AERIAL RADIOMETRIC AND MAGNETIC SURVEY: 77

ELKO
NATIONAL TOPOGRAPHIC MAP,
NEVADA, UTAH

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION OFFICE
GRAND JUNCTION, COLORADO
UNDER SMALL BUSINESS ADMINISTRATION SUBCONTRACT NO. SB0308(a) 77-C-508

WITH
GEO-LIFE, A JOINT VENTURE
BETWEEN
HIGH LIFE HELICOPTERS, INC.
PUYALLUP, WASHINGTON
AND
GEODATA INTERNATIONAL, INC.
DALLAS, TEXAS

Geodata International, inc.

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September 7, 1979

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VOLUME I

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SECTION I

INTRODUCTION

A. GENERAL

1. Area Surveyed

Geo-Life, a joint venture between High Life Helicopters, Inc., Puyallup, Washington, and Geodata International, Inc., Dallas, Texas., conducted an airborne gamma ray and total magnetic field survey during the periods May 19 to May 22, 1979 and August 2 to August 6, 1979. The survey covered a region of the states of Nevada and Utah identified as the Elko National Topographic Map NK11-12. The specific area of this report as outlined on Figure 1 was surveyed from an aircraft using large-volume radiation detectors with associated airborne electronic equipment. Each map line was flown in an east-west direction with an average length of 105 miles, and each tie line was flown in a north-south direction with an average length of 69 miles. Map lines and tie lines were surveyed using a Lama helicopter.

The Elko NTMS report describes the program, results, flight line profile data, and statistical analysis results.

2. Summary of the Location, Geology and Physiography of the Elko Map Sheet

The area represented by the Elko Quadrangle is located in northeastern Nevada and is bounded by latitudes 40° to 41° north and longitudes 114° to 116° west. The area lies in the eastern, nonvolcanic part (miogeosyncline) of the central part of the modern Basin and Range Province, bounded at the north by the Snake River lava plain of Idaho.

The geological history of the area is complex. The exposed rocks range in age from Precambrian to recent sediments. The structure varies from gentle tilting of the formations to strong folding and faulting, including thrusting. A large part of the structural deformation is attributed to the Nevadan and Laramide Orogenies.

Fig.1. Index Map Showing Area Surveyed

Fig. 2. NTMS Indicating Flight Line Location

B. OPERATIONAL PROGRAM

The airborne data gathered were reduced using ground-based computer facilities to give the basic uranium, thorium and potassium equivalent gamma radiation intensities, ratios of these intensities, aircraft altitude above the earth's surface, total gamma ray and earth's magnetic field intensity, correlated as a function of geologic units indicated from the developed geologic map. Results of analyses of these field data are presented as profile plots of the gamma radiation and earth's magnetic field. The surveyed area of Figure 1, which indicates latitude/longitude position, has been based according to the National Topographic Map Series (NTMS) which covers the United States with 1 latitude/2 longitude sheets. The topographic maps have a scale of approximately 1 inch = 4 miles. Each final base map is an overlay of the NTMS base map from which certain geographic data have been transposed, and includes the available geologic data. Each final anomaly map has the surveyed flight lines superpositioned with the standard deviations of each fifth data point relative to the average value within each geologic unit as determined for each NTMS map. These anomaly maps are identified as National Gamma Ray Map Series Maps (NGRMS).

Computer profile plots of the gamma radiation and magnetic field data have been created for all surveyed map lines and tie lines. Each line has indicated on the profiled line the location of each geologic type as a function of record number. The distribution of data within each geologic unit has been calculated and is included. The scale of the profile data in this final report is 1:500,000 and the scale of the NGRMS is both 1:250,000 and 1:500,000. The bound final report containing the 1:500,000 profile data also contains the flight line map, geologic base of the pertinent NTMS and the NGRMS maps indicating the standard deviations at the scale of 1:500,000. Two sets of profiled data for each line flown are included with one set displaying magnetic field, gamma radiation and other data. The second set includes only flight line magnetic field, temperature, pressure, and altitude data, plus magnetic field data as measured at a base station. Each set contains the flight line location relative to the geologic map. All data have been located giving latitude and longitude positions in fractional degrees as made possible from visual spotting, photographic recording of the aircraft location, and from VLF/OMEGA guidance of the aircraft and recording of location on magnetic tape. Data have been acquired and processed according to the data flow shown in Figure 3.

The magnetic data tapes containing (1) raw data, (2) the single record reduced data, (3) the statistical analysis data, and (4) the magnetic field data are converted to the EBCDIC format and retained for filing within the USDOE permanent data bank.

FIGURE 3. Data Flow Diagram

This final report includes a general geologic description of the area, including descriptions of the various geologic units and correlates the airborne data to the geologic units as provided by the geologic maps. Also included is a frequency distribution study of the data as a function of the geologic units encountered over the NTMS area including the tie line data.

This report also consists of a discussion of the area surveyed and includes all single record reduced data and averaged record data listings on MICROFICHE.

SECTION II

THE GEODATA AIRBORNE SYSTEM

A. GENERAL

The Geodata Airborne System is mounted in an Aerospatiale Lama helicopter shown in Figure 4. The functional block diagram is shown in Figure 5. Eight (8) 4" x 4" x 16" long NaI(Tl) detectors are used to measure spectrally the surface-emitted gamma ray intensity at an aircraft elevation of about 400 feet above the earth's surface. Two (2) 4" x 4" x 10" long NaI(Tl) detectors, which are largely shielded from the surface radiation, are used to measure the atmospheric ^{214}Bi radiation.

Two detector packages, each containing four of the eight 16" long detectors and each with 1,024 cu.in. of NaI(Tl), are used to measure gamma radiation from the surface. The total detector volume is 2,048 cu.in., and a $V/v \geq 20.0$ at an aircraft speed of 102.4 mph, (V = detector volume, in.³; v = aircraft speed, mph).

The system block diagram of Figure 5 shows the center of the system to be the Digital Equipment Corporation LSI-11 computer system. The 2,048 cu.in., 4π solid angle, detector data are accumulated for each one-second data integration period in a manner giving no readout dead time onto magnetic tape. A single magnetic tape is used to record total spectral data and all peripheral data. Analog presentation of the total gamma ray intensity, magnetic field and altitude data are plotted onto multitrack paper as data are gathered allowing immediate examination for data quality. A spectral presentation giving the sum of all one-second data sets is created by the ground-based computer for each flight line (EOFL) as quality control, Figure 6. Spectral data from the unshielded (4π) detector array are accumulated each 1.0 second, and spectral data from the shielded (2π) detector array are accumulated each 10.0 seconds. Data from the shielded detector are used to determine the concentration of atmospheric ^{214}Bi which allows calculation of the surface-emitted ^{214}Bi values before altitude corrections. All data are then corrected to a constant aircraft altitude above the surface of 400 feet. A highly accurate radar altimeter, the Collins ALT-50 system, makes measurement during each second. Automatic digital gain calibration of the detector arrays is accomplished by stabilizing on the ^{208}Tl photopeak by placing the 2.615 MeV photopeak into channel 224.

A proton precession magnetometer having a 0.25 gamma readout resolution and less than ± 2.0 gamma noise envelope is also sampled once each second giving a measurement of the total intensity of the earth's magnetic field. The sensor is carried as a "bird" on a 100-foot cable to minimize the magnetic effects of the helicopter. A permanent record of flight location is also made using 35mm film which records

Figure 4. Aerospatiale Lama Helicopter

Fig. 5. Functional Block Diagram

Figure 6. Typical End-of-Flight Line Spectral Plot

a continuous recoverable track with 20% frame overlap at an elevation of 400 feet. Position data from the Global Navigation encoding of latitude and longitude is placed onto magnetic tape each second. The record number-of-the-day along the flight line is displayed during flight and key aircraft positions are marked on the flight map with their appropriate record number.

The attenuation of gamma radiation is calculated using equations accounting for air density and uses experimentally determined values for linear attenuation coefficients. The energy region 3 MeV to 6 MeV is used to allow cosmic events to be removed from the data in the energy range 0-3 MeV. The average energy resolution of the 4π detector array related to the ^{137}Cs energy line at 662 keV did not exceed 11.1%, where the resolution for each detector was 9.5% or better.

The airborne equipment has three basic operating modes: (1) CALIBRATE, which allows proper gain calibrations of the radiation detectors to be set; (2) OPERATE, which allows data to be received, reduced and recorded, and (3) PLAYBACK, which allows the operator to examine the newly acquired data.

B. FLIGHT RECOVERY METHODS

Visually recorded data and photographically recorded data have been used to locate the flight line position. The Global Navigation GNS-500A is used to maintain the aircraft on flight line with the latitude and longitude data being recorded on magnetic tape to assist in flight line location. These lines have been positioned by many locations as a function of record numbers. These data are computer plotted giving the flight path as a solid line with ticks representing every tenth record location, and each "circle" representing every 50th record location. Figure 7 indicates the computer plot of a typical map line. These data are then transferred to form the flight line base shown in Figure 2. Location points used to position the flight line at least every 10 miles are shown on the flight line map as an "X".

C. DATA REDUCTION

The processing flow chart representative of the work performed for this survey is shown in Figure 3. The original field data tapes contain the various tag words, 4π spectrum and 2π spectral data for each one second along the flight line. The REFORM program sums the proper energy intervals of the spectra for each second and produces a trailer record for each line which contains the accumulated 4π and 2π spectra for the line. The CDTCRT is a data certification program which is run immediately upon receipt of the field data tapes and produces the EOFL spectral plots, Figure 6. The program identification and function are given as:

PROGRAM	FUNCTION
REFORM	Produce energy group sums and EOFL spectra.
FIXMOD	Primary processing for matrix reduction, BIAIR computation, live times, background and altitude correction.

Figure 7. Computer Presentation of Typical Map Line

Figure 8. Typical Map Line Showing Statistical Deviations

STACK Flight path recovery to produce plots of actual paths at a scale of 1:250,000.

DOPTAP Single record processing with latitude/longitude, IGRF and single point statistical adequacy computation. Produces microfiche.

MMPLT Averaged record processing with averaged statistical adequacy computation. Produces radiometric stacked profiles plot tapes.

GNDMRG Merges aircraft magnetometer and ground magnetometer in proper time sequence and transfers temperature, pressure and altitude information.

RMPLT Produces tapes for magnetometer stacked profile plots.

GEOLOG Produces averaged value microfiche with geology and plot tape for standard deviation "dot plots" related to geologic type.

HISTO, MERGE Programs preliminary to obtaining the histograms as a function of geologic type for the entire area.

DMPLT Produces plot tape for the area histograms.

As stated in the above list of program functions, the FIXMOD program performs the primary processes for determining the reported eTh, eU and K counting rate associated with the earth's surface as corrected to 400 feet above the surface. For this reason, the analytical work of this program is described in more detail below.

Each one second of 4 π spectral data is summed by the REFORM program according to the following energy intervals:

Cosmic:	3.0	to	6.0 MeV
²⁰⁸ Tl photopeak	2.410	to	2.796 MeV
²¹⁴ Bi photopeak	1.660	to	1.860 MeV
⁴⁰ K photopeak	1.357	to	1.556 MeV

In general, these raw sums contain counts not only from ground sources, but also from aircraft background and atmospheric radioactivity. To determine the counts in the energy intervals which are caused only by the isotope associated with the interval, a 4 x 4 matrix method is used. This matrix may be formed through the use of a standard cosmic spectrum, plus the Walker Field Pad determinations of α , β , γ , and f, or from four standard spectra representing respectively cosmic, thorium, uranium, and potassium pure spectra at a 400 foot altitude.

This matrix multiplication is represented by:

$$\begin{bmatrix} A_{11} & A_{12} & A_{13} & A_{14} \\ A_{21} & A_{22} & A_{23} & A_{24} \\ A_{31} & A_{32} & A_{33} & A_{34} \\ A_{41} & A_{42} & A_{43} & A_{44} \end{bmatrix} \cdot \begin{bmatrix} \text{COS} \\ \text{TL} \\ \text{BI} \\ \text{K} \end{bmatrix} = \begin{bmatrix} \text{MCOS} \\ \text{MTL} \\ \text{MBI} \\ \text{MK} \end{bmatrix}$$

where the A_{ij} are the elements of the 4 x 4 matrix; the column matrix on the left represents the four raw data sums and the column matrix on the right is the counts in each energy interval caused only by the indicated isotope. These matrix results counts are for the measured live time. To obtain the counts per second, it is necessary to divide by the live time, LTC1, thus:

$$\begin{aligned} \text{MCOS/LTC1} &= \text{COS1} \\ \text{MTL/LTC1} &= \text{TL1} \\ \text{MBI/LTC1} &= \text{BI1} \\ \text{MK/LTC1} &= \text{K1} \end{aligned}$$

The TL1, BI2 and K1 counts per second contain the aircraft associated backgrounds caused by thorium, uranium and ⁴⁰K. Geodata has determined these backgrounds for this installation to be 2.53 counts per second in the ²⁰⁸Tl energy interval due to background ²⁰⁸Tl, 2.08 counts per second in the ²¹⁴Bi energy interval due to background ²¹⁴Bi and 3.67 counts per second in the ⁴⁰K interval due to background ⁴⁰K. For this work, the background counting rates were determined by high altitude flights free from atmospheric ²¹⁴Bi. The backgrounds are checked during the survey by observing counting rates over large water bodies under the flight path.

The backgrounds are subtracted from the above determined count rate values

$$\begin{aligned} \overline{\text{TLI}} &= \text{TL1} - 2.53 \\ \overline{\text{BII}} &= \text{BI1} - 2.08 \\ \overline{\text{KI}} &= \text{K1} - 3.67 \end{aligned}$$

The $\overline{\text{BII}}$ value contains counts caused by atmospheric ²¹⁴Bi which must be subtracted before altitude correction is applied. The 2 π crystal data are used to determine the magnitude of the count to be subtracted. Since the predominant variable source affecting the 2 π crystal is the atmospheric ²¹⁴Bi, it is possible to utilize most of the spectrum in the BIAIR determination and thereby produce some improvement in the statistical error. The energy range used for the 2 π crystal is from 1.05 to 2.79 MeV. Within this range, the aircraft background has been determined as 3.11 counts per second, and the 2 π cosmic count greater than 3.0 MeV must be multiplied by 1.897 to determine the cosmic count in the 1.05 to 2.79 MeV range.

The atmospheric ²¹⁴Bi (BIAIR) associated with the unshielded detector array is determined using the shielded detector by the relation:

$$\text{BIAIR} = \text{G(X)} \cdot \frac{[\text{VA} - 1.897 \text{COS2} - 3.11 - (k_1 \overline{\text{TLI}} + k_2 \overline{\text{BII}} + k_3 \overline{\text{KI}})]}{(1 - k_2 \text{G(X)})}$$

where: G(X) is the relationship between the 4 π and 2 π detector measurement solid angle and the volume change of the detector arrays.

VA is the total count, 2 π , ch (91-239), c/s; COS2 is the 2 π cosmic count 3.0-6.0 MeV, c/s; k_1 , k_2 , k_3 are constant correction factors for the penetration/spill of the surface emanated radiation, and are respectively .208, .058, and .046.

$\overline{\text{TLI}}$, $\overline{\text{BII}}$, $\overline{\text{KI}}$ are results of data reduction, 4 π , c/s

The final ²¹⁴Bi counting rate caused by surface sources then

$$\text{BISUR} = \overline{\text{BII}} - \text{BIAIR}$$

The quantities $\overline{\text{TLI}}$, BISUR and $\overline{\text{KI}}$ are then corrected to an equivalent counting rate at 400 feet through the equations indicated below:

$$\text{TLS} = \overline{\text{TLI}} \cdot e^{-\mu_1(400 - \frac{\rho}{\rho_0} x)}$$

$$\text{BIS} = \text{BISUR} \cdot e^{-\mu_2(400 - \frac{\rho}{\rho_0} x)}$$

$$\text{KS} = \overline{\text{KI}} \cdot e^{-\mu_3(400 - \frac{\rho}{\rho_0} x)}$$

where:

TLS, BIS, KS = respective counting rates at 400 feet caused by surface sources

ρ = air density

ρ_0 = .001293 gm/cc, air density

μ_1, μ_2, μ_3 = respective linear attenuation coefficients

x = aircraft height above the surface in feet

Following data reduction, average values for each radiation variable and variable ratio are plotted for each flight line to demonstrate the consistency of average values and that a smooth flow of results continues from day to day and from start to finish of each day. Quality control on the eU (BIAIR) in the atmosphere is also monitored through examination of data acquired over water with the requirement being that near-zero intensities for BIS should exist. (See Sect. IV(E)).

Each profile has a latitude or longitude degree line to give accurate surface location of all data.

Magnetic field data are determined at the crossings of the tie line and map line data, and the corrections for the diurnal variations are determined. Any heading errors have previously been removed from all data. The magnetic field data are then IGRF corrected to give the residual magnetic field.

D. DATA PRESENTATION

The surveyed area was positioned geographically to completely cover the specific National Topographic Map. The topographic map has been used as the flight base and sufficient geographical and 15' location information have been shown. The flight line pattern has been super-positioned onto these created base maps where the standard deviation levels for each independent variable and each ratio of these variables have been plotted (NGRMS) based on the data contained within the total map area. Every fifth data point along each map line has its standard deviation value shown at the location of that value. Therefore, there are six NGRMS sheets which indicate the location and magnitude of anomalous data, Figure 10.

The radiometric multi-variable map line profile, which represents all variables as a function of their latitude or longitude location, depending on line direction, for each line, is presented at a scale of 1:500,000. Each profile presents:

1. Aircraft altitude above the surface
2. eTh (^{208}Tl from ^{232}Th decay series)
3. eU (^{214}Bi from ^{238}U decay series)
4. K (^{40}K from natural potassium)
5. BiAir (atmospheric ^{214}Bi)
6. Residual magnetic field
7. Gross count (greater than 400 keV)
8. eU/eTh ($^{214}\text{Bi}/^{208}\text{Tl}$) ratio
9. eU/K ($^{214}\text{Bi}/^{40}\text{K}$) ratio
10. eTh/K ($^{208}\text{Tl}/^{40}\text{K}$) ratio
11. Geologic data including aircraft flight path

The magnetic multi-variable map line profile, which represents five variables as a function of their latitude or longitude location, depending on line direction, for each line, plus geologic data at a scale of 1:500,000, is presented as:

1. Aircraft altitude
2. Atmospheric temperature
3. Atmospheric pressure
4. Magnetic field base line station data
5. Residual magnetic field data
6. Geological data including aircraft flight path

The output of these various computations supplies, beyond the two profile sets, the following data:

- * Histograms of the radiation data distribution within each geologic unit.
- * Histograms of the average velocity distribution for each one-second record for each map and tie line.
- * Histograms of the average altitude distribution for each one-second record for each map and tie line.

- * Tables giving the average radiation concentration of each geologic unit for each flight line.

- * Set of maps showing the standard deviation data as a function of location and radiation variable.

These types of presentation will be explained in this report.

SECTION III

GEOLOGY OF THE SURVEYED AREA

A. LOCATION AND GENERAL PHYSIOGRAPHY

An aeroradiometric survey was conducted over an area depicted by the Elko Quadrangle on a scale of 1:250,000 (N.T.M.S.). The surveyed area is located in northeastern Nevada and is bounded by longitudes 114° to 116° west and latitudes 40° to 41° north. The area is mainly within Elko County, Nevada, a small part of the northern portion of White Pine County, Nevada, and a small part of the western portion of Tooele County, Utah.

The area lies in the eastern, nonvolcanic part (miogeosyncline) of the Paleozoic Cordilleran geosyncline and in the northcentral part of the modern Basin and Range Province, bounded at the north by the Snake River lava plain of Idaho (Dott, 1955). The area belongs to the Great basin section of the Basin and Range Province (Fenneman, 1946). Long, narrow and isolated mountain ranges (largely dissected block mountains) are separated by valleys, which trend northnortheast and are approximately parallel. The drainage of the area has a gridiron arrangement; the rivers receive tributaries at right angles from both sides of ranges. The chief stream in the region is the Humboldt River, which flows through the northwestern part of the area. The summer climate is hot and the winter climate is severely cold. The lower country is covered by sagebrush, with mountain slopes covered with pine trees and junipers (Emmons, 1910).

B. GEOLOGY

The geological history of the region is complex. The age of various rock types exposed range from early Cambrian, or possibly Precambrian to Recent sediments. The structure varies from gentle tilting of the formations to strong faulting and folding to even thrust faulting. Normal faults are widespread and appear to border some mountain blocks, especially near Elko, but not everywhere (Dott, 1955).

The geologic formations are grouped into two series. One is a younger aggregate of Tertiary lavas, tuffs, and intrusives, and Quaternary tuffaceous deposits, lake beds and terrestrial strata including glacial deposits. The other is an older group consisting of pre-Cretaceous sedimentary formations, which have been broadly invaded in some areas by igneous intrusions (Winchester, 1923), and Precambrian metamorphic rocks. Most of the mountain ranges in the area are composed of the more resistant Paleozoic rocks, with valleys and depressions occupied by Cenozoic fluvial and lacustrine sediments. Outstanding among the various mountains are the Ruby Mountains, which are notable for their abundant beryl-bearing pegmatites (Olson and Hinrichs, 1960) and for their structure (Sharp, 1939, 1940 and 1942).

The Antler Orogeny was the first major orogenic episode known to have involved rocks of Paleozoic age in northcentral Nevada; others followed in Permian and Jurassic times. Each younger orogeny affected the older rocks and structures (Roberts, et al., 1958). A large part of the structural deformation is attributed to the Nevadan and Laramide Orogenies (Eugene, 1976).

The reader is referred to the following studies for a more in-depth review of specific aspects of the geology of the area. Paleozoic rocks from different locations were studied by Roberts et al (1958); Thorman (1970); and Smith and Ketnew (1975). Pennsylvanian stratigraphy was studied by Dott (1955), and Permian formations were studied by Fail (1960). Cenozoic formations were studied by Van Houtne (1956) and by Regnier (1960), with Tertiary thrusting being studied by Hazzard and Moran (1952). Pleistocene glaciation was investigated by Blackwelder (1931). Recent research about Basin and Range rifting, as it relates to the plate tectonic theory, was undertaken by Zoback and Thomson (1977). The investigation of uranium in volcanic rocks in Nevada was undertaken by Schrader (1977).

C. BRIEF DESCRIPTION OF THE GEOLOGIC UNITS

A brief description of the exposed geological units in the Elko Quadrangle is given based on the work of Emmons (1910), Smith and Ketner (1975) and from the geological map compiled by Willard Owens Associates, Inc.

Precambrian

PGu: Precambrian Metamorphic Rocks, Undifferentiated

This unit consists of gneisses, schists, metaquartzites and marbles, which extend to Cambrian time.

Paleozoic

Gc: Cambrian Carbonate Rocks, Minor Quartzites and Phyllites

This unit includes the Edgemont Formation and the Porter Peak Limestone.

Gp6p: Prospect Mountain Quartzite

This unit is a brownish-white orthoquartzite with intercalated thin layers of arenaceous shale.

Op: Pogonip Group (Ordovician)

This unit contains interstratified limestones and argillites at the base with a fine-grained limestone at the upper part. There are many poorly preserved fossils in this group.

Oe: Eureka Quartzite (Ordovician)

This unit is a massive and compact vitreous orthoquartzite. The grain size averages medium with a few scattered large grains. Interstitial clay makes up about 1 percent of the rock.

lpm: Lower Paleozoic Marble (Cambrian Devonian)

This unit consists of calcite and dolomite marble.

lpw: Lower Paleozoic Western Facies (Cambrian-Devonian)

This unit consists dominantly of fine-grained clastic sediments with some interbedded limestones and dolomites.

lpu: Lower Paleozoic Carbonates, Undifferentiated (Cambrian-Devonian)

This unit is composed of dolomites and limestones. It includes the Simonson, Serg, Lone Mountain, Laketown, and Ely Springs dolomites, and the Guilmette, Devil's Gate, Nevada, Roberts Mountain and Hanson Creek formations.

MDu: Mississippian-Devonian Sedimentary Rocks, Undifferentiated

This unit includes the Woodruff Formation, Joanna Limestone, and Pilot Shale. Rocks composing the Woodruff are principally siliceous mudstones and cherts with lesser amounts of shales, siltstones, dolomitic siltstones and dolomites. It also contains a few lenses of limestones, and a very few beds of sandy limestones and calcareous sandstones.

Lpu: Pennsylvanian Sedimentary Rocks, Undifferentiated

This unit contains dominantly limestones, minor clastics and andesitic tuffs. It includes the Mitchell Creek, Quilici, Moleen, Tomera and Hogan formations.

Lpmu: Pennsylvanian-Mississippian Clastic Sedimentary Rocks, Undifferentiated

This unit contains dominantly conglomerates, sandstones, and shales. It includes the Diamond Peak, Chainman, Schoonover and Webb formations.

Pu: Upper Permian Sedimentary Rocks, Undifferentiated

This unit consists dominantly of carbonates and phosphatic rocks, with minor cherts. It includes the Phosphoria, Gerster and Pequop formations, and the Park City Group.

PMI: Permian-Mississippian Limestone

This unit includes the Tripon Pass and Van Duzer limestone, and the Banner and Nelson formations.

PIPu: Permian-Pennsylvanian Carbonates

This unit consists of limestones and dolomites. It includes the Buckskin Mountain, Beacon Flat, Carlin Canyon, Strathearn, Sunflower, Winecup and Ferguson Mountain formations.

TrPu: Triassic-Permian Clastic Sedimentary Rocks, Undifferentiated

This unit contains minor greenstones and silty limestones. It includes the Edna Mountain, Moenkopi and Thaynes formations.

Mesozoic

JTrs: Sandstone and Shale (Jurassic)

This unit correlates with the Nugget and Aztec Sandstone, and the Chinle formation.

Kn: Newark Canyon Formation (Cretaceous)

This unit consists of nonmarine conglomerates, sandstones, siltstones, shales and limestones.

KJg: Granite and Related Rocks (Cretaceous Jurassic)

This unit is composed of granites, diorites, granodiorites and quartz monzonites.

Cenozoic

Tertiary

Ts: Tertiary Sedimentary Rocks

This unit consists dominantly of tuffs and welded tuffs, with minor clastics and carbonates.

Tf: Felsic Volcanic Extrusives

This unit consists dominantly of rhyolitic to dacitic flows and domes.

Tb: Mafic Volcanic Extrusives

This unit consists mainly of andesites and basalts.

Ti: Igneous Intrusives

This unit consists mainly of granites, rhyolites and quartz monzonites.

Quaternary

Qt: Tuffaceous Deposits

This unit consists of sinter and volcanic derivatives.

Qg: Glacial Deposits

This unit consists mainly of glacial moraines and glacial rock debris.

Qa: Alluvium

This unit consists of silts, sands and gravels along streams, including terrace deposits.

Qc: Colluvium and Landslide Deposits

Ql: Lacustrine Deposits

This unit includes beach gravels, bar gravels and playa sands.

Age Unknown

bx: Breccia

This unit consists mostly of fault breccias.

i: Intrusive Rocks

This unit consists mostly of plutons of silicic rock.

gn: Gneiss

D. RADIOACTIVE MINERAL OCCURENCES

There are no known occurrences of uranium deposits in the Elko Quadrangle.

SECTION IV

RESULTS OF DATA ANALYSIS

A. GEOLOGIC BASE MAPS

The Elko geologic base map is created to the scale of the NTMS with geologic data and includes latitude, longitude and major geological features. The geologic base map is shown without the super-positioned flight lines at the scale of 1:250,000 and 1:500,000.

B. NATIONAL GAMMA RAY MAP SERIES (NGRMS)

The geologic base has been photographically screened to allow emphasizing of the flight line locations and information regarding data analyses. These maps are the base to which the statistical information for six variables has been added for every fifth data point and are identified as the National Gamma Ray Map Series which are presented at the scale of 1:250,000 and 1:500,000. The detail data for each of these map lines are presented as profile information for six variables and location of geologic information with statistical data included along each map line as discussed in Section IV (F).

C. RADIOMETRIC STACKED PROFILES

The profiles of Map Lines 1 - 23 and Tie Lines 1 - 9 are presented within this report at the scale of 1:500,000. The same vertical scale is used for a given variable for all map lines, but the vertical scale changes to fit the specific variable plotted. The scale used for each variable are:

1. Altitude

100 feet/division, aircraft altitude above the surface; no averaging.

2. T_{L} (^{208}Tl)

10 counts/second/division (C/S/div.). Seven seconds of data are averaged with weighting of 1:2:3:4:3:2:1 and the average value plotted at the center of the group of 7. 5.5 c/s = 1 ppm eTh.

3. Bi (^{214}Bi)

5 C/S/div; 7-second weighted average as for T_{L} . 8.0 c/s = 1 ppm eU.

4. K (^{40}K)

25 C/S/div; 7-second weighted average as for T_{L} . 85.0 c/s = 1%K.

5. BiAir

5 C/S/div; 50 -second average.

6. Residual Magnetic Field (RMAG)

100 gammas/division; the residual magnetic field is the total magnetic field as measured by a proton precession magnetometer from which has been subtracted the International Geomagnetic Reference Field (Stassinapoulos; NSSDC-72-12).

7. Total Count, 400 keV to 2.80 MeV (GC)

500 C/S/div; no averaging

8. $^{214}\text{Bi}/^{208}\text{Tl}$ Ratio (Bi/T_{L})

.08 /div; 7-second weighted averaging as for T_{L} .

9. $^{214}\text{Bi}/^{40}\text{K}$ Ratio (Bi/K)

.04 /div; 7-second weighted averaging as for T_{L} .

10. $^{208}\text{Tl}/^{40}\text{K}$ Ratio (T_{L}/K)

.06 /div; 7-second weighted averaging as for T_{L} .

11. Geology

The surface geology along the flight line, with a width of about six miles, is displayed above the profiles and the flight path is superimposed.

D. MAGNETIC STACKED PROFILE DATA

For each Map Line and Tie line, a magnetic multiple-parameter stacked profile is produced at a scale of 1:500,000 in Volume II of this report, and at a scale of 1:250,000 as separate sheets. The same vertical scale is used for a given variable for all Map Lines, but the vertical scale varies to fit the specific variable plotted. The scales used for each variable are:

1. Altitude

100 feet/division; aircraft altitude above the surface; no averaging.

2. Temperature

1 degree celsius/division; no averaging.

3. Barometric Pressure

0.25 inches mercury/division; no averaging.

4. Base Station - Magnetic Field

5 gammas/div; no averaging

5. Residual Magnetic Field

50 gammas/division; no averaging.

E. MAGNETIC TAPES AND LISTINGS

The description of the magnetic tapes and their listings is presented in Appendix II.

F. STATISTICAL AND GEOLOGICALLY-CREATED DEVIATIONS IN RESULTANT DATA

A set of tables are included; see Tables 1-6. These list the average value for each geologic unit encountered on each flight line as a function of flight line for each of the radiation variables.

Standard deviations of the data have been calculated assuming the data to have a normal distribution within the geologic type. When geochemical anomalies modify the normal distribution, then the frequency distribution of the data will be distorted about the mean. Geologic unit data have been analyzed to determine the variance.

$$\sigma^2 = \frac{1}{N-1} \left\{ \sum_{i=1}^N x_i^2 - \frac{N\bar{x}^2}{N} \right\}$$

where the standard deviation is σ , N is the number of samples, x_i is the value at the sample number i, and $\bar{x}$ is the mean value for the geologic type. The listing for averaged record data output gives the mean value and magnitude of deviations, relative to the mean, with the $\pm 1\sigma$, $\pm 2\sigma$, and $\pm 3\sigma$ levels being placed on the NGRMS Sheets for the six variables as previously explained. The distribution of data within the geologic units encountered are included.

A statistical adequacy test is run on all data. If the test fails, the value of the displayed ratio variable is set to zero and not included in summary tables which gives the average value. The test is made on $T_2(eTh)$, Bi (eU) and K where:

	HX	CC	CPCP	GB	J	TPMH	LPU	JTRS	KJG	KW	LPM	LPU	LPW	MDU	DE	OP	PCU	PIPU	PML
ML 1		20				31	47					14		38	21			26	
ML 2		44				38	25					13		23	27			22	
ML 3		40				42	23					19		19	29			25	
ML 4		23				33	28					31	51	26		18		40	
ML 5		33				27	19					23	31			21		50	
ML 6		36							80			45	62			25		27	
ML 7		65				23			35			39				25		24	
ML 8						39	39					37	30			38			
ML 9		30	30		76	35	32		135			25		33			40		
ML10			36		109	33	42		37			16		27				28	
ML11			35			34	32		60			18						20	
ML12			42				21		45		34	15				9		23	
ML13			60			20	38		74		54	17				17		25	
ML14			73			24	31				48	29				33		22	
ML15			57	65		38	39				45	69				28		21	
ML16		28	49	40		38	27				35	30				25		63	
ML17			45			33	24				42	45						30	
ML18			60			30	22				36	23		33			24	26	
ML19			66	61		35	28					30		29			42	23	
ML20			48			43	24				42	41				25	77	29	
ML21		57				35	25					29			12	35	87	38	
ML22		62				27	31					28	21		24	25	72		
ML23		28	29			28	24		34			42	27		23	19	78	26	
TL 1						36	29											30	
TL 2						46													
TL 3			35	54					18		44								
TL 4			62			42	80										47		
TL 5					65							22	21		20			35	
TL 6															22	19			
TL 7							28		190			18				23		24	
TL 8		28	32				16		54			84						30	
TL 9						12													

Table 1. Geologic Unit Average Value as a Function of Map Line for ^{208}Tl (Counts/Second)

	PU	QA	QC	QG	QL	QT	TB	TF	TI	TRPU	TS		RX	CC	CPCP	GW	I	IPMU	IPU	JTRS	KJG	KN	LPM	LPU	LPW	MDU	OE	OP	PCU	PIPU	PKL
ML 1	15	16			16			26		14	19	ML 1		64				92	126					40		95	64	OP	PCU	PIPU	PKL
ML 2	15	17			13			23	15		20	ML 2		117				111	70					35		64	77				65
ML 3	15	18			13			21	13	18	22	ML 3		104				107	63					58		52	109				67
ML 4	16	19		18	14	14		24		16	22	ML 4		66				95	89					110	124	98		46			122
ML 5	16	19			14			23		23	22	ML 5		95				80	52					65	78			64			134
ML 6	15	17		5	14			22	12		17	ML 6		89						135				105	146			101			79
ML 7	17	18			15			28	15	15	18	ML 7		176				58		94				96				75			69
ML 8	15	19			17				17		19	ML 8						99	98					101	68			102			
ML 9	15	21			19			36	22	16	21	ML 9		118	125		170	92	86		217			74		86			119		
ML10	22	21	16		19		20	44	23	20	24	ML10			166		198	73	116		147			44		75					65
ML11	18	18	15	14	17				16	13	17	ML11			180			74	87		177			54							65
ML12	15	18	5	14	14		17			10	17	ML12			170				57		171		144	46			21				68
ML13	16	16		12	14		15			9	16	ML13			183			55	91		201		194	55			53				83
ML14	18	18	-4	15	19			31			17	ML14			210			74	82				182	90			99				71
ML15	16	19			19			23			21	ML15			172	195		92	96				143	120			85				82
ML16	18	15	13	10	18			16		22	18	ML16		103	159	141		94	75				125	98			78				123
ML17	18	17		12	18	18		22		14	17	ML17			139			87	63				147	117							77
ML18	16	16	10		18	20	16	22			17	ML18			129			76	65				155	88		92			177		71
ML19	15	17	21		17	18		15		17	17	ML19			142	151		95	75					76		85				143	74
ML20	18	19			18						19	ML20			130			110	78				101	129				82		161	75
ML21	19	22		23	19		19	21		21	21	ML21		141				89	63					86			42	112	165		92
ML22		17		18	18		13	15			16	ML22		145				78	79					76	51		70	89	161		
ML23	14	20		18	17			17			19	ML23		101	163			80	69		172			105	75		62	66	147		71
TL 1		18			18	19	14	17			17	TL 1						94	79												82
TL 2		18		18				18			17	TL 2						114													
TL 3		15	10	12	9						18	TL 3			133	149					119		144								
TL 4	14	14		10	14						17	TL 4			137			121	136										112		
TL 5	17	19			16			17			21	TL 5					207														
TL 6	21	18			15				16	19	23	TL 6												60	66		56				111
TL 7	15	22			21			24			23	TL 7								194						84	60				77
TL 8	18	21			17			18				TL 8		82	187				80		157			58			71				82
TL 9		18			22			28			22	TL 9						49	60					142							

Table 3. Geologic Unit Average Value as a Function of Map Line for ⁴⁰K (Counts/Second)

	PU	QA	QC	QG	OL	OT	TB	TF	TI	TRPU	TS		HX	CC	CPCP	GN	I	IPMU	IPU	JTRS	KJG	KN	LPM	LPU	LPW	MDU	OE	OP	PCU	PIPU	PML	
ML 1	215	147			105			129		202	119	ML 1		334				356	368					455			373	342			419	
ML 2	197	136			112			122	310		118	ML 2		374				342	362					409			376	363			398	
ML 3	235	142			115			147	216	203	151	ML 3		362				392	380					360			378	272			380	
ML 4	245	162		92	102	156		123		228	154	ML 4		375				349	321					304	415			411		333		
ML 5	312	164			178			121		150	171	ML 5		354				342	373					367	401			343		365		
ML 6	287	163		105	136			144	109		153	ML 6		400							592			436	435			261		338		
ML 7	261	173			123			213	101	193	155	ML 7		368				409			375			410			336		351			
ML 8	266	163			129			99			200	ML 8						392	418				368	454			378					
ML 9	281	161			158			244	139	170	157	ML 9		260	248		448	385	378		629		365			388			343			
ML10	353	156	86		146		136	220	131	182	145	ML10			220		536	450	373		242		384			363				427		
ML11	301	154	72	198	143				79	166	180	ML11			190			461	369		328		339							315		
ML12	263	182	32	88	163		305			143	144	ML12			249			378			263		243	325			491		348			
ML13	243	147		71	139		171			117	127	ML13			329			366	414		372		280	326			335		311			
ML14	372	143	-20	85	153			169			149	ML14			348			333	397				266	338			335		333			
ML15	241	165			163			137			185	ML15			338	347		414	368				321	492			335		264			
ML16	253	135	92	74	178			123		362	126	ML16		280	309	284		406	372				289	310			327		464			
ML17	310	153		93	165	170		415		301	133	ML17			336			381	392				292	392					385			
ML18	225	147	84		143	132	132	161			125	ML18			496			395	347				263	298		357			159	363		
ML19	227	131	160		136	140		296		129	129	ML19			473	407		369	348				390			344			313	319		
ML20	219	165			152						145	ML20			372			396	321				412	324			317	486	394			
ML21	185	176		162	152		133	273		340	166	ML21		406				419	416				351				284	328	529	410		
ML22		153		128	173		97	108			135	ML22		429				350	398				373	420			347	295	452			
ML23	200	159		150	142			115			164	ML23		280	185			347	352		200		413	358			379	348	525	375		
TL 1		135			123	116	90	116		159	135	TL 1						389	368											371		
TL 2		147		139				158			137	TL 2						406														
TL 3		134	58	93	159						118	TL 3									179		315									
TL 4	223	136		92	129						164	TL 4			275	366														414		
TL 5	204	154			158			113			216	TL 5					317	358	586													
TL 6	213	173			120				165	156	159	TL 6											373	328		358				317		
TL 7	233	152			200			127			245	TL 7									997						273	385				
TL 8	365	134			121			132				TL 8		352	172				361		362			326			342		323			
TL 9		205			210			169			138	TL 9						255	286					594					346			

Table 6. Geologic Unit Average Value as a Function of Map Line $^{208}\text{Tl}/^{232}\text{Th}$ (Times 1000)

	PU	QA	QC	QG	QL	QT	TR	TF	TI	TRPU	TS
FL 1	367	373			321			418		334	415
FL 2	390	374			312			383	380		386
FL 3	378	378			338			360	424	322	399
FL 4	342	372		226	255	326		358		290	390
FL 5	389	385			391			368		373	431
FL 6	396	388		317	372			431	390		424
FL 7	371	396			324			399	407	405	461
FL 8	368	426			334				415		390
FL 9	412	479			353			760	481	347	450
FL 10	378	404	129		346		401	840	474	367	477
FL 11	357	418	262	359	330				301		329
FL 12	376	413	237	186	379		350				431
FL 13	369	381		273	347		376			311	388
FL 14	386	392	324	261	377			661			378
FL 15	365	380			378			526			385
FL 16	334	390	245	267	392			374		295	362
FL 17	378	421		370	353	390		407			406
FL 18	324	405	398		297	483	447	444			390
FL 19	417	441	393		310	411		290		356	383
FL 20	332	442			318						413
FL 21	320	437		417	338		408	750		980	409
FL 22		404		409	334		413	370			406
FL 23	341	414		535	289			397			391
FL 1		403			331	326	372	374		400	457
FL 2		419		419				428			373
FL 3		377	318	234	412						392
FL 4	409	418		382	315						459
FL 5	349	394			305			411			389
FL 6	351	363			290				275	328	346
FL 7	336	386			356			384			502
FL 8	351	373			346			354			
FL 9		395			452			556			422

- (1) $\sigma_{T_L} = \sqrt{T_{L\Sigma} - T_{L1}}$; Test does not fail if $T_{L1} \geq 1.5 \sigma_{T_L}$
(2) $\sigma_{Bi} = \sqrt{Bi_{\Sigma} - Bi_{SUR}}$; Test does not fail if $Bi_{11} \geq 1.5 \sigma_{Bi}$
(3) $\sigma_K = \sqrt{K_{\Sigma} - K_1}$; Test does not fail if $K_1 \geq 1.5 \sigma_K$

Where Σ represents the total raw count in the energy interval, and subscript (1) represents results of 4 π data analysis. A column set is placed onto the microfiche for the single point listings of reduced data which lists A-K-U-T as altitude (A), potassium (K), uranium (U) and thorium (T). If the statistical adequacy test does not fail, a zero (0) is inserted. If it fails, a one (1) is inserted for the K-U-T. However, for altitude (A), 0 represents data from 0-700 feet. 1 represents data from 701-1000 feet, and 2 represents data from 1001 and greater feet.

G. FREQUENCY DISTRIBUTIONS OF DATA FOR EACH GEOLOGIC TYPE

The geologic units have been the basis for separation of the six radiation variables. Frequency distribution plots, which display the number of occurrences at a specific magnitude as a function of the magnitude for each of the six radiation variables, are included for each geologic unit. Data from all map line and tie lines have been included to determine these frequency distributions in Appendix I. Table A1-1 gives a summary of the average and standard deviation values for all geologic units, (also included on all histograms in Appendix I).

H. MICROFICHE REPRODUCTION OF THE SINGLE RECORD REDUCED AND AVERAGED RECORD DATA

The output listings of the single record non-averaged reduced data and averaged record data have been reproduced on MICROFICHE and are included with the report where up to 208 computer listings may be placed on a projectable 4" x 5-3/4" transparency.

I. TEST LINES

Flight lines within the map sheet area were chosen having a length of about five miles, and were surveyed prior to and following each day's operation, conditions allowing such flights. The results of these test line surveys over the same morning and evening surface location are summarized in Appendix III.

J. ALTITUDE AND GROUND SPEED HISTOGRAMS

A histogram of the ground speed of the helicopter and its altitude are included for each map and tie line in Appendix III.

K. ANOMALOUS DATA DETERMINED FROM EXAMINATION OF PROFILE LINE DATA

An evaluation of the results of all data from flight line profiles and statistical deviation maps (NGRMS maps) is made for each line. Particular attention should be given to the eU/eTh ratio in the profile data and in the NGRMS map to detect regions of anomalous eU.

1. Analysis of Histograms

The radioactivity data is shown in histogram form with counts per second (c/s) plotted against number of events (Appendix I). The histograms for ^{208}Tl and ^{40}K were examined for conformity to a Gaussian curve. It is generally assumed that a geologic map unit, which encompasses a fairly homogeneous lithology, would have a unimodal distribution. Where map units vary significantly from a unimodal distribution, a further subdivision into more homogeneous lithologic types may be recommended. Table 7 shows the map units for ^{208}Tl which vary from a unimodal model. Where feasible, critical values are given for separation of a distribution into two or more distributions. Units Tf, KJg, PlPu, and lpu have extensively high ^{208}Tl values.

2. Interpretation of Radioactivity Data

Introduction

The ^{214}Bi , ^{208}Tl and $^{214}\text{Bi}/^{208}\text{Tl}$ data were examined for anomalous values in the Elko Airborne Radiometric Maps. A radioactivity anomaly is considered to be: 1) a cluster of three or more values of one-standard deviation or greater that was visually distinguishable on the map; 2) a juxtaposition of two or more two-standard deviations; or 3) one or more three-standard deviation values. The anomalies were listed by flight line in Table 8; by geologic map unit in Table 9; Table 9 is statistically summarized in Table 10. Only positive anomalies were examined for ^{208}Tl and ^{214}Bi , but both positive and negative values were studied for the ratio anomaly.

A total of twenty-six geologic units showed anomalous values: Q1, Qc, Qa, Qg, Qt, Ts, Tf, Tb, Ti, KJg, TrPu, PlPu, Pu, lPMu, lPu, MDu, lpu, lpuw, lpm, Qe, Op, GP6P, Gc, P6, i, gn. Units Kn, JTrs, PM1 and bx contain no anomalous values. The percentage of anomalies by unit is given in Table 9 and summarized for the Time periods Quaternary, Tertiary, Mesozoic, Paleozoic, Precambrian and Age Unknown in Table 10. The Quaternary unit Qa contains approximately one-third of all the anomalous values.

Table 10 shows that the positive ratio anomalies are more numerous than those for ^{214}Bi or ^{208}Tl . Approximately 28 percent of the ratio anomalies are of the negative type. There are more positive ^{214}Bi anomalies than ^{208}Tl anomalies. There are two more geological units containing ^{214}Bi anomalies than ^{208}Tl anomalies, and positive or negative ratio values.

Quaternary Geologic Units: Q1, Qc, Qa, Qg and Qt

^{214}Bi and $^{214}\text{Bi}/^{208}\text{Tl}$ Anomalies

Approximately 50 percent of all ^{214}Bi anomalies, 50 percent of the positive ratio anomalies and 49 percent of the negative ratio anomalies

TABLE 7. Geologic Units with Significant Variations from Unimodal Distributions, Based on the Analysis of the ²⁰⁸Tl Histograms

Geologic Unit	No. of Events	Split Recommended
Ql	27,509	No
Qc	313	No
Qa	43,246	No
Qg	688	No
Qt	241	No
Ts	14,125	No
Tf	4,547	No
Tl	393	No
Ti	697	103
KJg	1,212	No
TRPu	1,265	62,101
Plpu	3,541	No
Pu	7,488	No
lPu	2,300	65
MDu	381	50
lpu	3,626	59,100
lpw	601	No
Oe	542	No
Op	2,460	No
EpEp	1,542	No
Gc	946	No
PGu	1,659	No
i	243	87
gn	302	No

TABLE 8. Summary of Anomalies

	²⁰⁸ Tl	²¹⁴ Bi	²¹⁴ Bi/ ²⁰⁸ Tl
ML 23	Qa, 40-70, 1640-1690, 2280-2290, 1300-1370; Ts, 1600-1640, 1770-1800; 1970-1990, 2100-2130; Qg, 1990-2000; lpu, 2290-2300.	Ts, 0-70, 1510-1530; PGu 1950-1980, 2120-2135, 2145-2160; Qa, 2280-2300, 160-175, 1290-1370; lPu 910-927; Oe, 932-945; Ql, 1200-1210	lpw, 20-40, 360-380, (330-350); lPMu, 525-540, 550-570, 600-610; Ts, 610-640; Oe, 930-960; Ql, 1010-1030, 1830-1850; Qa, 1420-1440, 2035-2040, 2050-2075, (1630-1665); EpEp, 1470-1480, 1500-1505
ML 22	lPMu, 770-778; PGu, 1705-1720, 1770-1780; Qa, 1965-2020, 2030-2070; Ql, 655-665, 1605-1645, 1655-1668, 1675-1695, 1700-1740; Oe, 820-830; Gc 1500-1532, 1550-1560	Qa, 710, 50-68, 1895-1910; lpu, 665-680, 690-700; Ql, 1160-1175, 1240-1260, 1295-1315, 1615-1640; Gc, 1500-1540	Ts, 570-595, (1480-1500); Ql, 540-570, 1970-2105; Qa, 1030-1040, 1860-1910, 1950-1970, (1970-1980), (2040-2060), (2110-2130)
ML 21	Ts, 80-90; PG, 1830-1910, 1990-2010; Qa, 2085-2190, 2250-2270; lpu, 3380-3390; Op, 3310-3380; Gc 2740-2760; Ql, 2540-2550	lPMu 735-760, 770-780; Ts, 980-1050, 1090-1110, 1210-1225, 1368-1380; Qa, 1235-1280, 2085-2100, 2120-2135, 2160-2190, 3230-3240; PGu, 1890-1925, 1985-2020; Qg, 2037-2055; lpu, 3460-3490; Op, 3350-3367, 3310-3340; Pu 3300-3340	Ts, 470-482, 565-580, 605-620, 700-720, 990-1010; Qa, 3270-3290, (2140-2155); Ql, 2205-2225; PlPu (230-265); Pu (2785-2800)
ML 20	Pu, 2955-2975, 2920-2935; Qa, 2830-2840, 2380-2480, 2340-2370, 20-40; PGu, 2645-2660; Ql, 80-110, 125-150	Qa, 2790-2805, 2410-2425, 2350-2380; PGu, 2720-2730; Ql, 160-170, 237-260; lpu, 700-735; Op, 735-760; 770-780; Pu, 830-845	Pu, 820-840, (2960-2970), (2925-2940); Qa, 840-890, 1290-1300, 1495-1505, (2810-2830), (2430-2445); Ql, 1810-1860, 1870-1930, 1980-2000; PGu (2640-2660)
ML 19	Ts, 4455-4465, 4850-4860; lPMu 4465-4480; PlPu, 4480-4492; Ts, 4850-4860; Qa, 5680-5720, 5750-5765, 6120-6150, 2100-2110, 2070-2080; EpEp 5820-5840, 5850-5900, 6050-6060; lPu, 6060-6070; Pu, 6070-6085, 6110-6120	Qc, 4965-4980; Ql, 3120-3130; lPMu 2210-2220; lpu, 5950-6005	Qa, 3230-3250, 2570-2580, (5690-5770), (6120-6130); PlPu, 2280-2310, (4480-4500); Tf, 2270-2280; lPMu, 2200-2230; Ts, (5210-5240); Pu (6010-6025)

(TABLE 8. Cont'd.)

	²⁰⁸ Tl	²¹⁴ Bi	²¹⁴ Bi/ ²⁰⁸ Tl
ML 18	Qt, 1780-1820; Qa, 1185-1200, 600-625, 335-360, 1860-1870; EpEp 550-570; Ql, 1775-1790	Qt, 800-810, lPu, 850-865; lpu, 1380-1390	Qa, 210-220, 450-455, (600-650), (450-500), (335-380), 815-825, 835-845, 920-935; PGu 150-165; Ql, 85-115, 125-135, 170-185; lPu, 855-865, 1900-1905; lpu, 1380-1400, 1925-1930, 2005-2010; lPMu, 1905-1915; Qt, (1780-1795)
ML 17	Qa, 2860-2870, 2890-2900, 3060-3070, 3640-3650, 3730-3770; Pu, 3800-3820; Ql, 2290-2310, 2260-2280	Qa, 3050-3060; Pu, 3860-3880, 2690-2730; Ql, 2970-2980; Tf, 2560-2565	Qa, 3980-3995, (3730-3755), 3855, 3400-3410, 2800-2820; lPu, 3370-3380; TRPu, 3280-3290; Ql, (3810-3840), 3240-3250, 2140-2190; Pu, 2690-2725, 2655-2680, 2615-2635; Ts, (2750-2770); PlPu, 2560-2610, 2525-2540, 2505-2520
ML 16	lPMu, 6230-6240; Qa, 5670-5680; lpm, 5650-5670, 5350-5530; lpm, 5050-5100; Pu, Ql, 4490-4510, 1650-1850; Op, 1400-1410, lPu, 1565-1600, 1620-1650	lPMu, 6250-6260, 1560-1600, 1605-1650; lpm, 5660-5670; Ts, 110-130; Qa, 130-140; Ql, 175-200, 1670-1680, 1750-1850; Pu, 385-410; Op, 1305-1320, 1500-1510	Qa, 6380-6400, 850-925, (4875-4950); gn, 5520-5530; lpm, 5050-5100; Pu, 805-820; Ql, 940-950, 960-970, 1870-1990, 2030, (4680-4750), (1690-1710); Ts, (6040-6055); Qg, (5400-5420); Tpm, 1570-1590), (1620-1640)
ML 15	lpm, 1010-1050, 1520-1530; gn, 1130-1160; Pu, 1970-1980, 2010-2020; Qa, 2560-2575; Tf, 2515-2560, 2190-2200; lpu, 2500-2515, 2465-2470; lPu, 2470-2500; Ql, 2200-2400	Ts, 715-750; EpEp, 1200-1240; lpm, 1270-1290; Qa, 1445-1460, 4170-4190, 3920, 3630-3660, 3560-3575, 2400-2405; lPu, 3430-3440, 2472-2500, 2412-2450; Tf, 2535-2550, 2515-2525, 2190-2210; lpu, 2500-2515, 2465-2472; Ql, 2370-2400, 2395-2360, 2210-2275	Ts, 545-585; lpm, 1590-1610, 1660-1670, (1010-1040); Qa, 4165-4180, 3900-3930, 3630-3650, 3470-3510, 3180-3190, (2585-2595), (2560-2570); lpu, 2445-2460; Ql, 2145-2155, 2065-2125; Pu, (1970-1985); lPu, (2480-2500) 3430-3455.
ML 14	Qa, 3780-3805, 5880-5890-6010-6020; EpEp, 3585-3620, lpm, 3475-3485, 3445-3455, 3390-3425; Op, 5730-5790, Tf, 5850-5880, 5930-5940, 5960-6010; Ql, 6020-6230	Ts, 4125-4140; Qa, 3940-3970, 5885-5900; lPMu, 4500; Pu, 4580-4600, 5005-5020, 5040-5050, 5090-5100; lPu, 4660-4675, 6010-6020; Ql, 5180-5195, 5570-5585, 6020-6200, 6215-6230, 6315-6327; Op, 5620-5630, 5640-5670, 5785-5800; Tf, 5855-5885, 5925-5940, 5960-5980, 5990-6010	Ts, 4120-4145, 5810-5825; Qa, 4490-4510, 5140-5170; lPu, 4540, 4655-4670, 4685-4700, (4068-4080); PlPu, 4565-4580; Pu, 4918-4923, 5000-5020, 5040-5050, 5092-5105; Ql, (2680-2690), 5180-5200, 6240-6260, 6300-6350, 6355-6370; Qg, (3405-3425); Op, 5660; Ts, 5810-5825; Tf, (5800-5880), (6000-6010)

(TABLE 8. Cont'd.)

	²⁰⁸ Tl	²¹⁴ Bi	²¹⁴ Bi/ ²⁰⁸ Tl
ML 13	GpGp 5720-5730; lpm, 5730-5750, 5810-5850, 5890-5900, 5920-5930; Pu, 6750-6780	lPu, 5075-5085; Qg, 6025-6050; Pu, 6750-6760; lpu, 590-610	Qg, 6025-6050; lPu, 6670-6680, (2030-2050); Qa, (6060-6075), (5770-5780), (5430-5445), (350-400); lpm, (5920-5935), (5750-5760); GpGp (5725-5740); Ts, (4890-4900); Q1, 2305-2340, 2350-2360; lpu, 590-620; Pu, 830-840, 960-1000, (890-900)
ML 12	Ts, 6960-6980, 6935-6960, 6720-6730; Qa, 6350-6385, 6300-6330, 6275-6285, 6170-6260; Q1, 2770-2825	Qa, 6562-6575; lpm, 5680 5710; lPu 4935-4945; Pu, 4320-4330	Ts, (6950-6960), (6770-6800, 4550; Qa, (6910-6920), (6680-6690), (6210-6225), (6170-6180), (6140-6180), 4900-4925, 3980-4030, 3935-3960, 3035-3070, 2930-3020; Pu, 4465-4475; Tb, 4420-4450; lpu, 3350, 3340; Q1, 2880-2910, 2675, 2605-2620, (5105-5125), (2790-2810)
ML 11	Qa, 190-215, 225-270, 280-290, 660-690, 710-755, 850-875; Q1, 1170-1182, 1140-1150, 1090-1125, 1030-1050, 990-1010	Qa, 660-680; Q1, 1590-1610, 1075-1085, 90-110; Ts, 2170-2182; lPu 430-440; lpu, 330-350	GpGp 1185-1210, 1230-1305; KJg, 1305-1315; Q1, 2000-2010, 120-140, 60-70; Qa, 1800-1810, 1550-1575, 405-470; lpu, 730-740, 620-630, 330-350; Ts, 500-515; lPu 425-440, 265-285, 210-245; Pu, 285-305; lPu (70-80)
ML 10	Ts, 4580-4690, 1055-1100; Qa, 4120-4220, 4040-4110, 2765-2780, 2720-2735, 1100-1205, 970-1055; Q1, 2780-2805, 2660-2720, 1205-1230, 805-955; i, 2735-2765; Tf, 70-110	Tb, 4700-4710; Qa, 4205-4220, 4060-4110, 2770-2780, 1685-1695, 1990-1210, 1150-1175, 1135-1140, 1105-1127, 1010-1035, 960-975, 110-130; Q1, 3140-3170, 1280-1300, 915-945, 880-905, 845-860, 35-60; i, 2755-2770; Pu, 1575-1590; Ts, 1070-1105; lPu 365-390; Tf, 70-110	Qa, 4470-4485, 3660-3750, 3480-3510, 3440-3460, 3400-3440 1390 -1410, (1040-1050), 150-215; KJg, 3770-3820, 3520-3600; Q1, 3400-3440, 3380-3390, 3350-3370, (2690-2700), 2630-2640; lPMu 365-380; lPu 215-220

(TABLE 8. Cont'd.)

	²⁰⁸ Tl	²¹⁴ Bi	²¹⁴ Bi/ ²⁰⁸ Tl
ML 9	Ts, 140-180, 200-210, 240-270, 100-120, 140-160, 565-600; Qa, 360-560, 650-670, 690-740, 750-800, 815-860, 1835-1895, 180-197, 355-475; 600-715; Ti, 960-1015; i, 1970-1980; Pu, 2100-2120, 25-35; KJg, 490-535; Q1, 715-870; lpu, 1000-1120; Tf, 1570-1585, 1590-1610	Ts, 130-145, 190-200, 100-115; Qa, 310-330, 350-360, 770-800, 1965, 20-30, 160-180, 380-390, 400-415, 440-450, 460-470, 605-630, 640-720, 1610-1625; Ti, 955-1020; Cc, 1190; KJg, 500-520; lpu, 1010-1040; MDu, 1240-1265; Tf, 1560-1580, 1590-1610	Qa, (370 390), (410-450), (885-900), 1520-1540, (1850-1890), 1490-1510, 1375-1430, 2300-2310; Q1, (740-755) (830-850), 1290-1315, 2230-2250, 2260-2270; Gc, 1190; Pu, (2105-2120), 2500-2510; 2310-2320; lpu, 1105-1130
ML 8	Ts, 4970-4985, 4950-4965, 1000-1020; Op, 4020-4030; Qa, 1510-1530, 1475-1490, 1245-1265, 890 930, 860-875, 845-850; Q1, 780-800, 750-770	Ts, 4957-4962, 1030-1050, 1000-1025; Qa, 1520-1535, 1480-1495, 1340-1350, 1260-1290, 1220-1235, 955-967, 895-930, 865-885, Q1, 785-800, 750-760; lpu, 440-455; lPu, 385-410	lPu, (5080-5090), 370-395, 300-365; lpu, (5040-5060); Qa, (4770-4780), 3505-3525, 3210-3220, (2800-2810), 320-345, 300-315, 260-270, 220-245; Ti, (4095-4105); Pu, 3580-3590; Ts, 3485-3505, 3435-3460, 1180-1220, 1125-1165, 1095, 1070, 1030-1050
ML 7	Ts, 5240-5295, 450-460; Gc, 5030-6100, 6140-6150; Op, 6180-6190; Pu, 6700-6720, 340-370, 690, 610, TRPu, 300-320; Qa, 420-450; lPu, 670-690; Q1, 880-910, 930-950; lpu, 1040-1075	Pu, 7065-7080, 7380-7400, 340-370; Qa, 7790-7800, 150-170, 220-235, 415-450, Tf, 75-110, 130-150; TRPu 310-320; lPu, 570-590, 1380-1395; Q1, 735-750; lpu, 1035-1045	Qa, 6630-6650, 6885-6900, 7120-7125, 7350-7370, 7680-7690, 7790-7810, 50-60, 1210-1230, 1580-1610, Pu, 7070-7125, (340 370); Q1, 7260-7275, (6450-6470), (6480-6500), (930 950); Tf, 80-90; Ts, 480 500, (5235-5250), (5270-5360); lPu, 1370-1390, 1420-1440, 1525-1530; Gc, (6060-6080)
ML 6	lpu, 2870-2880; Ts, 2850-2865; Qa, 2700-2730, 1235-1300, 1205-1220, 950-960, 820-880, 770-780; Pu, 555-560, 435-460; Q1, 710-720, 600-620	Qa, 2385-2400, 1290-1300, 1210-1220, 845-860; Tf, 1310-1320; lPu, 235 245	Qa, (2700-2770), 2380-2400, 1300-1310, 1140-1175, 830-860, 690-705, 605-625, 250-290, 490-525, 395-420, 230-240; Gc, 2020-2030; Ts, 665-675, 315-320; Pu, 510-530, 335-360, (560-570), (440-465); Q1, (600 620); lPu, 280-300
ML 5	Ts, 4390-4425, 5040-5060, 1540-1570, 1580-1610, Qa, 4425-4460, 430-445, 510-530, 535-550; TRPu, 180 280, 320-410; lPu, 1225-1250, 1300-1350	lpu, 2990-3005; Ts, 3445-3465, 4490-4505, 290-310, 1535-1570, 1580-1600; TRPu, 180-210, 240-260, 360-380, 395 400; Tf, 510-540; Qa, 600-610, 750-780, 890-900; 1460-1470, 1480-1500; lPu, 1310-1350	Qa, 4480-4490, 4775-4790, 4800-4850, 4900-4915, 4950-4975, 5170-5190, 5230-5250, 1625-1660, (1215-1230); Ts, 4630, 4695-4700, (5040-5055); lPu, 5250 5270, 5280-5295; TRPu, 5320-5335, 5340-5360; Pu, 5440-5460; Q1, 20-30; lPu, (1300-1320)

(TABLE 8. Cont'd.)

	²⁰⁸ Tl	²¹⁴ Bi	²¹⁴ Bi/ ²⁰⁸ Tl
ML 4	Ts, 4390-4425, 5040-5060, 1540-1570, 1580-1610; lPu, 180-280, 320-410; lPu, 1225-1250, 1300-1350	MDu, 1330-1340; Pu, 850-875, 580-630; Qa, 490, (560-610); Qa, 420-435, 400-415, 300-400, 250-280, 675-690	Q1, 1105-1120; Pu, 980-1005, 475-490, (560-610); Qa, 420-435, 400-415, 300-400, 250-280, 675-690
ML 3	lPMu 7770-7780; Pu, 6080-6100; Q1, 5310-5335, 1105-1120; Qa, 290-360, 390-430, 460-480, 490-510, 1050-1080; Tf, 620-670; Ts, 800-850, 855-880, 890-940, 1050 1080	Q1, 7905-7920, 5270-5300; Qa, 5245-5255, 290-300, 375-385, 530-560, 1070-1080; Ts, 630-660, 870-890, 900-910, 920-940, 1445 1460, 1620-1630, 1685 1700, 1710-1720	Qa, 6840-6850, 6525-6540, 6490-6500, 5530; Ts, 6740-6745, 1620-1630; TRPu 5770-5780; lPu, 750-770; Pu, (6085-6100); MDu, (5465-5490)
ML 2	lPMu 330-345; Qe, 895-930; Ts, 1700-1710; Pu, 1710-1730; Qa, 1740-1840, 1855-1880, 1960-1980, 1060-1125, 1030-1045, 950-1010, 900-930, 845-870, 665-685, 560-630	Qa, 1815-1825, 1835-1845, 1870-1885, 1035-1045, 845-855, 580-590; Tf, 1955-1965, 825-835	Tf, 1465-1475; Ti, 1490-1525; Qa, 1565-1580, 2170-2190; lPu, 2420; Pu, (1710-1740); Q1, (100-110); lPMu (290-300), 310-330; Gc, (850-860), (870-880); Qe (900-925)
ML 1	Qa, 5440 5480, 3735-3760, 270-300, 490-510, 635-650, 1070-1090; Pu, 5250-5260; Ts, 520-540, 1500-1570; lPu, 780-810, 1175-1190	Qa, 260 272, 900-915; Tf, 337-360, 420-430, 465-490; Ts, 520-530, lPu, 780-800	Qa, 3375-3400, lpu, 3210-3225, 3190-3200; Cc, 3030-3050; Tf, 815-825, (670-680); Pu, 1205-1225, (5250-5265); TRPu, 1260; lPu, (780 800); MDu, (1170 1185)
TL 1	lPMu, 5830 5840; Ts, 5205-5225, 5170-5200, 5070-5100, 4990-5050, 4960-4985, 4940-4955, 4830-4930	Ts, 5215-5240, 4965-4990, 4880-4920; Qa, 3815-3825	lPu, (510 525); Ts, (5180-5195), (1930-1950)
TL 2	lPMu, 1520-1525, 1640-1650; Qa, 2450-2580, 2590-2670, 2680-2810, 2860-2880	Ts, 2160-2170; Qa, 2515-2565, 2660-2690, 2700-2710	Ts, (2030-2040); Qa (2715-2725)

(TABLE 8. Cont'd.)

	²⁰⁸ Tl	²¹⁴ Bi	²¹⁴ Bi/ ²⁰⁸ Tl
TL 3	Qa, 2740-2760; CpCp, 3420-3435		KJg, 3950-3970; Q1, 4640-4650, (4145-4170); Qa 4830-4840
TL 4	Ts, 2510-2530, 2550-2560; Pu, 2950-2960, 3080-3130, 4580-4595; CpCp, 3140-3200; Qa, 3330-3365		PEu, 2780-2840; Pu, 2840-2860, (3080-3130), (4490-4500), (4865-4875); Qa, (3130-3140), (3330-3370), 4400-4410; Q1, (3410-3420)
TL 5	Qa, 600-690, 750-770; Q1, 770-780	Qa, 520-540, 645-680; Q1, 1695-1725, 1880-1910	Q1, 970-985, 5985-6000; Ts, 1450-1470, 1490-1510, 1530-1550; Qa, 2435-2460, 2825-2840, 2850-2860
TL 6	Pu, 520-555; P1Pu, 450-475; Qa, 950-990, 880-910	Pu, 540-560; Qa, 950-1000; Ts, 910-930	1pw, 1540-1550; P1Pu, 420-430; Ts, 205-215; Qa, 670-680, 640-660, 600-610, 265-275
TL 7	Q1, 1490-1520; Qa, 1550-1570, 2200-2215, 2225-2240, 2270-2310, 2315-2400, 2400-2510, 2565-2580, 2650-2685; Ts, 1570-1700; KJg, 1710-1850; Tf, 2815-2830	Op, 30-40, 135-155; Oe, 75-80; Q1, 450-465, 630-640, 665-680, 700-720, 725-740, 1320-1340, 1450-1460, 1490-1520; Qa, 1535-1580, 2450-2480, 2555-2570; Ts, 1580-1600, 1620-1690, 1850; KJg, 1705-1720, 1735-1750, 1760-1840; Tf, 2200-2225	Oe, 10-20, 70-85; Op, 30-40, 50-60; Qa, 200-220, 915-950, 1025-1035; Q1, 345-380, 410-440, 550-590, 650-680, 810-830, 1150-1160; Ts, 1870, 1890-1920, 1940-1950, 1960-1980; Pu, 2050-2060
TL 8	Op, 1650-1670; Q1, 715-730, 685-700, 630-660; Qa, 300-320, 200-265, 60-90	EpEp, 2620-2660; Ec, 2520-2560; Qa, 2470-2482, 300-320, 250-260, 190-240, 130-140; Pu, 1975-1990	EpEp, 2610-2650; Ec 2395-2410, 1870-1880; P1Pu, 2205-2215; 1pu, 2080-2090; Pu, 1935-1990; Op, 1855-1870, 1395-1410; Q1, (720-730), (680-700), (600-620)
TL 9	Tf, 610-630, 995-1050; P1Pu 630-635, 660-670; Qa, 670-770, 2210-2240; Q1, 770-885, 975-985, 1050-1130, 1170-1215, 1420-1445; Ts, 2340-2355, 2590-2600, 2630-2720, 2730-2740	Q1, 760-805, 845-870, 880-900, 910-925, 970-990, 1050-1140, 1160-1210; Tf, 1005-1050; 1pu, 1430-1450; P1Pu, 1645-1660; Qa, 1660-1690, 2220-2240, 2520-2530; Ts, 2310-2320, 2340-2380	Qa, 0-10, 55-65, 1660-1700, 1865-1890, (680-770); Q1, 170-180, 220-310, 320-330, 335-340, 350-390, 400-440, (770-820); P1Pu, 480-490, 510-520, 530-540, (615-640), (650-680), 1520-1550, 1650-1660; Pu, 560-570; Tf, 585-600, 1980-2000; Ts, (2630-2650), (2660-2700)

(....) denotes negative anomaly

TABLE 9. Radiometric Anomalies per Geologic Unit in the Elko Quadrangle

Geologic Units	²¹⁴ Bi	²⁰⁸ Tl	²¹⁴ Bi/ ²⁰⁸ Tl	²¹⁴ Bi/ ²⁰⁸ Tl
<u>Quaternary Units</u>				
Q1	56	43	59	(25)
Qc	1	0	1	(0)
Qa	110	122	112	(38)
Qg	2	1	1	(1)
Qt	1	0	0	(1)
<u>Tertiary Units</u>				
Ts	44	53	38	(17)
Tf	24	14	6	(3)
Tb	1	1	1	(0)
Ti	1	1	1	(1)
<u>Mesozoic</u>				
KJg	4	2	4	(0)
Kn	0	0	0	(0)
JTrs	0	0	0	(0)
TrPu	5	3	6	(0)
<u>Paleozoic Units</u>				
P1Pu	6	7	24	(6)
PMI	0	0	0	(0)
PU	20	23	26	(17)
1PMU	8	8	6	(4)
1PU	12	6	13	(7)
MDU	2	0	0	(2)
LPU	14	6	16	(0)
LPW	1	1	3	(2)
LPM	3	11	5	(3)
Oe	2	1	3	(1)
Op	12	6	7	(0)
GPpP	2	8	5	(1)
GC	3	5	5	(3)
<u>Precambrian</u>				
PCU	6	7	2	(1)
<u>Age Unknown</u>				
bx	0	0	0	(0)
i	1	2	0	(0)
Total	341	322	345	133

(....) Denotes negative anomalies

TABLE 10. Statistical Summary of Radioactivity Anomalies in the Elko Quadrangle

	²⁰⁸ Tl	²¹⁴ Bi	²¹⁴ Bi/ ²⁰⁸ Tl
<u>Quaternary Geologic Map Units</u>			
No. of Anomalies	170	166	173 (65)
No. of units with Anomalies	5	3	4 (4)
<u>Tertiary Units</u>			
No. of Anomalies	70	69	46 (21)
No. of units with Anomalies	4	4	4 (3)
<u>Mesozoic Units</u>			
No. of Anomalies	9	5	10 (0)
No. of units with Anomalies	2	2	2 (0)
<u>Paleozoic Units</u>			
No. of Anomalies	85	82	113 (46)
No. of units with Anomalies	12	11	11 (10)
<u>Precambrian Units</u>			
No. of Anomalies	6	7	2 (1)
No. of units with Anomalies	1	1	1 (1)
<u>Age Unknown Units</u>			
No. of Anomalies	1	3	1 (0)
No. of units with Anomalies	1	2	1 (0)
<u>Total Sample</u>			
No. of Anomalies	341	322	345 (133)
No. of units with Anomalies	25	23	23 (18)

(....) denotes negative anomalies

occur in Quaternary units. 65 percent of these occur in the unit Qa for ^{214}Bi , 64 percent for the positive ratio and 59 percent for the negative ratio. In addition, 33 percent of the Quaternary anomalies occur in the unit Q1 for ^{214}Bi , 34 percent for the positive ratio and 39 percent for the negative ratio.

11 percent of the positive ratio anomalies in the unit Qa coincide or overlap with positive ^{214}Bi values. 16 percent of the positive ratio anomalies in the unit Q1 coincide or overlap with positive ^{214}Bi values.

Positive ratio anomalies that coincide with or overlap positive ^{214}Bi anomalies occur at ML22, station 1860-1910; ML 21, near station 3270-3290 and station 2205-2225; ML 20, station 840-890; ML 17, near station 3855; ML 15, stations 4165-4180 and 3630-3650; ML 14, stations 4490-4510, 5180-5200, near 6240-6260 and 6300-6350; ML 13, station 6025-6050; ML 12, near station 4900-4925; ML 11, station 95-110; ML 6, stations 2380-2400 and 220235; ML 5, station 4480-4490; TL 6, station 670-680; TL 7, near station 400-440 and station 650-680; TL 9, station 1660-1700.

^{208}Tl Anomalies

Approximately 50 percent of all ^{208}Tl anomalies occur in Quaternary units with 73 percent of these in the unit Qa and 26 percent in the unit Q1. 46 percent of the ^{208}Tl and ^{214}Bi anomalies coincide or overlap. These occur on ML 23, stations 40-70, 1990-2000, 2280-2290 and 1300-1370; ML 22, stations 655-665 and 1605-1645; ML 20, stations 2380-2480 and 2340-2370; ML 18, station 1780-1830; ML 17, station 3060-3070; ML 16, station 5670-5680; ML 15, stations 2560-2575 and 2200-2400; ML 14, stations 5880-5890, 6010-6020 and 6020-6230; ML 11, stations 660-690, 1170-1182 and near 1090-1125; ML 10, stations 4120-4220, 4040-4110, 2780-2805, 2765-2780, 2720-2735, 2660-2720, 1205-1230 and 805-955; ML 9, stations 360-370, 750-800, 180-197, 355-475, 600-715 and 715-870; ML 8, stations 1510-1530, 1475-1490, 1245-1265, 890-930, 860-875, 780-800 and 750-770; ML 7, station, 420-450; ML 6, stations 1285-1300, 1205-1220 and 820-880; ML 5, stations 510-530 and 535-550; ML 4, station 905-920; ML 3, stations 290-360, 390-430, 490-510 and 1050-1080; ML 2, stations 1805-1840, 1855-1880, 1030-1045, 845-870 and 560-630; ML 1, stations 270-300 and 490-510; TL 2, stations 2500-2580 and 2680-2720; TL 5, station 600-690; TL 6, station 950-990; TL 7, stations 1490-1520, 1550-1570, 2460-2510 and 2565-2580; TL 8, stations 300-320 and 200-265; TL 9, stations 670-770, 770-885, 975-985, 1050-1130, 1170-1215, 1420-1445 and 2210-2240.

Tertiary Geologic Units: Ts, Tf, Tb and Ti

^{214}Bi and $^{214}\text{Bi}/^{208}\text{Tl}$ Anomalies

Approximately 21 percent of all ^{214}Bi anomalies, 13 percent of the positive ratio anomalies and 16 percent of the negative ratio anomalies occur in Tertiary units. Approximately 63 percent of these

occur in the unit Ts for ^{214}Bi , 83 percent for positive ratio and 81 percent for negative ratio. In addition, approximately 34 percent of the anomalies in Tertiary units occur in the unit Tf for ^{214}Bi . Thirteen percent for positive ratio and 14 percent for negative ratio. 13 percent of the positive ratio anomalies in the unit Ts coincide or overlap with positive ^{214}Bi values. 17 percent of the positive ratio anomalies in the unit Tf coincide or overlap with positive ^{214}Bi values.

Positive ratio anomalies that coincide with or overlap positive ^{214}Bi anomalies occur at ML 21, station 990-1010; ML 14, station 4120-4145 and near station 5810-5820; ML 8, station 1180-1220; ML 7, station 80-90; ML 3, station 1620-1630.

^{208}Tl Anomalies

Approximately 21 percent of all ^{208}Tl anomalies occur in Tertiary units with 77 percent of these in the unit Ts and 20 percent in the unit Tf. 42 percent of the ^{208}Tl and ^{214}Bi anomalies coincide or overlap in Tertiary units. These occur on ML 15, station 2515-2560; ML 14, stations 5850-5880, 5930-5940 and 5960-6010; ML 10 near station 4580-4690 and stations 1055-1100 and 70-110; ML 9, stations 140-180, 200-210, 960-1015 100-120, 140-160, 565-600, 1570-1585 and 1590-1610; ML 8, stations 4950-4965 and 1000-1020; ML 5 stations 1540-1570 and 1580-1610; ML 4, stations 920-935, 785-800 and 760-772; ML 3, stations 620-670, 855-880 and 890-940; ML 1, station 515-540; TL 1, station 5205-5225; TL 7, station 1570-1700; TL 9, stations 995-1050 and 2340-2355.

Mesozoic Geologic Units: KJg and TrPu

^{214}Bi and $^{214}\text{Bi}/^{208}\text{Tl}$ Anomalies

Approximately 3 percent of all ^{214}Bi anomalies, 3 percent of all positive ratio anomalies and no negative ratio anomalies occur in Mesozoic units. None of the ratio anomalies in the Mesozoic units coincide or overlap with positive ^{214}Bi values.

^{208}Tl Anomalies

Approximately 2 percent of all ^{208}Tl anomalies occur in Mesozoic units. 100 percent of the ^{208}Tl and ^{214}Bi anomalies coincide or overlap in the Mesozoic units. These occur on ML 9, station 490-535; ML 8, station 300-320; ML 5, stations 180-280 and 320-410; TL 7, station 1710-1850.

Paleozoic Geologic Units: PIPu, Pu, 1PMu, 1Pu, MDu, 1pu, 1pw,

1pm, Oe, Op, 6p6p and 6c

^{214}Bi and $^{214}\text{Bi}/^{208}\text{Tl}$ Anomalies

Approximately 25 percent of all ^{214}Bi anomalies, 33 percent of all positive ratio anomalies and 35 percent of all negative ratio anomalies

occur in Paleozoic units. Approximately 24 percent of these occur in the unit Pu for ^{214}Bi , 23 percent for the positive ratio and 43 percent for the negative ratio. 27 percent of the positive ratio anomalies in the Paleozoic units coincide or overlap with positive ^{214}Bi values.

Positive ratio anomalies that coincide with or overlap positive ^{214}Bi anomalies occur at ML 23, stations 20-40, 930-960 and 1500-1505; ML 20, station 820-840; ML 19, station 2200-2230; ML 18, stations 855-865 and 1380-1400; ML 17, station 2690-2725; ML 15, stations 3430-3455 and 2445-2460; ML 14, stations 4565-4580, 4655-4670, 5000-5020, 5040-5050, 5090-5105 and 5660; ML 13, station 590-620; ML 12, station 5650-5680; ML 11, stations 425-440 and 330-350; ML 10, station 365-380; ML 9, station 1190; ML 8, station 370-395; ML 7, stations 7070-7085 and 1370-1390; TL 7, stations 30-40 and 75-85; TL 8, stations 2610-2650 and 1935-1990; TL 9, station 1650-1660.

^{208}Tl Anomalies

Approximately 25 percent of all ^{208}Tl anomalies occur in Paleozoic units. 30 percent of the ^{208}Tl and ^{214}Bi anomalies coincide or overlap in the Paleozoic units. These occur on ML 23, station 2290-2300; ML 22, stations 770-778 and 1500-1532; ML 21, station 3380-3390; ML 17, station 3800-3820; ML 16, stations 6230-6240, 5650-5670, 1400-1410, 1565-1600 and 1620-1650; ML 15, stations 2500-2515, 2470-2500 and 2465-2470; ML 14, station 5730-5790; ML 13, station 6750-6780; ML 9, stations 25-35 and 1000-1120; ML 7, stations 340-370, 570-590, 590-610 and 1040-1075; ML 5, station 1300-1350; ML 1, station 780-810; TL 6, station 520-555; TL 8, station 1650-1670.

Precambrian Geologic Units: PG

^{214}Bi and $^{214}\text{Bi}/^{208}\text{Tl}$ Anomalies

Approximately 2 percent of all ^{214}Bi anomalies, 1 percent of all positive ratio anomalies and 1 percent of all negative ratio anomalies occur in the Precambrian unit PGu. No positive ratio anomalies in the Precambrian unit PGu coincide or overlap with positive ^{214}Bi values.

^{208}Tl Anomalies

Approximately 2 percent of all ^{208}Tl anomalies occur in Precambrian units. 43 percent of the ^{208}Tl and ^{214}Bi anomalies coincide or overlap in the Precambrian unit PGu. These occur on ML 23, station 2100-2130; ML 21, stations 1830-1910 and 1990-2010.

Age Unknown Geologic Units: i and gn

^{214}Bi and $^{214}\text{Bi}/\text{Tl}$ Anomalies

Approximately 0.3 percent of all ^{214}Bi anomalies. 0.3 percent of all positive ratio anomalies and no negative ratio anomalies occur

in units of unknown age. No positive ratio anomalies coincide or overlap with positive ^{214}Bi anomalies.

^{208}Tl Anomalies

Approximately 1 percent of all ^{208}Tl anomalies occur in units of unknown age. Approximately 67 percent of the ^{208}Tl and ^{214}Bi anomalies coincide or overlap in the Paleozoic units. These all occur in the unit i. They occur on ML 10, station 2735-2765; ML 9, station 1970-1980.

Cultural Features

There are several cultural features such as the towns of Elko and Wendover, mining activities and Franklin Lake that might affect the radiometric data. However, there are no anomalies that appear to be directly associated with these activities.

3. Summary and Recommendations

^{214}Bi anomalies are scattered throughout the area but are strongly concentrated in the southeast, east and northcentral portions of the area. ^{208}Tl shows a similar distribution, with an additional concentration of anomalies in the western portion of the area. Positive ratio anomalies are more scattered than the ^{214}Bi values, and are especially concentrated in the central and northeastern portions of the area primarily in the Paleozoic Carbonate units P1Pu, 1Pu and to a certain extent in the Quaternary unit Qa, which is alluvium. Negative ratio anomalies are widely scattered, but show concentrations in the east, north central and western portions of the area.

A total of twenty-six geologic units showed anomalous values: Q1, Qc, Qa, Qg, Qt, Ts, Tf, Tb, Ti, KJg, TrPu, P1Pu, Pu, PMu, 1Pu, MDu, 1pu, 1pw, 1pm, Oe, Op, GpGp, Gc, P6c, i and gn. When the number of anomalies per unit is normalized against the number of times the unit was encountered in flight, units Tf, 1Pu, 1pu and Op have significantly more Bi anomalies than the other units; units Ts, P6u and i have significantly more ^{208}Tl anomalies than the other units; units P1Pu, 1Pu, 1pu and Gu have significantly more positive ratio anomalies than the other units; and units Pu and Gc have significantly more negative ratio anomalies than the other units. Overall the extensive lumping of geological units into undifferentiated units makes it difficult to interpret the true nature of the various anomalies.

Since unit Tf consists of felsic volcanics, the higher ^{214}Bi anomalies in it suggest local high uranium contents, which are probably inherent to these igneous rocks because of the lack of significantly high ratio anomalies for this unit. This inference is also reflected in the positive skewedness of the ^{214}Bi histogram. Unit Pu is undifferentiated sediments, mainly carbonates, but include clastics and tuffs. As suggested by the histograms, interunit lithological changes probably account for most, if not all, of these anomalies. Unit 1pu is undifferentiated carbonates. The histograms suggest that there are significant interunit

lithological changes. However, the presence of significantly high ratio anomalies suggests the possibility of epigenetic enrichment of uranium. Unit Op is a carbonate and argillite sequence. The lack of significant positive ratio anomalies does not suggest epigenetic uranium mineralization in this unit. Interunit lithological changes may account for the increased ^{214}Bi anomalies.

The increased ^{208}Tl anomalies in units P0, Ts and i probably reflect the metamorphic nature of the PC unit and the igneous components of the Ts and i units.

APPENDIX I

FREQUENCY DISTRIBUTION OF RADIATION DATA

AS A FUNCTION OF GEOLOGIC UNIT

	T _L		B _i		K		B _i /T _L		B _i /K		T _L /K		NO. EVENTS	GEOL. UNIT
	σ	$\bar{X}$	σ	$\bar{X}$	σ	$\bar{X}$	σ	$\bar{X}$	σ	$\bar{X}$	σ	$\bar{X}$		
AI-1	18.1360	42.0	5.7544	14.1	41.6051	113.6	0.2055	0.3860	0.0673	0.1373	0.0632	0.3673	946	CC
	20.1480	49.2	6.5900	12.6	41.3207	152.0	0.2480	0.3223	0.0493	0.0883	0.1417	0.3372	1542	CPCP
	18.6814	55.3	5.2342	8.2	43.1992	171.4	0.1133	0.1652	0.0377	0.0535	0.0916	0.3279	302	GN
	26.3041	75.9	5.2576	19.9	31.7880	196.1	0.1007	0.2818	0.0356	0.1049	0.1233	0.3886	243	I
	10.0268	33.7	4.1618	16.5	24.5900	89.2	0.2378	0.5365	0.0803	0.1989	0.0672	0.3804	2442	IPMU
	17.3299	29.9	5.5841	17.0	31.6814	79.3	0.3048	0.6678	0.1054	0.2391	0.0866	0.3729	2300	IPU
	58.7065	70.5	9.5744	19.0	45.9817	166.8	0.3104	0.4175	0.0525	0.1166	0.2843	0.4004	1212	KJG
	15.5614	42.8	5.9861	11.5	44.9102	151.2	0.1609	0.2903	0.0481	0.0813	0.0829	0.2910	2344	LPM
	20.7929	26.8	7.0350	12.3	40.3662	73.5	0.3529	0.5490	0.1460	0.1968	0.1053	0.3671	3626	LPU
	12.8467	27.7	6.9076	13.5	30.8877	73.2	0.2207	0.5199	0.0774	0.1928	0.0757	0.3816	601	LPW
	14.9944	28.2	5.8097	14.9	37.5591	80.7	0.1939	0.5629	0.0694	0.1961	0.0727	0.3546	381	MDU
	6.9166	24.3	5.2127	10.7	23.6776	72.6	0.2587	0.4685	0.0838	0.1573	0.0655	0.3442	542	OE
	9.1673	24.1	5.3064	10.8	32.3637	75.9	0.2711	0.4814	0.1197	0.1636	0.0851	0.3342	2460	OP
	24.7188	65.8	7.5680	17.3	34.7761	149.6	0.1725	0.2965	0.0690	0.1238	0.1224	0.4409	1659	PCU
	20.3274	30.0	6.0654	19.2	39.5525	81.8	0.3818	0.7766	0.1149	0.2648	0.0853	0.3597	3541	PIPU
	12.8002	26.6	4.8251	16.7	29.7377	72.0	0.3106	0.7163	0.1192	0.2623	0.0773	0.3731	7488	PU
	21.9408	51.9	5.7899	18.6	41.2627	129.1	0.1832	0.4037	0.0635	0.1556	0.0895	0.3996	43246	QA
	16.9968	55.7	9.9474	8.7	37.6856	187.9	0.2342	0.2112	0.0632	0.0545	0.0894	0.3027	313	QC
	17.2133	46.5	6.7277	14.8	41.1078	149.4	0.1708	0.3468	0.0490	0.1052	0.1166	0.3238	688	QG
	19.3693	42.1	6.0115	17.4	41.8237	122.9	0.1887	0.4498	0.1053	0.1516	0.1370	0.3441	27509	QL
	18.6528	45.0	3.5650	16.8	28.6622	116.3	0.1267	0.4146	0.0321	0.1488	0.0758	0.3748	241	QT
	14.6623	51.9	4.7299	17.3	35.7652	129.3	0.1668	0.3667	0.0576	0.1441	0.0661	0.4044	393	TB
	36.0889	77.3	8.2084	24.0	49.4781	177.8	0.1557	0.3471	0.0648	0.1442	0.1394	0.4312	4547	TF
	29.5889	67.2	8.3350	18.9	53.6568	153.2	0.1778	0.3260	0.0699	0.1372	0.0788	0.4319	697	TI
	23.0009	41.1	5.6910	17.8	52.7007	112.6	0.2764	0.5286	0.0888	0.1821	0.1131	0.3623	1265	TRPU
	17.8953	56.4	5.3513	19.5	40.1826	139.4	0.1491	0.3744	0.0579	0.1501	0.0733	0.4083	14125	TS

Table AI-1 Summary of Average and Standard Deviation Values for the NTMS as a Function of Geologic Unit

ELKO

A1

ELKO

A2

A3

A4

A7

A8

A 9

A 10

APPENDIX II
DESCRIPTION OF MAGNETIC TAPES AND LISTINGS

A. DESCRIPTION OF DATA TAPES

A1. General

All data tapes are 9-track, 800 BPI (NRZI), odd parity, EBCDIC code. Each tape contains a gum label giving the survey project name, month and year of survey, tape type, subcontractor name, date tape created, tape reel count, tape recording characteristics, block size in Bytes and location of tape format information.

The general description for each of the tape types is as follows:

Block Number	Description
1	Format Description
2	Tape Identification
3	First Data Block
4	Second Data Block
.	.
.	.
.	Last Data Block
EOF	

A2. Raw Spectral Data Tapes

Block Size (Physical Record): 6600 characters
Logical Record, Data : 1100 characters

1. Format Description Block (Block 1)

The Format Description utilizes 4248 characters. The remaining 2352 characters of this block are blanks.

Line Number	Character Number
1	1234567890123456789012345678901234567890123456789012
2	01 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)
3	RAW SPECTRAL DATA TAPE
4	FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK ON TAPE)
5	ITEM FORMAT DESCRIPTION
6	1 A40 QUADRANGLE NAME AS PROJECT IDENTIFICATION
7	2 A20 NAME OF SUBCONTRACTOR
8	3 14 APPROXIMATE DATE OF SURVEY (MONTH, YEAR)
9	
10	

Line Number	Character Number
11	1234567890123456789012345678901234567890123456789012
12	4 I1 AERIAL SYSTEM IDENTIFICATION CODE
13	5 A20 AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER
14	6 I3 BFEC CALIBRATION REPORT NUMBER
15	7 F6.3 4PI SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL PLACES IN SECONDS
16	8 F6.3 2PI SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL PLACES IN SECONDS
17	9 I3 NUMBER OF CHANNELS (0-3 MEV) FOR 4PI SYSTEM
18	10 I3 NUMBER OF CHANNELS (0-3 MEV) FOR 2PI SYSTEM
19	11 I3 NUMBER OF FLIGHT LINES ON THIS TAPE
20	12 I4 FIRST FLIGHT LINE NUMBER ON THIS TAPE
21	13 I6 FIRST RECORD NUMBER OF FIRST FLIGHT LINE
22	14 I3 JULIAN DATE (DAY OF YEAR) FIRST FLIGHT LINE WAS COLLECTED
23	15-17 14,I6,I3 REPEAT OF ITEMS 12-14 FOR SECOND FLIGHT LINE ON THIS TAPE
24	*
25	*
26	*
27	*
28	*
29	*
30	306-308 14,I6,I3 REPEAT OF ITEMS 12-14 FOR 99TH FLIGHT LINE ON THIS TAPE
31	
32	FORMAT FOR RAW SPECTRAL DATA RECORD (THIRD THRU LAST BLOCK ON TAPE)
33	ITEM FORMAT DESCRIPTION
34	1 I1 AERIAL SYSTEM IDENTIFICATION CODE
35	2 I4 FLIGHT LINE NUMBER
36	3 I6 RECORD IDENTIFICATION NUMBER
37	4 I6 GMT TIME OF DAY (HHMMSS)
38	5 F8.4 LATITUDE TO FOUR DECIMAL PLACES IN DEGREES
39	6 F8.4 LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES
40	7 F6.1 TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS
41	8 F7.1 TOTAL MAGNETIC FIELD INTENSITY TO ONE DECIMAL PLACE IN GAMMAS
42	9 A8 SURFACE GEOLOGIC MAP UNIT CODE
43	10 I4 QUALITY FLAG CODES
44	11 F4.1 OUTSIDE AIR TEMPERATURE TO ONE DECIMAL PLACE IN DEGREES CELSIUS
45	12 F5.1 OUTSIDE AIR PRESSURE TO ONE DECIMAL PLACE IN MMHG
46	13 F5.3 LIVE TIME COUNTING PERIOD TO THREE DECIMAL PLACES IN SECONDS
47	14 I4 SUMMED RAW OUTPUT FROM COSMIC CHANNELS (3-6 MEV) IN COUNTS
48	15 I4 RAW OUTPUT FROM CHANNEL 1 IN COUNTS
49	16 I4 RAW OUTPUT FROM CHANNEL 2 IN COUNTS
50	*
51	*
52	*
53	*
54	270 I4 RAW OUTPUT FROM CHANNEL 256 IN COUNTS
55	- - - 2352 BLANK CHARACTERS

2. Tape Identification Block (Block 2)

The information and format for this block are indicated in lines 8 through 30 of the Format Description Block A2.1, and 1396 characters are produced. The remaining 5204 characters in this block are blanks.

If fewer than 99 flight lines exist, the unused flight line information, 13 characters per flight line, is filled with 9's through the 99th flight line.

3. Raw Spectral Data Blocks

The information and format for the logical records in these blocks are indicated in lines 36 through 59 of the Format Description Block A2.1. One logical record contains 1100 characters. There are six such logical records per 6600 character physical record or block.

The 2 π data logical record is recorded after the corresponding 4 π data collection intervals at a frequency dependent on the 2 π system data collection interval. For example, if the 4 π data collection interval is 1 second and the 2 π data collection interval is 10 seconds, then 10 records of 4 π data are recorded followed by 1 record of the 2 π data which was collected during the preceding 10 seconds. The format for the 2 π data is identical to that of the 4 π data, except for lines 40 through 49 of the Format Description Block given above. These variables are expressed in the 2 π record as all nines in the format specified for I and F fields, and all zeros for A fields.

A3. Single Record Reduced Data Tapes

Block Size (Physical Record): 6900 characters
Logical Record, Data : 138 characters

1. Format Description Block (Block 1)

The Format Description utilizes 6768 characters. The remaining 132 characters of this block are blanks.

Line Number	Character Number
1	02 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)
2	
3	SINGLE RECORD REDUCED DATA TAPE
4	
5	FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)
6	

Line Number	Character Number
7	ITEM FORMAT DESCRIPTION
8	1 A40 QUADRANGLE NAME AS PROJECT IDENTIFICATION
9	2 A20 NAME OF SUBCONTRACTOR
10	3 I4 APPROXIMATE DATE OF SURVEY (MONTH, YEAR)
11	4 I1 NUMBER OF AERIAL SYSTEMS USED TO COLLECT DATA FOR THIS QUADRANGLE
12	
13	5 I1 AERIAL SYSTEM IDENTIFICATION CODE FOR FIRST SYSTEM
14	6 A20 AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER FOR FIRST SYSTEM
15	
16	7 F6.1 NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE IN CPS PER PERCENT K FOR FIRST SYSTEM
17	
18	8 F6.1 NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL URANIUM (BI-214) TO ONE DECIMAL PLACE IN CPS PER PPM EQUIVALENT U
19	
20	9 F6.1 NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE IN CPS PER PPM EQUIVALENT TH
21	
22	10 I6 BLANK FIELD (999999)
23	11 F6.3 4PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL PLACES IN SECONDS FOR FIRST SYSTEM
24	
25	12 F6.3 2PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL PLACES IN SECONDS FOR FIRST SYSTEM
26	
27	13 I3 NUMBER OF CHANNELS (0-3 MEV) IN 4PI SYSTEM FOR FIRST AERIAL SYSTEM
28	
29	14 I3 NUMBER OF CHANNELS (0-3 MEV) IN 2PI SYSTEM FOR FIRST AERIAL SYSTEM
30	
31	15-24 (SAME) REPEAT OF ITEMS 5-14 FOR SECOND AERIAL SYSTEM
32	* * *
33	* * *
34	* * *
35	
36	85-94 (SAME) REPEAT OF ITEMS 5-14 FOR NINTH AERIAL SYSTEM
37	
38	95 I3 NUMBER OF FLIGHT LINES ON THIS TAPE
39	
40	96 I4 FIRST FLIGHT LINE NUMBER ON THIS TAPE
41	
42	97 I6 FIRST RECORD NUMBER OF FIRST FLIGHT LINE
43	
44	98 I3 JULIAN DATE (DAY OF YEAR) FIRST FLIGHT-LINE DATA WAS COLLECTED
45	
46	99-101 I4,I6,I3 REPEAT OF ITEMS 96-98 FOR SECOND FLIGHT LINE ON THIS TAPE
47	* * *
48	* * *
49	* * *
50	390-392 I4,I6,I3 REPEAT OF ITEMS 96-98 FOR 99TH FLIGHT LINE ON THIS TAPE
51	
52	FORMAT FOR SINGLE RECORD REDUCED DATA RECORD (THIRD THRU LAST BLOCK)
53	
54	ITEM FORMAT DESCRIPTION
55	1 I1 AERIAL SYSTEM IDENTIFICATION CODE
56	2 I4 FLIGHT LINE NUMBER
57	3 I6 RECORD IDENTIFICATION NUMBER
58	4 I6 GMT TIME OF DAY (HHMMSS)
59	5 F8.4 LATITUDE TO FOUR DECIMAL PLACES IN DEGREES

Line Number	Character Number
60	6 F8.4 LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES
61	7 F6.1 TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS
62	8 F7.1 RESIDUAL (IGRF REMOVED) MAGNETIC FIELD INTENSITY TO ONE DECIMAL PLACE IN GAMMAS
63	
64	9 A8 SURFACE GEOLOGIC MAP UNIT CODE
65	10 I4 QUALITY FLAG CODES
66	11 F6.1 APPARENT CONCENTRATION OF TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE IN PERCENT K
67	
68	12 F4.1 UNCERTAINTY IN TERRESTRIAL POTASSIUM TO ONE DECIMAL PLACE IN PERCENT K
69	
70	13 F6.1 APPARENT CONCENTRATION OF TERRESTRIAL URANIUM (BI-214) TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
71	
72	14 F4.1 UNCERTAINTY IN TERRESTRIAL URANIUM TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
73	
74	15 F6.1 APPARENT CONCENTRATION OF TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
75	
76	16 F4.1 UNCERTAINTY IN TERRESTRIAL THORIUM TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
77	
78	17 F6.1 URANIUM-TO-THORIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
79	
80	18 F6.1 URANIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PERCENT K
81	
82	19 F6.1 THORIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH PER PERCENT K
83	
84	20 F8.1 GROSS GAMMA (0.4-3.0 MEV) COUNT RATE TO ONE DECIMAL PLACE IN COUNTS PER SECOND
85	
86	21 F6.1 UNCERTAINTY IN GROSS GAMMA COUNT RATE TO ONE DECIMAL PLACE IN COUNTS PER SECOND
87	
88	22 F5.1 ATMOSPHERIC BI-214 4PI CORRECTION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
89	
90	23 F4.1 UNCERTAINTY IN ATMOSPHERIC BI-214 4PI CORRECTION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
91	
92	24 F4.1 OUTSIDE AIR TEMPERATURE TO ONE DECIMAL PLACE IN DEGREES CELSIUS
93	
94	25 F5.1 OUTSIDE AIR PRESSURE TO ONE DECIMAL PLACE IN MMHG

2. Tape Identification Block (Block 2)

The information and format for this block are indicated in lines 8 through 49 of the Format Description Block A3.1, and 1922 characters are produced. The remaining 4978 characters of this block are blanks.

If less than nine aerial systems are used, the space allocated for additional systems is filled with 9's in the format specified for each item using I and F fields, and with zeros for A fields.

Similarly, if fewer than 99 flight lines exist, the unused flight line information, 13 characters per flight line, is filled with 9's through the 99th flight line.

3. Single Record Reduced Data Blocks

The information and format for the logical records in these blocks are indicated in lines 55 through 94 of the Format Description Block A3.1. One logical record contains 138 characters. There are 50 such logical records per 6900 character physical record or block.

The data appearing in locations specified by lines 68, 72, 76, 86 and 90 of the Format Description Block A3.1 are 9's in the format specified in each case.

A4. Statistical Analysis Data Tapes

Block Size (Physical Record): 8000 characters
Logical Record, Data : 160 characters

1. Format Description Block (Block 1)

The Format Description utilizes 7560 characters. The remaining 440 characters are blanks.

Line Number	Character Number		
	12345678901234567890123456789012345678901234567890123456789012		
1	03	0978	(DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)
2			
3			STATISTICAL ANALYSIS DATA TAPE
4			
5			FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)
6			
7	ITEM	FORMAT	DESCRIPTION
8	1	A40	QUADRANGLE NAME AS PROJECT IDENTIFICATION
9	2	A20	NAME OF SUBCONTRACTOR
10	3	I4	APPROXIMATE DATE OF SURVEY (MONTH, YEAR)
11	4	I1	NUMBER OF AERIAL SYSTEMS USED TO COLLECT DATA FOR THIS QUADRANGLE
12			
13	5	I1	AERIAL SYSTEM IDENTIFICATION CODE FOR FIRST SYSTEM
14	6	A20	AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER FOR FIRST SYSTEM
15			
16	7	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE IN CPS PER PERCENT K
17			
18			
19	8	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL URANIUM (BI-214) TO ONE DECIMAL PLACE IN CPS PER PPM EQUIVALENT U
20			
21			
22	9	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE IN CPS PER PPM EQUIVALENT TH
23			
24			
25	10	I6	BLANK FIELD (999999)
26	11	F6.3	4PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL PLACES IN SECONDS FOR FIRST SYSTEM
27			
28	12	F6.3	2PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL PLACES IN SECONDS FOR FIRST SYSTEM
29			

AII-6

Line Number	Character Number		
	12345678901234567890123456789012345678901234567890123456789012		
30	13	I3	NUMBER OF CHANNELS (0-3 MEV) IN 4PI SYSTEM FOR FIRST AERIAL SYSTEM
31			
32	14	I3	NUMBER OF CHANNELS (0-3 MEV) IN 2PI SYSTEM FOR FIRST AERIAL SYSTEM
33			
34	15-24	(SAME)	REPEAT OF ITEMS 5-14 FOR SECOND AERIAL SYSTEM
35	*	*	*
36	*	*	*
37	*	*	*
38	85-94	(SAME)	REPEAT OF ITEMS 5-14 FOR NINTH AERIAL SYSTEM
39	95	I3	NUMBER OF FLIGHT LINES ON THIS TAPE
40	96	I4	FIRST FLIGHT LINE NUMBER ON THIS TAPE
41	97	I6	FIRST RECORD NUMBER OF FIRST FLIGHT LINE
42	98	I3	JULIAN DATE (DAY OF YEAR) FIRST FLIGHT LINE DATA WAS COLLECTED
43			
44	99-101	I4,I6,I3	REPEAT OF ITEMS 96-98 FOR SECOND FLIGHT LINE ON THIS TAPE
45			
46	*	*	*
47	*	*	*
48	*	*	*
49	390-392	I4,I6,I3	REPEAT OF ITEMS 96-98 FOR 99TH FLIGHT LINE ON THIS TAPE
50			
51			
52			FORMAT FOR STATISTICAL ANALYSIS DATA RECORD (THIRD THRU LAST BLOCK)
53			
54	ITEM	FORMAT	DESCRIPTION
55	1	I1	AERIAL SYSTEM IDENTIFICATION CODE
56	2	I4	FLIGHT LINE NUMBER
57	3	I6	RECORD IDENTIFICATION NUMBER
58	4	I6	GMT TIME OF DAY (HHMMSS)
59	5	F8.4	LATITUDE TO FOUR DECIMAL PLACES IN DEGREES
60	6	F8.4	LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES
61	7	F6.1	TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS
62	8	F7.1	RESIDUAL (IGRF REMOVED) MAGNETIC FIELD INTENSITY TO ONE DECIMAL PLACE IN GAMMAS
63			
64	9	A8	SURFACE GEOLOGIC MAP UNIT CODE
65	10	I5	QUALITY FLAG CODES
66	11	F6.1	AVERAGED CONCENTRATION OF TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE IN PERCENT K
67			
68	12	F4.1	UNCERTAINTY IN TERRESTRIAL POTASSIUM TO ONE DECIMAL PLACE IN PERCENT K
69			
70	13	F5.1	POTASSIUM STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED
71			
72	14	F6.1	AVERAGED CONCENTRATION OF TERRESTRIAL URANIUM (BI-214) TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
73			
74	15	F4.1	UNCERTAINTY IN TERRESTRIAL URANIUM TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
75			
76	16	F5.1	URANIUM STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED
77			
78	17	F6.1	AVERAGED CONCENTRATION OF TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
79			
80	18	F4.1	UNCERTAINTY IN TERRESTRIAL THORIUM TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
81			

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Line Number	Character Number		
	12345678901234567890123456789012345678901234567890123456789012		
82	19	F5.1	THORIUM STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED
83			
84	20	F8.1	GROSS GAMMA (0.4-3.0 MEV) COUNT RATE TO ONE DECIMAL PLACE IN COUNTS PER SECOND
85			
86	21	F6.1	UNCERTAINTY IN GROSS GAMMA COUNT RATE TO ONE DECIMAL PLACE IN COUNTS PER SECOND
87			
88	22	F5.1	ATMOSPHERIC BI-214 4PI CORRECTION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
89			
90	23	F4.1	UNCERTAINTY IN ATMOSPHERIC BI-214 4PI CORRECTION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
91			
92	24	F6.1	AVERAGED URANIUM-TO-THORIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
93			
94	25	F5.1	URANIUM-TO-THORIUM RATIO STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED
95			
96	26	F6.1	AVERAGED URANIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PERCENT K
97			
98	27	F5.1	URANIUM-TO-POTASSIUM RATIO STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED
99			
100			
101	28	F6.1	AVERAGED THORIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH PER PERCENT K
102			
103	29	F5.1	THORIUM-TO-POTASSIUM RATIO STANDARD DEVIATION FROM THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED
104			
105			

2. Tape Identification Block (Block 2)

The information and format for this block are indicated in lines 8 through 49 of the Format Description Block A4.1, and 1922 characters are produced. The remaining 6078 characters of this block are blanks.

If less than nine aerial systems are used, the space allocated for additional systems is filled with 9's in the format specified for each item using I and F fields, and with zeros for A fields.

Similarly, if fewer than 99 flight lines exist, the unused flight line information, 13 characters per flight line, is filled with 9's through the 99th flight line.

3. Statistical Analysis Data Blocks

The information and format for the logical records in these blocks are indicated in lines 55 through 103 of the Format Description Block A4.1. One logical record contains 160 characters. There are 50 such logical records per 8000 character physical record or block.

The data appearing in locations specified by lines 68, 74, 80, 86 and 90 of the Format Description Block A4.1 are 9's in the format specified in each case.

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A5. Magnetic Data Tapes

Block Size (Physical Record): 8000 characters
Logical Record (Data) : 80 characters

1. Format Description Block (Block 1)

The Format Description utilizes 3384 characters. The remaining 4616 characters are blanks.

Line Number	Character Number		
	12345678901234567890123456789012345678901234567890123456789012		
1	04	0978	(DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)
2			
3			MAGNETIC DATA TAPE
4			
5			FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)
6			
7	ITEM	FORMAT	DESCRIPTION
8	1	A40	QUADRANGLE NAME AS PROJECT IDENTIFICATION
9	2	A20	NAME OF SUBCONTRACTOR
10	3	I4	APPROXIMATE DATE OF SURVEY (MONTH, YEAR)
11	4	I3	NUMBER OF FLIGHT LINES ON THIS TAPE
12	5	I4	FIRST FLIGHT LINE ON THIS TAPE
13	6	I6	FIRST RECORD NUMBER OF FIRST FLIGHT LINE
14	7	I3	JULIAN DATE (DAY OF YEAR) FIRST FLIGHT LINE DATA WAS COLLECTED
15			
16	8	F8.4	LATITUDE OF GROUND BASE STATION TO FOUR DECIMAL PLACES IN DEGREES FOR FIRST FLIGHT LINE
17			
18	9	F8.4	LONGITUDE OF GROUND BASE STATION TO FOUR DECIMAL PLACES IN DEGREES FOR FIRST FLIGHT LINE
19			
20	10-14	(SAME)	REPEAT OF ITEMS 5-9 FOR SECOND FLIGHT LINE ON THIS TAPE
21			
22	*	*	*
23	*	*	*
24	*	*	*
25	495-499	(SAME)	REPEAT OF ITEMS 5-9 FOR 99TH FLIGHT LINE ON THIS TAPE
26			
27			
28			FORMAT FOR MAGNETIC DATA RECORD (THIRD THRU LAST BLOCK)
29			
30	ITEM	FORMAT	DESCRIPTION
31	1	I1	AERIAL SYSTEM IDENTIFICATION CODE
32	2	I4	FLIGHT LINE NUMBER
33	3	I6	RECORD IDENTIFICATION NUMBER
34	4	I6	GMT TIME OF DAY (HHMMSS)
35	5	F8.4	LATITUDE TO FOUR DECIMAL PLACES IN DEGREES
36	6	F8.4	LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES
37	7	F6.1	TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS
38	8	F5.1	OUTSIDE AIR PRESSURE TO ONE DECIMAL PLACE IN MMHG
39	9	A8	SURFACE GEOLOGIC MAP UNIT CODE
40	10	F7.1	TOTAL MAGNETIC FIELD INTENSITY TO ONE DECIMAL PLACE IN GAMMAS
41			
42	11	F7.1	RESIDUAL (IGRF REMOVED) MAGNETIC FIELD INTENSITY

Line Number	Character Number		
	12345678901234567890123456789012345678901234567890123456789012		
44	12	F7.1	DIURNAL MAGNETIC INTENSITY VARIATION TO ONE DECIMAL PLACE IN GAMMAS
45			
46	13	F7.1	MAGNETIC DEPTH-TO-BASEMENT TO ONE DECIMAL PLACE IN METERS (IF REQUIRED)
47			

2. Tape Identification Block (Block 2)

The information and format for this block are indicated in lines 8 through 25 of the Format Description Block A5.1, and 2938 characters are produced. The remaining 5062 characters of this block are blanks.

If fewer than 99 flight lines exist, the unused flight line information, 29 characters per flight line, is filled with 9's through the 99th flight line in the format indicated.

3. Magnetic Data Blocks

The information and format for the logical records in these blocks are indicated in lines 31 through 46 of the Format Description Block A5.1. One logical record contains 80 characters. There are 100 such logical records per 8000 character physical record or block.

If the magnetic depth-to-basement is not required, this item is expressed as 99999.9.

A6. Statistical Analysis Summary Tapes

Block Size (Physical Record): 7000 characters
Logical Record (Data) : 140 characters

1. Format Description Block (Block 1)

The Format Description utilizes 4320 characters. The remaining 2680 characters are blanks.

Line Number	Character Number		
	12345678901234567890123456789012345678901234567890123456789012		
1	05	0978	(DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODE)
2			
3			STATISTICAL ANALYSIS SUMMARY TAPE (OR FILE)
4			
5			FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)
6			
7	ITEM	FORMAT	DESCRIPTION
8	1	A40	QUADRANGLE NAME AS PROJECT IDENTIFICATION
9	2	A20	NAME OF SUBCONTRACTOR
10	3	I4	APPROXIMATE DATE OF SURVEY (MONTH, YEAR)
11	4	I6	NUMBER OF GEOLOGIC MAP UNITS USED FOR THIS

Line Number	Character Number		
	12345678901234567890123456789012345678901234567890123456789012		
12			QUADRANGLE
13			
14			FORMAT FOR STATISTICAL ANALYSIS SUMMARY DATA RECORD (THIRD THRU LAST BLOCK)
15			
16			
17	ITEM	FORMAT	DESCRIPTION
18	1	A8	SURFACE GEOLOGIC MAP UNIT IDENTIFYING CODE
19	2	I6	TOTAL RECORDS FOR GEOLOGIC MAP UNIT
20	3	I6	NUMBER OF POTASSIUM RECORDS COMPUTED FOR GEOLOGIC UNIT
21			
22	4	F6.1	POTASSIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PERCENT K
23			
24	5	F6.1	POTASSIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PERCENT K
25			
26	6	A3	POTASSIUM CONCENTRATION DISTRIBUTION CODE
27	7	I6	NUMBER OF URANIUM RECORDS COMPUTED FOR GEOLOGIC UNIT
28	8	F6.1	URANIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
29			
30	9	F6.1	URANIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
31			
32	10	A3	URANIUM CONCENTRATION DISTRIBUTION CODE
33	11	I6	NUMBER OF THORIUM RECORDS COMPUTED FOR GEOLOGIC UNIT
34	12	F6.1	THORIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
35			
36	13	F6.1	THORIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
37			
38	14	A3	THORIUM CONCENTRATION DISTRIBUTION CODE
39	15	I6	NUMBER OF URANIUM-TO-THORIUM RATIO RECORDS COMPUTED FOR GEOLOGIC UNIT
40			
41	16	F6.1	URANIUM-TO-THORIUM RATIO MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
42			
43	17	F6.1	URANIUM-TO-THORIUM RATIO STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
44			
45			
46	18	A3	URANIUM-TO-THORIUM RATIO DISTRIBUTION CODE
47	19	I6	NUMBER OF URANIUM-TO-POTASSIUM RATIO RECORDS COMPUTED FOR GEOLOGIC UNIT
48			
49	20	F6.1	URANIUM-TO-POTASSIUM RATIO MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PERCENT K
50			
51	21	F6.1	URANIUM-TO-POTASSIUM RATIO STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PERCENT K
52			
53	22	A3	URANIUM-TO-POTASSIUM RATIO DISTRIBUTION CODE
54	23	I6	NUMBER OF THORIUM-TO-POTASSIUM RATIO RECORDS COMPUTED FOR GEOLOGIC UNIT
55			
56	24	F6.1	THORIUM-TO-POTASSIUM RATIO MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH PER PERCENT K
57			
58	25	F6.1	THORIUM-TO-POTASSIUM RATIO STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH PER PERCENT K
59			
60	26	A3	THORIUM-TO-POTASSIUM RATIO DISTRIBUTION CODE

2. Tape Identification Block (Block 2)

The information and format for this block are indicated in lines 8 through 11 of the Format Description Block A6.1, and 70 characters are produced. The remaining 6930 characters of this block are blanks.

3. Statistical Analysis Summary Data Blocks

The information and format for the logical records in these blocks are indicated in lines 18 through 60 of the Format Description Block A6.1. One logical record contains 140 characters. There are 50 such logical records per 7000 character physical record or block.

B. DESCRIPTION OF LISTINGS

B1. Single record reduced data listings: include the following information on Microfiche:

ITEM	DESCRIPTION
REC	Sequential record number
Lat	Location Y in latitude
Long	Location X in longitude
RMag	Residual magnetic field, gammas
Alt	Surface altitude
GEO UNIT	Geologic Type
AKUT	A=Altitude; K=Potassium; U=Uranium T=Thorium - Results of statistical adequacy test
COS	Cosmic c/s
BiAir	Airborne ²¹⁴ Bi, 4π data
GC	Gross count, .4 MeV - 2.8 MeV
T ₂	²⁰⁸ Tl c/s
Bi	²¹⁴ Bi c/s
K	⁴⁰ K c/s
BI:T ₂	Ratio
BI:k	Ratio
T ₂ :K	Ratio
TEMP	Outside Air Temperature (°C)
BP	Atmospheric Pressure (In. Hg)

B2. Averaged record data listings: include the following information on Microfiche:

ITEM	DESCRIPTION
REC	Sequential Record number
GEO UNIT	Geologic type
AKUT	A=Altitude; K=Potassium; U=Uranium; T=Thorium - Results of statistical adequacy test
Long	Longitude of X location of geologic type
Lat	Latitude of Y location of geologic type
RMag	Residual magnetic field, gammas
COS	Cosmic, 4π
BiAir	Atmospheric Bi, 4π
GC	Gross count, c/s

ITEM

DESCRIPTION

T ₂	T ₂ value, c/s
Rank	T ₂ standard deviation rank
Bi	Bi value, c/s
Rank	Bi standard deviation rank
K	K value, c/s
Rank	K standard deviation rank
Bi/T ₂	Ratio value
Rank	Bi/T ₂ standard deviation rank
Bi/K	Ratio value
Rank	Bi/K standard deviation rank
T ₂ /K	Ratio value
Rank	T ₂ /K standard deviation rank

GEODATA INT. INC. SINGLE REC LISTING ELKO										TIE LINE 1N										
REC	LAT	LONG	RMAG	ALT	GEOUNT	A	K	U	T	COS	BIAIR	GC	TL	BI	K	BI:TL	MI:K	TL:K	TEMP	HP
1	40.7167	115.8762	-382.4	400	IPU	0	0	0	0	29	10.6	866	30	7	77	0.233	0.091	0.340	26.0	24.01
2	40.7167	115.8762	-382.4	400	IPU	0	0	0	0	39	10.6	1584	44	12	104	0.273	0.115	0.423	26.0	23.98
3	40.7167	115.8762	-382.3	410	IPU	0	0	0	0	26	10.6	1581	36	17	106	0.472	0.160	0.340	26.0	24.00
4	40.7170	115.8763	-382.5	406	IPU	0	0	0	0	36	10.6	1507	44	7	114	0.159	0.061	0.386	26.0	23.96
5	40.7176	115.8763	-382.9	399	IPU	0	0	0	0	32	10.6	1635	42	16	100	0.381	0.160	0.420	26.0	24.01
6	40.7179	115.8764	-383.2	379	IPU	0	0	0	0	29	10.6	1505	47	16	94	0.340	0.170	0.500	26.0	23.99
7	40.7182	115.8764	-383.0	368	IPU	0	0	0	0	31	10.6	1642	43	20	117	0.465	0.171	0.368	26.0	24.01
8	40.7185	115.8764	-244.6	368	IPU	0	0	1	0	34	10.6	1585	58	6	110	0.103	0.055	0.527	26.0	24.00
9	40.7188	115.8765	-246.0	365	IPU	0	0	0	0	45	10.6	1619	49	17	115	0.347	0.148	0.426	26.0	24.01
10	40.7191	115.8765	-246.3	354	IPU	0	0	0	0	40	10.6	1702	45	26	111	0.578	0.234	0.405	26.0	24.01
11	40.7194	115.8765	-246.0	346	IPU	0	0	0	0	31	10.6	1654	38	24	110	0.632	0.218	0.345	26.0	24.01
12	40.7197	115.8766	-245.2	339	IPMU	0	0	0	0	36	10.6	1688	43	27	130	0.628	0.208	0.331	26.0	23.99
13	40.7200	115.8766	-244.8	340	IPMU	0	0	0	0	26	10.6	1736	67	19	113	0.284	0.168	0.593	26.0	24.01
14	40.7203	115.8766	-244.2	352	IPMU	0	0	0	0	37	10.6	1654	47	24	114	0.511	0.211	0.412	26.0	24.04
15	40.7206	115.8767	-242.3	350	IPMU	0	0	0	0	42	10.6	1738	61	15	123	0.246	0.122	0.496	26.0	24.07
16	40.7209	115.8767	-241.9	358	IPMU	0	0	0	0	25	10.6	1777	65	17	138	0.262	0.123	0.471	26.0	24.00
17	40.7212	115.8768	-242.9	354	IPMU	0	0	0	0	35	10.6	1794	55	23	120	0.418	0.192	0.458	26.0	24.04
18	40.7215	115.8768	-242.5	359	IPMU	0	0	0	0	34	10.6	1710	48	29	131	0.604	0.221	0.366	26.0	24.01
19	40.7218	115.8768	-243.7	350	IPMU	0	0	0	0	33	10.6	1752	56	15	134	0.268	0.112	0.418	25.9	24.02
20	40.7221	115.8769	-243.0	367	IPMU	0	0	0	0	28	10.6	1746	50	24	123	0.480	0.195	0.407	26.0	24.05
21	40.7224	115.8769	-242.3	376	IPMU	0	0	0	0	31	13.0	1647	40	18	127	0.450	0.142	0.315	26.0	24.06
22	40.7227	115.8769	-241.8	365	IPMU	0	0	1	0	36	13.0	1671	53	5	124	0.094	0.040	0.427	26.0	24.04
23	40.7230	115.8770	-241.0	358	IPMU	0	0	0	0	33	13.0	1709	49	13	141	0.265	0.092	0.348	26.0	24.05
24	40.7233	115.8770	-239.2	358	IPMU	0	0	0	0	39	13.0	1731	51	20	121	0.392	0.165	0.421	26.0	23.98
25	40.7236	115.8770	-238.7	347	IPMU	0	0	0	0	20	13.0	1899	48	28	136	0.583	0.206	0.353	26.0	24.05
26	40.7239	115.8771	-235.9	339	IPMU	0	0	0	0	31	13.0	1747	57	22	129	0.386	0.171	0.442	26.0	24.05
27	40.7242	115.8771	-233.5	340	IPMU	0	0	0	0	34	13.0	1703	54	24	116	0.444	0.207	0.466	26.0	24.06
28	40.7245	115.8771	-231.7	338	IPMU	0	0	0	0	27	13.0	1696	47	15	132	0.319	0.114	0.356	26.0	24.08
29	40.7248	115.8772	-229.7	329	IPMU	0	0	0	0	24	13.0	1703	52	18	109	0.346	0.165	0.477	26.1	24.05
30	40.7251	115.8772	-227.8	329	IPMU	0	0	0	0	32	13.0	1805	79	11	118	0.139	0.093	0.669	26.1	24.05
31	40.7254	115.8772	-227.7	335	IPMU	0	0	0	0	25	12.4	1744	48	29	116	0.604	0.250	0.414	26.1	24.06
32	40.7257	115.8773	-226.9	330	IPMU	0	0	0	0	28	12.4	1762	53	18	131	0.340	0.137	0.405	26.2	24.07
33	40.7260	115.8773	-224.6	326	IPMU	0	0	0	0	33	12.4	1786	46	19	137	0.413	0.139	0.336	26.3	24.07
34	40.7263	115.8773	-223.9	334	IPMU	0	0	0	0	29	12.4	1878	53	20	144	0.377	0.139	0.368	26.2	24.07
35	40.7266	115.8774	-222.5	348	IPMU	0	0	0	0	24	12.4	1867	66	14	141	0.212	0.099	0.468	26.2	24.07
36	40.7269	115.8774	-221.3	354	IPMU	0	0	0	0	34	12.4	1849	64	21	145	0.328	0.145	0.441	26.2	24.07
37	40.7272	115.8774	-221.7	350	IPMU	0	0	0	0	31	12.4	1887	53	16	154	0.302	0.104	0.344	26.2	24.05
38	40.7275	115.8775	-221.6	355	IPMU	0	0	0	0	34	12.4	1837	43	24	156	0.558	0.154	0.276	26.2	24.08
39	40.7278	115.8775	-221.1	350	QA	0	0	0	0	40	12.4	1833	51	21	142	0.412	0.148	0.359	26.2	24.07
40	40.7281	115.8775	-221.5	350	QA	0	0	0	0	32	12.4	1873	46	22	161	0.478	0.137	0.286	26.2	24.08
41	40.7284	115.8776	-221.7	341	QA	0	0	0	0	42	12.9	1843	53	21	161	0.396	0.130	0.329	26.2	24.06
42	40.7287	115.8776	-223.5	350	QA	0	0	0	0	33	12.9	1801	37	17	149	0.459	0.114	0.248	26.2	24.06
43	40.7290	115.8776	-224.1	353	QA	0	0	0	0	27	12.9	1747	56	9	131	0.161	0.069	0.427	26.2	24.03
44	40.7293	115.8777	-225.0	360	QA	0	0	0	0	27	12.9	1816	55	14	141	0.255	0.099	0.390	26.1	24.07
45	40.7296	115.8777	-227.0	348	QA	0	0	0	0	25	12.9	1776	57	17	140	0.298	0.121	0.407	26.2	24.07
46	40.7299	115.8777	-226.9	351	QA	0	0	0	0	47	12.9	1680	41	18	129	0.439	0.140	0.318	26.2	24.08
47	40.7302	115.8778	-227.5	360	QA	0	0	0	0	31	12.9	1633	42	21	110	0.500	0.191	0.382	26.2	24.07
48	40.7305	115.8778	-229.9	352	QA	0	0	0	0	26	12.9	1778	57	19	130	0.333	0.146	0.438	26.2	24.07
49	40.7308	115.8778	-231.4	342	QA	0	0	0	0	34	12.9	1695	54	20	137	0.370	0.146	0.394	26.4	24.09
50	40.7311	115.8779	-231.1	342	QA	0	0	0	0	36	12.9	1716	46	33	127	0.717	0.260	0.362	26.3	24.10
51	40.7314	115.8779	-232.1	333	QA	0	0	0	0	22	12.1	1715	41	18	134	0.439	0.134	0.306	26.3	24.08
52	40.7317	115.8779	-231.8	325	QA	0	0	0	0	34	12.1	1652	42	19	123	0.452	0.154	0.341	26.3	24.13
53	40.7320	115.8780	-231.3	310	QA	0	0	0	0	28	12.1	1614	45	22	123	0.489	0.179	0.366	26.3	24.10
54	40.7323	115.8780	-231.5	312	QA	0	0	0	0	20	12.1	1685	57	15	129	0.263	0.116	0.442	26.3	24.10
REC	LAT	LONG	RMAG	ALT	GEOUNT	A	K	U	T	COS	BIAIR	GC	TL	BI	K	BI:TL	MI:K	TL:K	TEMP	BP
55	40.7326	115.8780	-232.9	303	QA	0	0	0	0	42	12.1	1631	47	16	132	0.340	0.121	0.356	26.3	24.17
56	40.7329	115.8781	-233.9	325	QA	0	0	0	0	28	12.1	1737	47	19	130	0.404	0.146	0.362	26.3	24.11
57	40.7332	115.8781	-232.6	295	QA	0	0	0	0	24	12.1	1705	57	29	118	0.509	0.246	0.483	26.3	24.11

ATI-15

GEODATA INT. INC. AVERAGE REC LISTING ELKS

TIE LINE 1N

ELKS TIE LINE 1N																
RCN	GEU UNIT	BI RANK	A	K	U	T	K RANK	LONG	BI/TL RANK	LAT	BI/K RANK	RMAG	TL/K RANK	COS	BIAIR	GC
1	30+0	IPU	7-1	0	0	0	0	115.8762	0.233-1	40.7167	0.080-1	-382.4	0.345+0	29	10.6	866
2	44+0	IPU	12-0	0	0	0	0	115.8762	0.273-1	40.7167	0.105-1	-382.4	0.386+0	39	10.6	1584
3	36+0	IPU	17 0	0	0	0	0	115.8762	0.472-0	40.7167	0.147-0	-382.3	0.310+0	26	10.6	1581
4	41+0	IPU	13-0	0	0	0	0	115.8763	0.316-1	40.7170	0.115-1	-382.5	0.365-0	36	10.6	1507
5	43+0	IPU	14-0	0	0	0	0	115.8763	0.321-1	40.7176	0.122-1	-382.9	0.380+0	32	10.6	1635
6	45+0	IPU	14-0	0	0	0	0	115.8764	0.317-1	40.7179	0.125-1	-383.2	0.394+0	29	10.6	1505
7	47+1	IPU	15-0	0	0	0	0	115.8764	0.323-1	40.7182	0.129-1	-383.0	0.400+0	31	10.6	1642
8	48+1	IPU	16-0	0	0	0	0	115.8764	0.335-1	40.7185	0.135-0	-244.6	0.403+0	34	10.6	1585
9	47+1	IPU	18+0	0	0	0	0	115.8765	0.390-0	40.7188	0.150-0	-246.0	0.386+0	45	10.6	1619
10	47+0	IPU	20+0	0	0	0	0	115.8765	0.441-0	40.7191	0.167-0	-246.3	0.379+0	40	10.6	1702
11	47+0	IPU	22+0	0	0	0	0	115.8765	0.474-0	40.7194	0.178-0	-246.0	0.376+0	31	10.6	1654
12	48+1	IPMU	23+1	0	0	0	0	115.8766	0.472-0	40.7197	0.181-0	-245.2	0.383+0	36	10.6	1688
13	52+1	IPMU	21+1	0	0	0	0	115.8766	0.414-0	40.7200	0.170-0	-244.8	0.411+0	26	10.6	1736
14	55+2	IPMU	20+1	0	0	0	0	115.8766	0.378-0	40.7203	0.159-0	-244.2	0.422+0	37	10.6	1654
15	57+2	IPMU	20+0	0	0	0	0	115.8767	0.353-0	40.7206	0.151-0	-242.3	0.429+0	42	10.6	1738
16	57+2	IPMU	20+0	0	0	0	0	115.8767	0.350-0	40.7209	0.148-0	-241.9	0.423+0	25	10.6	1777
17	55+2	IPMU	21+1	0	0	0	0	115.8768	0.380-0	40.7212	0.154-0	-242.9	0.405+0	35	10.6	1794
18	53+1	IPMU	21+1	0	0	0	0	115.8768	0.403-0	40.7215	0.156-0	-242.5	0.386+0	34	10.6	1710
19	51+1	IPMU	20+0	0	0	0	0	115.8768	0.391-0	40.7218	0.146-0	-243.2	0.373-0	33	10.6	1752
20	49+1	IPMU	18+0	0	0	0	0	115.8769	0.377-0	40.7221	0.136-0	-243.0	0.360-0	28	10.6	1746
21	48+1	IPMU	16 0	0	0	0	0	115.8769	0.339-0	40.7224	0.119-0	-242.3	0.352-0	31	13.0	1647
22	49+1	IPMU	15-0	0	0	0	0	115.8769	0.311-0	40.7227	0.110-1	-241.8	0.354-0	36	13.0	1671
23	49+1	IPMU	16+0	0	0	0	0	115.8770	0.335-0	40.7230	0.118-1	-241.0	0.354-0	33	13.0	1709
24	50+1	IPMU	18+0	0	0	0	0	115.8770	0.370-0	40.7233	0.134-0	-239.2	0.364-0	39	13.0	1731
25	51+1	IPMU	20+1	0	0	0	0	115.8770	0.404-0	40.7236	0.149-0	-238.7	0.370-0	20	13.0	1899
26	51+1	IPMU	21+1	0	0	0	0	115.8771	0.415-0	40.7239	0.158-0	-235.9	0.380-0	31	13.0	1747
27	53+1	IPMU	20+0	0	0	0	0	115.8771	0.385-0	40.7242	0.154-0	-233.5	0.402+0	34	13.0	1703

APPENDIX III
PRODUCTION SUMMARY

APPENDIX III				
PRODUCTION SUMMARY - SURVEY TIME PERIOD				
ML/TL	DATE FLOWN	SURVEY LINE MILES	AVERAGE SPEED/DAY	AVERAGE ALTITUDE/DAY
ML1E-6ETL5	May 19, 1978	333	93.96	415.71
ML14E-22E ML11ETL6N	May 20, 1979	565	82.14	471.69
ML7E-10E TL6STL7	May 21, 1978	316	93.43	449.03
ML,23ETL8, 9N,9S	May 22, 1978	192	85.25	533.95
ML16W-21W TL1N,1S,2	August 2, 1978	457	85.58	390.47
ML12E-13E ML10W-15W	August 3, 1978	424	86.41	439.13
ML4W-9WML4M, 9M	August 4, 1978	352	85.83	430.84
ML2W,3WML23W ML1MTL4	August 5, 1978	263	83.17	422.77
ML1WML22WTL3	August 6, 1978	157	89.05	451.20

AIII-1

TABLE AIII-1 Test Line Results												
UNIT	1978											
	May 19	May 20	May 21	May 22	Aug. 2	Aug. 3	Aug. 4	Aug. 5	Aug. 6			
PRE COS	29.61	30.61	30.53	31.72	30.19	26.54	27.54	28.97	29.64			
POS COS	—	32.82	33.40	34.48	34.88	29.25	27.84	32.03	30.12			
TI	56.12	59.78	58.05	58.91	42.01	46.98	47.25	45.33	41.67			
TI	—	55.06	56.46	57.17	37.27	45.31	46.05	43.97	44.71			
Bi	22.54	24.97	23.73	23.24	20.07	19.30	21.81	18.84	18.57			
Bi	—	22.02	23.05	21.17	14.95	16.22	17.63	15.52	17.80			
K	150.96	160.00	160.86	161.15	100.53	129.25	126.66	107.01	99.78			
K	—	147.87	150.37	151.69	86.64	123.11	123.50	105.18	107.01			
GC	1759.37	1845.86	1819.52	1822.53	1630.23	1816.83	1843.46	1735.23	1644.45			
GC	—	1756.68	1821.62	1786.53	1520.93	1720.33	1706.94	1688.70	1705.07			
BiAir	7.52	10.56	9.78	7.52	16.98	17.34	20.66	23.21	19.45			
BiAir	—	10.49	18.77	13.37	9.60	12.67	10.19	17.87	17.09			
ALT	387.23	401.80	392.34	394.16	363.63	419.42	426.14	390.84	381.42			
ALT	—	384.89	381.37	383.37	505.03	417.83	401.00	428.79	418.90			

AIII-2

TABLE AIII-2 Average Lama I Speed and Altitude Determined from Data of Appendix II

LINE	AVERAGE SPEED, MPH	AVERAGE ALTITUDE, FT	LINE	AVERAGE SPEED, MPH	AVERAGE ALTITUDE, FT
ML 1E	86.88	426.79	TL 1N	74.97	310.42
ML 2E	105.01	408.55	TL 1S	89.41	393.42
ML 3E	74.20	387.23	TL 2	94.69	382.28
ML 4E	115.14	445.96	TL 3	91.13	513.64
ML 5E	75.50	425.03	TL 4	90.34	408.13
ML 6E	112.20	434.17	TL 5	88.81	382.25
ML 7E	88.29	490.78	TL 6N	90.44	414.05
ML 8E	97.66	438.13	TL 6S	102.12	398.64
ML 9E	92.74	421.49	TL 7	86.71	447.05
ML 10E	93.04	500.09	TL 8	93.47	573.08
ML 11E	91.00	481.84	TL 9N	74.94	634.09
ML 12E	86.13	441.08	TL 9S	93.06	409.12
ML 13E	78.51	474.24	ML 1W	88.34	414.49
ML 14E	83.86	517.02	ML 2W	94.83	429.69
ML 15E	84.64	512.98	ML 3W	86.12	421.03
ML 16E	92.35	472.85	ML 4W	93.38	438.77
ML 17E	89.32	477.38	ML 5W	87.50	448.60
ML 18E	95.64	492.18	ML 6W	80.96	432.32
ML 19E	90.11	470.23	ML 7W	85.78	417.73
ML 20E	89.33	459.63	ML 8W	92.22	418.79
ML 21E	88.33	430.26	ML 9W	87.40	431.60
ML 22E	82.33	460.14	ML 10W	86.67	418.39
ML 23E	79.53	519.50	ML 11W	91.74	386.84

AIII-3

TABLE AIII-2 Average Lama I Speed and Altitude Determined from Data of Appendix II (Continued)

LINE	AVERAGE SPEED, MPH	AVERAGE ALTITUDE, FT	LINE	AVERAGE SPEED, MPH	AVERAGE ALTITUDE, FT
ML 23W	81.51	409.21			
ML 1M	63.07	445.79			
ML 5M	97.29	428.24			
ML 4M	62.11	430.66			
ML 12W	85.27	423.34			
ML 13W	92.95	428.91			
ML 14W	83.45	457.21			
ML 15W	86.66	483.05			
ML 16W	70.66	421.27			
ML 17W	88.86	415.18			
ML 18W	88.91	402.59			
ML 19W	88.00	407.95			
ML 20W	93.15	386.95			
ML 21W	81.54	395.16			
ML 22W	87.67	425.46			

AIII-4

TABLE AIII-3 Diurnal Corrections to Map Line Data

LINE	DIURNAL CORRECTIONS IN GAMMAS	LINE	DIURNAL CORRECTIONS IN GAMMAS
1 E	0	1 W	14
2 E	- 1	2 W	-10
3 E	- 1	3 W	0
4 E	0	4 W	-17
5 E	2	5 W	- 7
6 E	- 2	6 W	- 3
7 E	8	7 W	0
8 E	11	8 W	8
9 E	9	9 W	8
10 E	5	10 W	-19
11 E	-10	11 W	-10
12 E	2	12 W	- 2
13 E	9	13 W	11
14 E	-25	14 W	13
15 E	-18	15 W	9
16 E	-12	15 W	9
17 E	-11	17 W	9
18 E	- 8	18 W	12
19 E	- 5	19 W	13
20 E	- 4	20 W	9
21 E	- 6	21 W	0
22 E	- 8	22 W	- 9
23 E	7	23 W	- 4

AIII-5

TABLE AIII-3 Diurnal Corrections to Map Line Data (Continued)

TL	<u>LINE</u>	<u>DIURNAL CORRECTIONS IN GAMMAS</u>	<u>LINE</u>	<u>DIURNAL CORRECTIONS IN GAMMAS</u>
	TL1N	- 7		
	1S	- 20		
	2	- 12		
	3	11		
	4	0		
	5	0		
	6N	- 7		
	6S	- 6		
	7	- 15		
	8	4		
	9N	9		
	9S	7

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ELKO, NEVADA; UTAH
214 ± STANDARD DEVIATIONS

GEODATA INTERNATIONAL, INC.
7035 JOHN W. CARPENTER FRWY. DALLAS, TEXAS 75247
NATIONAL GAMMA RAY MAP SERIES

ELKO, NEVADA; UTAH
40' ± STANDARD DEVIATIONS

GEODATA INTERNATIONAL, INC.
7035 JOHN W. CARPENTER FRWY. DALLAS, TEXAS 75247
NATIONAL GAMMA RAY MAP SERIES

ELKO, NEVADA; UTAH
214Bi/206Pb ± STANDARD DEVIATIONS

GEODATA INTERNATIONAL, INC.
7035 JOHN W. CARPENTER FRWY. DALLAS, TEXAS 75247
NATIONAL GAMMA RAY MAP SERIES

ELKO, NEVADA; UTAH
214Bi/40K ± STANDARD DEVIATIONS

GEODATA INTERNATIONAL, INC.
7035 JOHN W. CARPENTER FRWY. DALLAS, TEXAS 75247
NATIONAL GAMMA RAY MAP SERIES

0 5 10 15 20 25 30 MILES
0 5 10 15 20 25 30 KILOMETERS

ELKO, NEVADA; UTAH
208 T_R / 40 K ± STANDARD DEVIATIONS

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 59475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

ML 2 ELKO WEST

115°30'

ML 2 ELKO EAST

114°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

ML 2 ELKO WEST

0 5 10 15 MILES

ML 2 ELKO EAST

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

ML 3 ELKO WEST

ML 3 ELKO EAST

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

114°45'

114°30'

ML 5 ELK ML 5 ELKO EAST

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

ML 7 ELKO WEST

0 5 10 15 MILES

115°30'

ML 7 ELKO EAST

114°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

ML 8 ELKO WEST

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 MILES

115°30'

ML 8 ELKO EAST

114°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

ML 8 ELKO EAST

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

ML 10 ELKO WEST

0 5 10 15 MILES

ML 10 ELKO EAST

114°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

ML 11 ELKO WEST

5 10 15 MILES

ML 11 ELKO EAST

114°30'

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

ML 12 ELKO WEST

ML 12 ELKO EAST

114°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

TL/K
.05 /DIV

BI/K
.04 /DIV

BI/TL
.03 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

ML 13 ELKO WEST

0 5 10 15 MILES

ML 13 ELKO EAST

114°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

TL/K
.05 /DIV

BI/K
.04 /DIV

BI/TL
.03 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TI
10 C/S/DIV

ALT
100 FT/DIV

ML 14 ELKO WEST

0 5 10 15 MILES

115°30'

ML 14 ELKO EAST

114°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

C
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

ML 16 ELKO WEST

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000

ML 16 ELKO EAST

114°30'

MAG
D GAMMA/DIV
ASE = -1500

MAG
GAMMA/DIV
ASE = 54475

RESSURE
.25 IN HG/DIV
ASE = 20

EMP
DEG C/DIV
ASE = 15

LT
00 FT/DIV

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

ML 17 ELKO WEST

115°30'

ML 17 ELKO EAST

114°30'

ML17

ML 17 ELKO WEST

ML 17 ELKO EAST

L/K
06 /DIV

I/K
04 /DIV

I/TL
08 /DIV

OC
00 C/S/DIV

MAG
00 GAMMAS/DIV
BASE = -300

IAIR
C/S/DIV

5 C/S/DIV

I
C/S/DIV

L
C/S/DIV

LT
00 FT/DIV

ML 18 ELKO WEST

ML 18 ELKO EAST

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

ML 18 ELKO WEST

115°30'

ML 18 ELKO EAST

114°30'

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

ML 19 ELKO WEST

115°30'

ML 19 ELKO EAST

114°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
DEG C/DIV
BASE = 15

ALT
100 FT/DIV

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAR
C/S/DIV

K
5 C/S/DIV

BI
C/S/DIV

L
0 C/S/DIV

ALT
00 FT/DIV

ML 20 ELKO WEST

115°30'

ML 20 ELKO EAST

114°30'

1000
GAMMA/DIV
SE = -1500

1000
GAMMA/DIV
SE = 54475

1000
PRESSURE
25 IN HG/DIV
SE = 20

1000
MP
DEG C/DIV
SE = 15

1000
T
FT/DIV

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

ML 21 ELKO WEST

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 MILES

115° 30'

ML 21 ELKO EAST

114° 30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

ML 22 ELKO WEST

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 MILES

115°30'

ML 22 ELKO EAST

15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 MILES

114°30'

MAG
GAMMA/DIV
BASE = -1500

MAG
GAMMA/DIV
BASE = 54475

PRESSURE
25 IN HG/DIV
BASE = 20

TEMP
DEG C/DIV
BASE = 15

ALT
FT/DIV

ML 23 ELKO WEST

0 5 10 15 MILES

ML 23 ELKO EAST

15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

TL 1 ELKO TIES

40°15'

TL 1 ELKO TIES

40°45'

0 5 10 15 20 MILES

MAG
0 GAMMA/DIV
BASE = -1500

MAG
0 GAMMA/DIV
BASE = 54475

RESSURE
25 IN HG/DIV
BASE = 20

EMP
DEG C/DIV
BASE = 15

LT
0 FT/DIV

TL 1 ELKO TIES

TL 1 ELKO TIES

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

TL 2 ELKO TIES

0 5 10 15 MILES

40°30'

MAG
0 GAMMA/DIV
BASE = -1500

MAG
GAMMA/DIV
BASE = 54475

RESSURE
.25 IN HG/DIV
BASE = 20

TEMP
DEG C/DIV
BASE = 15

LT
100 FT/DIV

TL 2 ELKO TIES

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 MILES

40°30'

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

TL 3 CLKO TIES

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
MILES

40°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

TL 3 ELKO TIES

5 0 5 10 MILES

40°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

TL 4 ELKO TIES

40°30' 10 MILES

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

TI 5 ELKO TIES

0 10 20 30 40 50 MILES

40°30'

RMAG
10 GAMMA/DIV
BASE = -1500

3MAG
GAMMA/DIV
BASE = 54475

PRESSURE
.25 IN HG/DIV
BASE = 20

TEMP
DEG C/DIV
BASE = 15

ILT
100 FT/DIV

TL 5 ELKO TIES

40°30'
MILES

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

TL 6 ELKO TIES

40°15'

TL 6 ELKO TIES

40°30'

TL/K
.06 /DIV

BI/K
.04 /DIV

BI/TL
.08 /DIV

GC
500 C/S/DIV

RMAG
100 GAMMAS/DIV
BASE = -300

BIAIR
5 C/S/DIV

K
25 C/S/DIV

BI
5 C/S/DIV

TL
10 C/S/DIV

ALT
100 FT/DIV

TL ? ELKO TIES

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

TL 7 ELKO TIES

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 MILES

40°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

TL 8 ELKO TIES

0 5 10 15 MILES

40°30'

RMAG
50 GAMMA/DIV
BASE = -1500

BMAG
5 GAMMA/DIV
BASE = 54475

PRESSURE
0.25 IN HG/DIV
BASE = 20

TEMP
1 DEG C/DIV
BASE = 15

ALT
100 FT/DIV

40°45'

TL 9 ELKO TIES

12 13 14 15 16 17 18