS						
		-3	-2	-1	0	+1	+2	+3
POTASIMUM	DIST NORMAL	0. 0272	0. 1457	0. 2642	0. 3827	0. 5012	0. 6197	0. 7382
URANIUM	DIST NORMAL	0. 3641	0. 8996	1. 4351	1. 9706	2. 5061	3. 0416	3. 5771
THORIUM	DIST NORMAL	0. 9407	1. 9415	2. 9423	3. 9431	4. 9439	5. 9447	6. 9455
U/K	DIST NORMAL	-0. 9678	1. 2507	3. 4692	5. 6877	7. 9062	10. 1247	12. 3432
U/TH	DIST NORMAL	-0. 0361	0. 1544	0. 3449	0. 5354	0. 7259	0. 9164	1. 1069
TH/K	DIST NORMAL	2. 7890	5. 5058	8. 2226	10. 9394	13. 6562	16. 3730	19. 0898

		MAP UNIT UNONS						
		-3	-2	-1	0	+1	+2	+3
POTASIMUM	DIST NORMAL	0. 0742	0. 1792	0. 2842	0. 3892	0. 4942	0. 5992	0. 7042
URANIUM	DIST NORMAL	-0. 4905	0. 2428	0. 9761	1. 7094	2. 4427	3. 1760	3. 9093
THORIUM	DIST NORMAL	2. 2119	3. 0870	3. 9621	4. 8372	5. 7123	6. 5874	7. 4625
U/K	DIST NORMAL	-1. 7106	0. 4379	2. 5864	4. 7349	6. 8834	9. 0319	11. 1804
U/TH	DIST NORMAL	-0. 0978	0. 0558	0. 2094	0. 3630	0. 5166	0. 6702	0. 8238
TH/K	DIST NORMAL	5. 4106	7. 9078	10. 4050	12. 9022	15. 3994	17. 8966	20. 3938

MAP UNIT TEZW

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASIMUM	0.579	0.586	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
URANIUM	2.287	2.332	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
THORIUM	5.055	4.974	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U/K	3.954	4.238	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U/TH	0.452	0.487	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TH/K	8.757	8.666	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	1040	1050	1060	1070
POTASIMUM	0.000	0.000	0.000	0.000
URANIUM	0.000	0.000	0.000	0.000
THORIUM	0.000	0.000	0.000	0.000
U/K	0.000	0.000	0.000	0.000
U/TH	0.000	0.000	0.000	0.000
TH/K	0.000	0.000	0.000	0.000

MAP UNIT TET

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASIMUM	0.712	0.686	0.565	0.644	0.635	0.685	0.697	0.733	0.680	0.615	0.769	0.797	0.000	0.797	0.687
URANIUM	2.563	2.559	2.164	2.517	2.407	2.585	1.696	1.857	1.708	1.819	1.914	2.157	0.000	2.146	1.984
THORIUM	6.240	5.942	5.365	6.083	5.767	5.693	5.154	5.703	5.461	5.224	5.820	6.073	0.000	6.185	5.948
U/K	3.742	3.868	4.129	4.036	4.184	4.016	2.425	2.646	2.691	3.137	2.570	2.805	0.000	2.898	3.178
U/TH	0.415	0.431	0.414	0.415	0.420	0.460	0.327	0.328	0.315	0.355	0.331	0.359	0.000	0.360	0.338
TH/K	9.086	9.087	10.078	9.754	10.073	8.858	7.509	8.100	8.552	8.826	7.782	7.817	0.000	8.031	9.405

	1040	1050	1060	1070
POTASIMUM	0.523	0.000	0.000	0.000
URANIUM	1.870	0.000	0.000	0.000
THORIUM	5.715	0.000	0.000	0.000
U/K	3.667	0.000	0.000	0.000
U/TH	0.329	0.000	0.000	0.000
TH/K	11.134	0.000	0.000	0.000

MAP UNIT TEW

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASium	0.667	0.709	0.631	0.705	0.605	0.667	0.602	0.612	0.567	0.520	0.535	0.646	0.000	0.907	0.766
URANIUM	2.652	2.807	2.627	2.789	2.428	2.639	1.632	1.830	1.732	1.665	1.813	2.104	0.000	2.872	2.211
THORIUM	5.927	6.157	5.714	6.525	5.623	6.119	4.916	5.457	4.999	4.854	5.211	5.845	0.000	7.077	6.287
U/K	4.169	4.044	4.383	4.134	4.058	3.993	2.677	3.111	3.215	3.273	3.489	3.511	0.000	3.172	2.976
U/TH	0.452	0.460	0.462	0.433	0.436	0.435	0.322	0.340	0.353	0.349	0.349	0.365	0.000	0.408	0.355
TH/K	9.175	8.844	9.534	9.552	9.350	9.256	8.528	9.246	9.398	9.434	10.121	9.518	0.000	7.832	8.460

	1040	1050	1060	1070
POTASium	0.544	0.000	0.000	0.000
URANIUM	1.982	0.000	0.000	0.000
THORIUM	5.814	0.000	0.000	0.000
U/K	3.689	0.000	0.000	0.000
U/TH	0.340	0.000	0.000	0.000
TH/K	10.912	0.000	0.000	0.000

MAP UNIT TPAN

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASium	0.633	0.620	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.993
URANIUM	2.370	2.714	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.837
THORIUM	5.938	6.086	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.789
U/K	3.837	4.390	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.867
U/TH	0.407	0.449	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.418
TH/K	9.464	9.811	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.869

	1040	1050	1060	1070
POTASium	0.000	0.000	0.000	0.000
URANIUM	0.000	0.000	0.000	0.000
THORIUM	0.000	0.000	0.000	0.000
U/K	0.000	0.000	0.000	0.000
U/TH	0.000	0.000	0.000	0.000
TH/K	0.000	0.000	0.000	0.000

MAP UNIT TPAP

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASIMUM	0.805	0.624	0.668	0.703	0.649	0.660	0.641	0.734	0.726	0.648	0.541	0.597	0.000	0.000	0.000
URANIUM	3.009	3.011	2.844	3.126	2.721	2.977	1.931	2.160	2.249	1.915	2.120	2.021	0.000	0.000	0.000
THORIUM	8.387	7.834	7.485	7.950	7.222	7.289	6.404	7.217	6.636	5.824	5.844	6.288	0.000	0.000	0.000
U/K	3.903	5.102	4.510	4.564	4.380	4.648	3.106	3.003	3.168	3.107	3.984	3.445	0.000	0.000	0.000
U/TH	0.362	0.390	0.393	0.397	0.382	0.413	0.305	0.302	0.341	0.334	0.364	0.327	0.000	0.000	0.000
TH/K	10.671	13.080	11.597	11.496	11.478	11.271	10.222	9.970	9.269	9.205	10.985	10.589	0.000	0.000	0.000

	1040	1050	1060	1070
POTASIMUM	0.687	0.000	0.000	0.000
URANIUM	2.058	0.000	0.000	0.000
THORIUM	6.697	0.000	0.000	0.000
U/K	3.099	0.000	0.000	0.000
U/TH	0.310	0.000	0.000	0.000
TH/K	9.933	0.000	0.000	0.000

MAP UNIT TPAC

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASIMUM	0.489	0.508	0.455	0.630	0.614	0.714	0.611	0.666	0.631	0.595	0.677	0.795	0.000	0.000	0.000
URANIUM	2.678	2.604	2.423	2.869	2.842	2.832	2.166	1.992	1.877	2.121	2.572	2.334	0.000	0.000	0.000
THORIUM	6.187	5.822	6.282	7.295	7.359	8.246	6.450	6.832	6.104	6.009	7.298	7.433	0.000	0.000	0.000
U/K	5.873	5.199	5.783	4.651	5.187	4.003	3.599	3.048	2.994	3.640	3.882	2.986	0.000	0.000	0.000
U/TH	0.439	0.453	0.389	0.392	0.389	0.345	0.338	0.295	0.311	0.358	0.355	0.317	0.000	0.000	0.000
TH/K	13.549	11.513	14.383	12.035	13.110	11.738	10.798	10.413	9.722	10.153	10.991	9.468	0.000	0.000	0.000

	1040	1050	1060	1070
POTASIMUM	0.700	0.000	0.000	0.000
URANIUM	2.372	0.000	0.000	0.000
THORIUM	7.358	0.000	0.000	0.000
U/K	3.515	0.000	0.000	0.000
U/TH	0.327	0.000	0.000	0.000
TH/K	10.785	0.000	0.000	0.000

MAP UNIT KRM

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASium	0.000	0.000	0.000	0.000	0.000	0.000	0.513	0.577	0.524	0.521	0.538	0.547	0.000	0.000	0.000
URANIUM	0.000	0.000	0.000	0.000	0.000	0.000	2.600	1.962	2.030	1.913	2.252	2.312	0.000	0.000	0.000
THORIUM	0.000	0.000	0.000	0.000	0.000	0.000	8.288	6.812	6.810	5.505	5.917	5.801	0.000	0.000	0.000
U/K	0.000	0.000	0.000	0.000	0.000	0.000	5.357	3.694	4.077	3.799	4.352	4.607	0.000	0.000	0.000
U/TH	0.000	0.000	0.000	0.000	0.000	0.000	0.318	0.295	0.317	0.354	0.384	0.420	0.000	0.000	0.000
TH/K	0.000	0.000	0.000	0.000	0.000	0.000	17.159	12.364	13.004	10.697	11.275	10.915	0.000	0.000	0.000

	1040	1050	1060	1070
POTASium	0.000	0.559	0.000	0.000
URANIUM	0.000	2.820	0.000	0.000
THORIUM	0.000	7.125	0.000	0.000
U/K	0.000	5.118	0.000	0.000
U/TH	0.000	0.402	0.000	0.000
TH/K	0.000	12.827	0.000	0.000

MAP UNIT KD

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASium	0.559	0.537	0.576	0.537	0.617	0.614	0.605	0.645	0.546	0.526	0.557	0.616	0.000	0.000	0.000
URANIUM	3.621	3.542	3.547	3.685	3.470	3.455	2.493	2.539	2.502	2.598	2.698	3.399	0.000	0.000	0.000
THORIUM	9.236	8.923	8.877	9.134	9.040	8.783	7.927	7.627	7.347	6.967	7.537	7.629	0.000	0.000	0.000
U/K	6.946	7.164	6.533	7.166	5.825	5.789	4.236	3.981	4.688	5.116	4.989	5.744	0.000	0.000	0.000
U/TH	0.396	0.405	0.403	0.408	0.385	0.395	0.316	0.331	0.342	0.374	0.359	0.467	0.000	0.000	0.000
TH/K	17.605	17.957	16.374	17.759	15.371	14.722	13.472	12.083	13.859	13.746	13.800	12.588	0.000	0.000	0.000

	1040	1050	1060	1070
POTASium	0.000	0.572	0.000	0.000
URANIUM	0.000	3.491	0.000	0.000
THORIUM	0.000	8.989	0.000	0.000
U/K	0.000	6.492	0.000	0.000
U/TH	0.000	0.391	0.000	0.000
TH/K	0.000	16.721	0.000	0.000

MAP UNIT KM

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASium	0.858	0.608	0.543	0.546	0.496	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
URANIUM	4.005	3.522	3.044	3.494	3.549	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
THORIUM	8.470	9.188	8.396	9.374	9.555	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U/K	4.908	6.513	6.040	6.701	7.415	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U/TH	0.477	0.386	0.366	0.375	0.371	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TH/K	10.532	16.875	16.834	18.088	19.943	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	1040	1050	1060	1070
POTASium	0.000	0.622	0.000	0.000
URANIUM	0.000	3.432	0.000	0.000
THORIUM	0.000	9.209	0.000	0.000
U/K	0.000	6.233	0.000	0.000
U/TH	0.000	0.374	0.000	0.000
TH/K	0.000	17.102	0.000	0.000

MAP UNIT KC

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASium	0.000	0.000	0.495	0.495	0.442	0.491	0.500	0.497	0.450	0.404	0.386	0.514	0.000	0.000	0.000
URANIUM	0.000	0.000	3.095	2.939	2.934	3.157	3.126	2.383	2.435	2.048	2.213	2.140	0.000	0.000	0.000
THORIUM	0.000	0.000	8.239	8.113	8.732	8.498	8.905	7.491	7.618	5.286	5.491	6.509	0.000	0.000	0.000
U/K	0.000	0.000	6.276	6.543	6.824	6.974	6.381	4.957	5.684	5.233	5.842	4.337	0.000	0.000	0.000
U/TH	0.000	0.000	0.376	0.365	0.338	0.376	0.347	0.319	0.324	0.393	0.409	0.337	0.000	0.000	0.000
TH/K	0.000	0.000	16.691	18.129	20.297	18.486	18.160	15.656	17.621	13.386	14.386	13.030	0.000	0.000	0.000

	1040	1050	1060	1070
POTASium	0.000	0.568	0.399	0.000
URANIUM	0.000	3.204	2.074	0.000
THORIUM	0.000	8.483	5.817	0.000
U/K	0.000	6.021	5.351	0.000
U/TH	0.000	0.380	0.367	0.000
TH/K	0.000	16.079	14.750	0.000

MAP UNIT KT

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASIMUM	0.310	0.334	0.338	0.309	0.324	0.361	0.376	0.395	0.348	0.404	0.331	0.365	0.000	0.000	0.000
URANIUM	2.297	2.387	2.320	2.326	2.417	2.501	1.595	1.686	1.563	1.856	1.738	1.746	0.000	0.000	0.000
THORIUM	5.471	5.779	5.824	5.476	6.201	5.871	5.517	5.089	4.651	4.801	3.760	4.135	0.000	0.000	0.000
U/K	7.878	7.583	7.234	7.895	7.748	7.441	4.370	4.603	4.872	4.806	5.352	4.754	0.000	0.000	0.000
U/TH	0.427	0.420	0.406	0.432	0.394	0.433	0.289	0.336	0.342	0.398	0.469	0.426	0.000	0.000	0.000
TH/K	18.661	18.038	17.935	18.334	19.782	17.050	15.104	13.613	14.122	12.316	11.467	11.356	0.000	0.000	0.000

	1040	1050	1060	1070
POTASIMUM	0.000	0.000	0.414	0.339
URANIUM	0.000	0.000	2.302	2.218
THORIUM	0.000	0.000	5.872	4.483
U/K	0.000	0.000	5.702	7.026
U/TH	0.000	0.000	0.393	0.509
TH/K	0.000	0.000	14.525	13.977

MAP UNIT MC

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASIMUM	0.000	0.000	0.000	0.000	0.000	0.000	0.346	0.402	0.446	0.000	0.000	0.000	0.000	0.000	0.000
URANIUM	0.000	0.000	0.000	0.000	0.000	0.000	1.619	1.495	1.640	0.000	0.000	0.000	0.000	0.000	0.000
THORIUM	0.000	0.000	0.000	0.000	0.000	0.000	4.766	4.892	4.876	0.000	0.000	0.000	0.000	0.000	0.000
U/K	0.000	0.000	0.000	0.000	0.000	0.000	4.883	3.883	3.760	0.000	0.000	0.000	0.000	0.000	0.000
U/TH	0.000	0.000	0.000	0.000	0.000	0.000	0.346	0.312	0.338	0.000	0.000	0.000	0.000	0.000	0.000
TH/K	0.000	0.000	0.000	0.000	0.000	0.000	13.999	12.584	11.058	0.000	0.000	0.000	0.000	0.000	0.000

	1040	1050	1060	1070
POTASIMUM	0.000	0.000	0.000	0.000
URANIUM	0.000	0.000	0.000	0.000
THORIUM	0.000	0.000	0.000	0.000
U/K	0.000	0.000	0.000	0.000
U/TH	0.000	0.000	0.000	0.000
TH/K	0.000	0.000	0.000	0.000

MAP UNIT M

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.345	0.334	0.000	0.000	0.000
URANIUM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.825	1.215	0.000	0.000	0.000
THORIUM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.810	3.933	0.000	0.000	0.000
U/K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.332	3.869	0.000	0.000	0.000
U/TH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.472	0.313	0.000	0.000	0.000
TH/K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	11.411	12.775	0.000	0.000	0.000

	1040	1050	1060	1070
POTASium	0.000	0.000	0.000	0.329
URANIUM	0.000	0.000	0.000	2.328
THORIUM	0.000	0.000	0.000	3.395
U/K	0.000	0.000	0.000	7.245
U/TH	0.000	0.000	0.000	0.688
TH/K	0.000	0.000	0.000	10.718

MAP UNIT MP

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASium	0.310	0.282	0.306	0.283	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
URANIUM	2.043	2.194	2.146	2.190	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
THORIUM	4.938	4.412	5.204	4.772	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U/K	6.889	8.097	7.120	8.087	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U/TH	0.418	0.501	0.414	0.464	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TH/K	16.543	16.070	17.158	17.414	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	1040	1050	1060	1070
POTASium	0.000	0.000	0.000	0.349
URANIUM	0.000	0.000	0.000	2.200
THORIUM	0.000	0.000	0.000	4.982
U/K	0.000	0.000	0.000	6.390
U/TH	0.000	0.000	0.000	0.452
TH/K	0.000	0.000	0.000	14.435

MAP UNIT MB

	B20	B30	B40	B50	B60	B70	B80	B90	900	910	920	930	1010	1020	1030
POTASSIUM	0.000	0.000	0.000	0.000	0.000	0.570	0.392	0.316	0.589	0.000	0.000	0.000	0.000	0.000	0.000
URANIUM	0.000	0.000	0.000	0.000	0.000	3.072	1.627	1.832	1.198	0.000	0.000	0.000	0.000	0.000	0.000
THORIUM	0.000	0.000	0.000	0.000	0.000	6.731	5.093	4.080	5.251	0.000	0.000	0.000	0.000	0.000	0.000
U/K	0.000	0.000	0.000	0.000	0.000	5.708	4.560	5.998	2.131	0.000	0.000	0.000	0.000	0.000	0.000
U/TH	0.000	0.000	0.000	0.000	0.000	0.459	0.323	0.449	0.227	0.000	0.000	0.000	0.000	0.000	0.000
TH/K	0.000	0.000	0.000	0.000	0.000	12.473	13.747	13.513	9.107	0.000	0.000	0.000	0.000	0.000	0.000

	1040	1050	1060	1070
POTASSIUM	0.000	0.000	0.000	0.336
URANIUM	0.000	0.000	0.000	2.522
THORIUM	0.000	0.000	0.000	4.231
U/K	0.000	0.000	0.000	7.883
U/TH	0.000	0.000	0.000	0.603
TH/K	0.000	0.000	0.000	13.070

MAP UNIT MGS

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.401	0.000	0.000	0.000	0.000	0.000
URANIUM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.621	0.000	0.000	0.000	0.000	0.000
THORIUM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.697	0.000	0.000	0.000	0.000	0.000
U/K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.044	0.000	0.000	0.000	0.000	0.000
U/TH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.439	0.000	0.000	0.000	0.000	0.000
TH/K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	9.337	0.000	0.000	0.000	0.000	0.000

	1040	1050	1060	1070
POTASium	0.000	0.000	0.000	0.387
URANIUM	0.000	0.000	0.000	2.181
THORIUM	0.000	0.000	0.000	3.538
U/K	0.000	0.000	0.000	5.778
U/TH	0.000	0.000	0.000	0.617
TH/K	0.000	0.000	0.000	9.317

MAP UNIT MFS

	820	830	840	850	860	870	880	890	900	910	920	930	1010	1020	1030
POTASium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.407	0.471	0.314	0.301	0.000	0.000	0.000	0.000
URANIUM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.404	1.549	1.163	1.430	0.000	0.000	0.000	0.000
THORIUM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.375	5.098	3.034	3.015	0.000	0.000	0.000	0.000
U/K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.808	3.849	3.797	5.111	0.000	0.000	0.000	0.000
U/TH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.329	0.324	0.386	0.506	0.000	0.000	0.000	0.000
TH/K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	11.635	11.545	9.724	10.887	0.000	0.000	0.000	0.000

	1040	1050	1060	1070
POTASium	0.000	0.000	0.000	0.380
URANIUM	0.000	0.000	0.000	2.306
THORIUM	0.000	0.000	0.000	3.873
U/K	0.000	0.000	0.000	6.561
U/TH	0.000	0.000	0.000	0.622
TH/K	0.000	0.000	0.000	10.748

MAP UNIT UNONS

[illegible]

	1040	1050	1060	1070
POTASSIUM	0.000	0.000	0.000	0.395
URANIUM	0.000	0.000	0.000	3.013
THORIUM	0.000	0.000	0.000	4.959
U/K	0.000	0.000	0.000	7.674
U/TH	0.000	0.000	0.000	0.610
TH/K	0.000	0.000	0.000	12.615

APPENDIX H - Pseudo Contour Maps

TUPELO

Potassium Pseudo-Contour Map - Tupelo Quadrangle

EXPLANATION		
PRINT CHARACTER	VALUE	
0	LE	0.1000
1	0.1000	0.1550
2	0.1550	0.2100
3	0.2100	0.2650
4	0.2650	0.3200
5	0.3200	0.3750
6	0.3750	0.4300
7	0.4300	0.4850
8	0.4850	0.5400
9	0.5400	0.5950
10	0.5950	0.6500
11	0.6500	0.7050
12	0.7050	0.7600
13	0.7600	0.8150
14	0.8150	0.8700
15	0.8700	0.9250
16	0.9250	0.9800
17	0.9800	1.0350
18	1.0350	1.0900
GT	1.0900	

SCALE IN EQUIVALENT PERCENT

TUPELO

Uranium Pseudo-Contour Map - Tupelo Quadrangle

PRINT CHARACTER		VALUE	
0	LE	0.7500	
1	0.7500	0.9500	
2	0.9500	1.1500	
3	1.1500	1.3500	
4	1.3500	1.5500	
5	1.5500	1.7500	
6	1.7500	1.9500	
7	1.9500	2.1500	
8	2.1500	2.3500	
9	2.3500	2.5500	
	2.5500	2.7500	
	2.7500	2.9500	
	2.9500	3.1500	
	3.1500	3.3500	
	3.3500	3.5500	
	3.5500	3.7500	
	3.7500	3.9500	
	3.9500	4.1500	
	4.1500	4.3500	
GT	4.3500		

SCALE IN EQUIVALENT PPM

TUPELO

[illegible]

EXPLANATION

PRINT CHARACTER	VALUE
0	0. 5000
	0. 5000 1. 1000
1	1. 1000 1. 7000
	1. 7000 2. 3000
2	2. 3000 2. 9000
	2. 9000 3. 5000
3	3. 5000 4. 1000
	4. 1000 4. 7000
4	4. 7000 5. 3000
	5. 3000 5. 9000
5	5. 9000 6. 5000
	6. 5000 7. 1000
6	7. 1000 7. 7000
	7. 7000 8. 3000
7	8. 3000 8. 9000
	8. 9000 9. 5000
8	9. 5000 10. 1000
	10. 1000 10. 7000
9	10. 7000 11. 3000
	11. 3000

TUPELO

Thorium/Potassium Pseudo-Contour Map - Tupelo Quadrangle

PRINT CHARACTER		EXPLANATION	
		VALUE	
0	LE	0.0000	
1	0.0000	1.5000	
2	1.5000	3.0000	
3	3.0000	4.5000	
4	4.5000	6.0000	
5	6.0000	7.5000	
6	7.5000	9.0000	
7	9.0000	10.5000	
8	10.5000	12.0000	
9	12.0000	13.5000	
0	13.5000	15.0000	
1	15.0000	16.5000	
2	16.5000	18.0000	
3	18.0000	19.5000	
4	19.5000	21.0000	
5	21.0000	22.5000	
6	22.5000	24.0000	
7	24.0000	25.5000	
8	25.5000	27.0000	
9	GT	27.0000	

TUPELO

EXPLANATION

PRINT CHARACTER		VALUE
0	LE	0.0000
1	0.0000	0.5000
2	0.5000	1.0000
3	1.0000	1.5000
4	1.5000	2.0000
5	2.0000	2.5000
6	2.5000	3.0000
7	3.0000	3.5000
8	3.5000	4.0000
9	4.0000	4.5000
0	4.5000	5.0000
1	5.0000	5.5000
2	5.5000	6.0000
3	6.0000	6.5000
4	6.5000	7.0000
5	7.0000	7.5000
6	7.5000	8.0000
7	8.0000	8.5000
8	8.5000	9.0000
9	9.0000	9.5000
GT		9.0000

Uranium/Potassium Pseudo-Contour Map - Tupelo Quadrangle

TUPELO

Uranium/Thorium Pseudo-Contour Map - Tupelo Quadrangle

PRINT CHARACTER		VALUE
0	LE	0.0000
1		0.0550
2		0.1100
3		0.1650
4		0.2200
5		0.2750
6		0.3300
7		0.3850
8		0.4400
9		0.4950
GT		0.5500

TUPELO

3333	44	5	6	777	7	77	65	32	1	000000000	111	2222222222222222	22
33333	4	5	6	77	77	65	32	1	000000000	11	22222222222222222222222222222222	333	
33333	44	55	66	777	6	54	2	1	000000000	1	222		

EXPLANATION	
PRINT CHARACTER	VALUE
0	LE -860. 0000
	-860. 0000 -815. 0000
1	-815. 0000 -770. 0000
	-770. 0000 -725. 0000
2	-725. 0000 -680. 0000
	-680. 0000 -635. 0000
3	-635. 0000 -590. 0000
	-590. 0000 -545. 0000
4	-545. 0000 -500. 0000
	-500. 0000 -455. 0000
5	-455. 0000 -410. 0000
	-410. 0000 -365. 0000
6	-365. 0000 -320. 0000
	-320. 0000 -275. 0000
7	-275. 0000 -230. 0000
	-230. 0000 -185. 0000
8	-185. 0000 -140. 0000
	-140. 0000 -95. 0000
9	-95. 0000 -50. 0000
	GT -50. 0000

SCALE IN GAMMAS

TUPELO QUADRANGLE - NTMS NI 16-4
SINGLE RECORD LISTING - GEOMETRICS DATA ACQUIRED 0330. LINE 820

TUPELO QUADRANGLE - NTMS NI 16-4
SINGLE RECORD LISTING - GEOMETRICS DATA ACQUIRED 0330. LINE 820