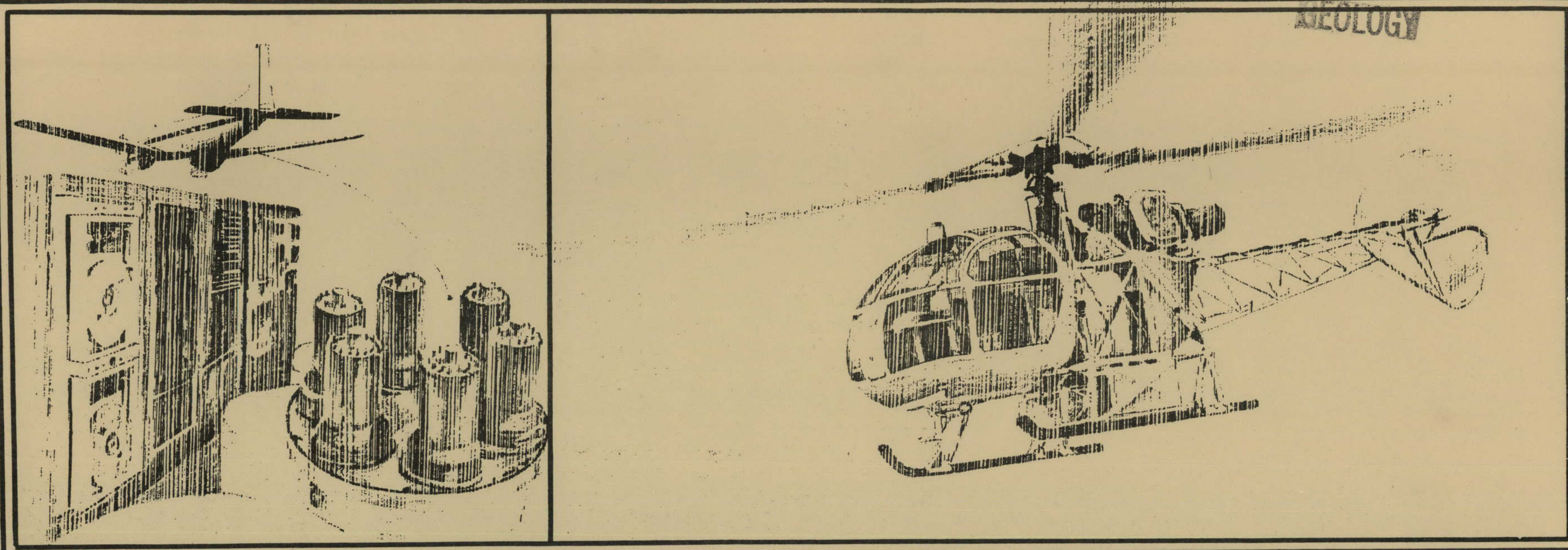

AERIAL RADIOMETRIC AND MAGNETIC SURVEY

NATIONAL TOPOGRAPHIC MAP

ROCKY MOUNT
AND
MANTEO
NORTH CAROLINA

PREPARED FOR THE U. S. DEPARTMENT OF ENERGY
GRAND JUNCTION OFFICE
GRAND JUNCTION, COLORADO
UNDER BENDIX FIELD ENGINEERING CORPORATION SUBCONTRACT #79-337-S

Geodata International, inc.
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AERIAL RADIOMETRIC AND MAGNETIC SURVEY

ROCKY MOUNT/MANTEO TOPOGRAPHIC MAP

NORTH CAROLINA

SOUTHEAST U.S. PROJECT

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION OFFICE
GRAND JUNCTION, COLORADO

UNDER BENDIX FIELD ENGINEERING SUBCONTRACT NO. 79-336-S
BY
GEODATA INTERNATIONAL, INC.
DALLAS, TEXAS

Geodata International, Inc.
7035 John W. Carpenter Freeway
Dallas, Texas 75247

"ROCKY MOUNT/MANTEO TOPOGRAPHIC SURVEY"

ABSTRACT

The results of analyses of the airborne gamma radiation and total magnetic field survey flown for the region identified as the Rocky Mount/Manteo National Topographic Map NI18-1 is presented in this report. The airborne data gathered is reduced by ground computer facilities to yield profile plots of 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. The distribution of data within each geologic unit, for all surveyed map lines and tie lines, has been calculated and is included. Two sets of profiled data for each line are included, with one set displaying the above-cited data. The second set includes only flight line magnetic field, temperature, pressure, altitude data plus magnetic field data as measured at a base station. A general description of the area, including descriptions of the various geologic units and the corresponding airborne data, is included also.

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INTRODUCTION

SECTION I.

INTRODUCTION

A. SURVEY AREA

Geodata International, Inc., Dallas, Texas, conducted an airborne gamma ray and total magnetic field survey for the Rocky Mount/Manteo National Topographic Map Sheets as outlined in Figure I.1. This survey was performed from a fixed-wing aircraft, using a computer-controlled, large-volume radiation detector system to detect the gamma radiation flux emanating from the surface materials. Each map line was flown in an east-west direction with line lengths of 82.0 miles; each tie line was flown in a north-south direction with line lengths of 69.0 miles. Map lines and tie lines are located as shown in Figure II.1.

Sections I through IV of this report present information and results associated with this specific survey. Section V gives the data acquisition and the processing procedures which are generally applicable to any survey flown with the equipment described.

B. SUMMARY OF MAP LOCATION, GEOLOGY AND PHYSIOGRAPHY

The Rocky Mount/Manteo map areas are located over a part of eastern North Carolina. The survey area is bounded by the latitudes 35°00' to 36°00' north and longitudes 74°00' to 78°00' west. The map areas are part of the Atlantic Coastal Plain from the Fall Line east to the margin of the Atlantic Ocean. It is a low, gently undulating surface with large estuarine areas, and shallow lagoons between the main land and offshore barrier islands. The Coastal Plain is, in many places, poorly drained, with large marshes and swamps, and several large inland water areas. (Figure I.2)

The geology of the eastern half of the area is dominated by Quaternary unconsolidated deposits, with many sands, silts, clays and muds. The western half of the area is dominated by Early and Middle Tertiary units - particularly the Yorktown Formation - and by Upper Cretaceous units. In the Fall Line area, where rivers originating in the Piedmont Plateau have cut valleys through the Coastal Plain sediments, Precambrian or Paleozoic rocks crop out. The rocks are either meta-sedimentaries, often with volcanic materials included, or igneous intrusives, with granitic composition.

The Lee Creek Phosphate unit of the Miocene deposits is known to contain large supplies of <u>very low grade</u> uranium (Southern Inter-

state Nuclear Board, 1969). The Upper Cretaceous units also have sediments with the potential for uranium ion concentration. However, so far, no prospects have been recorded for the Cretaceous units.

Figure I.1 Survey Index Map

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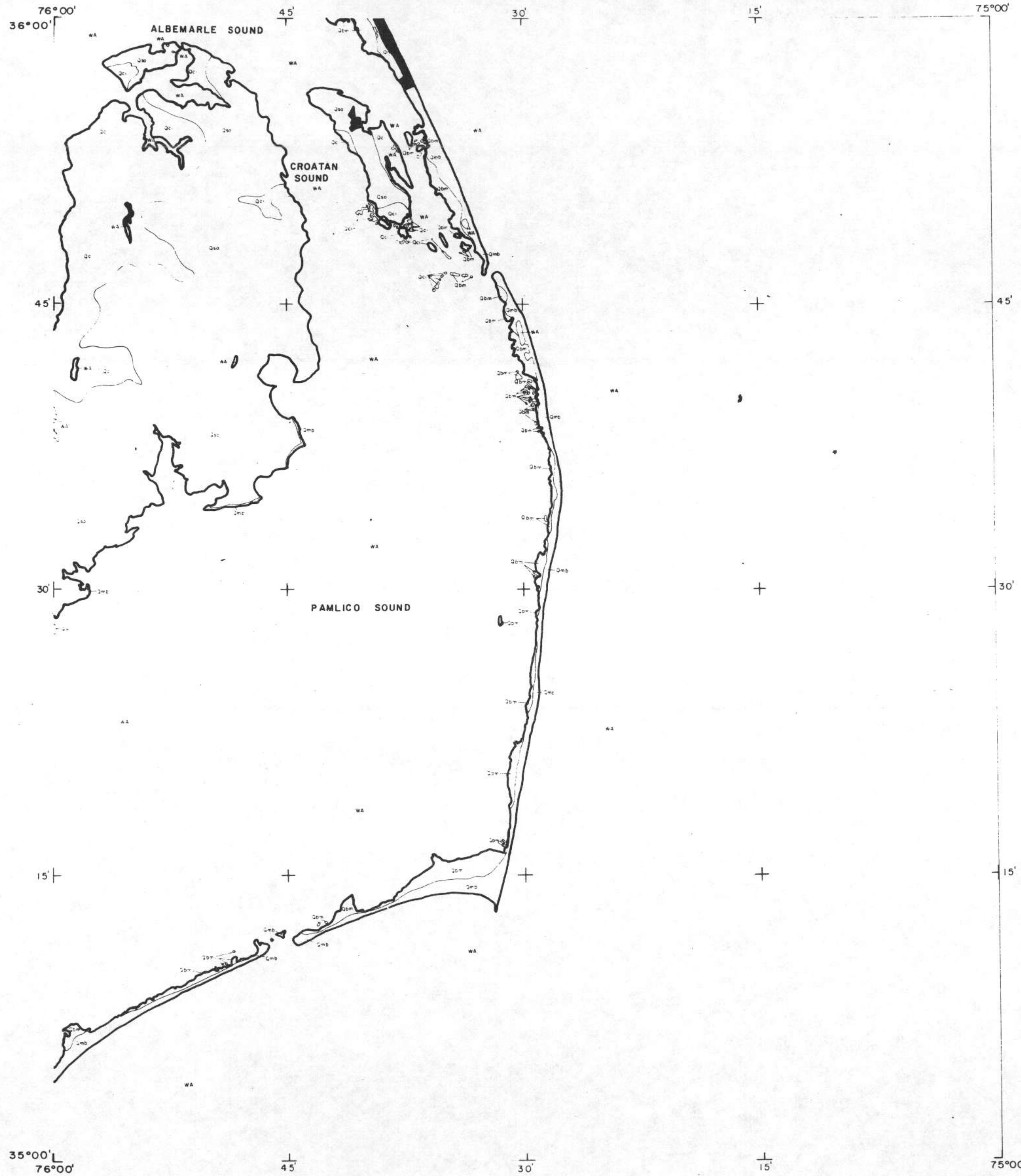
NATIONAL GAMMA RAY MAP SERIES

GREENSBORO	NORFOLK	EAST-VILLE
RALEIGH	ROCKY MOUNT	MANTEO
FLORENCE	BEAUFORT	

Figure I.2 Geologic Base Map

5 0 5 10 15 20 25 MILES
5 0 5 10 15 20 25 30 KILOMETERS
By International Exploration

ROCKY MOUNT, NORTH CAROLINA
GEOLOGY
REF: NTMS, NI 18-1
PREPARED FOR
U.S. DEPARTMENT OF ENERGY



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GEODATA INTERNATIONAL, INC.

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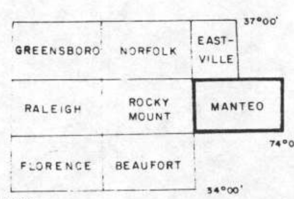
NATIONAL GAMMA RAY MAP SERIES

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 30 KILOMETERS

By International Exploration



MANTEO, NORTH CAROLINA

GEOLOGY

REF NTMS, NI 18-2

PREPARED FOR

U.S. DEPARTMENT OF ENERGY

SECTION II

FLIGHT OPERATIONS

SECTION II.

FLIGHT OPERATIONS

A. SURVEY TIME SUMMARY

The Rocky Mount/Manteo map sheets were flown between August 13 and August 23, 1979. A detailed list of dates flown and lines flown on those dates, as well as average altitude and speed for those dates, appears in Appendix I.A.

B. LINE COORDINATE LOCATION

Global navigation system data have been used to locate the positions of the flight lines. These lines are positioned and verified by point locations, determined by visual sighting by the navigator or photographic recovery, and corresponding record numbers displayed by the on-board computer. The data are then plotted as solid lines with ticks every ten records, circles every fifty records, and record numbers every one hundred records. Record numbers and circles also appear at the end of each line. The points used for location reference (at least every 10 miles) are marked with an "X". The flight base is then photographed with the geologic base map to produce the composite map in Figure II.1.

C. TEST LINES

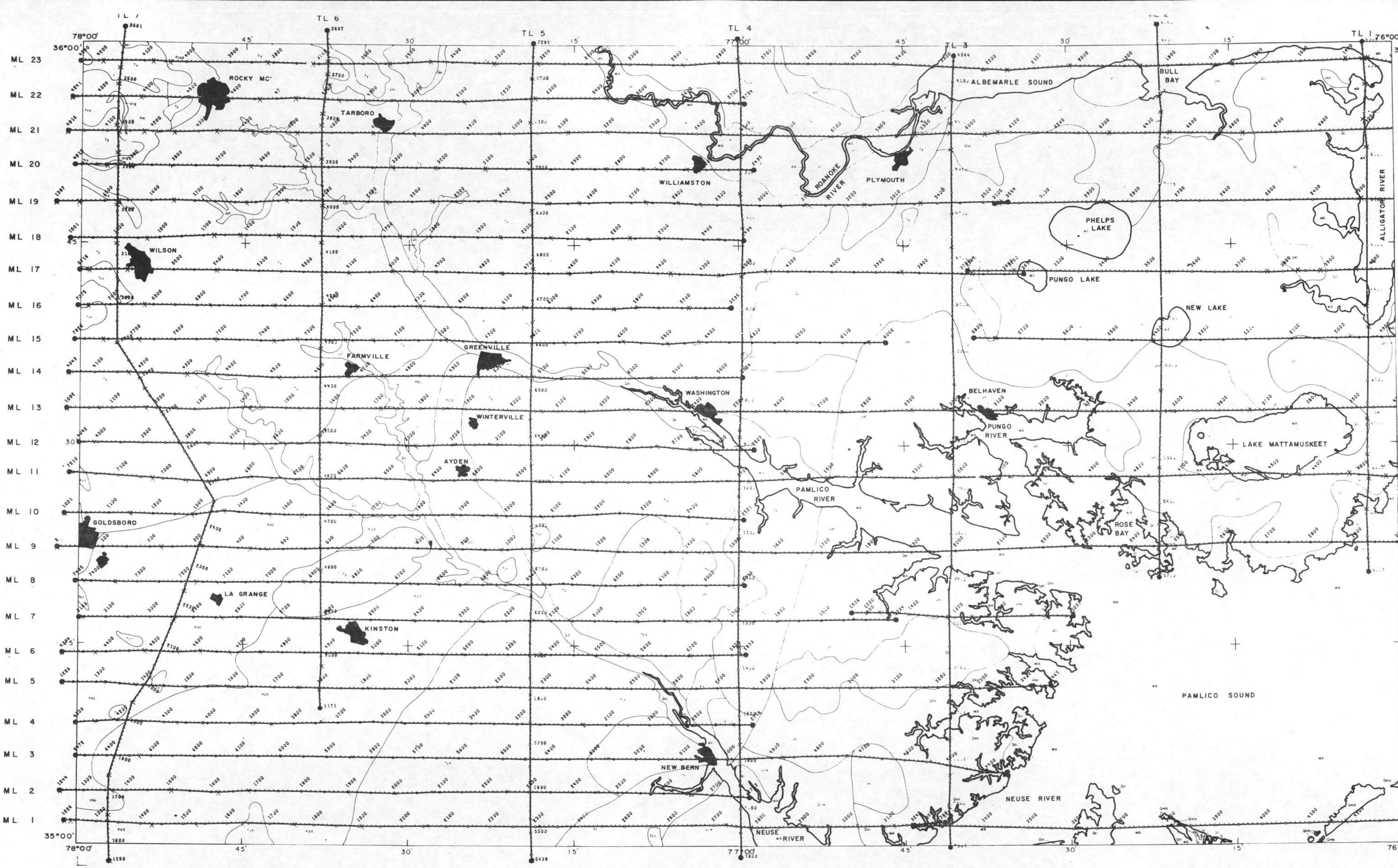
When conditions allow, two five-mile test lines are flown, one at the beginning of the day and one at the end of the day, over the same base. The data are used to check the repeatability of the system's measurements, and are presented in Appendix I.B.

D. MAGNETIC DIURNAL CORRECTION - BASE STATION

A base station magnetometer is set up in the area to acquire data pertaining to the diurnal changes in the magnetic field. These data are analyzed to evaluate a diurnal correction to the magnetic data obtained by the aircraft. A list of these corrections appears in Appendix I.C.

E. ALTITUDE AND GROUND SPEED SUMMARY

The average altitude and ground speed for each line is determined. A list by date appears in Appendix I.A, and is discussed in Section II.A. A list by flight line is given in Appendix I.E.



"X" INDICATES FILM VERIFIED POINTS

Figure II.1 NTMS Showing Flight Line Location

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 30 KILOMETERS

GEODATA INTERNATIONAL, INC.
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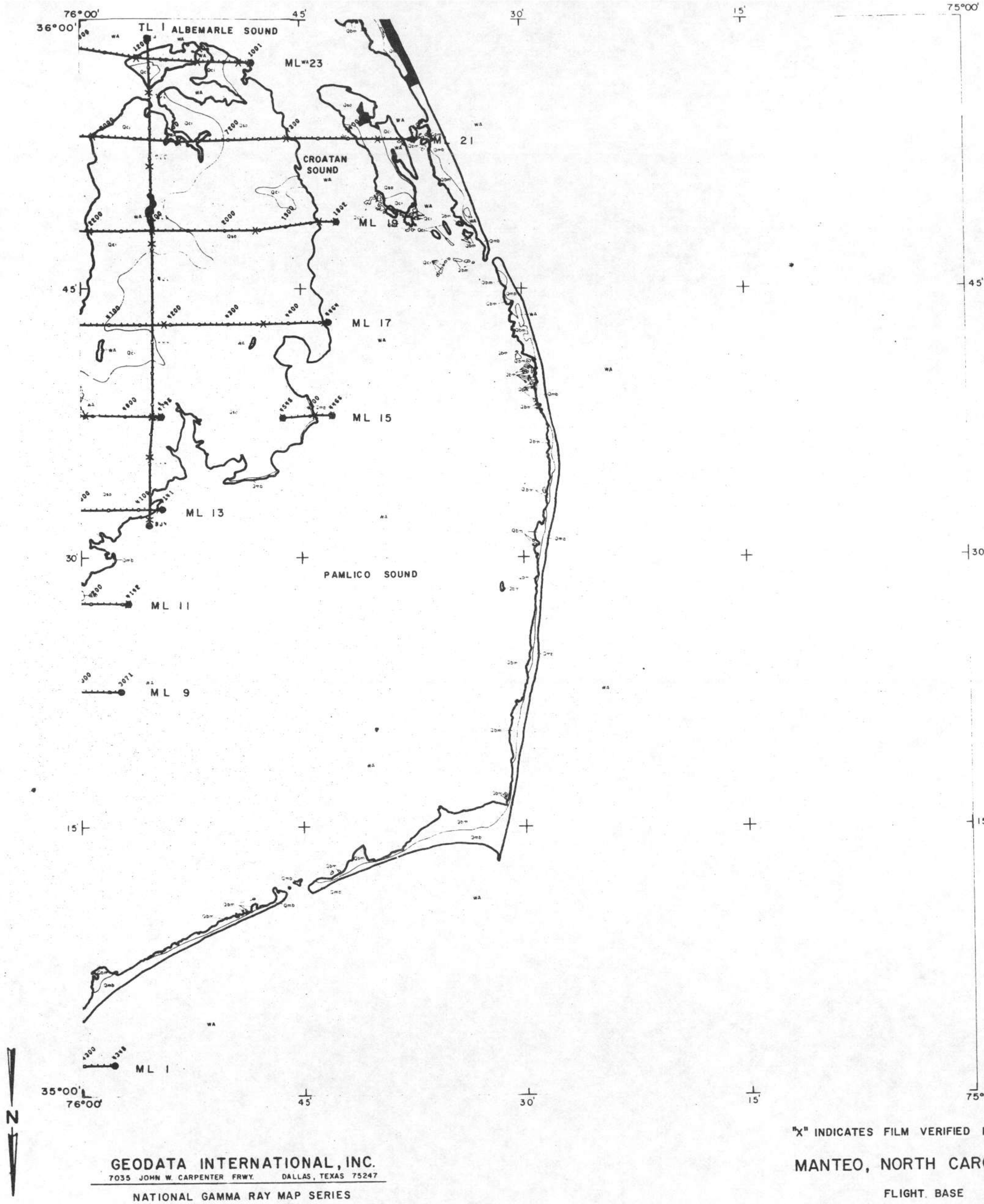
NATIONAL GAMMA RAY MAP SERIES

ROCKY MOUNT, NORTH CAROLINA
FLIGHT BASE
REF: NTMS, NI 18-1
PREPARED FOR
U.S. DEPARTMENT OF ENERGY



"X" INDICATES FILM VERIFIED POINTS

MANTEO, NORTH CAROLINA

FLIGHT BASE

REF NTMS, NI 18-2

PREPARED FOR
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GEODATA INTERNATIONAL, INC.
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NATIONAL GAMMA RAY MAP SERIES

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

SECTION III

GEOLOGY OF THE SURVEYED AREA

SECTION III.

GEOLOGY OF THE SURVEYED AREA

A. LOCATION AND GENERAL PHYSIOGRAPHY

The aerial radiometric and magnetic survey was conducted over the land areas of the Rocky Mount (N.T.M.S., 1953) and Manteo (N.T.M.S., 1957) national topographic map sheets. The Rocky Mount/Manteo map areas are in eastern North Carolina. They are bounded by the latitudes 35°00' to 36°00' north and by longitudes 74°00' to 78°00' west. The map areas include all, or part, of the counties of Beaufort, Bertie, Craven, Carteret, Chowan, Dare, Edgecombe, Greene, Hyde, Jones, Lenoir, Martin, Pitt, Pamlico, Washington, Wayne and Wilson.

The physiography of the map area is dominated by a lowland, which is a part of the eastern margin of the United States. The lowland passes under the sea without significant change of its gradual slope (Fenneman, 1938). The submerged portion of the slope is the Continental Shelf, and the emerged portion is the Coastal Plain... "Together, these two provinces constitute the Atlantic Coastal Plain, one of the major physiographic divisions of the United States..." (Fenneman, 1938, p. 1).

The emergent portion of the Atlantic Plain begins to the south of New England; it reaches a maximum width in Texas. The ratio of emergent area to submergent area of the plain has been subject to frequent changes during the Cenozoic Era.

The structural extent of the Coastal Plain is limited to geological formations of Cretaceous age and younger. The inner, or western, boundary is the inner edge of the Cretaceous units (Fenneman, 1938). This boundary is termed the Fall Line.

The Fall Line is not a true line, but a broad zone, some 30 to 40 miles wide. In this zone, the Coastal Plain sediments of Cretaceous age, or younger, cover the upland, interfluve, areas; whereas, granites, slates and other crystalline rocks are exposed along the water-courses, where erosion has removed the Mesozoic and Cenozoic sediments (Stuckey, 1965). West of the Fall Line, but not within the map area, is the Piedmont Plateau, east of the Fall Line are the Coastal Plain sediments.

The Coastal Plain has a strong resemblance to the Continental Shelf, with similar stratified materials. Sediments that have been exposed and eroded tend to be older than those of the shelf. The older sediments tend to be consolidated into sandstones and limestones, etc. The more recent sediments retain much of their original unconsolidated condition.

The slope of the emergent plain is small, generally 2 to 4 feet per mile. Generally, the youngest sediments occupy a narrow belt near the sea. Inland, progressively older beds are exposed. The older beds dip beneath younger beds in a seaward direction. The steeper dips of the older beds indicate that the continental margin has intermittently tilted seaward as its outer edge is covered by sediments. Further inland, the surface gradient increases. Differential erosion of the strata of unequal resistance produces lower-lying belts on the weaker rocks, with intervening ridges on the more resistant outcrops. The ridges are generally broad, low and inconspicuous.

From Cape Lookout (latitude 34½° north) northward, the Atlantic Coastal Plain is deeply indented by branching estuaries or bays. It is a fringe of peninsulas. The edge of the continent has been submerged, and the river valleys are drowned. The degree of submergence increases northward. The term "embayed section" has been used to describe this physiographic region (Fenneman, 1938).

The embayed section reaches its maximum width in North Carolina. The surface features are closely related to the nature of the underlying geology. In the past, seven or more terraces have been distinguished. The age of the terraces decreases, but their distinctiveness increases, from highest to lowest. The lower ones include some little eroded surfaces. In places, erosional scarps were thought to separate the terraces. The terraces were known, in ascending order, as the Pamlico, Talbot, Penholoway, Wicomico, Sunderland, Coharie and Brandywine (Cooke, 1931). The terraces were considered to be Quaternary age (Cooke, 1935), but their mode of origin was a matter of considerable controversy.

The Coastal Plain consists of two natural divisions. The inner portion is a gently undulating, well drained area. The outer portion is low-lying, and, in places, it is swampy. The outer portion is termed the tidewater region (Stuckey, 1965).

Along the coast of North Carolina, there is a chain of islands. The islands are covered with sand dunes. From this chain of sandy islands, Cape Hatteras juts out into the Atlantic Ocean. Between the outer banks and the mainland, there is an extensive shallow body of water. This almost tideless body of water is composed of two sounds: Albemarle and Pamlico sounds. A large peninsula extends into the sound area between the Albemarle Sound and the Tar-Pamlico River. The peninsula between the Tar-Pamlico and Neuse rivers is smaller. The Tidewater Region is relatively low lying, and does not average more than twenty feet in elevation. Much of the Tidewater Region is occupied by swamps and marshes, of which the Dismal Swamp may be the best known. Many lakes are found in the Tidewater Region. North of the Pamlico River are Lake Mattamuskeet, New Lake, Pungo Lake, and Phelps Lake.

The Inner Coastal Plain extends westward from the Tidewater Region to the Fall Line. It increases in width from north to south across North Carolina. In elevation, it rises gradually from less than fifty feet above sea level at the western limits of the Tidewater Region to a maximum along the eastern edge of the Piedmont Plateau. The Inner Coastal Plain, north of a line drawn from New Bern to Raleigh, is well drained and flat to gently rolling. South of this imaginary line, the eastern half of the Inner Coastal Plain is like the Tidewater Region. Most of the surface is a flat sandy plain, occupied by swamps, marshes and lakes. South of a line from Raleigh to New Bern, the western half of the Inner Coastal Plain is very similar to the area north of this line (Stuckey, 1965).

B. GEOLOGY

Precambrian and Paleozoic Eras

It appears that Early Precambrian sedimentary and igneous rocks, such as occur in the gneisses, schists and granite gneisses of the Appalachian Mountains and Piedmont Plateau, may have formed completely across the state, perhaps as far east as the present edge of the Continental Shelf. Deep drilling in the Coastal Plain shows that the area is, in part, underlain, at great depth, by gneisses, schists and granites (Stuckey, 1965). The gneisses and schists were orginally, in part, of sedimentary origin, and, in part, of igneous origin. The gneisses and schists were intruded by granites, which were later metamorphosed to granite gneisses. Following the intrusion of granite, the whole series was intensely folded and metamorphosed into micaceous gneiss, micaceous schist, hornblende gneiss and various granitic gneisses. Succeeding this deformation, there was a prolonged period during which Early Precambrian gneisses, schists and granitic gneisses were eroded to a flat surface.

Little is known about the geography and topography of the eastern half of North Carolina at the beginning of Late Precambrian time. In the west, downwarping formed a number of elongate troughs that represent the first beginnings of the Appalachian Geosyncline. Into these troughs, large amounts of sedimentary and volcanic materials were poured. These rocks do not appear to underlie the Rocky Mount/Manteo map areas.

By the beginning of Cambrian time, a mio-geosynclinal belt had developed along the inner part of the Appalachian Geosyncline. Sedimentary rocks deposited in the mio-geosyncline were folded and faulted, but little metamorphosed. Lower Cambrian sediments originated from the deeply weathered mantle on the Canadian Shield. By the beginning of Middle Cambrian time, most of the Shield close to the mio-geosyncline had been stripped of its weathered mantle.

The continental interior began to warp downward. A sea transgressed westward, and deposited sediments over the Lower Cambrian rocks. The Cambrian system of sedimentary rocks grades from sandstone and shale, through interbedded limestone and shale, to thick limestone and dolomite at the top.

Early in the Ordovician Period, the Appalachian mio-geosyncline was well established in eastern Tennessee. The geosyncline continued to subside. As it did, it received sediments throughout much of the Paleozoic Era. In the Slate Belt of the eastern Piedmont Plateau, and western Coastal Plain, volcano-sedimentary materials were laid down. Ten to fifteen thousand feet of volcano-sedimentary rocks of Ordovician age are present in the eastern half of the Piedmont Plateau.

Intense volcanic activity took place along the eastern half of the Piedmont Plateau, and parts of the Coastal Plain, all the way from the vicinity of Petersburg and Farmville, Virginina, southwestward across North Carolina. In North Carolina, this zone, occupied by volcanic rocks, is known as the Carolina Slate Belt. The western border lies some miles eastward of Charlotte, Lexington, and Thomasville, and west of Greensboro. The eastern limit is unknown; it is covered by the sediments of the Coastal Plain. Some deep wells in the Coastal Plain appear to have penetrated rocks of the Carolina Slate Belt.

Volcanics do not cover the entire area of the Carolina Slate Belt. The "Great Slate Formation" of Olmsted (1825) passes completely across the state from northeast to southwest. Except for granitic intrusives, this part of the state is occupied by volcano-sedimentary rocks.

Along the eastern side of the Slate Belt, there is a narrow zone of Triassic sediments, some 5 to 15 miles across. The Triassic rocks are down-faulted along their eastern border by a well defined normal fault, the Jonesboro Fault.

The rocks of the Slate Belt have a complex character and a well developed cleavage. Early workers considered the rocks to be metasedimentary, but noted that they contained porphyry, whetstone, breccia and conglomerate. Later workers recognized the rocks to be mainly volcanic. However, considerable amounts of sedimentary rocks were also present.

As is presently known, the rocks of the Carolina Slate Belt consist of lava flows, interbedded with beds of ash, tuff, breccia, shale and slate. All of the rocks, except the flows, contain considerable sedimentary material; i.e., mud, clay, silt, sand and conglomerate. The flows, breccias, tuffs, ash beds, and beds of

shale or slate are interbedded, and do not generally occupy definite stratigraphic positions within the series.

The rhyolites and andesites range from fine-grained to coarsely porphyritic. The basalts are often amygdaloid. The breccias range from rhyolitic to andesitic. The breccia fragments are apparently pyroclastic. The tuffs are generally acidic; the tuff fragments are generally less than half an inch in diameter, and are often emplaced in fine-grained, non-volcanic material.

Conley (1962) shows that the Carolina Slate Belt rocks may be classified into several mappable units. Some of the units are local, others cover wide areas. For purposes of general description, they may be divided into: (1) felsic volcanics; (ii) mafic volcanics; and (iii) bedded argillites.

The felsic volcanic rocks occupy about half of the Slate Belt in the central part of the state. They predominate in the area along the eastern border of the Piedmont Plateau, and western part of the Coastal Plain. The felsic rocks are dominated by materials of either volcanic flow or fragmental origin. The flows are generally rhyolitic; whereas, the fragmental material ranges from rhyolitic to dacitic. The fragmental rocks consist of breccias and coarse--to-fine tuffs. Lenses of bedded slate and mafic volcanics are of limited extent (Stuckey, 1965).

The rhyolite occurs in narrow bands and lenses interbedded with the breccias and tuffs. None of the rhyolitic outcrops show any evidence of metamorphism (Stuckey, 1965).

Bedded argillites, commonly referred to as volcanic slate, occur in the southern part of the Slate Belt.

The bedded argillites consist of mainly dark-colored, or bluish shales or slates. The argillites are either massive or thick-bedded. The beds occasionally show very finely marked bedding planes. Contacts between the slates and tuffs are generally gradational. In places, the slates show little effect of metamorphism; elsewhere, they may be strongly metamorphosed. The cleavage of the argillites rarely corresponds to the bedding planes of the rock. In places, especially near igneous intrusives and mineralized zones, the argillite is highly silicified (Stuckey, 1965).

The volcano-sedimentary rocks were probably deposited under geosynclinal conditions (Stuckey, 1965), perhaps in a eugeosynclinal environment. The volcanics originated from beneath the surface; whereas, the non-volcanic sediments were derived from narrow uplifted belts present in, or adjacent to, the trough. The thick-

ness of the volcano-sedimentaries is variable, but may be as great as 10,000 to 15,000 feet (Stuckey, 1965).

At the commencement of the Silurian Period, a mountain system, generally referred to as the Taconic Mountains, occupied the eastern margin of North America. These mountains reached their maximum elevations in New York and New England. There is no direct evidence for the mountain system in North Carolina. However, it appears probable that all of the state was well above sea level during the Taconic Orogeny, and continued to be highland throughout the remainder of the Paleozoic Era. The main geologic processes in North Carolina during the remainder of the Paleozoic Era were intrusion, metamorphism and erosion (Stuckey, 1965).

In North Carolina, igneous intrusive rocks, generally considered to range in age from Devonian through Permian, consist of granites, pegmatites, syenite and diorite gabbro. Within the map areas, granite crops-out along the western border of the Coastal Plain. In general, the granites of this area are massive, equigranular and display little effect of metamorphism. Jointing is abundant. The granites often appear younger than the enclosing rocks (Stuckey, 1965).

The granitic textures are mainly medium- to coarse-grained; porphyritic textures are common. Orthoclase, microcline and quartz are the common minerals. In places, the intrusions are quartz monzonite; elsewhere, they are biotite granite. The rocks vary from light- to medium-grey and from light- or medium-pink to red (Stuckey, 1965). Pegmatite dikes are of minor importance on the Piedmont Plateau, but not in the Coastal Plain area.

Mesozoic Era

Mesozoic rocks were formed in North Carolina during each of the three periods. Rocks of Triassic age were formed in two areas in the Piedmont Plateau.

In Early Triassic time, all of North Carolina as far east as the edge of the present Continental Shelf was above sea level. By Late Middle Triassic time, much of the Piedmont Plateau and Coastal Plain had been worn down to a broad plain, which cut across older, more complex structures. In Late Triassic time, the earth's crust was elevated and broken by normal faults. Troughs were formed by down-faulting. Streams deposited their sediments into these depositional basins. The rocks of the Deep River Basin consist of red, brown, purple, or grey claystone shale, sandstone, conglomerate and fanglomerate. The Deep River Basin deposits are subdivided into the Pekin Formation, the Cumnock Formation, and the Sanford Formation (Stuckey, 1965). The units are immediately to the west of the Rocky Mount map area.

At the commencement of the Jurassic Period, all of North Carolina was above sea level. The Appalachian Mountains, which were high and rugged at the beginning of the Triassic Period, were subdued by the end of that period. Renewed uplift occurred during the Palisade disturbance, and the mountains and Piedmont were re-elevated. Early and Middle Jurassic time saw active erosion, and by Late Jurassic time, the Fall Zone Peneplain had been produced (Stuckey, 1965).

At the advent of the Late Jurassic time, the Fall Zone Peneplain was elevated and tilted. The present Piedmont and mountain areas were re-elevated; whereas, the Coastal Plain was depressed. The crystalline basement beneath the Coastal Plain slopes gently eastward from the present Fall Line to the 2,500 foot subsea contour, at a gradient of some 25 to 35 feet per mile. As the downwarping proceeded below sea level, Late Jurassic deposits were built up on the paleo-shelf area. The Upper Jurassic sediments are extensive in the Coastal Plain subsurface to the west of Cape Hatteras. Subsurface wells penetrate these Jurassic sediments, which, in places, are in excess of 1,300 feet thick. The upper fifty percent of these sediments are of marine origin, and are comprised of limestones, dolomites and oolitic rocks. Conglomeritic sandstones and shale are interbedded, but are not abundant.

Beneath the marine sediments, there are conglomeritic sandstones and arkose. The upper sandstones are white to light-grey, coarse-grained, conglomeritic, feldspathic, and calcareous; they are interbedded with grey-green and red sandy shale. Below this, there are white, red, and pink sandstones, which are stained with hematite. These sandstones are also arkosic and conglomeritic, and interbedded with red and green sandy mudstone (Stuckey, 1965).

The physical features of North Carolina at the beginning of Cretaceous time are not well known; it is thought that they are not dissimilar to those of Late Jurassic time after the Fall Zone Peneplain had been elevated and tilted (Stuckey, 1965). Two physical features in the crystalline floor of the Coastal Plain appear to have controlled the thickness and distribution of the Cretaceous sediments in North Carolina: (i) the Great Carolina Ridge, (ii) a subsidiary embayment of the major geosynclinal province to the north and east (Stuckey, 1965).

The two structural features may have been formed as a result of movement in a mobile zone or belt at depth. They were probably formed about the beginning of the Late Jurassic (Stuckey, 1965).

Except for a small area of western Northampton County, surficial or near-surface sediments of Lower Cretaceous age are not known to occur in North Carolina, and they do not crop-out in the map area.

Established formations of Upper Cretaceous age in North Carolina, in ascending order, consist of the Tuscaloosa Formation, the Black Creek Formation, and the Peedee Formation.

The main outcrops of the Tuscaloosa Formation are along the western part of the Coastal Plain. Smaller outcrops occur along the Tar River in Edgecombe County and the Roanoke River in Northampton, Halifax and Bertie counties, where younger sediments have been removed. The greater part of the formation is of terrigenous origin. It contains no fossils, except a few fragmental plant remains. The Tuscaloosa lithologies were derived from disintegration of the crystalline rocks of the present Piedmont Plateau. Stratigraphy varies greatly. In general, the formation consists of sand and clay beds, with varying intergradations of arenaceous clays and argillaceous sands. The sands are fine- to coarse-textured, and are generally arkosic. The clays contain abundant muscovite. The sands are grey and greenish-grey, but other colors are locally present. The clays are drab-colored with green, greenish-grey and grey hues.

In wells in Craven, Carteret, Pamlico and Dare counties, the Tuscaloosa consists of oyster-bearing sands, sandstones, limestones and vari-colored clays and shales that appear to be of marine origin.

The thickness of the formation ranges from a feather-edge at its western outcrops to nearly 1,800 feet in the Pamlico Sound area. From well records, it appears that the Tuscaloosa may average a 300 to 400 feet thickness in the Coastal Plain area (Stuckey, 1965).

Eastward of the Tuscaloosa outcrop is the Black Creek Formation. The outcrop width of the Black Creek varies from less than 5 to 30 or more miles. Eastward of the main outcrop area, it continues beneath the Peedee and younger formations, and extends onto the present Continental Shelf. The Black Creek rests unconformably over the Tuscaloosa Formation, and where the Tuscaloosa is absent, unconformably over the crystalline basement.

The unit consists, typically, of thinly bedded sands and clays that vary rapidly, both horizontally and vertically. Beds of sand and clay may be inclined at considerable angles due to current bedding. The clays are generally dark, and are carbonaceous. The sands are fine- to medium-grained, and grey to light-yellow in color. Ferrous oxide and glauconite may be present in places.

The bedded and cross-bedded sands, clays, and lignites, which are typical of the Black Creek Formation, were deposited in a shallow sea, in bays and in estuaries. Calcareous beds in the upper Snow Hill Member may have been deposited in deeper waters (Stuckey, 1965).

The Black Creek beds strike northeast to southwest, and dip to the southeast. Its thickness varies from a feather-edge along its western outcrop to about 1,300 feet in Dare County. Stuckey (1965) estimates its average thickness to be between 500 and 600 feet.

The Peedee Formation crops-out in a belt that is eastward of the exposed part of the Black Creek Formation, and extends from the Tar River at Greenville, Pitt County, southwestward to the South Carolina line. Along Cape Fear River, the outcrop has a maximum width in excess of 25 miles.

The Peedee Formation consists predominantly of dark-green or grey, glauconitic and argillaceous sands and impure limestone. The sands contain fine mica, and are commonly calcareous. In places, the calcareous sands grade into impure limestone.

Varying amounts of dark marine clay are interbedded with the Peedee sands. The materials are well compacted, but not truly consolidated. Fossil shells and shell fragments, principally mollusks, are present at places as layers 1 to 5 feet thick. The strike of the formation is approximately north 20 degrees east. The beds dip gently to the southeast at about 20 to 25 feet per mile. Thickness varies between 220 feet and 700 feet.

Cenozoic Era

Cenozoic formations are extensively distributed throughout the Coastal Plain of North Carolina. The strata thicken seaward to and beyond the present coastline (Stuckey, 1965). Strata of Paleocene age are not recognized in surface exposures in North Carolina. However, the Beaufort Formation of Paleocene age has been recognized in wells in Dare, Pamlico, Beaufort, Martin, Bertie, Hertford, Gates and Chowan counties, and underlies all counties to the east. The Beaufort appears to rest conformably on Upper Cretaceous strata. It consists of marine beds that were deposited in a partially restricted basin. This suggests that whereas most of the Coastal Plain of North Carolina was above sea level at the beginning of the Cenozoic, the Albemarle Sound area was a basin beneath sea level in which sedimentation continued uninterrupted from Late Cretaceous times into Paleocene times (Stuckey, 1965).

Strata of Lower Eocene age do not crop-out in North Carolina. They have been recognized in the subsurface. Thus, at the beginning of Eocene time, the Coastal Plain of North Carolina was slightly above sea level. In Early Eocene time, Lower Eocene beds were deposited near the present coastline as the Coastal Plain was warped downward. These Lower Eocene sediments were later covered by Middle and Upper Eocene beds.

The Castle Hayne Limestone crops-out in an irregular belt, which varies from a few miles wide to as much as 20 miles wide. It extends from Brunswick County northwestward to Beaufort County. To the east and north, the unit continues beneath younger formations. In many places, the Castle Hayne Formation consists of finely broken calcareous marl. Locally, it may be more consolidated. In many places, the limestone is fossiliferous, and may be composed of shells. In other areas, the shells have been leached away, and the remnant rock is cavernous. Beds and lenses of sand and clay are present.

The overlying Trent Formation may also be Eocene in age, and is often considered part of the Castle Hayne Limestone (Stuckey, 1965, p. 176). The Trent is generally a consolidated shell rock. Fossils are numerous. However, locally the Trent may be unconsolidated, and resembles the younger marls (Richards, 1950).

"...Little information is available for the extent or correlation of deposits of Oligocene age in the state. Part of the problem relates to the placement of the Oligocene-Miocene boundary... Another part of the problem is related to the misuse of the term 'Trent Formation'. Other parts of the problem are due to local stratigraphic associations and lithologies, apparently brought about by a moderate shift of the depositional axis of a local basin at the close of Eocene time, and uplift and post-depositional erosion that has resulted in a number of unconnected or partially connected remnants of Oligocene and younger deposits, chiefly in Craven, Jones, Onslow and Carteret counties..." (Brown, 1963).

At the end of Eocene or Early Oligocene time, most of the Coastal Plain was raised above sea level. There was extensive erosion. In the subsurface, along the outer edge of the Coastal Plain some 1,100 to 1,300 feet of Miocene sediments occur (Stuckey, 1965). The oldest of the Miocene map units is the Belgrade/Silverdale unit. It is divided into three subunits: the lowest subunit is a sandy pelecypod biomicrudite; the middle subunit is an unconsolidated quartz arenite; the uppermost subunit is a sandy pelecypod-mold biomicrudite.

About the beginning of Middle Miocene time, a restricted basin developed in Beaufort County and adjacent areas. Important amounts of phosphatic sands, clays and thin intercalated shell limestone layers were deposited. The unit is termed the Pungo River Formation (Stuckey, 1965). The phosphorite section consists of layers of phosphatic sand and thin, intercalated shell limestone beds. The unit varies from a few feet to more than 100 feet in thickness.

The Yorktown Formation is Late Miocene age. The Lower Yorktown unit consists mainly of a dark, bluish-green, medium-to-fine argillaceous sand with many shells. Occasionally, it is indurated. Marl beds are common. Sandy phases are also common. Black phosphatic pebbles are occasionally found. Its thickness is extremely variable. The dip toward the ocean is less than 10 feet per mile. The Upper Yorktown consists chiefly of sands and shell marls, with a slight admixture of clay (Richards, 1950). The Yorktown was deposited in a shallow marine environment. In the outcrop areas, the unit varies in thickness from a few feet to nearly 250 feet (Stuckey, 1965).

At the close of the Miocene, the Coastal Plain was emergent, and was greatly eroded. This is shown by the extensive distribution of remnants of the Miocene sediments, and the fact that Plio-Pleistocene sediments are unconformable with all older formations on which they rest (Stuckey, 1965).

Lithologically, the Waccamaw Formation resembles the Yorktown. It consists of loose grey to buff, fine quartz sand. Shell marls are present. The unit is thin, and rarely exceeds 25 feet in thickness (Richards, 1950).

Over much of the map area, the Miocene and Pliocene sediments are mantled by largely unconsolidated sandy, silty, clayey and shelly Quaternary sediments that range in thickness from a thin veneer to more than 100 feet in the vicinity of Cape Lookout (Mixon and Pilkey, 1976). Many of these sediments are included in the Socatsee Formation. The Socatsee includes the Flanner Beach Formation, the Bogue Sand, the Minnesott Sand, the Core Creek Sand and the Atlantic Sand as described by Mixon and Pilkey (1976).

Mixon and Pilkey (1976) informally divide the Flanner Beach Formation into three members. Two of these members, the Newport and the Arapahoe consist mainly of well sorted sands, which are thought to be barrier deposits emplaced on either side of the ancestral Neuse River estuary. The third member, the Beard Creek, consists of fossiliferous silty and clayey sands, interbedded with lesser amounts of silt and clay. It was deposited largely in lagoonal and estuarine environments.

The Core Creek Sand is a well sorted, fine-to-medium sand, interbedded with thin clays; much of the sand above the water table appears to have been leached white. Cross-bedded sand units, as much as 8 inches wide, which include clay laminae cross-beds, are suggestive of tidal-flat deposits (Mixon and Pilkey, 1976).

A beach ridge complex, which was probably formed during the Late Pleistocene, was called the Atlantic Barrier (Mixon and Pilkey, 1976). The Atlantic Sand is a clean quartz sand.

A second beach ridge complex is divided into two parts: (i) an older part, termed the Cedar Island Barrier, and (ii) a Holocene beach and ridge dune. The sands of the Cedar Island Barrier are known as the Cedar Island Sand. Silty sands and muds directly underlying the salt marsh and sand flats are mapped as the silty sand facies of the Cedar Island Sand (Qci).

The seaward part of the emerged Coastal Plain is a chain of barrier islands. Northeast of Cape Lookout, these are known as the Core banks; west of Cape Lookout, they are known as the Shackleford and Bogue banks (Mixon and Pilkey, 1976). They are mapped as the Qmb unit.

The salt marshes and sounds, bays and estuaries behind the outer barrier islands are areas of active sedimentation and, in some areas, erosion. The back barrier deposits may be divided into sandy and muddy facies. Salt-marsh muds accumulate through the baffle effect of certain marsh grasses. Although the marsh mud accumulations are more common along the borders of the sheltered bays, they also occur in areas exposed to estuarine waves (Mixon and Pilkey, 1976).

C. DESCRIPTION OF GEOLOGIC MAP UNITS

Cenozoic

Quaternary

Holocene

Qal: Recent Alluvium

These are floodplain deposits.

Qmb: Beach and Dune Deposits

The unit includes quartz and shell sand; the sand is well sorted, fine-to-coarse, pale-grey, yellowish-grey and yellowish-brown. The unit includes minor amounts of fine gravels.

Qbm: Marsh Deposits

The unit includes soft silty and clayey muds, peats, lesser amounts of clayey and silty sands.

Holocene-Pleistocene

Qci: Marsh Deposits

Clayey and silty sands, with well sorted sand of Pleistocene age, are overlain by a veneer of Holocene salt-marsh peat, muds and sands.

Qso: Socatsee Formation

The Socatsee is comprised of a quartzose sand, clayey and silty sand, and bluish-grey fossiliferous clay. The unit includes the Flanner Beach Formation, the Bogue Sand, the Minnesott Sand, the Core Creek Sand and the Atlantic Sand.

Pleistocene

Qcw: Canepatch/Waccamaw Formation

Complex deposits of humate-impregnated sand, fossiliferous sandy clay, peat and beach rock; it is semi-indurated, fine-to-coarse sand, with abundant mollusk shells.

Tertiary

Miocene

Ty: Yorktown Formation

The Yorktown consists of a sand and coquina; the sand is tan to reddish-brown, and cross-bedded; the sand includes layers of buff clay. There is also dark-blue to grey fossiliferous sand.

Tbs: Belgrade/Silverdale Formations

The upper unit is a sandy pelecypod-mold biomicrudite.

The middle unit is an unconsolidated quartz arenite.

The lower unit is a sandy pelecypod biomicrudite.

Oligocene

Tt: Trent Formation

The upper unit is a barnacle pelecypod-mold biomicrudite.

The middle unit is an unconsolidated sandy pelecypod-mold biomicrudite.

The upper unit is a sandy echinoid biosparite.

Eocene

Tch: Castle Hayne Limestone

A white-to-grey sand and marl facies, with sandy calcitic and dolomite shell limestones; some glauconite, pyrite, and phosphate are present.

Mesozoic

Cretaceous

Kpd: Peedee Formation

This is a dark micaceous, argillaceous, fine glauconitic sand. It has a molluscan fauna.

Kbc: Black Creek Formation

This is a black laminated clay with interbedded fine-grained sands.

Kt: Tuscaloosa Formation

Arkosic sands and clays of tan, red and grey colors, comprise the Tuscaloosa Formation.

Precambrian/Paleozoic

arg: Argillite

The unit is argillite, but includes novaculite, greywacke and conglomerate.

fvs: Felsic Volcanics

The unit is mainly acid tuffs, breccias and flows. It is partially sedimentary. It also includes mafic fragments and flow material, with lenses of bedded slate. There are also lenses of gneiss, schist and phyllite.

Pzpb: Petersburg Granite

The Petersburg Granite is composed of microcline and biotite-rich granites and some chloritic granodiorite.

D. RADIOACTIVE MINERAL PROSPECTS IN THE SURVEYED AREA

There is no uranium production in North Carolina at this time (Southern Interstate Nuclear Board, 1969). Within the Rocky Mount/Manteo map areas, there may be potential for by-product uranium recovery from the phosphatic rocks of Beaufort and neighboring counties (Southern Interstate Nuclear Board).

Caldwell (1968) stated the following about the Lee Creek Phosphate:

> "Lee Creek Phosphate is located in a large Miocene phosphorite deposit on the Atlantic Coastal Plain in what is now Beaufort County, North Carolina. The deposit is uniform over a large distance... and flat-lying... A mineralogical study of the deposit by Thomas P. Rooney and Paul F. Kerr, Columbia University, reports total reserves estimated at 10 billion tons..., with an average P_2O_5 content of 18%. This estimate is open to question, and others quote only 1.5-2.0 billion tons in the 50,000 acres."

Kimrey (1965) reported that the amount of radioactivity varied directly with the amount of phosphate present. Brown (1958) determined uranium percentages of 0.003 and 0.008, respectively, from two assayed samples.

A potentially favorable environment for uranium mineralization occurs in the Upper Cretaceous continental sediments east of the Fall Line of the Piedmont. The sands of the Tuscaloosa and Black Creek formations are high in organic material, and have been lightened in color through processes of reduction. The sediments that were deposited on an undulating crystalline basement, perhaps under swampy conditions, contain buried stream channels and conglomerates. These environments have proven to be favorable for uraniferous deposits in locations in the western United States (Southern Interstate Nuclear Board, 1969).

SECTION IV

RESULTS OF DATA ANALYSIS

SECTION IV.

RESULTS OF DATA ANALYSIS

A. DESCRIPTION OF STACKED DATA PROFILES

1. Multivariable Radiometric Stacked Data Profiles

These profiles are presented at a horizontal scale of 1:500,000. The vertical scales are:

Altitude: 100 feet/div.; aircraft altitude above the surface

TL(^{208}Tℓ)*	1.0 ppm/div;	7.24 c/s = 1 ppm/eTh
BI(^{214}Bi)*	0.25 ppm/div;	13.85 c/s = 1 ppm/eU
K (^{40}K)*	0.15 %/div;	105.0 c/s = 1%K
BiAir	2.5 c/s/div.	50 seconds averaged

Residual Magnetic Field 100 gammas/div. (See Sec.V.B.1)

GC (Count from 400 keV to 3.0 MeV) 300 c/s/div.

Bi/TL	0.05 /div.
Bi/K	0.20 /div.
TL/K	0.70 /div.

Geology Strip: An approximate six-mile width of the geology map, containing each line, is displayed above the profiles.

* 7-second average weighted 1:2:3:4:3:2:1 is used and plotted at center.

2. Residual Magnetic Field Profiles

Altitude:	100 feet/div.
Temperature:	1.0 ^{o}C/div.
Pressure:	3 mm of Hg/div.
Base Magnetic Field:	10 gammas/div.
Residual Magnetic Field:	20 gammas/div.

Geology Strip: An approximate six-mile width of the geology map, containing each line, is displayed above the profiles.

All profiles appear in Section IV.H.

B. SINGLE AND AVERAGE RECORD LISTINGS

Single and average record listings are provided on microfiche. Samples of each type are presented in Appendix III.

C. STATISTICAL PRESENTATION OF DATA BY GEOLOGIC TYPE

Tables IV.(1-6) contain the average value of each variable as a function of line number and geologic type. The tables are in order eTh, eU, K, eU/eTh, eU/K, eTh/K.

D. FREQUENCY DISTRIBUTON OF DATA FOR EACH GEOLOGIC TYPE

Table IV.7 contains the mean, standard deviation, and number of events for each geologic type encountered over the entire map sheet. Histograms for these data appear in Section IV.H.2.

E. DATA INTERPRETATION

1. Analysis of Geologic Histograms

The radioactivity data is shown in histogram form with parts per million or percent 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 IV.8 shows the map units, which vary from a unimodal model, and for which separation of two or more distributions is feasible. Only units with excess of 200 events are considered.

2. Discussion of Anomalies

Introduction

The ^{208}Tℓ, ^{214}Bi, and ^{214}Bi/^{208}Tℓ (ratio) data were examined for anomalous values. An anomaly is defined by a minimum of two adjacent, two-standard deviation values, or a single, three-standard deviation value. The anomalies were listed by flight line in Table IV.9; by aeologic map unit in Table IV.10; Table IV.10 is statistically summarized in Table IV.11. Only positive anomalies were examined for ^{208}Tℓ and ^{214}Bi, but both positive and negative values were studied for the ratio anomaly.

	QAL	QMB	QBM	QCI	QSO	QCW	TY	TBS	TT	TCH	KPD	KRC	KT	ARG	FVS	PZPB
ML 1		18		5	30	31			45	29	24					
ML 2						36	35		21	37	25	23				
ML 3				27	31	18	35			38	25	22				
ML 4	18			34			51		13	34	26	28				
ML 5	21			23	24		36		26	35	32	25				
ML 6	22						42			29	37	32				
ML 7	37			35	30		44			33	39	29				
ML 8	43			28			31			48	40	33				
ML 9	28			20	24		47			44	37	39				
ML10	36			55			42			45	40	36				
ML11	35			14	32		49				37	46			44	
ML12	45						41				43	42				
ML13	34			25	29		46			32	41	40				
ML14	36						43				34	42				
ML15	44			20	32		44					41				
ML16	44						48								65	
ML17	49			36	26		49								52	
ML18	47						47									
ML19	54			25	37		45								22	51
ML20	53			33			43							91	84	
ML21	48			32	36		44							57	43	
ML22	66			47			52							26	35	71
ML23	42			25	23		55								43	47
TL 1				17	26											
TL 2				21	27											
TL 3				34	28											
TL 4	37			36		42	45									
TL 5	40						45			31	33					
TL 6	59						44				38	41				
TL 7	34						47				23	30		56	46	
TL 1(MANTEO)				22	18											

Table IV.1 Geologic Unit Average Value as a Function of Map Line for eTh (PPM Times 10)

	QAL	QMB	QBM	QCI	QSO	QCW	TY	TBS	TT	TCH	KPD	KRC	KT	ARG	FVS	PZPB
ML 1		26		[illegible]	29	30			33	33	39					
ML 2						41	39		51	37	41	41				
ML 3				29	31	33	33			33	36	36				
ML 4	33			31			33		45	33	37	42				
ML 5	62			32	56		45		45	44	49	54				
ML 6	47						33			34	33	35				
ML 7	43			46	42		32			38	35	39				
ML 8	33			35			35			29	35	35				
ML 9	31			30	69		28			27	30	33				
ML10	34			27			33			26	32	34				
ML11	32			32	27		32				32	29			29	
ML12	34						31				33	32				
ML13	33			26	28		31			35	37	33				
ML14	36						32				35	31				
ML15	35			28	30		28					28				
ML16	29						30								28	
ML17	28			28	29		30								30	
ML18	30						31									
ML19	27			25	21		30								31	29
ML20	27			33			31							25	22	
ML21	29			32	31		31							26	33	
ML22	32			30			29							37	35	31
ML23	32			34	30		31								48	36
TL 1				30	29											
TL 2				29	27											
TL 3				27	28											
TL 4	30			29		29	31									
TL 5	27						29			31	29					
TL 6	27						32				30	32				
TL 7	42						32				35	32		34	30	
TL 1(MANTEO)				27	28											

Table IV.4 Geologic Unit Average Value as a Function of Map Line for eU/eTh (Times 100)

	QAL	QMB	QBM	QCI	QSO	QCW	TY	TBS	TT	TCH	KPD	KRC	KT	ARG	FVS	PZPB
ML 1		5		3	9	10			14	10	9					
ML 2						15	13		10	13	10	9				
ML 3				7	10	6	11			12	9	8				
ML 4	7			11			16		5	11	9	11				
ML 5	9			8	11		16		11	15	15	14				
ML 6	9						13			10	12	10				
ML 7	15			11	12		14			12	13	11				
ML 8	13			10			10			13	14	11				
ML 9	9			7	20		13			11	11	12				
ML10	12			15			14			11	13	12				
ML11	11			3	9		16				12	13			13	
ML12	14						12				14	13				
ML13	11			6	8		14			11	15	13				
ML14	12						14				12	13				
ML15	16			6	10		12					11				
ML16	13						14								18	
ML17	14			10	7		15								16	
ML18	14						14									
ML19	14			7	8		13								8	15
ML20	14			12			13							22	19	
ML21	14			10	11		13							15	14	
ML22	20			13			15							9	12	19
ML23	12			8	7		16								20	17
TL 1				5	10											
TL 2				5	8											
TL 3				9	8											
TL 4	11			11		13	14									
TL 5	11						13			9	9					
TL 6	15						13				11	13				
TL 7	14						14				8	10		14	12	
TL 1(MANTEO)				6	5											

Table IV.2 Geologic Unit Average Value as a Function of Map Line for eU (PPM Times 10)

	QAL	QMB	QBM	QCI	QSO	QCW	TY	TBS	TT	TCH	KPD	KRC	KT	ARG	FVS	PZPB
ML 1		1660		2420	1678	2578			3843	6836	7080					
ML 2						2595	3932		4933	6849	10151	6456				
ML 3				1828	2162	2236	3983			8583	7497	4999				
ML 4	3195			2983			3218		2710	7720	7704	9398				
ML 5	3818			3948	3657		4367		3103	7806	12583	11208				
ML 6	3960						2857			4959	2911	2438				
ML 7	4731			3260	2681		2726			4501	5999	4593				
ML 8	3375			3711			3601			2812	4000	5040				
ML 9	2571			2729	4904		3452			2848	3423	7564				
ML10	5136			2453			5894			3230	6692	8278				
ML11	3713			1014	1447		6884				6237	6464			7077	
ML12	6304						5980				8556	9182				
ML13	3498			1061	1627		5848			3117	9010	9670				
ML14	3841						4993				7157	7172				
ML15	4396			2645	2352		4821					7441				
ML16	2455						5191								8715	
ML17	1865			3003	1440		5279								6842	
ML18	2486						5601									
ML19	3695			1758	1329		5007								4412	5903
ML20	2842			2361			5530							2224	3926	
ML21	3188			1880	1547		5071							4610	5543	
ML22	2846			2315			4920							6354	6090	4411
ML23	2668			1743	1413		3098								3096	4260
TL 1				1121	1357											
TL 2				1342	1416											
TL 3				1910	1532											
TL 4	1908			2515		2179	2885									
TL 5	3835						5659			6346	2235					
TL 6	3017						5932				5407	8447				
TL 7	5823						7598				8143	6307		4002	5572	
TL 1(MANTEO)				1537	1635											

Table IV.5 Geologic Unit Average Value as a Function of Map Line for eU/K (Times 1000)

	QAL	QMB	QBM	QCI	QSO	QCW	TY	TBS	TT	TCH	KPD	KRC	KT	ARG	FVS	PZPB
ML 1		26		14	53	39			42	16	14					
ML 2						63	35		22	22	13	15				
ML 3				42	46	24	31			16	13	16				
ML 4	20			40			54		23	21	13	12				
ML 5	27			24	41		44		39	24	14	14				
ML 6	27						47			30	58	60				
ML 7	40			42	48		52			36	30	31				
ML 8	44			27			33			49	41	31				
ML 9	35			19	33		47			43	40	20				
ML10	26			63			28			41	22	16				
ML11	33			37	61		29				21	26			18	
ML12	24						25				18	16				
ML13	32			60	51		35			36	18	16				
ML14	41						38				18	19				
ML15	46			26	28		45					17				
ML16	77						39								21	
ML17	86			38	40		36								24	
ML18	76						32									
ML19	48			39	59		37								17	27
ML20	81			50			34							103	54	
ML21	54			58	72		40							34	28	
ML22	75			64			49							15	21	63
ML23	65			46	50		78								70	50
TL 1				61	59											
TL 2				41	53											
TL 3				47	52											
TL 4	61			47		57	52									
TL 5	30						33			17	45					
TL 6	77						33				33	20				
TL 7	26						23				11	21		40	28	
TL 1(MANTEO)				36	31											

Table IV.3 Geologic Unit Average Value as a Function of Map Line for K (PC Times 100)

	QAL	QMB	QBM	QCI	QSO	QCW	TY	TBS	TT	TCH	KPD	KRC	KT	ARG	FVS	PZPB
ML 1		6666		4103	5699	9075			11786	21403	19423					
ML 2						6247	10630		10121	19434	22380	16382				
ML 3				5926	7066	8102	12912			26233	21154	14197				
ML 4	8646			8661			9746		6222	23360	21387	22845				
ML 5	6421			9537	6442		9488		6677	18407	26079	20239				
ML 6	8691						8950			14463	9125	7026				
ML 7	10847			7568	6511		8541			11623	16778	12233				
ML 8	10268			10135			10941			9679	11490	15157				
ML 9	8606			8509	6642		12358			10516	11410	22680				
ML10	14609			8869			17664			11922	21897	24568				
ML11	11457			3647	5291		21118				20404	21474			23847	
ML12	19416						19645				25220	29740				
ML13	9840			4563	5814		18440			9253	24550	29090				
ML14	10711						15261				22219	23818				
ML15	12327			7931	8084		16063					25779				
ML16	8014						16623								30909	
ML17	6318			10290	5007		17325								22849	
ML18	8127						18429									
ML19	13480			6537	6134		16101								14297	19503
ML20	9795			7457			19068							9113	17212	
ML21	10634			5767	5086		16575							17616	16475	
ML22	9092			7591			16861							17141	17688	14554
ML23	7836			5130	4695		10017								6438	11713
TL 1				3466	4478											
TL 2				5282	5568											
TL 3				7061	5562											
TL 4	6099			8848		7321	9373									
TL 5	15458						19196			21207	7669					
TL 6	10521						19949				17365	25500				
TL 7	13756						24422				22177	19439		12742	20671	
TL 1(MANTEO)				5683	6348											

Table IV.6 Geologic Unit Average Value as a Function of Map Line for eTh/K (Times 1000)

eTh		eU		K		eU/eTh		eU/K		eTh/K		MAX. NO. EVENTS	GEOL. UNIT
σ	X̄	σ	X̄	σ	X̄	σ	X̄	σ	X̄	σ	X̄		
1.8083	4.2	0.4910	1.3	0.3191	0.5	0.8385	0.3913	2.8460	3.7792	7.3689	11.1534	2093.0	QAL
1.0208	1.3	0.1883	0.4	0.1001	0.2	0.3346	0.3752	0.6852	1.2987	2.9725	4.6426	43.0	QAB
1.7147	1.9	0.4703	0.6	0.2561	0.3	1.5967	0.5071	7.5276	2.5109	9.3532	6.8491	8317.0	QCI
1.5861	2.3	0.7597	0.7	0.2906	0.4	2.2967	0.4607	18.1883	2.4660	5.9536	5.8658	7748.0	QSO
1.4826	2.9	0.4975	0.8	0.2234	0.4	0.1503	0.3060	1.4650	2.5002	4.2946	8.8180	594.0	QCW
1.4722	4.6	0.4332	1.4	0.2941	0.4	0.0892	0.3089	7.2455	6.3586	18.6574	20.1004	23167.0	TY
1.6520	3.3	0.4676	1.2	0.1676	0.3	0.2536	0.4106	2.1717	4.0929	4.8595	10.6722	445.0	TT
1.2707	3.4	0.4445	1.1	0.1564	0.2	1.1057	0.3915	19.4369	9.9867	10.0483	28.7723	4634.0	TCH
1.1745	3.1	0.4134	1.1	0.1839	0.2	0.1616	0.3689	28.9386	10.5318	18.8429	27.8060	5278.0	KPD
1.2535	3.4	0.4109	1.2	0.1934	0.2	0.1371	0.3557	32.7716	10.0901	18.4655	28.1995	4544.0	KBC
3.4253	6.2	0.6957	1.6	0.4384	0.6	0.1075	0.3062	4.0752	4.6741	9.0347	14.5854	85.0	ARG
2.3025	4.8	0.5352	1.4	0.1899	0.3	0.1056	0.3182	3.4954	6.4750	9.8392	20.8065	630.0	FVS
2.0728	5.7	0.3243	1.8	0.3385	0.5	0.0926	0.3364	2.2260	4.7385	5.5103	14.1262	169.0	PZPB

Table IV.7 Mean (X̄) and Standard Deviation (σ) for Each Geologic Type.

TABLE IV.8 Geologic Units with Significant Variations from Unimodal Distributions, Based on the Analysis of the eTh Histograms

Geologic Unit	No. Events	^{208}Tℓ Recommended Split (c/s)
Qal	1985	none
Qci	4588	none
Qso	5454	none
Qcw	507	none
Tt	417	35;
Kpd	5060	none
Kbc	4415	none
Fvs	618	none

TABLE IV.9 Summary of Anomalies

	$^{208}T\ell$	^{214}Bi	$^{214}Bi/^{208}T\ell$
ML1	Tt,2440-2445;		Kpd,1805-1815;Qcw,2705-2710, 3020;
ML2			Kpd,1420,1470,1535-1545, 1725-1730;Tch,2270,2290;Tt, 2520,2560-2570,2680-2685;
ML3	Tch,5680,5700	Tch,5670-5700;	Qcw,4955;Ty,5085,5095-5100; Tch,5375;Kpd,6245-6250;
ML4	Tch,3025-3030	Tch,3500-3515;	Tt,2875;Kpd,3870,3900,4150;
ML5		Kpd,1935-1940,1950, 2340-2345,2505-2510; Ty,2780;	Kbc,1275,1290-1295,1320, 1340,1350,1370;Ty,1420-1440; Kbc,1500-1530,1540-1550;1580, 1580,1600-1610,1640;Kpd,1700-1710,1980,2080,2300-2320;Qal, 2585;Tch,2615-2625;Ty,2730-2745;Qso,2980-2990;Qci,3060-3065,3125-3135,3145;
ML6	Kpd,4875;Kbc,4550;		Kbc,4355,4375-4380,4455;Qal, 5560-5565;Ty,5760
ML7E			Qso,1150-1160,1315-1325;
ML7W	Tch,1850-1855;Kpd,2340-2345,2350-2360;Kbc,3040-3045;	Tch,2235-2240;Kpd,2315 -2320,2335-2345;Kbc, 3020-3025;	Tch,1990,2015,2190,3110;
ML8	Tch,6140-6145,6155-6165; Kpd,4600-4605;	Tch,6140-6145;Kpd,6505 -6510;Ty,6895-6910;	Qci,6025,6285;Ty,6745-6755; Kbc,7255;
ML9	Kbc,230-240;	Kbc,230-235;Qso,1830-1860	Qso,1800-1850;
ML10	Kpd,1955-1960,1980-1995; Qci,2430-2445,2480-2495;	Qci,2465-2475;	Ty,1230,2240,2310,2350;
ML11	Qso,4260-4280;Kbc,6545-6550;	Ty,6825-6870;	Ty,7040-7045;
ML12			Ty,3040-3045;
ML13E	Qci,3755;	Ty,1265-1270;	
ML14			Ty,4525;
ML15W	Qso,6005-6010;	Qal,6920-6930;	Ty,7030,7280-7285;(Ty,6834-6840);
ML16	Ty,7000-7010;		Ty,6450,6560-6565,6690-6695;
ML17E			
ML17W	Qci,3815-3825;Ty,5375-5385,5400-5405;	Ty,5365-5375,5610-5640	(Qci,3625)

(TABLE IV.9 Cont'd.)

	$^{208}T\ell$	^{214}Bi	$^{214}Bi/^{208}T\ell$
ML18	Ty,1220-1245,1330-1335;	Ty,1220-1225,1470-1480	Ty,2090;
ML19E	Qso,2810-2815;		
ML19W	Qal,1725-1780;Ty,15775-1580,1655-1670,1710;	Qal,1710-1725;	Ty,3030-3040,3250-3265;
ML20	Ty,3730-3735,3805-3820; arg,3930-3940;	Ty,3720-3725;	Ty,2755-2760;
ML21	Ty,4250-4255;		Ty,5260;Qso,7425;
ML22	Ty,4595-4615,4865-4870, 4885-4895,4950-4955;Qci, 5455-5480,5555-5560,5590, 5660-5670;	Ty,4815-4820;Qal,4900-4920;Qci,5470,5560-5565,5590-5600,5665-5670;	Pzpd,4455;Ty,5070,5350;
ML23	Ty,3570-3585,3605-3610, 3650-3750,3760-3930;	Ty,3575-3580,3680-3720 3725-3730,3765-3770, 3790-3810,3815-3920;	Ty,3080,4120-4125,4200-4210;
TL1			Qci,6790;
TL2			Qci,5020-5025:
TL3	Qci,4060-4070;		Qci,3275;
TL4		Qci,215-220;	
TL5			
TL6	Ty,3680-3780;	Ty,3690-3710;Qal,3720-3730;	Ty,4245-4250;
TL7	Ty,2950;	arg,3325;Kbc,2310-2315 2445;	Ty,4880;
TL9			Kbc,2315;Ty,2650,2970, 3415-3420;

(...) denotes negative anomaly

TABLE IV.10 Radioactivity Anomalies per Geologic Map Unit

Geologic Unit	$^{208}T\ell$	^{214}Bi	$^{214}Bi/^{208}T\ell$	
Qal	1	4	2	
Qci	9	5	7	(1)
Qso	3	1	5	
Qcw	0	0	2	
Ty	16	17	33	(1)
Tt	1	0	4	
Tch	9	4	8	
Kpd	6	7	13	
Kbc	4	3	17	
arg	1	1	0	
P_3pb	0	0	1	

(...) denotes negative anomaly

TABLE IV.11 Statistical Summary of Radioactivity Anomalies by Geologic Unit

Geologic Unit	$^{208}T\ell$	^{214}Bi	$^{214}Bi/^{208}T\ell$	
Quaternary				
No. of units w/anomalies	3	3	4	(1)
No. of anomalies	13	10	16	(1)
Tertiary				
No. of units w/anomalies	3	2	3	(1)
No. of anomalies	26	21	45	(1)
Mesozoic				
No. of units w/anomalies	2	2	2	
No. of anomalies	10	10	30	
Paleozoic/Precambrian				
No. of units w/anomalies	1	1	1	
No. of anomalies	1	1	1	
Total Sample				
No. of units w/anomalies	9	8	10	(2)
No. of anomalies	50	42	82	(2)

(...) denotes negative anomaly

The Relationship between Radioactivity Anomalies and Geologic Map Units

Quaternary Geologic Units: Qal, Qci, Qso and Qcw

$^{208}T\ell$ Anomalies

Twenty-six percent of the $^{208}T\ell$ anomalies occur in three Quaternary units, Qal, Qci and Qso. The three units occupy almost twenty-four percent of the flown land area. Most of the anomalies are in the Qci unit. None of the anomalies coincide geographically with $^{214}Bi/^{208}T\ell$ anomalies. Variations in lithology and ground moisture most probably account for many, if not all, of the anomalies.

^{214}Bi and $^{214}Bi/^{208}T\ell$ Anomalies

Twenty-four percent of the ^{214}Bi anomalies occur in three Quaternary units; whereas, almost twenty percent of the $^{214}Bi/^{208}T\ell$ anomalies occur in four of the Quaternary units. These units cover some twenty-four and twenty-five percent, respectively, of the flown land area.

As with the $^{208}T\ell$ anomalies, the Qci unit has the highest aggregate of anomalies, although it occupies less area than the Qso unit. Only one ^{214}Bi anomaly coincides geographically with a ratio anomaly. This occurs at ML9, stations 1800-1850, in the Qso unit. The significance of this extensive anomaly is not understood. However, it requires further attention.

Tertiary Geologic Units: Ty,Tch and Tt

$^{208}T\ell$ Anomalies

Fifty-two percent of the $^{208}T\ell$ anomalies occur in three Tertiary units (Ty,Tt and Tch). These three units occupy some fifty-five percent of the land area. The Ty unit, alone, has forty-five percent of the surveyed area, but only thirty-two percent of the $^{208}T\ell$ anomalies. None of the $^{208}T\ell$ anomalies coincide with $^{214}Bi/^{208}T\ell$ anomalies. Most of the anomalies are thought to be associated with intra-unit changes in lithology.

^{214}Bi and $^{214}Bi/^{208}T\ell$ Anomalies

Fifty percent of ^{214}Bi and fifty-five percent of the $^{214}Bi/^{208}T\ell$ anomalies occur in two and three, respectively, of the Tertiary units. The units occupy some fifty-four to fifty-five percent

of the map area. Most of the anomalies occur in the Ty unit - Yorktown Formation - which occupies more than forty-five percent of the land area. None of the ^{214}Bi anomalies coincide with ratio anomalies. The phosphate-rich deposits in the Miocene sediments are known to contain low-grade uranium concentrations, but are probably too low a grade for commercial production.

Mesozoic Geologic Units: Kpd and Kbc

$^{208}T\ell$ Anomalies

Twenty percent of the $^{208}T\ell$ anomalies occur in the Cretaceous units, Kpd and Kbc. These two units occupy almost nineteen percent of the surveyed land area. They are fairly evenly distributed between the two area. None of the $^{208}T\ell$ anomalies coincide with $^{214}Bi/^{208}T\ell$ anomalies. The $^{208}T\ell$ anomalies may reflect some intra-unit changes in geology.

^{214}Bi and $^{214}Bi/^{208}T\ell$ Anomalies

Nearly twenty-four percent of the ^{214}Bi and thirty-six percent of the ratio anomalies occur in the two Cretaceous units - Kpd and Kbc - and these units occupy only nineteen percent of the surveyed area. Most of the ^{214}Bi anomalies occur in the Kpd unit; whereas, most of the $^{214}Bi/^{208}T\ell$ anomalies occur in the Kbc unit. None of the ^{214}Bi anomalies coincide geographically with the ratio anomalies.

The sediments, particularly the carbonaceous sands, of the Kbc unit - the Black Creek Formation - are potentially favorable environments for the epigenetically or supergenetically precipitated uranyl ion complexes. Anomalies in the Kbc unit may require closer scrutiny.

Paleozoic/Precambrian Geologic Units: arg and Pzpb

$^{208}T\ell$ Anomalies

One $^{208}T\ell$ anomaly occurs in an arg unit, ML20, stations 3930-3940; the arg unit occupies only 0.16 percent of the surveyed area. The anomaly does not coincide with a $^{214}Bi/^{208}T\ell$ anomaly. The anomaly may be associated with a hydrothermal vein deposit. It is not considered to be particularly significant.

^{214}Bi and $^{214}Bi/^{208}T\ell$ Anomalies

One ^{214}Bi anomaly occurs in the arg unit on TL7, station 3325 The anomaly does not coincide geographically with a ratio anomaly. The anomaly may be associated with a vein deposit.

One ratio anomaly occurs in the Pzpb unit. The Pzpb unit occupies some 0.33 percent of the surveyed area. The anomaly is not considered to be of particular significance.

Relationship between Radioactivity Anomalies and the Location of Known Radioactive Mineral Deposits

The only known concentrations of radioactive mineral deposits occur in the phosphatic rocks of the Lee Creek Phosphate, of Miocene age. The phosphate is a subunit of the Pungo River Formation, which does not appear as an outcrop. The Lee Creek Phosphate has very low grade uranium concentration. It is not economically significant at this time.

In view of the fact that the Lee Creek Phosphate is not mapped as an outcrop on the geological map of the area, it is not possible to determine whether or not any of the ^{214}Bi or $^{214}Bi/^{208}T\ell$ anomalies are associated with the deposit.

Relationship of Radioactivity Anomalies to Cultural Features

$^{208}T\ell$ Anomalies

Two $^{208}T\ell$ anomalies occur in the vicinity of the town of Rocky Mount. These anomalies occur on ML22, stations 4515-4520 and stations 4595-4615.

^{214}Bi Anomalies

A ^{214}Bi anomaly on ML17, stations 5510-5540, occurs to the west of the town of Wilson in the Yorktown Formation.

$^{214}Bi/^{208}T\ell$ Anomaly

A small three sigma anomaly occurs to the west of the town of New Bern, on ML3, station 5085. A second $^{214}Bi/^{208}T\ell$ anomaly occurs to the northeast of Greenville on ML15W, stations 6835-6840.

Trends

$^{208}T\ell$ Anomalies

The $^{208}T\ell$ anomalies are unevenly distributed throughout the map sheet area. Relatively few of the $^{208}T\ell$ anomalies occur in the eastern part of the map sheet, although this may be partially a function of flight line spacings. The major groupings of $^{208}T\ell$ anomalies occur in the northwestern corner, and in the central portion of the map sheet.

The cluster in the northeastern corner is north of ML16, and mainly west of TL6. It includes a very extensive series of two and three sigma anomalies on ML23, between stations 3650 and 3925. The anomalies are mainly over the Ty unit.

The more centrally located anomaly is between TL4 and TL6, and between ML7 and ML11. The anomalies are located over a variety of Cretaceous, Tertiary and Quaternary units.

^{214}Bi Anomalies

The ^{214}Bi anomalies have a similar distribution to the $^{208}T\ell$ anomalies; many of the two sets of anomalies coincide geographically. Three clusters of ^{214}Bi anomalies are noted.

In the northeastern corner, north of ML17 and mainly west of TL6, there is a group which includes an extensive, but discontinuous, series of two and three sigma anomalies along ML23, between stations 3680 and 3920. The northeastern cluster is located mainly over the Ty unit.

A second cluster occurs between TL4 and TL6, and between ML3 and ML8. The ^{214}Bi anomalies occur over a variety of Cretaceous, Tertiary and Quaternary units.

A third and smaller cluster is concentrated in the vicinity of TL7, between ML11 and ML7. These anomalies are mainly in the Black Creek Formation of Cretaceous age.

$^{214}Bi/^{208}T\ell$ Anomalies

The $^{214}Bi/^{208}T\ell$ anomalies are more evenly distributed throughout the map area than the other two sets of anomalies. Partly because of the lower density of flight lines, fewer ratio anomalies occur in the northeastern quadrant of the map than elsewhere. More anomalies occur in the southern half of the survey area than in the northern half. The greatest density of anomalies is in the southeastern corner, west of TL6 and south of ML7 in the Kbc and Kpd units.

3. Summary and Recommendations

The greatest concentrations of radioactivity anomalies are in the Tertiary units, mainly the Yorktown Formation. The higher concentration in these units may be partially a factor of the greater density of flight lines in the eastern half of the map area. The Tertiary and Cretaceous units have the best prospects for uranium ion concentration, but coinciding pairs of ^{214}Bi and $^{214}Bi/^{208}T\ell$ anomalies do not occur over these units.

Many of the $^{208}T\ell$ and ^{214}Bi anomalies coincide geographically. When such coincidences occur over sedimentary units, without hydrothermal vein intrusions, this is generally indicative of changes in intra-unit lithology, or near-surface hydrologic conditions.

F. NATIONAL GAMMA RAY MAP SERIES (NGRMS)

The geologic base has been photographically screened to allow emphasis of the flight line locations and of the information regarding data analysis. These maps are used as the base for presenting statistical information on the six variables:

* $^{208}T\ell$
* ^{214}Bi
* ^{40}K
* $^{214}Bi/^{208}T\ell$ Ratio
* $^{214}Bi/^{40}K$ Ratio
* $^{208}T\ell/^{40}K$ Ratio

The six NGRMS sheets are presented in Figures IV.(1-6) of this report at a scale of 1:500,000 and as separate sheets at a scale of 1:250,000.

The statistical information is summarized on these maps through the utilization of one, two or three dots above or below the flight line at every fifth data point. One dot above the line indicates that the variable value at that point is between 1σ and 2σ greater than the mean value for that geologic type where σ values are determined for each geologic type based on all flight line data from the area, as is discussed further in Section V.B.4. Two dots indicate values between 2σ and 3σ, and three dots show values greater than 3σ. Dots below the line indicate the variable values which are less than the mean value by 1, 2 or 3σ in the same manner.

G. LINE PRINTER CONTOURS

Printer contours have been generated at a 1:500,000 scale for seven variables (eTh, eU, K, eU/eTh, eU/K, eTh/K, RMag, respectively). They appear in Appendix IV. Note that every alternate contour interval is composed of blanks to help delineate contour boundaries. Dots are used where the denominator value for a ratio is approaching zero, and to denote non-data areas.

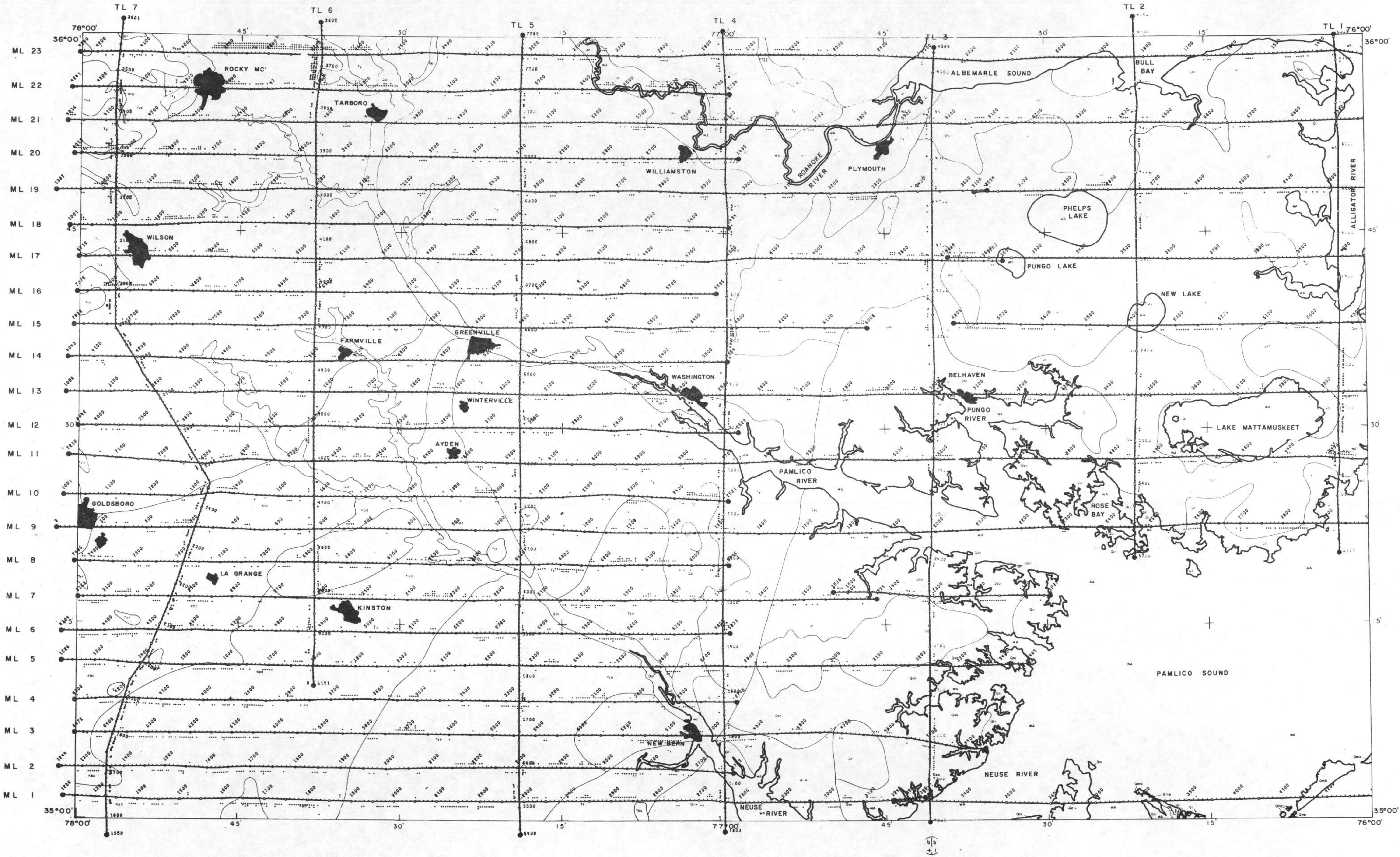
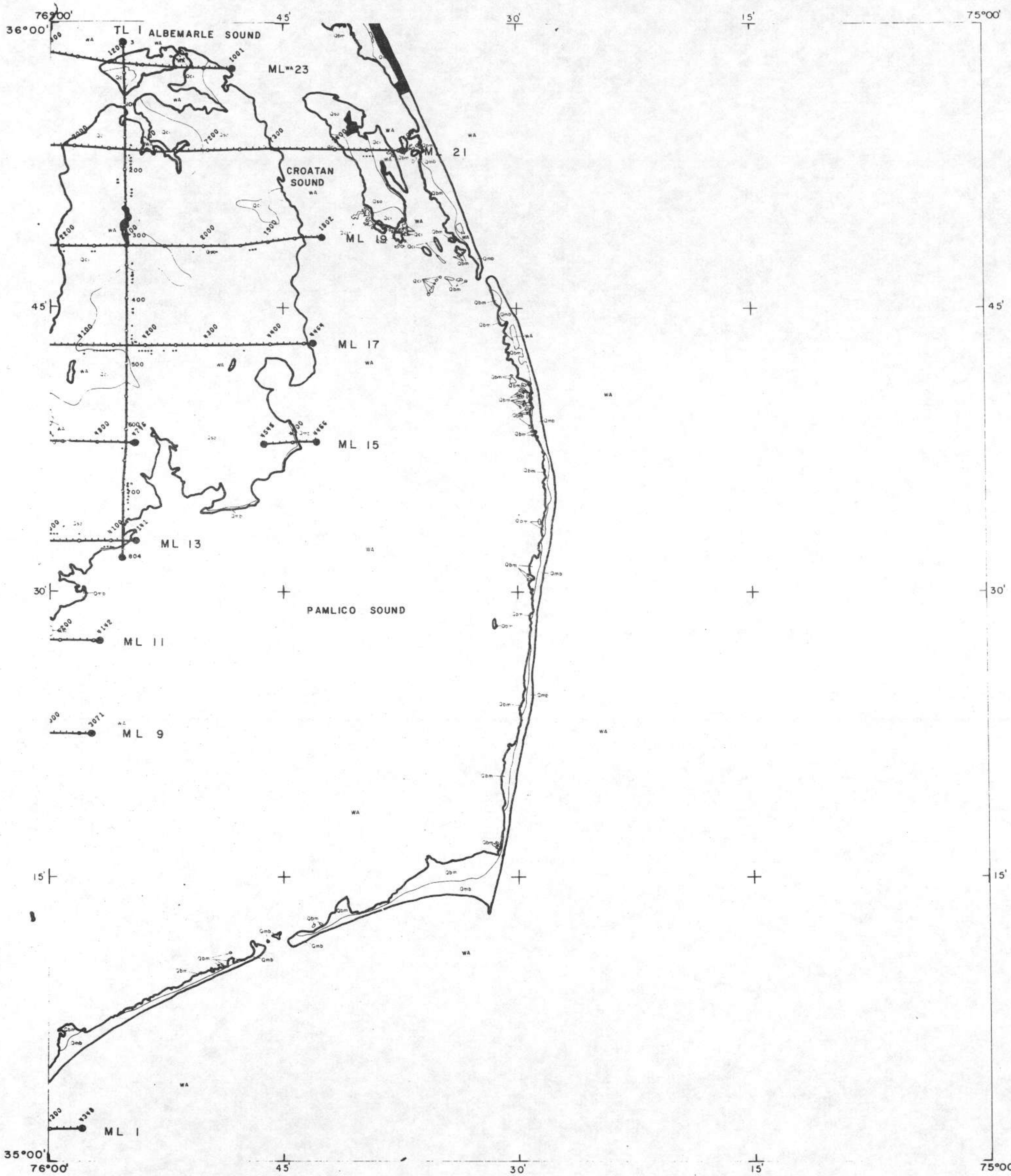


Figure IV.1 National Gamma Ray Map Series

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

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

ROCKY MOUNT, NORTH CAROLINA
^{208}Tl ± STANDARD DEVIATIONS
REF: NTMS, NI 18-1
PREPARED FOR
U.S. DEPARTMENT OF ENERGY



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5 0 5 10 15 20 25 30 KILOMETERS

MANTEO, NORTH CAROLINA
^{208}Tl ± STANDARD DEVIATIONS
REF NTMS, NI 18-2
PREPARED FOR
U. S. DEPARTMENT OF ENERGY

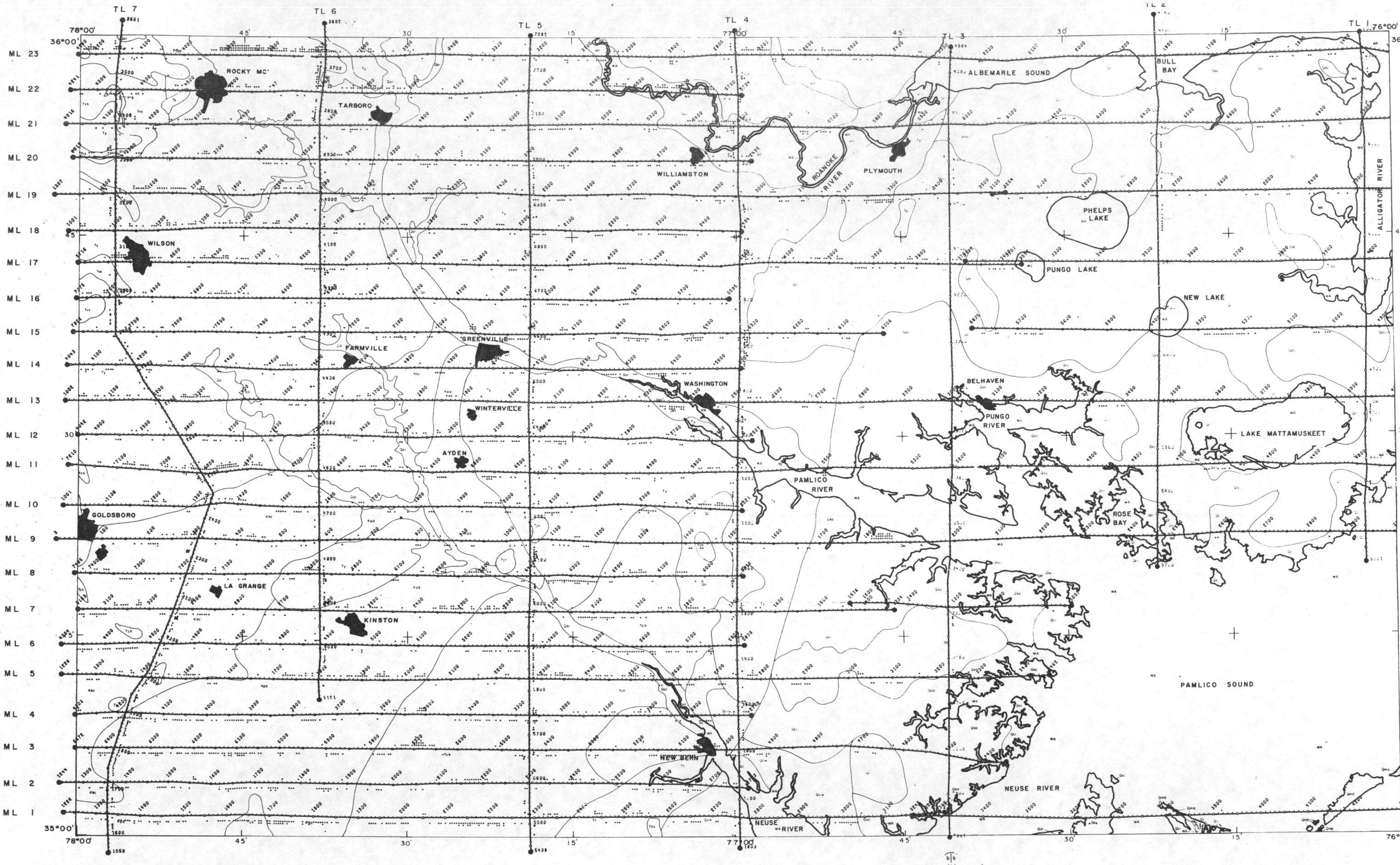

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Figure IV.2 National Gamma Ray Map Series

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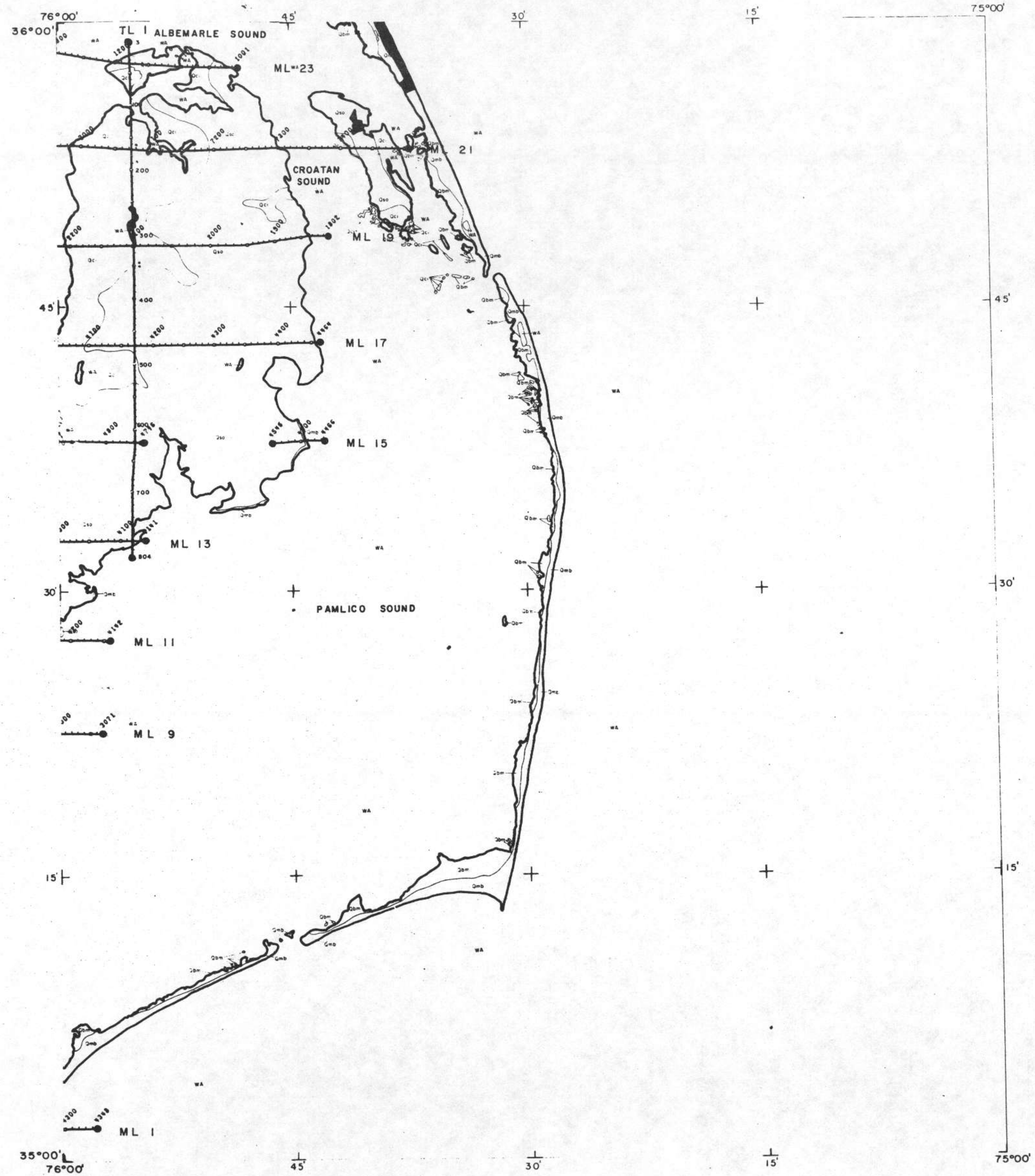
5 0 5 10 15 20 25 30 KILOMETERS

ROCKY MOUNT, NORTH CAROLINA

^{214}Bi ± STANDARD DEVIATIONS

REF: NTMS, NI 18-1

PREPARED FOR
U.S. DEPARTMENT OF ENERGY



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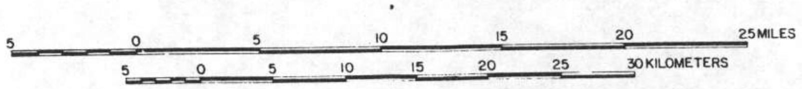

MANTEO, NORTH CAROLINA

^{214}Bi ± STANDARD DEVIATIONS

REF NTMS, NI 18-2

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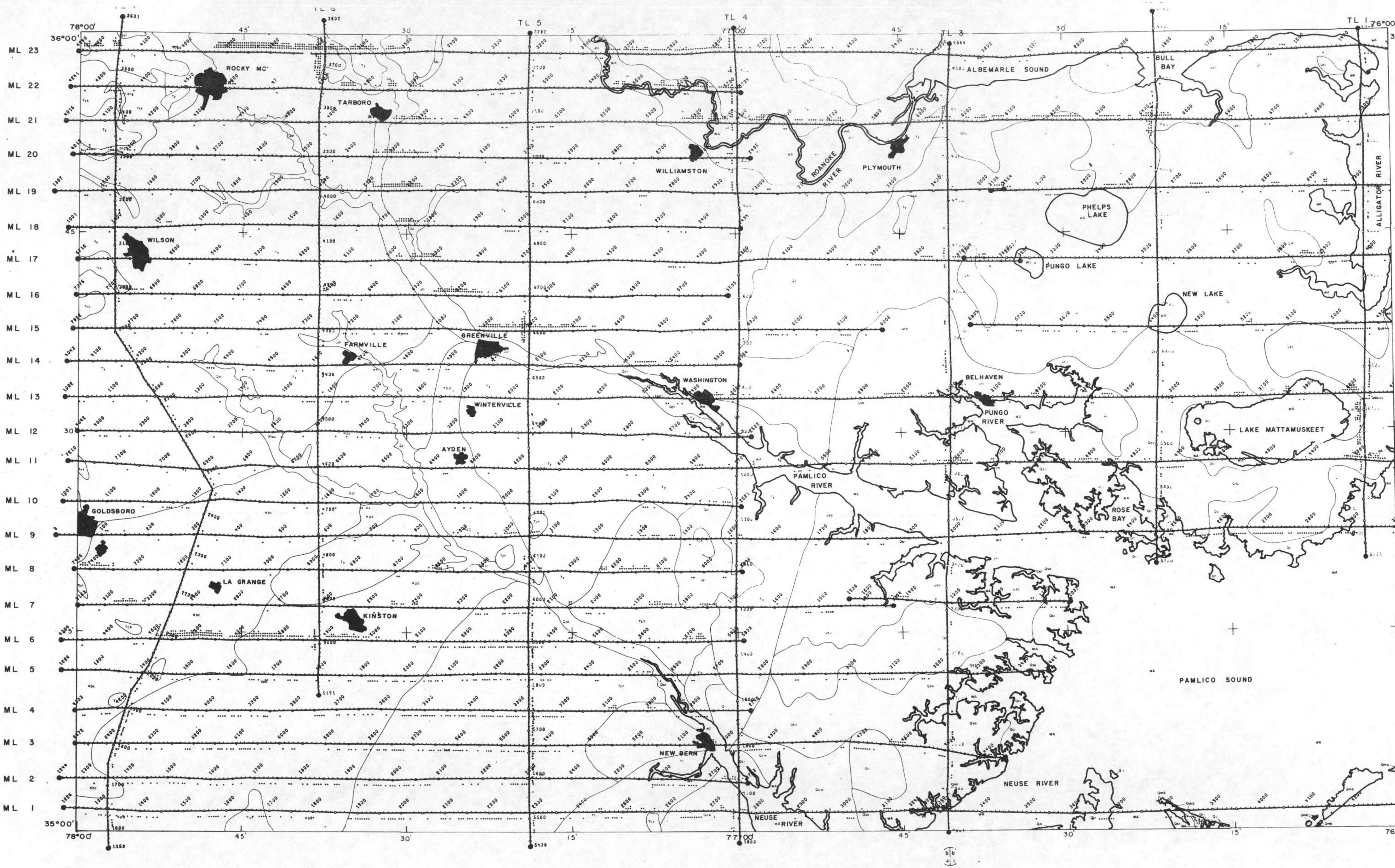

Figure IV.3 National Gamma Ray Map Series

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5 0 5 10 15 20 25 30 KILOMETERS

ROCKY MOUNT, NORTH CAROLINA
^{40}K ± STANDARD DEVIATIONS
REF: NTMS, NI 18-1
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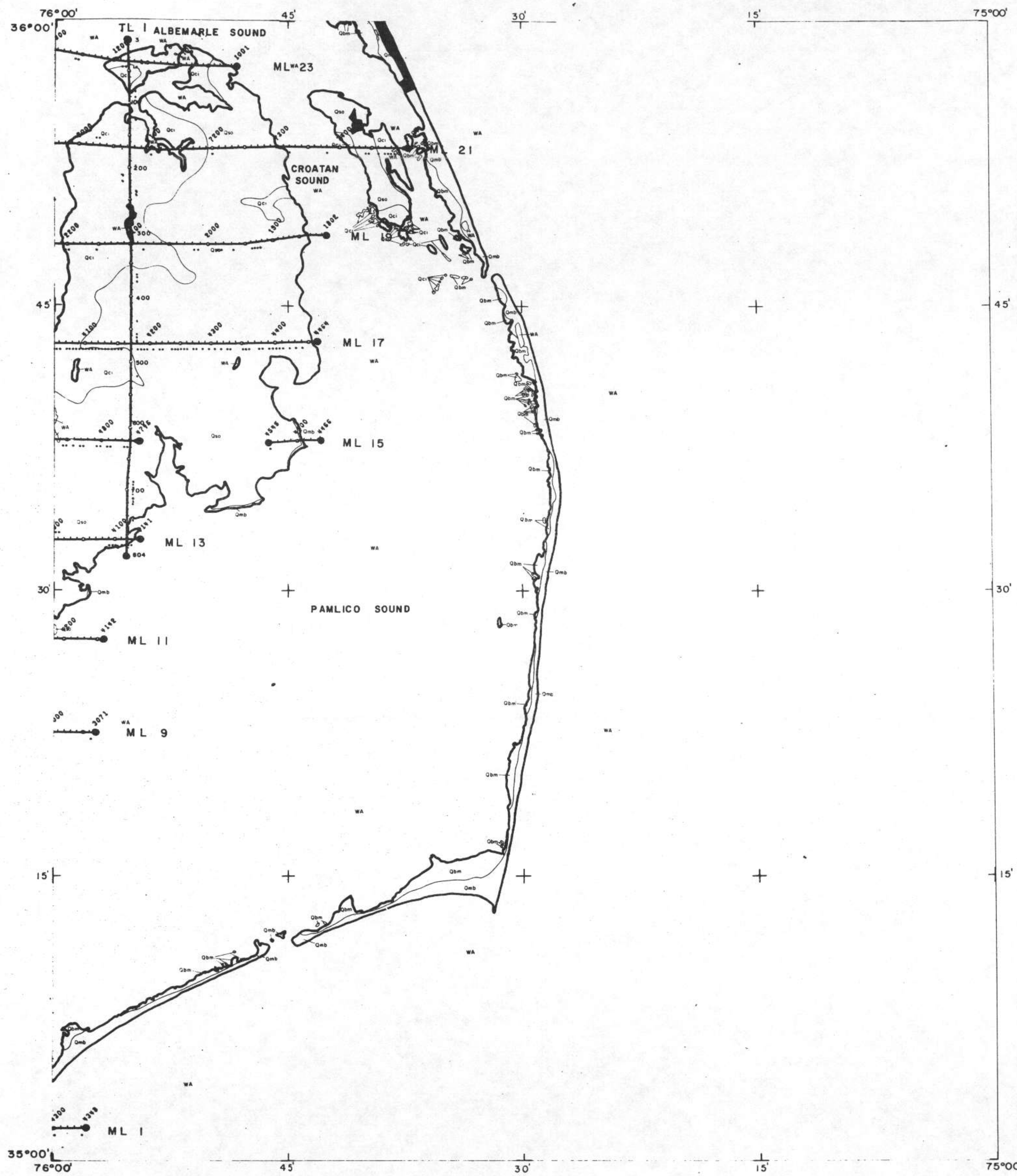

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5 0 5 10 15 20 25 MILES
5 0 5 10 15 20 25 30 KILOMETERS

MANTEO, NORTH CAROLINA

$^{40}K \pm$ STANDARD DEVIATIONS

REF. NTMS, NI 18-2

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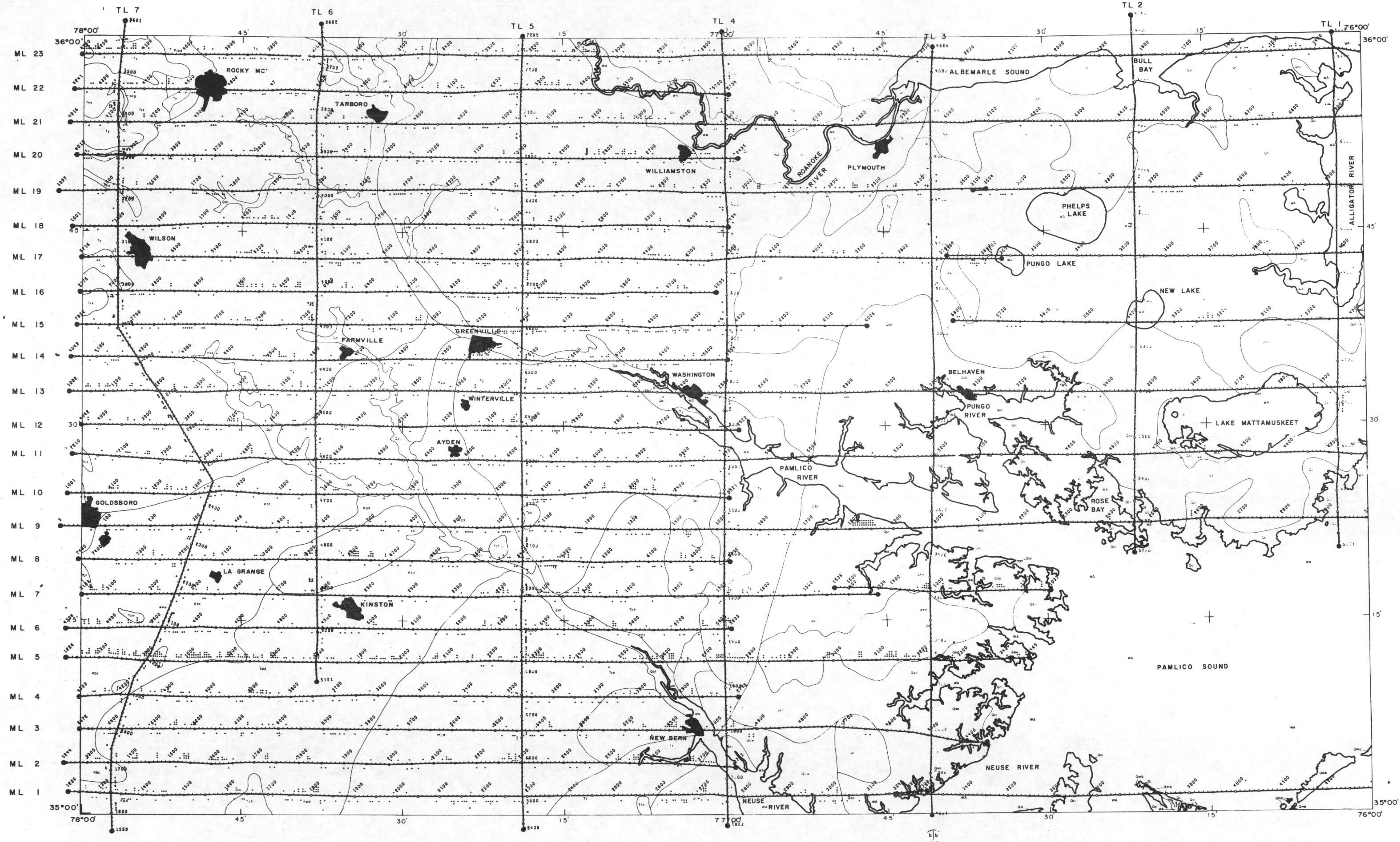

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Figure IV.4 National Gamma Ray Map Series

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

ROCKY MOUNT, NORTH CAROLINA
$^{214}Bi/^{208}Tl$ ± STANDARD DEVIATIONS
REF: NTMS, NI 18-1
PREPARED FOR
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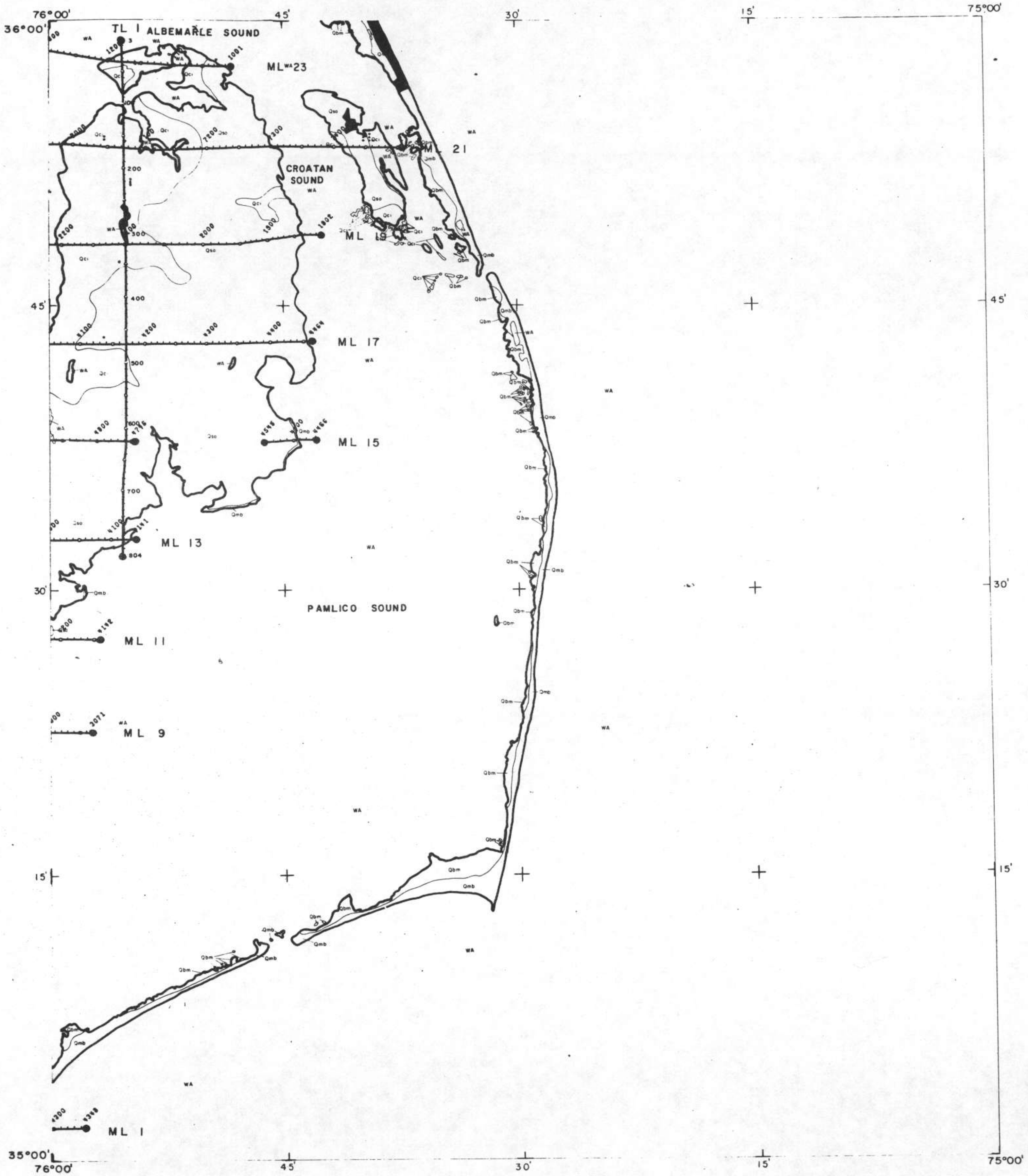

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MANTEO, NORTH CAROLINA

$^{214}Bi/^{208}Tl$ ± STANDARD DEVIATIONS

REF NTMS, NI 18-2

PREPARED FOR

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5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 30 KILOMETERS

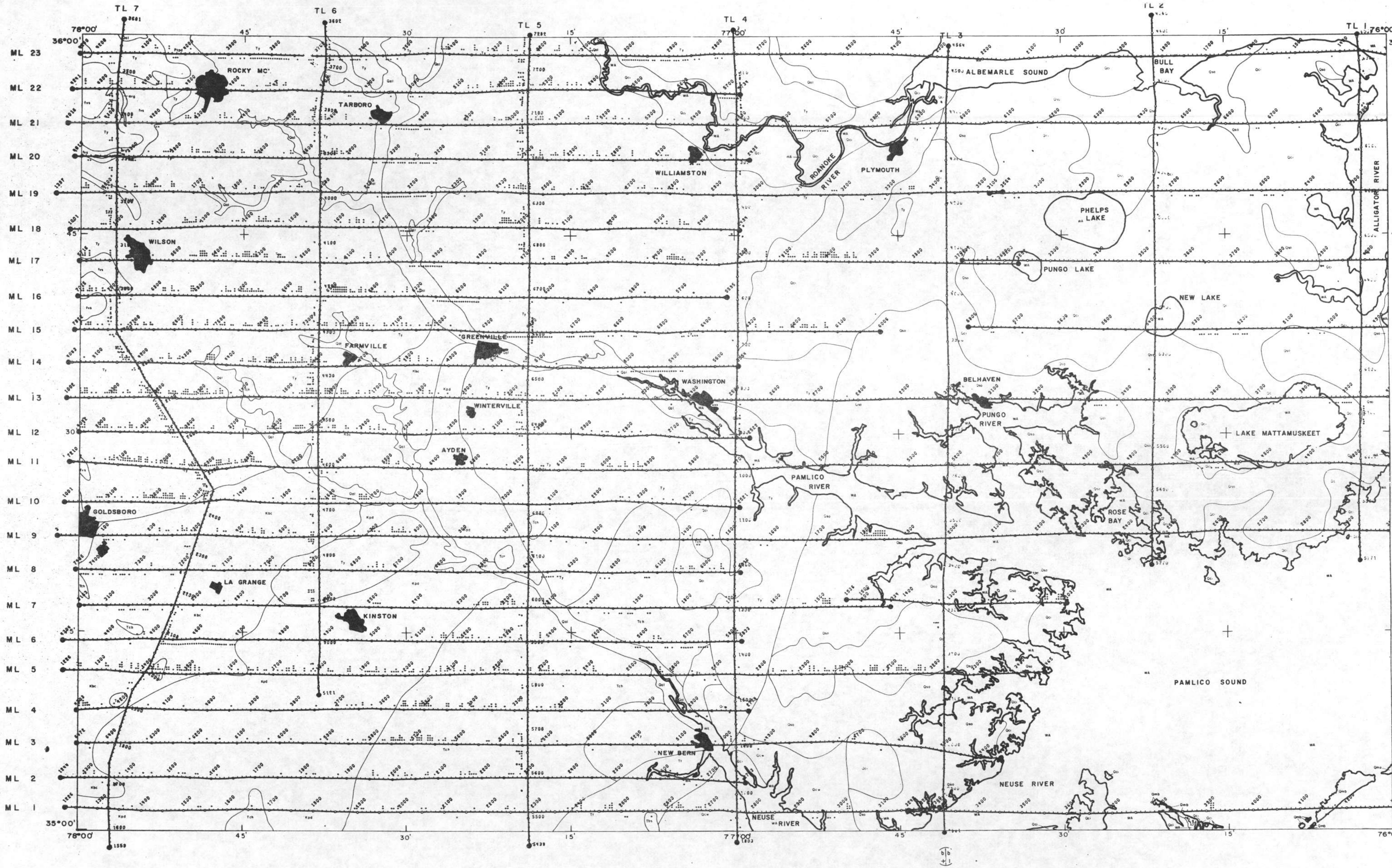

Figure IV.5 National Gamma Ray Map Series

ROCKY MOUNT, NORTH CAROLINA

$^{214}Bi/^{40}K$ ± STANDARD DEVIATIONS

REF: NTMS, NI 18-1

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

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

IV-14j

MANTEO, NORTH CAROLINA
$^{214}Bi / ^{40}K$ ± STANDARD DEVIATIONS
REF. NTMS, NI 18-2
PREPARED FOR
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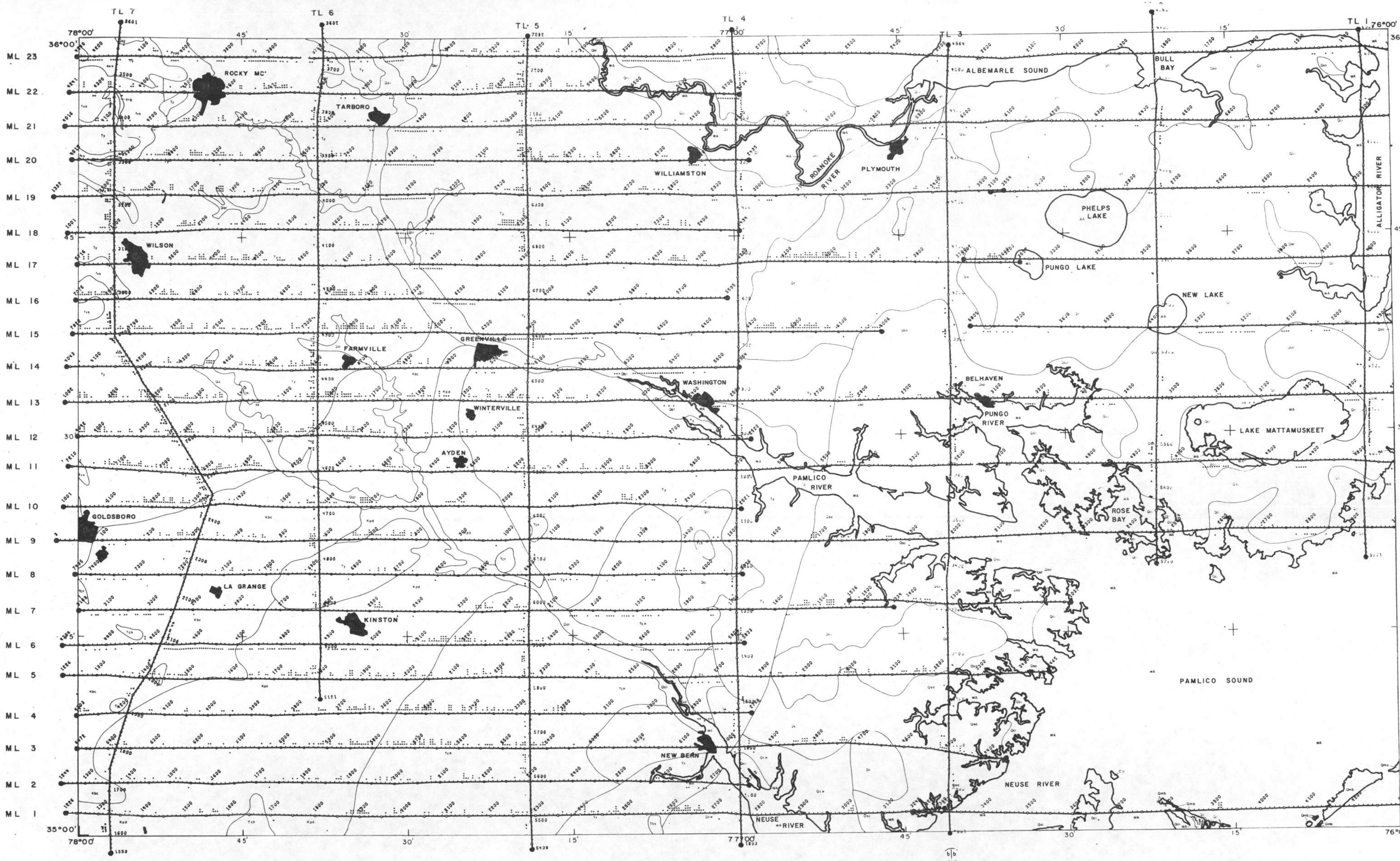
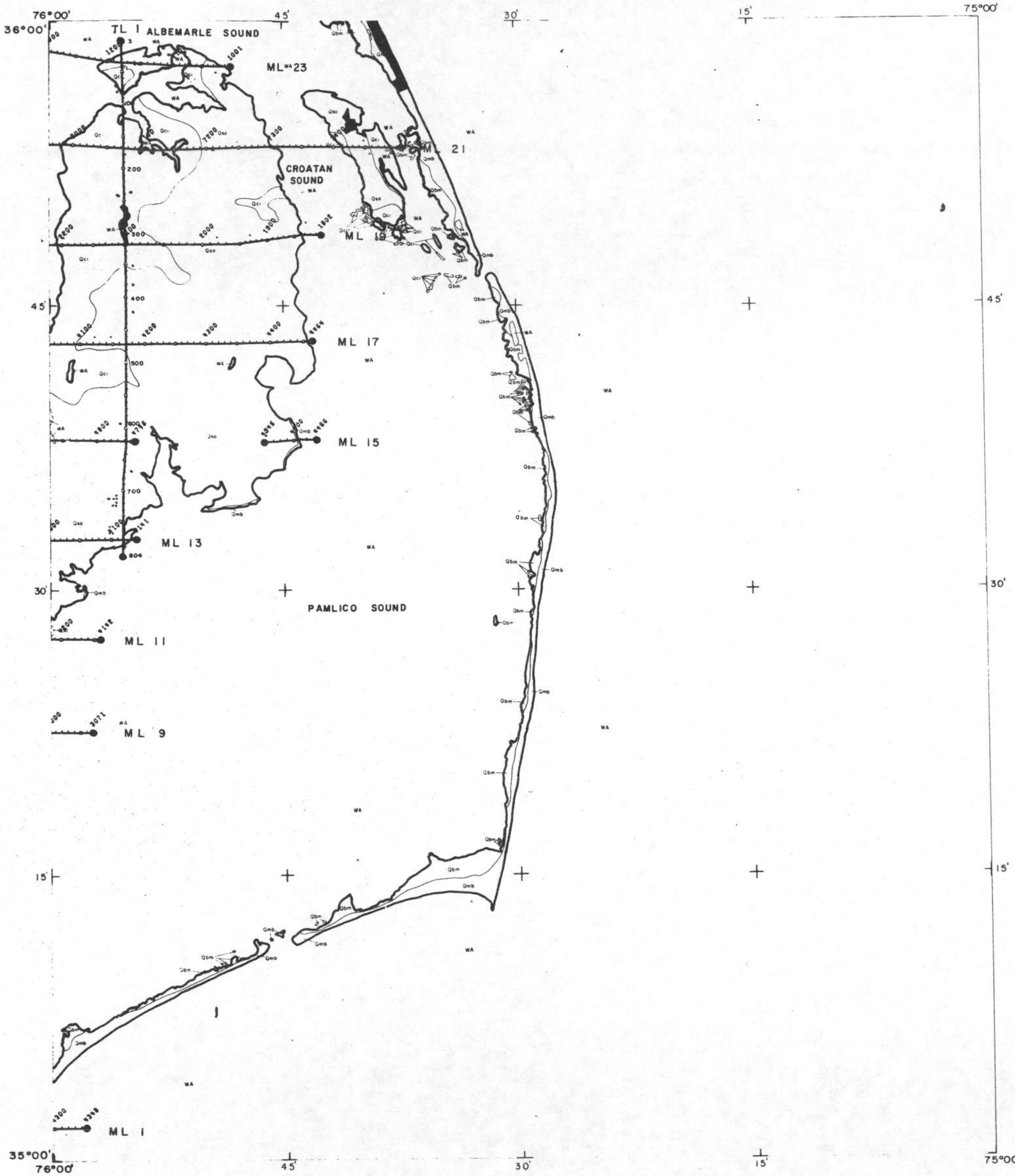


Figure IV.6 National Gamma Ray Map Series

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

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

ROCKY MOUNT, NORTH CAROLINA
$^{208}Tl/^{40}K$ ± STANDARD DEVIATIONS
REF: NTMS, NI 18-1
PREPARED FOR
U.S. DEPARTMENT OF ENERGY



GEODATA INTERNATIONAL, INC.

7035 JOHN W. CARPENTER FRWY. DALLAS, TEXAS 75247

NATIONAL GAMMA RAY MAP SERIES

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 30 KILOMETERS

MANTEO, NORTH CAROLINA

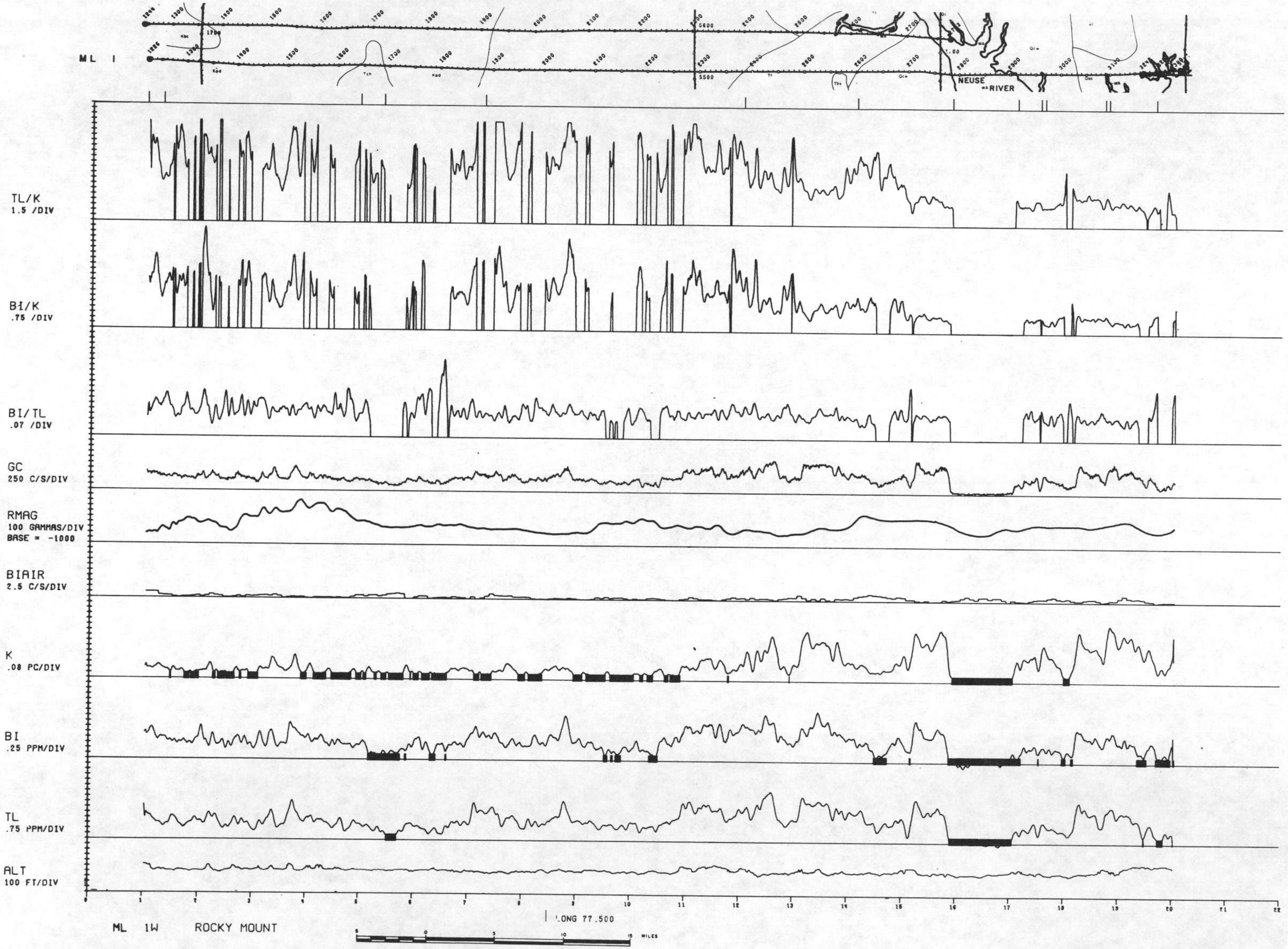
$^{208}Tl/^{40}K$ ± STANDARD DEVIATIONS

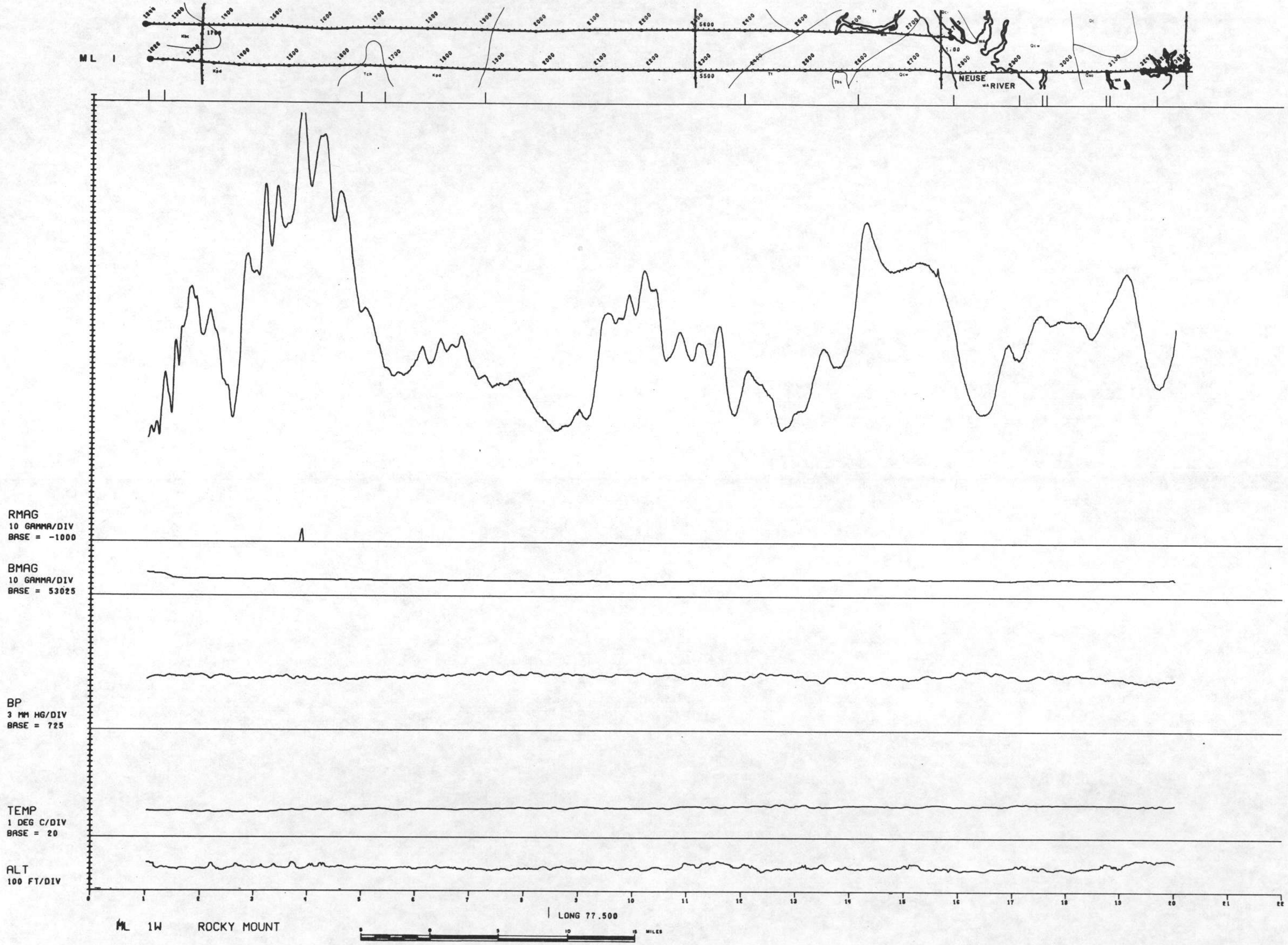
REF. NTMS, NI 18-2

PREPARED FOR

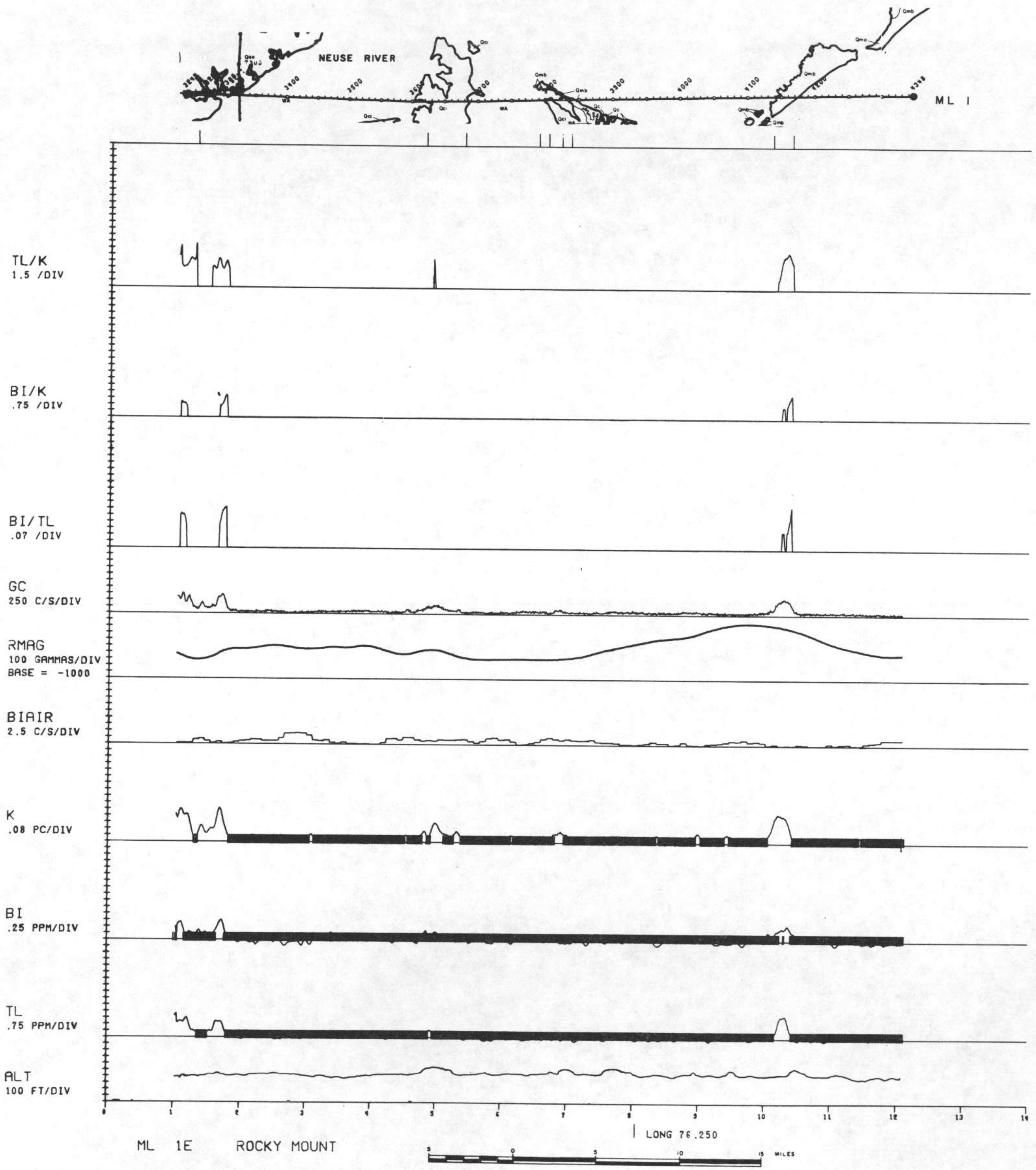
U.S. DEPARTMENT OF ENERGY

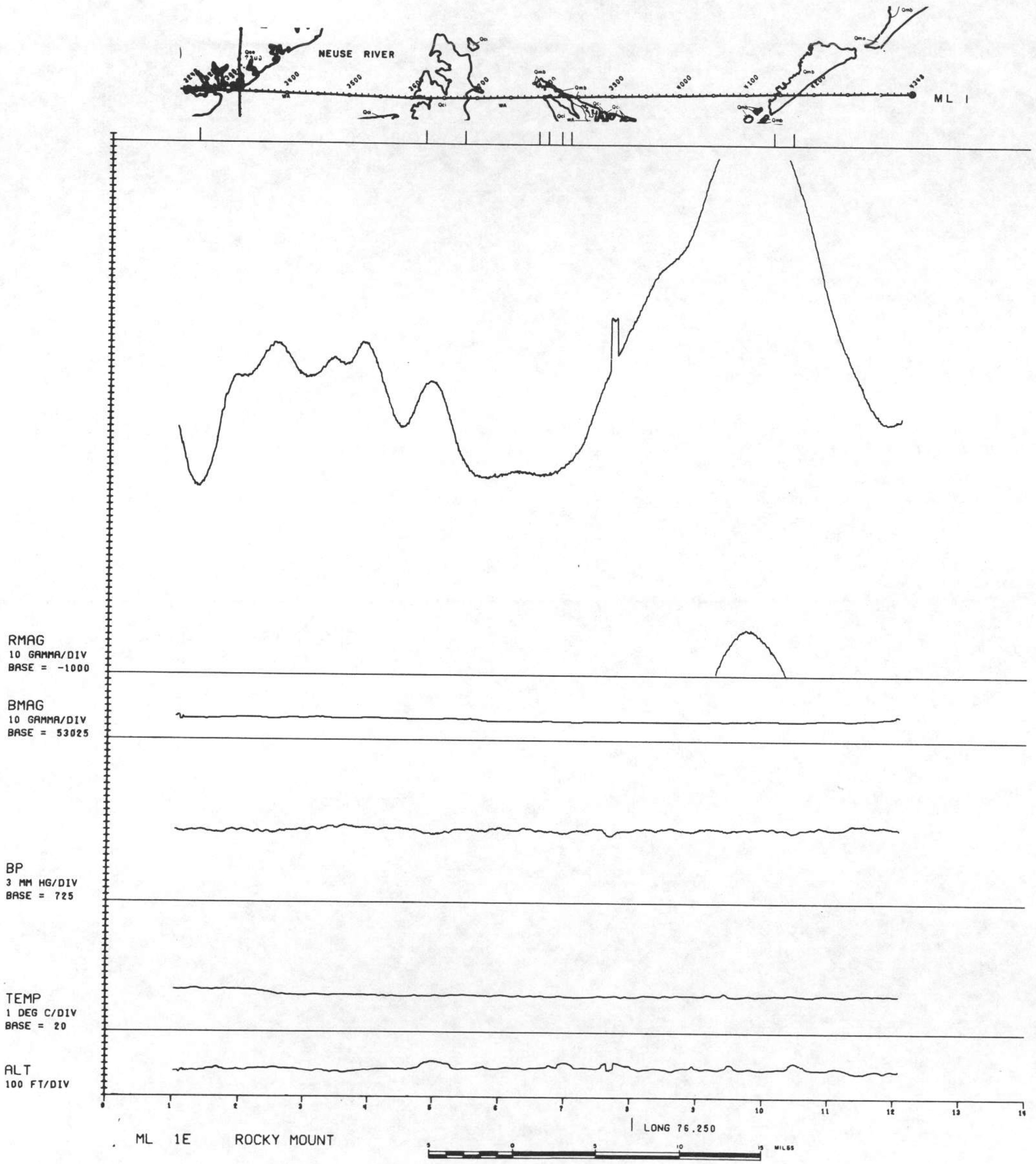
H. STACKED DATA PROFILES AND GEOLOGIC HISTOGRAMS

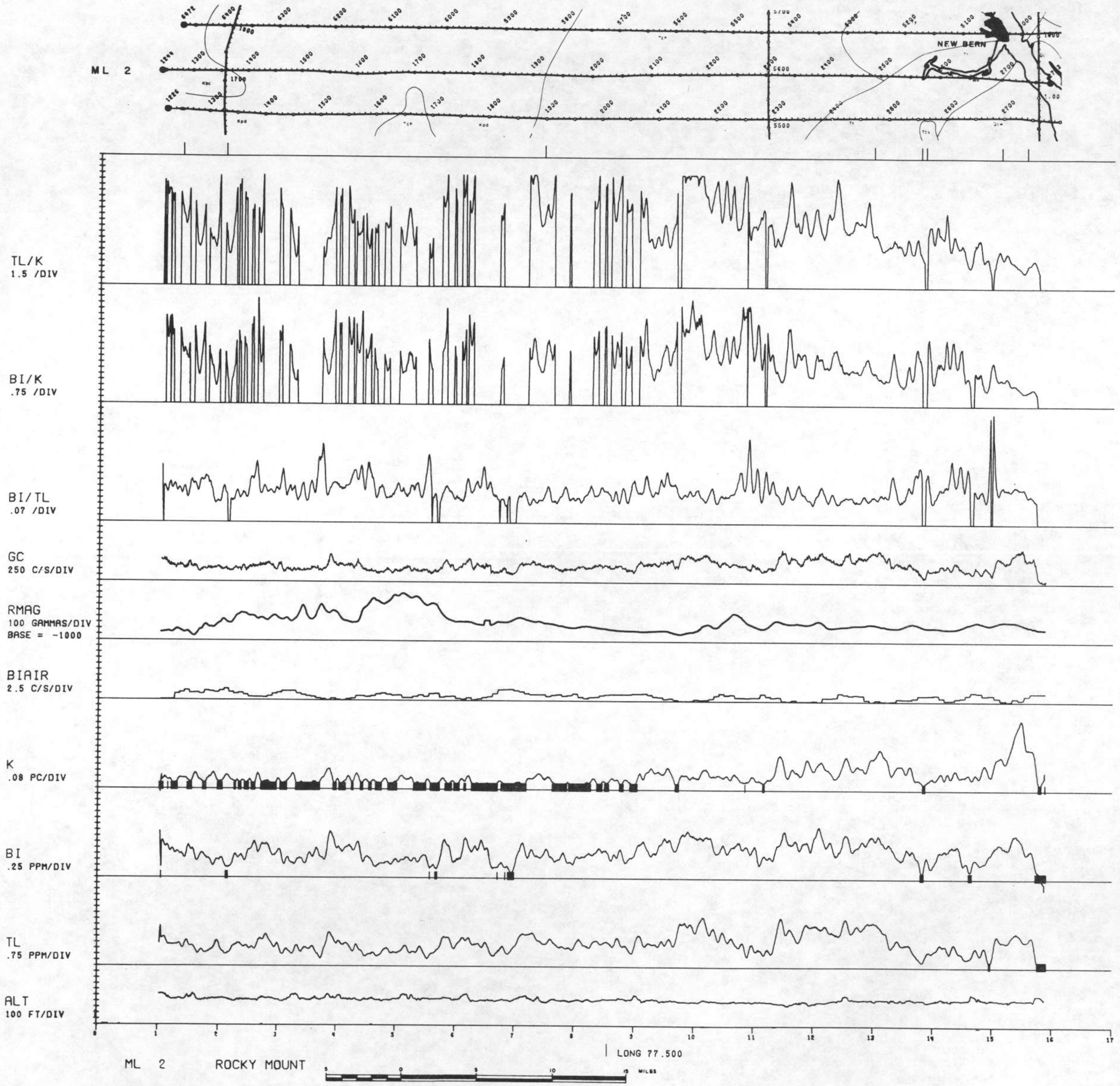

ML 1
NEUSE
RIVER
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 77.500
MILES
ML 1W ROCKY MOUNT



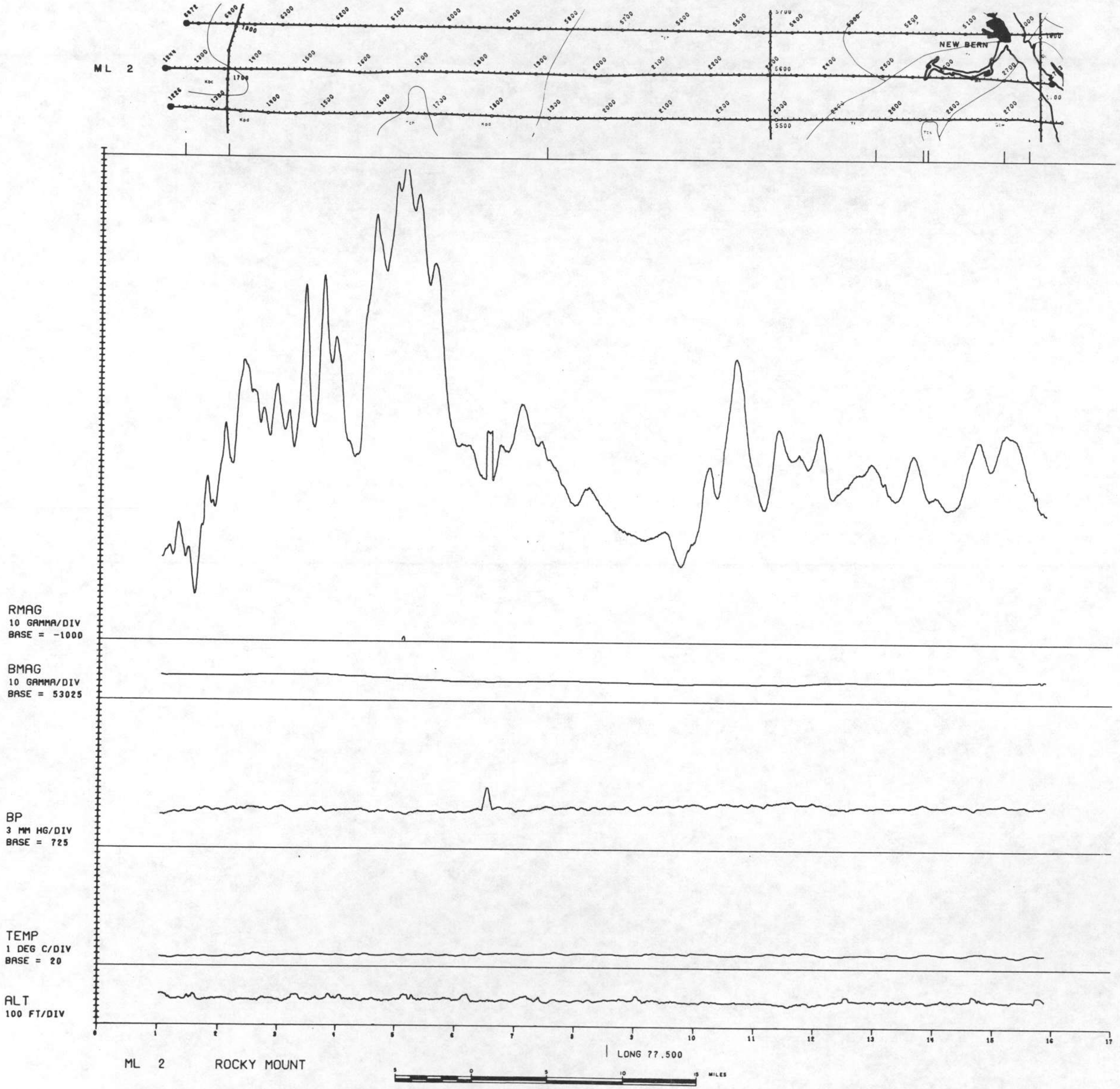
ML 1W ROCKY MOUNT

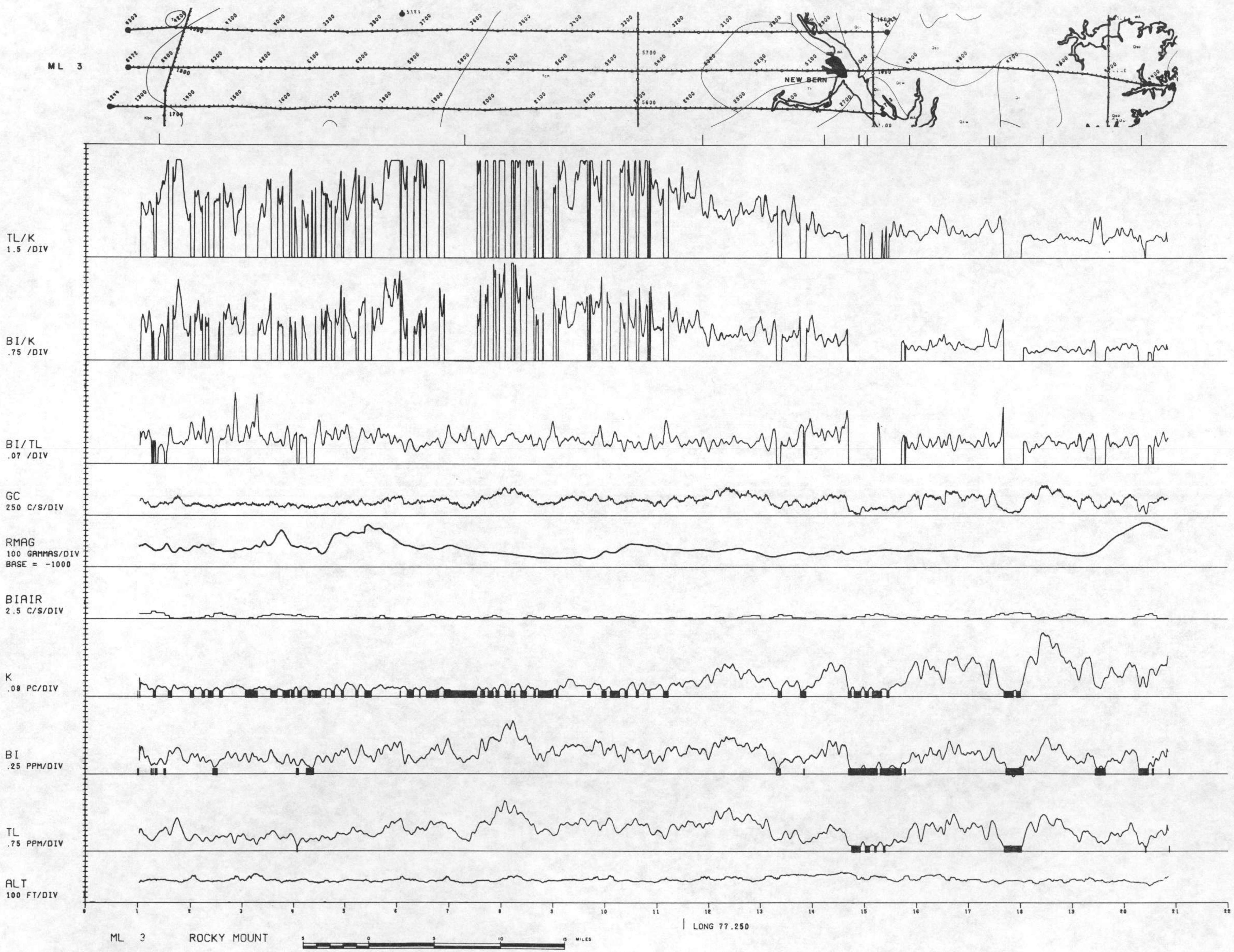

NEUSE RIVER
ML 1
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 76.250
MILES
ML 1E ROCKY MOUNT


NEUSE RIVER
ML 1
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 76.250
ML 1E ROCKY MOUNT
MILES

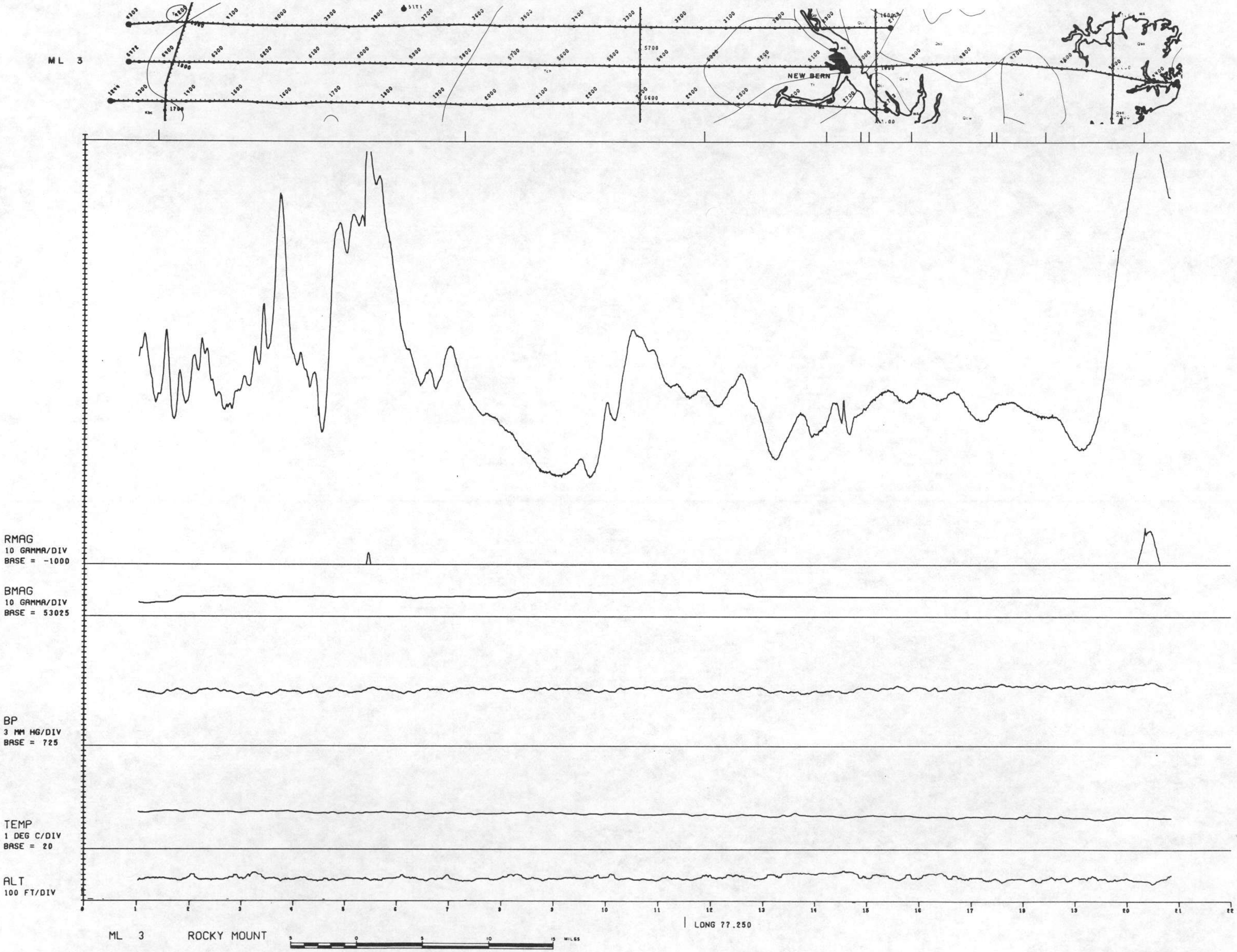


ML 2 ROCKY MOUNT

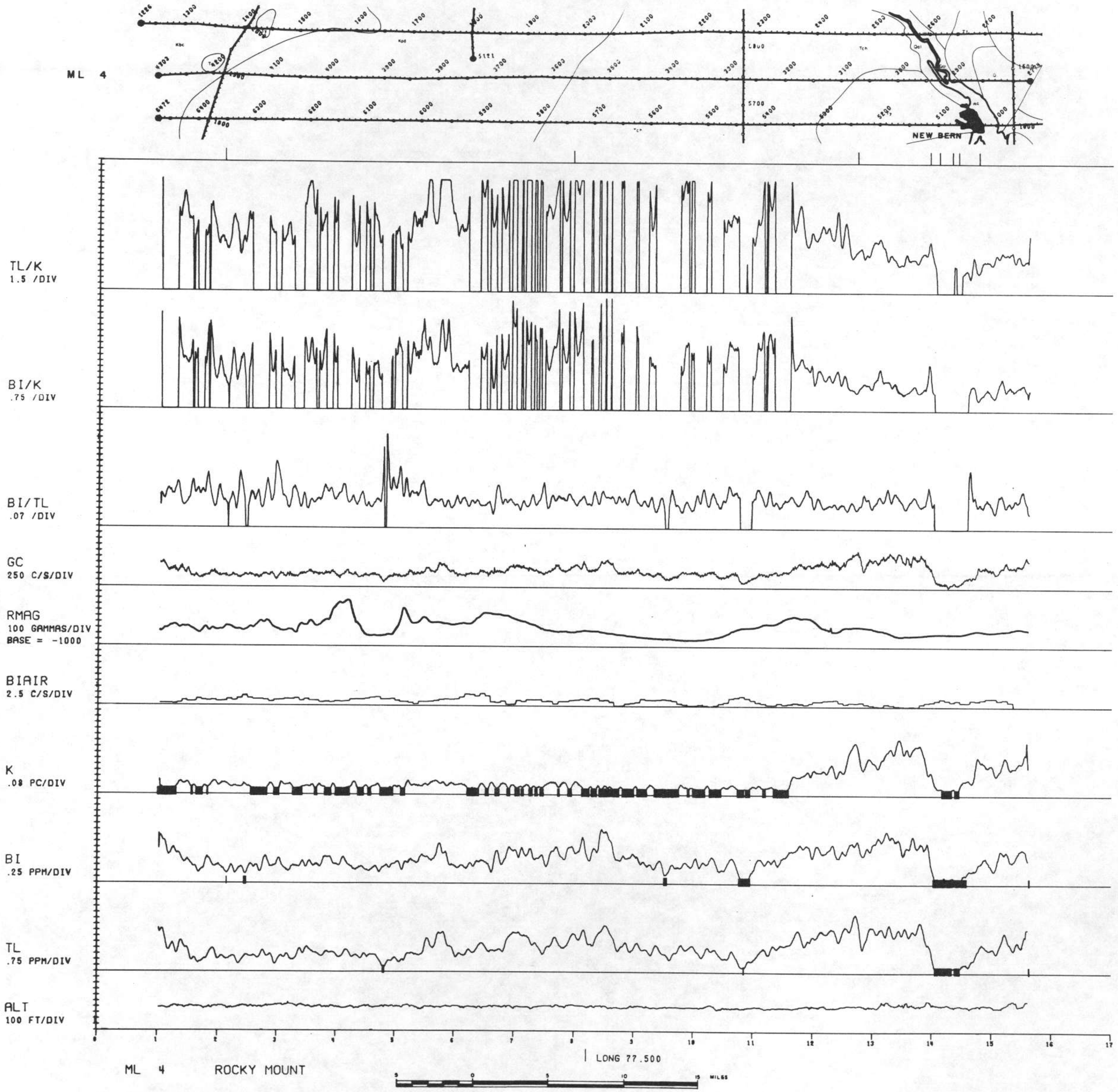

ML 2
NEW BERN
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.500
ML 2 ROCKY MOUNT
MILES



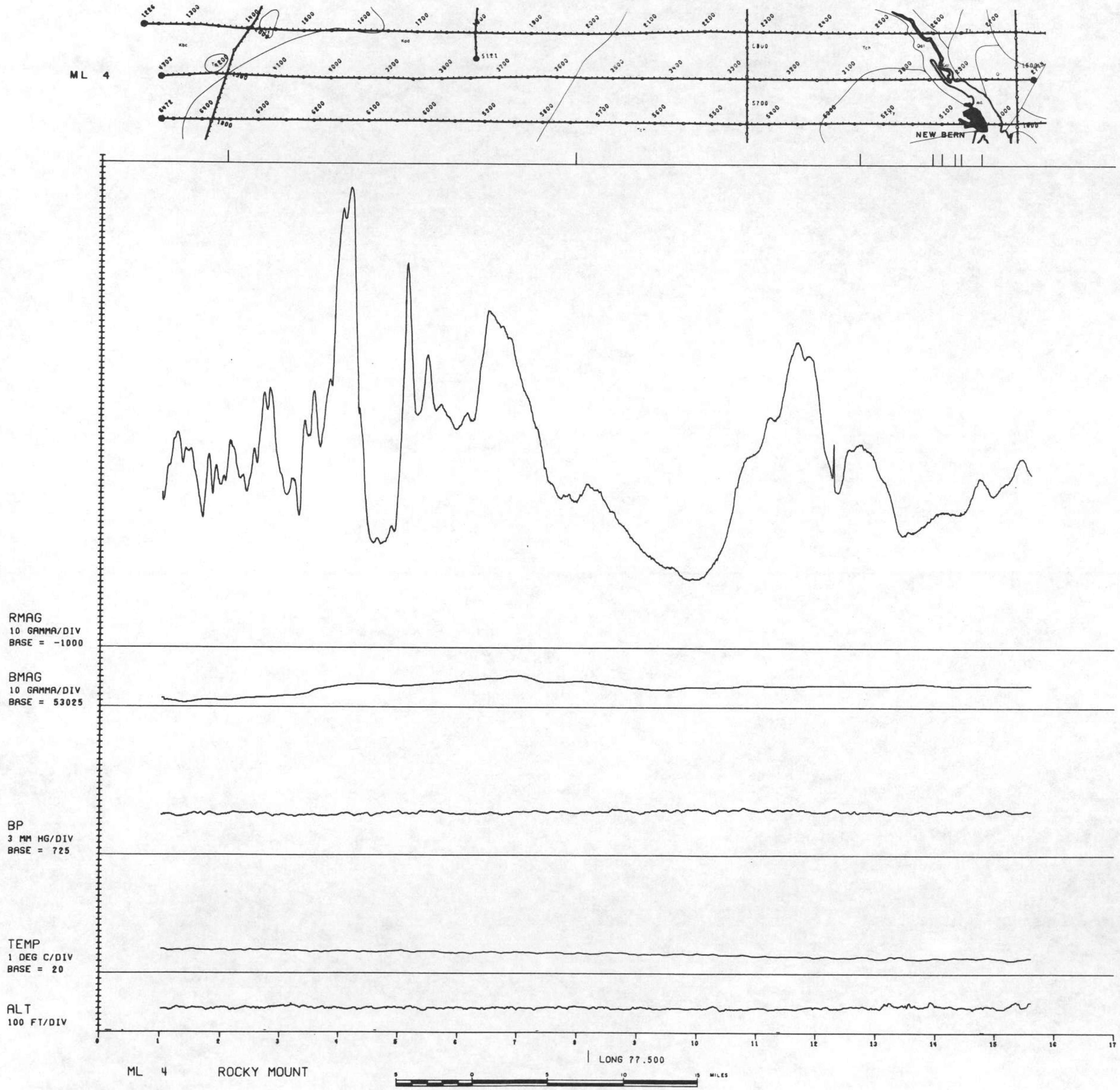
ML 3 ROCKY MOUNT

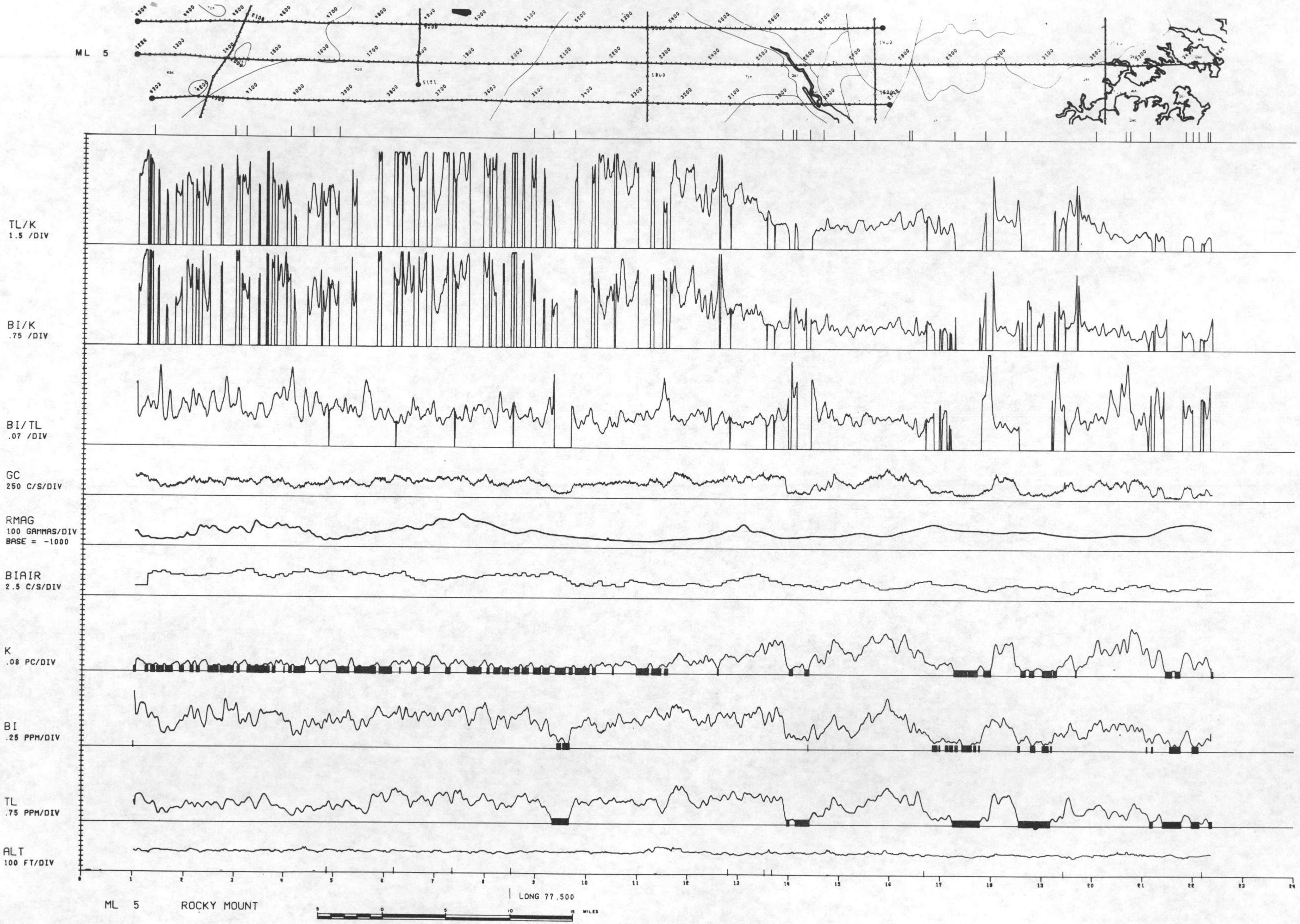


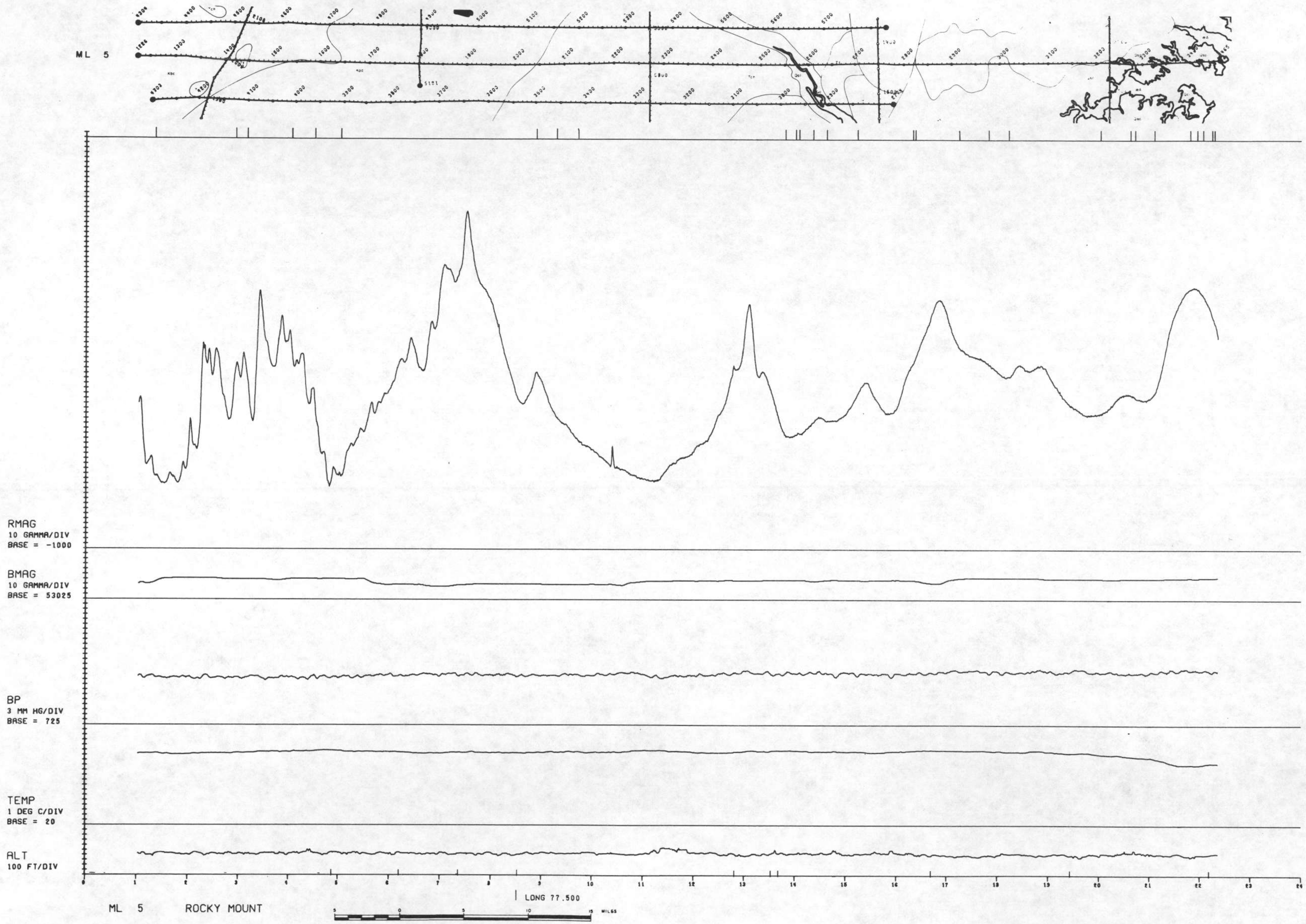
ML 3 ROCKY MOUNT



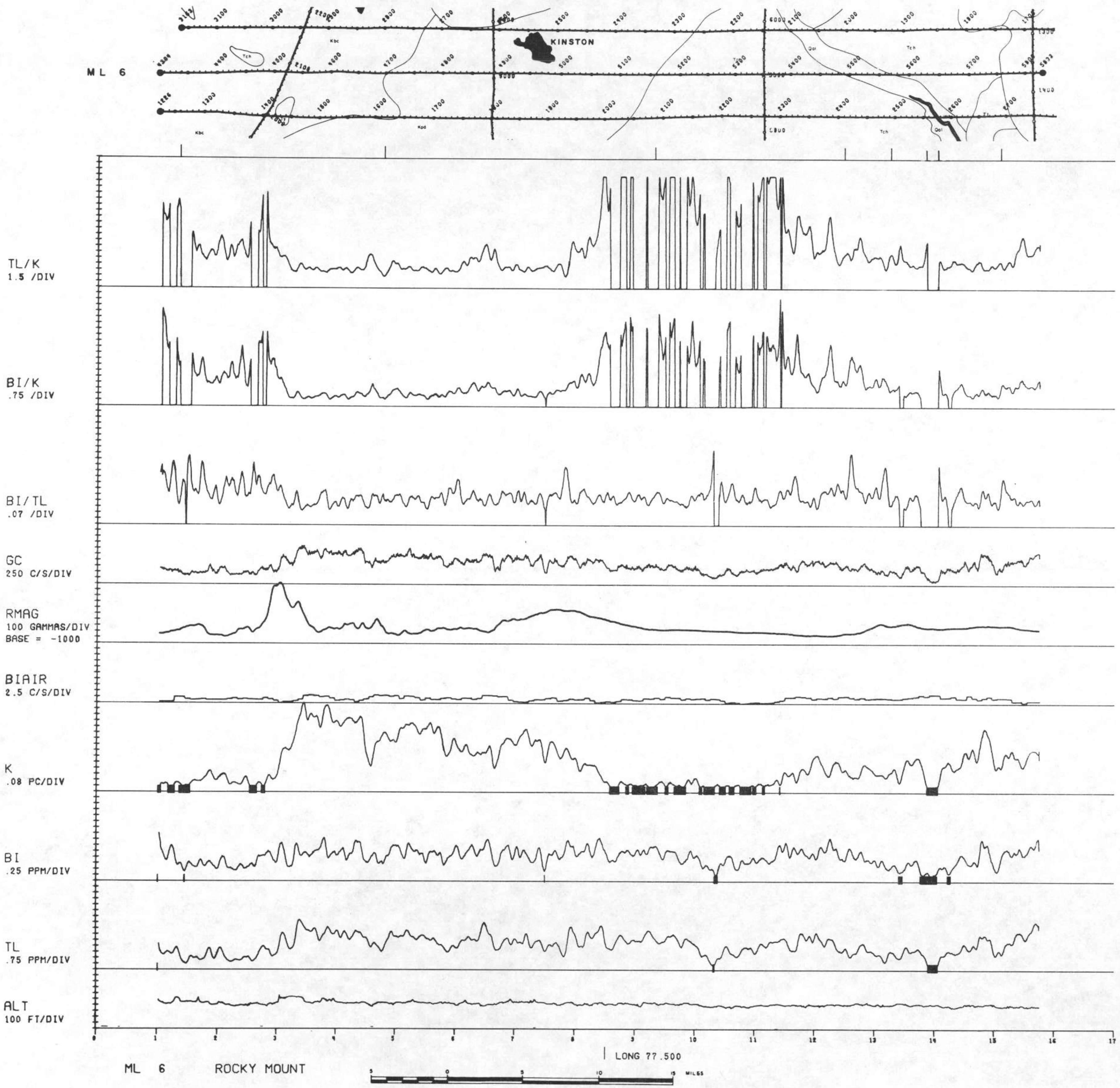
ML 4 ROCKY MOUNT


ML 4
NEW BERN
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
LONG 77.500
MILES
ML 4 ROCKY MOUNT

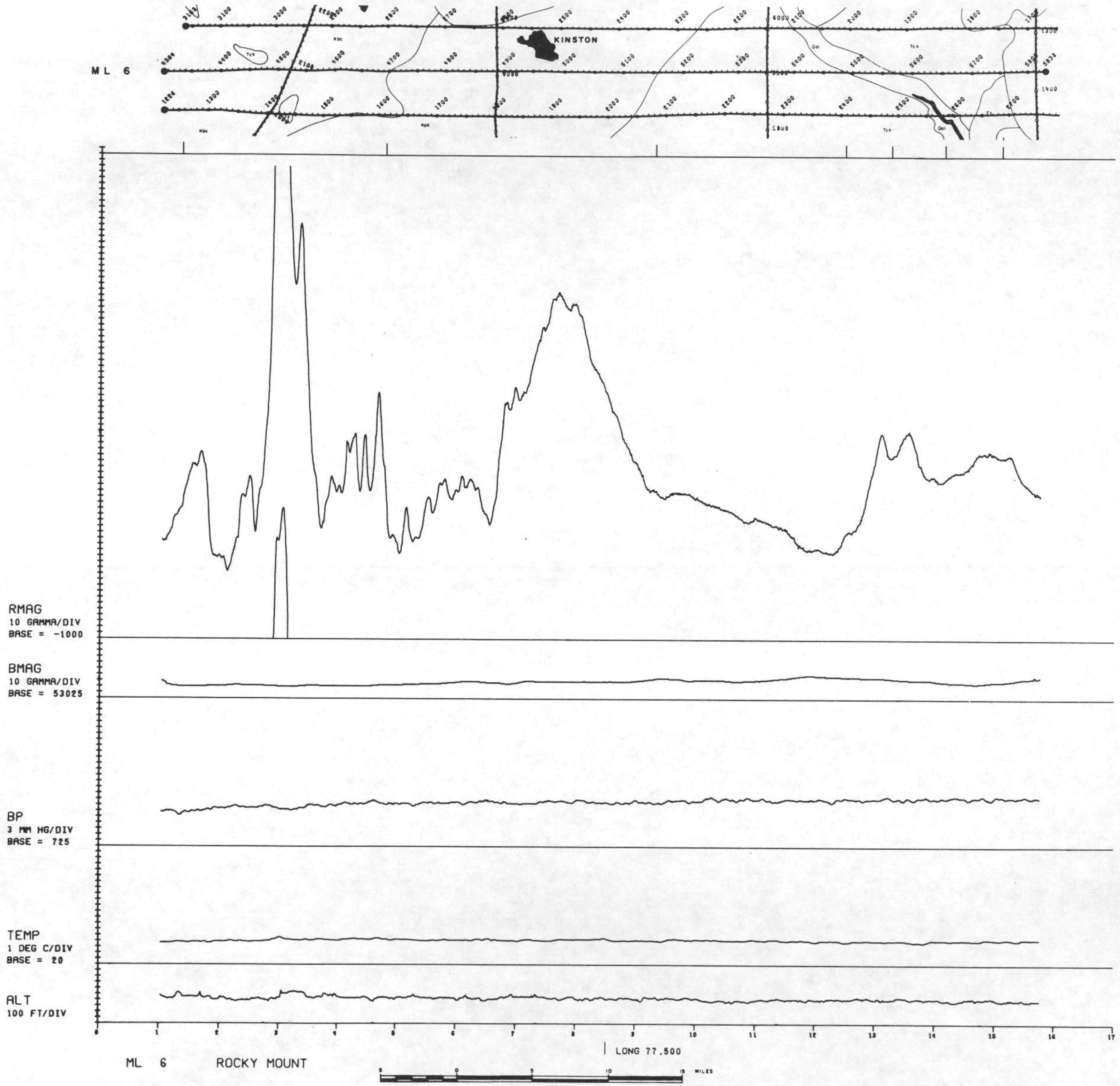

ML 5
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
ML 5 ROCKY MOUNT
LONG 77.500
MILES



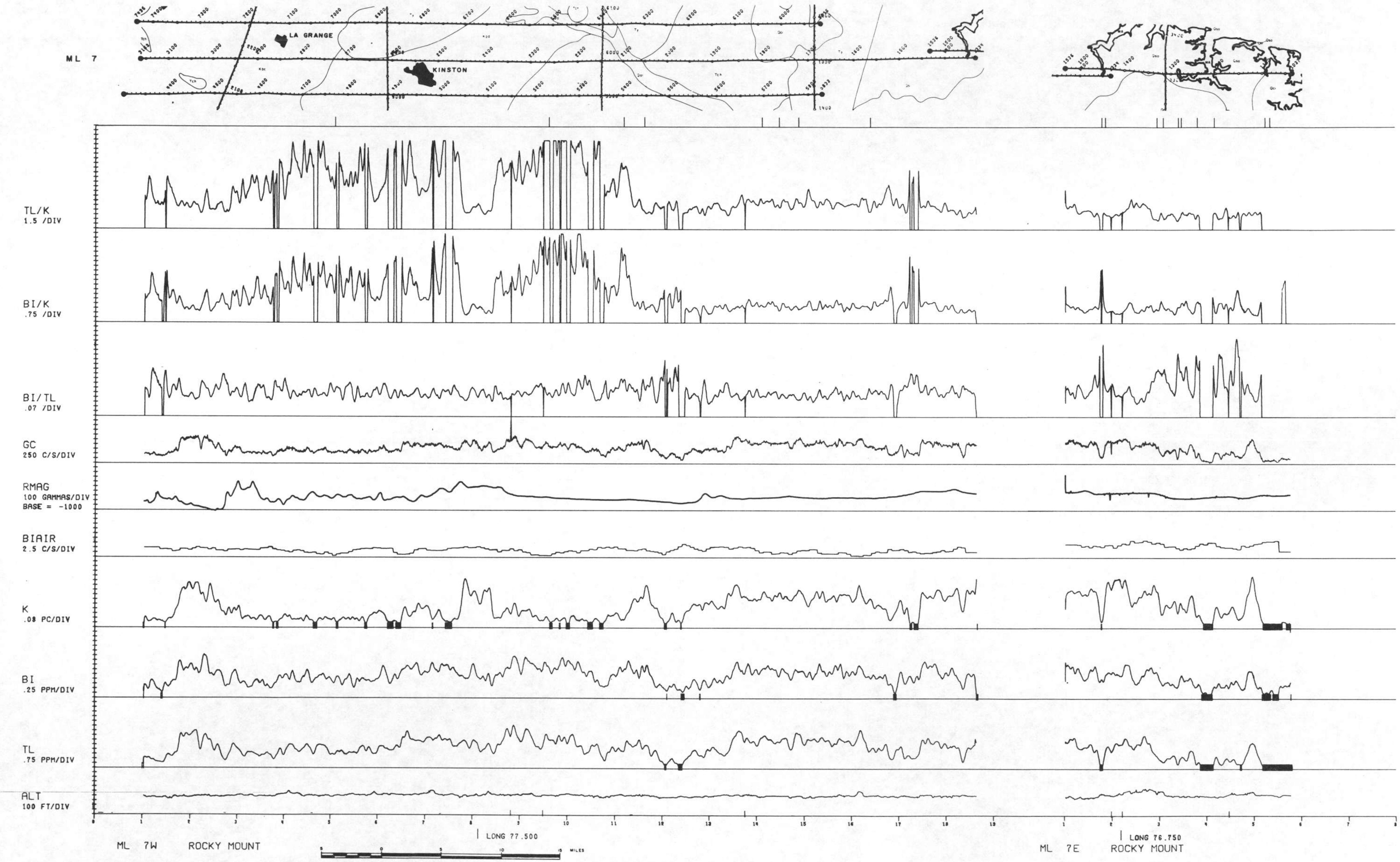
ML 5 ROCKY MOUNT



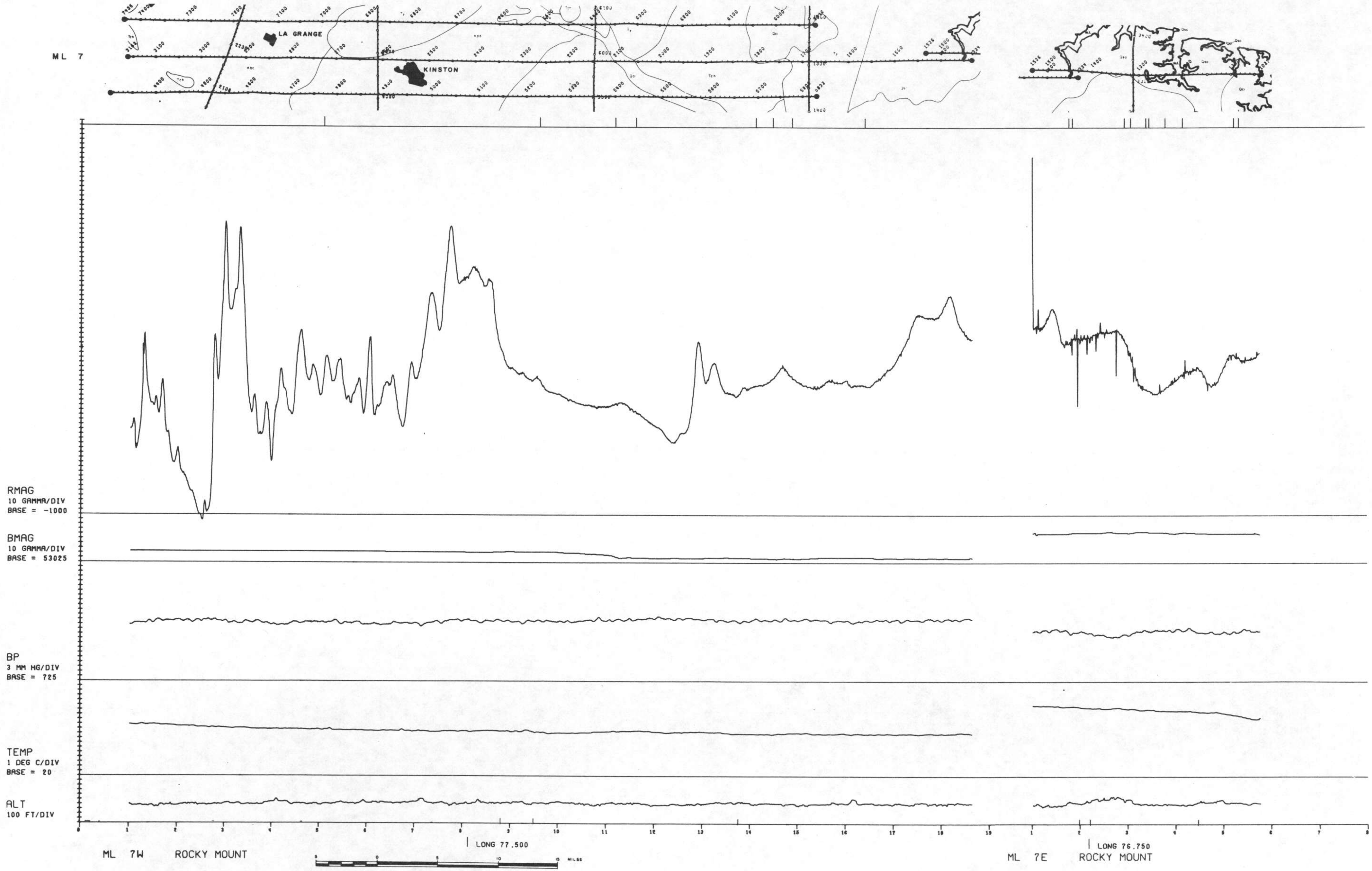
ML 6 ROCKY MOUNT

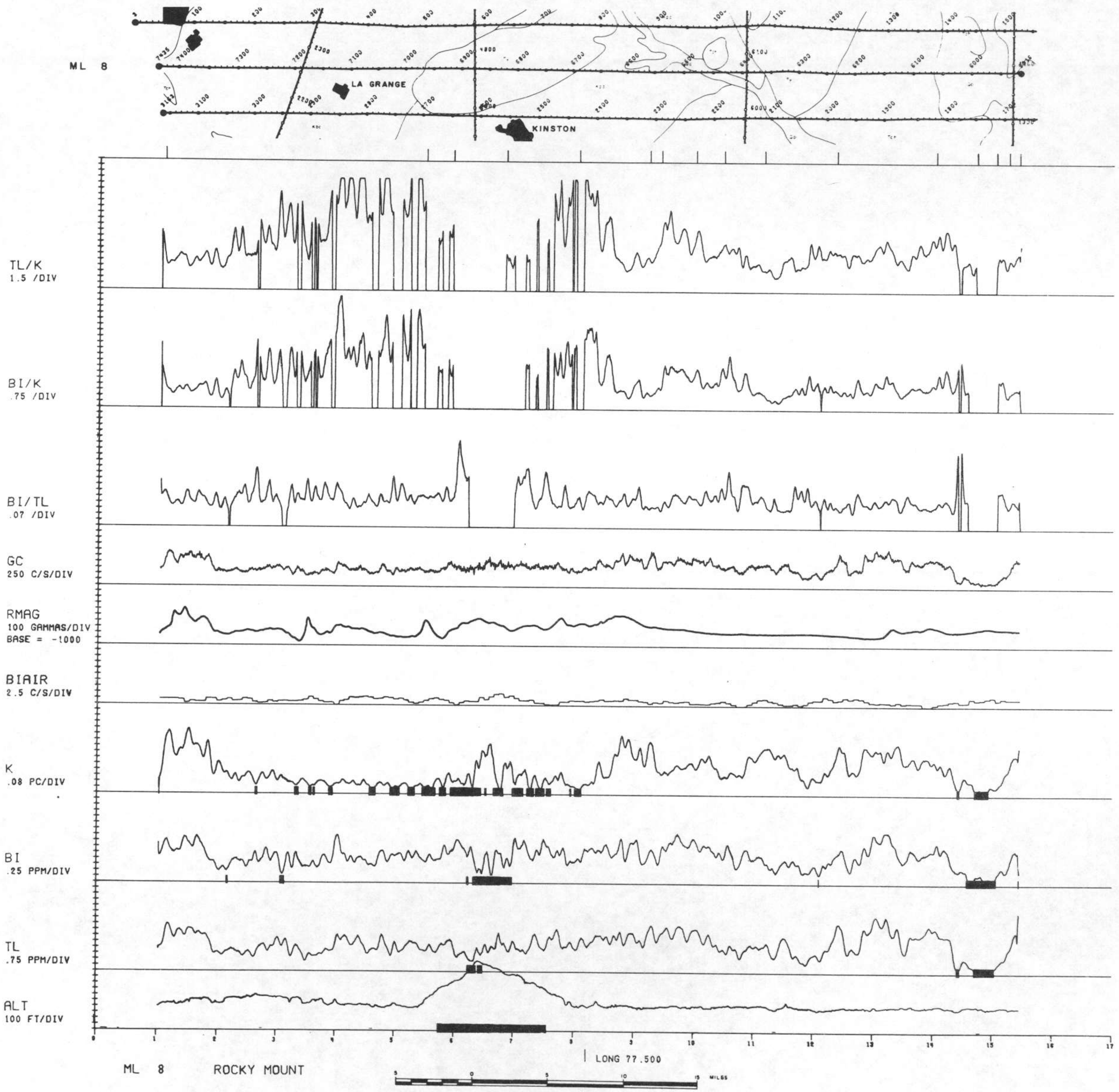


ML 6
KINSTON
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.500
MILES
ML 6 ROCKY MOUNT

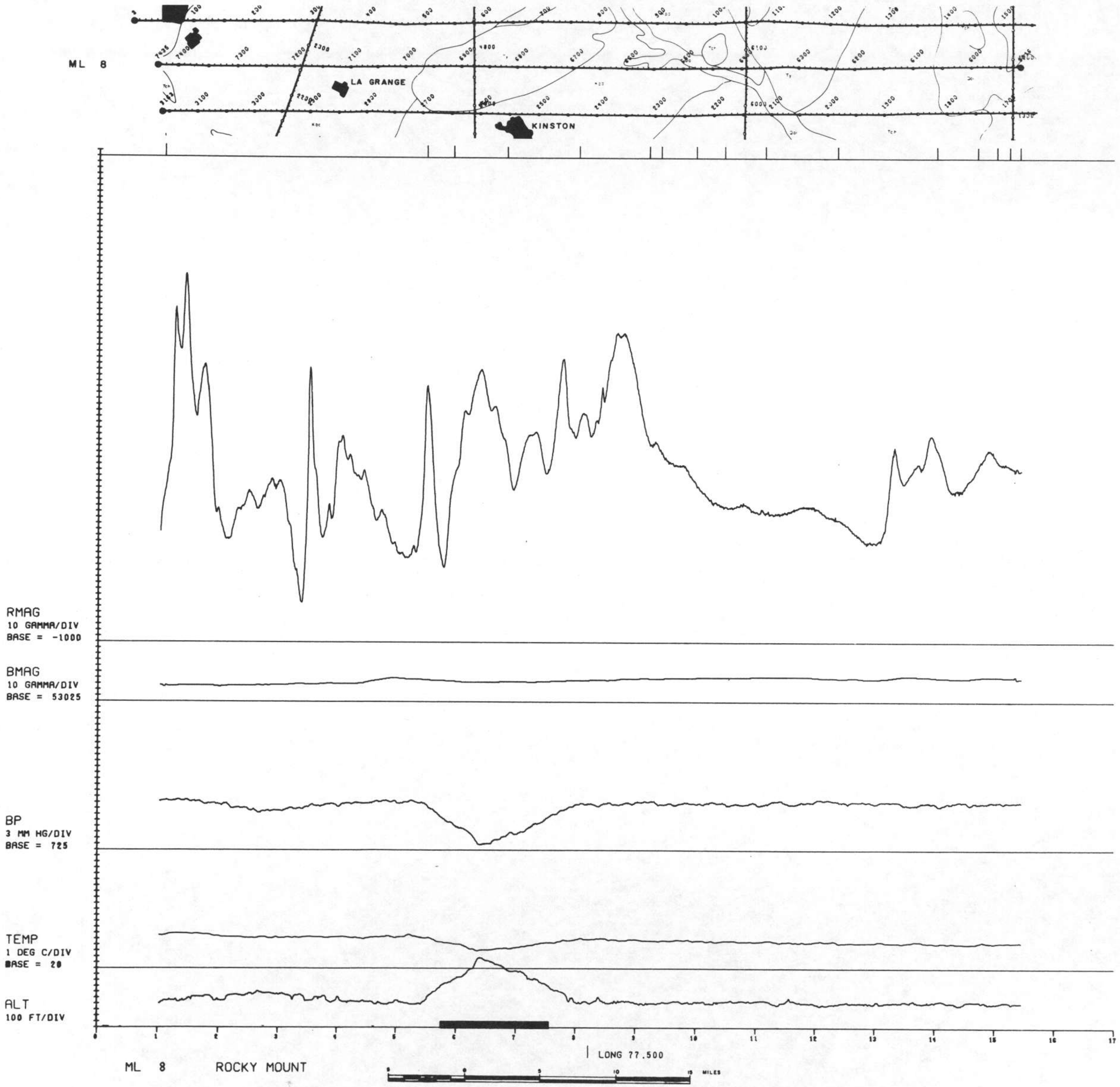


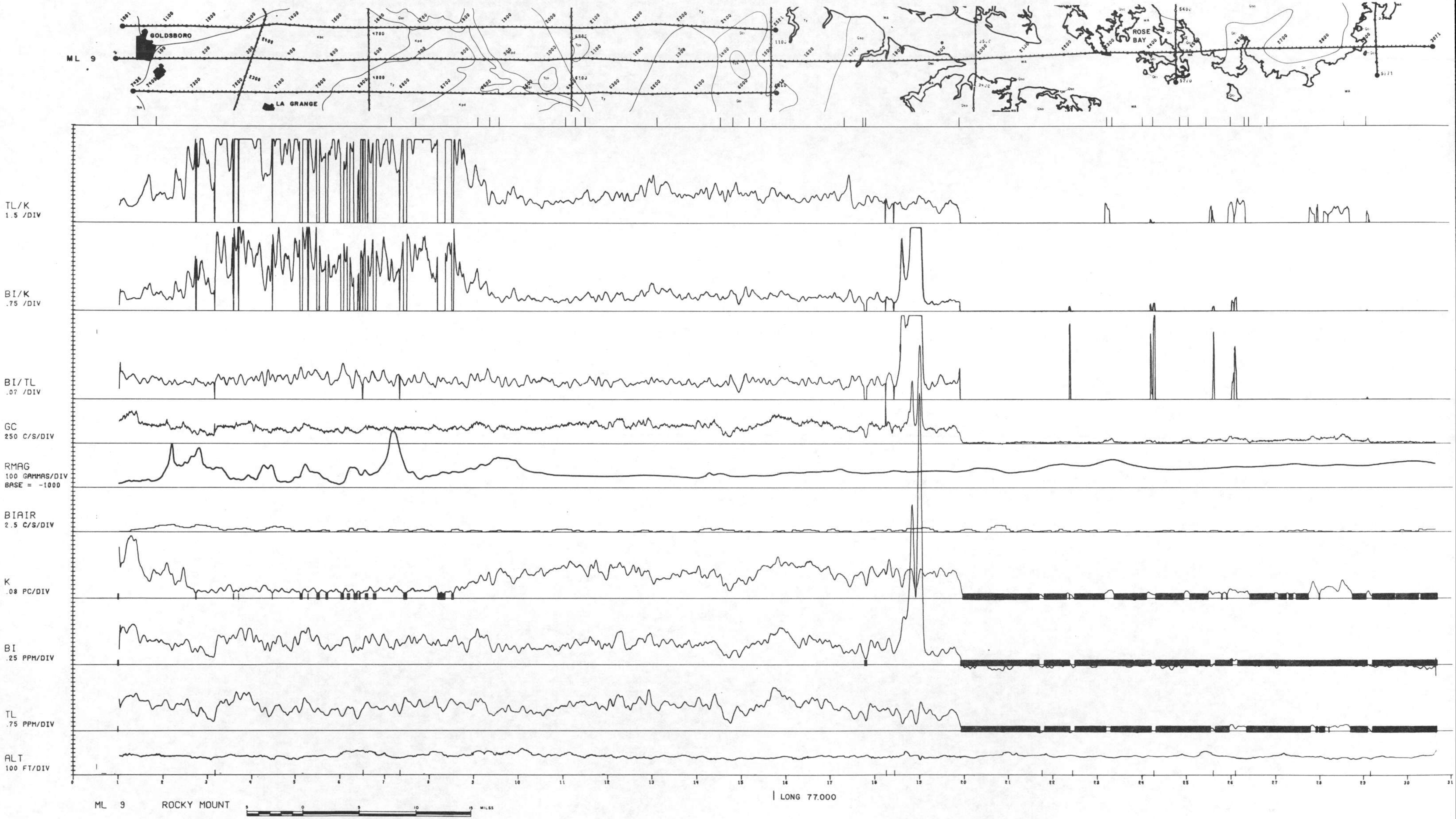
ML 7
LA GRANGE
KINSTON
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 77.500
LONG 76.750
ML 7W ROCKY MOUNT
ML 7E ROCKY MOUNT
MILES

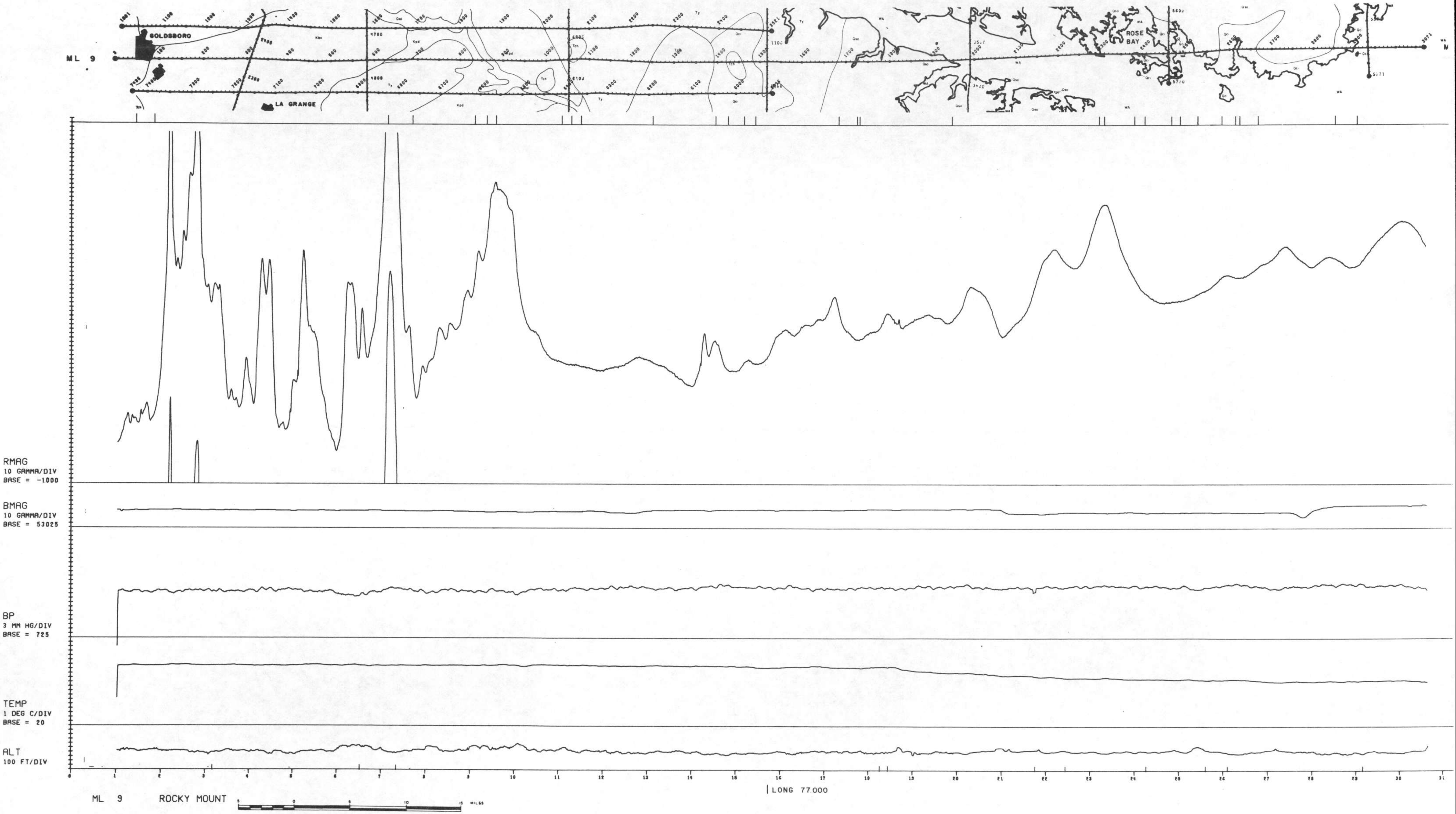

ML 7
LA GRANGE
KINSTON
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.500
LONG 76.750
ML 7W ROCKY MOUNT
ML 7E ROCKY MOUNT

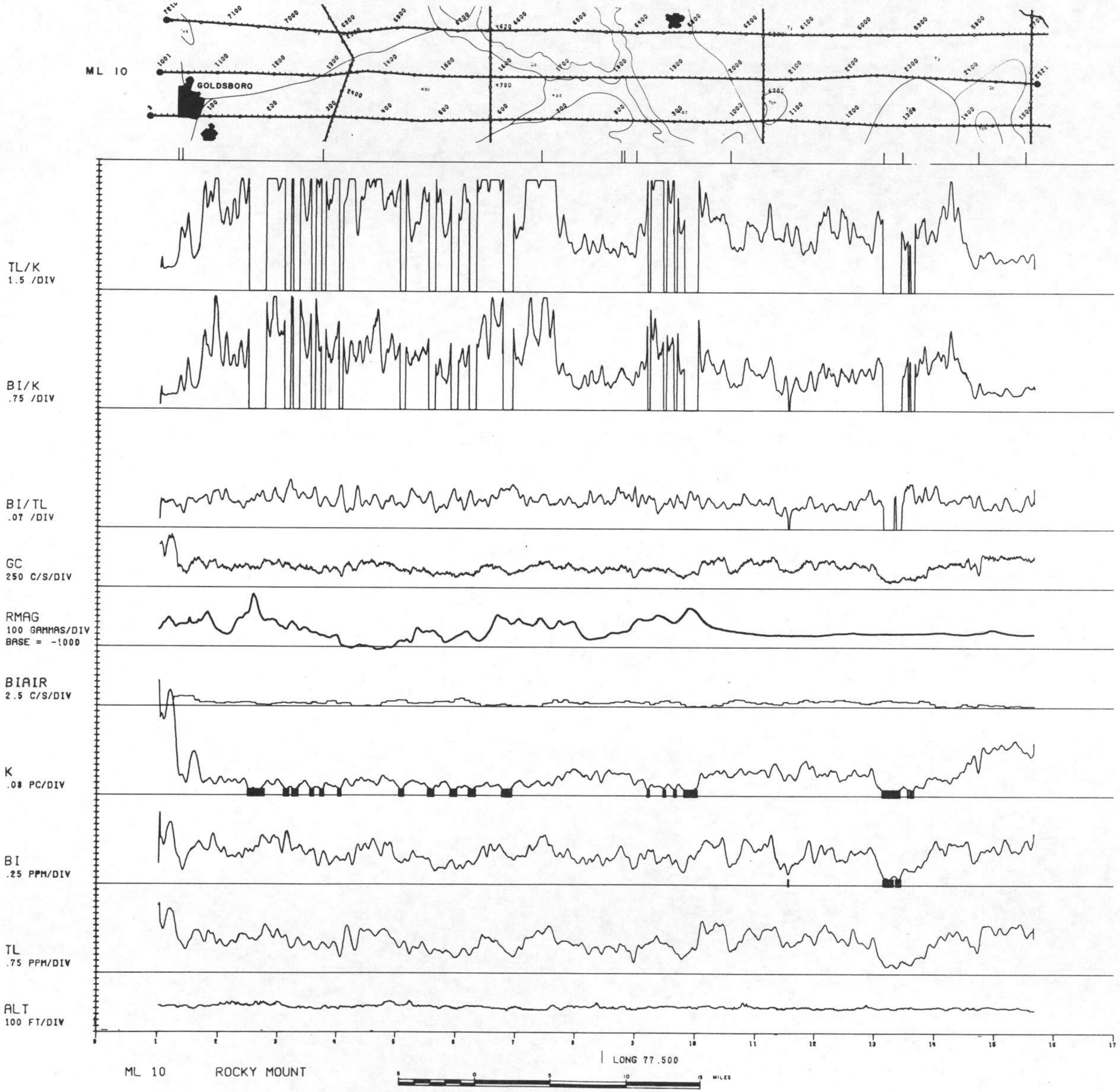


ML 8
LA GRANGE
KINSTON
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 77.500
ML 8 ROCKY MOUNT
MILES

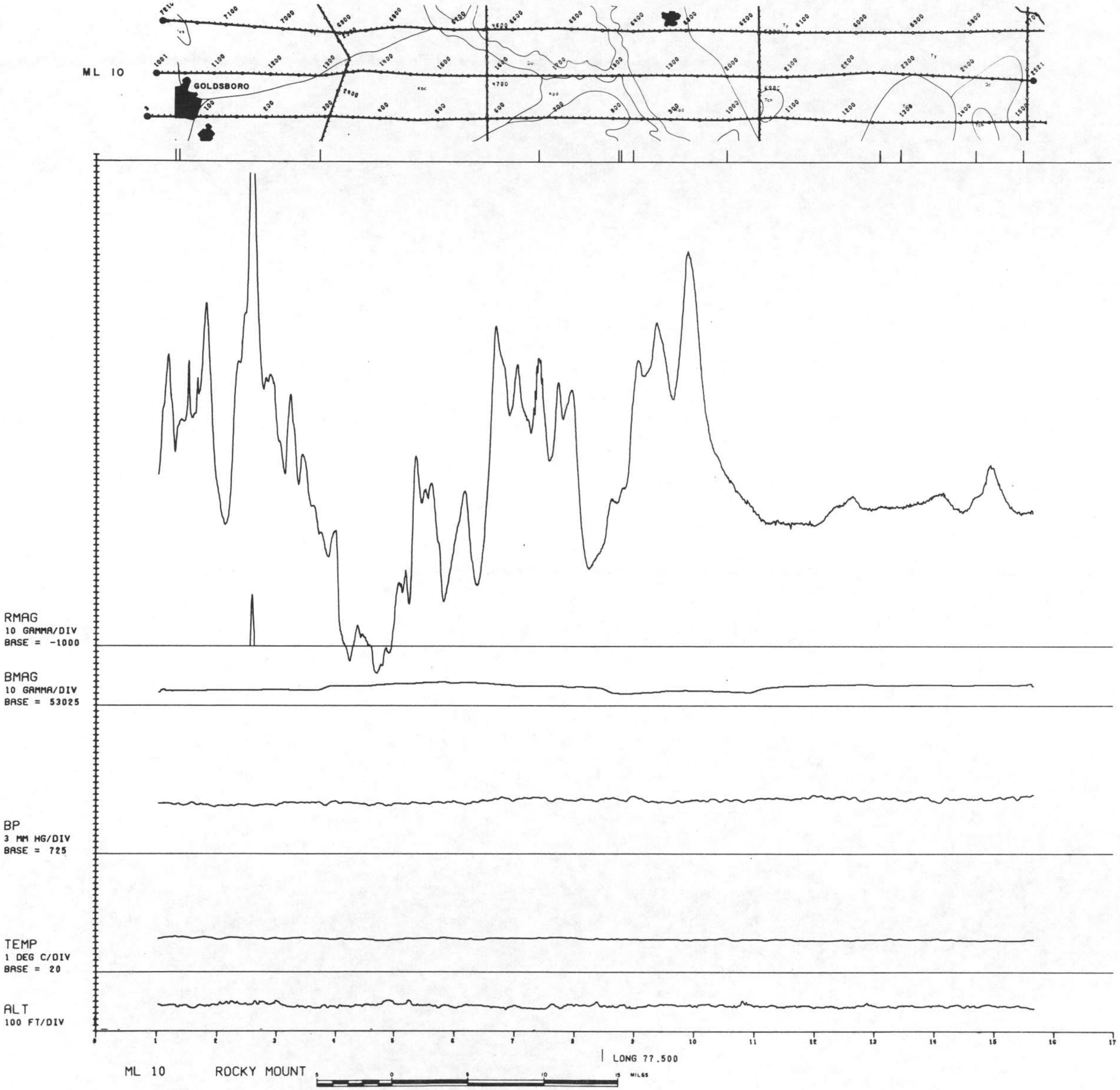

ML 8
LA GRANGE
KINSTON
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.500
ML 8 ROCKY MOUNT
MILES

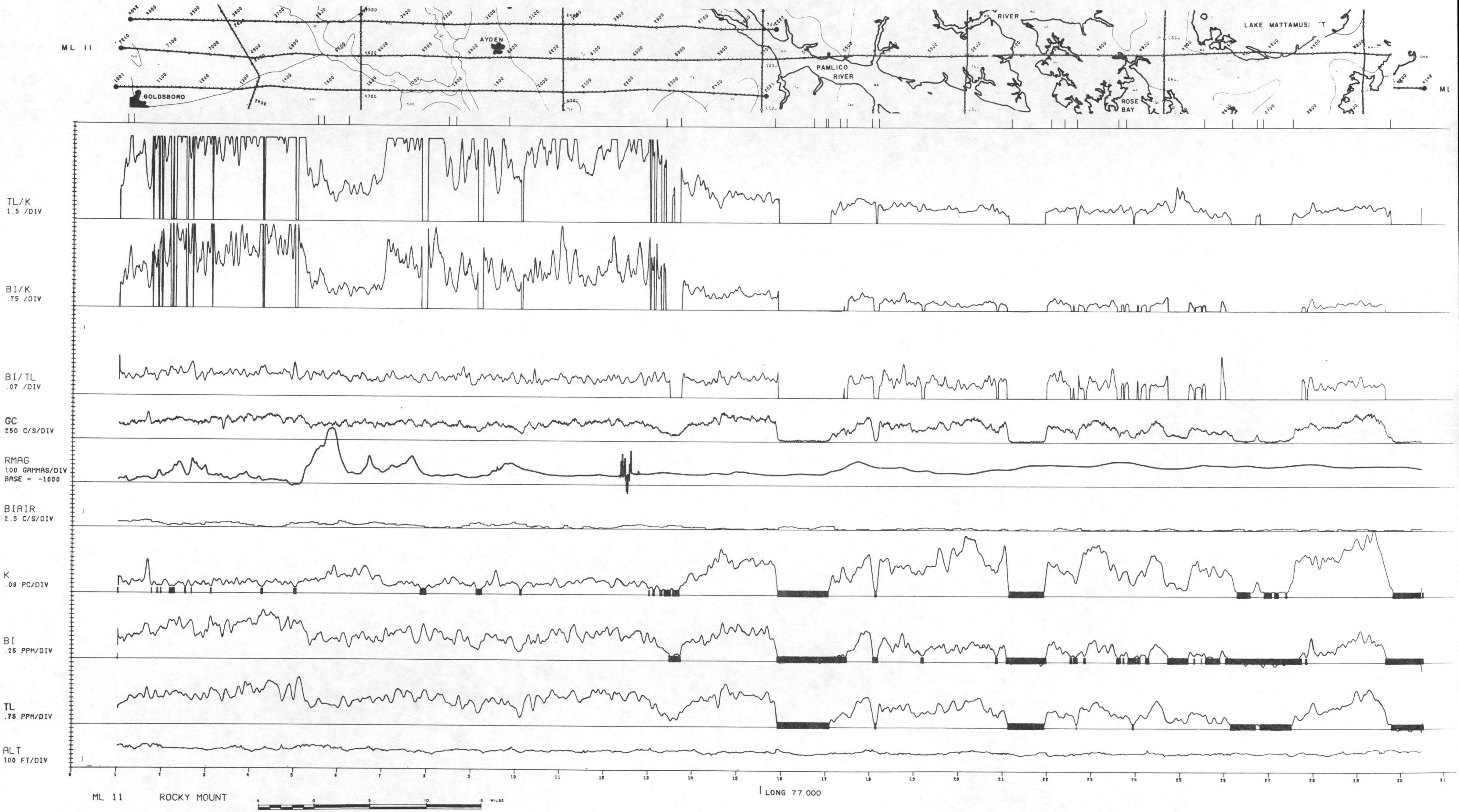

ML 9
GOLDSBORO
LA GRANGE
ROSE BAY
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 77.000
ML 9 ROCKY MOUNT
MILES

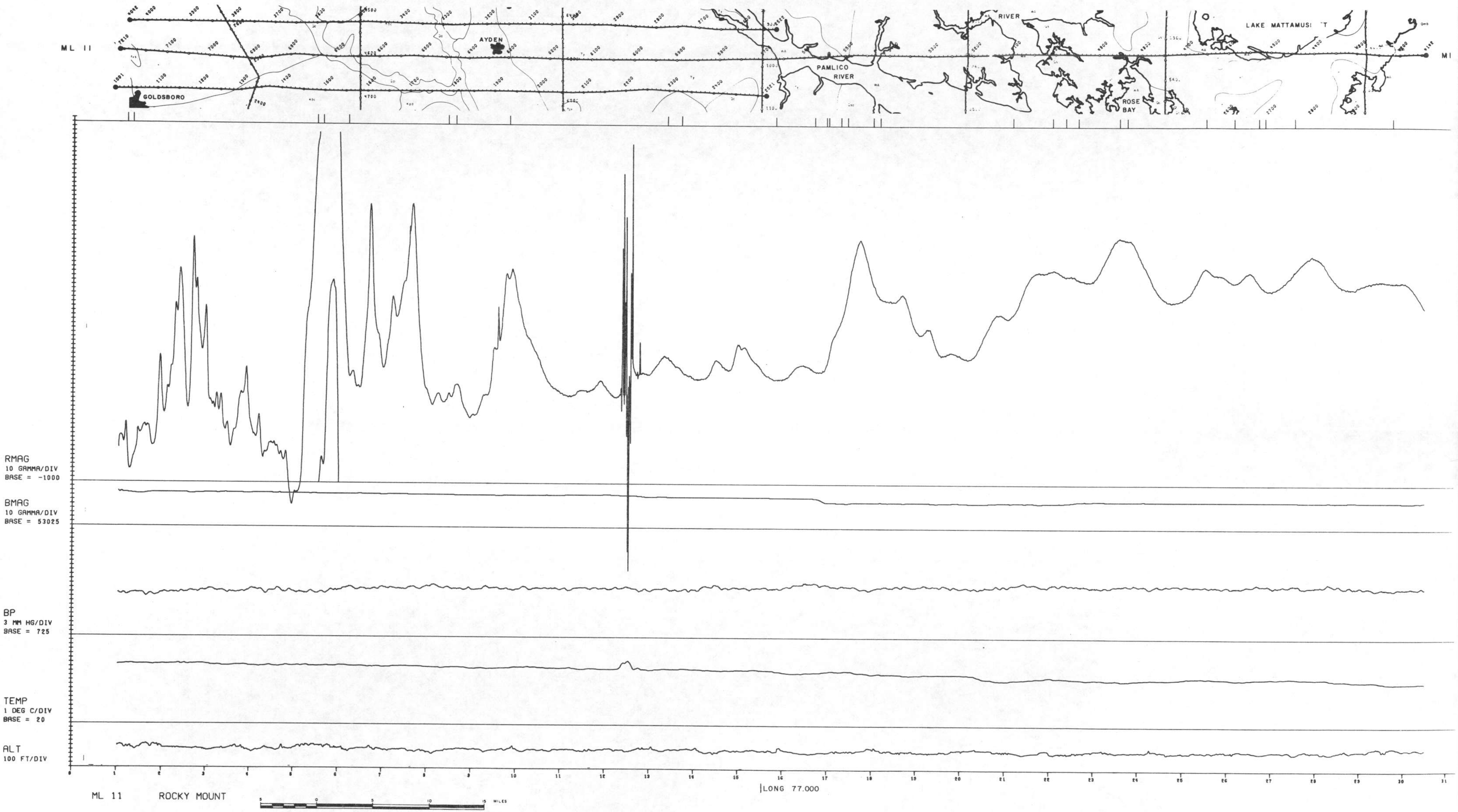

ML 9
GOLDSBORO
LA GRANGE
ROSE BAY
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.000
ML 9 ROCKY MOUNT
MILES



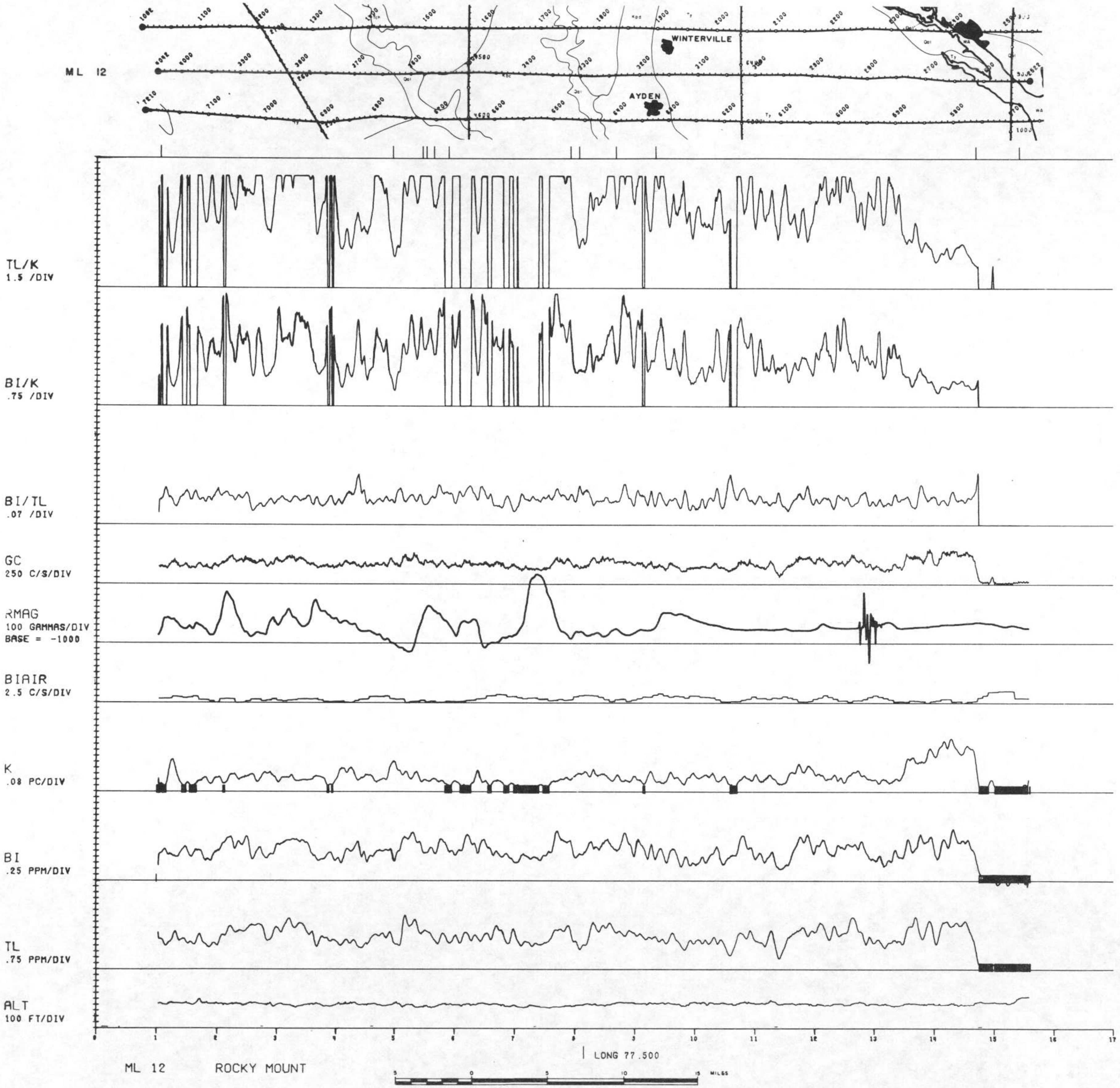
ML 10 ROCKY MOUNT

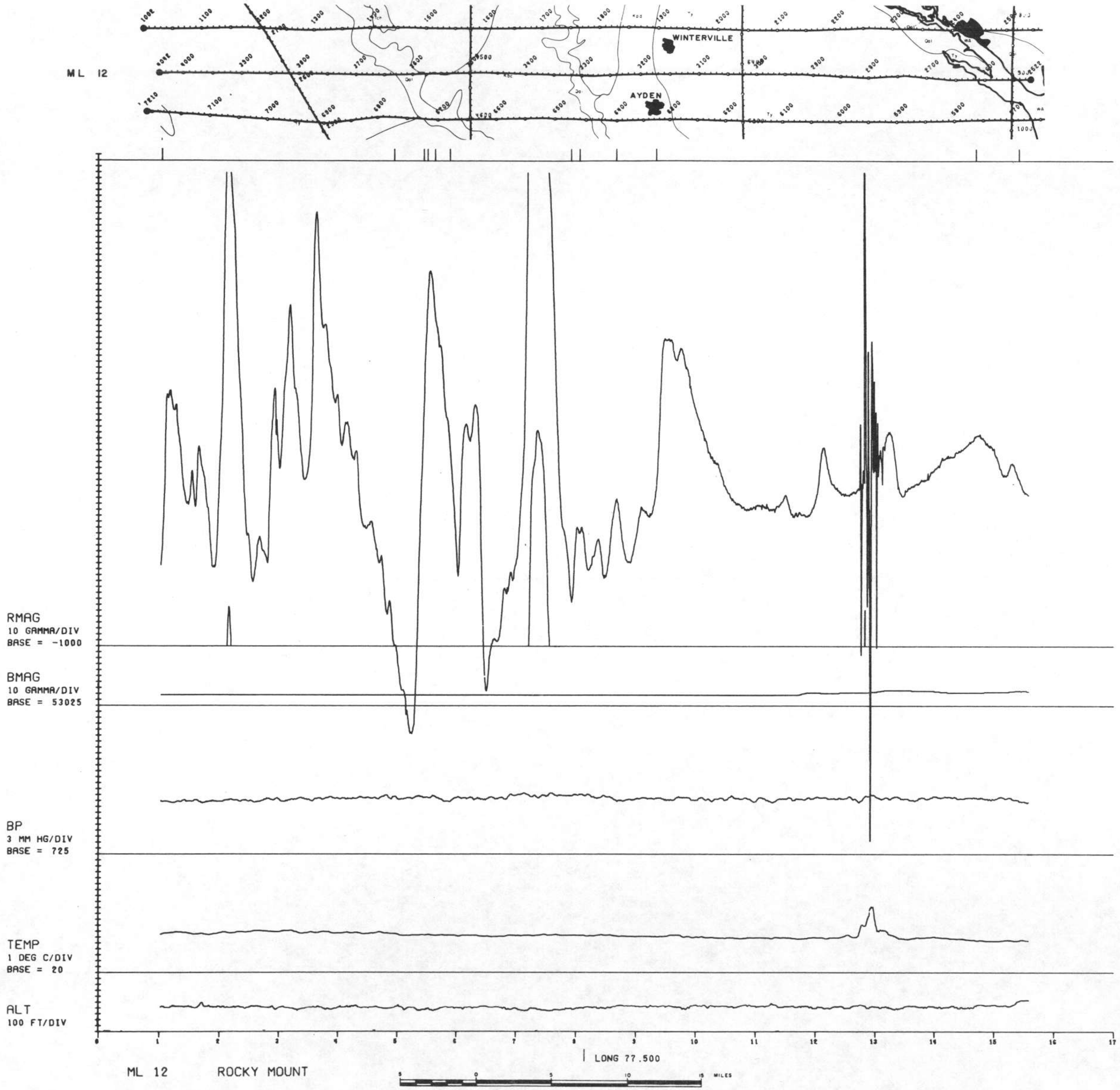

ML 10
GOLDSBORO
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.500
ML 10
ROCKY MOUNT
MILES


ML 11
GOLDSBORO
AYDEN
PAMLICO
RIVER
RIVER
ROSE
BAY
LAKE MATTAMUSKEET
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 77.000
ML 11 ROCKY MOUNT
MILES

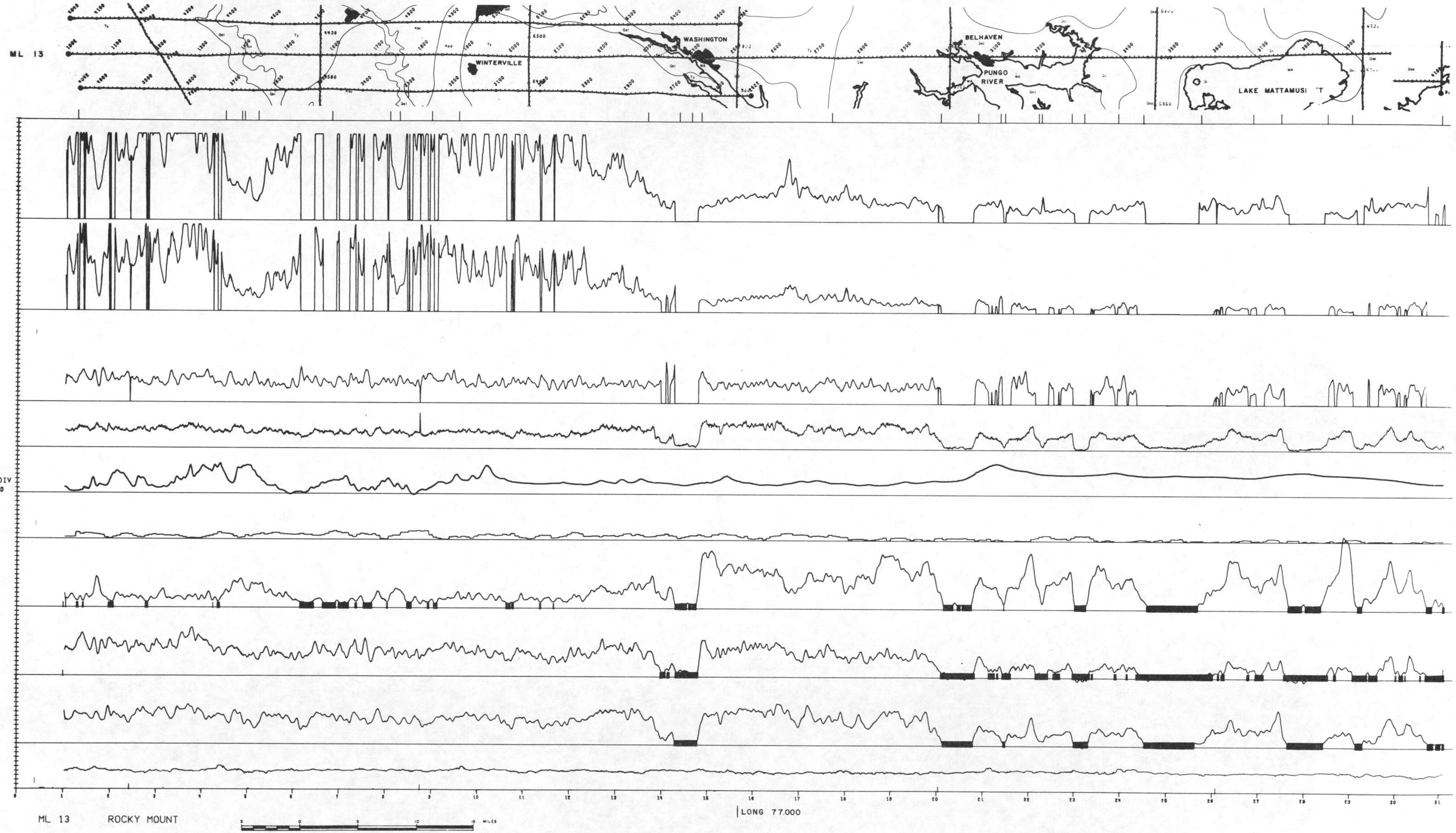


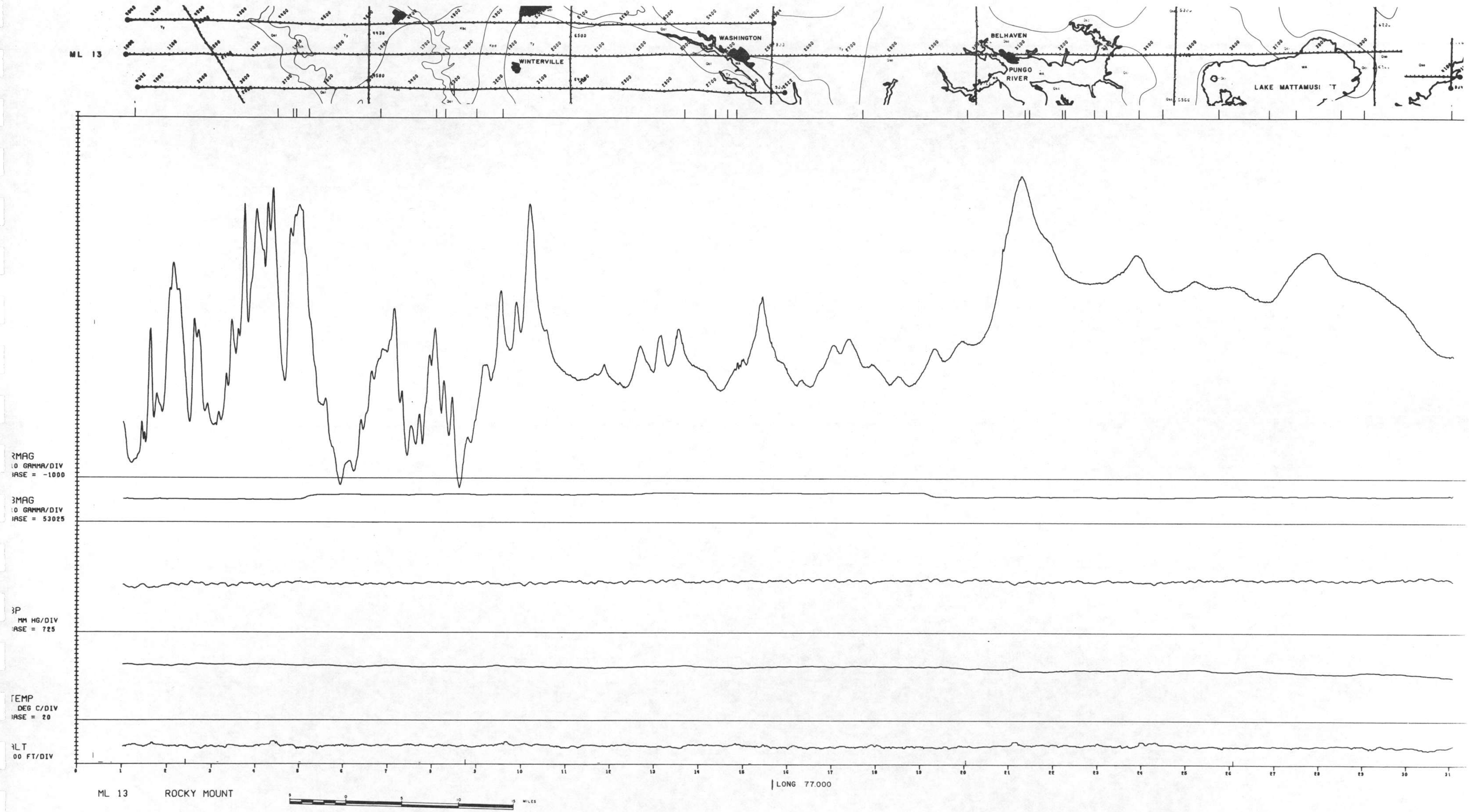
ML 11 ROCKY MOUNT


ML 12
WINTERVILLE
AYDEN
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 77.500
ML 12 ROCKY MOUNT
MILES

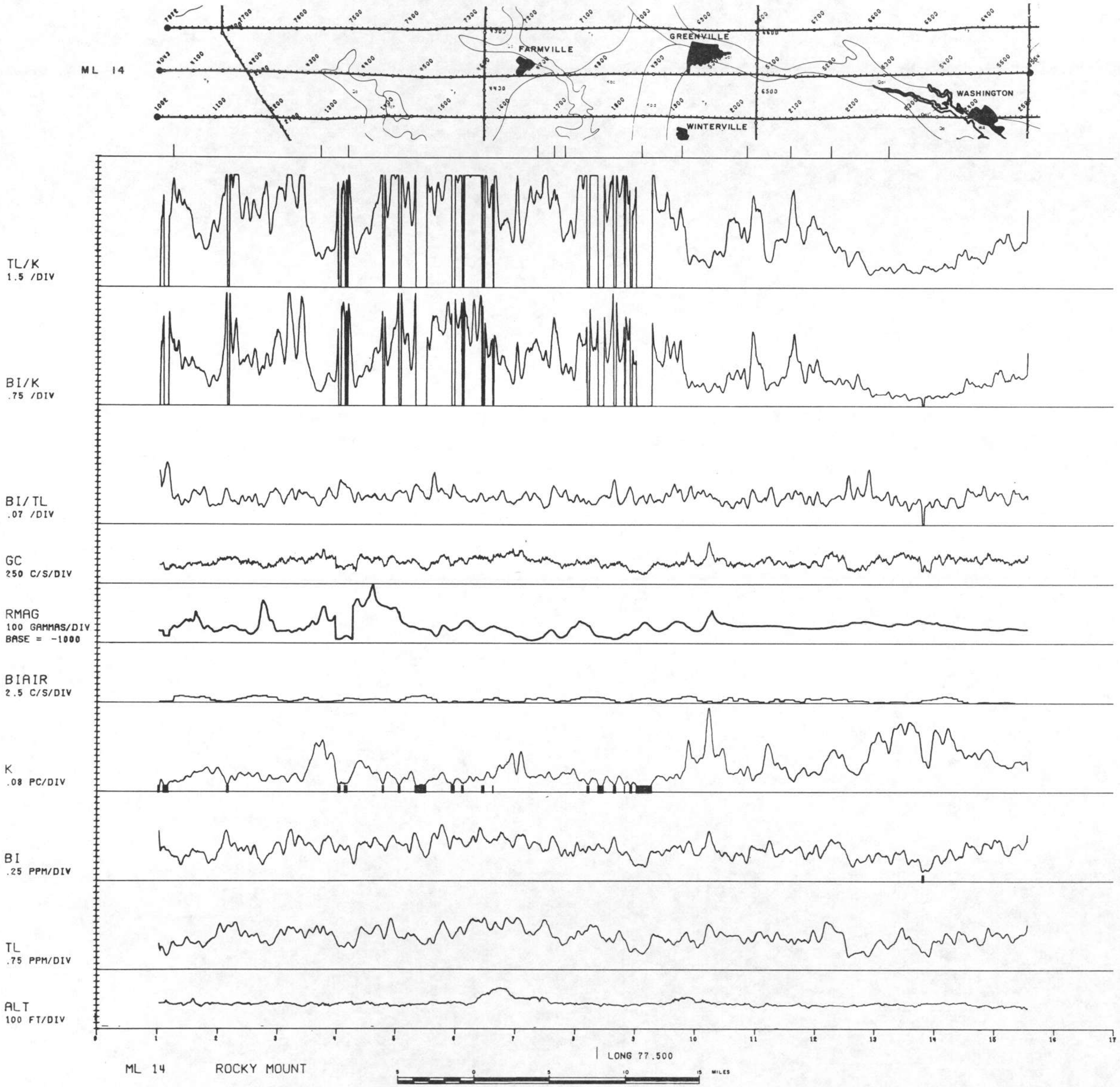


ML 12 ROCKY MOUNT

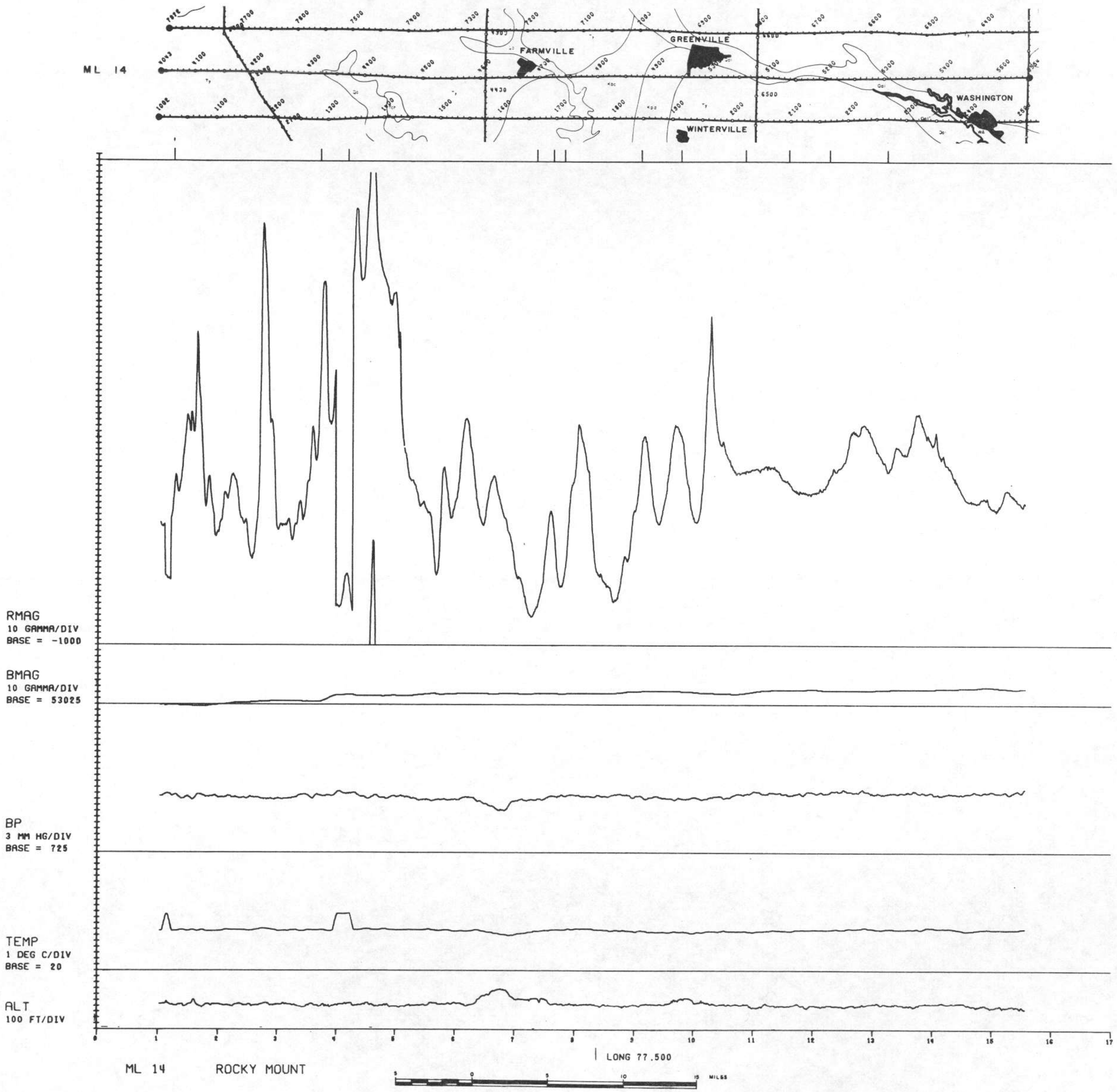

ML 13
WASHINGTON
WINTERVILLE
BELHAVEN
PUNGO
RIVER
LAKE MATTAMUSI
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
ML 13
ROCKY MOUNT
LONG 77.000
MILES



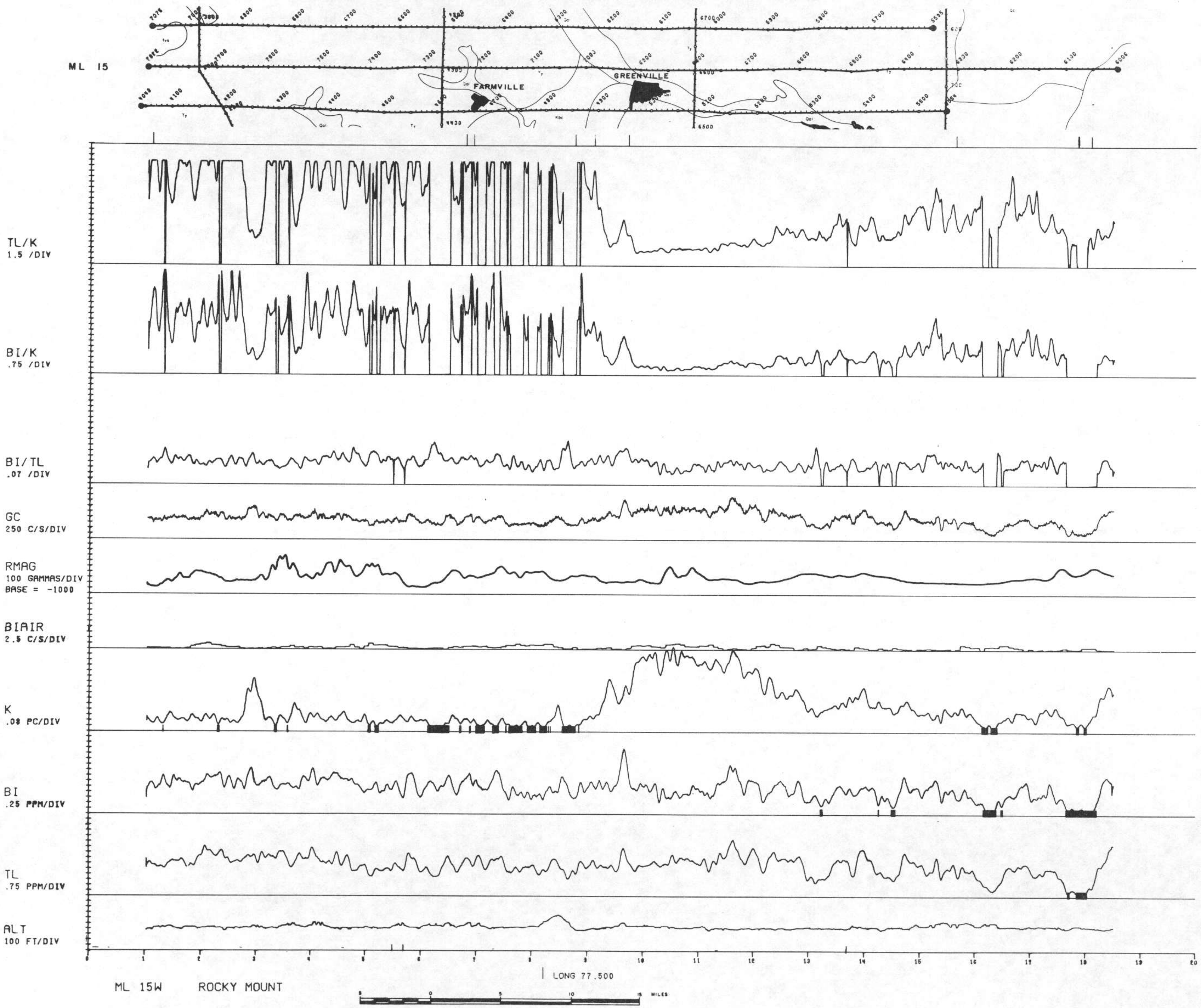
ML 13
WASHINGTON
WINTERVILLE
BELHAVEN
PUNGO
RIVER
LAKE MATTAMUSI
RMAG
GAMMA/DIV
BASE = -1000
BMAG
GAMMA/DIV
BASE = 53025
BP
MM HG/DIV
BASE = 725
TEMP
DEG C/DIV
BASE = 20
ALT
00 FT/DIV
LONG 77.000
ML 13 ROCKY MOUNT
MILES

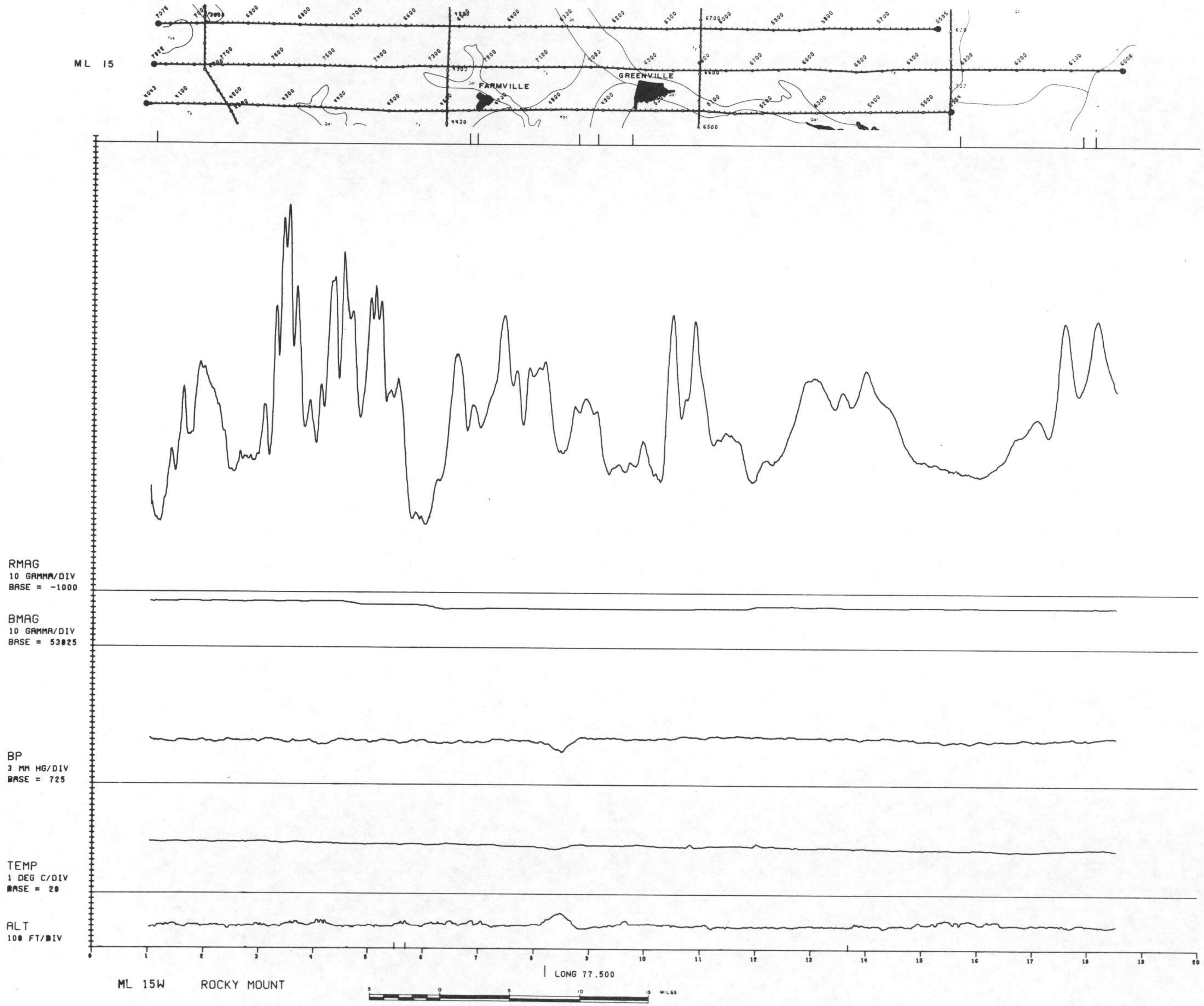


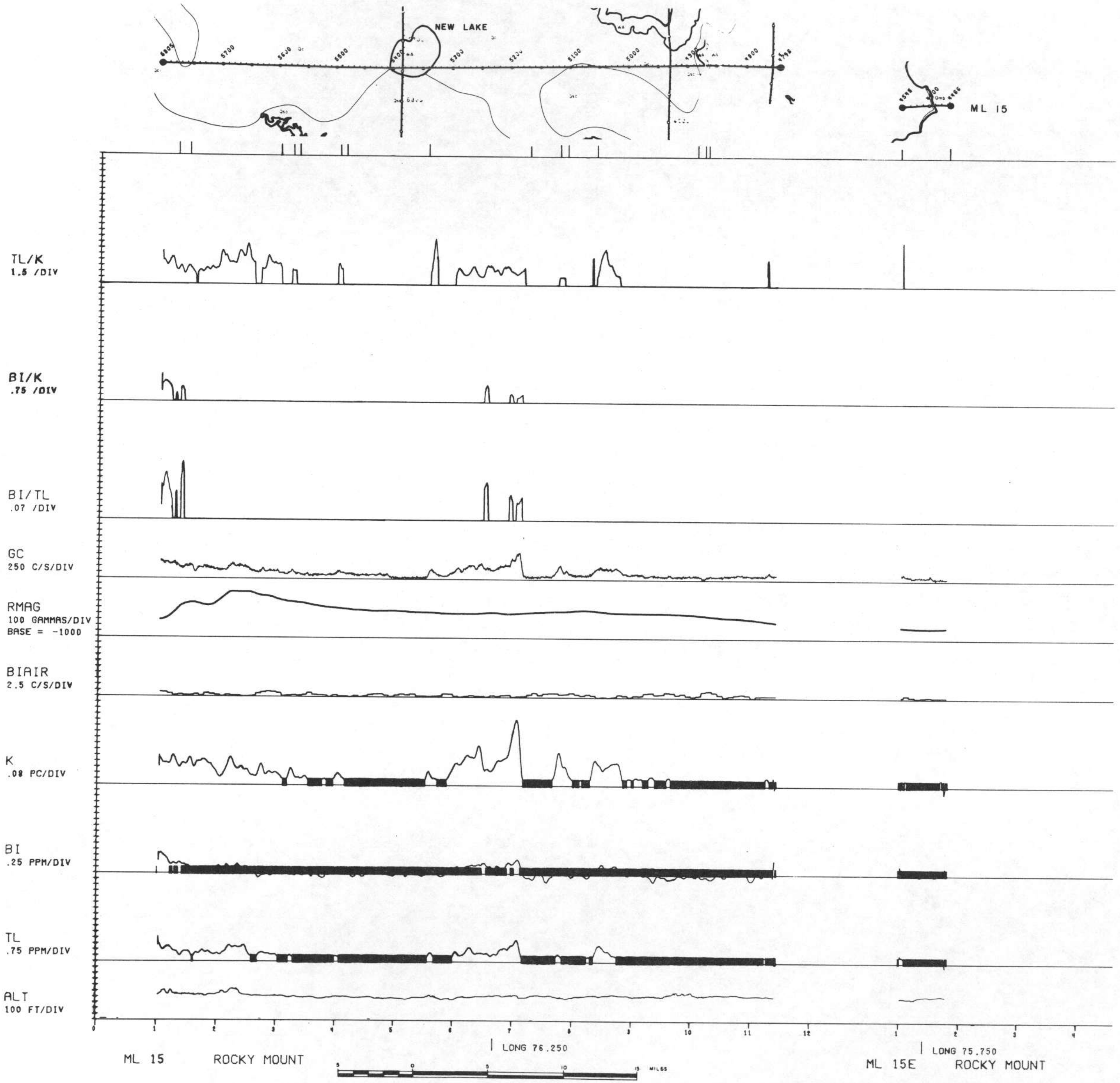
ML 14 ROCKY MOUNT

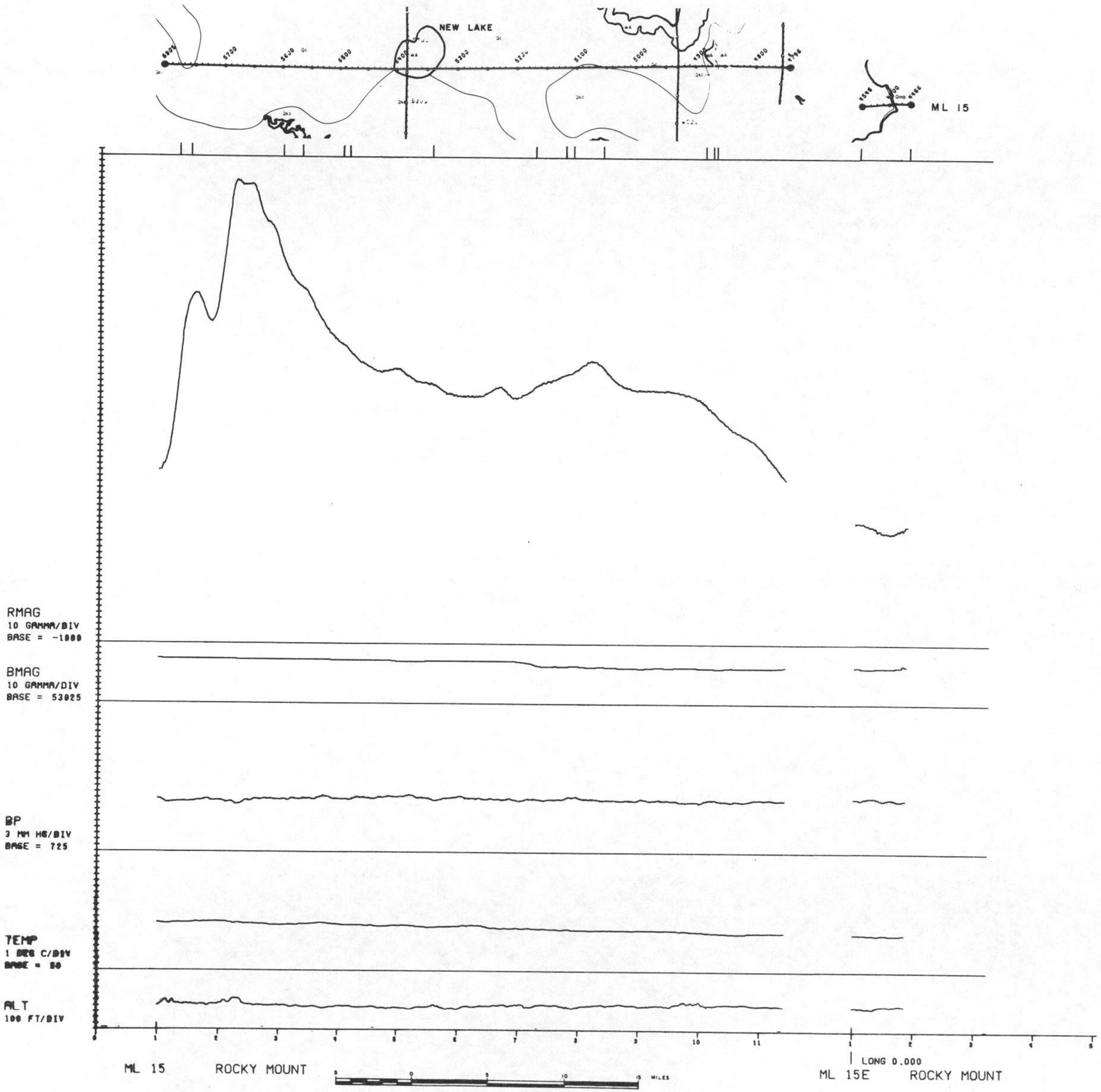


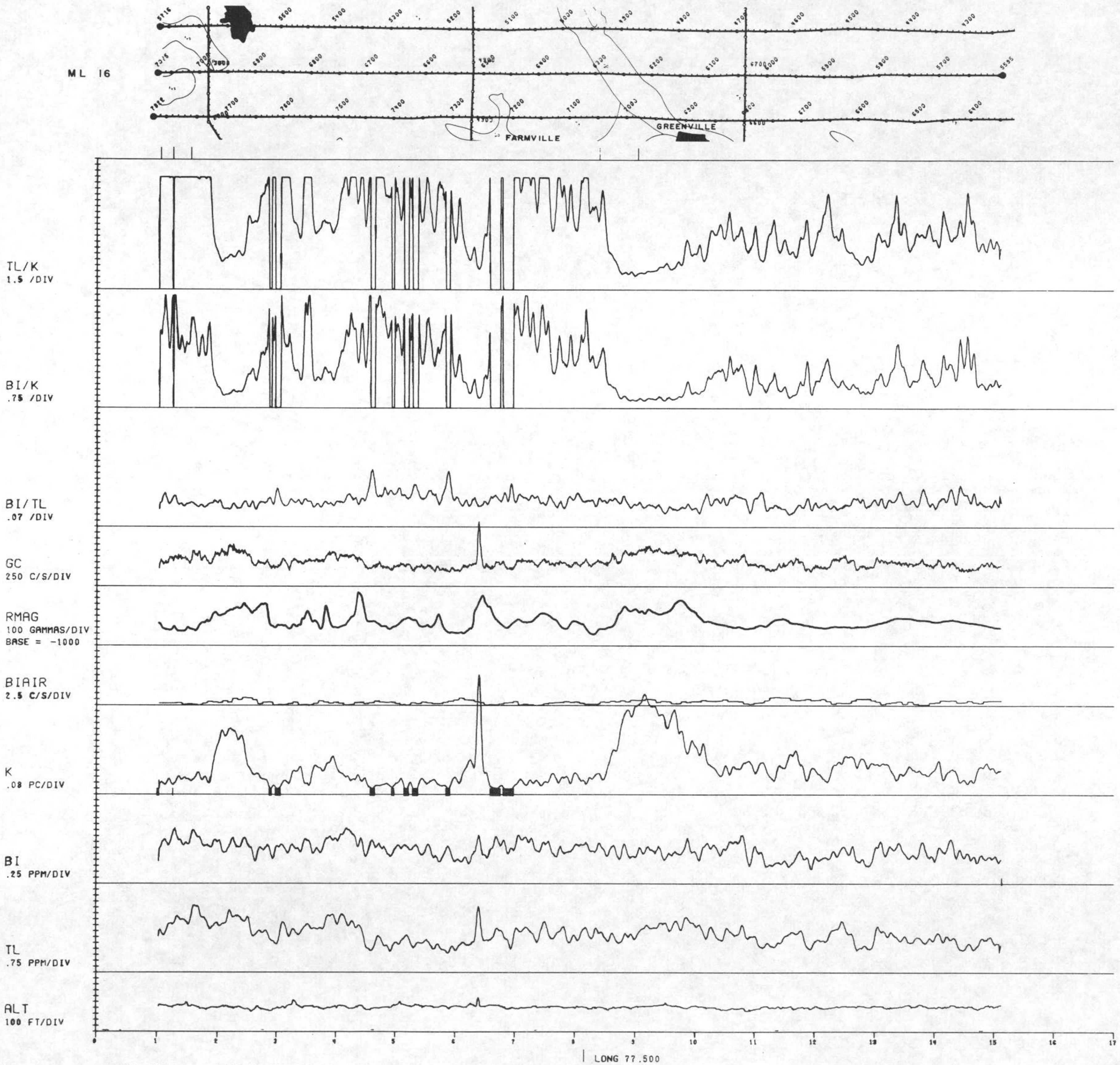
ML 14 ROCKY MOUNT


ML 15
FARMVILLE
GREENVILLE
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 77.500
ML 15W ROCKY MOUNT
MILES

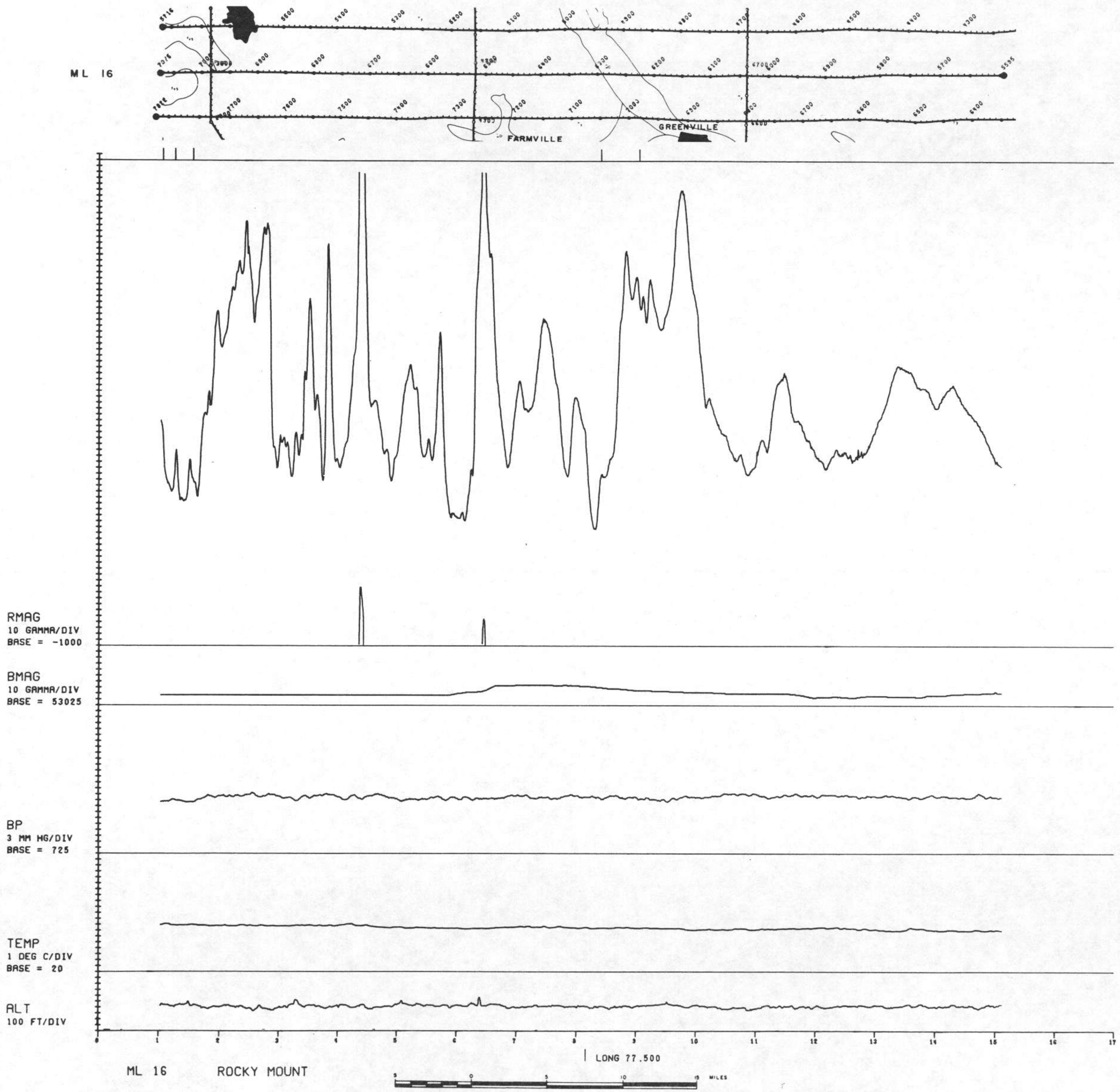

ML 15
FARMVILLE
GREENVILLE
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.500
ML 15W ROCKY MOUNT
MILES

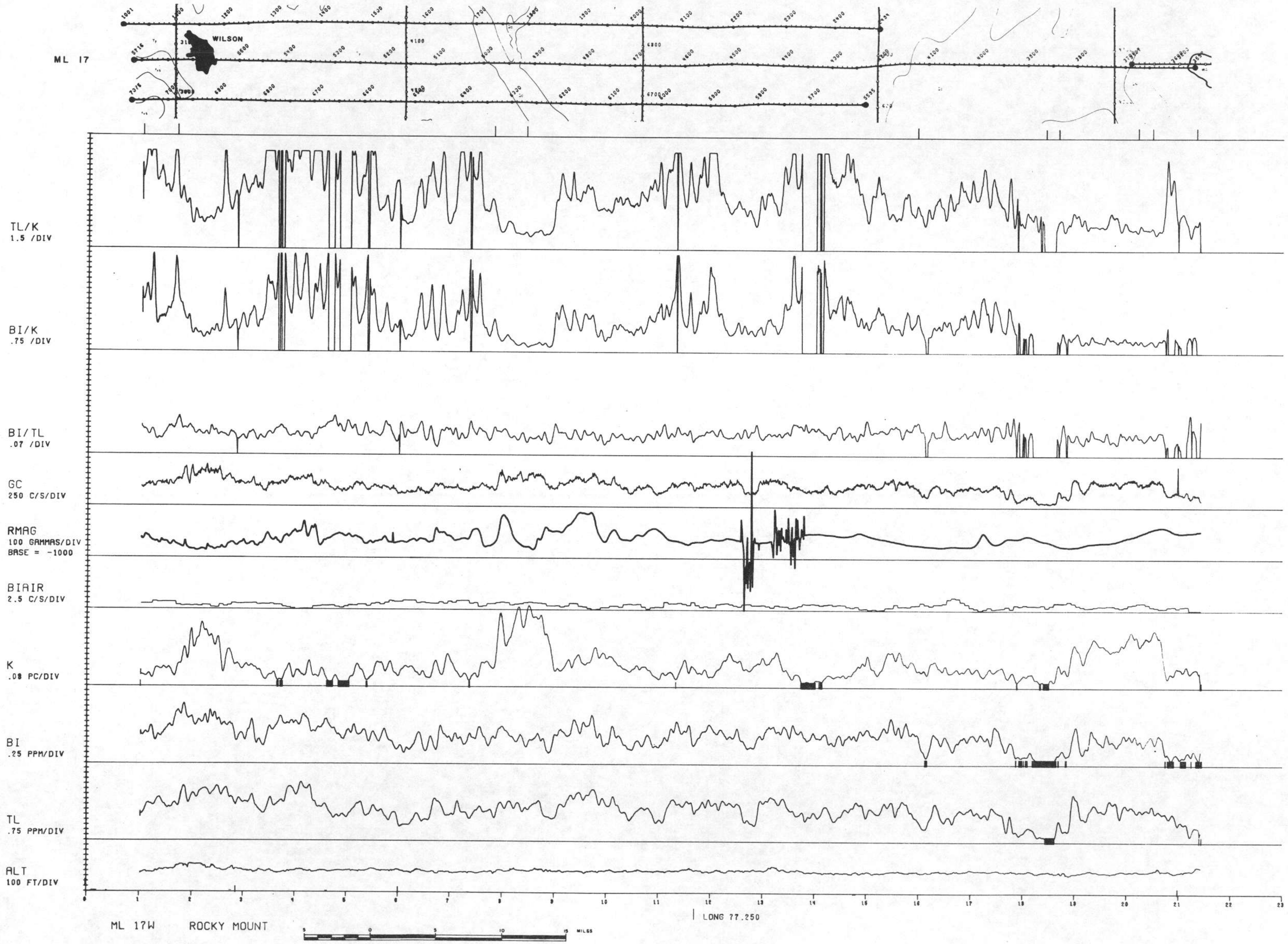

NEW LAKE
ML 15
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 76.250
LONG 75.750
ML 15 ROCKY MOUNT
ML 15E ROCKY MOUNT
MILES

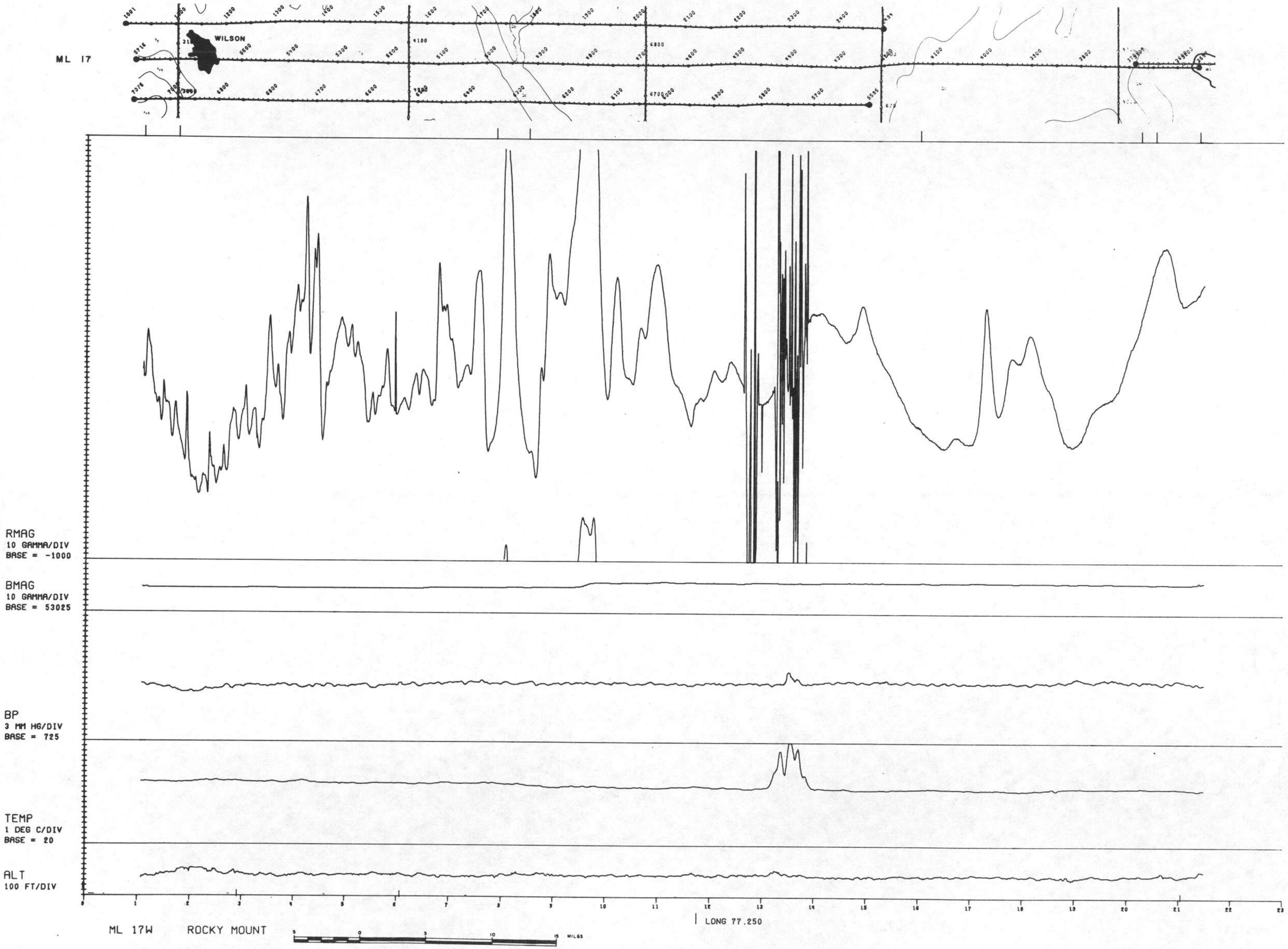

NEW LAKE
ML 15
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 50
ALT
100 FT/DIV
ML 15 ROCKY MOUNT
MILES
LONG 0.000
ML 15E ROCKY MOUNT

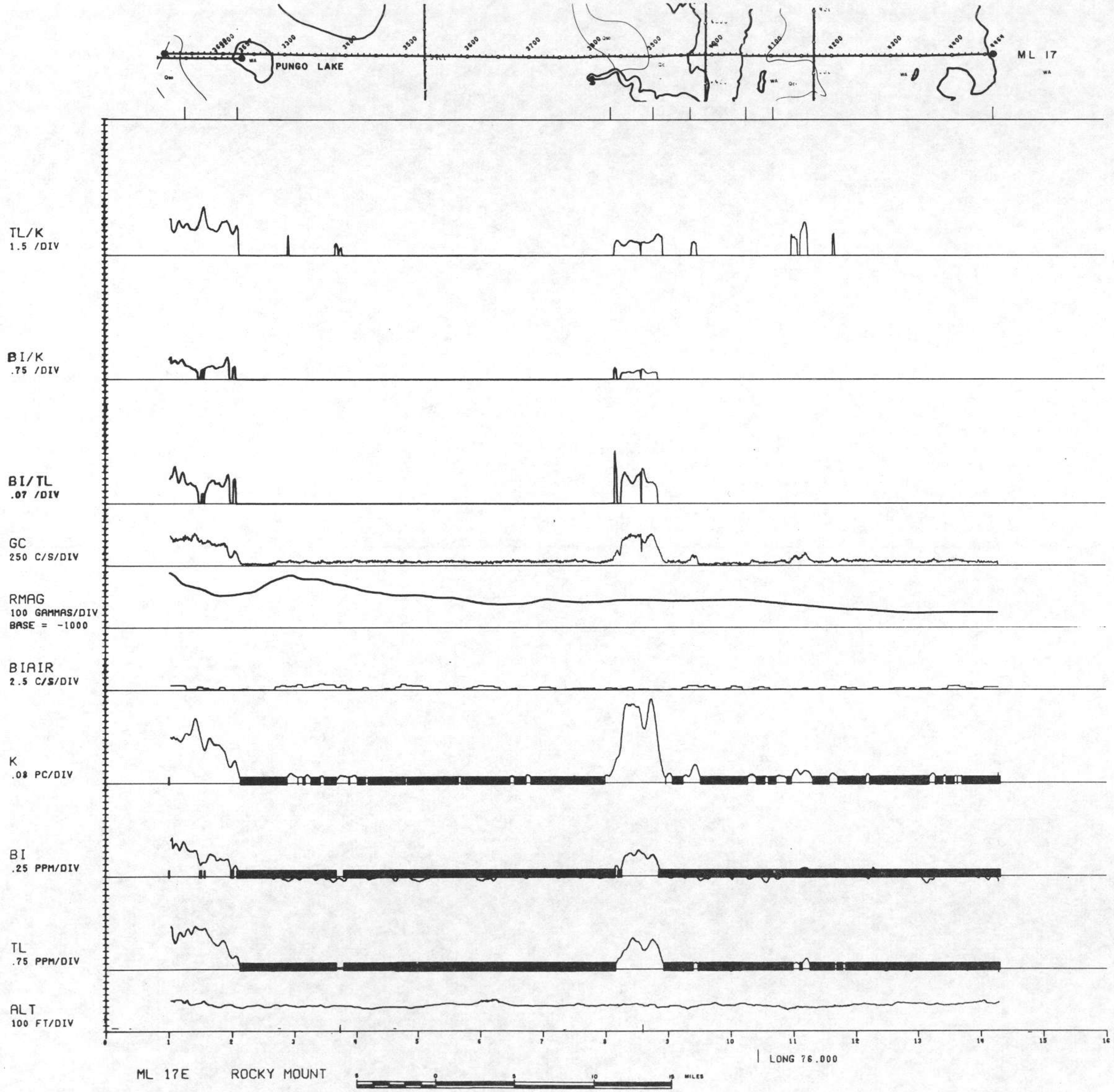


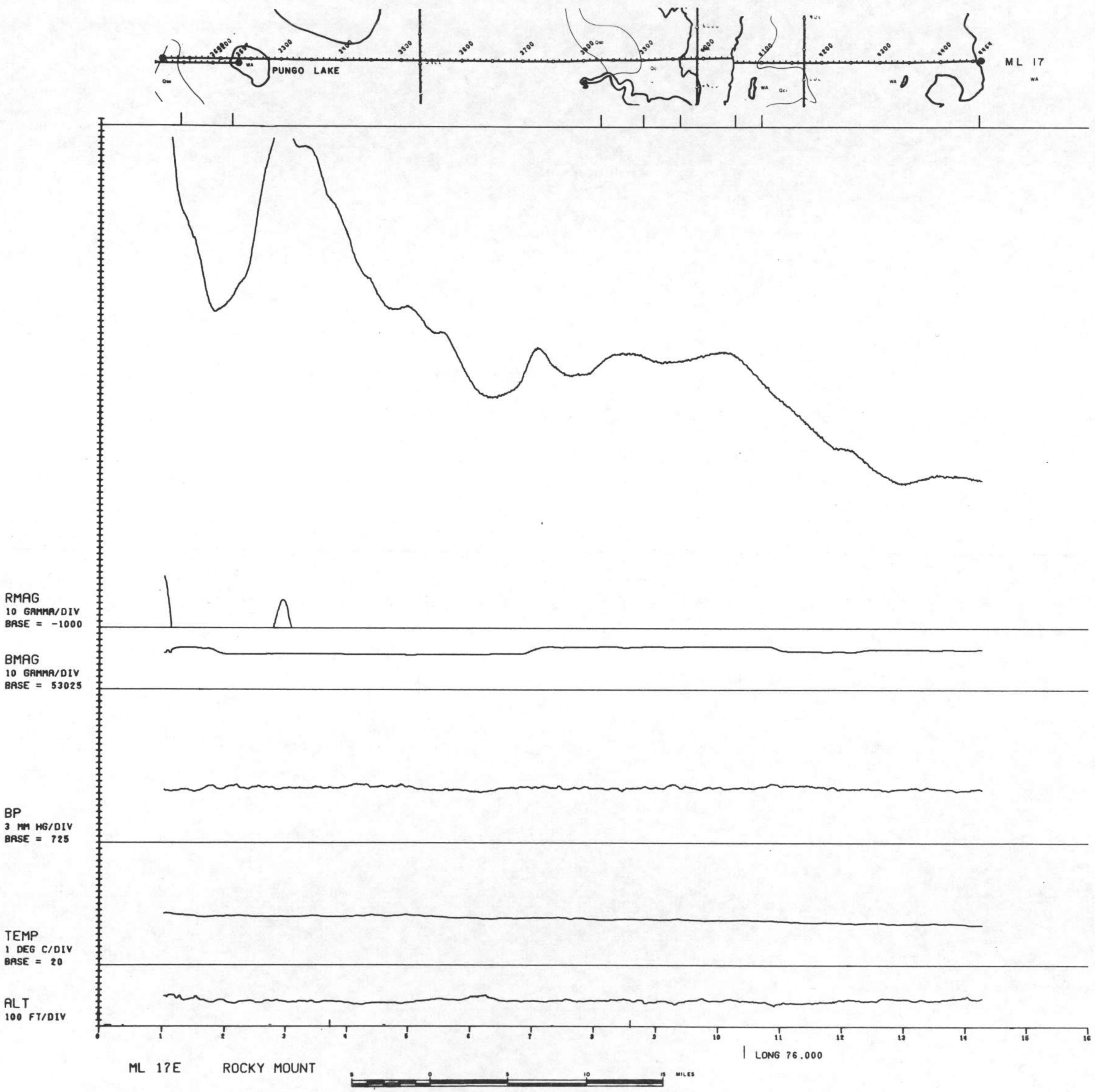
ML 16 ROCKY MOUNT


ML 16
FARMVILLE
GREENVILLE
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.500
ML 16 ROCKY MOUNT
MILES

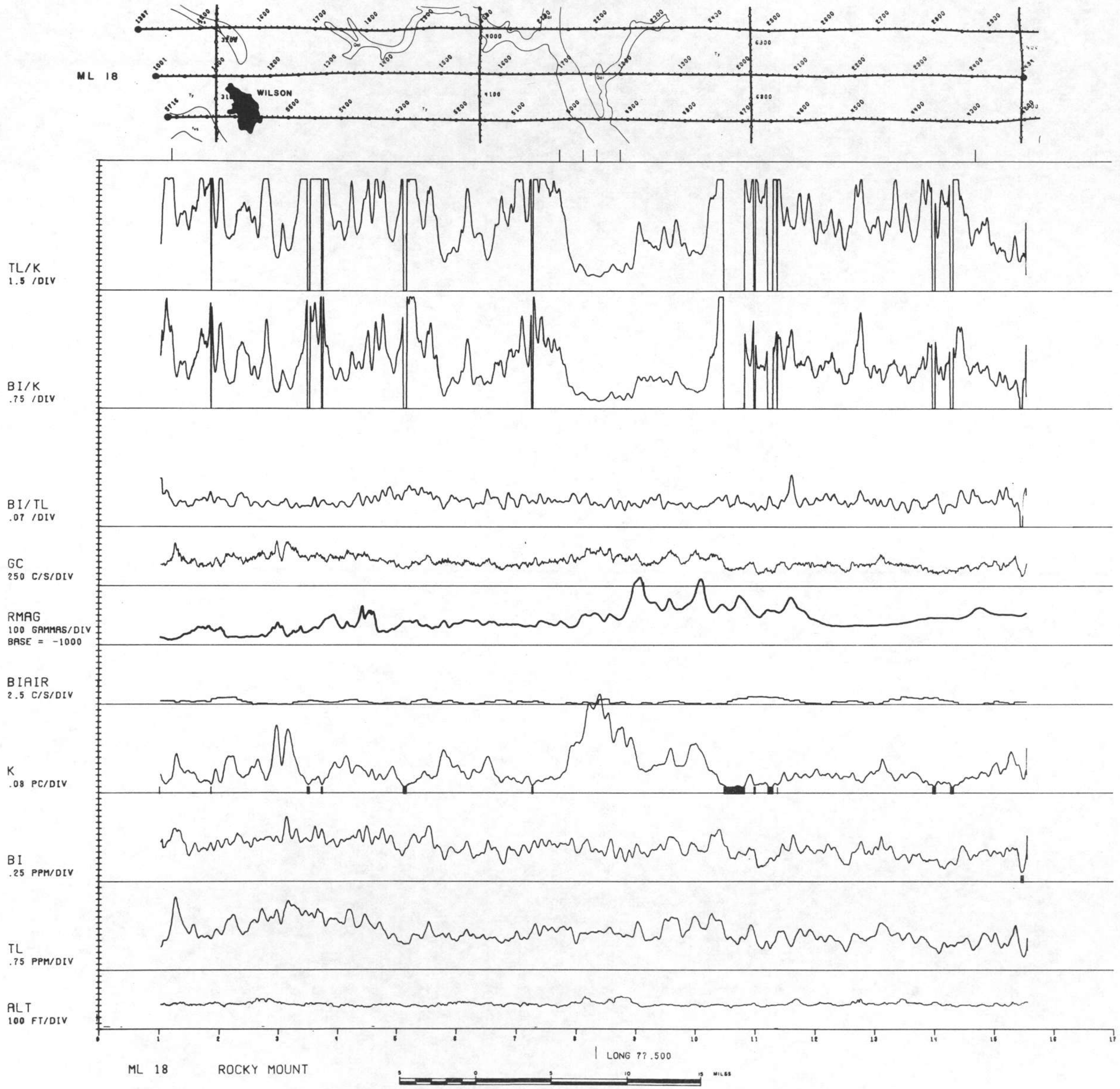

ML 17
WILSON
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 77.250
ML 17W
ROCKY MOUNT
MILES


ML 17
WILSON
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.250
ML 17W
ROCKY MOUNT
MILES

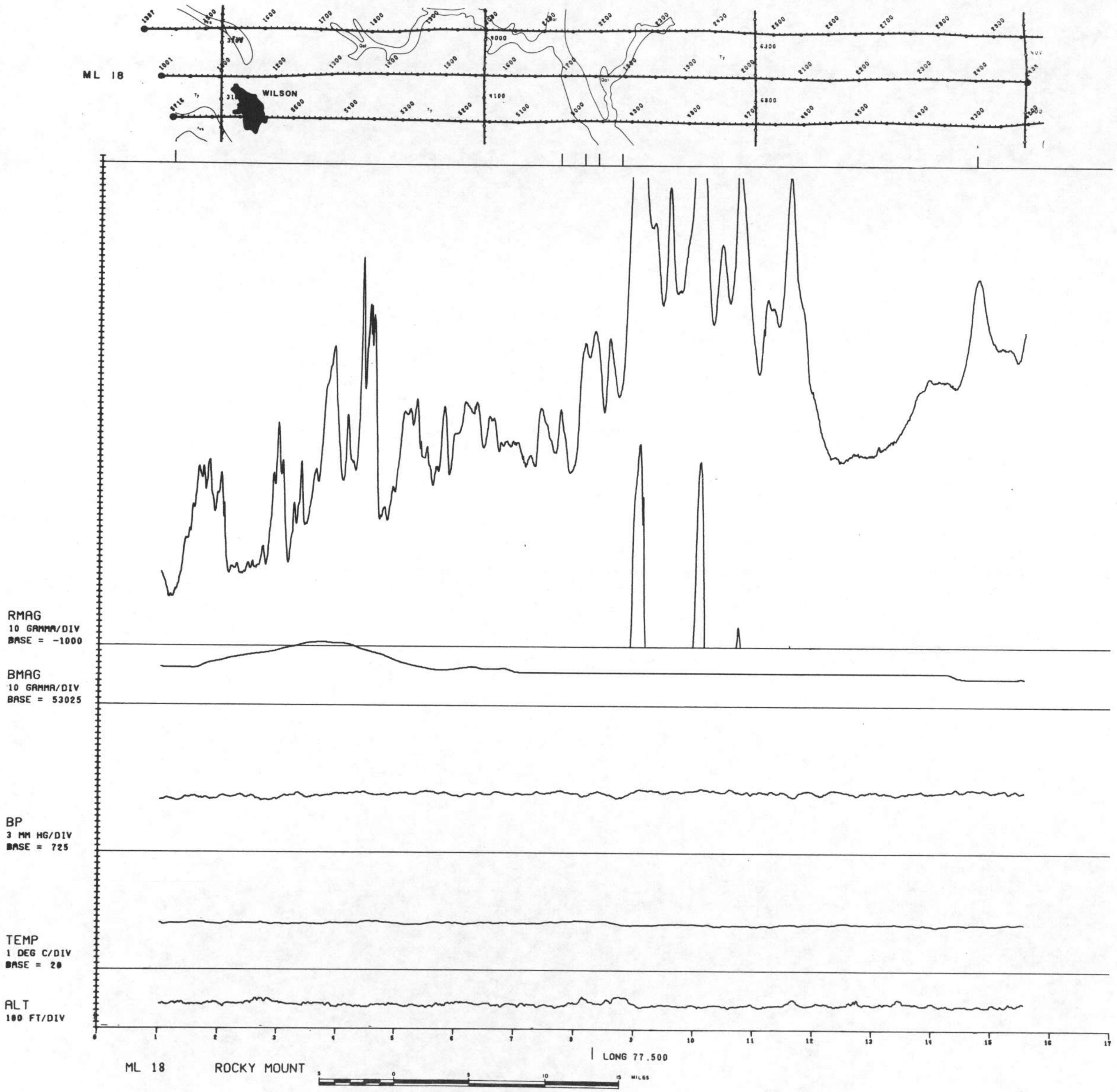

PUNGO LAKE
ML 17
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 76.000
ML 17E
ROCKY MOUNT
MILES



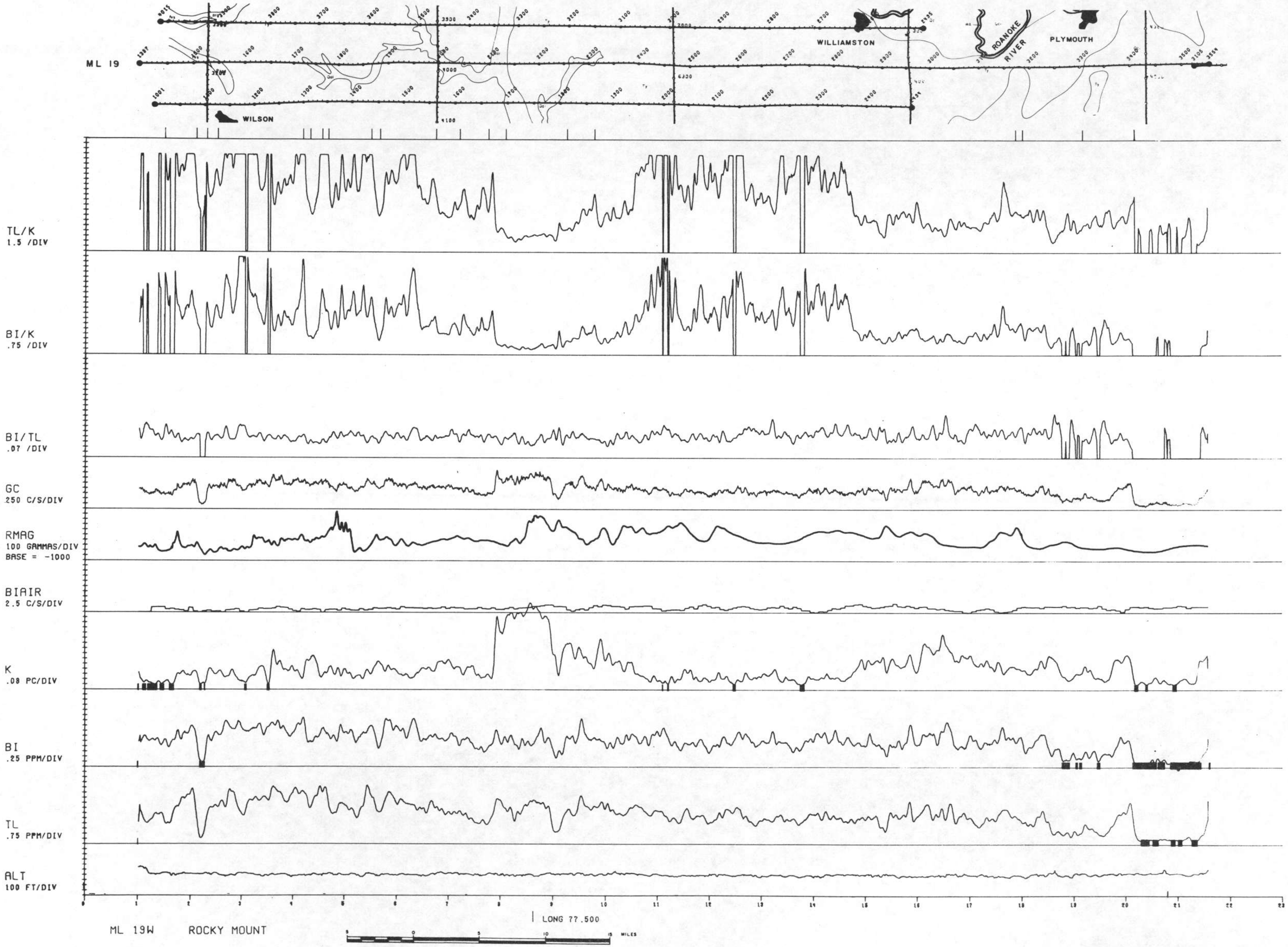
ML 17E ROCKY MOUNT

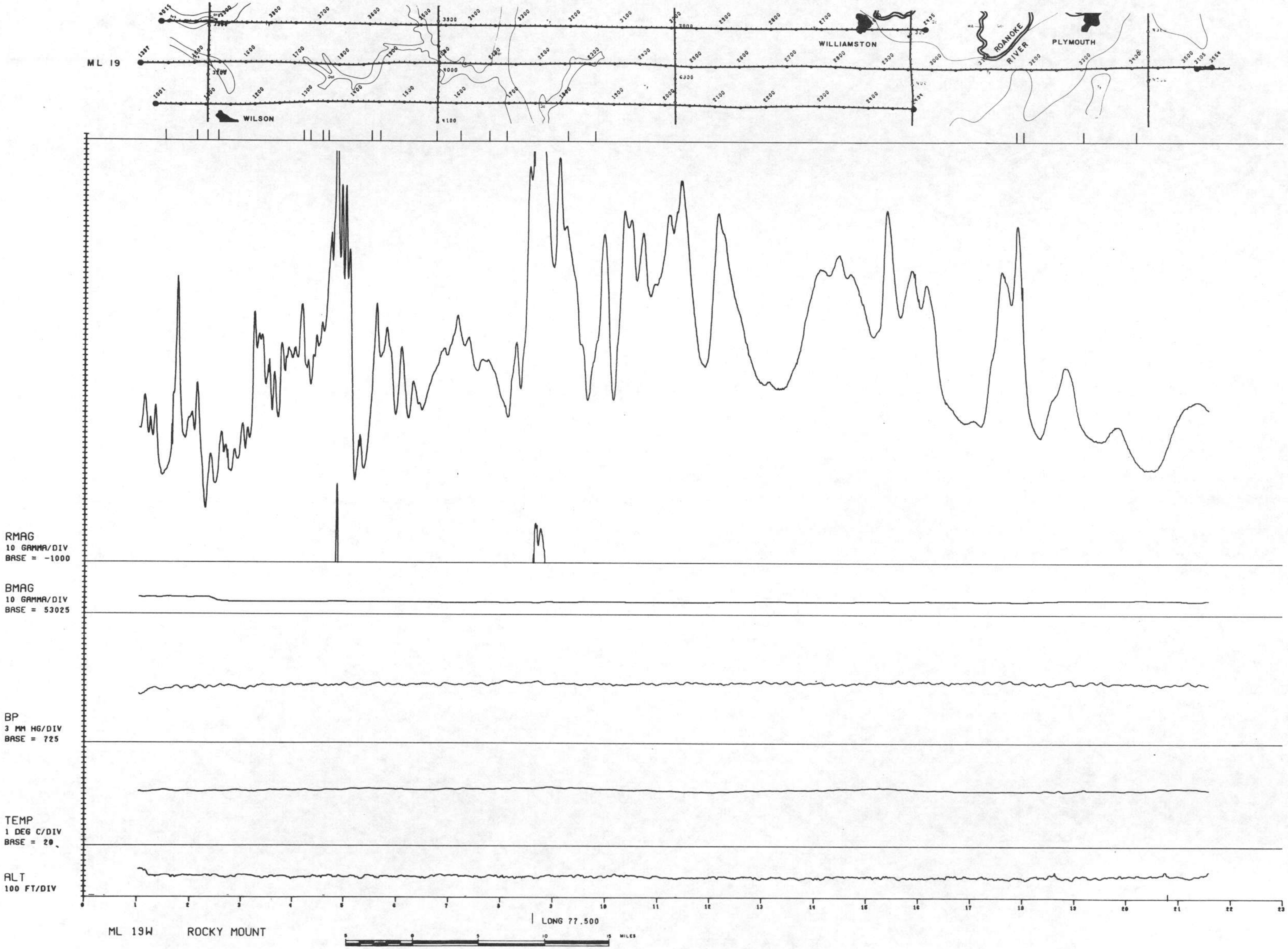


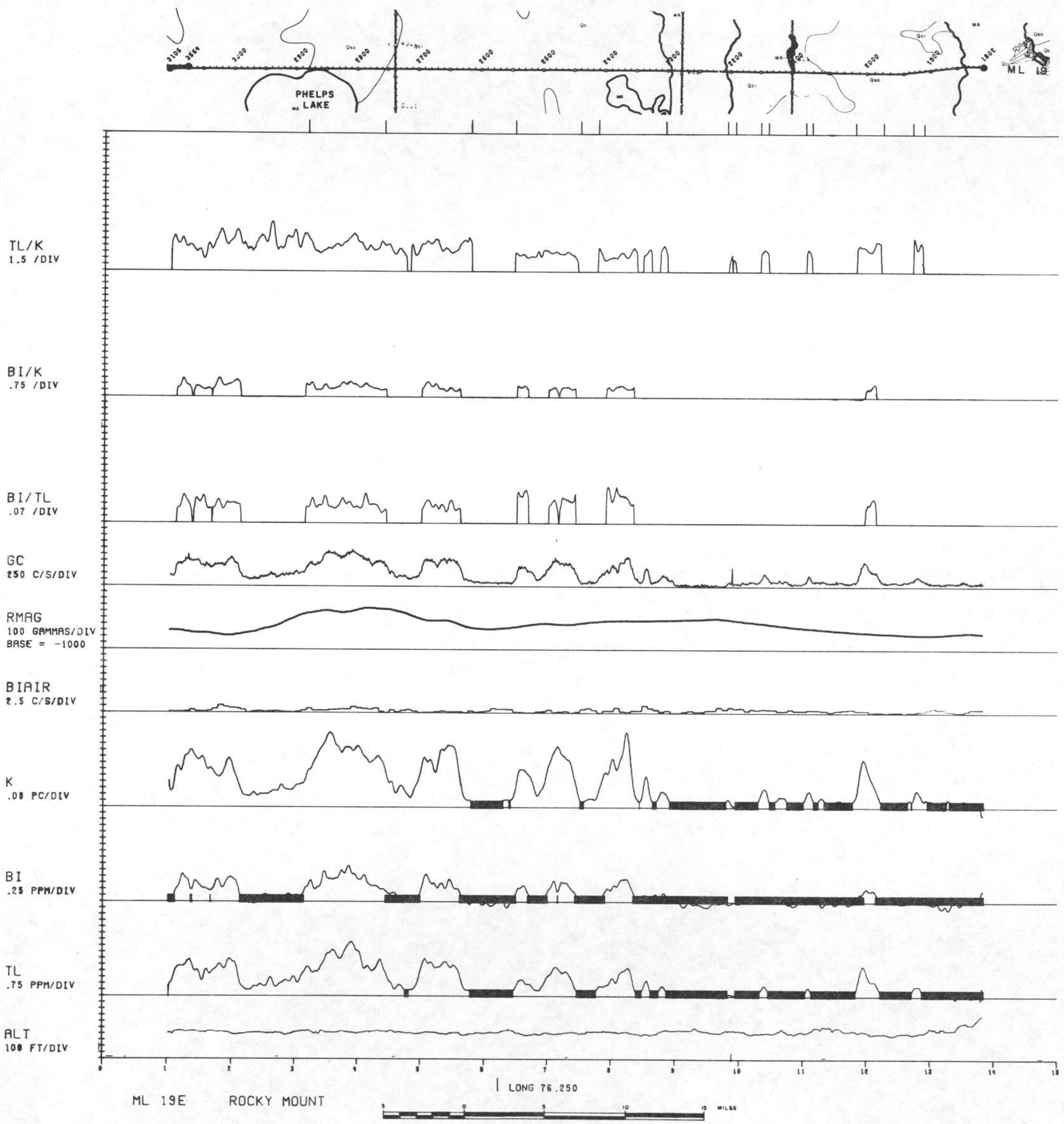
ML 18 ROCKY MOUNT



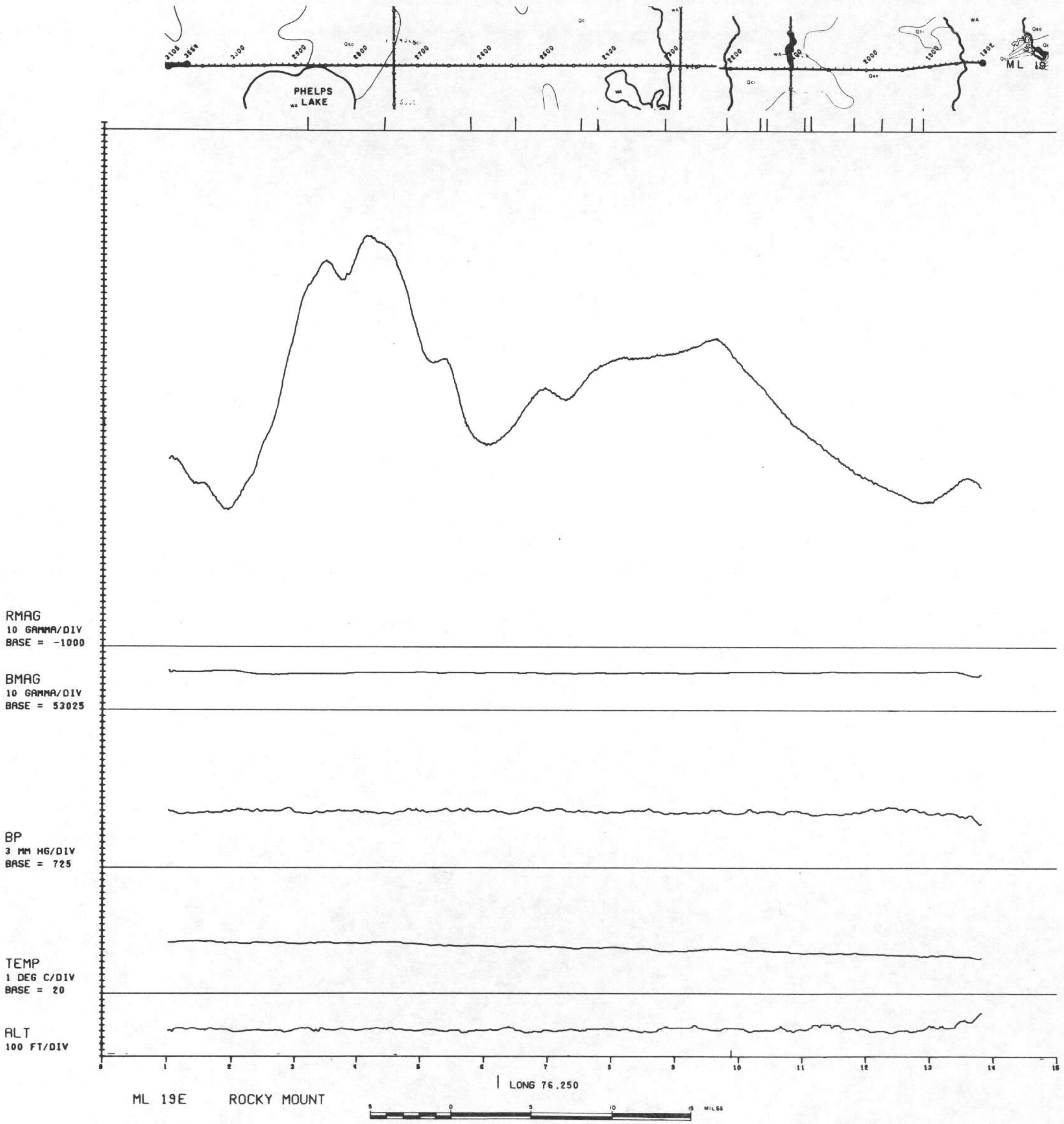
ML 18
WILSON
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.500
ML 18
ROCKY MOUNT
MILES

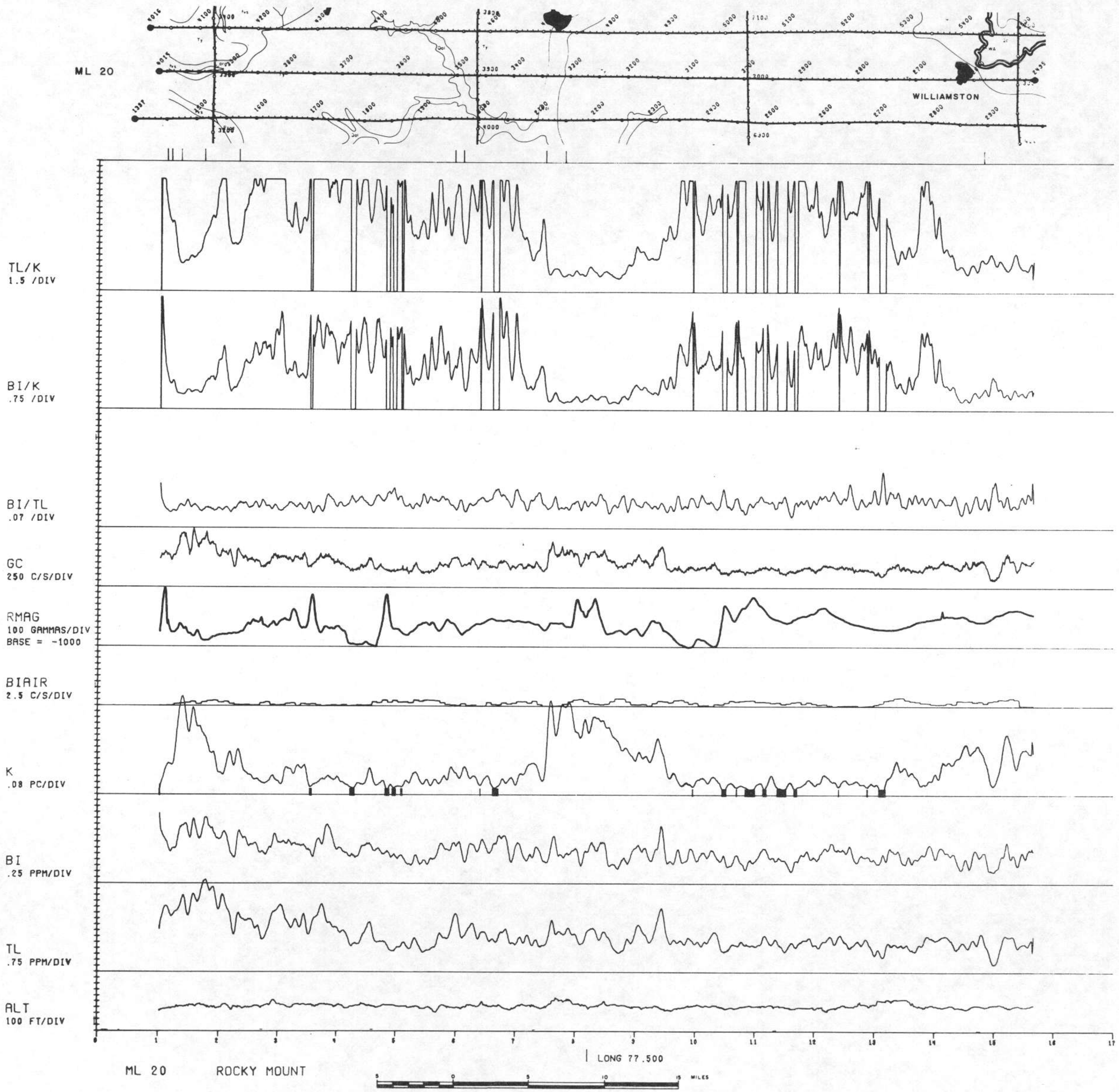

ML 19
WILSON
WILLIAMSTON
ROANOKE RIVER
PLYMOUTH
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 77.500
ML 19W
ROCKY MOUNT
MILES

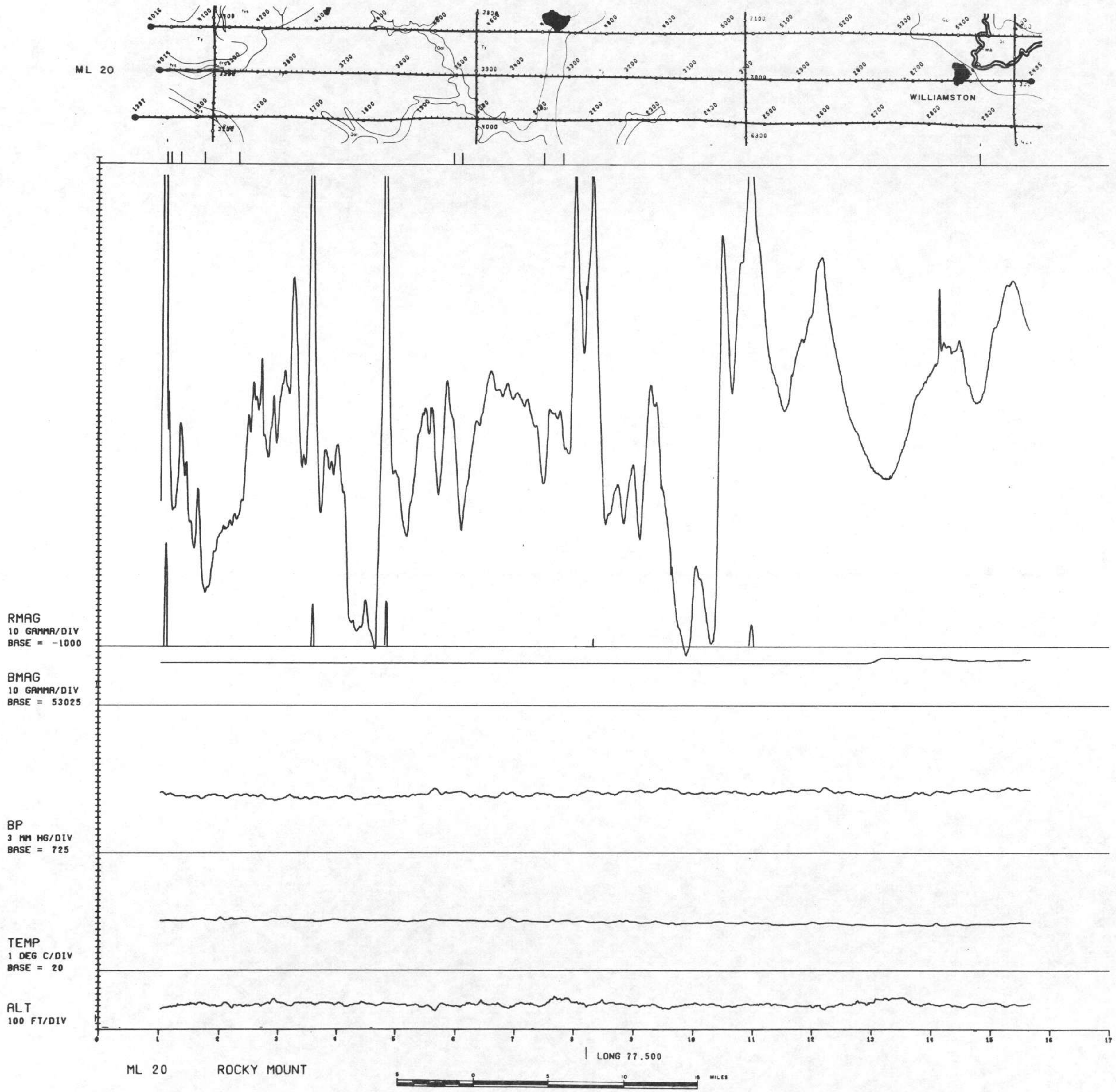

ML 19
WILSON
WILLIAMSTON
ROANOKE RIVER
PLYMOUTH
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.500
MILES
ML 19W
ROCKY MOUNT



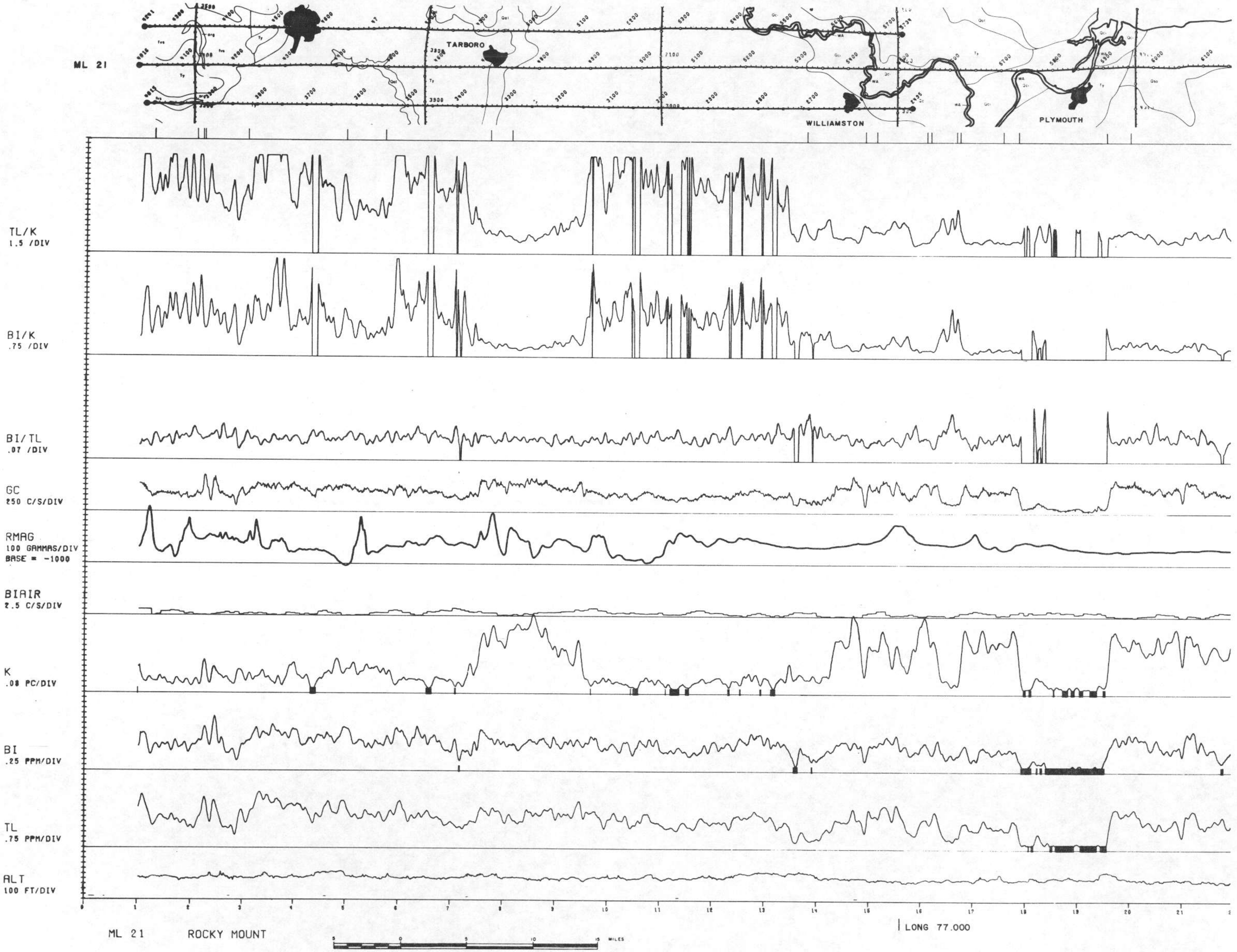
ML 19E ROCKY MOUNT

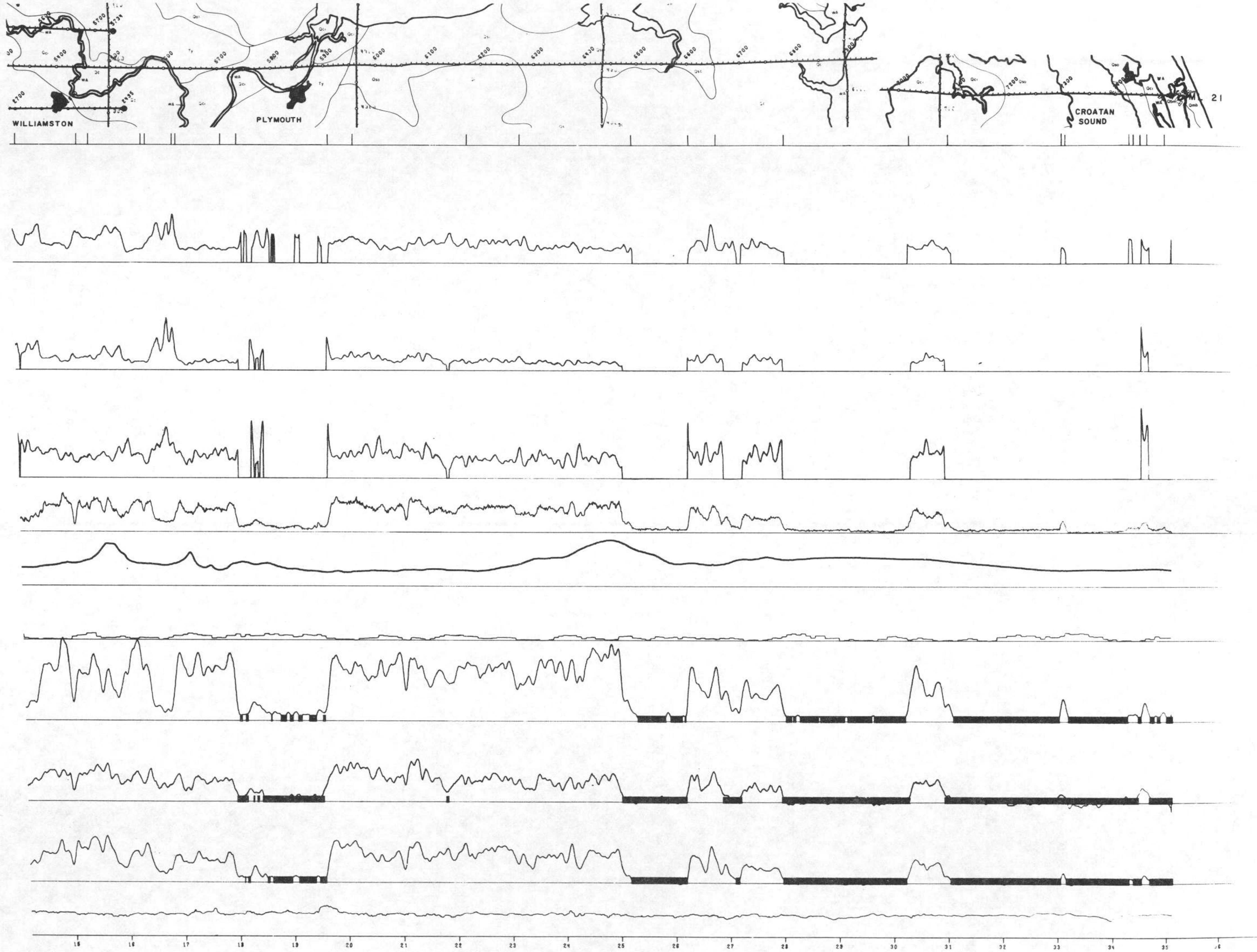

PHELPS
LAKE
ML 19
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 76.250
ML 19E
ROCKY MOUNT
MILES


ML 20
WILLIAMSTON
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 77.500
ML 20 ROCKY MOUNT
MILES

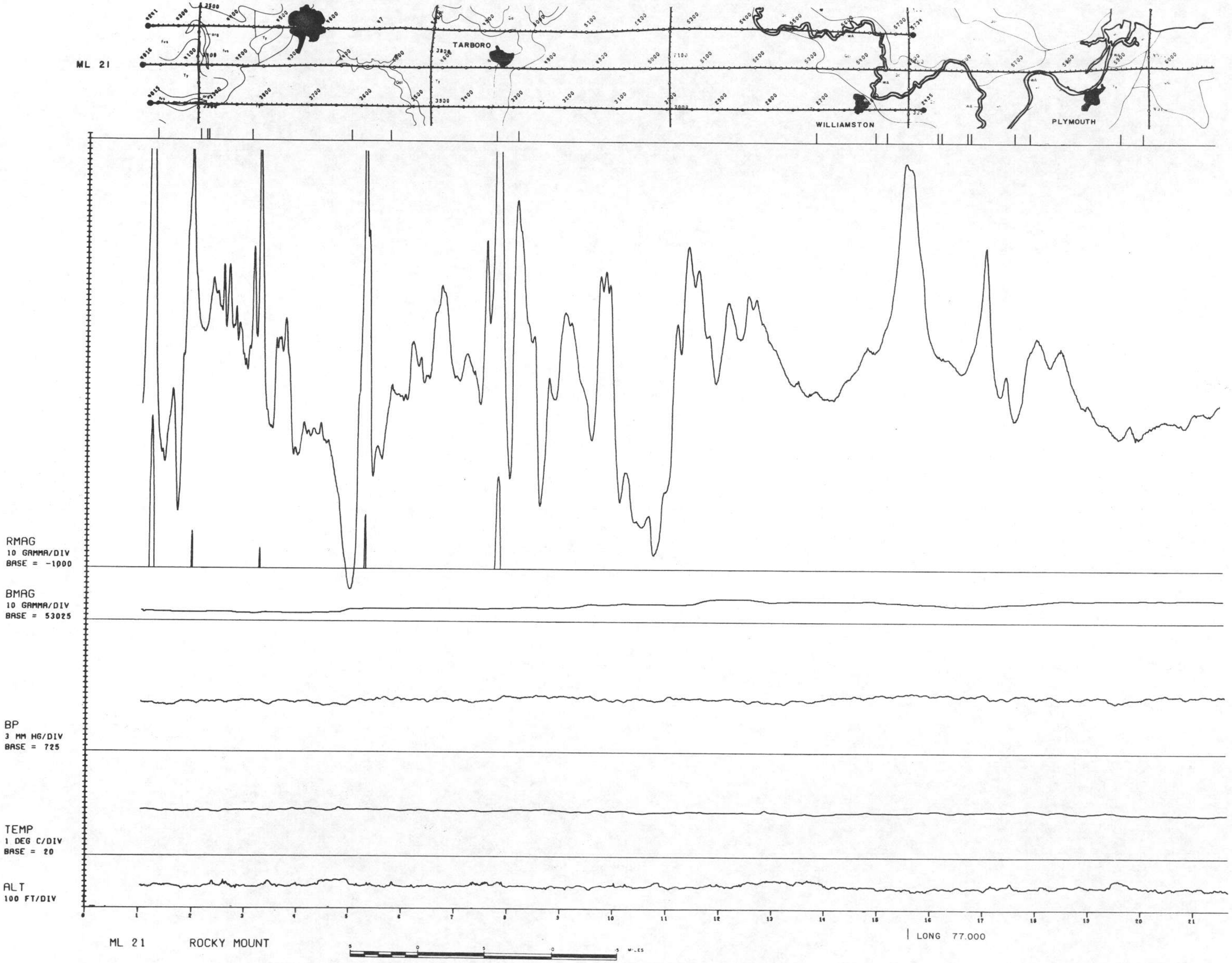


ML 20 ROCKY MOUNT

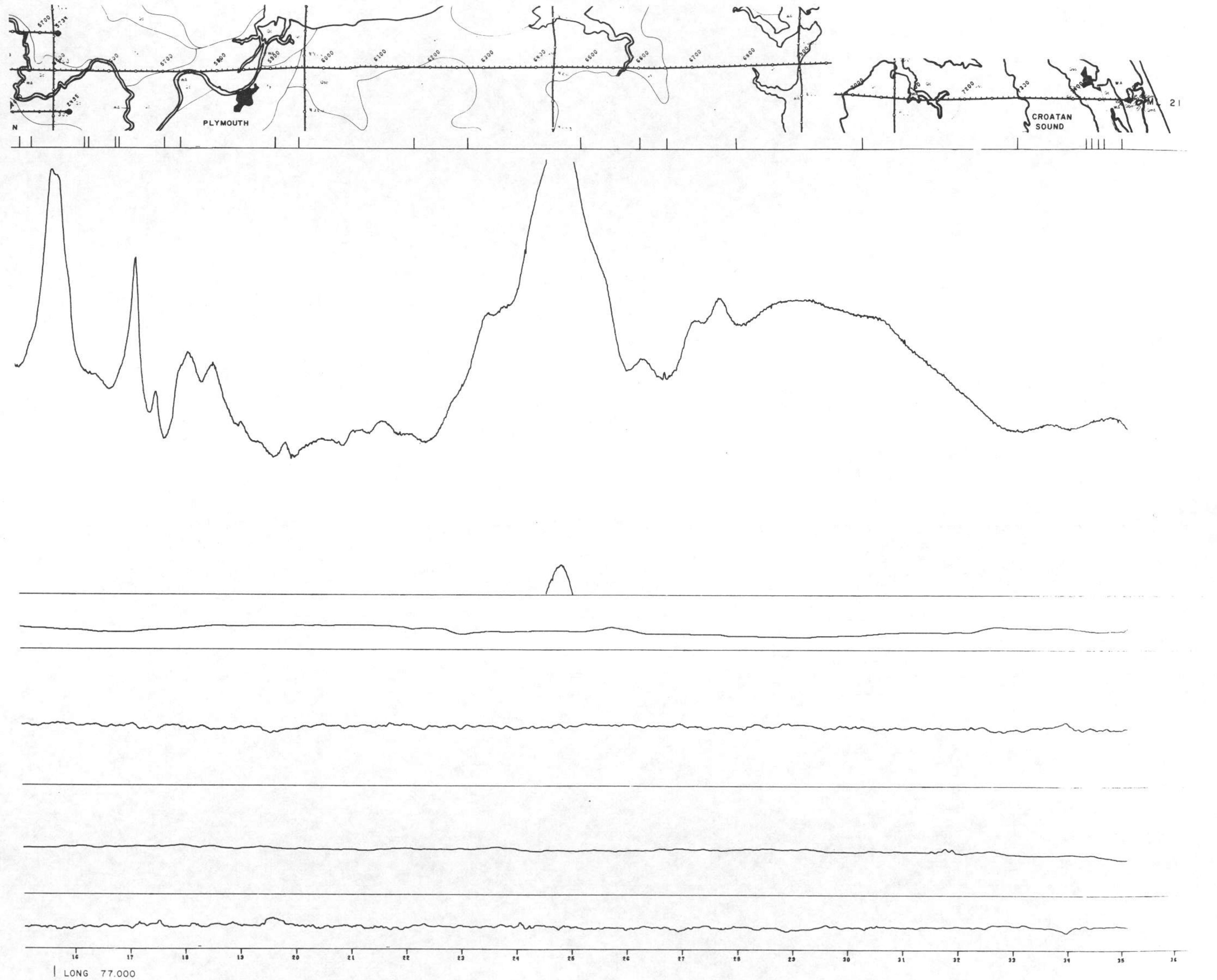

ML 21
TARBORO
WILLIAMSTON
PLYMOUTH
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LONG 77.000
ML 21
ROCKY MOUNT
MILES

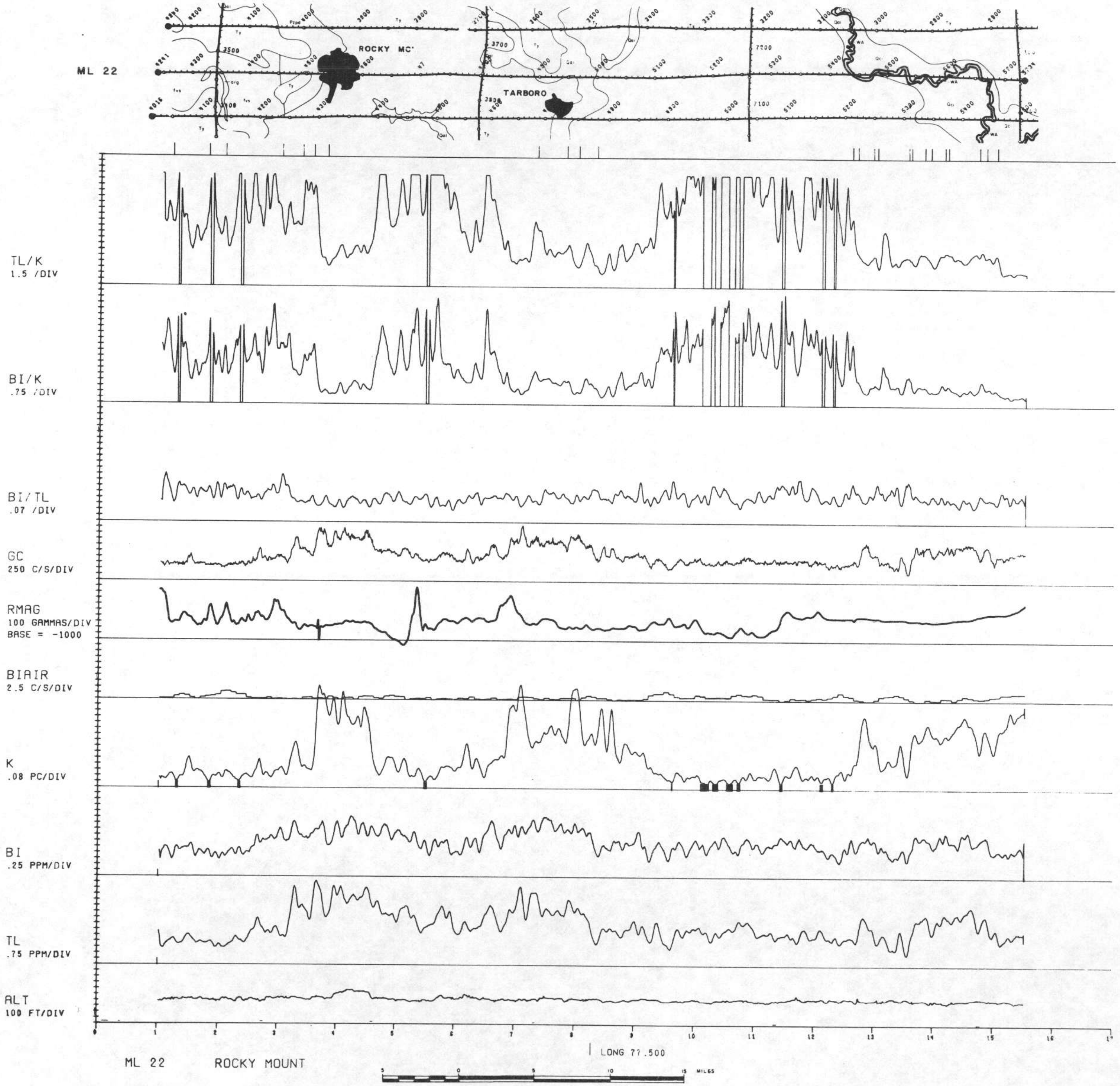


LONG 77.000

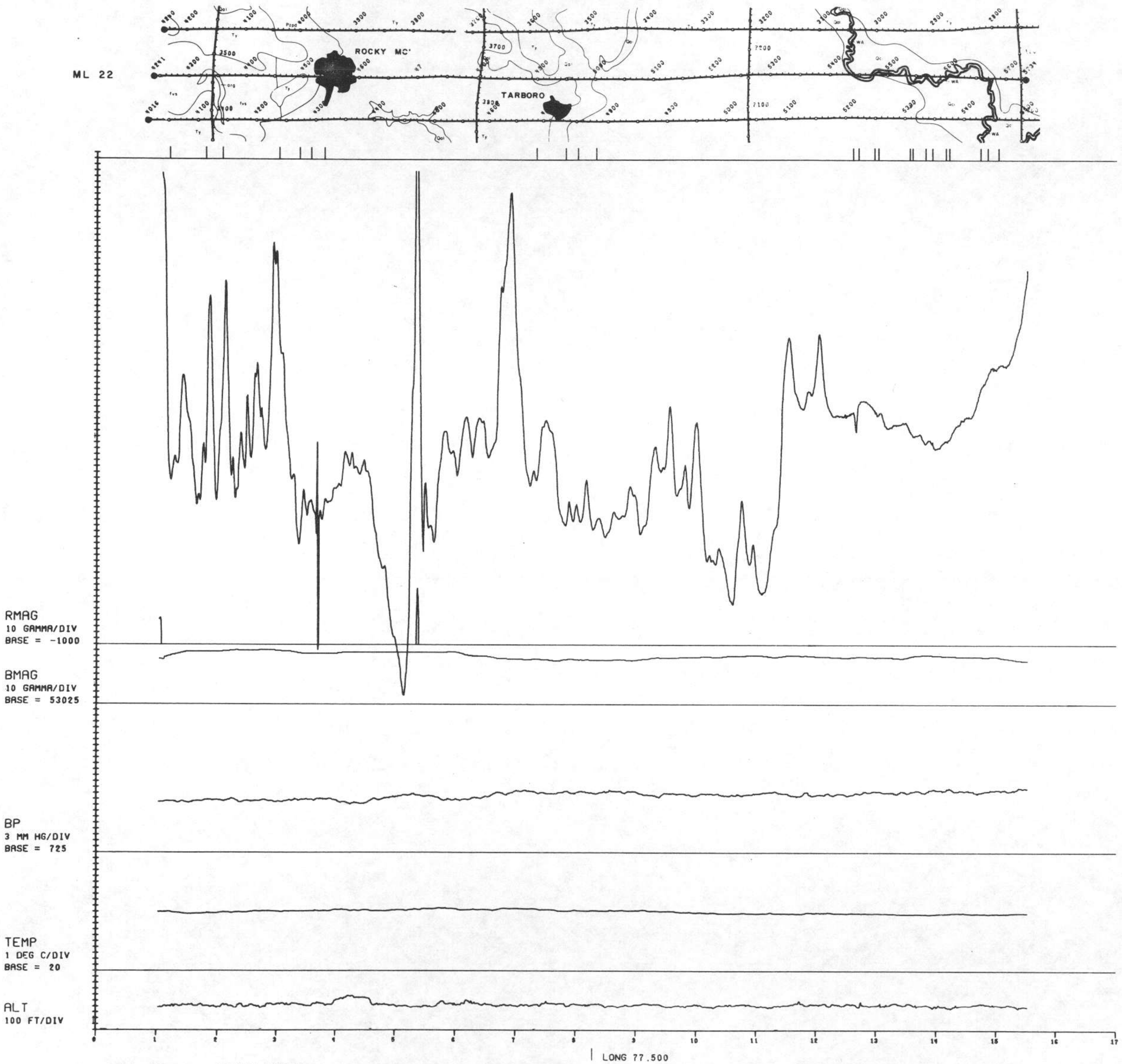


ML 21 ROCKY MOUNT

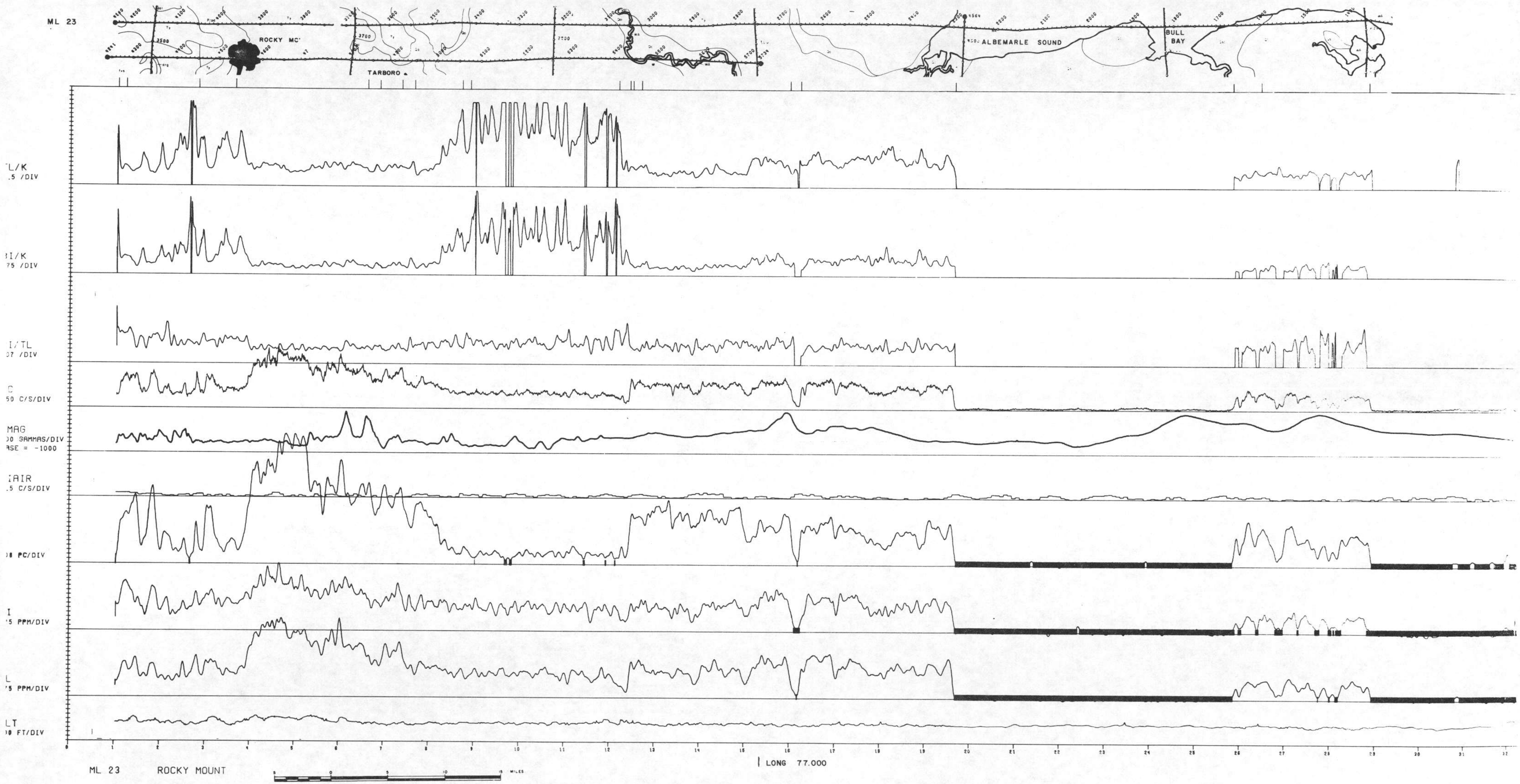

PLYMOUTH
CROATAN SOUND
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
LONG 77.000

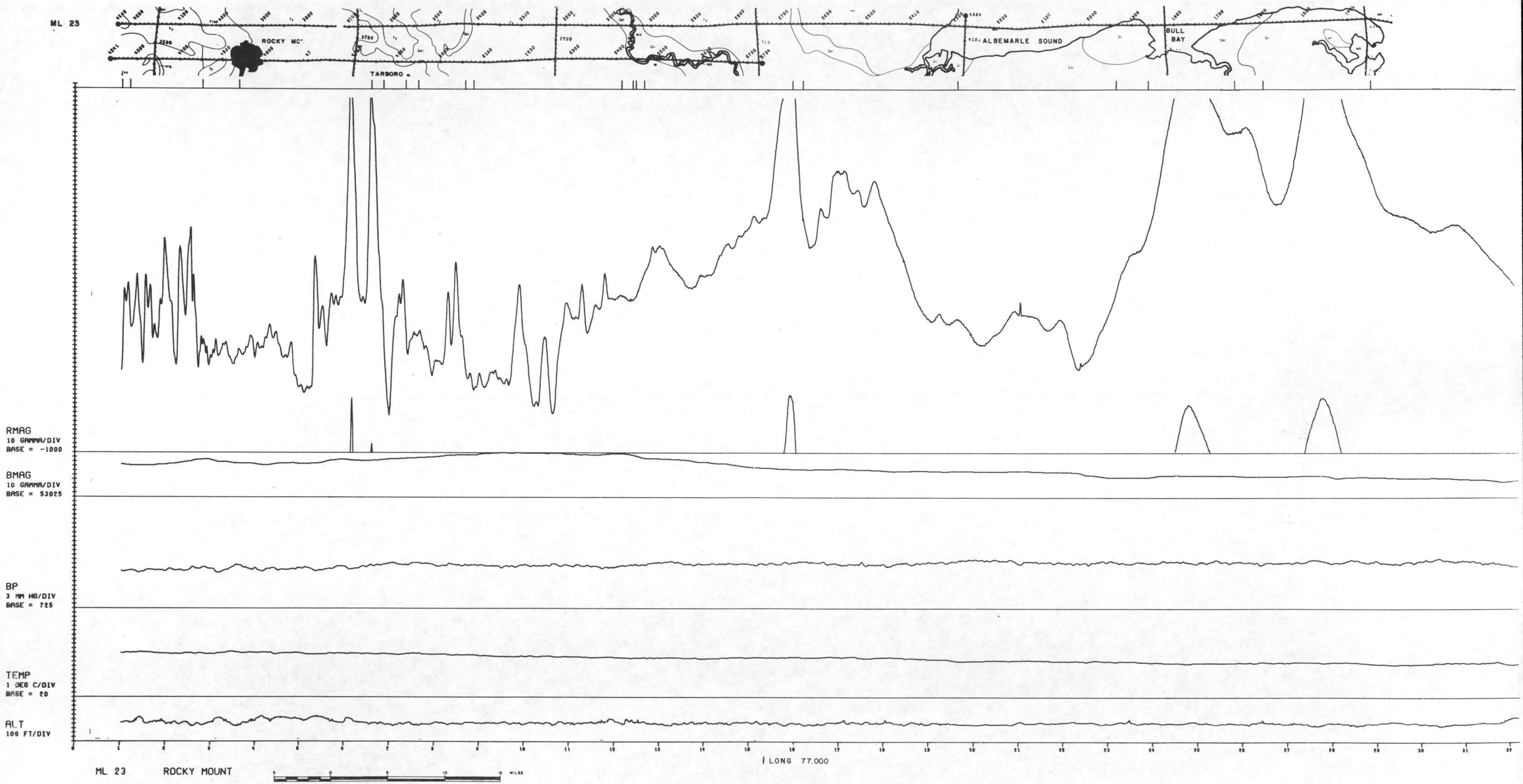


ML 22 ROCKY MOUNT

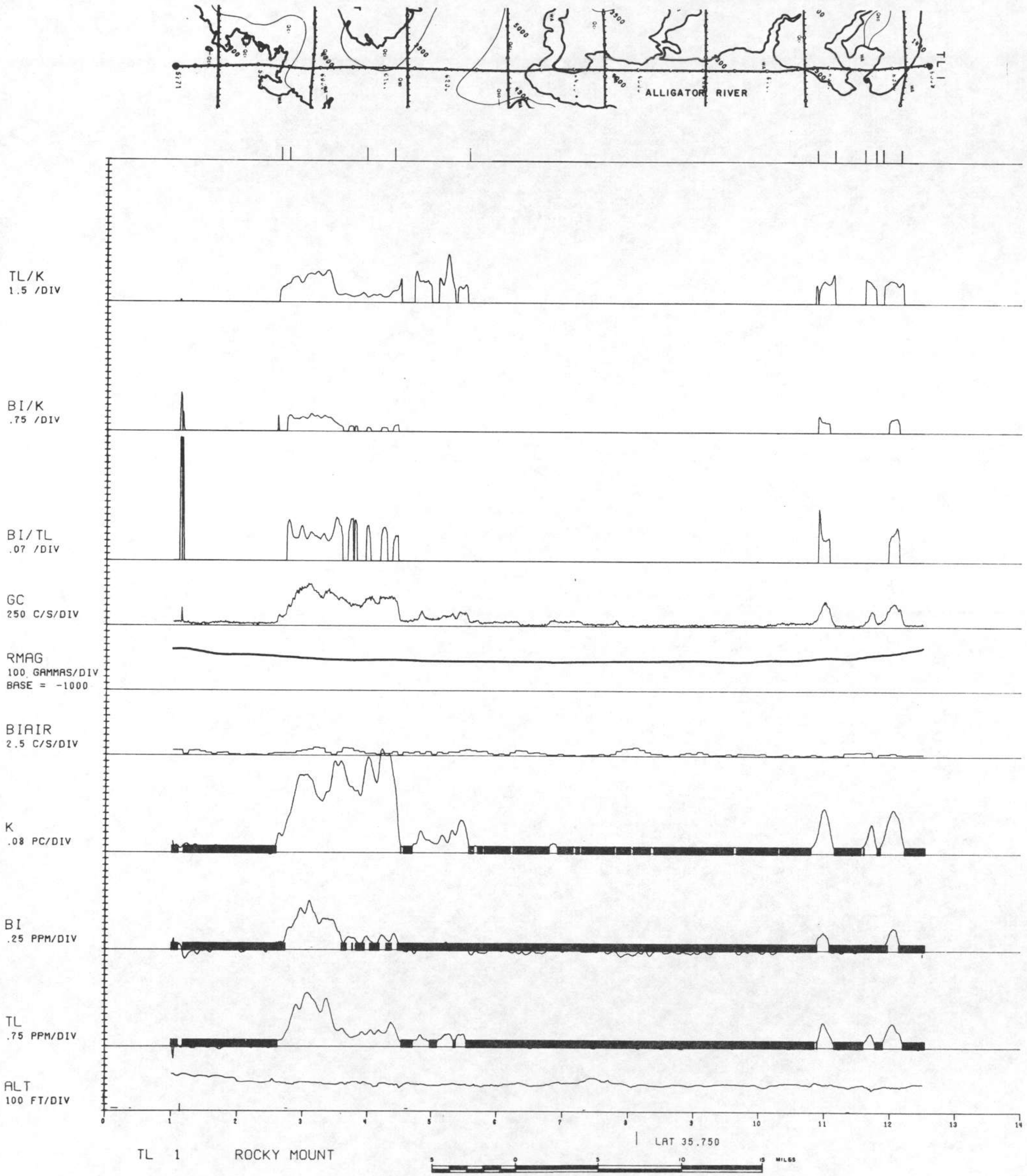


ML 22 ROCKY MOUNT

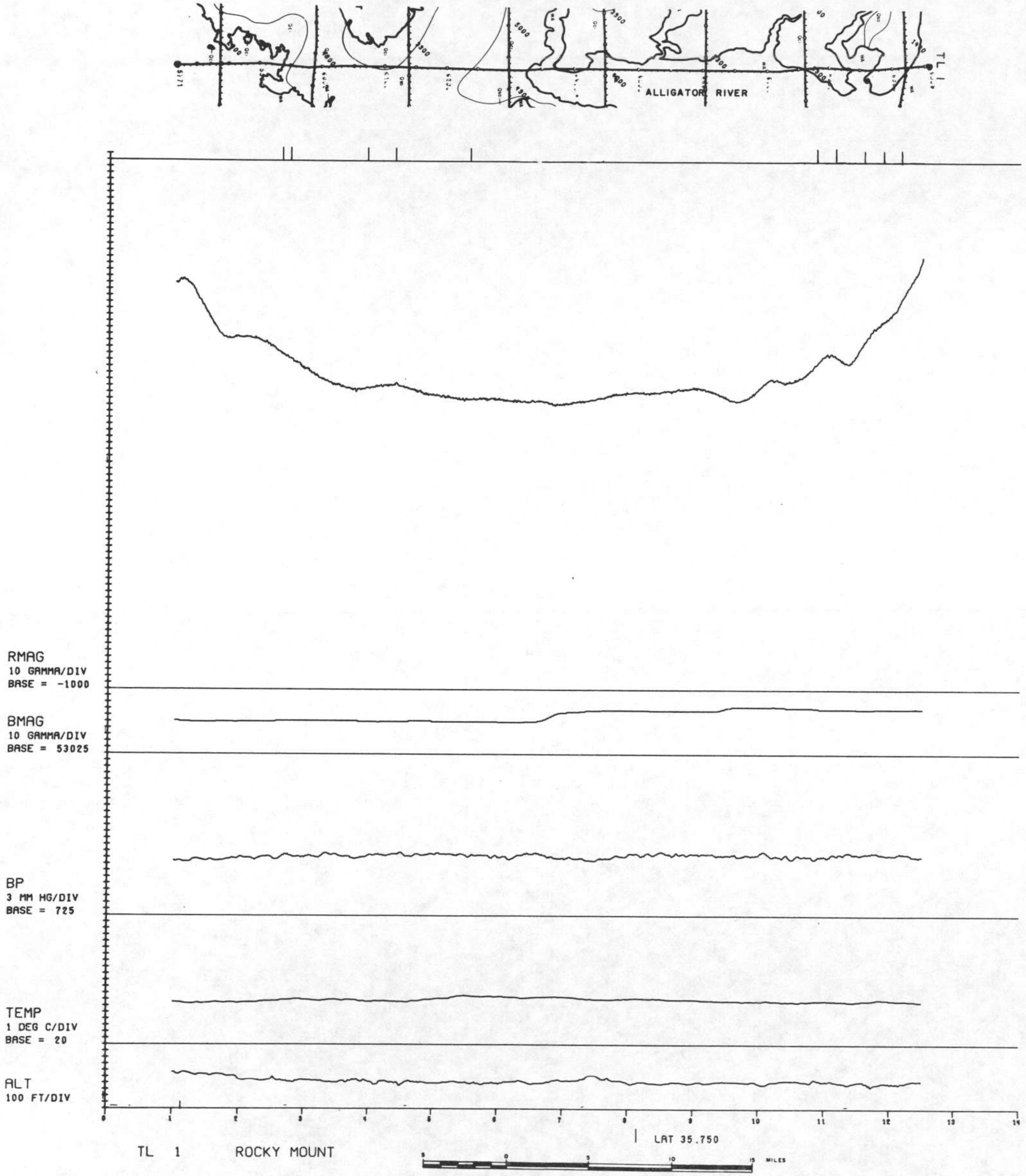

ML 23
ROCKY MOUNT
TARBORO
ALBEMARLE SOUND
BULL BAY
TL/K
.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
TC
50 C/S/DIV
MAG
00 GAMMAS/DIV
BASE = -1000
BIAIR
.5 C/S/DIV
00 PC/DIV
BI
.5 PPM/DIV
TL
.75 PPM/DIV
ALT
00 FT/DIV
ML 23 ROCKY MOUNT
LONG 77.000
MILES



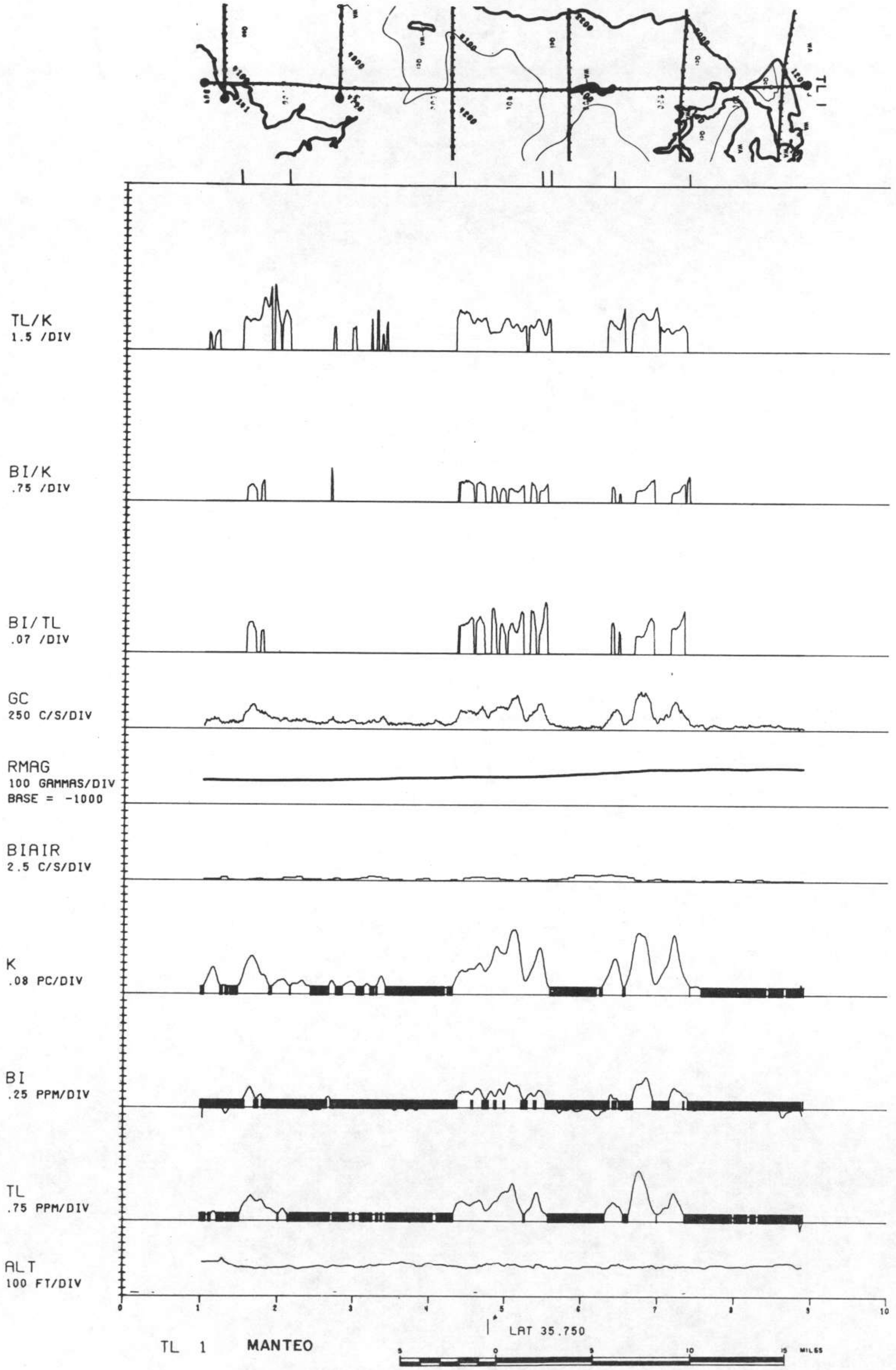
ML 23
ROCKY MOUNT
TARBORO
ALBEMARLE SOUND
BULL BAY
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LONG 77.000
ML 23 ROCKY MOUNT
MILES

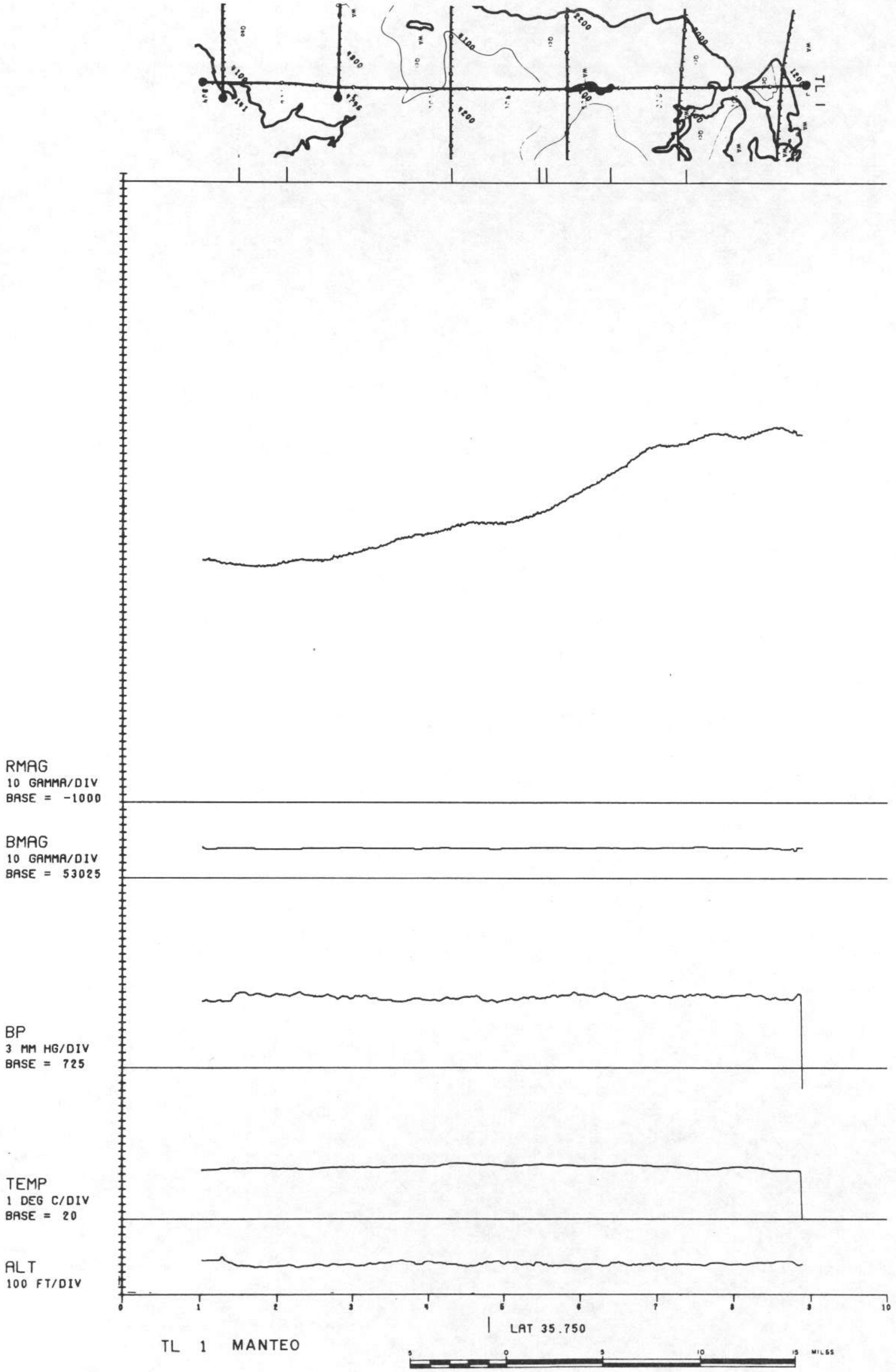


TL 1 ROCKY MOUNT

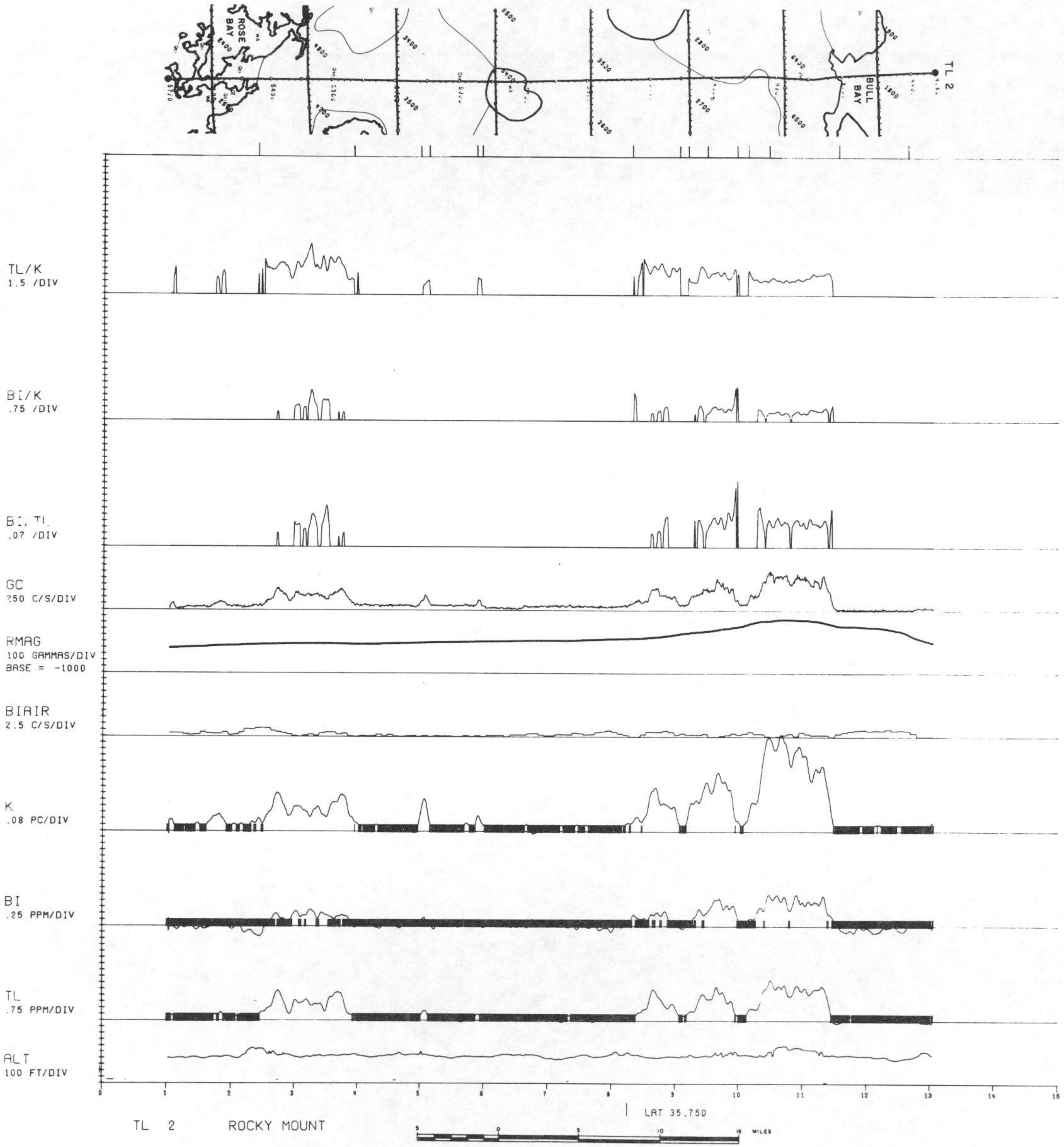


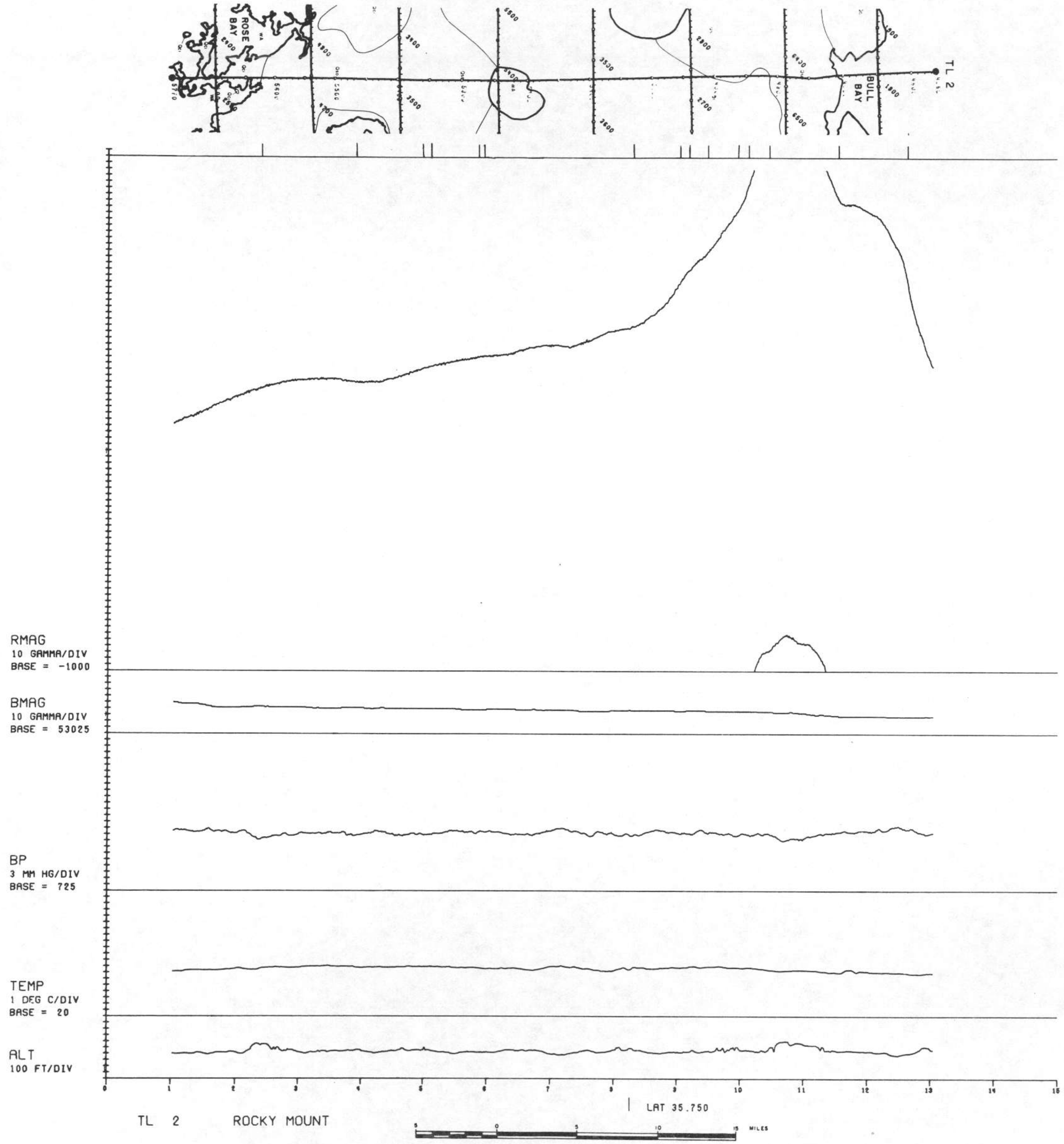
TL 1 ROCKY MOUNT

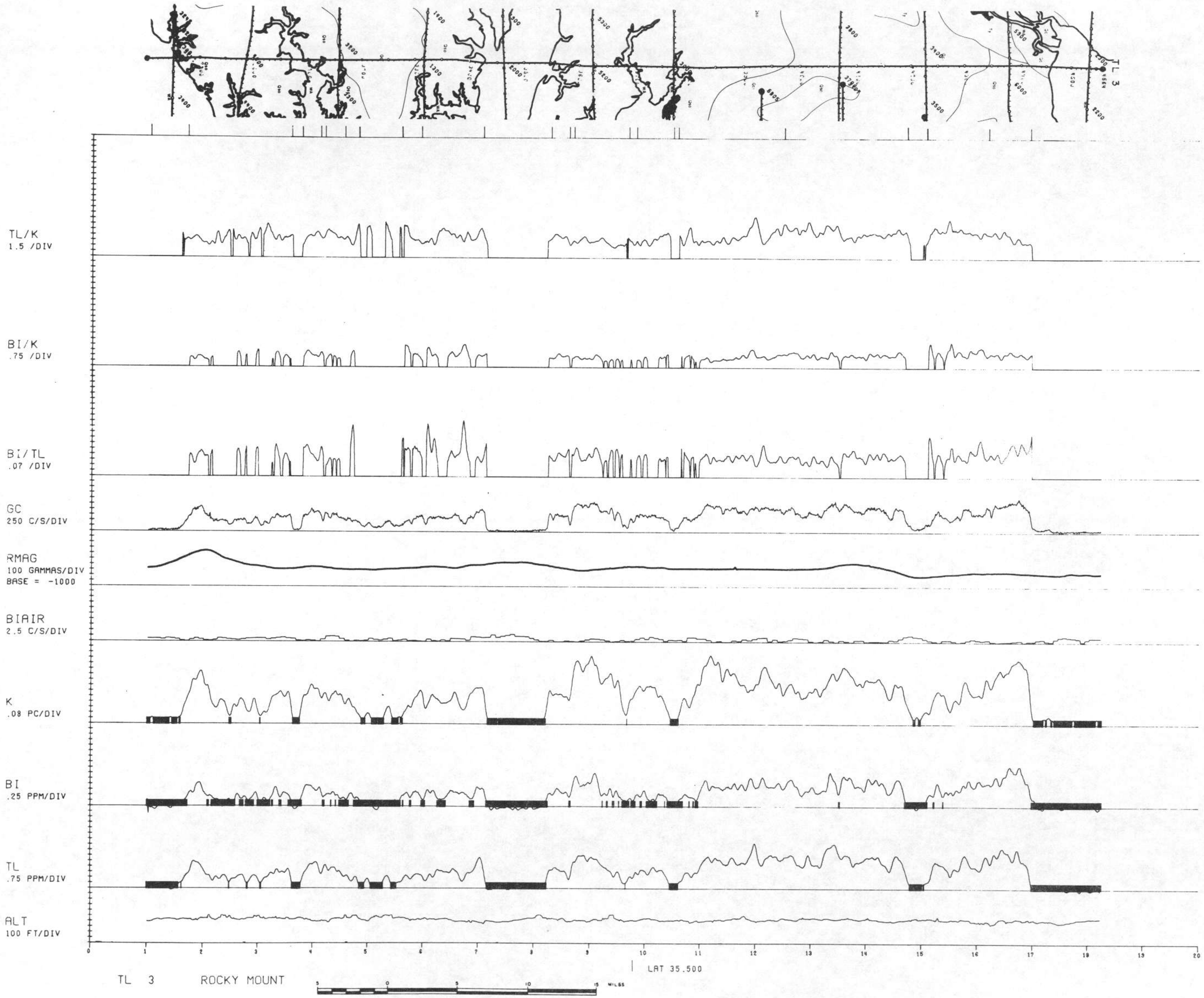

TL 1
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
0
1
2
3
4
5
6
7
8
9
10
LAT 35.750
TL 1 MANTEO
MILES

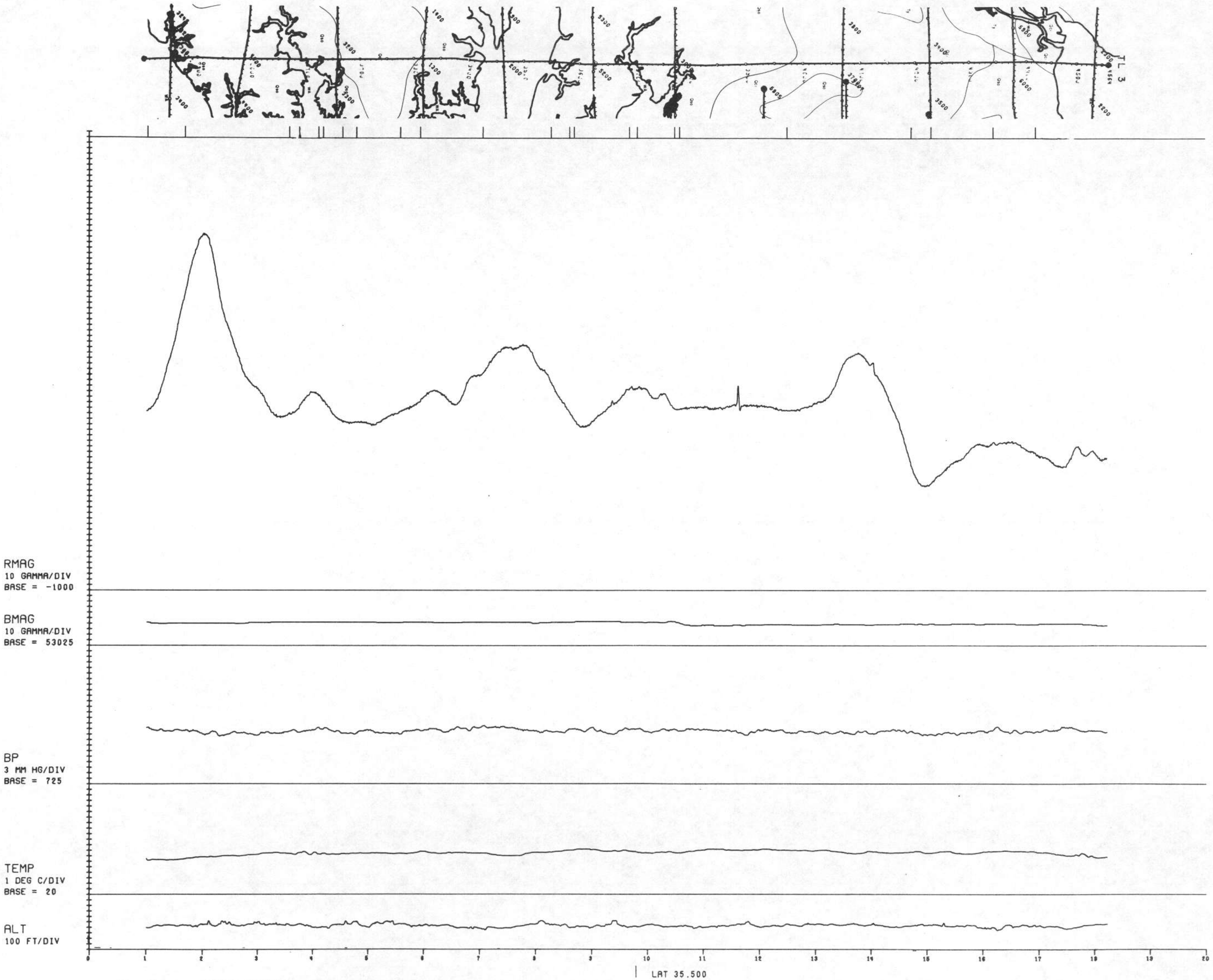

TL 1
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LAT 35.750
MILES

TL 1 MANTEO

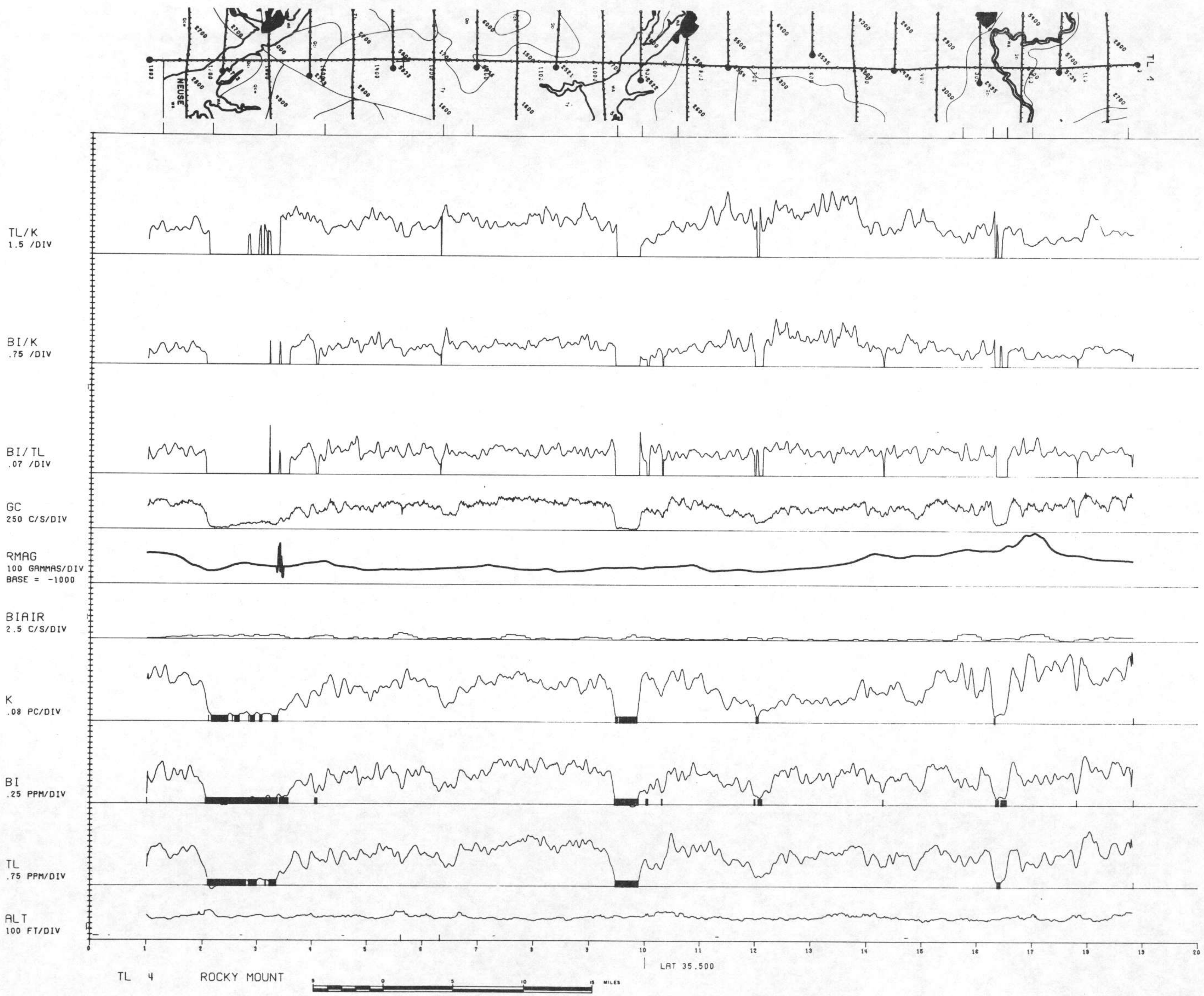

ROSE BAY
BULL BAY
TL 2
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
LAT 35.750
TL 2 ROCKY MOUNT
MILES


ROSE BAY
BULL BAY
TL 2
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
LAT 35.750
MILES
TL 2 ROCKY MOUNT

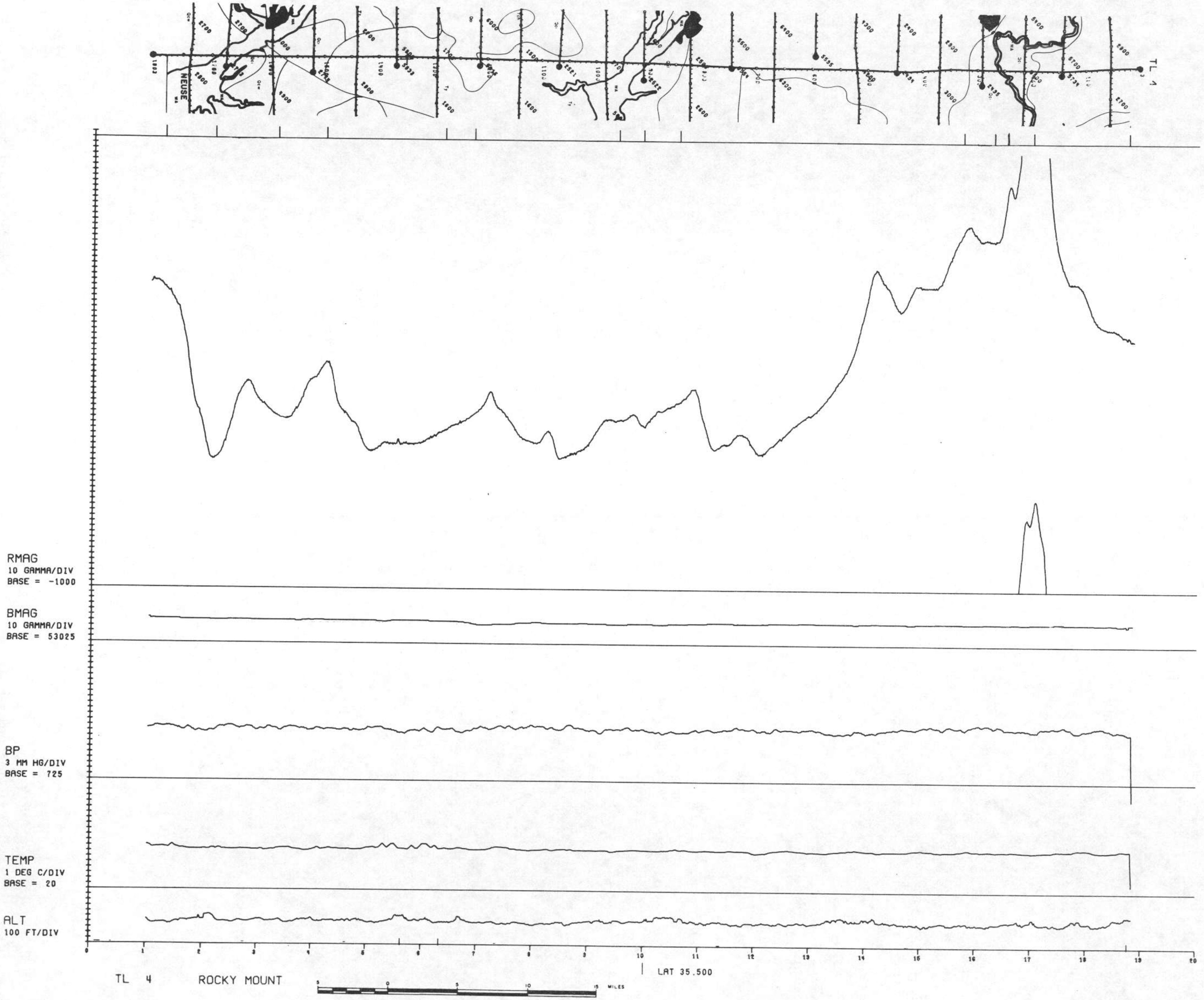

TL 3
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
LAT 35.500
TL 3 ROCKY MOUNT
MILES



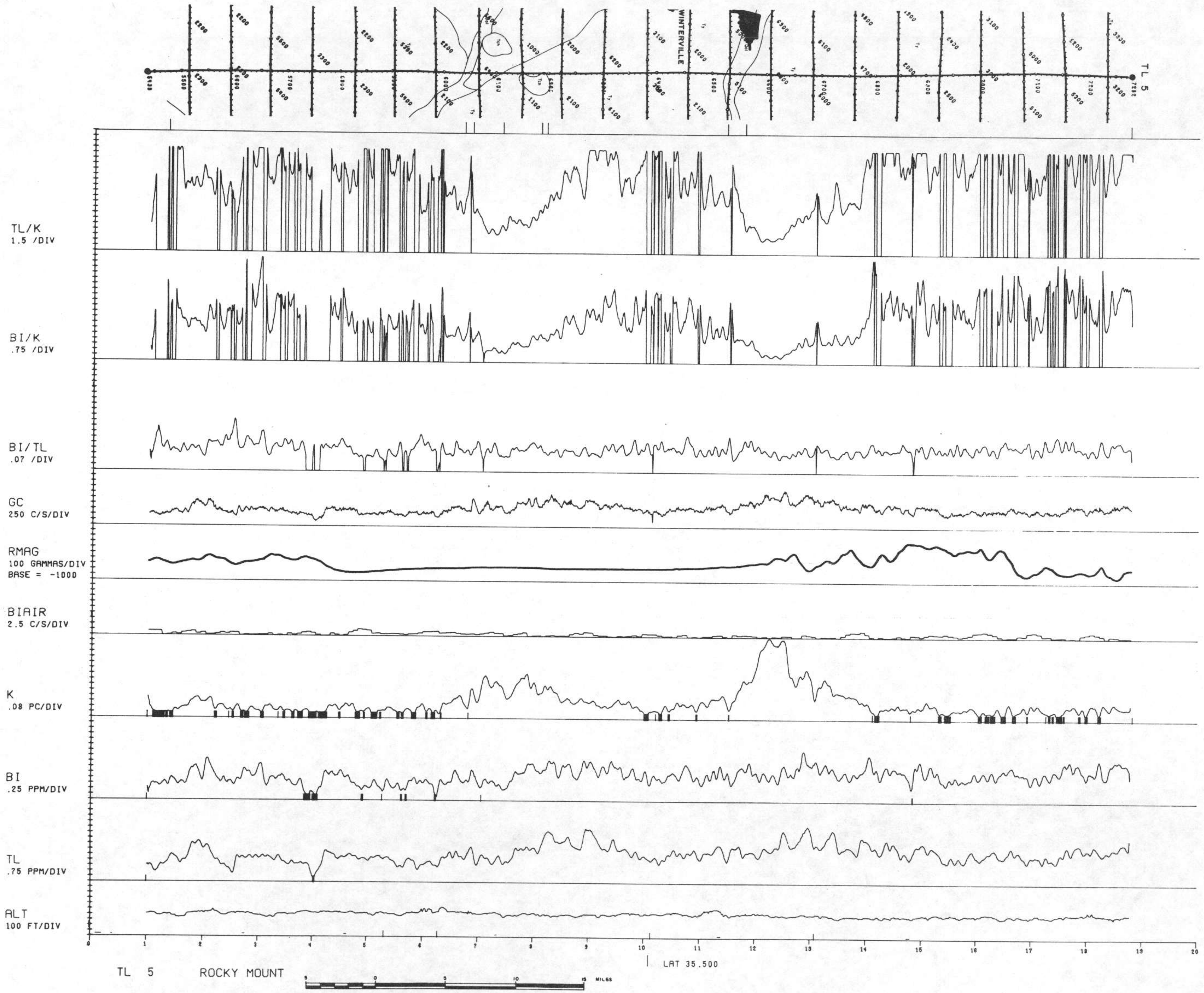
TL 3 ROCKY MOUNT



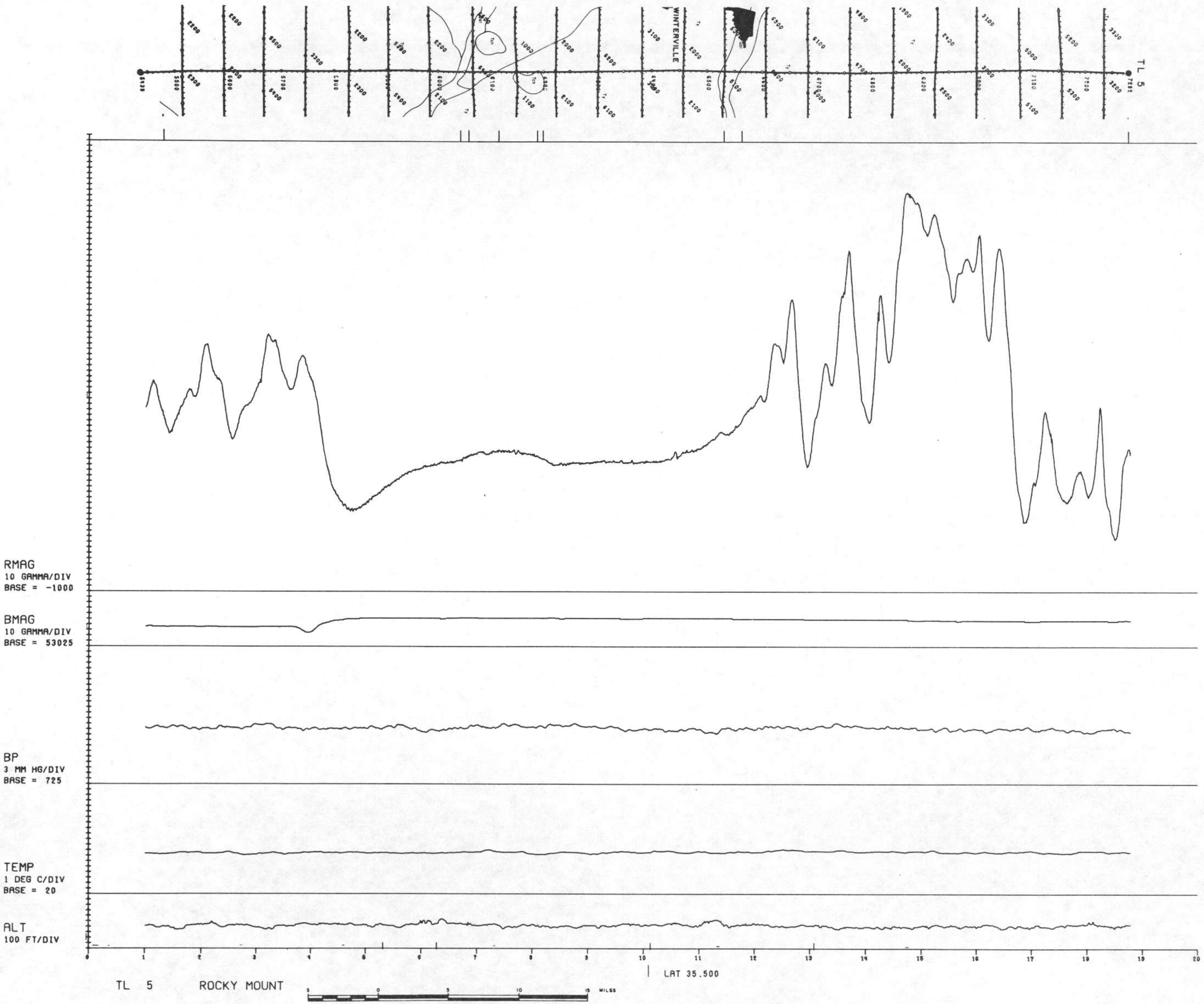
TL 4 ROCKY MOUNT



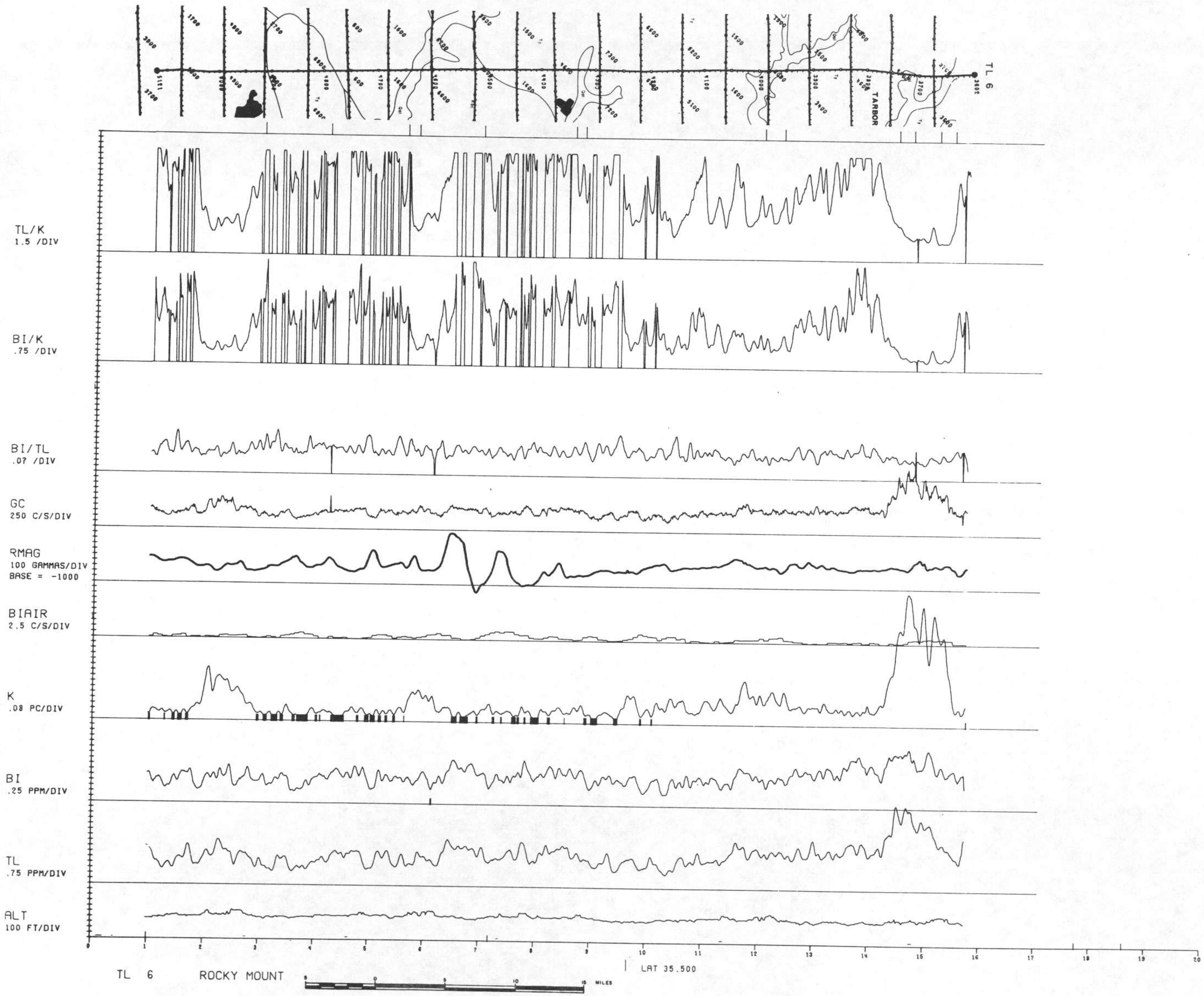
TL 4 ROCKY MOUNT



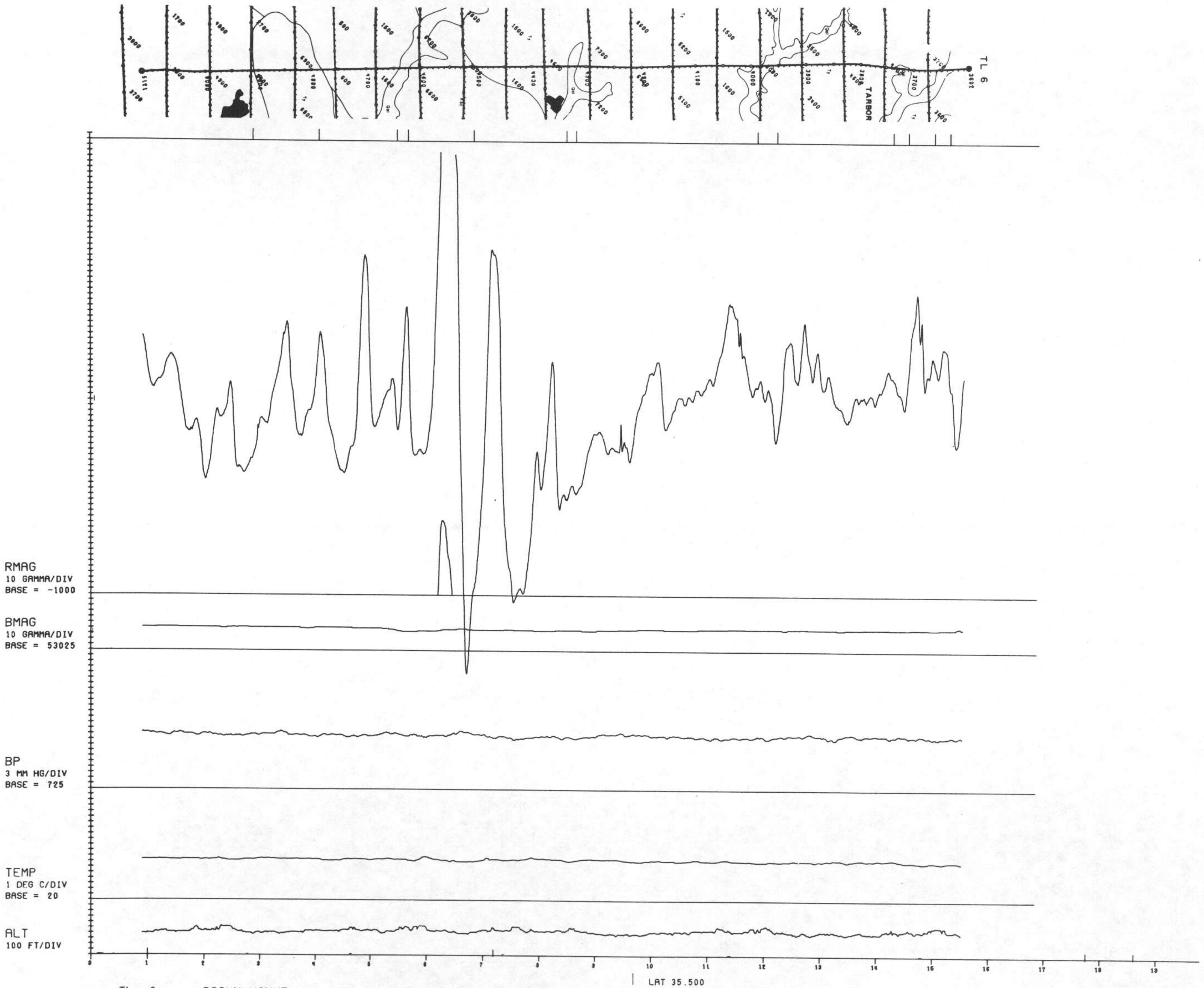
TL 5 ROCKY MOUNT



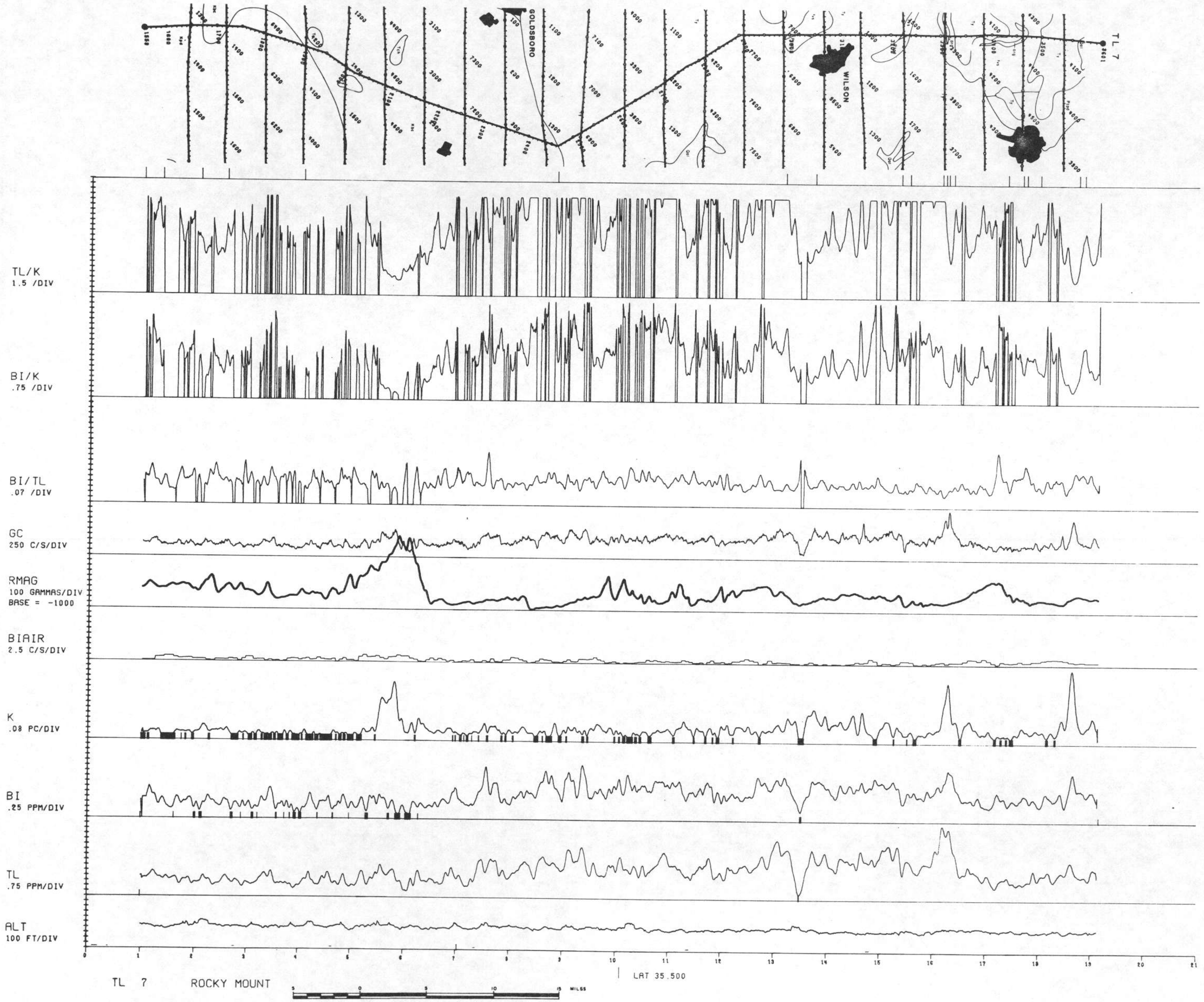
TL 5 ROCKY MOUNT



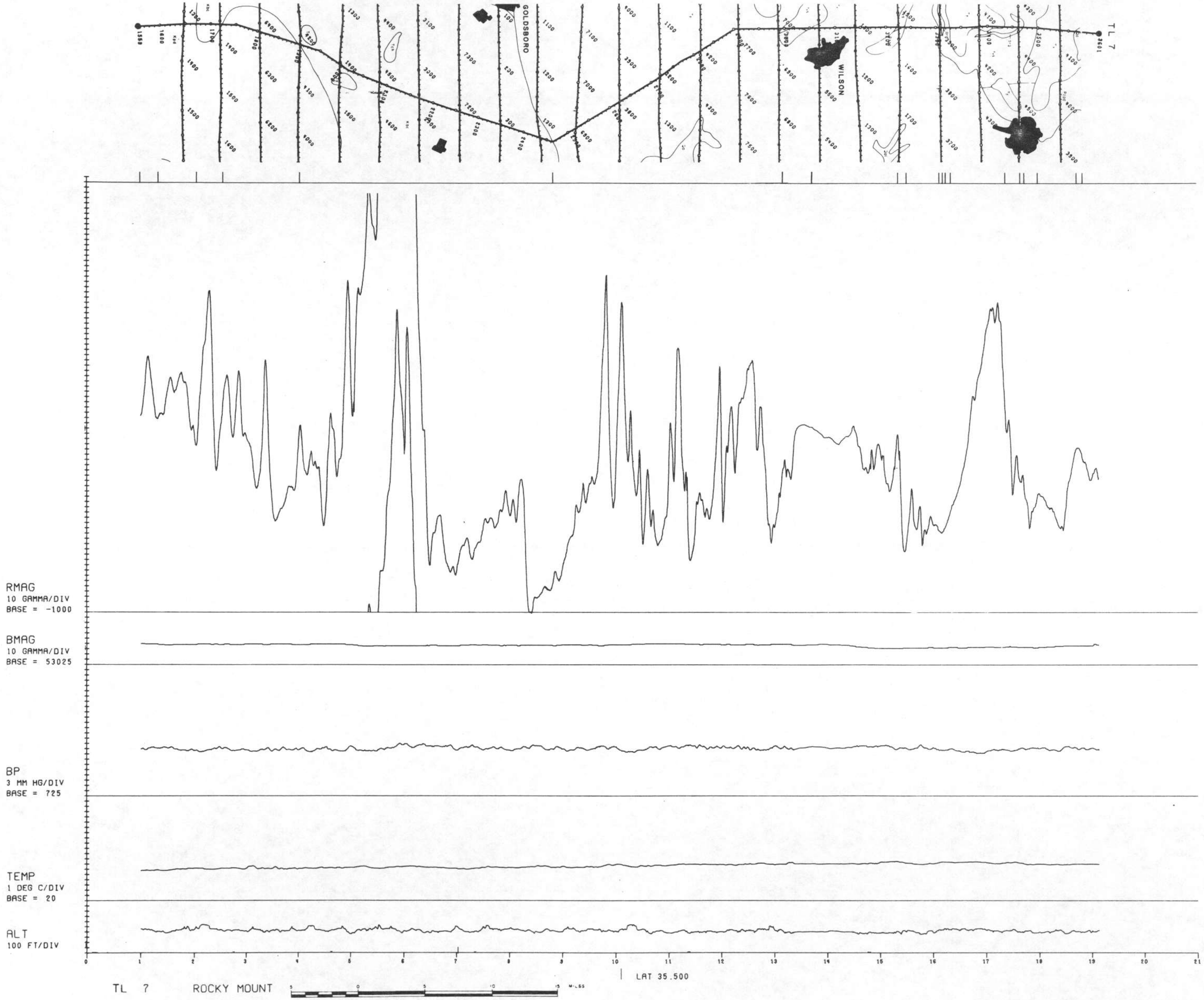
TL 6
TARBOR
TL/K
1.5 /DIV
BI/K
.75 /DIV
BI/TL
.07 /DIV
GC
250 C/S/DIV
RMAG
100 GAMMAS/DIV
BASE = -1000
BIAIR
2.5 C/S/DIV
K
.08 PC/DIV
BI
.25 PPM/DIV
TL
.75 PPM/DIV
ALT
100 FT/DIV
TL 6 ROCKY MOUNT
LAT 35.500

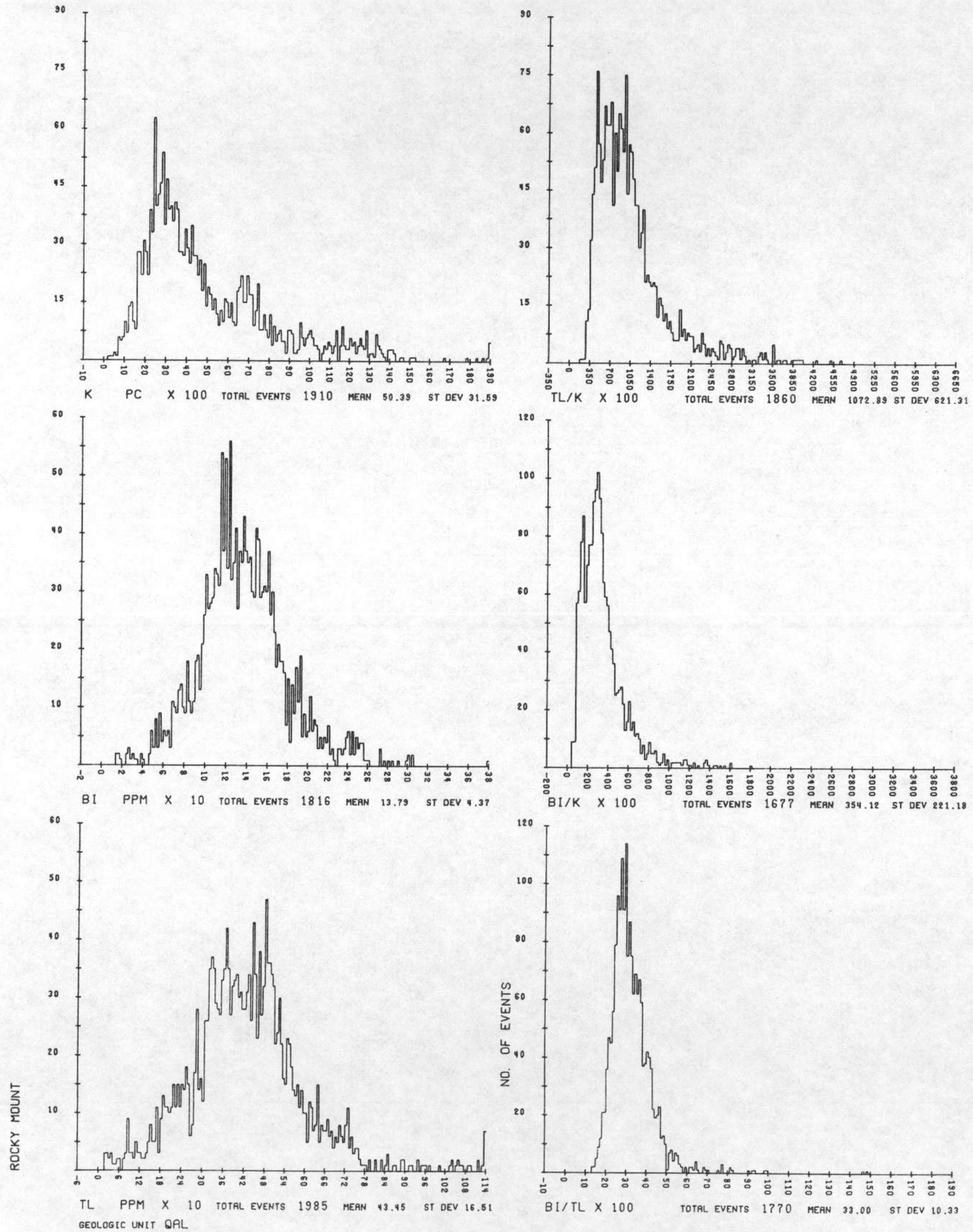


TL 6 ROCKY MOUNT



TL 7 ROCKY MOUNT


GOLDSBORO
WILSON
TL 7
RMAG
10 GAMMA/DIV
BASE = -1000
BMAG
10 GAMMA/DIV
BASE = 53025
BP
3 MM HG/DIV
BASE = 725
TEMP
1 DEG C/DIV
BASE = 20
ALT
100 FT/DIV
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
LAT 35.500
TL 7 ROCKY MOUNT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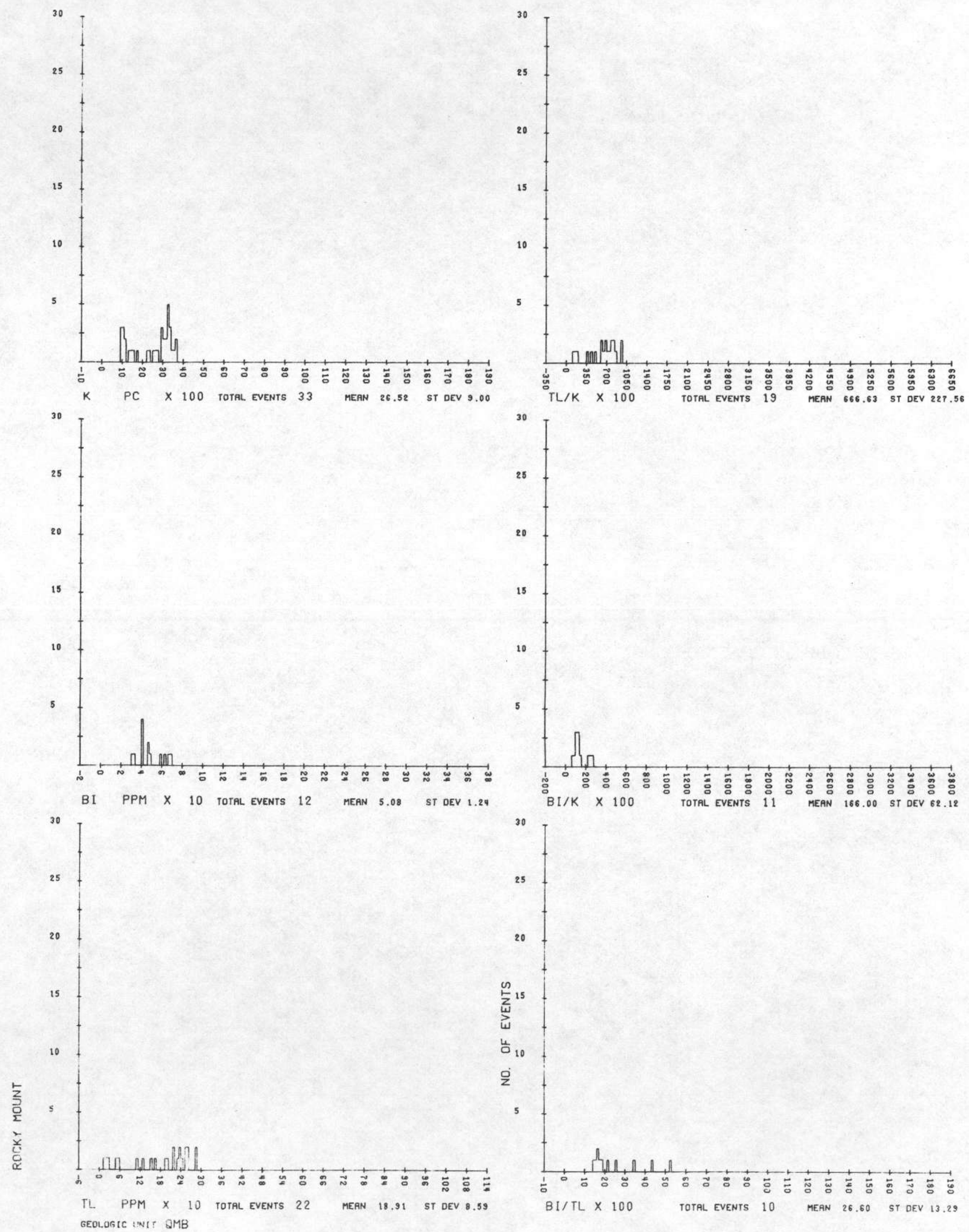
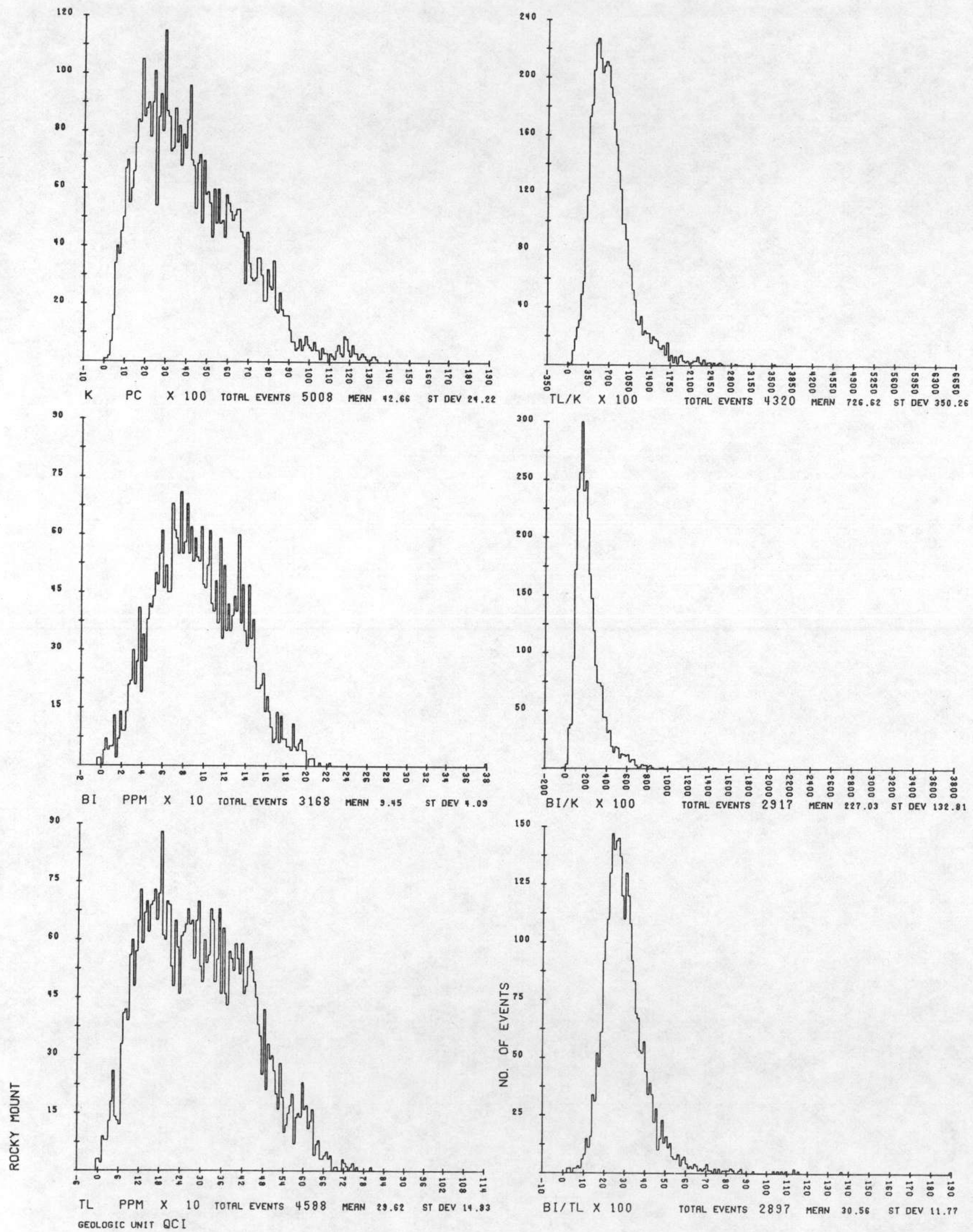
TL/K X 100 TOTAL EVENTS 1860 MEAN 1072.89 ST DEV 621.31
BI PPM X 10 TOTAL EVENTS 1816 MEAN 13.79 ST DEV 4.37
BI/K X 100 TOTAL EVENTS 1677 MEAN 354.12 ST DEV 221.18
TL PPM X 10 TOTAL EVENTS 1985 MEAN 43.45 ST DEV 16.51
BI/TL X 100 TOTAL EVENTS 1770 MEAN 33.00 ST DEV 10.33
NO. OF EVENTS
ROCKY MOUNT
GEOLOGIC UNIT QAL

A 1

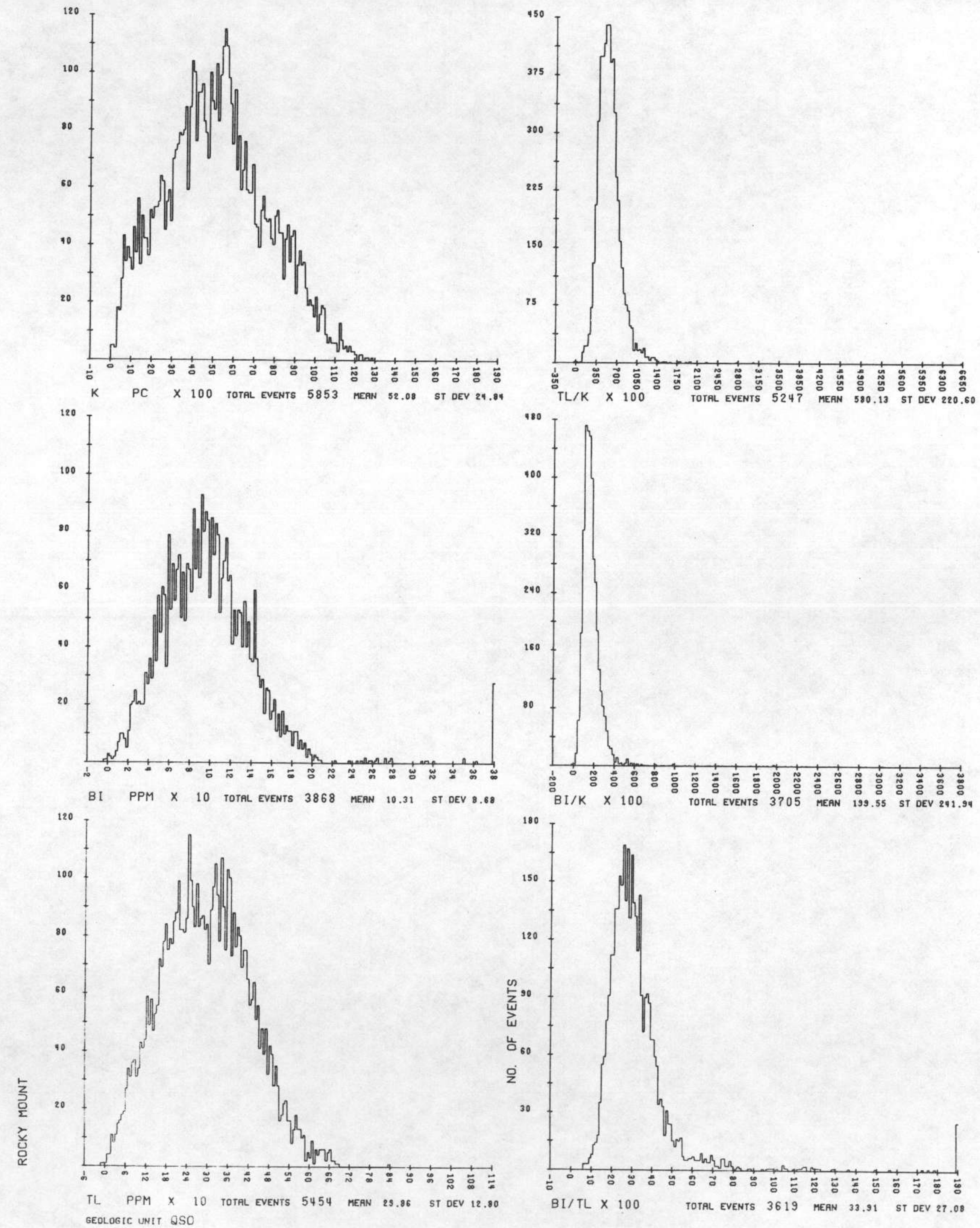

K PC X 100 TOTAL EVENTS 33 MEAN 26.52 ST DEV 9.00
TL/K X 100 TOTAL EVENTS 19 MEAN 666.63 ST DEV 227.56
BI PPM X 10 TOTAL EVENTS 12 MEAN 5.08 ST DEV 1.24
BI/K X 100 TOTAL EVENTS 11 MEAN 166.00 ST DEV 62.12
TL PPM X 10 TOTAL EVENTS 22 MEAN 18.91 ST DEV 8.59
BI/TL X 100 TOTAL EVENTS 10 MEAN 26.60 ST DEV 13.29
NO. OF EVENTS
ROCKY MOUNT
GEOLOGIC UNIT QMB

A 2



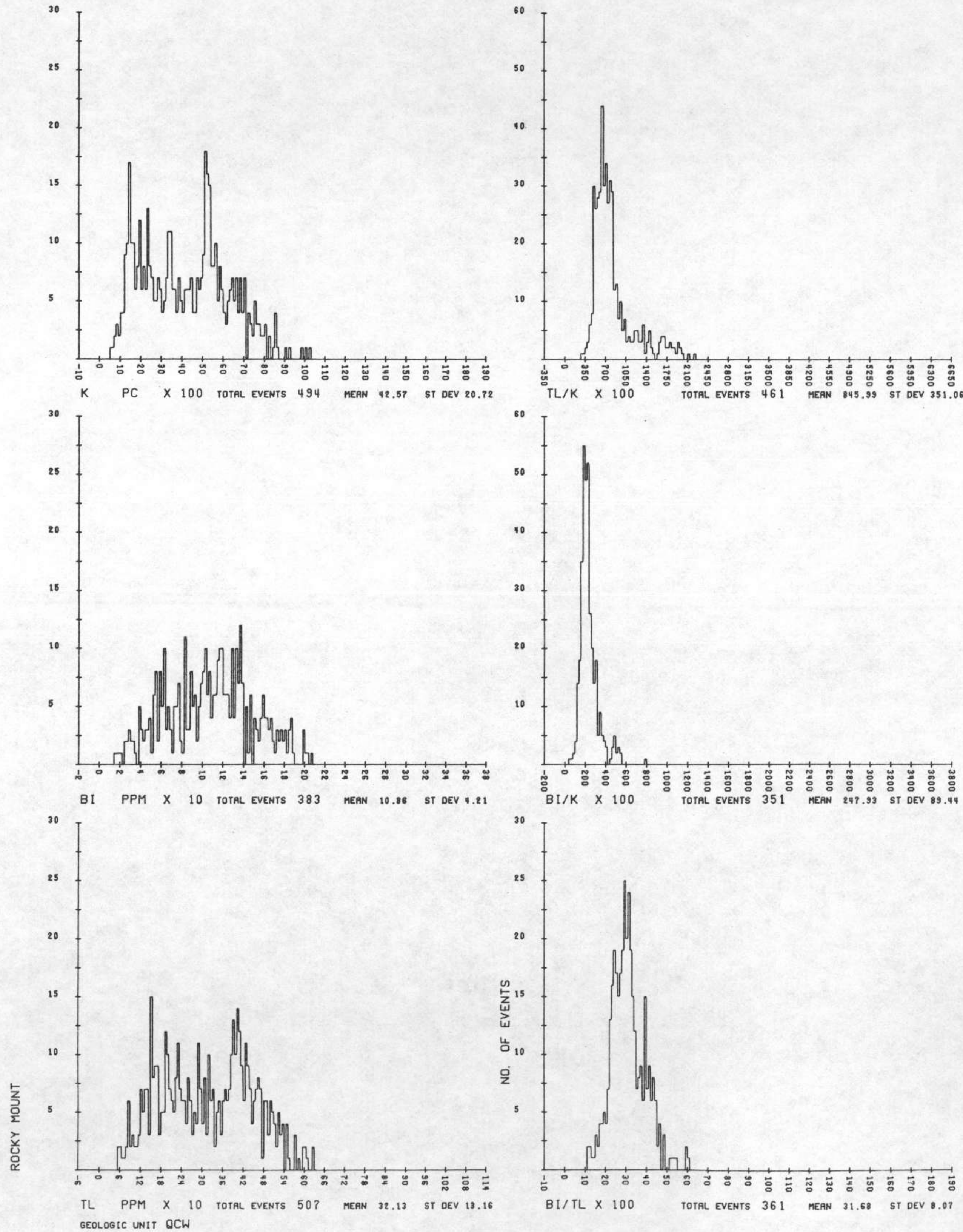
ROCKY MOUNT
NO. OF EVENTS
K PC X 100 TOTAL EVENTS 5008 MEAN 42.66 ST DEV 24.22
TL/K X 100 TOTAL EVENTS 4320 MEAN 726.62 ST DEV 350.26
BI PPM X 10 TOTAL EVENTS 3168 MEAN 9.45 ST DEV 4.09
BI/K X 100 TOTAL EVENTS 2917 MEAN 227.03 ST DEV 132.81
TL PPM X 10 TOTAL EVENTS 4588 MEAN 29.62 ST DEV 14.83
BI/TL X 100 TOTAL EVENTS 2897 MEAN 30.56 ST DEV 11.77
GEOLOGIC UNIT QCI

A 3

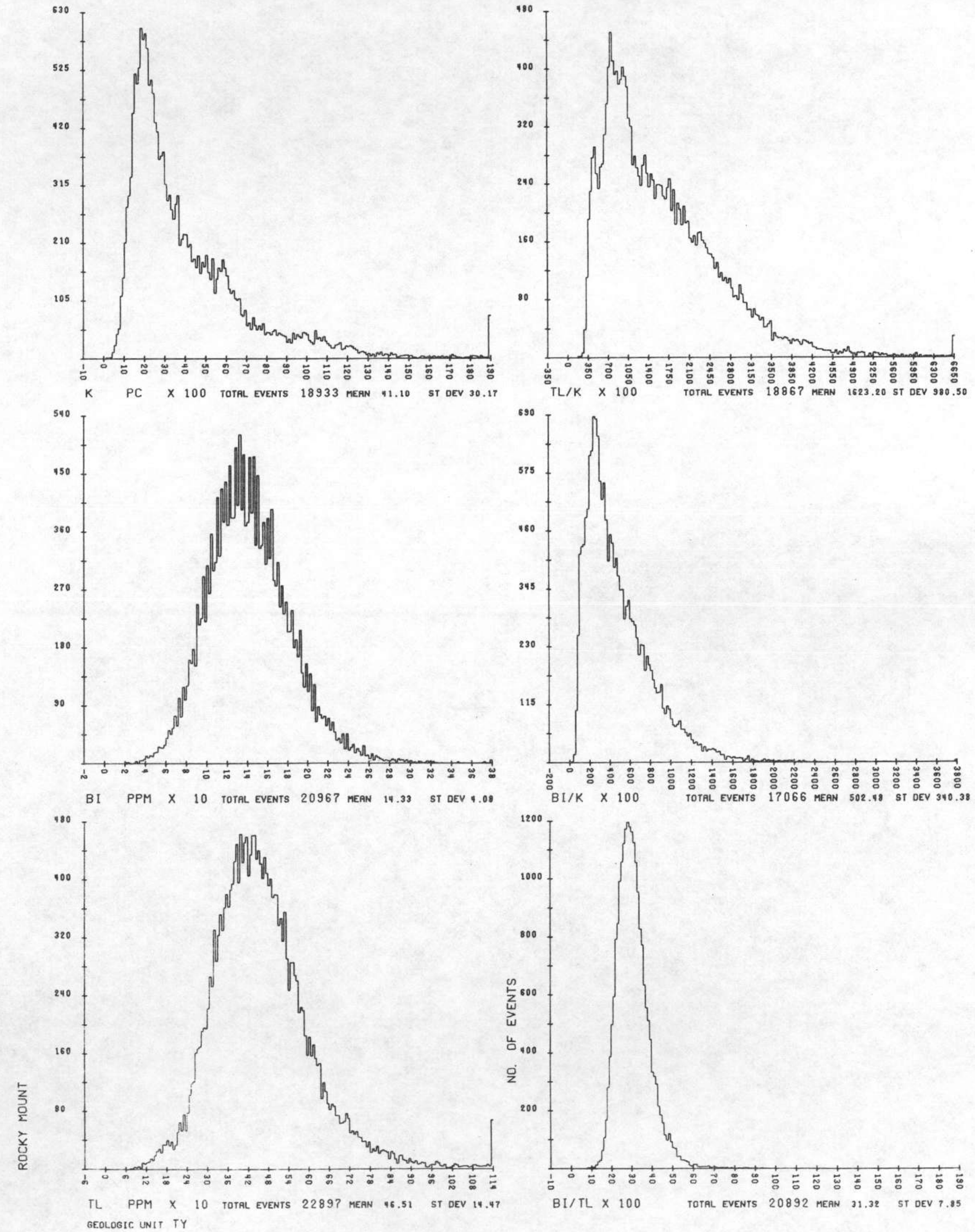


ROCKY MOUNT
NO. OF EVENTS
K PC X 100 TOTAL EVENTS 5853 MEAN 52.08 ST DEV 24.84
TL/K X 100 TOTAL EVENTS 5247 MEAN 580.13 ST DEV 220.60
BI PPM X 10 TOTAL EVENTS 3868 MEAN 10.31 ST DEV 8.68
BI/K X 100 TOTAL EVENTS 3705 MEAN 139.55 ST DEV 241.94
TL PPM X 10 TOTAL EVENTS 5454 MEAN 29.86 ST DEV 12.80
BI/TL X 100 TOTAL EVENTS 3619 MEAN 33.91 ST DEV 27.08
GEOLOGIC UNIT QSO

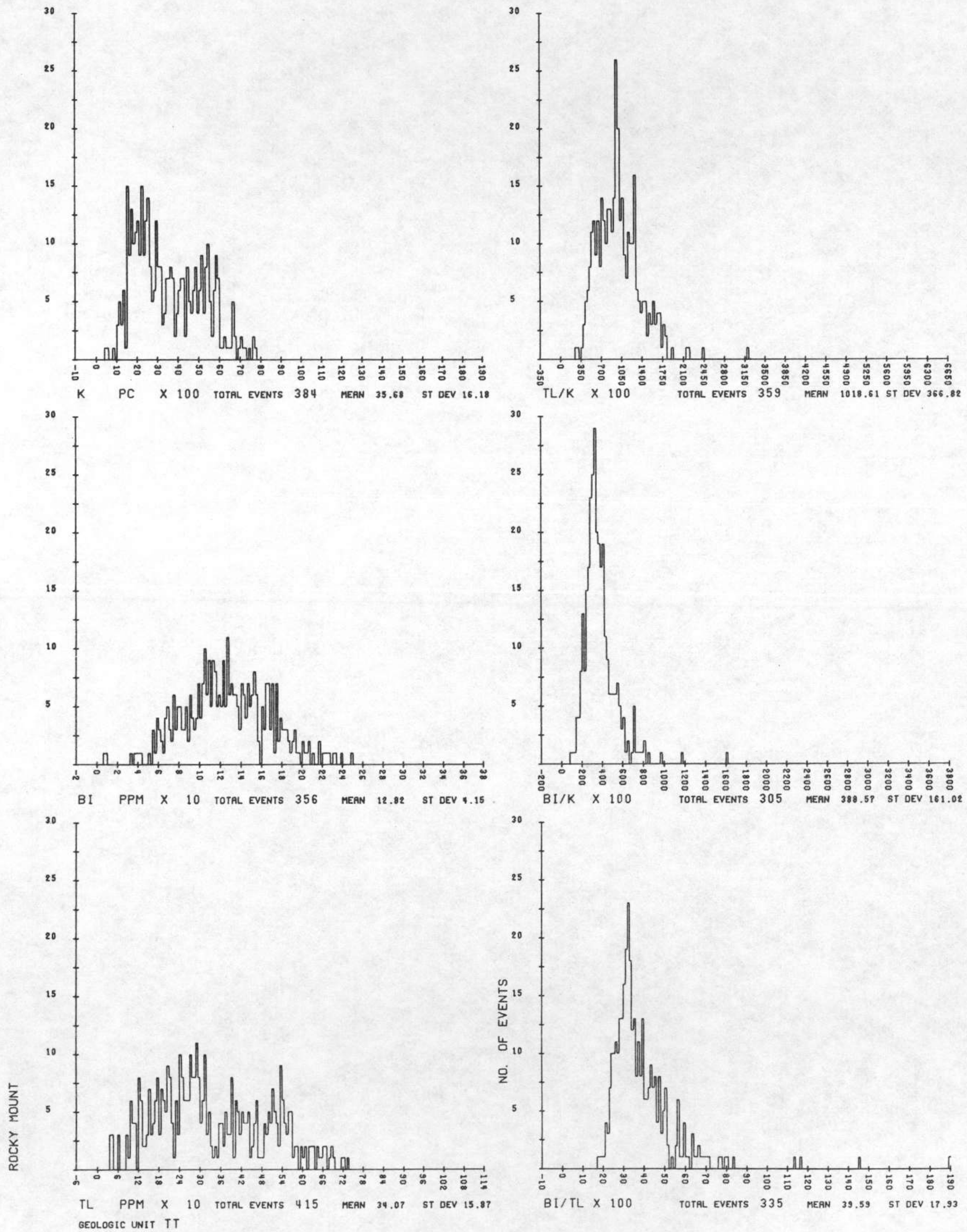
A 4


K PC X 100 TOTAL EVENTS 494 MEAN 42.57 ST DEV 20.72
TL/K X 100 TOTAL EVENTS 461 MEAN 845.99 ST DEV 351.06
BI PPM X 10 TOTAL EVENTS 383 MEAN 10.86 ST DEV 4.21
BI/K X 100 TOTAL EVENTS 351 MEAN 247.93 ST DEV 89.44
TL PPM X 10 TOTAL EVENTS 507 MEAN 32.13 ST DEV 13.16
BI/TL X 100 TOTAL EVENTS 361 MEAN 31.68 ST DEV 8.07
ROCKY MOUNT
NO. OF EVENTS
GEOLOGIC UNIT QCW

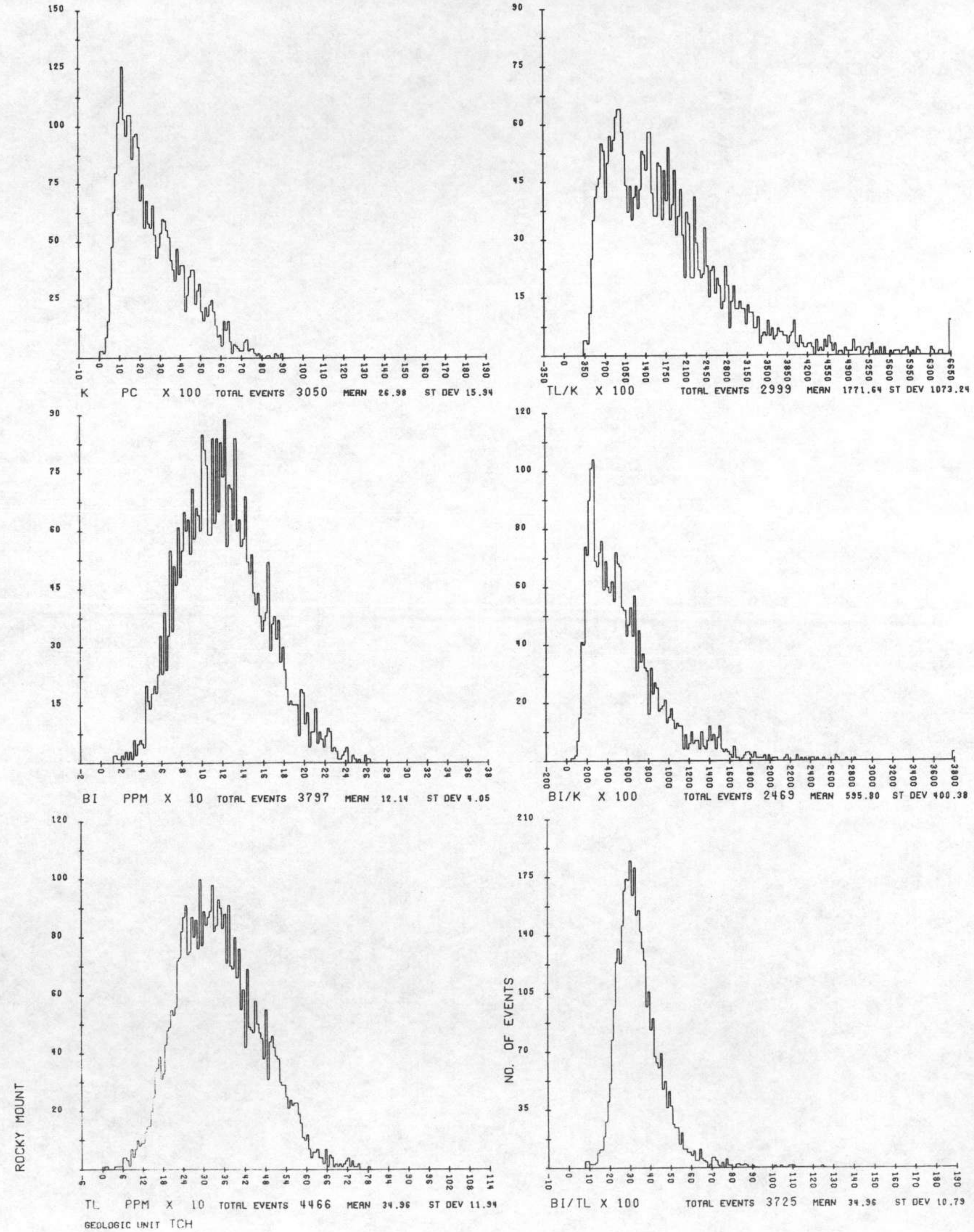
A 5


K PC X 100 TOTAL EVENTS 18933 MEAN 41.10 ST DEV 30.17
TL/K X 100 TOTAL EVENTS 18867 MEAN 1623.20 ST DEV 980.50
BI PPM X 10 TOTAL EVENTS 20967 MEAN 14.33 ST DEV 4.08
BI/K X 100 TOTAL EVENTS 17066 MEAN 502.48 ST DEV 340.38
TL PPM X 10 TOTAL EVENTS 22897 MEAN 46.51 ST DEV 14.47
BI/TL X 100 TOTAL EVENTS 20892 MEAN 31.32 ST DEV 7.85
ROCKY MOUNT
NO. OF EVENTS
GEOLOGIC UNIT TY

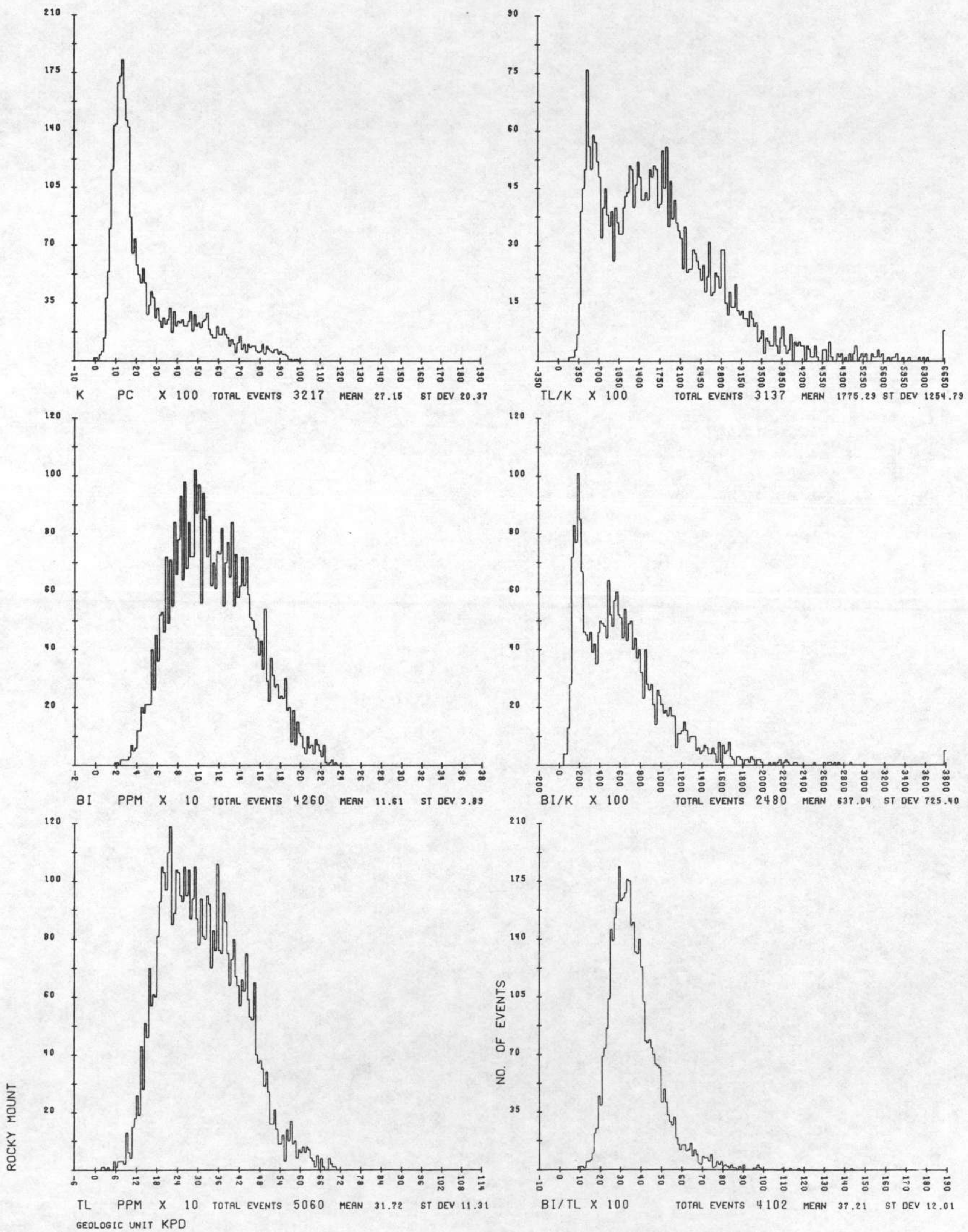
A 6


K PC X 100 TOTAL EVENTS 384 MEAN 35.68 ST DEV 16.18
TL/K X 100 TOTAL EVENTS 359 MEAN 1018.61 ST DEV 366.82
BI PPM X 10 TOTAL EVENTS 356 MEAN 12.82 ST DEV 4.15
BI/K X 100 TOTAL EVENTS 305 MEAN 388.57 ST DEV 161.02
TL PPM X 10 TOTAL EVENTS 415 MEAN 34.07 ST DEV 15.87
BI/TL X 100 TOTAL EVENTS 335 MEAN 39.59 ST DEV 17.93
NO. OF EVENTS
ROCKY MOUNT
GEOLOGIC UNIT TT

A 7


K PC X 100 TOTAL EVENTS 3050 MEAN 26.98 ST DEV 15.94
TL/K X 100 TOTAL EVENTS 2999 MEAN 1771.64 ST DEV 1073.24
BI PPM X 10 TOTAL EVENTS 3797 MEAN 12.14 ST DEV 4.05
BI/K X 100 TOTAL EVENTS 2469 MEAN 595.80 ST DEV 400.38
TL PPM X 10 TOTAL EVENTS 4466 MEAN 34.96 ST DEV 11.94
BI/TL X 100 TOTAL EVENTS 3725 MEAN 34.96 ST DEV 10.79
NO. OF EVENTS
ROCKY MOUNT
GEOLOGIC UNIT TCH

A 8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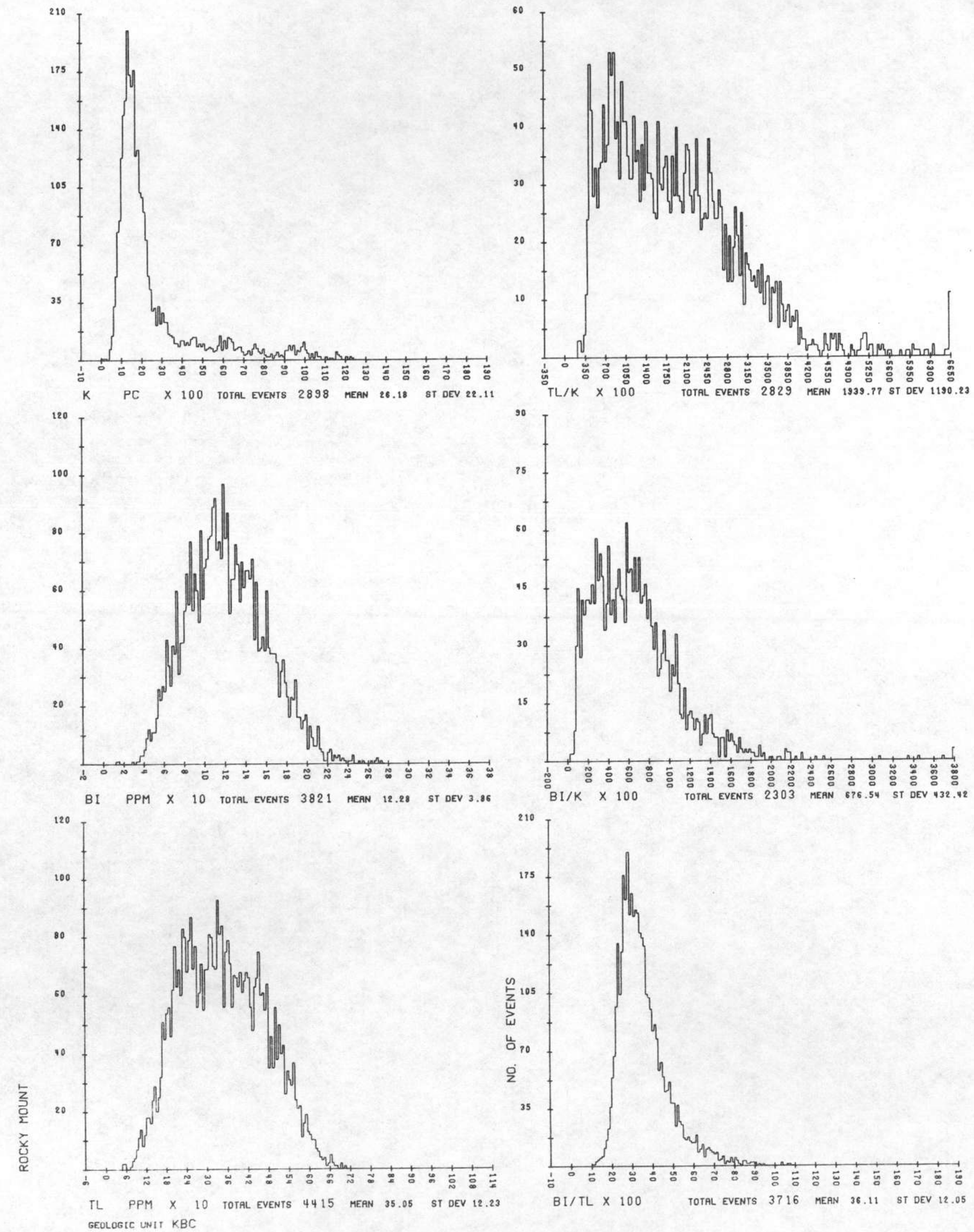
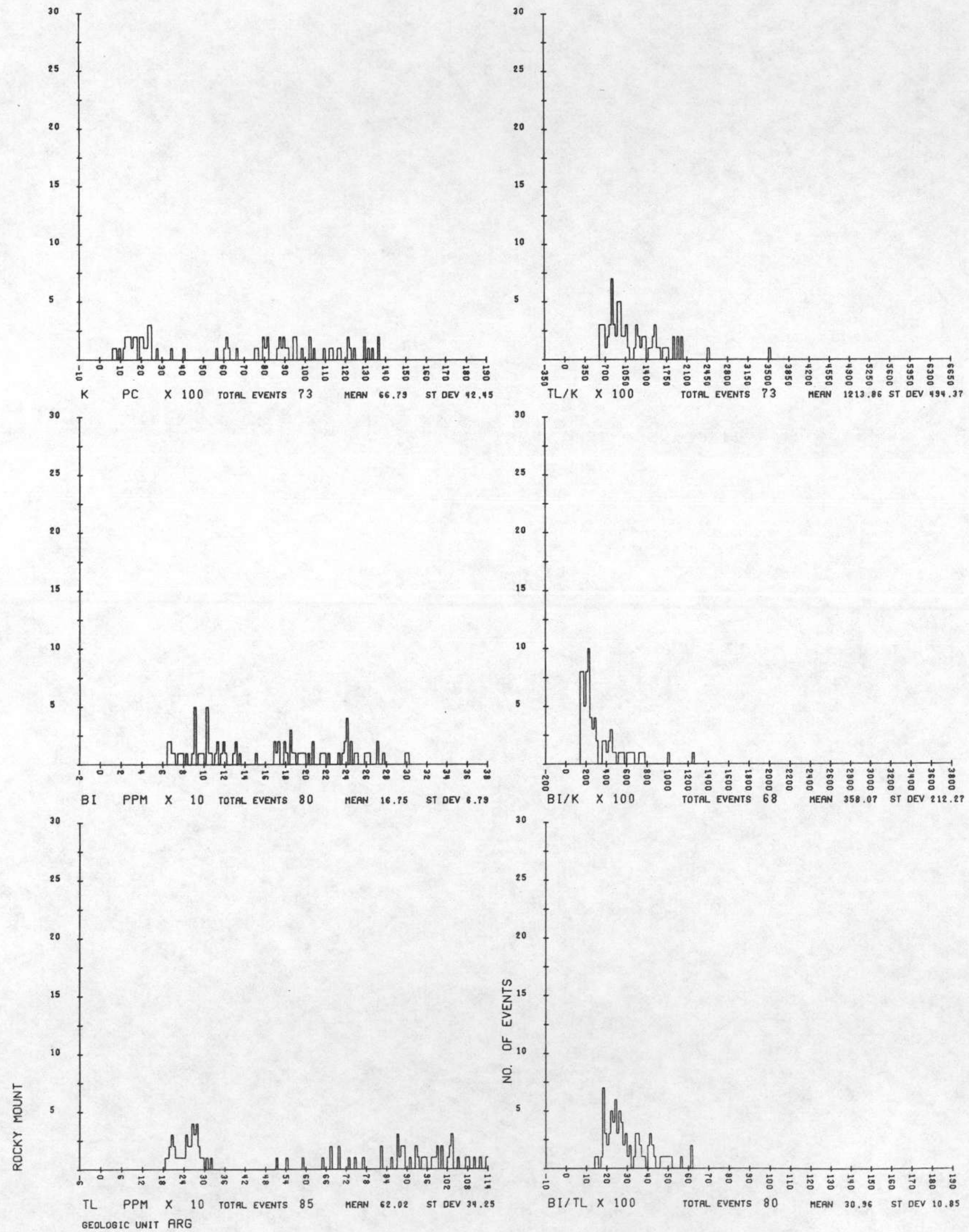
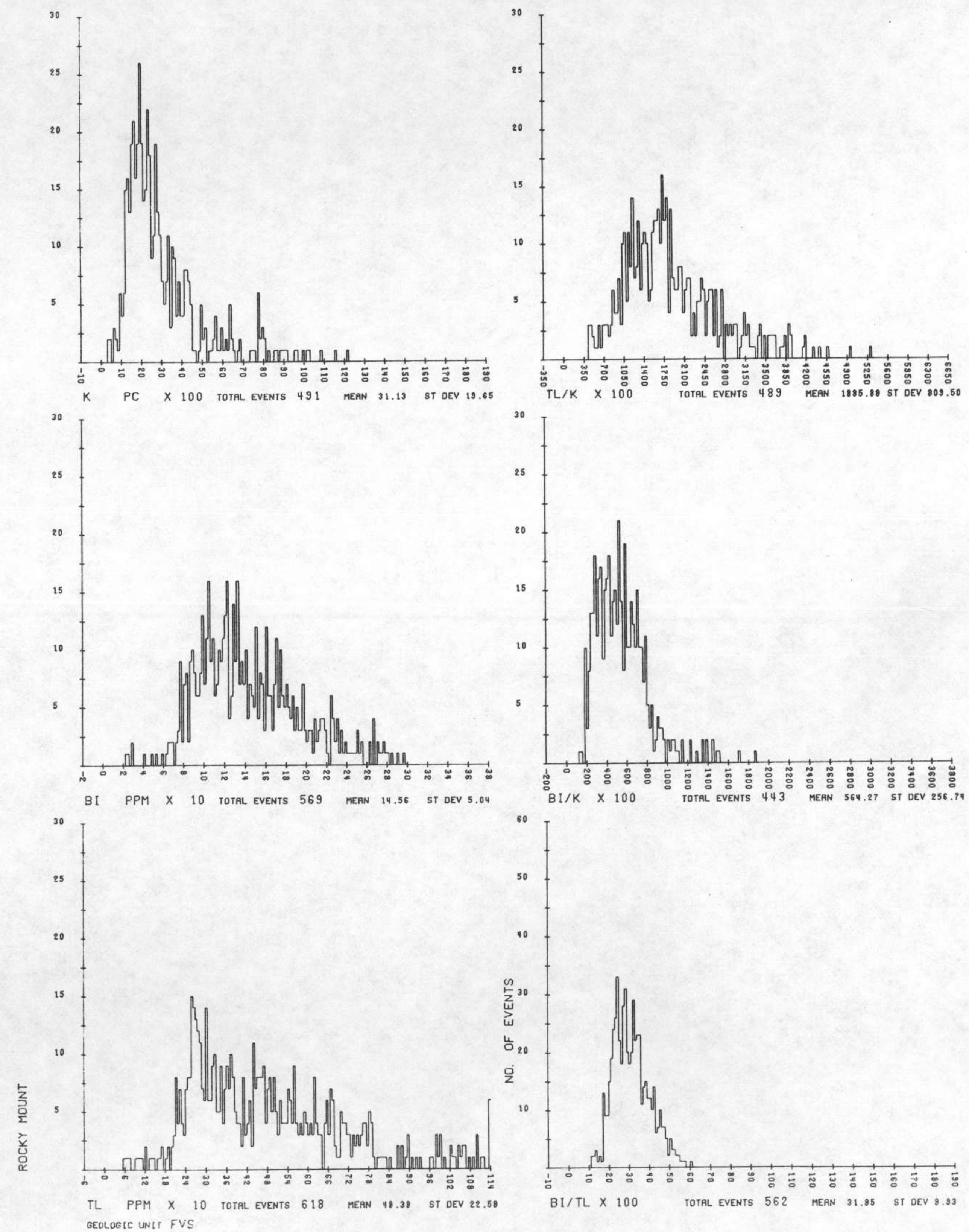
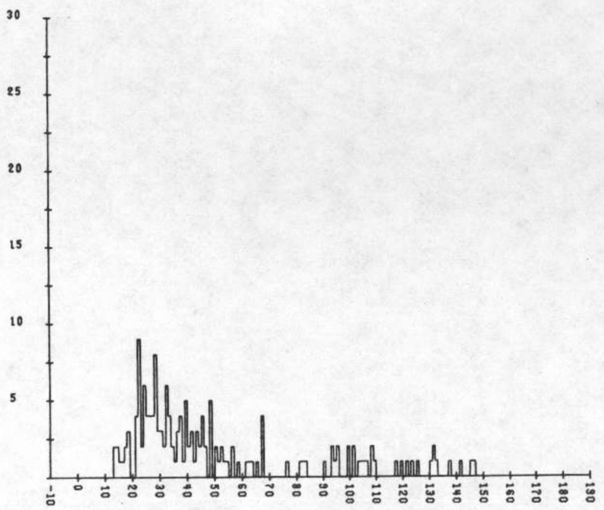
TL/K X 100 TOTAL EVENTS 3137 MEAN 1775.29 ST DEV 1254.79
BI PPM X 10 TOTAL EVENTS 4260 MEAN 11.61 ST DEV 3.89
BI/K X 100 TOTAL EVENTS 2480 MEAN 637.04 ST DEV 725.40
TL PPM X 10 TOTAL EVENTS 5060 MEAN 31.72 ST DEV 11.31
BI/TL X 100 TOTAL EVENTS 4102 MEAN 37.21 ST DEV 12.01
ROCKY MOUNT
NO. OF EVENTS
GEOLOGIC UNIT KPD

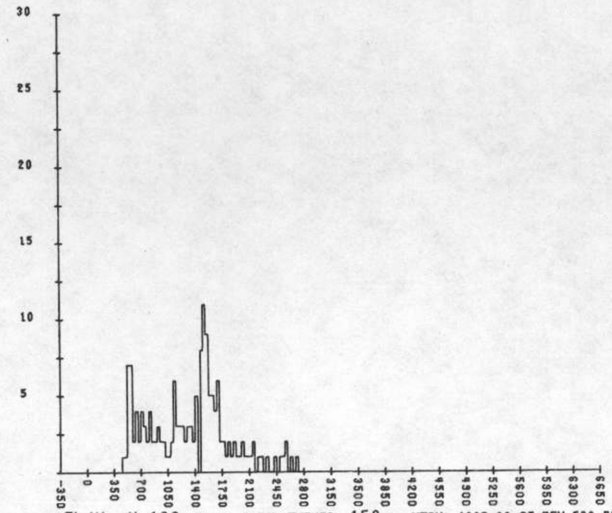

K PC X 100 TOTAL EVENTS 2898 MEAN 26.18 ST DEV 22.11
TL/K X 100 TOTAL EVENTS 2829 MEAN 1939.77 ST DEV 1190.23
BI PPM X 10 TOTAL EVENTS 3821 MEAN 12.28 ST DEV 3.86
BI/K X 100 TOTAL EVENTS 2303 MEAN 676.54 ST DEV 432.42
TL PPM X 10 TOTAL EVENTS 4415 MEAN 35.05 ST DEV 12.23
BI/TL X 100 TOTAL EVENTS 3716 MEAN 36.11 ST DEV 12.05
ROCKY MOUNT
NO. OF EVENTS
GEOLOGIC UNIT KBC


K PC X 100 TOTAL EVENTS 73 MEAN 66.79 ST DEV 42.45
TL/K X 100 TOTAL EVENTS 73 MEAN 1213.86 ST DEV 494.37
BI PPM X 10 TOTAL EVENTS 80 MEAN 16.75 ST DEV 6.79
BI/K X 100 TOTAL EVENTS 68 MEAN 358.07 ST DEV 212.27
TL PPM X 10 TOTAL EVENTS 85 MEAN 62.02 ST DEV 34.25
BI/TL X 100 TOTAL EVENTS 80 MEAN 30.96 ST DEV 10.85
ROCKY MOUNT
NO. OF EVENTS
GEOLOGIC UNIT ARG

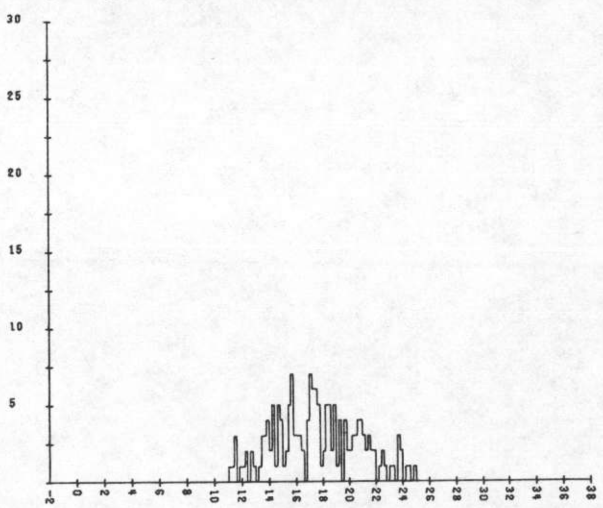

K PC X 100 TOTAL EVENTS 491 MEAN 31.13 ST DEV 19.65
TL/K X 100 TOTAL EVENTS 489 MEAN 1885.88 ST DEV 809.50
BI PPM X 10 TOTAL EVENTS 569 MEAN 14.56 ST DEV 5.04
BI/K X 100 TOTAL EVENTS 443 MEAN 564.27 ST DEV 256.74
TL PPM X 10 TOTAL EVENTS 618 MEAN 48.38 ST DEV 22.58
BI/TL X 100 TOTAL EVENTS 562 MEAN 31.85 ST DEV 8.93
ROCKY MOUNT
NO. OF EVENTS
GEOLOGIC UNIT FVS



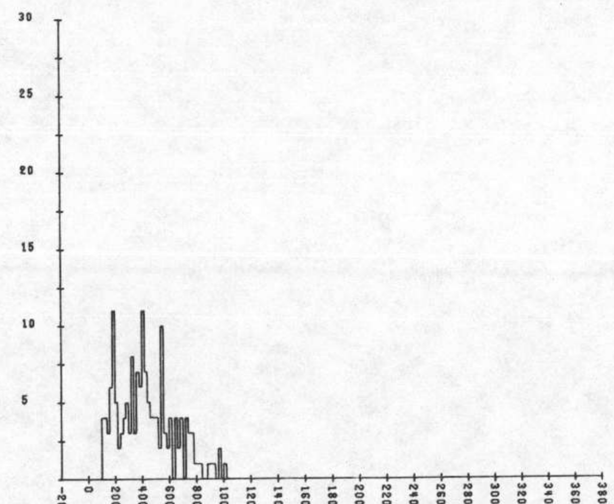
K PC X 100 TOTAL EVENTS 158 MEAN 51.97 ST DEV 34.03



TL/K X 100 TOTAL EVENTS 158 MEAN 1367.09 ST DEV 522.75

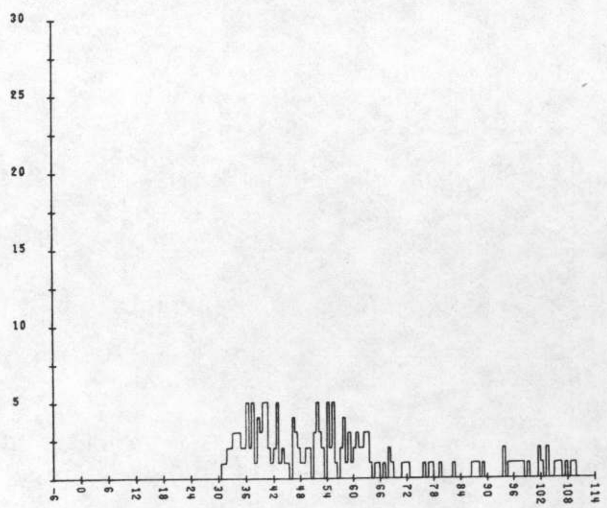


BI PPM X 10 TOTAL EVENTS 166 MEAN 17.72 ST DEV 3.20



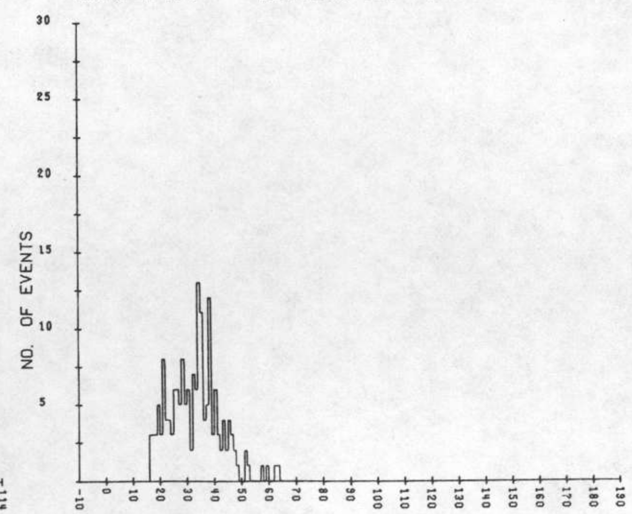
BI/K X 100 TOTAL EVENTS 155 MEAN 450.28 ST DEV 206.03

ROCKY MOUNT



TL PPM X 10 TOTAL EVENTS 169 MEAN 56.72 ST DEV 20.73

GEOLOGIC UNIT PZPB



BI/TL X 100 TOTAL EVENTS 166 MEAN 33.93 ST DEV 9.22

SECTION V

GEODATA DATA AQUISITION AND PROCESSING

SECTION V.

GEODATA DATA ACQUISITION AND PROCESSING

A. DATA ACQUISITION SYSTEM

A brief description of the computer-linked Geodata Data Acquisition System (GDAS), used in the present survey, is presented here. The five primary components of the GDAS, which are mounted aboard a Douglas Super DC-3 aircraft, Figure V.1, are:

1) An array of nine (9) 11½" dia. by 4" thick NaI(Tℓ) detectors;

2) a NOVA mini-computer system

3) a Collins ALT-50 radar altimeter system;

4) a proton precession magnetometer; and

5) a Bendix DRA-12C doppler navigation system.

The nine-crystal detector array has been calibrated to measure the gamma radiation spectrum between 0-6 MeV. The contents of the 3 to 6 MeV interval is monitored in order to reduce the contributions of the cosmic events in the 0-3 MeV interval, which is of primary interest in this survey. Eight of the nine detectors are mounted to measure the 4π solid angle gamma radiation spectrum emanating from the earth's surface. The ninth detector, which is partially shielded underneath by a 3.5-inch lead plate, is situated to measure the ^{214}Bi radiation incoming from the upper 2π solid angle.

Each crystal detector has an estimated volume of 415.5 cubic inches, resulting in a total volume for the entire 4π system of 3324 cubic inches. The estimated volume to velocity ratio for this sytem is 23.7, where the average speed for the DC3-S is approximately 140 mph.

The energy resolution of the GDAS as calculated from the ^{137}Cs 662 keV photopeak was 10.7%, where each individual crystal was 9.0% or better. Automatic digital gain calibration for the eight detector array and the single detector system was accomplished by stabilizing on the ^{40}K photopeak data.

The NOVA computer, shown in the system block diagram of Figure V.2. is the control center of the GDAS. The data is gathered by the computer for every one-second period in a manner giving no dead time when readout to the magnetic tapes for storage. Two magnetic tape recorders are used; one to record the total spectral data and the computer tabulated results (LDT), and the other to record only the computer tabulated results (CDT).

Figure V.1 Survey Aircraft

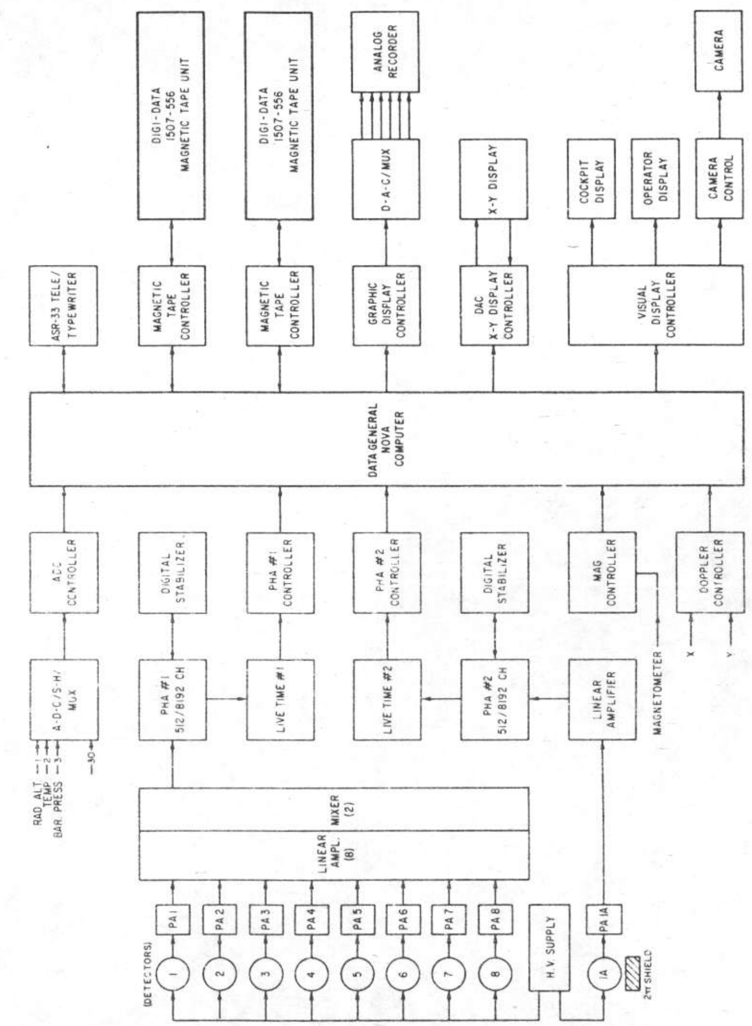


Figure V.2 System Block Diagram

Digital-to-analog conversion of the resultant intensities, their ratios and the magnetic field data are plotted on multi-track paper, allowing immediate examination for anomalous data.

The spectral data from the single detector system gathers and records the 2π spectral data every nine seconds. This 2π data is necessary to determine the amount of atmospheric ^{214}Bi radiation in the 4π spectral data. A third segment of the computer's core gathers and sums the total 2π and 4π gamma radiation spectra for each flight line, which can then be plotted as shown in Figure V.3 (EOFL spectrum).

Due to the dependence of the gamma ray data on altitude, a highly accurate radar altimeter is used. The Collins ALT-50 system is designed to make a series of 8 measurements per second, where the resulting altitude is the average.

Since the gathered data are dependent on the current ambient temperature and pressure readings, a Senso-Tek barometric pressure sensor and a Hy-Col thermocouple sensor were used to monitor conditions outside the aircraft.

A proton precession magnetometer sensor, having a 0.25 gamma readout resolution and less than a 1.0 gamma noise envelope, is sampled every second to yield a measurement of the total intensity of the earth's magnetic field below the aircraft. The sensor is carried as a "bird" on a 100-foot cable in order to minimize the magnetic effects of the aircraft.

A Bendix DRA-12C navigation system with a ±100th/nautical mile accuracy provides a doppler navigation cross-track and along-track analog signal to be recorded each second onto magnetic tape. Two other methods are used to properly locate the aircraft's track: visual sightings and photography. The first method is employed by the navigator who marks flight map location reference points with computer-displayed record numbers. The second method is a 35mm film that records a continuous, recoverable track which has a 20% overlap/frame at an elevation of 400 feet.

There are three basic operating modes of the GDAS that the operator can manipulate:

1) CALIBRATE, which allows proper gain calibration for the detectors;

2) OPERATE, which allows data to be collected, summed and recorded; and

3) PLAYBACK, which allows the operator to examine the newly acquired data.

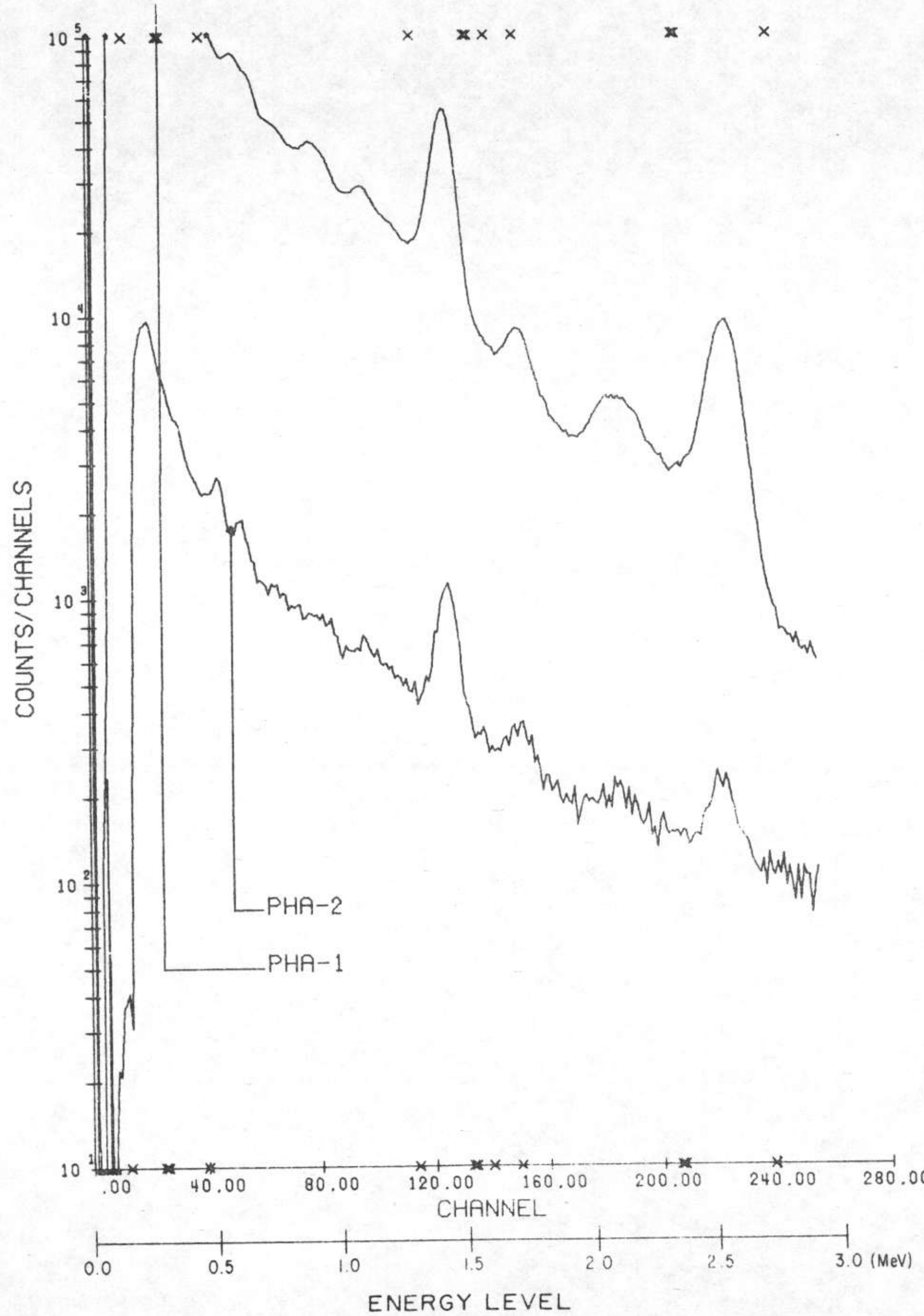


Figure V.3 Typical End-of-Flight-Line Spectral Plot

B. DATA PROCESSING

1. Data Reduction

The field data tapes produced by the data acquisition system (Section V.A) contain the 4π and 2π gamma radiation spectra, measured between 0 to 6 MeV. The resulting gamma ray spectra are composite spectra of the several different isotopes that emit gamma rays within the detectors' energy range. The method used in this work to determine the concentrations of the different isotopes monitored is discussed in this section.

In this work, there are four different isotopes which contributed to the resultant composite spectra under consideration. In order of the highest to lowest energy emitter, they are: cosmic, eTh, eU and K counting rates.

Isotope	Energy Interval (MeV)
Cosmic	3.0 to 6.0
^{208}Tl	2.410 to 2.796
^{214}Bi	1.661 to 1.860
^{40}K	1.357 to 1.556

Due to the occurrence of Compton scatter at all gamma ray energy intervals, a 4 x 4 matrix method approach is used to "spectrally strip" the group summed counting rates into their individual counting rates attributed only to the isotope associated with that energy interval.

This matrix method approach is theoretically applicable to a spectrum containing any number of isotopic gamma rays. For convenience, the four isotopes will be denoted as: COS, TL, BI and K. The channel group sum for each energy interval can be considered to consist of fractional components of each of its constituents. For instance, one can write for the TL channel group sum:

$$aCOS + 1.0TL + fBI + 0.0K = MTL$$

where MTL is the channel group sum count;

and the coefficients, which are known as Compton coefficients, for each variable represent the responses of the data gathering system to each isotope over the entire energy spectrum.

Similarly, equations can be written for the energy interval group sums for MCOS, MBI and MK, as shown below in matrix notation by

$$\begin{bmatrix} 1.0 & 0.0 & 0.0 & 0.0 \\ a & 1.0 & f & 0.0 \\ b & \alpha & 1.0 & g \\ c & \beta & \gamma & 1.0 \end{bmatrix} \begin{bmatrix} COS \\ TL \\ BI \\ K \end{bmatrix} = \begin{bmatrix} MCOS \\ MTL \\ MBI \\ MK \end{bmatrix}$$

where each element of the 4 x 4 matrix is a Compton coefficient. By inverting the 4 x 4 matrix and multiplying on the left by the channel group sum matrix, the resulting column matrix, whose elements are COS, TL, BI, and K, represents the counts in each energy interval attributed only to the indicated isotope source.

Table V.1 contains the data reduction parameters, coefficients and backgrounds used in this survey. The listed Compton coefficients were determined from data acquired during high altitude flights and from "known" test pad data concentrations in Grand Junction, Colorado.

The resulting reduced counting rates for COS, TL, BI and K must then be normalized with respect to the measured live time counting rate of the data acquisition system. This is necessary in order to restore the linear relationship between the photopeak counts and the source's intensity. This procedure is accomplished by dividing the reduced counts by the live time, LTC1:

thus,

$$COS1 = COS/LTC1$$
$$TL1 = TL/LTC1$$
$$BI1 = BI/LTC1$$
$$K1 = K/LTC1$$

The next step in the data processing involves the subtraction of the background counts present onboard the aircraft. The background counts, which exist in the aircraft and its equipment, are determined from high altitude data where the data acquisition is free from all ground sources and atmospheric ^{214}Bi contamination. The background counts, denoted as B_{TL}, B_{BI} and B_K, used in this work are listed in Table V.1. During the processing, the backgrounds are checked by observing the resulting counting rates over large bodies of water, where the rates would have near zero intensities. The gross count's background counting rate, B_{GC}, over channels 35-239, is also given in Table V.1.

After the backgrounds have been subtracted from the live time corrected photopeak counts, thus

$$\overline{TL1} = TL1 - B_{T\ell}$$
$$\overline{BI1} = BI1 - B_{Bi}$$
$$\overline{K1} = K1 - B_K$$

The resulting counting rates for $\overline{TL1}$ and $\overline{K1}$ represent the counts contributed only by the sources below the aircraft on the earth's surface. In the case of $\overline{BI1}$, an additional source of ^{214}Bi radiation, which is caused by atmospheric ^{214}Bi, BIAIR, is still eminent.

The 2π detector system data is used to determine the magnitude of the BIAIR to be subtracted. Since the predominate variable source affecting the 2π detector is the atmospheric ^{214}Bi, it is possible to utilize most of the 2π spectrum in the BIAIR determination, and thereby produce some improvement in the statistical error. The energy interval used for the 2π crystal is between 1.05 to 2.79 MeV. Within this interval, the aircraft's background, $B_{2\pi}$, and its Compton coefficient, $C_{2\pi}$, have been determined from the high altitude data. (See Table V.1).

The BIAIR associated with the unshielded detector array is determined, using the shielded detector by the relation:

$$BIAIR = \left(\frac{G(x)}{1 - k_2 G(x)}\right) [VC - C_{2\pi} \cdot COS1 - B_{2\pi} - RVALM]$$

where

G(x) is the relationship between the 4π and 2π solid angles, the channel group sums and the number of detectors in the detector arrays;

VC is the 2π total count group sum of channels 91-239, c/s:

COS1 is the 4π cosmic count, greater than 3.0 MeV, c/s;

and,

$$RVALM = k_1 \overline{TL1} + k_2 \overline{BI1} + k_3 \overline{K1}$$

where k_1, k_2, k_3 are constant factors that correct for the penetration/spill of the emanated surface radiation. These penetration/spill constants are dependent on the amount of lead shielding used on the 2π crystal. The values used in this work are listed in Table V.1.

$\overline{TL1}$, $\overline{BI1}$ and $\overline{K1}$ have already been defined as the 4π reduced data counting rates, c/s.

Finally, the ^{214}Bi counting rate caused only by the surface sources is given by

$$BISUR = \overline{BI1} - BIAIR$$

Briefly summarizing, $\overline{TL1}$, BISUR and $\overline{K1}$ are the counting rates as measured at the height of the aircraft. All interfering counts from cosmic, backgrounds and atmospheric ^{214}Bi have been removed.

Since the various counting rates are dependent upon the height of the aircraft above the surface terrain, it is necessary to correct the associated isotope's counting rate to an altitude of 400 feet above the surface terrain. This is accomplished through the equations indicated below:

$$TLS = \overline{TL1} \cdot e^{-\mu_1 (400 - \frac{\rho}{\rho_o} x)}$$

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

$$KS = \overline{K1} \cdot e^{-\mu_3 (400 - \frac{\rho}{\rho_o} x)}$$

and

$$GC(\text{gross count}) = (\overline{GC} - B_{GC} - S \cdot BIAIR) \cdot e^{-\mu_4 (400 - \frac{\rho}{\rho_o} x)}$$

where

$\overline{GC}$ is the live time corrected gross count. channels 35-239,

S is the ratio of the BI data, channels 35-239 to channels 143-159,

B_{GC} is the gross count background,

TLS,BIS,KS	are the respective photopeak's counting rates at 400 feet;
ρ_o	is the air density at standard temperature and pressure; 0.001293 gm/cc
ρ	is the air density at the time the survey data was flown;
μ_1,μ_2,μ_3,μ_4	are the respective linear attenuation coefficients;
x	is the aircraft's height above the surface terrain in feet.

The attenuation coefficients and other constants used in the altitude normalization are listed in Table V.1.

After each flight line of data has undergone the above data reduction, the average values for each radiation variable and variable ratios for each of the flight lines were plotted to demonstrate the consistency of the average values and that a smooth flow continues from day to day, and from the start to the finish of each day.

Diurnal variations of the magnetic field base station intensity were measured and applied to the field data. (See Section II.D and Appendix I.C). The magnetic heading corrections for the aircraft and its equipment used in this survey were determined by flying a predetermined path at a survey altitude in first an east to west direction, then in a west to east direction. The same procedure is used on a north to south path. Based on the data obtained in this fashion, see Table V.1, the heading corrections were removed from all the data. The magnetic field data were then IGRF corrected to give the residual magnetic field. The International Geomagnetic Reference Field subtracted was provided by the U.S. Geological Survey with reference to the IAGA Bulletin #38, "Grid Values and Charts by the IGRF 1975.0", National Technical Information Service Report #PB265483.

The system sensitivities at 400 feet used in this survey are shown in Table V.1.

2. Description of the Data Processing

The processing flow chart representative of the work performed in this survey is shown in Figure V.4.

As stated in Section V.A., the original field data tapes were recorded to contain the various tag words, 4π and 2π spectral

TABLE V.1: DATA REDUCTION PARAMETERS AND CONSTANTS - N540S 1979

AIRCRAFT BACKGROUNDS				COSMIC CORRECTION RATIOS	
Detector	Parameter	Window	Value (CPS)	Parameter	Value
Terrestrial (4π)	B_K	Potassium	25.82	c	0.2028
	B_{Bi}	Uranium	9.42	b	0.1546
	$B_{T\ell}$	Thorium	7.60	a	0.1897
	B_{GC}	Gross	337.0	-	
Atmospheric (2π)	$B_{2\pi}$	Uranium	8.19	$C_{2\pi}$	0.2169

DERIVED STRIPPING COEFFICIENTS AND RATIOS			
Coefficient	Value	Coefficient	Value
α	0.2889	k_1	0.053
β	0.3896	k_2	0.0
γ	0.8669	k_3	0.0
f	0.0	S	17.5
g	0.0		

LINEAR ABSORPTION COEFFICIENTS		
Radio Element	Parameter	Value ($x10^{-3}$ per ft.)
Potassium	μ_1	2.795
Uranium	μ_2	2.212
Thorium	μ_3	2.129
Gross	μ_4	2.160

MAGNETIC HEADING CORRECTION	
Flight Direction	Correction (gammas)
West to East	+3.56
East to West	-3.56
North to South	-1.0
South to North	+1.0

RADIOELEMENT	SYSTEM SENSITIVITIES AT 400 FEET
Potassium (cps/%K)	105.00
Uranium (cps/ppm eU)	13.85
Thorium (cps/ppm eTh)	7.24

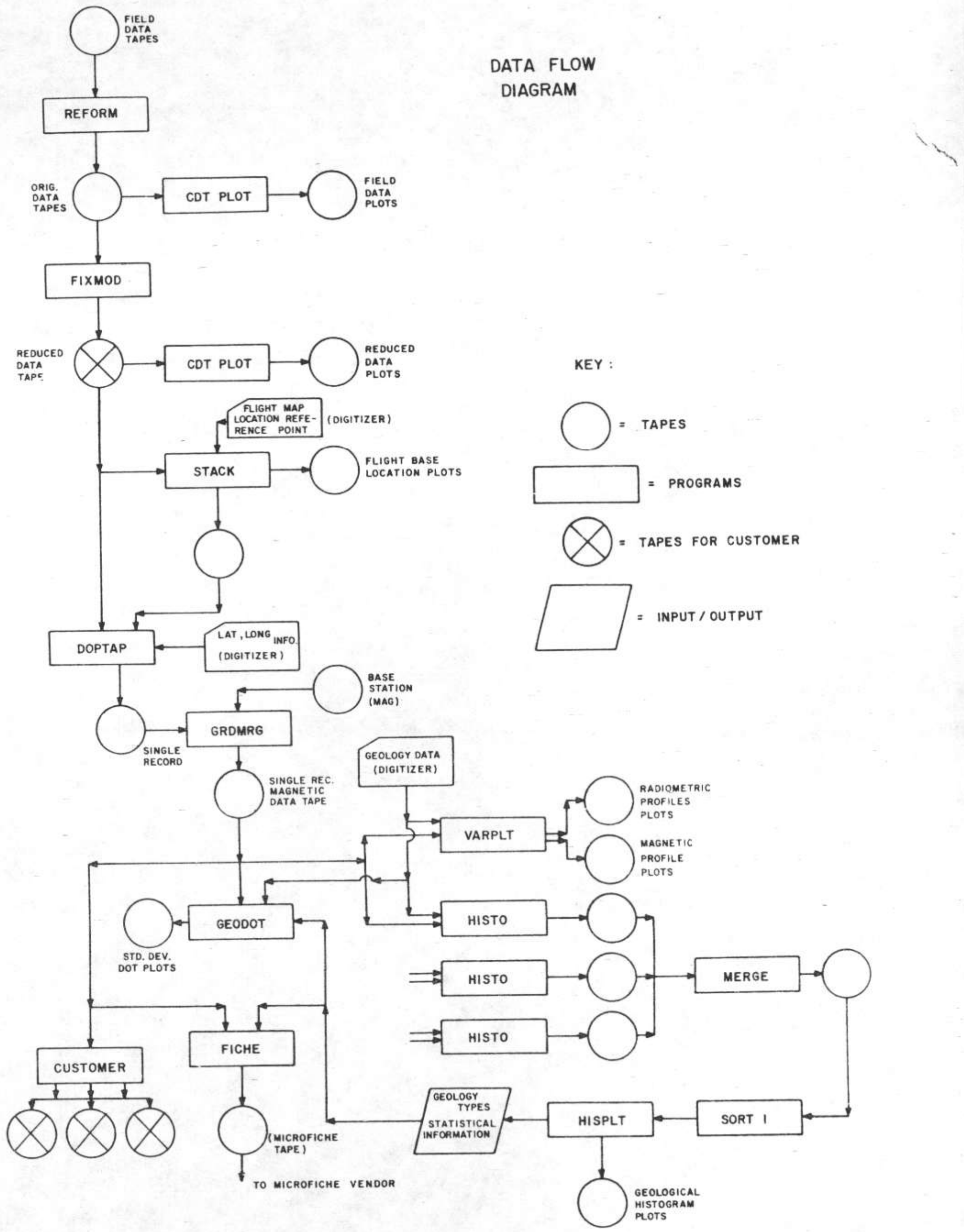


Figure V.4 Data Reduction Flow Chart

data and the trailer record sums for each flight line. The purpose of the REFORM program is to sum the raw spectral data (LDT) into the proper group sum energy intervals for each second for each line. The CDTPLT program is a data certification program that produces the EOFL spectral plots, Figure V.3, and profiles of each of the channel group sums, which are plotted as a function of each line's record numbers.

A brief summary of each program and its uses is given below:

PROGRAM	FUNCTION
REFORM	Produces energy group sums and EOFL spectra.
FIXMOD	Primary processing for "spectral stripping" matrix reduction, live time normalization, background and BIAIR subtraction, and altitude corrections.
STACK	Flight path recovery to produce record location map at a scale of 1:250,000.
DOPTAP	Single record processing with latitude/longitude positioning, IGRF and single point statistical adequacy computations, and magnetic heading corrections.
GNDMRG	Merges aircraft magnetometer and ground magnetometer in proper time sequence and applies diurnal corrections to the field data.
VARPLT	Produces radiometric and magnetic stacked profile plot tapes.
HISTO,MERGE, and SORT1	Preliminary programs to prepare/sort data as a function of geologic type for the entire area.
HISPLT	Produces geological histograms,mean and standard deviation tables,and plot tape for the entire area.
GEODOT	Produces plot tape for standard deviation "dot plots" related to geologic type.
FICHE	Produces average record and single record reduced data listings and microfiche tapes, which are sent to microfiche vendor.
CUSTOMER	Produces all customer required tapes.

3. Data Presentation

The surveyed area was positioned geographically to completely cover the specific National Topographic Map. Each topographic map has been used as the flight base and sufficient geographical and 15' location information has been shown. The flight line pattern has been superpositioned 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.

The multivariable map line profile, which represents 10 variables as a function of their latitude and longitude location for each line, is presented at a scale of 1:500,000. Each profile presents:

1. Aircraft altitude above the surface
2. eTh ($^{208}T\ell$ 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 ($^{214}Bi/^{208}T\ell$) ratio
9. eU/K ($^{214}Bi/^{40}K$) ratio
10. eTh/K ($^{208}T\ell/^{40}K$) ratio
11. Geologic data, including aircraft flight path

The residual magnetic field map line profile, which represents five variables as a function of their latitude and longitude location 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. Residual magnetic field data
5. Magnetic field base line station data
6. Geological data, including aircraft flight path

The output of these various computations supplies, beyond 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.
* Average radiation concentration for each variable as a function of flight line, including the atmospheric ^{214}Bi.
* Set of maps showing the standard deviation data as a function of location and radiation variable.
* Printer plot contour maps of eTh, eU, K, eU/K, eU/eTh, eTh/K and the magnetics at a scale of 1:500,000.

4. Statistical Analysis Procedures

It is necessary to exclude from the statistical analysis all variables which have too low a counting rate to be statistically valid, and data which were obtained at altitudes above 1,000 feet. To this end, a statistical adequacy test was run on all data for each data record. If a given value of Tℓ, Bi or K failed the test, that variable value, and any ratio value associated with it, were not used in the statistical determinations of mean and standard deviation values. In addition, such values are indicated on the radiometric profiles by a vertical (tick) mark along the base line for the variable, and are flagged in the single record and averaged record listings (microfiche). The ratio values are set to zero in the Radiometric Profile Plots. The flags in the listings appear under the heading AKUT for altitude, ^{40}K, ^{214}Bi and $^{208}T\ell$, respectively. The flags are zero for statistically valid data, and one for rejected data in the case of K, U and T. For altitude (A), a zero indicates altitudes to 700 feet, a one (1) indicates altitudes between 700 and 1,000 feet, and a two (2) indicates altitudes above 1,000 feet.

The tests used to reject data were as follows:

(1) $\overline{T\ell I} < 1.5 \sqrt{T\ell w - \overline{T\ell I}} = 1.5\sigma T$

(2) $BISUR < 1.5 \sqrt{Biw - BISUR} = 1.5\sigma B$

(3) $\overline{KI} < 1.5 \sqrt{Kw - \overline{KI}} = 1.5\sigma K$

where the "w" subscript refers to the respective window counting rates from the raw data and $\overline{T\ell 1}$, BISUR and $\overline{K1}$ have previously been defined. If any of the above inequalities were true, the associated variable was flagged, and that value was rejected in all statistical determinations.

The values of the radicals in the above equations, which are indicated as σT, σB, σK and the barred values, were calculated on the basis of a single record value for determining flags in the single record listings and the 7-point weighted values for determining flags in the averaged records listings.

The mean value and standard deviations were calculated assuming the data to have a normal distribution within a geologic type. The equation used in determining the variance is:

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

where N is the number of statistically valid samples for a given geologic type, x_i is the value of the variable for sample number i, and $\bar{x}$ is the mean value of the variable for the geologic type. Values from the entire survey of the area are used in these computations.

APPENDICES

AI.A PRODUCTION SUMMARY - SURVEY TIME PERIOD

ML/TL	DATE FLOWN	SURVEY LINE MILES	AVERAGE SPEED/DAY	AVERAGE ALTITUDE/DAY
ML2,4,6,8, 10,12,14,16 18,20,21,22 23	August 13, 1979	839	135	430
ML1E,1W,3	August 16, 1979	184	137	445
ML15E,15W, 15C,17E,19E, TL1,2,3,4,5 6,7, TL1(Manteo)	August 17, 1979	643	139	426
ML9,11,13, 17W,19W	August 18, 1979	485	133	418
ML5,7E	August 20, 1979	101	132	434
ML7W	August 23, 1979	65	135	417

AI.B TEST LINE RESULTS

	AUGUST - 1979					
UNIT	13	16	17*	18	20*	23
PRE COS	31.52	31.62	31.16	31.02	30.16	29.80
POS COS	31.21	31.37	31.02	-	-	-
T1	29.96	30.08	14.44	15.86	21.34	31.84
T1	29.17	29.17	31.54	-	-	-
Bi	18.86	14.39	9.06	10.03	14.36	19.11
Bi	15.72	15.43	14.63	-	-	-
K	25.35	26.91	12.01	14.57	21.18	27.26
K	28.58	28.81	24.09	-	-	-
TGC	893.66	848.90	500.00	678.34	812.96	909.67
TGC	859.67	853.97	859.54	-	-	-
BiAir	4.56	2.49	1.78	2.13	4.21	6.90
BiAir	3.40	3.74	3.58	-	-	-
ALT	498.70	436.06	438.29	547.32	563.72	436.85
ALT	456.85	454.89	463.30	-	-	-

* Test Line Location Changes

AI.C DIURNAL CORRECTIONS TO LINE DATA

LINE	DIURNAL CORRECTIONS IN GAMMAS	LINE	DIURNAL CORRECTIONS IN GAMMAS
TL7	3	ML19E	-18
TL6	0	ML19W	14
TL5	-6	ML20	-33
TL4	0	ML21	8
TL3	0	ML22	-41
TL2	2	ML23	-26
TL1	-19		
TL1(Manteo)	0		
ML1W	9		
ML1E	8		
ML2	4		
ML3	0		
ML4	6		
ML5	2		
ML6	11		
ML7W	23		
ML7E	-22		
ML8	3		
ML9	0		
ML10	9		
ML11	-27		
ML12	20		
ML13	-20		
ML14	22		
ML15E	-21		
ML15C	-27		
ML15W	-35		
ML16	19		
ML17W	-14		
ML17E	-23		
ML18	-24		

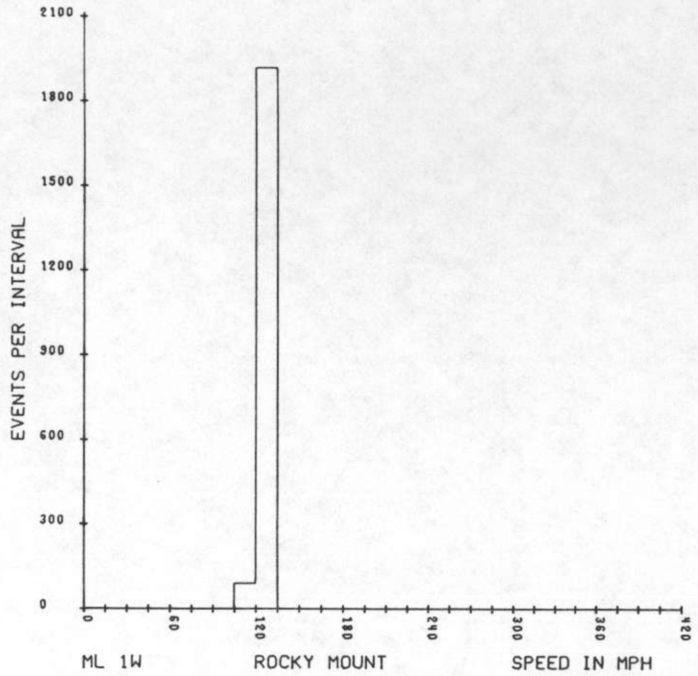
AI.D EXPLANATORY NOTES

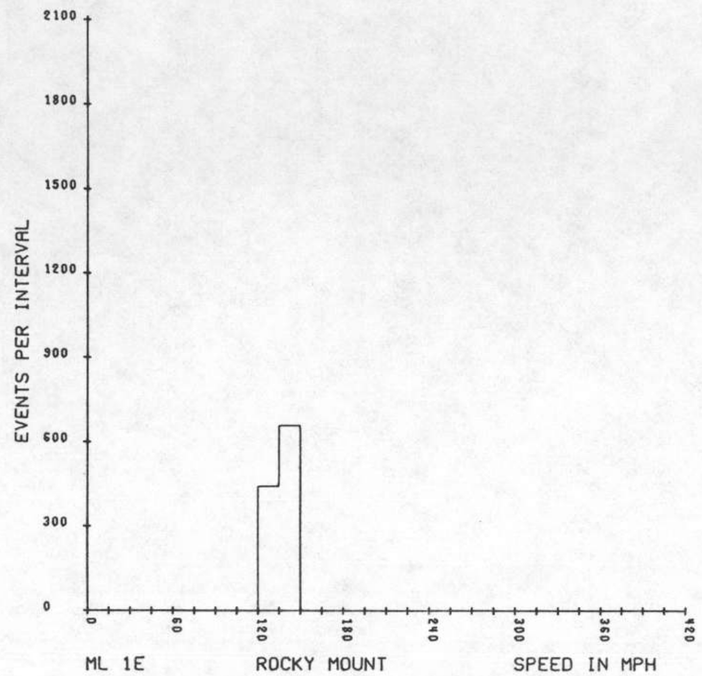
The correspondence between the map/tie line numbering systems of the base maps and profiles of this report to those listed on the customer magnetic tapes is given below:

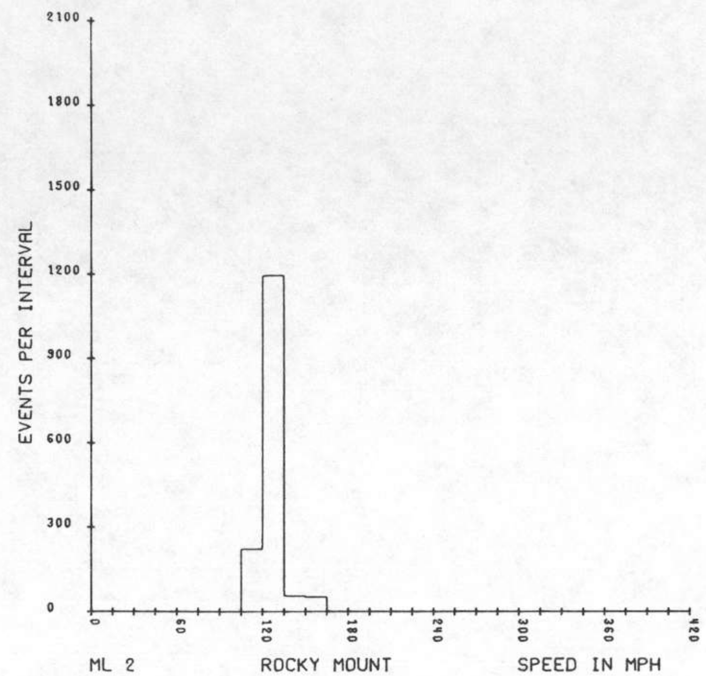
Report	Customer Tapes	Report	Customer Tapes
ML1W	20		
ML1E	21		
ML2	40		
ML3	60		
ML4	80		
ML5	100		
ML6	120		
ML7W	140		
ML7E	141		
ML8	160		
ML9	180		
ML10	200		
ML11	220		
ML12	240		
ML13	260		
ML14	280		
ML15W	300		
ML15C	301		
ML15E	302		
ML16	320		
ML17W	340		
ML17E	341		
ML18	360		
ML19W	380		
ML19E	381		
ML20	400		
ML21	420		
ML22	440		
ML23	460		
TL1	5020		
TL2	5040		
TL3	5060		
TL4	5080		
TL5	5100		
TL6	5120		
TL7	5140		
TL1(Manteo)			

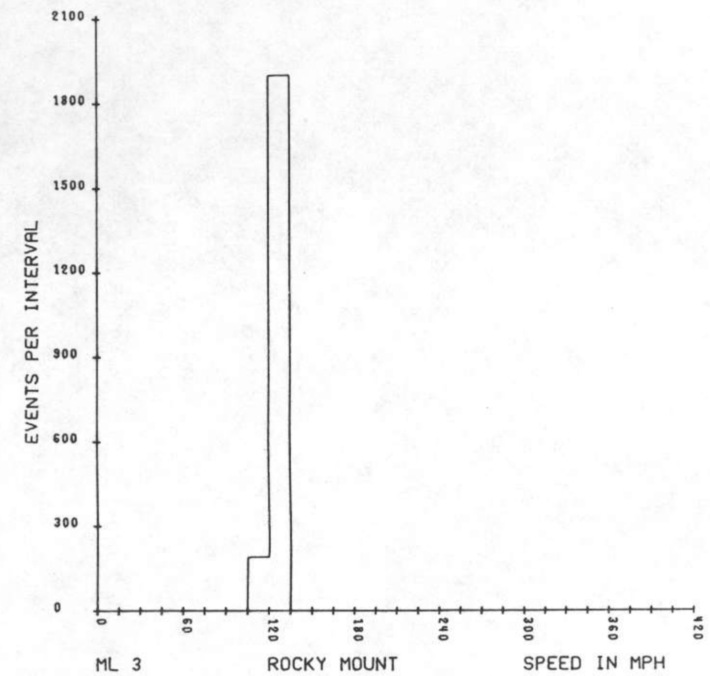
AI.E AVERAGE SPEED AND ALTITUDE DATA SUMMARY

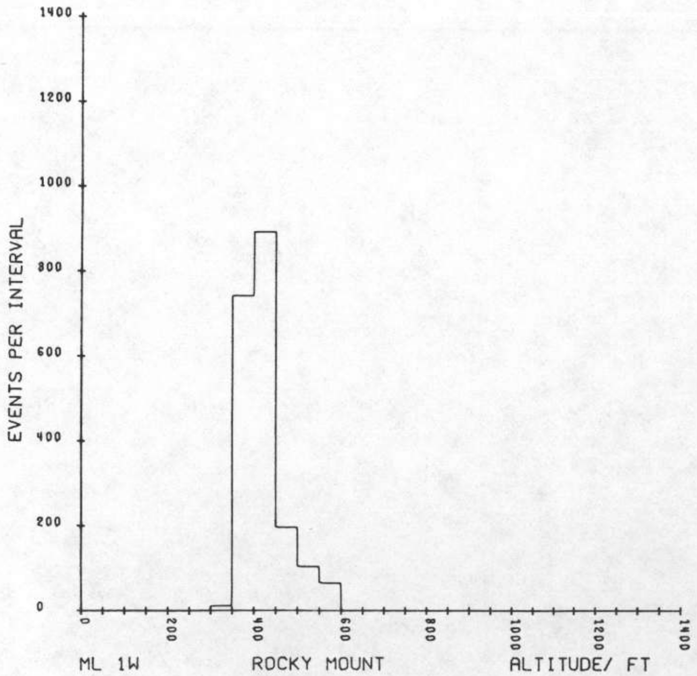
LINE	AVERAGE SPEED, MPH	AVERAGE ALTITUDE, FT	LINE	AVERAGE SPEED, MPH	AVERAGE ALTITUDE, FT
TL7	132.35	422.46			
TL6	135.26	436.30			
TL5	135.73	417.25			
TL4	139.70	431.22			
TL3	140.17	429.15			
TL2	141.23	442.35			
TL1	137.23	427.28			
TL1(Manteo)	140.08	400.00			
ML1W	134.33	445.87			
ML1E	143.98	443.20			
ML2	134.37	438.96			
ML3	133.69	446.32			
ML4	133.64	416.55			
ML5	134.48	427.91			
ML6	134.41	423.66			
ML7W	135.46	416.98			
ML7E	130.40	441.33			
ML8	133.86	509.76			
ML9	135.10	425.50			
ML10	135.49	428.71			
ML11	133.95	429.04			
ML12	134.85	411.31			
ML13	133.96	414.70			
ML14	135.66	432.39			
ML15E	142.50	416.86			
ML15C	135.15	421.62			
ML15W	135.02	435.91			
ML16	133.62	413.24			
ML17W	132.75	418.82			
ML17E	136.11	413.77			
ML18	135.24	419.40			
ML19E	136.42	429.00			
ML19W	131.43	405.57			
ML20	134.89	423.73			
ML21	134.75	424.56			
ML22	135.89	427.68			
ML23	134.61	426.08			

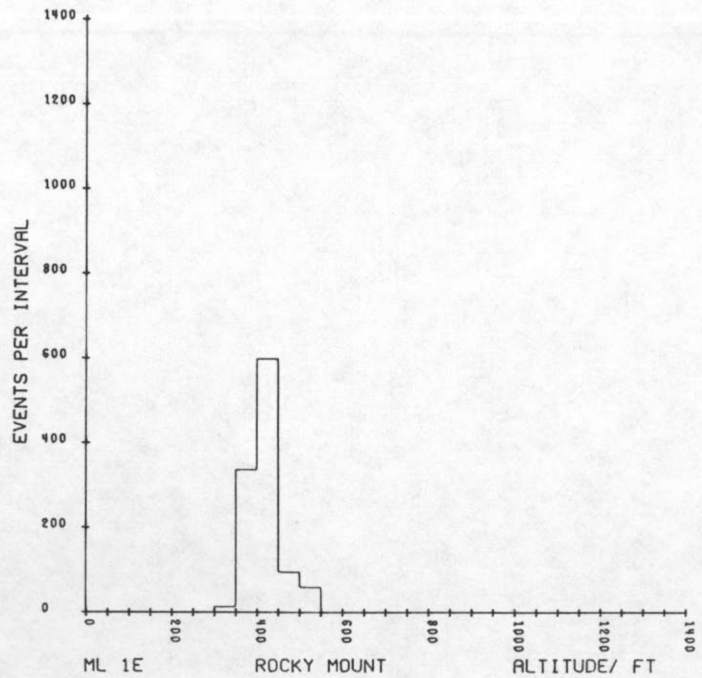

EVENTS PER INTERVAL
2100
1800
1500
1200
900
600
300
0
0
60
120
180
240
300
360
420
ML 1W
ROCKY MOUNT
SPEED IN MPH

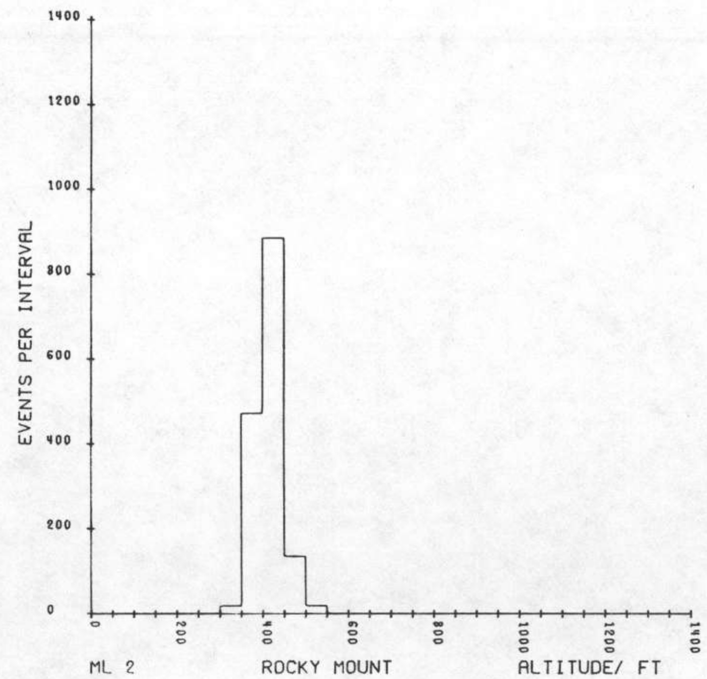

EVENTS PER INTERVAL
2100
1800
1500
1200
900
600
300
0
0
60
120
180
240
300
360
420
ML 1E
ROCKY MOUNT
SPEED IN MPH

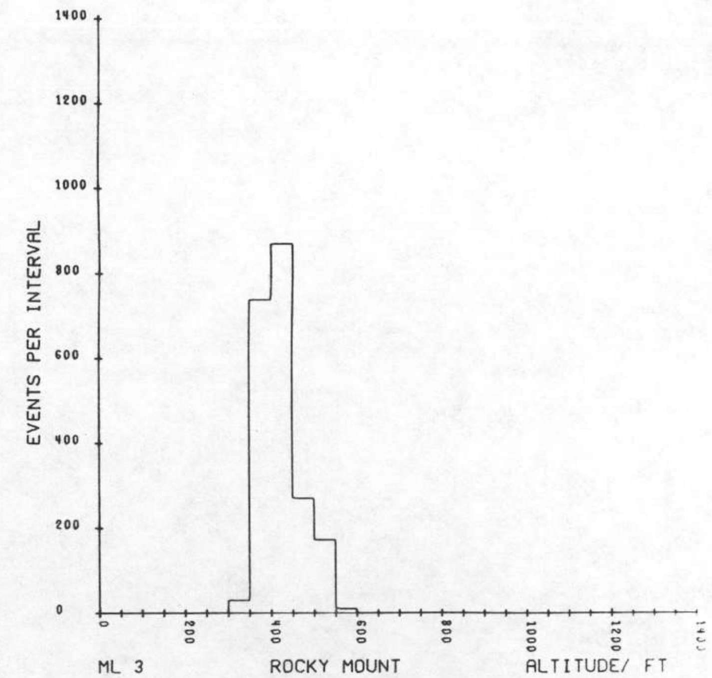

EVENTS PER INTERVAL
2100
1800
1500
1200
900
600
300
0
0
60
120
180
240
300
360
420
ML 2
ROCKY MOUNT
SPEED IN MPH

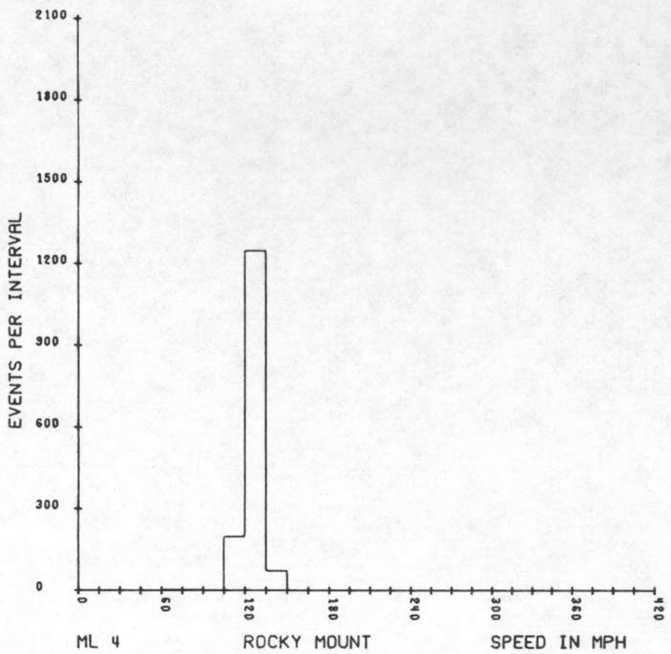

EVENTS PER INTERVAL
2100
1800
1500
1200
900
600
300
0
0
60
120
180
240
300
360
420
ML 3
ROCKY MOUNT
SPEED IN MPH

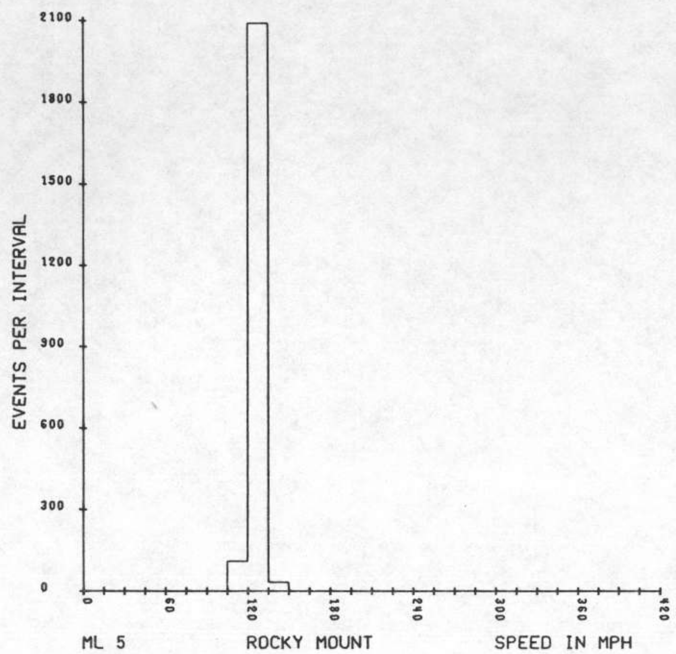

EVENTS PER INTERVAL
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
ML 1W
ROCKY MOUNT
ALTITUDE/ FT

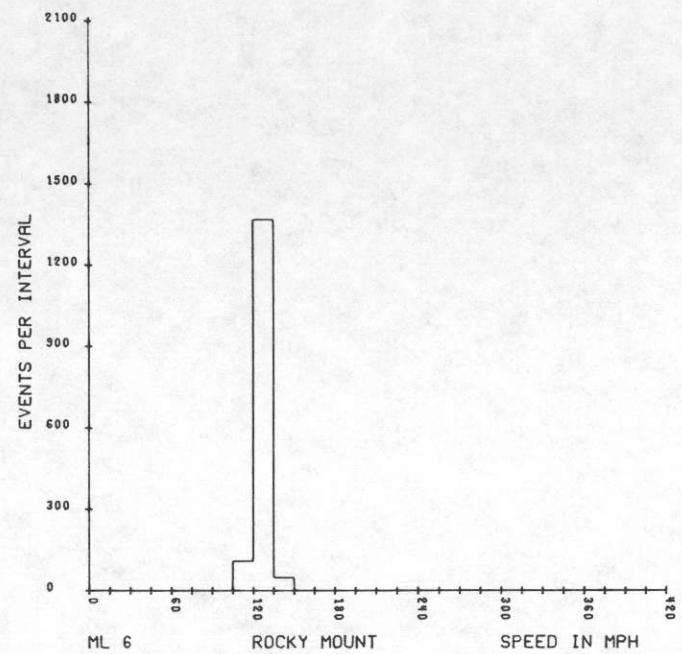

EVENTS PER INTERVAL
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
ML 1E
ROCKY MOUNT
ALTITUDE/ FT

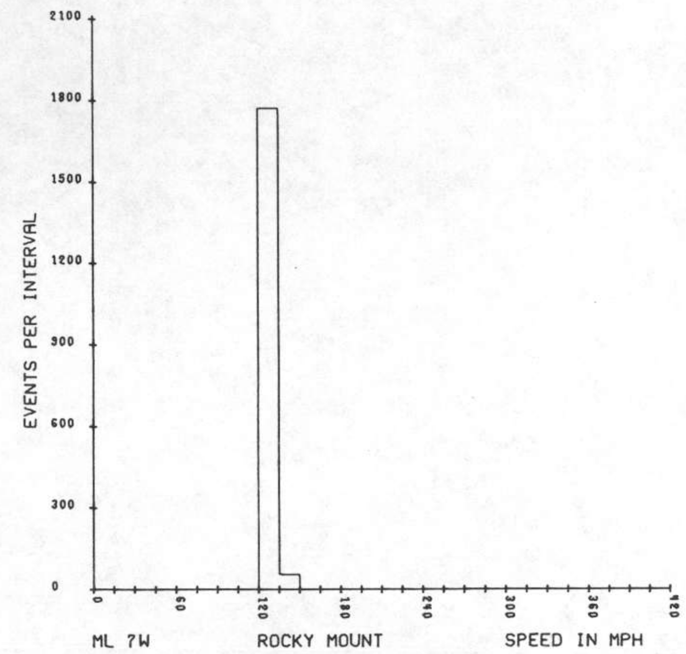

EVENTS PER INTERVAL
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
ML 2
ROCKY MOUNT
ALTITUDE/ FT

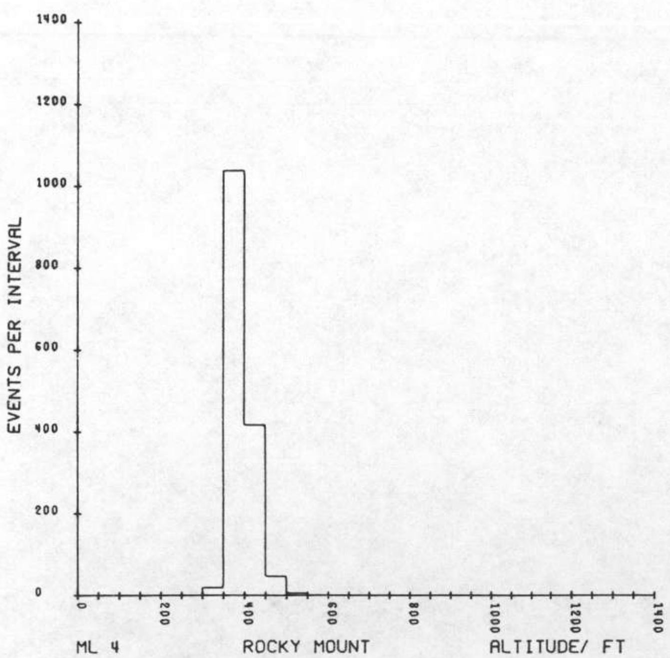

EVENTS PER INTERVAL
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
ML 3
ROCKY MOUNT
ALTITUDE/ FT

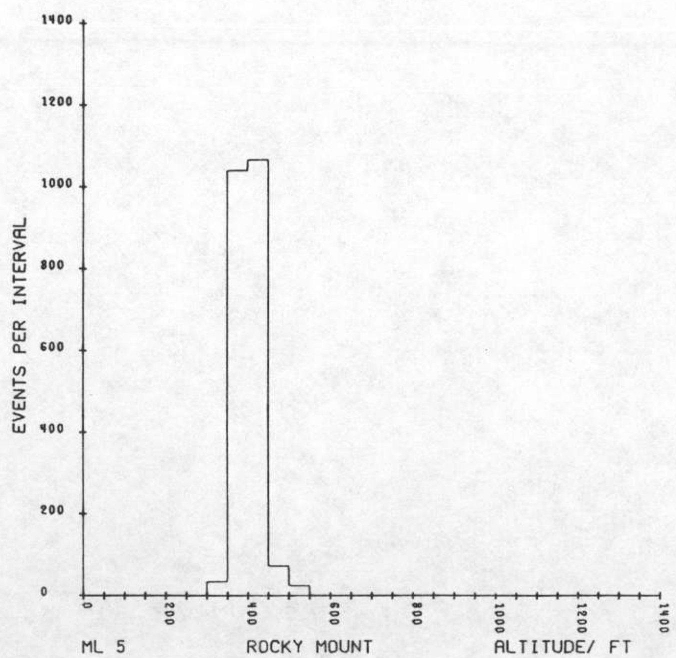

EVENTS PER INTERVAL
0
300
600
900
1200
1500
1800
2100
0
60
120
180
240
300
360
420
ML 4
ROCKY MOUNT
SPEED IN MPH

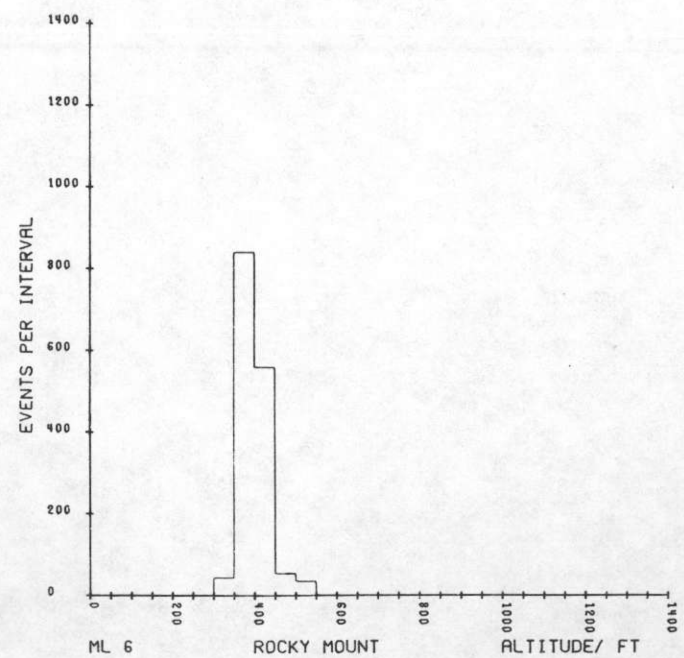

EVENTS PER INTERVAL
0
300
600
900
1200
1500
1800
2100
0
60
120
180
240
300
360
420
ML 5
ROCKY MOUNT
SPEED IN MPH

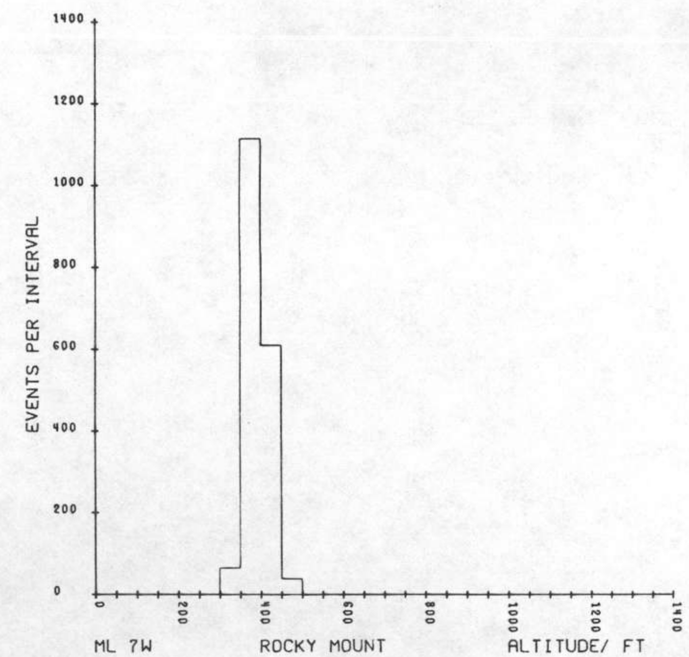

EVENTS PER INTERVAL
0
300
600
900
1200
1500
1800
2100
0
60
120
180
240
300
360
420
ML 6
ROCKY MOUNT
SPEED IN MPH

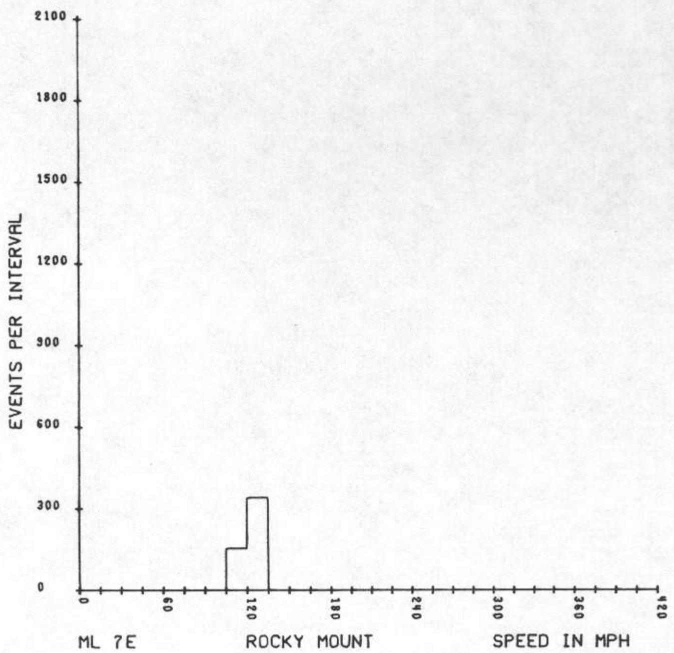

EVENTS PER INTERVAL
0
300
600
900
1200
1500
1800
2100
0
60
120
180
240
300
360
420
ML 7W
ROCKY MOUNT
SPEED IN MPH

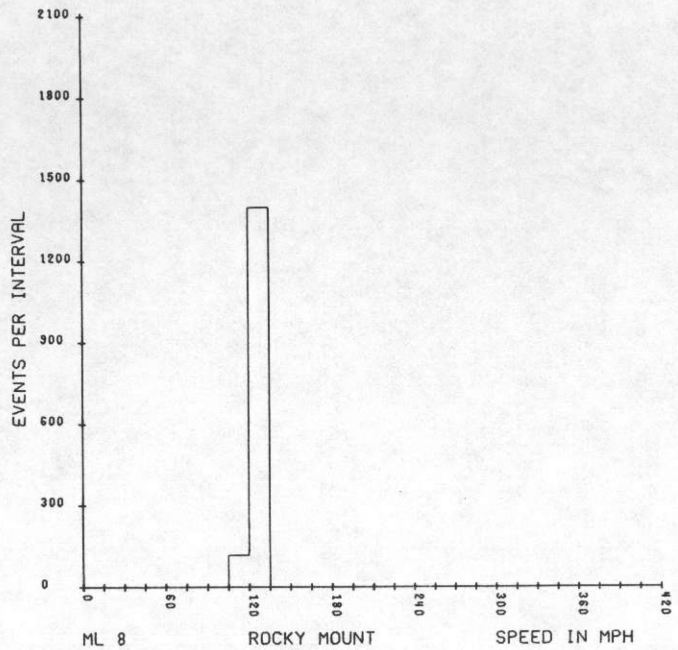

EVENTS PER INTERVAL
0
200
400
600
800
1000
1200
1400
0
200
400
600
800
1000
1200
1400
ML 4
ROCKY MOUNT
ALTITUDE/ FT

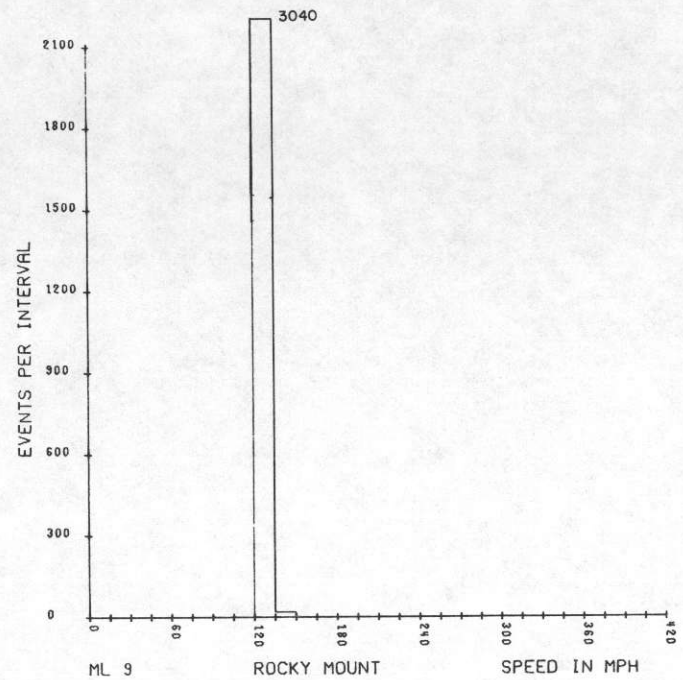

EVENTS PER INTERVAL
0
200
400
600
800
1000
1200
1400
0
200
400
600
800
1000
1200
1400
ML 5
ROCKY MOUNT
ALTITUDE/ FT

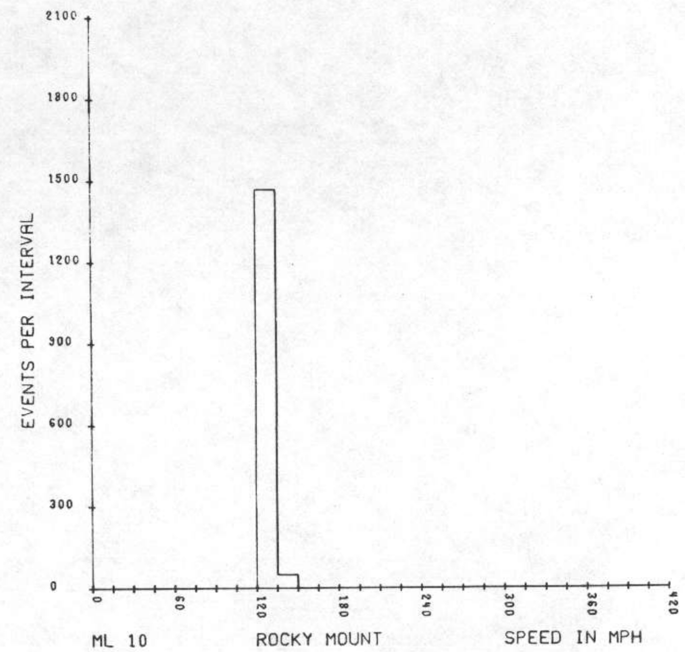

EVENTS PER INTERVAL
0
200
400
600
800
1000
1200
1400
0
200
400
600
800
1000
1200
1400
ML 6
ROCKY MOUNT
ALTITUDE/ FT

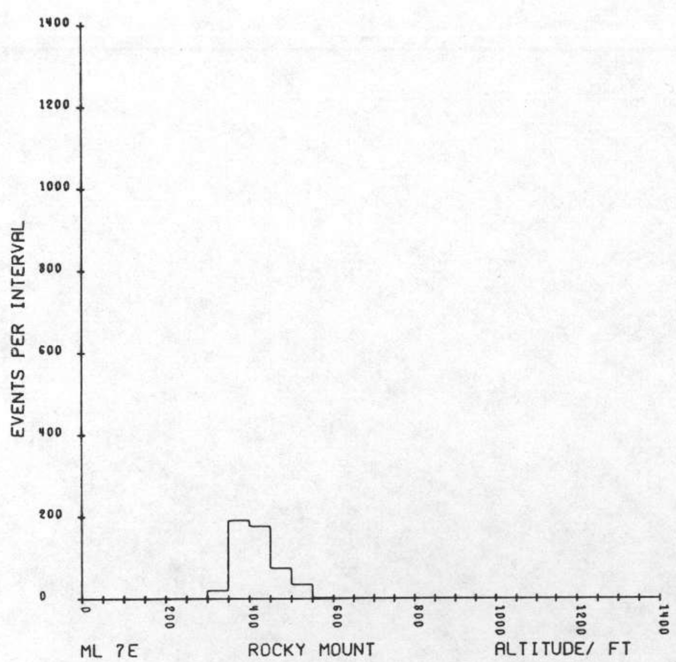

EVENTS PER INTERVAL
0
200
400
600
800
1000
1200
1400
0
200
400
600
800
1000
1200
1400
ML 7W
ROCKY MOUNT
ALTITUDE/ FT

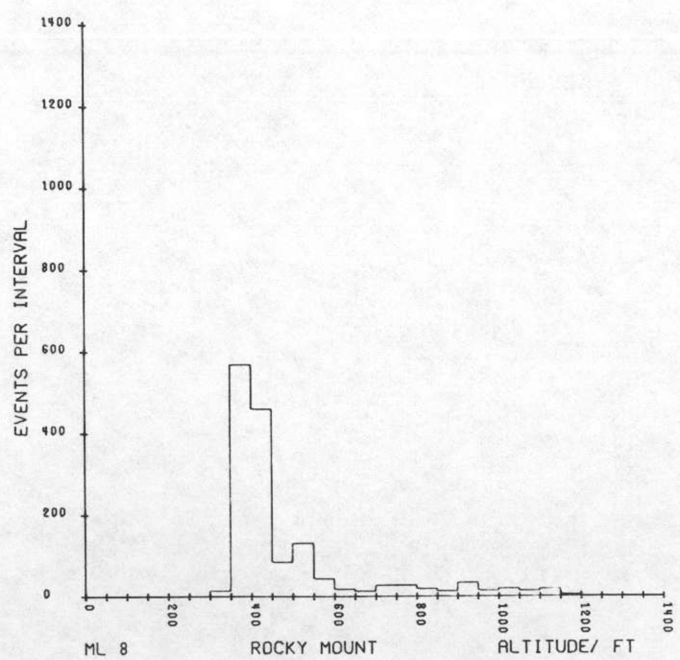

EVENTS PER INTERVAL
ML 7E
ROCKY MOUNT
SPEED IN MPH

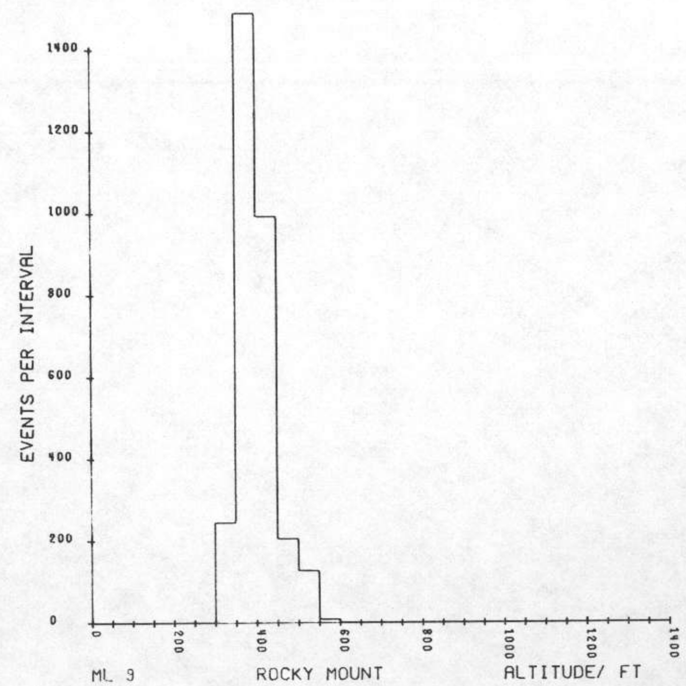

EVENTS PER INTERVAL
ML 8
ROCKY MOUNT
SPEED IN MPH

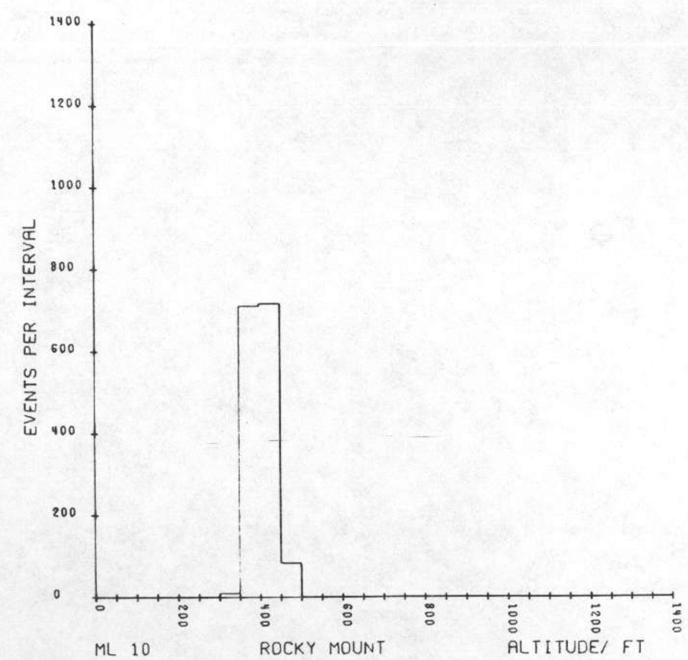

3040
EVENTS PER INTERVAL
ML 9
ROCKY MOUNT
SPEED IN MPH

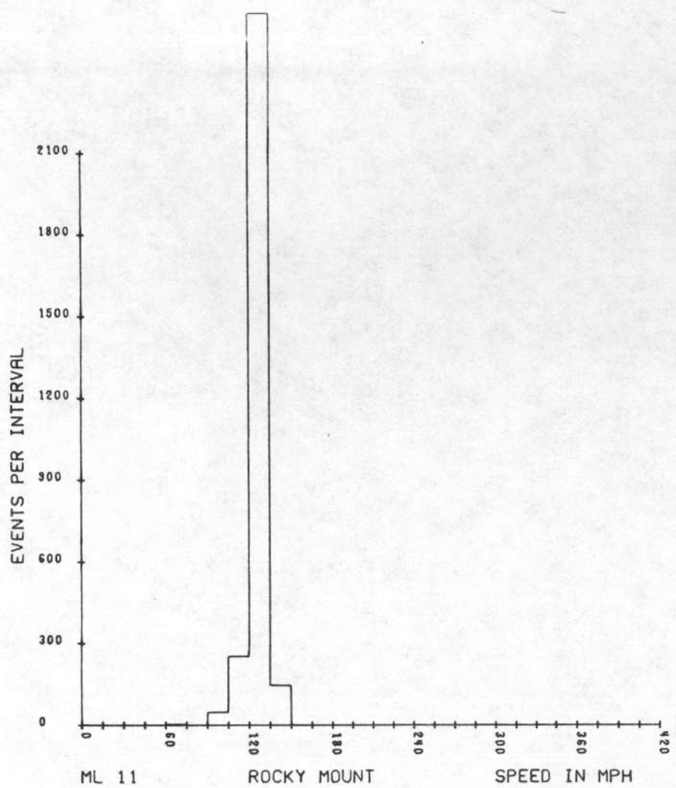

EVENTS PER INTERVAL
ML 10
ROCKY MOUNT
SPEED IN MPH

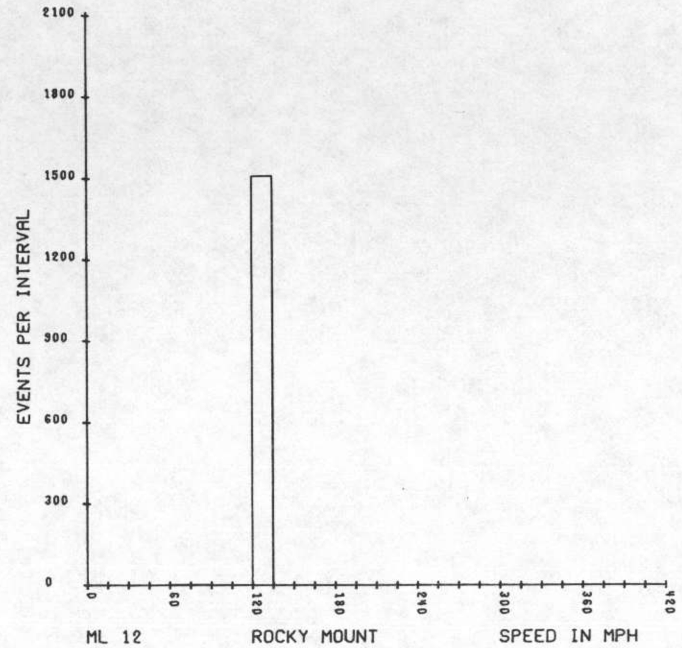

EVENTS PER INTERVAL
ML 7E
ROCKY MOUNT
ALTITUDE/ FT

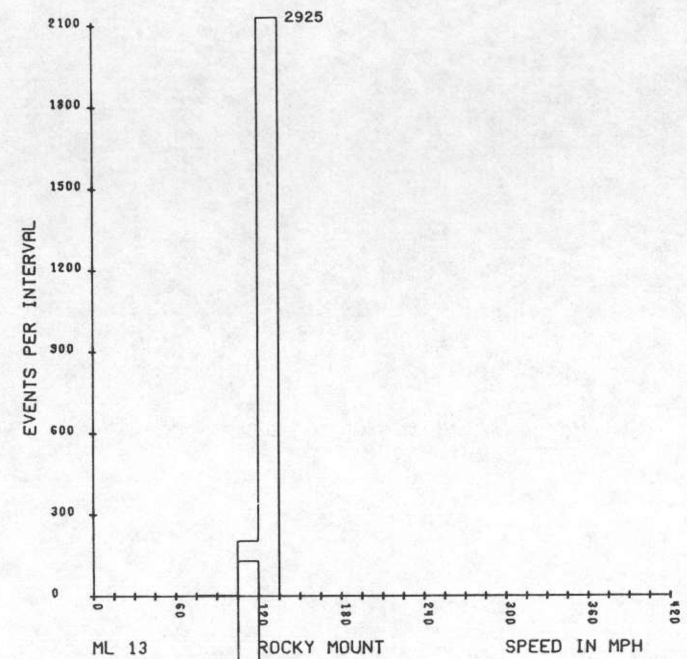

EVENTS PER INTERVAL
ML 8
ROCKY MOUNT
ALTITUDE/ FT

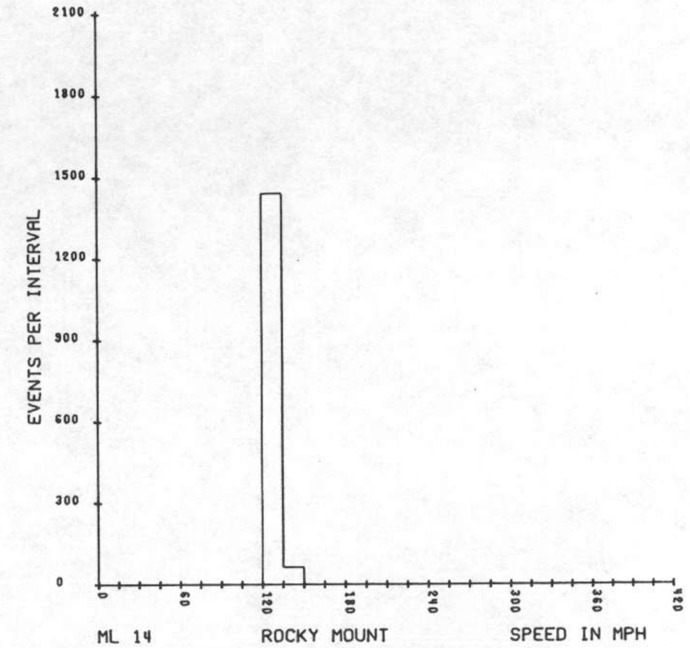

EVENTS PER INTERVAL
ML 9
ROCKY MOUNT
ALTITUDE/ FT

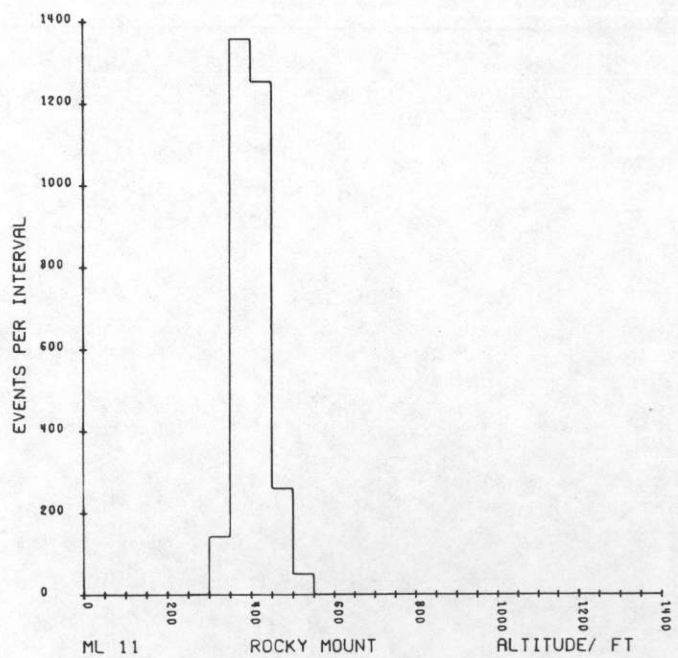

EVENTS PER INTERVAL
ML 10
ROCKY MOUNT
ALTITUDE/ FT

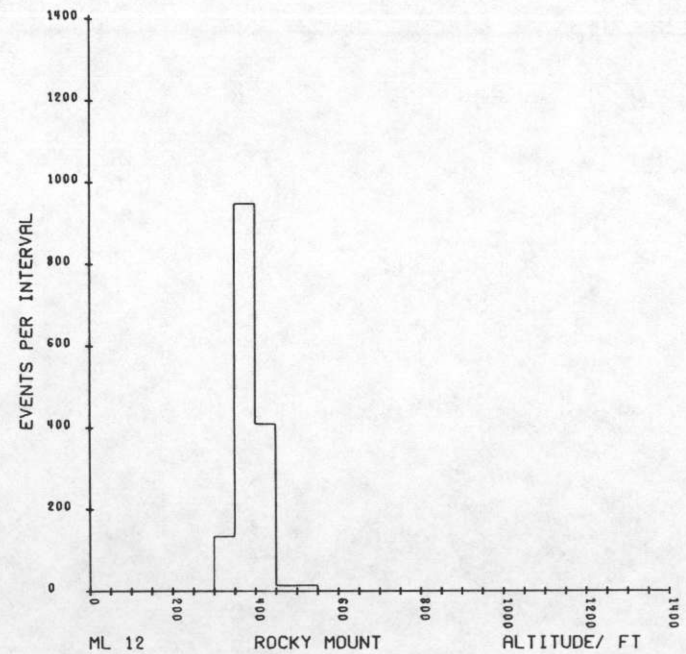

EVENTS PER INTERVAL
0
300
600
900
1200
1500
1800
2100
0
60
120
180
240
300
360
420
ML 11
ROCKY MOUNT
SPEED IN MPH

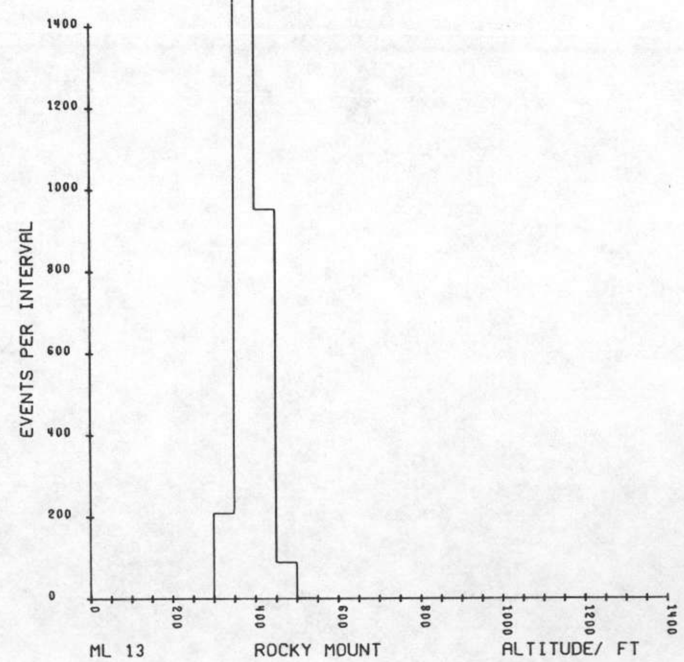

EVENTS PER INTERVAL
0
300
600
900
1200
1500
1800
2100
0
60
120
180
240
300
360
420
ML 12
ROCKY MOUNT
SPEED IN MPH

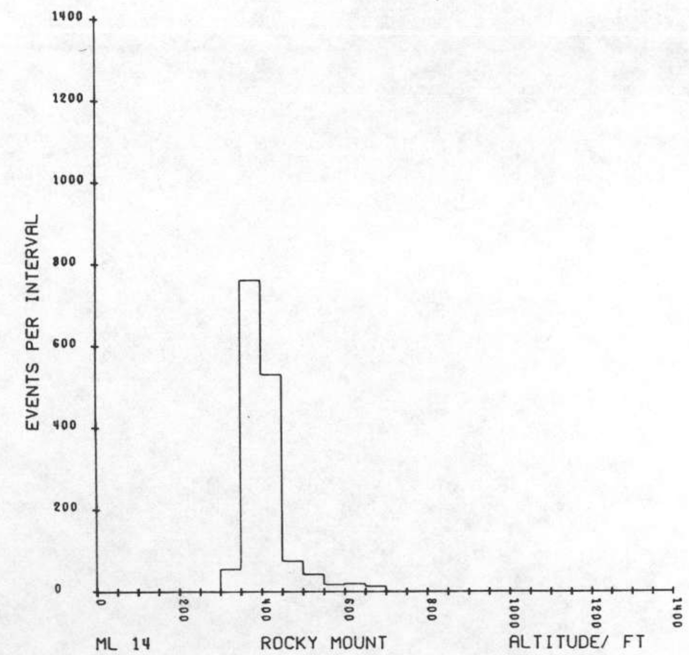

2925
EVENTS PER INTERVAL
0
300
600
900
1200
1500
1800
2100
0
60
120
180
240
300
360
420
ML 13
ROCKY MOUNT
SPEED IN MPH


EVENTS PER INTERVAL
0
300
600
900
1200
1500
1800
2100
0
60
120
180
240
300
360
420
ML 14
ROCKY MOUNT
SPEED IN MPH


EVENTS PER INTERVAL
0
200
400
600
800
1000
1200
1400
0
200
400
600
800
1000
1200
1400
ML 11
ROCKY MOUNT
ALTITUDE/ FT


EVENTS PER INTERVAL
0
200
400
600
800
1000
1200
1400
0
200
400
600
800
1000
1200
1400
ML 12
ROCKY MOUNT
ALTITUDE/ FT


EVENTS PER INTERVAL
0
200
400
600
800
1000
1200
1400
0
200
400
600
800
1000
1200
1400
ML 13
ROCKY MOUNT
ALTITUDE/ FT


EVENTS PER INTERVAL
0
200
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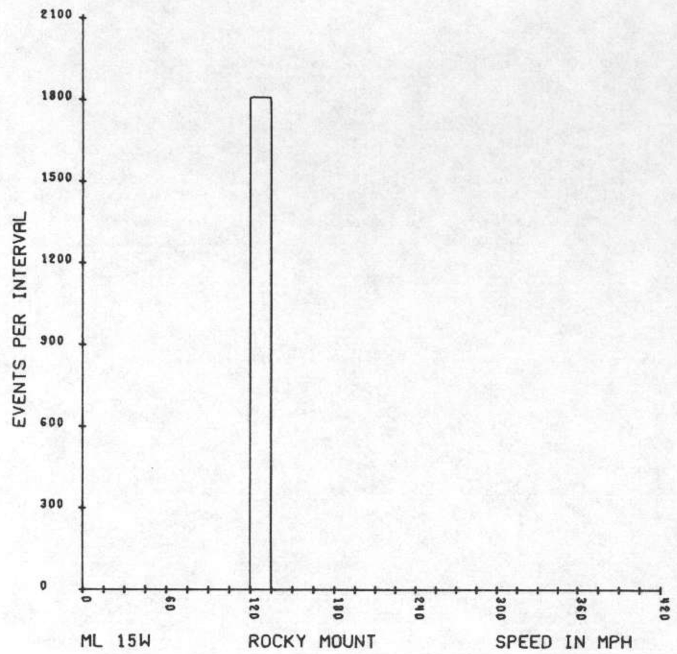
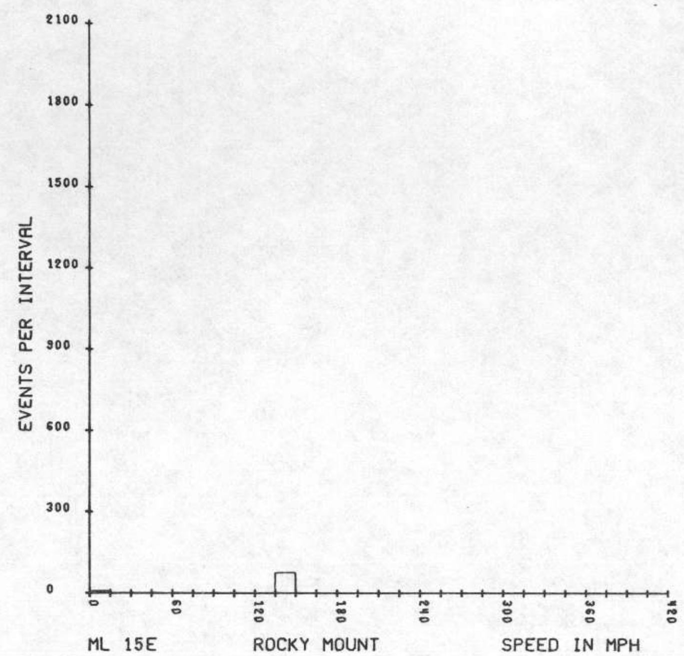
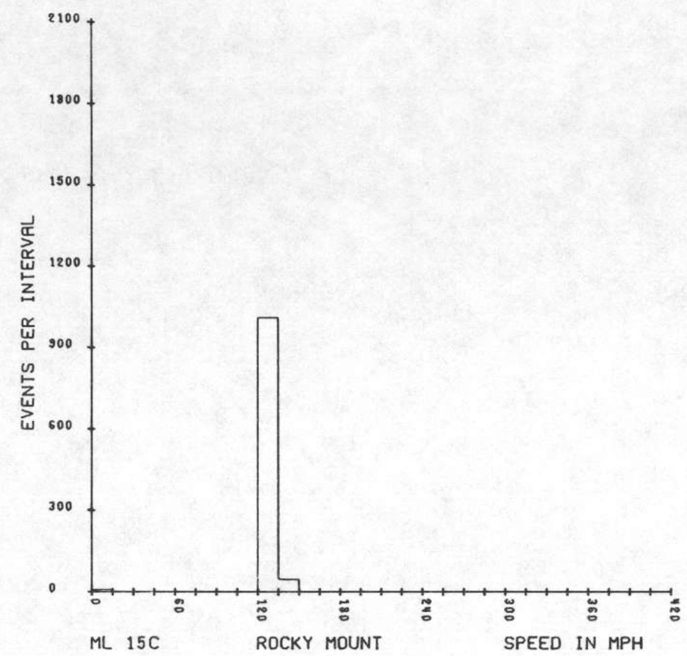
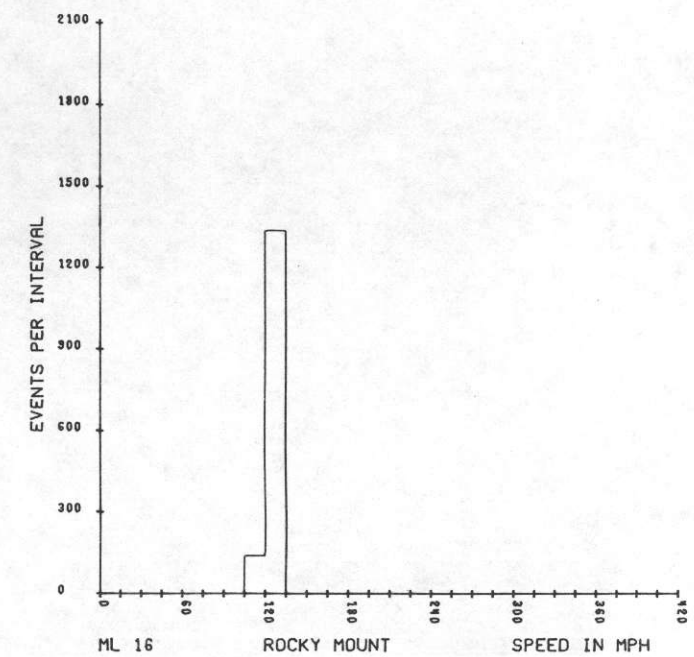
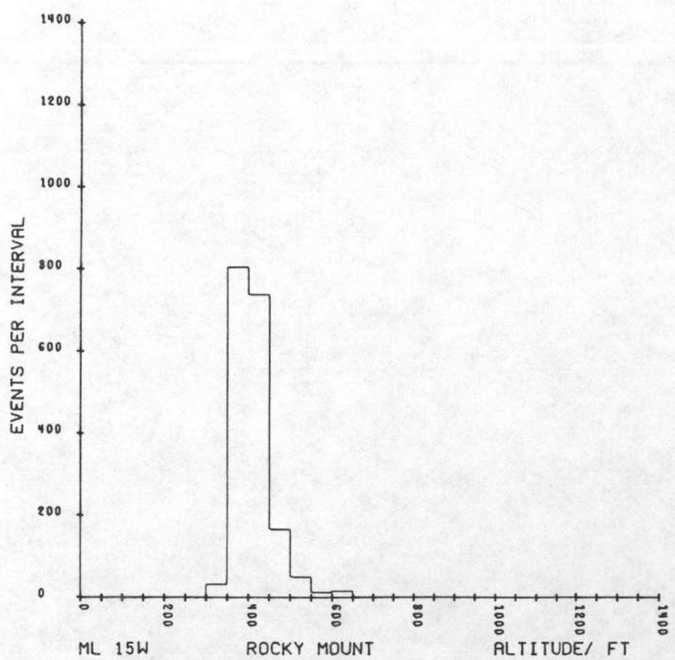
600
800
1000
1200
1400
0
200
400
600
800
1000
1200
1400
ML 14
ROCKY MOUNT
ALTITUDE/ FT

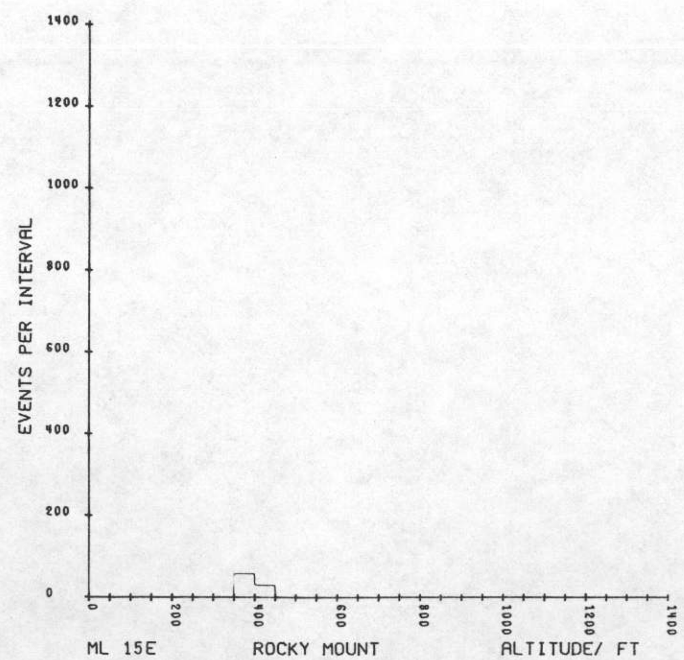

EVENTS PER INTERVAL
ML 15W
ROCKY MOUNT
SPEED IN MPH

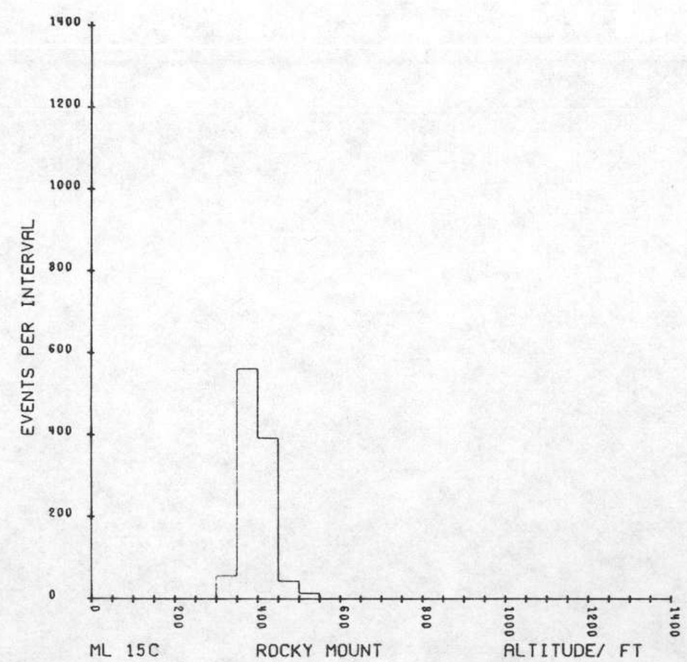

EVENTS PER INTERVAL
ML 15E
ROCKY MOUNT
SPEED IN MPH

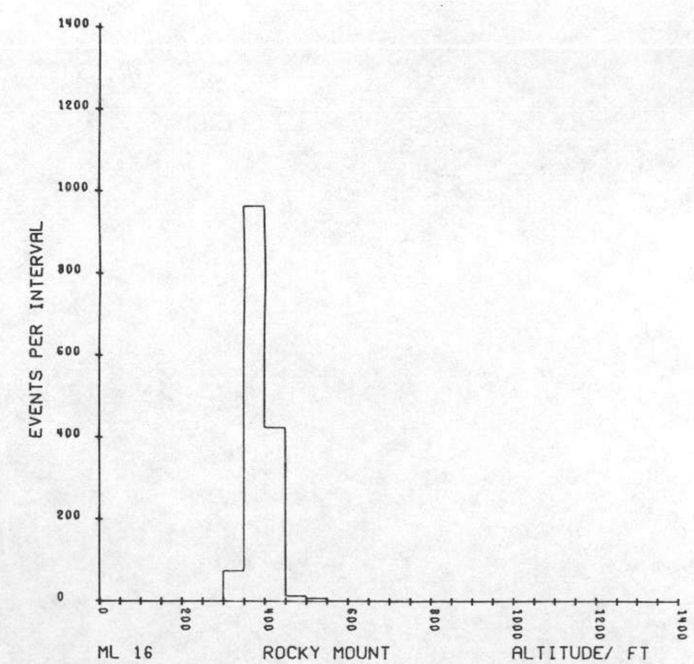

EVENTS PER INTERVAL
ML 15C
ROCKY MOUNT
SPEED IN MPH

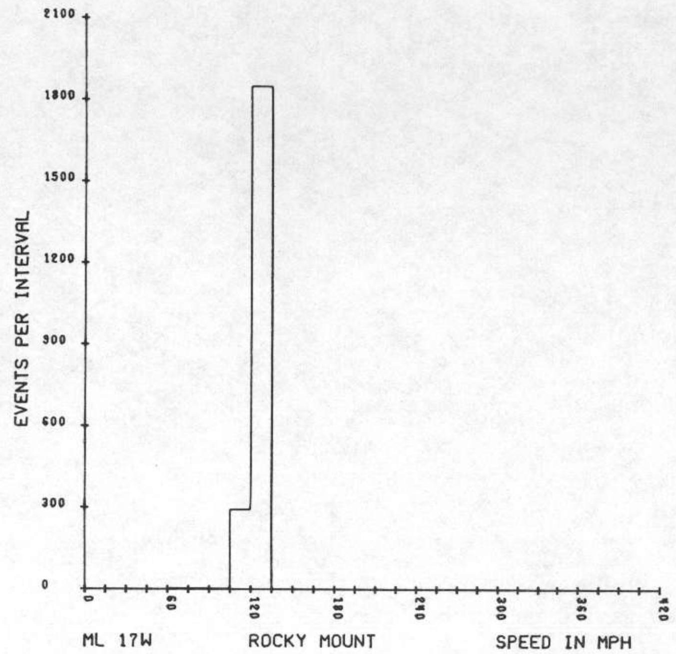

EVENTS PER INTERVAL
ML 16
ROCKY MOUNT
SPEED IN MPH

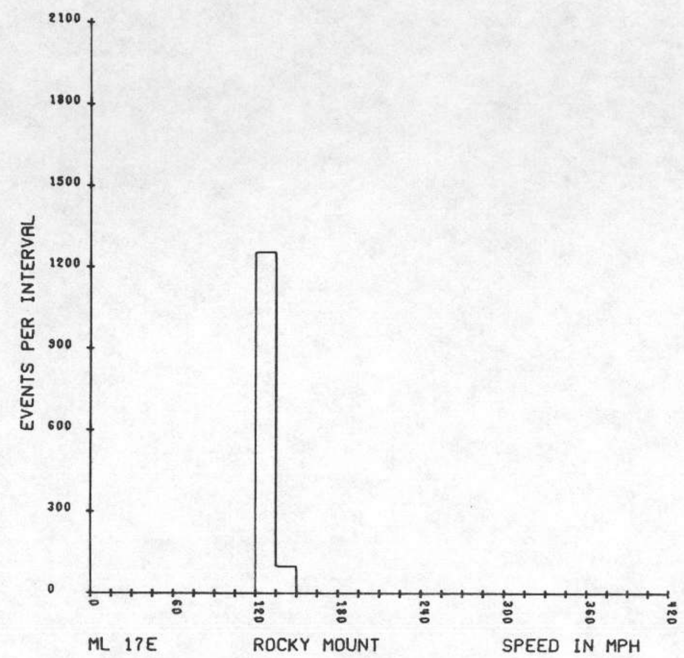

EVENTS PER INTERVAL
ML 15W
ROCKY MOUNT
ALTITUDE/ FT

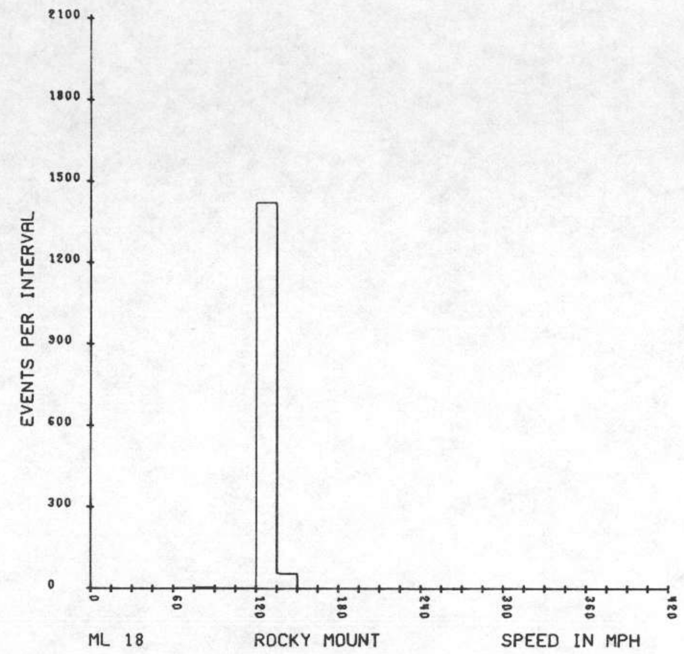

EVENTS PER INTERVAL
ML 15E
ROCKY MOUNT
ALTITUDE/ FT

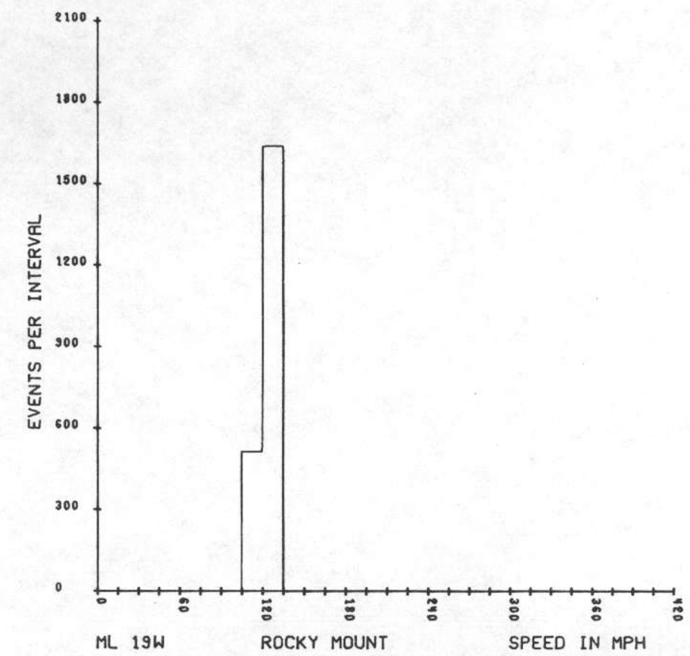

EVENTS PER INTERVAL
ML 15C
ROCKY MOUNT
ALTITUDE/ FT

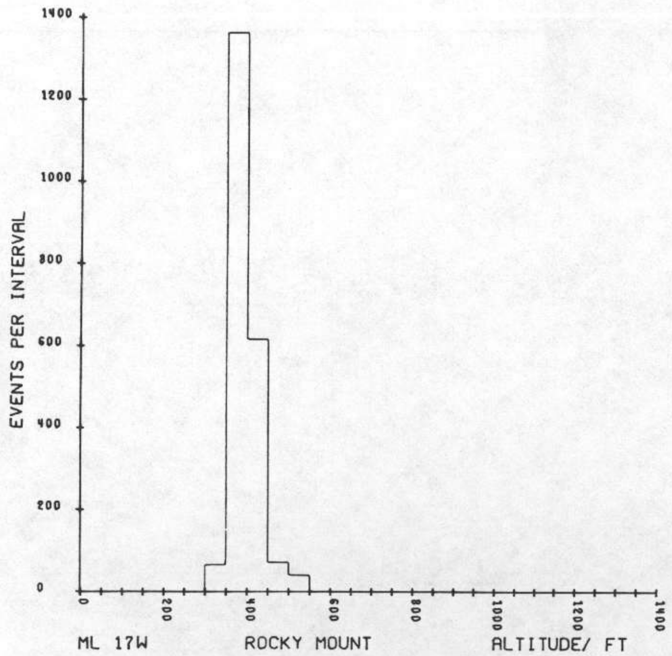

EVENTS PER INTERVAL
ML 16
ROCKY MOUNT
ALTITUDE/ FT

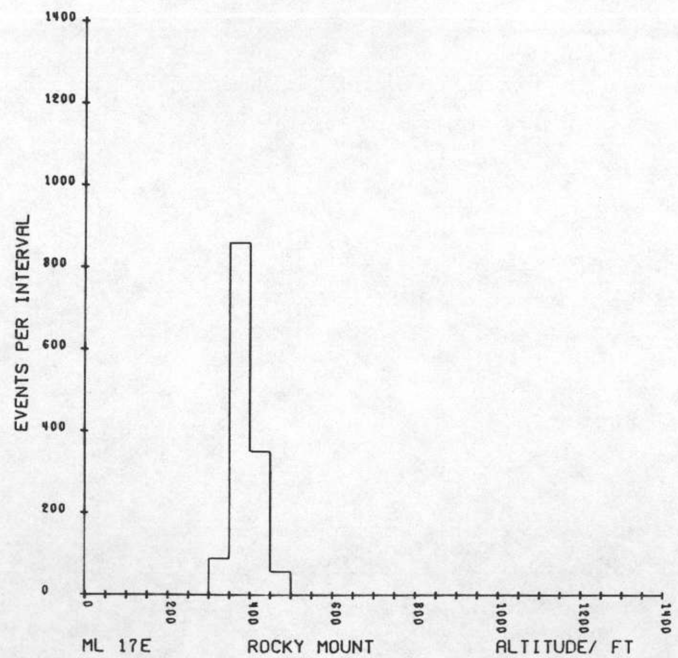

EVENTS PER INTERVAL
0 300 600 900 1200 1500 1800 2100
0 60 120 180 240 300 360 420
ML 17W
ROCKY MOUNT
SPEED IN MPH

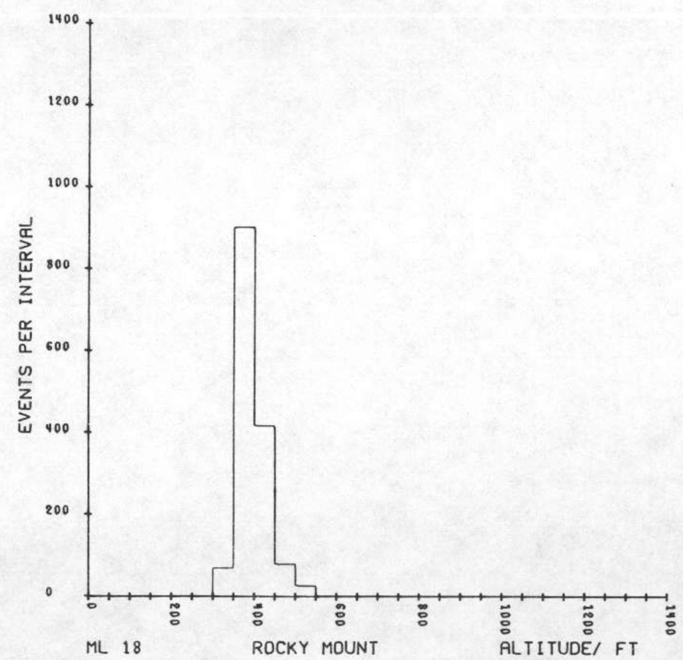

EVENTS PER INTERVAL
0 300 600 900 1200 1500 1800 2100
0 60 120 180 240 300 360 420
ML 17E
ROCKY MOUNT
SPEED IN MPH

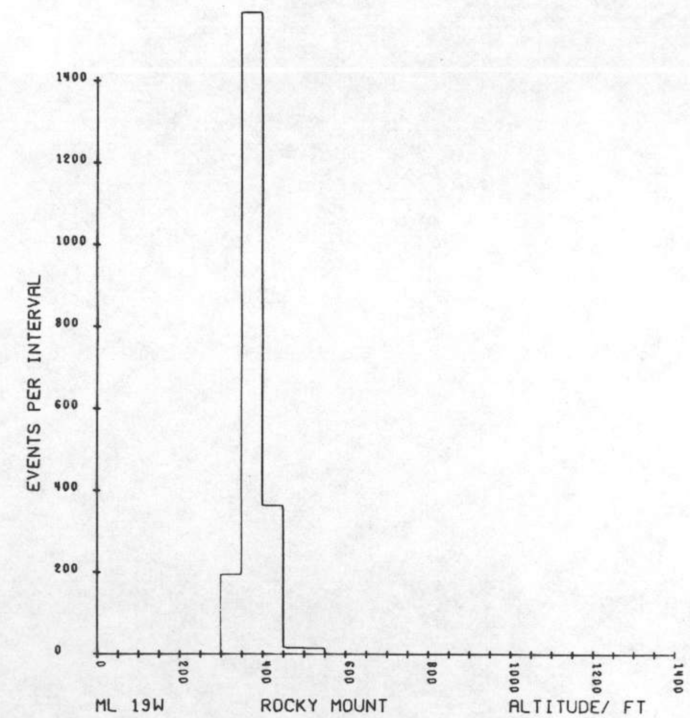

EVENTS PER INTERVAL
0 300 600 900 1200 1500 1800 2100
0 60 120 180 240 300 360 420
ML 18
ROCKY MOUNT
SPEED IN MPH

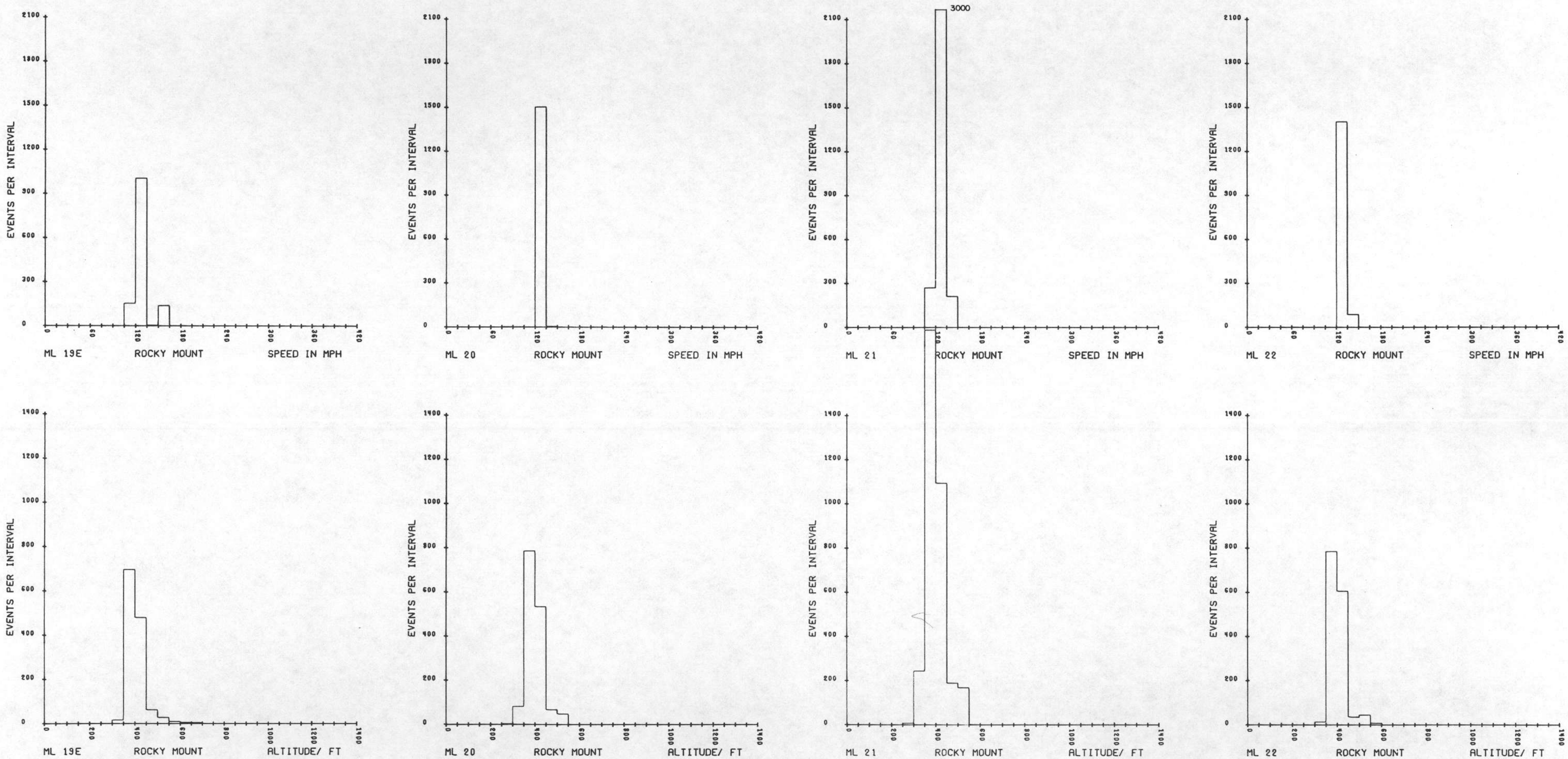

EVENTS PER INTERVAL
0 300 600 900 1200 1500 1800 2100
0 60 120 180 240 300 360 420
ML 19W
ROCKY MOUNT
SPEED IN MPH

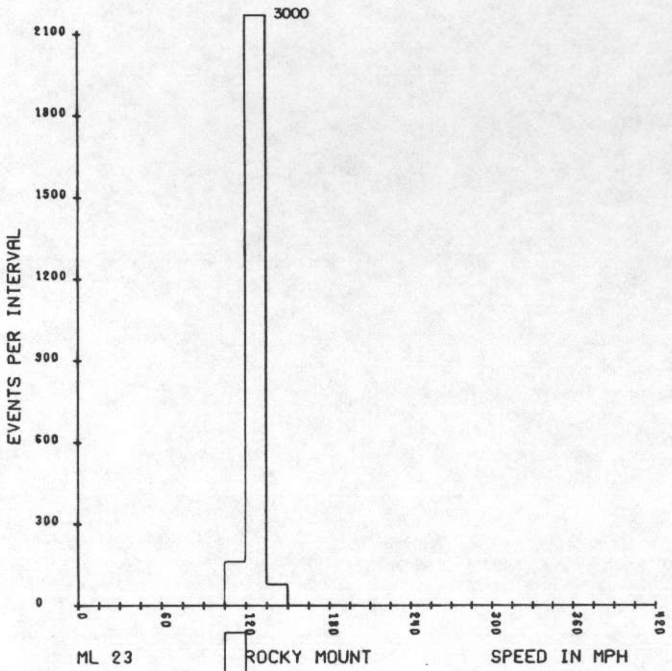

EVENTS PER INTERVAL
0 200 400 600 800 1000 1200 1400
0 200 400 600 800 1000 1200 1400
ML 17W
ROCKY MOUNT
ALTITUDE/ FT

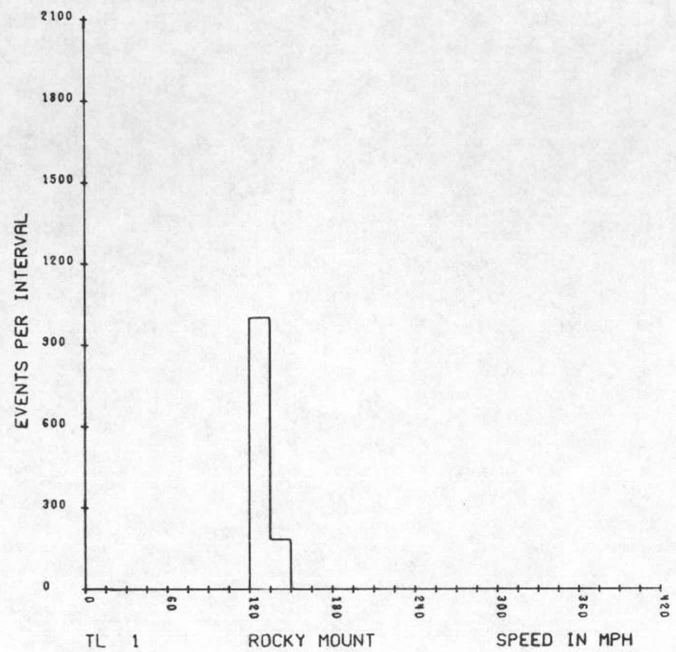

EVENTS PER INTERVAL
0 200 400 600 800 1000 1200 1400
0 200 400 600 800 1000 1200 1400
ML 17E
ROCKY MOUNT
ALTITUDE/ FT

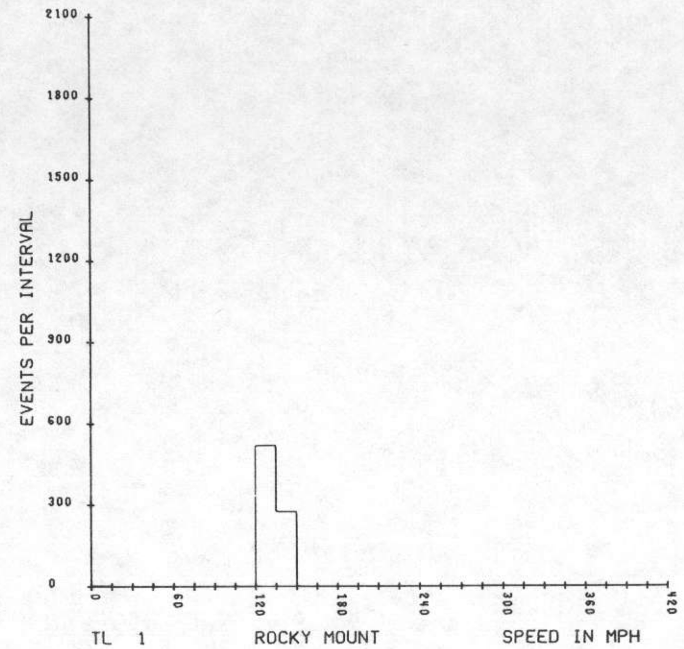

EVENTS PER INTERVAL
0 200 400 600 800 1000 1200 1400
0 200 400 600 800 1000 1200 1400
ML 18
ROCKY MOUNT
ALTITUDE/ FT

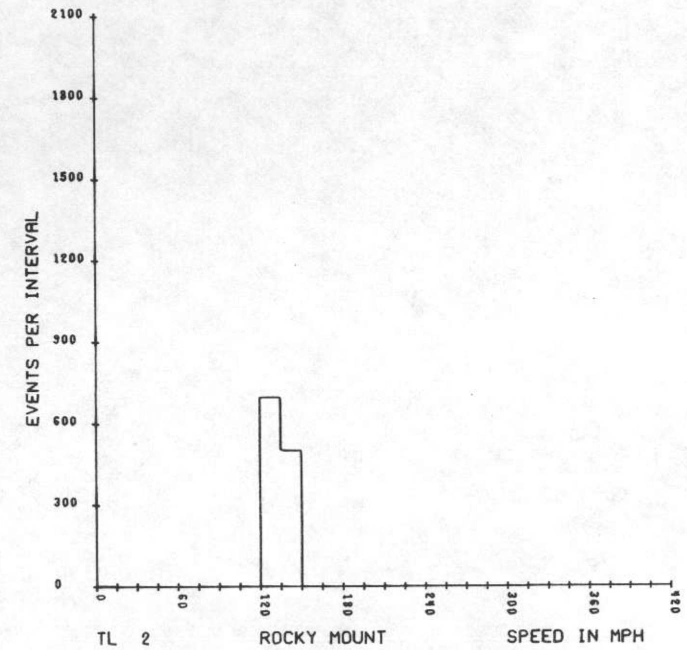

EVENTS PER INTERVAL
0 200 400 600 800 1000 1200 1400
0 200 400 600 800 1000 1200 1400
ML 19W
ROCKY MOUNT
ALTITUDE/ FT

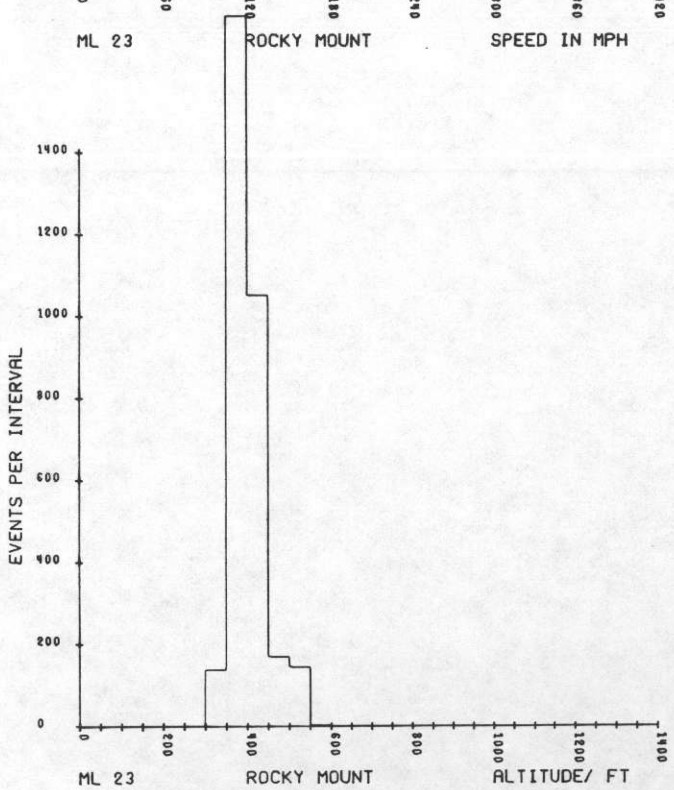

EVENTS PER INTERVAL
ML 19E ROCKY MOUNT SPEED IN MPH
ML 20 ROCKY MOUNT SPEED IN MPH
3000
ML 21 ROCKY MOUNT SPEED IN MPH
ML 22 ROCKY MOUNT SPEED IN MPH
ML 19E ROCKY MOUNT ALTITUDE/ FT
ML 20 ROCKY MOUNT ALTITUDE/ FT
ML 21 ROCKY MOUNT ALTITUDE/ FT
ML 22 ROCKY MOUNT ALTITUDE/ FT

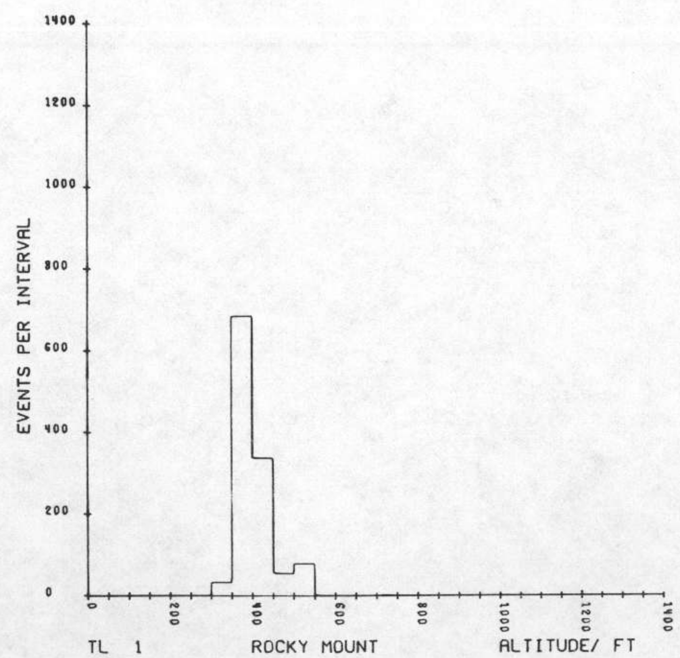

3000
EVENTS PER INTERVAL
ML 23
ROCKY MOUNT
SPEED IN MPH

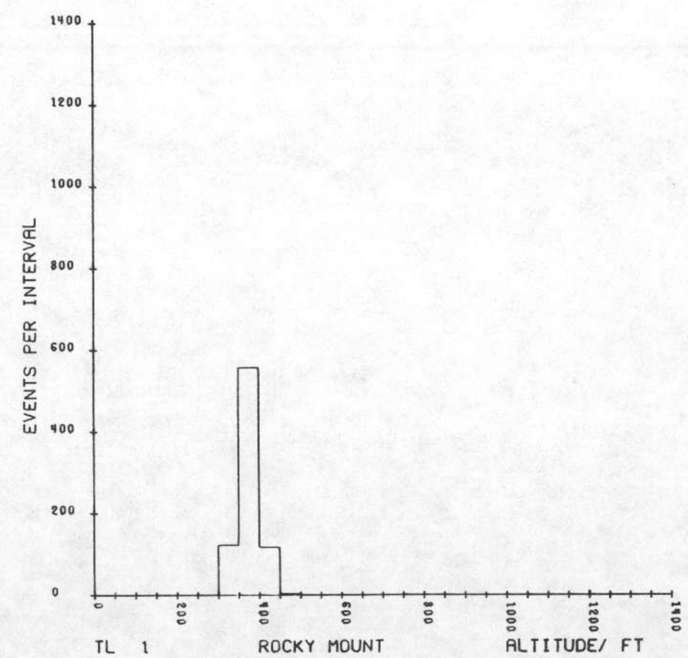

EVENTS PER INTERVAL
TL 1
ROCKY MOUNT
SPEED IN MPH

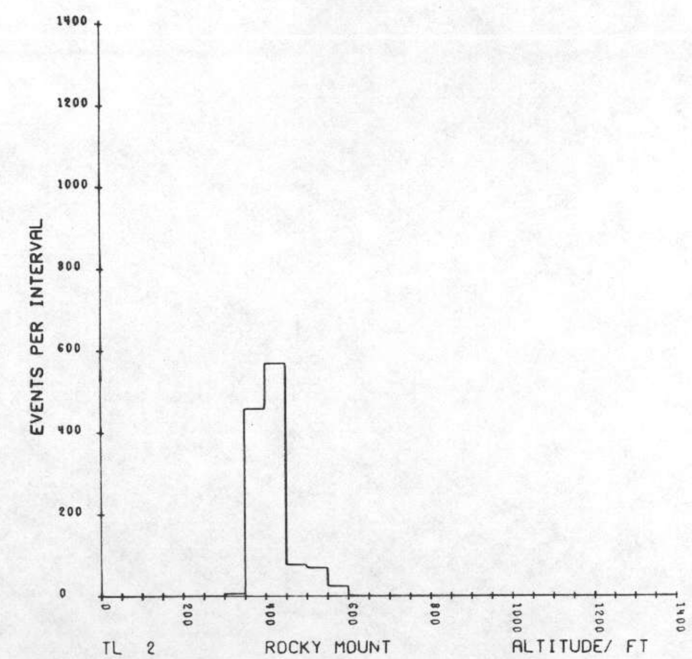

EVENTS PER INTERVAL
TL 1
ROCKY MOUNT
SPEED IN MPH

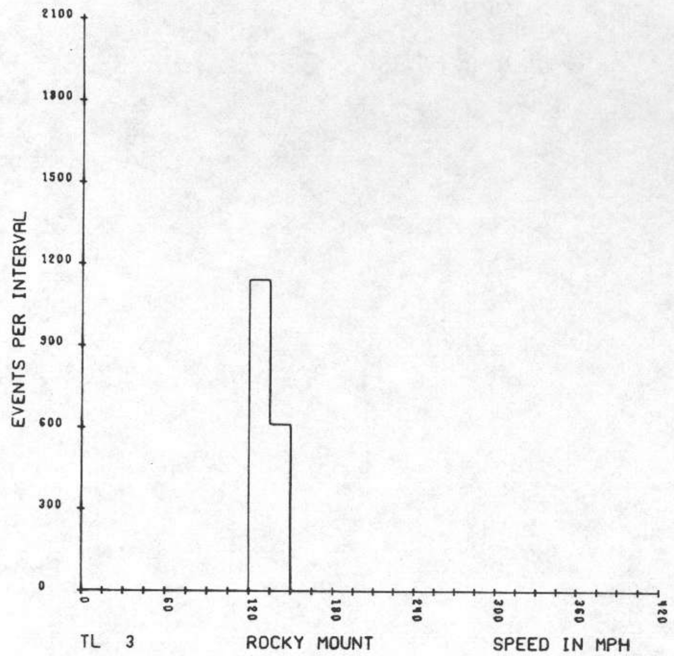

EVENTS PER INTERVAL
TL 2
ROCKY MOUNT
SPEED IN MPH

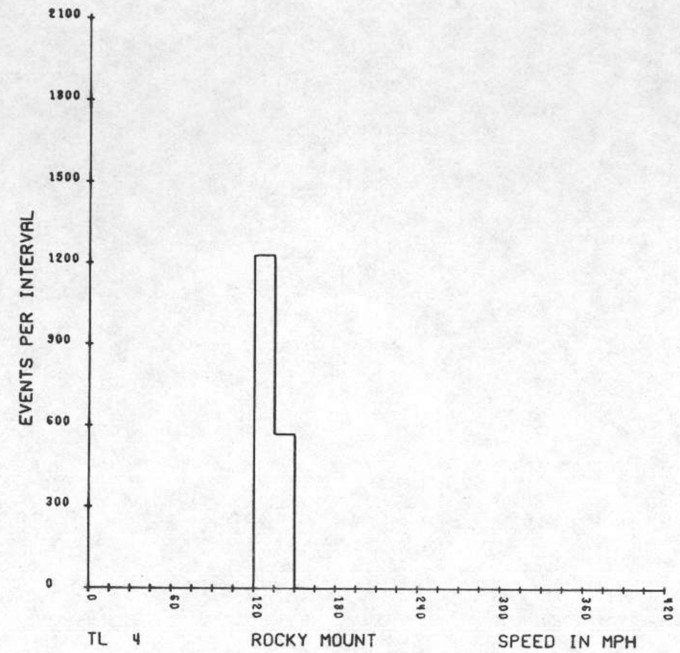

EVENTS PER INTERVAL
ML 23
ROCKY MOUNT
ALTITUDE/ FT

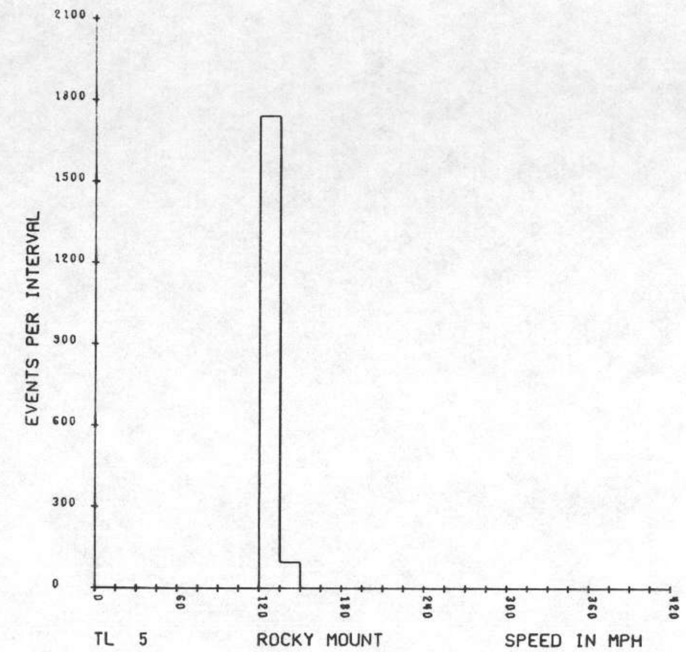

EVENTS PER INTERVAL
TL 1
ROCKY MOUNT
ALTITUDE/ FT

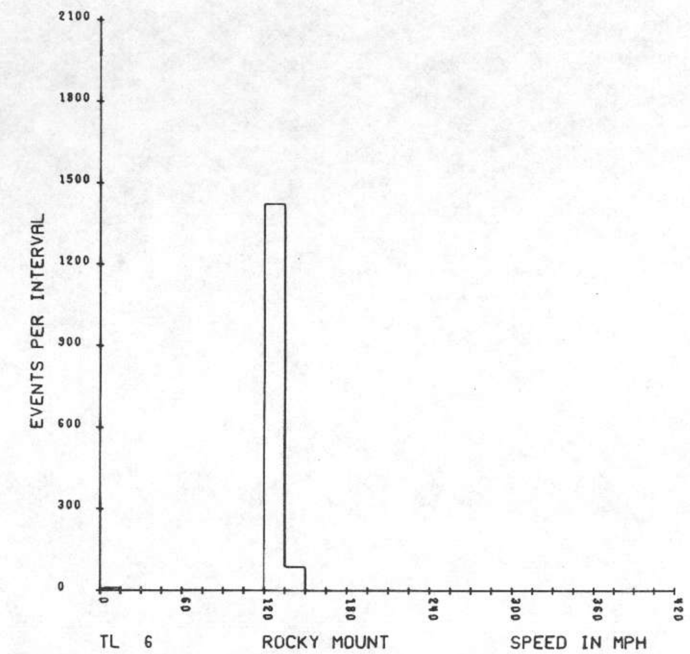

EVENTS PER INTERVAL
TL 1
ROCKY MOUNT
ALTITUDE/ FT

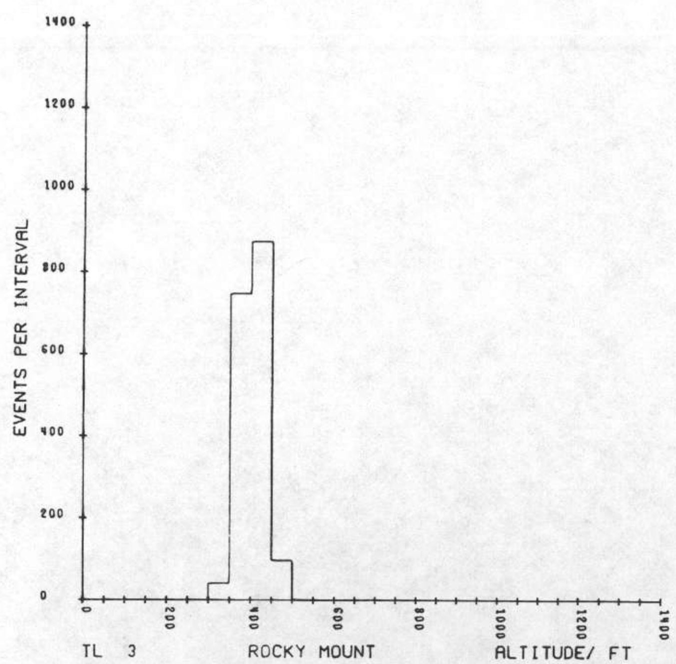

EVENTS PER INTERVAL
TL 2
ROCKY MOUNT
ALTITUDE/ FT

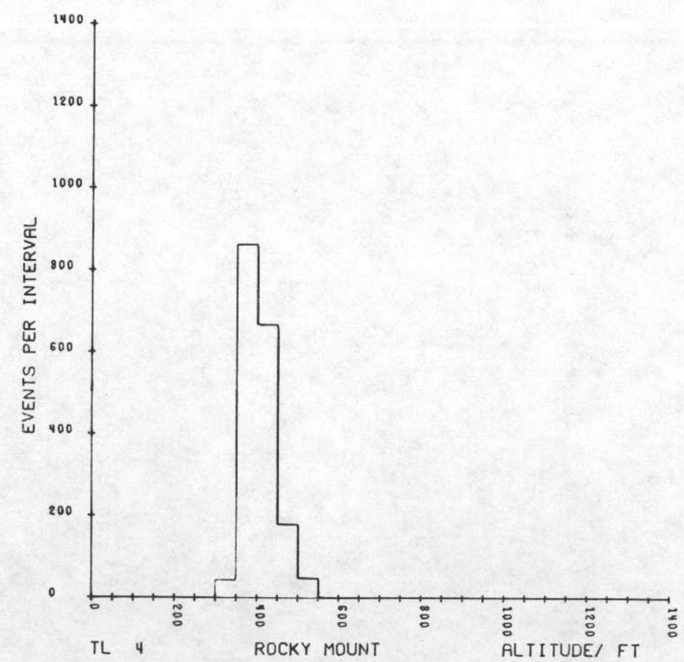

EVENTS PER INTERVAL
TL 3
ROCKY MOUNT
SPEED IN MPH

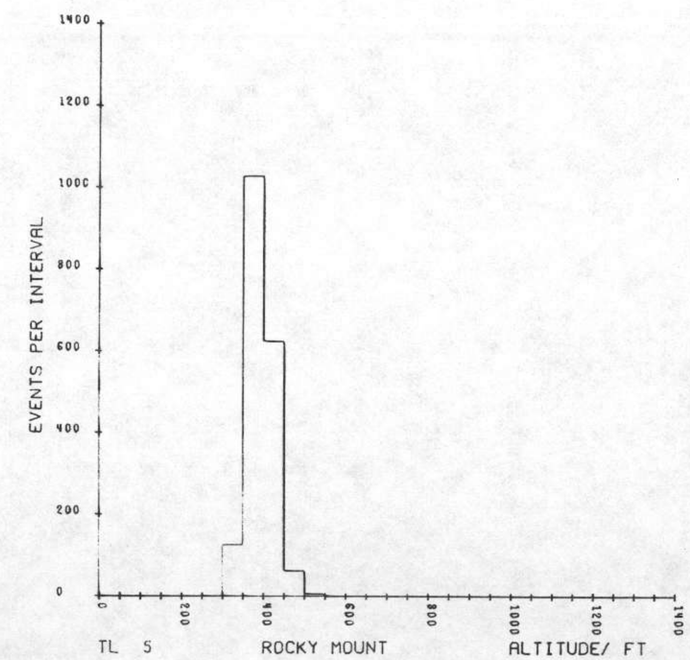

EVENTS PER INTERVAL
TL 4
ROCKY MOUNT
SPEED IN MPH

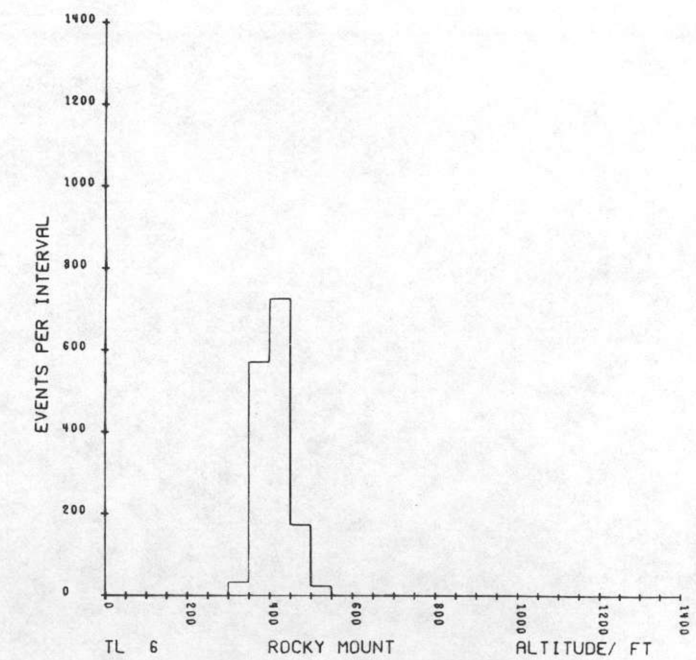

EVENTS PER INTERVAL
TL 5
ROCKY MOUNT
SPEED IN MPH

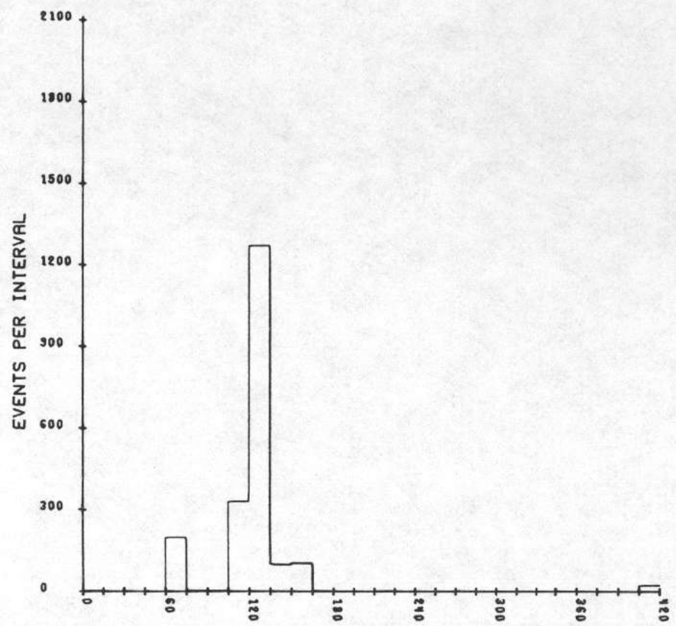

EVENTS PER INTERVAL
TL 6
ROCKY MOUNT
SPEED IN MPH


EVENTS PER INTERVAL
TL 3
ROCKY MOUNT
ALTITUDE/ FT

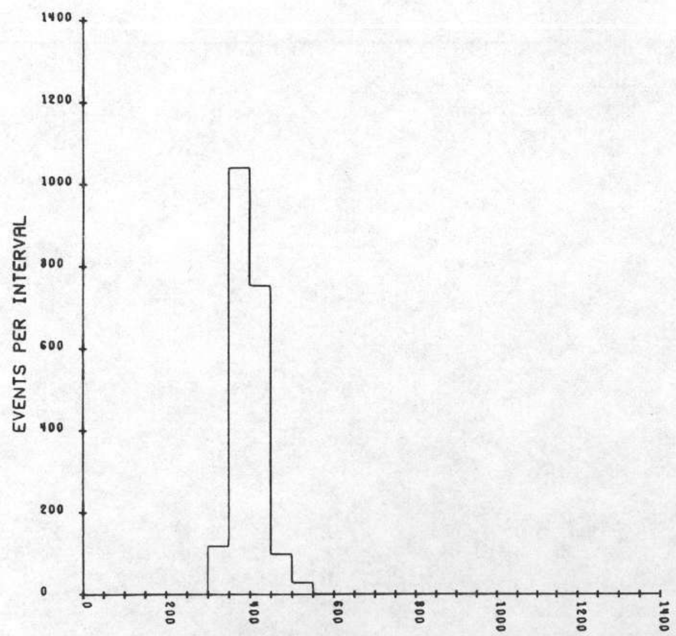

EVENTS PER INTERVAL
TL 4
ROCKY MOUNT
ALTITUDE/ FT


EVENTS PER INTERVAL
TL 5
ROCKY MOUNT
ALTITUDE/ FT


EVENTS PER INTERVAL
TL 6
ROCKY MOUNT
ALTITUDE/ FT



TL 7 ROCKY MOUNT SPEED IN MPH



TL 7 ROCKY MOUNT ALTITUDE/ FT

APPENDIX II

TAPE FORMAT STATEMENTS

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.

Character Number: 12345678901234567890123456789012345678901234567890123456789012

Line Number			
1	01 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)		
2			
3	RAW SPECTRAL DATA TAPE		
4			
5	FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK ON TAPE)		
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)

Character Number: 12345678901234567890123456789012345678901234567890123456789012

Line Number			
11	4	I1	AERIAL SYSTEM IDENTIFICATION CODE
12	5	A20	AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER
13	6	I3	BFEC CALIBRATION REPORT NUMBER
14	7	F6.3	4PI SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL
15			PLACES IN SECONDS
16	8	F6.3	2PI SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL
17			PLACES IN SECONDS
18	9	I3	NUMBER OF CHANNELS (0-3 MEV) FOR 4PI SYSTEM
19	10	I3	NUMBER OF CHANNELS (0-3 MEV) FOR 2PI SYSTEM
20	11	I3	NUMBER OF FLIGHT LINES ON THIS TAPE
21	12	I4	FIRST FLIGHT LINE NUMBER ON THIS TAPE
22	13	I6	FIRST RECORD NUMBER OF FIRST FLIGHT LINE
23	14	I3	JULIAN DATE (DAY OF YEAR) FIRST FLIGHT LINE WAS
24			COLLECTED
25	15-17	I4,I6,I3	REPEAT OF ITEMS 12-14 FOR SECOND FLIGHT LINE ON THIS
26			TAPE
27	*	*	*
28	*	*	*
29	*	*	*
30	306-308	I4,I6,I3	REPEAT OF ITEMS 12-14 FOR 99TH FLIGHT LINE ON THIS
31			TAPE
32			
33	FORMAT FOR RAW SPECTRAL DATA RECORD (THIRD THRU LAST BLOCK ON TAPE)		
34			
35	ITEM	FORMAT	DESCRIPTION
36	1	I1	AERIAL SYSTEM IDENTIFICATION CODE
37	2	I4	FLIGHT LINE NUMBER
38	3	I6	RECORD IDENTIFICATION NUMBER
39	4	I6	GMT TIME OF DAY (HHMMSS)
40	5	F8.4	LATITUDE TO FOUR DECIMAL PLACES IN DEGREES
41	6	F8.4	LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES
42	7	F6.1	TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS
43	8	F7.1	TOTAL MAGNETIC FIELD INTENSITY TO ONE DECIMAL PLACE
44			IN GAMMAS
45	9	A8	SURFACE GEOLOGIC MAP UNIT CODE
46	10	I4	QUALITY FLAG CODES
47	11	F4.1	OUTSIDE AIR TEMPERATURE TO ONE DECIMAL PLACE IN
48			DEGREES CELSIUS
49	12	F5.1	OUTSIDE AIR PRESSURE TO ONE DECIMAL PLACE IN MMHG
50	13	F5.3	LIVE TIME COUNTING PERIOD TO THREE DECIMAL PLACES IN
51			SECONDS
52	14	I4	SUMMED RAW OUTPUT FROM COSMIC CHANNELS (3-6 MEV) IN
53			COUNTS
54	15	I4	RAW OUTPUT FROM CHANNEL 1 IN COUNTS
55	16	I4	RAW OUTPUT FROM CHANNEL 2 IN COUNTS
56	*	*	*
57	*	*	*
58	*	*	*
59	270	I4	RAW OUTPUT FROM CHANNEL 256 IN COUNTS
-	-	-	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 2π data logical record is recorded after the corresponding 4π data collection intervals at a frequency dependent on the 2π system data collection interval. For example, if the 4π data collection interval is 1 second and the 2π data collection interval is 10 seconds, then 10 records of 4π data are recorded followed by 1 record of the 2π data which was collected during the preceding 10 seconds. The format for the 2π data is identical to that of the 4π data, except for lines 40 through 49 of the Format Description Block given above. These variables are expressed in the 2π 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 123456789012345678901234567890123456789012345678901234567890123456789012
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 1234567890123456789012345678901234567890123456789012345678901234567890123456789012		
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
12			THIS QUADRANGLE
13	5	I1	AERIAL SYSTEM IDENTIFICATION CODE FOR FIRST SYSTEM
14	6	A20	AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER FOR
15			FIRST SYSTEM
16	7	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO
17			TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE
18			IN CPS PER PERCENT K FOR FIRST SYSTEM
19	8	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO
20			TERRESTRIAL URANIUM (BI-214) TO ONE DECIMAL PLACE
21			IN CPS PER PPM EQUIVALENT U
22	9	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO
23			TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE
24			IN CPS PER PPM EQUIVALENT TH
25	10	I6	BLANK FIELD (999999)
26	11	F6.3	4PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL
27			PLACES IN SECONDS FOR FIRST SYSTEM
28	12	F6.3	2PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL
29			PLACES IN SECONDS FOR FIRST SYSTEM
30	13	I3	NUMBER OF CHANNELS (0-3 MEV) IN 4PI SYSTEM FOR FIRST
31			AERIAL SYSTEM
32	14	I3	NUMBER OF CHANNELS (0-3 MEV) IN 2PI SYSTEM FOR FIRST
33			AERIAL SYSTEM
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
43			COLLECTED
44	99-101	I4,I6,I3	REPEAT OF ITEMS 96-98 FOR SECOND FLIGHT LINE ON THIS
45			TAPE
46	*	*	*
47	*	*	*
48	*	*	*
49	390-392	I4,I6,I3	REPEAT OF ITEMS 96-98 FOR 99TH FLIGHT LINE ON THIS
50			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 1234567890123456789012345678901234567890123456789012345678901234567890123456789012		
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
63			TO ONE DECIMAL PLACE IN GAMMAS
64	9	A8	SURFACE GEOLOGIC MAP UNIT CODE
65	10	I4	QUALITY FLAG CODES
66	11	F6.1	APPARENT CONCENTRATION OF TERRESTRIAL POTASSIUM
67			(K-40) TO ONE DECIMAL PLACE IN PERCENT K
68	12	F4.1	UNCERTAINTY IN TERRESTRIAL POTASSIUM TO ONE DECIMAL
69			PLACE IN PERCENT K
70	13	F6.1	APPARENT CONCENTRATION OF TERRESTRIAL URANIUM
71			(BI-214) TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
72	14	F4.1	UNCERTAINTY IN TERRESTRIAL URANIUM TO ONE DECIMAL
73			PLACE IN PPM EQUIVALENT U
74	15	F6.1	APPARENT CONCENTRATION OF TERRESTRIAL THORIUM
75			(TL-208) TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
76	16	F4.1	UNCERTAINTY IN TERRESTRIAL THORIUM TO ONE DECIMAL
77			PLACE IN PPM EQUIVALENT TH
78	17	F6.1	URANIUM-TO-THORIUM RATIO TO ONE DECIMAL PLACE IN
79			PPM EQUIVALENT U PER PPM EQUIVALENT TH
80	18	F6.1	URANIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN
81			PPM EQUIVALENT U PER PERCENT K
82	19	F6.1	THORIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN
83			PPM EQUIVALENT TH PER PERCENT K
84	20	F8.1	GROSS GAMMA (0.4-3.0 MEV) COUNT RATE TO ONE DECIMAL
85			PLACE IN COUNTS PER SECOND
86	21	F6.1	UNCERTAINTY IN GROSS GAMMA COUNT RATE TO ONE DECIMAL
87			PLACE IN COUNTS PER SECOND
88	22	F5.1	ATMOSPHERIC BI-214 4PI CORRECTION TO ONE DECIMAL
89			PLACE IN PPM EQUIVALENT U
90	23	F4.1	UNCERTAINTY IN ATMOSPHERIC BI-214 4PI CORRECTION
91			TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
92	24	F4.1	OUTSIDE AIR TEMPERATURE TO ONE DECIMAL PLACE IN
93			DEGREES CELSIUS
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 Tapes (Data and Summary)
File 1: Statistical Analysis Data

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                                 Character Number
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
12                       THIS QUADRANGLE
13      5      I1        AERIAL SYSTEM IDENTIFICATION CODE FOR FIRST SYSTEM
14      6      A20       AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER FOR
15                       FIRST SYSTEM
16      7      F6.1      NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO
17                       TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE
18                       IN CPS PER PERCENT K
19      8      F6.1      NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO
20                       TERRESTRIAL URANIUM (BI-214) TO ONE DECIMAL PLACE
21                       IN CPS PER PPM EQUIVALENT U
22      9      F6.1      NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO
23                       TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE
24                       IN CPS PER PPM EQUIVALENT TH
25      10     I6        BLANK FIELD (999999)
26      11     F6.3      4PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL
27                       PLACES IN SECONDS FOR FIRST SYSTEM
28      12     F6.3      2PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL
29                       PLACES IN SECONDS FOR FIRST SYSTEM
```



```
Line                                 Character Number
Number  12345678901234567890123456789012345678901234567890123456789012

30      13        I3           NUMBER OF CHANNELS (0-3 MEV) IN 4PI SYSTEM FOR FIRST
31                             AERIAL SYSTEM
32      14        I3           NUMBER OF CHANNELS (0-3 MEV) IN 2PI SYSTEM FOR FIRST
33                             AERIAL SYSTEM
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
43                             COLLECTED
44      99-101    I4,I6,I3     REPEAT OF ITEMS 96-98 FOR SECOND FLIGHT LINE ON THIS
45                             TAPE
46      *         *                                  *
47      *         *                                  *
48      *         *                                  *
49      390-392   I4,I6,I3     REPEAT OF ITEMS 96-98 FOR 99TH FLIGHT LINE ON THIS
50                             TAPE
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
63                             TO ONE DECIMAL PLACE IN GAMMAS
64      9         A8           SURFACE GEOLOGIC MAP UNIT CODE
65      10        I5           QUALITY FLAG CODES
66      11        F6.1         AVERAGED CONCENTRATION OF TERRESTRIAL POTASSIUM
67                             (K-40) TO ONE DECIMAL PLACE IN PERCENT K
68      12        F4.1         UNCERTAINTY IN TERRESTRIAL POTASSIUM TO ONE DECIMAL
69                             PLACE IN PERCENT K
70      13        F5.1         POTASSIUM STANDARD DEVIATION FROM THE MEAN TO ONE
71                             DECIMAL PLACE AND ALGEBRAICALLY SIGNED
72      14        F6.1         AVERAGED CONCENTRATION OF TERRESTRIAL URANIUM
73                             (BI-214) TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
74      15        F4.1         UNCERTAINTY IN TERRESTRIAL URANIUM TO ONE DECIMAL
75                             PLACE IN PPM EQUIVALENT U
76      16        F5.1         URANIUM STANDARD DEVIATION FROM THE MEAN TO ONE
77                             DECIMAL PLACE AND ALGEBRAICALLY SIGNED
78      17        F6.1         AVERAGED CONCENTRATION OF TERRESTRIAL THORIUM
79                             (TL-208) TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
80      18        F4.1         UNCERTAINTY IN TERRESTRIAL THORIUM TO ONE DECIMAL
81                             PLACE IN PPM EQUIVALENT TH
```



```
Line                                 Character Number
Number  12345678901234567890123456789012345678901234567890123456789012

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

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.

File 2: Statistical Analysis Summary

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                        Character Number
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
12                     QUADRANGLE
13
14      FORMAT FOR STATISTICAL ANALYSIS SUMMARY DATA RECORD (THIRD THRU LAST
15      BLOCK)
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
21                     UNIT
22      4     F6.1     POTASSIUM CONCENTRATION MEAN TO ONE DECIMAL
23                     PLACE IN PERCENT K
24      5     F6.1     POTASSIUM CONCENTRATION STANDARD DEVIATION TO ONE
25                     DECIMAL PLACE IN PERCENT K
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
29                     IN PPM EQUIVALENT U
30      9     F6.1     URANIUM CONCENTRATION STANDARD DEVIATION TO ONE
31                     DECIMAL PLACE IN PPM EQUIVALENT U
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
35                     PPM EQUIVALENT TH
36      13    F6.1     THORIUM CONCENTRATION STANDARD DEVIATION TO ONE
37                     DECIMAL PLACE IN PPM EQUIVALENT TH
```



```
Line                        Character Number
Number  12345678901234567890123456789012345678901234567890123456789012

38      14    A3       THORIUM CONCENTRATION DISTRIBUTION CODE
39      15    I6       NUMBER OF URANIUM-TO-THORIUM RATIO RECORDS COMPUTED
40                     FOR GEOLOGIC UNIT
41      16    F6.1     URANIUM-TO-THORIUM RATIO MEAN TO ONE DECIMAL PLACE
42                     IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
43      17    F6.1     URANIUM-TO-THORIUM RATIO STANDARD DEVIATION TO ONE
44                     DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT
45                     TH
46      18    A3       URANIUM-TO-THORIUM RATIO DISTRIBUTION CODE
47      19    I6       NUMBER OF URANIUM-TO-POTASSIUM RATIO RECORDS
48                     COMPUTED FOR GEOLOGIC UNIT
49      20    F6.1     URANIUM-TO-POTASSIUM RATIO MEAN TO ONE DECIMAL PLACE
50                     IN PPM EQUIVALENT U PER PERCENT K
51      21    F6.1     URANIUM-TO-POTASSIUM RATIO STANDARD DEVIATION TO ONE
52                     DECIMAL PLACE IN PPM EQUIVALENT U PER PERCENT K
53      22    A3       URANIUM-TO-POTASSIUM RATIO DISTRIBUTION CODE
54      23    I6       NUMBER OF THORIUM-TO-POTASSIUM RATIO RECORDS
55                     COMPUTED FOR GEOLOGIC UNIT
56      24    F6.1     THORIUM-TO-POTASSIUM RATIO MEAN TO ONE DECIMAL PLACE
57                     IN PPM EQUIVALENT TH PER PERCENT K
58      25    F6.1     THORIUM-TO-POTASSIUM RATIO STANDARD DEVIATION TO ONE
59                     DECIMAL PLACE IN PPM EQUIVALENT TH PER PERCENT K
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.

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                        Character Number
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
15                        COLLECTED
16      8        F8.4     LATITUDE OF GROUND BASE STATION TO FOUR DECIMAL
17                        PLACES IN DEGREES FOR FIRST FLIGHT LINE
18      9        F8.4     LONGITUDE OF GROUND BASE STATION TO FOUR DECIMAL
19                        PLACES IN DEGREES FOR FIRST FLIGHT LINE
20      10-14    (SAME)   REPEAT OF ITEMS 5-9 FOR SECOND FLIGHT LINE ON THIS
21                        TAPE
22      *        *                          *
23      *        *                          *
24      *        *                          *
25      495-499  (SAME)   REPEAT OF ITEMS 5-9 FOR 99TH FLIGHT LINE ON THIS
26                        TAPE
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
41                        IN GAMMAS
42      11       F7.1     RESIDUAL (IGRF REMOVED) MAGNETIC FIELD INTENSITY
43                        TO ONE DECIMAL PLACE IN GAMMAS
44      12       F7.1     DIURNAL MAGNETIC INTENSITY VARIATION TO ONE DECIMAL
45                        PLACE IN GAMMAS
46      13       F7.1     MAGNETIC DEPTH-TO-BASEMENT TO ONE DECIMAL PLACE
47                        IN METERS (IF REQUIRED)
```

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.

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
Tℓ	^{208}Tℓ c/s
Bi	^{214}Bi c/s
K	^{40}K c/s
BI:Tℓ	Ratio
BI:k	Ratio
Tℓ:K	Ratio
TEMP	Outside Air Temperature (^{o}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
Tℓ	Tℓ value, c/s
Rank	Tℓ standard deviation rank
Bi	Bi value, c/s
Rank	Bi standard deviation rank
K	K value, c/s
Rank	K standard deviation rank
Bi/Tℓ	Ratio value
Rank	Bi/Tℓ standard deviation rank
Bi/K	Ratio value
Rank	Bi/K standard deviation rank
Tℓ/K	Ratio value
Rank	Tℓ/K standard deviation rank

GEODATA INT. INC.   SINGLE REC LISTING   1979
ROCKY MOUNT/MANTEO   NI 18-1   TIELINE 7
ROCKY MOUNT/MANTEO   TIELINE 7

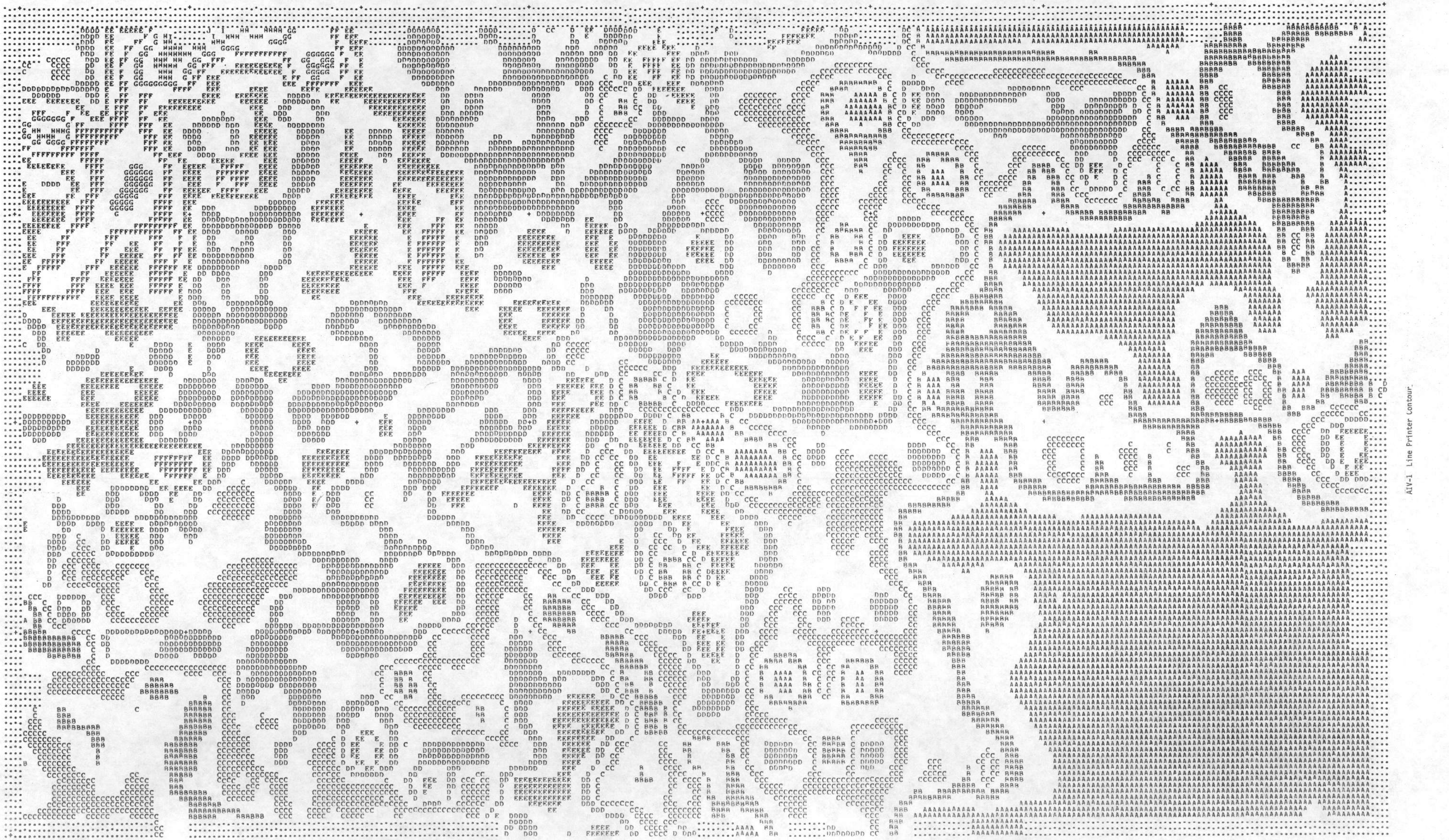
RCN	GEOUNIT	AKUT	LAT	LONG	RMAG	COS	GC	BIAIR	ALT	TEMP	BP	TL	BI	K	BI/TL	BI/K	TL/K
1559	ZNA	0100	34.9771	77.9517	-596.6	25	618	0.2	452	25.1	750.6	2.8	1.7	0.0	0.60	33.21	55.25
1560	ZNA	0111	34.9771	77.9517	-640.8	18	70	0.2	450	25.7	751.6	0.1	0.0	0.0	0.72	2.00	2.76
1561	ZNA	0100	34.9771	77.9517	-631.5	36	639	0.2	459	25.9	751.6	2.9	1.8	0.0	0.62	36.10	58.01
1562	ZNA	0100	34.9776	77.9518	-626.1	20	674	0.2	455	25.8	751.6	2.9	0.9	0.1	0.30	9.10	30.47
1563	ZNA	0010	34.9788	77.9518	-622.6	31	618	0.2	451	25.8	752.6	3.0	0.0	0.2	0.03	0.62	18.77
1564	ZNA	0000	34.9794	77.9518	-615.5	35	643	0.2	442	25.7	752.6	1.1	1.2	0.1	1.11	9.21	8.29
1565	ZNA	0100	34.9799	77.9518	-608.3	16	644	0.2	436	25.8	752.1	2.8	1.6	0.0	0.58	31.77	55.25
1566	ZNA	0000	34.9805	77.9519	-600.9	31	596	0.2	437	25.8	752.1	2.9	0.6	0.1	0.22	5.25	23.43
1567	ZNA	0000	34.9810	77.9519	-591.6	26	627	0.2	445	25.7	752.6	3.6	0.6	0.2	0.18	4.27	23.58
1568	ZNA	0100	34.9816	77.9519	-581.6	26	649	0.2	449	25.8	752.6	2.3	1.9	0.0	0.80	37.54	46.96
1569	ZNA	0100	34.9821	77.9519	-570.7	37	627	0.2	452	25.6	750.6	1.9	0.9	0.0	0.45	17.33	38.67
1570	ZNA	0000	34.9827	77.9520	-559.5	32	649	0.2	455	25.8	750.6	3.0	0.6	0.3	0.19	2.25	11.82
1571	ZNA	0000	34.9832	77.9520	-539.3	25	658	0.2	448	25.8	750.6	3.3	0.7	0.2	0.22	3.99	18.32
1572	ZNA	0000	34.9838	77.9520	-529.7	27	579	0.2	442	25.9	751.1	3.3	0.7	0.1	0.22	5.06	23.21
1573	ZNA	0100	34.9844	77.9520	-521.5	41	585	0.2	437	25.9	752.1	1.5	1.6	-0.1	1.05	31.77	30.39
1574	ZNA	0100	34.9849	77.9520	-513.8	29	624	0.2	440	25.9	752.6	2.8	1.2	0.1	0.44	18.43	41.48
1575	ZNA	0000	34.9855	77.9521	-512.1	32	670	0.2	445	25.8	752.6	2.9	0.6	0.2	0.22	4.27	19.04
1576	ZNA	0100	34.9860	77.9521	-512.1	32	689	0.2	448	25.8	751.6	1.5	1.4	0.1	0.95	13.79	14.51
1577	ZNA	0100	34.9866	77.9521	-518.7	24	756	0.2	444	25.7	752.6	4.1	3.2	0.1	0.77	37.07	48.35
1578	ZNA	0000	34.9871	77.9521	-527.3	33	791	0.2	437	25.6	753.1	3.5	1.2	0.3	0.36	3.68	10.36
1579	ZNA	0000	34.9877	77.9521	-536.5	36	788	0.2	430	25.8	752.6	3.5	1.2	0.2	0.33	6.74	20.15
1580	ZNA	0000	34.9882	77.9522	-546.7	31	773	0.2	435	25.8	752.1	3.6	1.4	0.1	0.38	10.29	26.94
1581	ZNA	0100	34.9888	77.9522	-553.3	41	784	0.2	437	25.8	752.1	1.5	1.8	0.0	1.19	36.10	30.39
1582	ZNA	0100	34.9893	77.9522	-562.1	35	845	0.2	437	25.8	753.6	2.6	0.7	0.1	0.28	8.42	30.62
1583	ZNA	0000	34.9899	77.9522	-569.7	23	839	0.2	433	25.8	752.6	3.7	1.0	0.3	0.27	3.42	12.63
1584	ZNA	0100	34.9905	77.9523	-579.8	42	840	0.2	423	25.8	753.6	5.0	0.9	0.0	0.19	18.77	99.45
1585	ZNA	0000	34.9910	77.9523	-586.7	25	785	0.2	419	25.8	753.1	5.0	0.8	0.3	0.16	2.88	18.01
1586	ZNA	0000	34.9916	77.9523	-597.2	35	869	1.7	418	25.8	752.1	2.2	1.5	0.2	0.69	9.96	14.51
1587	ZNA	0000	34.9921	77.9523	-604.6	37	842	1.7	412	25.6	752.6	4.4	1.5	0.2	0.34	8.85	25.79
1588	ZNA	0100	34.9927	77.9523	-613.2	24	841	1.7	402	25.8	753.6	3.2	1.1	0.1	0.34	11.38	33.37
1589	ZNA	0100	34.9932	77.9524	-619.1	33	685	1.7	400	25.7	752.6	3.7	1.4	0.0	0.37	27.44	74.58
1590	ZNA	0000	34.9938	77.9524	-629.1	32	690	1.7	398	25.9	751.1	2.8	0.9	0.1	0.31	6.07	19.34
1591	ZNA	0000	34.9943	77.9524	-628.5	25	706	1.7	393	26.1	753.6	3.0	0.7	0.1	0.24	5.06	21.28
1592	ZNA	0000	34.9949	77.9524	-631.4	27	692	1.7	409	25.8	752.1	3.2	0.5	0.2	0.16	2.79	17.56
1593	ZNA	0000	34.9954	77.9525	-632.0	22	649	1.7	405	25.8	752.6	3.7	0.6	0.1	0.17	5.69	32.65
1594	ZNA	0000	34.9960	77.9525	-632.1	34	609	1.7	404	25.9	752.1	1.9	1.1	0.2	0.56	5.41	9.67
1595	KPD	0010	34.9966	77.9525	-629.1	38	628	1.8	404	25.9	751.6	2.6	0.0	0.2	0.04	0.42	11.03
1596	KPD	0010	34.9971	77.9525	-627.2	28	540	1.8	408	25.7	752.6	2.8	0.4	0.2	0.16	2.39	15.27
1597	KPD	0000	34.9977	77.9525	-624.7	23	567	1.8	407	25.9	752.6	2.9	0.8	0.2	0.27	3.48	12.69
1598	KPD	0100	34.9982	77.9526	-621.6	33	570	1.8	402	25.7	753.1	2.3	1.1	-0.1	0.46	21.66	46.96
1599	KPD	0100	34.9988	77.9526	-622.7	31	534	1.8	400	25.8	751.6	3.7	1.2	-0.1	0.31	23.10	74.58
1600	KPD	0100	34.9993	77.9526	-621.0	40	573	1.8	394	25.7	751.6	3.5	0.7	0.1	0.21	7.58	36.27
1601	KPD	0000	34.9999	77.9526	-621.0	21	640	1.8	397	25.7	752.1	2.2	0.9	0.1	0.39	6.50	16.58
1602	KPD	0100	35.0004	77.9526	-621.5	32	531	1.8	405	25.8	753.6	1.0	1.4	0.1	1.42	16.01	11.28
1603	KPD	0000	35.0010	77.9527	-622.3	27	570	1.8	412	25.7	752.6	4.6	0.6	0.1	0.13	4.04	31.92
1604	KPD	0100	35.0015	77.9527	-624.9	39	613	2.4	409	25.7	753.6	2.3	1.3	-0.1	0.55	25.99	46.96
1605	KPD	0100	35.0021	77.9527	-622.5	32	519	2.4	397	25.6	751.6	1.9	0.9	0.0	0.49	18.77	38.67
1606	KPD	0000	35.0026	77.9527	-622.9	34	551	2.4	387	25.8	753.6	1.7	1.0	0.2	0.61	5.31	8.70
1607	KPD	0100	35.0032	77.9528	-617.5	27	539	2.4	384	25.8	752.6	3.2	0.9	0.0	0.27	17.33	63.53
1608	KPD	0100	35.0038	77.9528	-606.6	39	492	2.4	378	25.7	753.6	2.9	0.5	0.0	0.17	10.11	58.01
1609	KPD	0010	35.0043	77.9528	-600.5	23	502	2.4	376	25.7	753.1	2.5	0.4	0.1	0.17	3.79	21.77
1610	KPD	0100	35.0049	77.9528	-593.8	19	529	2.4	376	25.7	752.6	3.0	0.6	0.0	0.21	13.00	60.77
1611	KPD	0010	35.0054	77.9528	-588.6	27	534	2.4	376	25.8	752.1	4.6	-0.3	0.2	0.02	0.66	29.93
1612	KPD	0100	35.0060	77.9529	-581.9	41	529	2.4	380	25.8	752.1	1.9	1.4	-0.1	0.71	27.44	38.67
1613	KPD	0100	35.0065	77.9529	-576.6	26	506	2.4	381	25.8	753.6	3.2	1.2	-0.1	0.39	24.55	63.53
1614	KPD	0010	35.0071	77.9529	-571.2	27	540	2.4	381	25.7	752.1	3.0	0.1	0.1	0.03	0.70	21.28
1615	KPD	0110	35.0076	77.9529	-565.0	37	508	2.4	386	25.8	751.6	2.3	0.1	0.1	0.06	1.90	30.85

GEODATA INT. INC.   AVERAGE REC LISTING   1979
ROCKY MOUNT/MANTEO   NI 18-1   TIELINE 7
ROCKY MOUNT/MANTEO   TIELINE 7

RCN	GEOUNIT	AKUT	LAT	LONG	RMAG	COS	GC	BIAIR	TL RANK	BI RANK	K RANK	BI/TL RANK	BI/K RANK	TL/K RANK
1559	ZNA	0000	34.9771	77.9517	-596.6	25	618	0.2	2.8- 1	1.7+ 1	0.0- 1	0.60+ 2	33.21+ 6	55.25+ 3
1560	ZNA	0000	34.9771	77.9517	-640.8	18	70	0.2	0.1- 2	0.0- 3	0.0- 1	0.72+ 3	2.00- 1	2.76- 1
1561	ZNA	0000	34.9771	77.9517	-631.5	36	639	0.2	2.9- 1	1.8+ 1	0.0- 1	0.62+ 2	36.10+ 7	58.01+ 4
1562	ZNA	0000	34.9776	77.9518	-626.1	20	674	0.2	2.3- 1	0.9- 1	0.1- 1	0.39+ 0	11.61+ 1	29.79+ 1
1563	ZNA	0000	34.9788	77.9518	-622.6	31	618	0.2	2.4- 1	0.9- 1	0.1- 1	0.36- 0	8.84+ 1	24.83+ 1
1564	ZNA	0000	34.9794	77.9518	-615.5	35	643	0.2	2.5- 1	0.9- 1	0.1- 1	0.38- 0	8.95+ 1	23.55+ 0
1565	ZNA	0000	34.9799	77.9518	-608.3	16	644	0.2	2.6- 1	1.0- 1	0.1- 1	0.39+ 0	10.14+ 1	26.31+ 1
1566	ZNA	0000	34.9805	77.9519	-600.9	31	596	0.2	2.7- 1	1.0- 1	0.1- 1	0.39+ 0	11.25+ 1	29.21+ 1
1567	ZNA	0000	34.9810	77.9519	-591.6	26	627	0.2	2.7- 1	1.1- 1	0.1- 1	0.39+ 0	11.75+ 1	30.36+ 1
1568	ZNA	0000	34.9816	77.9519	-581.6	26	649	0.2	2.7- 1	1.1- 1	0.1- 1	0.38- 0	11.55+ 1	30.15+ 1
1569	ZNA	0000	34.9821	77.9519	-570.7	37	627	0.2	2.7- 1	0.9- 1	0.1- 1	0.34- 0	8.63+ 0	25.35+ 1
1570	ZNA	0000	34.9827	77.9520	-559.5	32	649	0.2	2.8- 1	0.9- 1	0.1- 1	0.33- 0	7.43+ 0	22.71+ 0
1571	ZNA	0000	34.9832	77.9520	-539.3	25	658	0.2	2.8- 1	0.9- 1	0.1- 1	0.33- 0	8.01+ 0	24.00+ 0
1572	ZNA	0000	34.9838	77.9520	-529.7	27	579	0.2	2.8- 1	0.9- 1	0.1- 1	0.34- 0	8.87+ 1	26.23+ 1
1573	ZNA	0000	34.9844	77.9520	-521.5	41	585	0.2	2.6- 1	1.1- 1	0.1- 1	0.41+ 0	12.55+ 1	30.55+ 1
1574	ZNA	0000	34.9849	77.9520	-513.8	29	624	0.2	2.6- 1	1.2- 0	0.1- 1	0.48+ 1	15.80+ 2	32.97+ 1
1575	ZNA	0000	34.9855	77.9521	-512.1	32	670	0.2	2.7- 1	1.4- 0	0.1- 1	0.52+ 1	13.65+ 2	26.29+ 1
1576	ZNA	0000	34.9860	77.9521	-512.1	32	689	0.2	2.8- 1	1.6+ 0	0.1- 1	0.56+ 1	12.28+ 1	22.00+ 0
1577	ZNA	0000	34.9866	77.9521	-518.7	24	756	0.2	3.2- 1	1.7+ 1	0.2- 1	0.53+ 1	10.75+ 1	20.19+ 0
1578	ZNA	0000	34.9871	77.9521	-527.3	33	791	0.2	3.2- 0	1.6+ 0	0.2- 1	0.51+ 1	9.51+ 1	18.75+ 0
1579	ZNA	0000	34.9877	77.9521	-536.5	36	788	0.2	3.2- 1	1.5+ 0	0.2- 1	0.49+ 1	10.03+ 1	20.60+ 0
1580	ZNA	0000	34.9882	77.9522	-546.7	31	773	0.2	3.1- 1	1.4+ 0	0.1- 1	0.46+ 1	9.91+ 1	21.76+ 0
1581	ZNA	0000	34.9888	77.9522	-553.3	41	784	0.2	3.0- 1	1.2- 0	0.1- 1	0.42+ 0	10.35+ 1	24.58+ 1
1582	ZNA	0000	34.9893	77.9522	-562.1	35	845	0.2	3.2- 0	1.1- 1	0.1- 1	0.35- 0	9.13+ 1	26.41+ 1
1583	ZNA	0000	34.9899	77.9522	-569.7	23	839	0.2	3.5- 0	1.1- 1	0.1- 1	0.30- 1	7.43+ 0	24.52+ 1
1584	ZNA	0000	34.9905	77.9523	-579.8	42	840	0.2	3.9- 0	1.1- 1	0.1- 1	0.28- 1	7.07+ 0	25.67+ 1
1585	ZNA	0000	34.9910	77.9523	-586.7	25	785	0.2	4.0- 0	1.1- 1	0.2- 1	0.27- 1	6.44- 0	23.50+ 0
1586	ZNA	0000	34.9916	77.9523	-597.2	35	869	1.7	3.8- 0	1.2- 0	0.2- 1	0.32- 0	7.91+ 0	24.74+ 1
1587	ZNA	0000	34.9921	77.9523	-604.6	37	842	1.7	3.7- 0	1.2- 0	0.1- 1	0.34- 0	9.38+ 1	27.65+ 1
1588	ZNA	0000	34.9927	77.9523	-613.2	24	841	1.7	3.4- 0	1.2- 0	0.1- 1	0.35- 0	10.12+ 1	28.94+ 1
1589	ZNA	0000	34.9932	77.9524	-619.1	33	685	1.7	3.3- 0	1.1- 1	0.1- 1	0.34- 0	10.64+ 1	31.65+ 1
1590	ZNA	0000	34.9938	77.9524	-629.1	32	690	1.7	3.3- 0	0.9- 1	0.1- 1	0.29- 1	8.21+ 0	28.41+ 1
1591	ZNA	0000	34.9943	77.9524	-628.5	25	706	1.7	3.1- 1	0.8- 1	0.1- 1	0.26- 1	6.40- 0	24.20+ 1
1592	ZNA	0000	34.9949	77.9524	-631.4	27	692	1.7	3.0- 1	0.7- 1	0.2- 1	0.23- 1	4.72- 0	20.16+ 0
1593	ZNA	0000	34.9954	77.9525	-632.0	22	649	1.7	2.9- 1	0.6- 2	0.2- 1	0.21- 1	3.76- 1	17.54- 0
1594	ZNA	0000	34.9960	77.9525	-632.1	34	609	1.7	2.8- 1	0.6- 2	0.2- 1	0.22- 1	3.28- 1	15.12- 0
1595	KPD	0000	34.9966	77.9525	-629.1	38	628	1.8	2.7- 0	0.6- 2	0.2- 1	0.21- 1	3.12- 0	14.98- 0
1596	KPD	0000	34.9971	77.9525	-627.2	28	540	1.8	2.7- 0	0.6- 1	0.1- 1	0.23- 1	4.32- 0	18.41+ 0
1597	KPD	0000	34.9977	77.9525	-624.7	23	567	1.8	2.8- 0	0.7- 1	0.1- 1	0.26- 1	6.72+ 0	25.56+ 1
1598	KPD	0000	34.9982	77.9526	-621.6	33	570	1.8	2.9- 0	0.8- 1	0.1- 1	0.29- 1	14.17+ 1	49.38+ 3
1599	KPD	0000	34.9988	77.9526	-622.7	31	534	1.8	2.9- 0	0.9- 1	0.0- 1	0.33- 0	18.95+ 2	57.84+ 3
1600	KPD	0000	34.9993	77.9526	-621.0	40	573	1.8	2.9- 0	1.0- 1	0.0- 1	0.33- 0	19.04+ 2	57.15+ 3
1601	KPD	0000	34.9999	77.9526	-621.0	21	640	1.8	2.7- 0	1.0- 1	0.1- 1	0.36- 0	16.89+ 1	46.96+ 2
1602	KPD	0000	35.0004	77.9526	-621.5	32	531	1.8	2.6- 1	1.0- 1	0.1- 1	0.39+ 0	15.10+ 1	39.21+ 2
1603	KPD	0000	35.0010	77.9527	-622.3	27	570	1.8	2.6- 1	1.0- 1	0.1- 1	0.38+ 0	13.71+ 1	36.39+ 1
1604	KPD	0000	35.0015	77.9527	-624.9	39	613	2.4	2.5- 1	1.0- 0	0.1- 1	0.41+ 0	20.08+ 2	48.82+ 2
1605	KPD	0000	35.0021	77.9527	-622.5	32	519	2.4	2.4- 1	1.0- 1	0.1- 1	0.40+ 0	18.66+ 2	47.21+ 2
1606	KPD	0000	35.0026	77.9527	-622.9	34	551	2.4	2.5- 1	0.9- 1	0.1- 1	0.36- 0	13.82+ 1	38.79+ 2
1607	KPD	0000	35.0032	77.9528	-617.5	27	539	2.4	2.5- 1	0.8- 1	0.1- 1	0.31- 0	13.91+ 1	44.44+ 2
1608	KPD	0000	35.0038	77.9528	-606.6	39	492	2.4	2.8- 0	0.6- 1	0.1- 1	0.22- 1	8.96+ 0	40.28+ 2
1609	KPD	0000	35.0043	77.9528	-600.5	23	502	2.4	2.9- 0	0.5- 2	0.1- 1	0.19- 2	8.74+ 0	46.85+ 2
1610	KPD	0000	35.0049	77.9528	-593.8	19	529	2.4	3.1- 0	0.6- 2	0.0- 1	0.18- 2	11.10+ 1	61.64+ 3
1611	KPD	0000	35.0054	77.9528	-588.6	27	534	2.4	3.2- 0	0.6- 2	0.0- 1	0.17- 2	11.01+ 1	63.02+ 4
1612	KPD	0000	35.0060	77.9529	-581.9	41	529	2.4	3.0- 0	0.6- 1	0.0- 1	0.22- 1	12.91+ 1	59.91+ 3
1613	KPD	0000	35.0065	77.9529	-576.6	26	506	2.4	2.9- 0	0.6- 1	0.0- 1	0.22- 1	12.82+ 1	57.32+ 3
1614	KPD	0000	35.0071	77.9529	-571.2	27	540	2.4	2.7- 0	0.5- 2	0.0- 1	0.20- 1	10.47+ 1	53.35+ 3
1615	KPD	0000	35.0076	77.9529	-565.0	37	508	2.4	2.4- 1	0.5- 2	0.1- 1	0.20- 1	9.24+ 0	46.88+ 2

CONTOUR INTERVAL= 0.60 ROCKY MOUNT/MANTEO LAT 35.000 LONG -78.000

TL



GEODATA INTERNATIONAL, INC.
DALLAS, TEXAS

A< 0.60 | 1.20<B< 1.80 | 2.40<C< 3.00 | 3.60<D< 4.20 | 4.80<E< 5.40 | 6.00<F< 6.60

7.20<G< 7.80 | 8.40<H< 9.00 | 9.60<I< 10.20 | 10.80<J< 11.40 | 12.00<K< 12.60

AIV-1 Line Printer Contour.

CONTOUR INTERVAL= 0.27 ROCKY MOUNT/MANTEO LAT 35.000 LONG -78.000

BJ

AIV-Z Line Printer Contour

GEODATA INTERNATIONAL, INC.
DALLAS, TEXAS

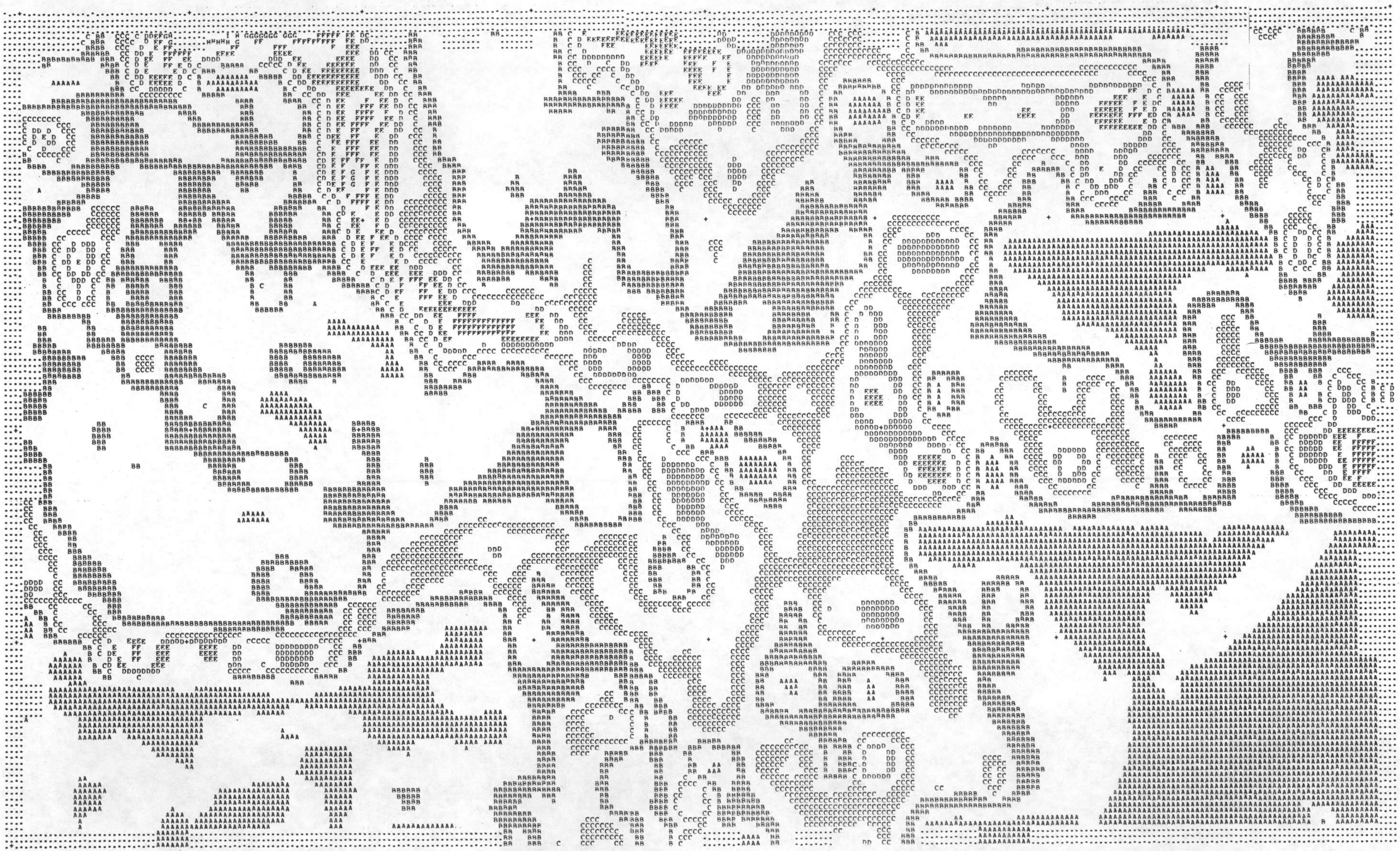
A< 0.27 0.55<B< 0.82 1.10<C< 1.38 1.65<D< 1.92 2.20<E< 2.47 2.75<F< 3.02

3.30<G< 3.57 3.85<H< 4.13 4.40<I< 4.67 4.95<J< 5.22

SCALE= 6.350 GRID INTERVAL= 2.400 29-JAN-80 16:30

CONTOUR INTERVAL= 0.10 ROCKY MOUNT/MANTEO LAT 35.000 LONG -78.000

K



AIV-3 Line Printer Contour

GEODATA INTERNATIONAL, INC.
DALLAS, TEXAS

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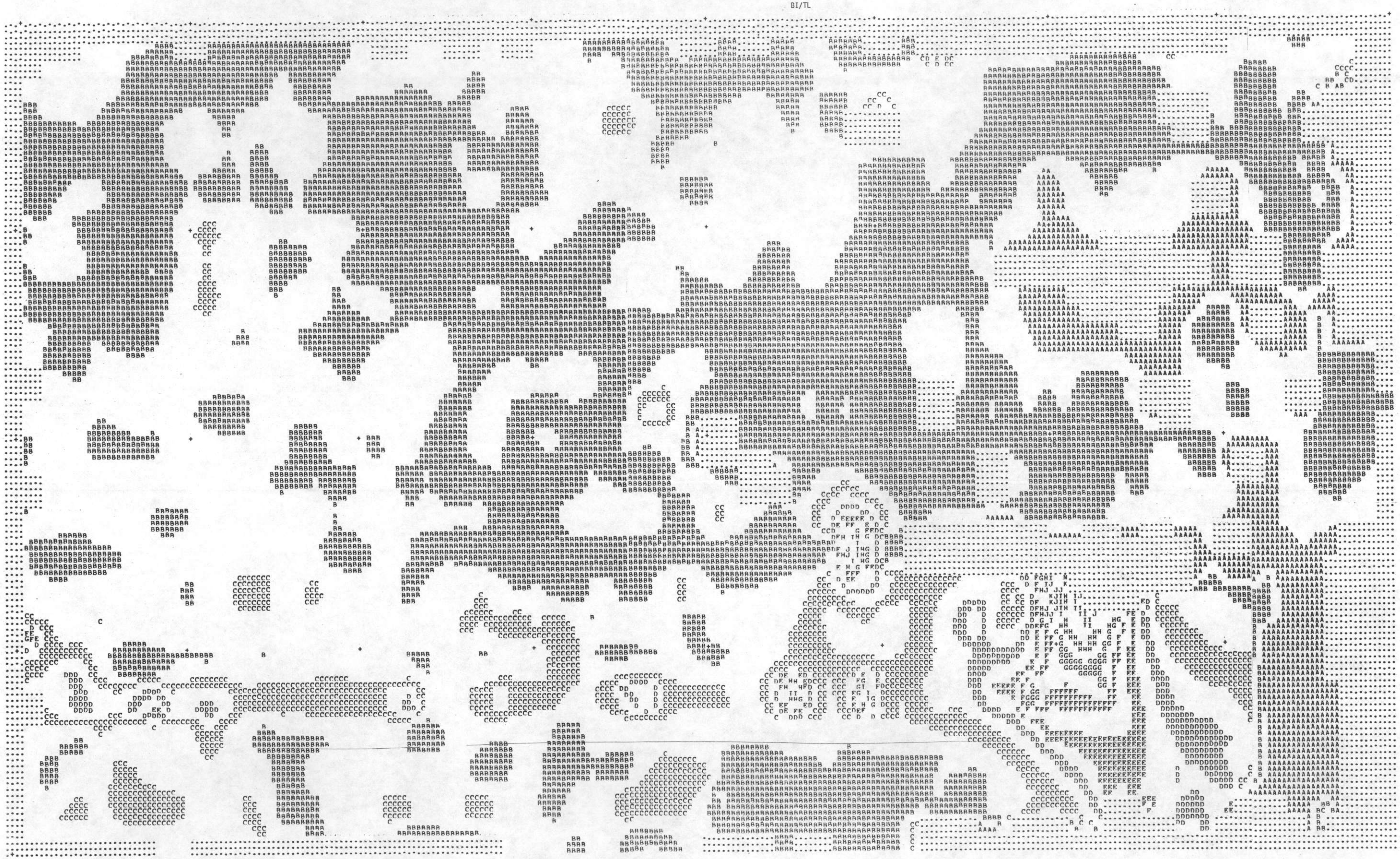
	1.20<G< 1.30	1.40<H< 1.50	1.60<I< 1.70	1.80<J< 1.90	2.00<K< 2.10

SCALE= 6.350 GRID INTERVAL= 2.400 29-JAN-80 16:31

CONTOUR INTERVAL= 0.10 ROCKY MOUNT/MANTEO LAT 35.000 LONG -78.000

BI/TL



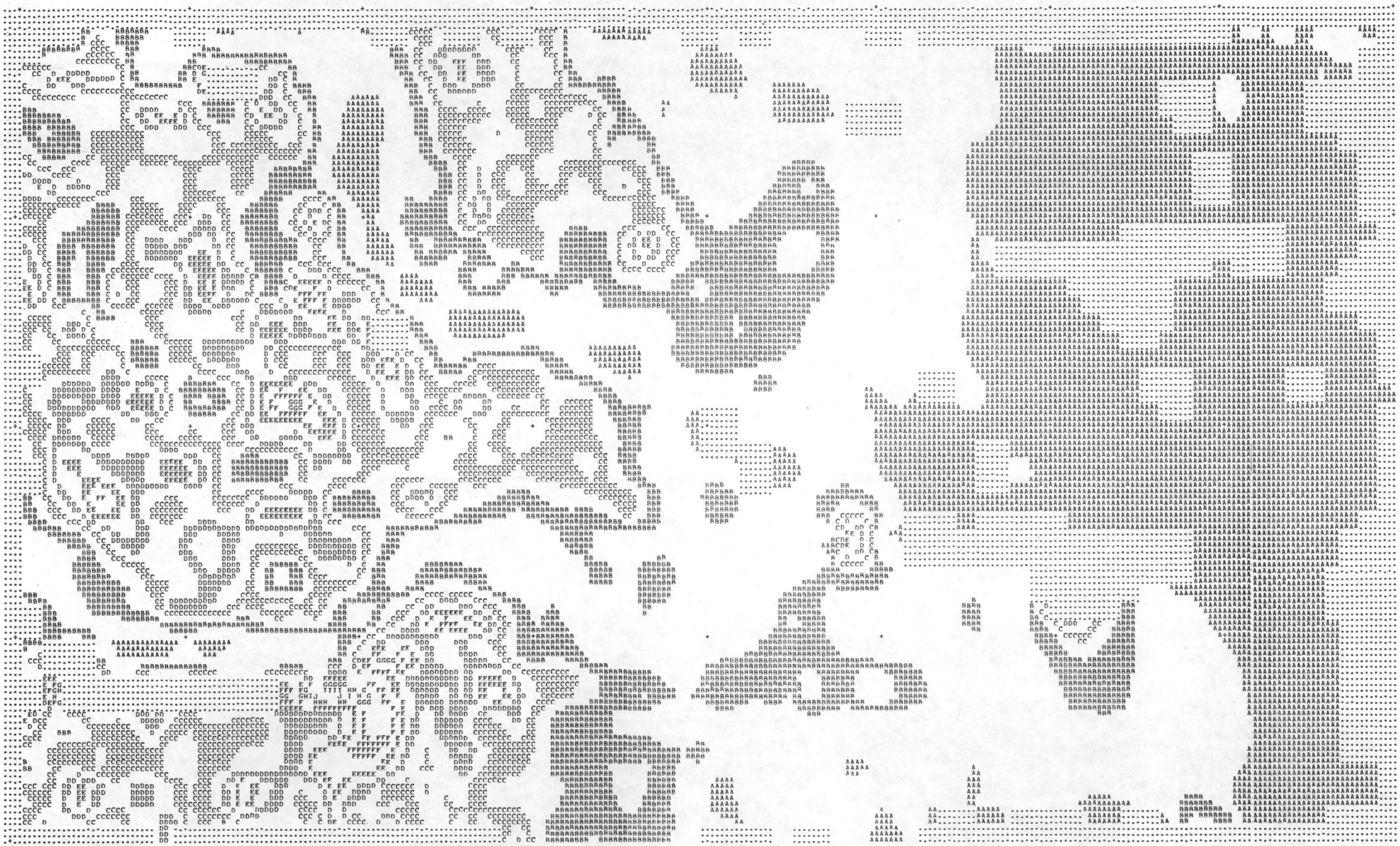
GEODATA INTERNATIONAL, INC.
DALLAS, TEXAS

A< 0.10	0.20<B< 0.30	0.40<C< 0.50	0.60<D< 0.70	0.80<E< 0.90	1.00<F< 1.10
	1.20<G< 1.30	1.40<H< 1.50	1.60<I< 1.70	1.80<J< 1.90	2.00<K< 2.10
	2.20<L< 2.30	2.40<M< 2.50			

AIV-4 Line Printer Contour

CONTOUR INTERVAL= 1.50 ROCKY MOUNT/MANTEO LAT 35.000 LONG -78.000

BI/K



GEODATA INTERNATIONAL, INC.
DALLAS, TEXAS

A< 1.5	3.0<B< 4.5	6.0<C< 7.5	9.0<D< 10.5	12.0<E< 13.5	15.0<F< 16.5
	18.0<G< 19.5	21.0<H< 22.5	24.0<I< 25.5	27.0<J< 28.5	30.0<K< 31.5

AIV-5 Line Printer Contour

CONTOUR INTERVAL= 5.25 ROCKY MOUNT/MANTEO LAT 35.000 LONG -78.000

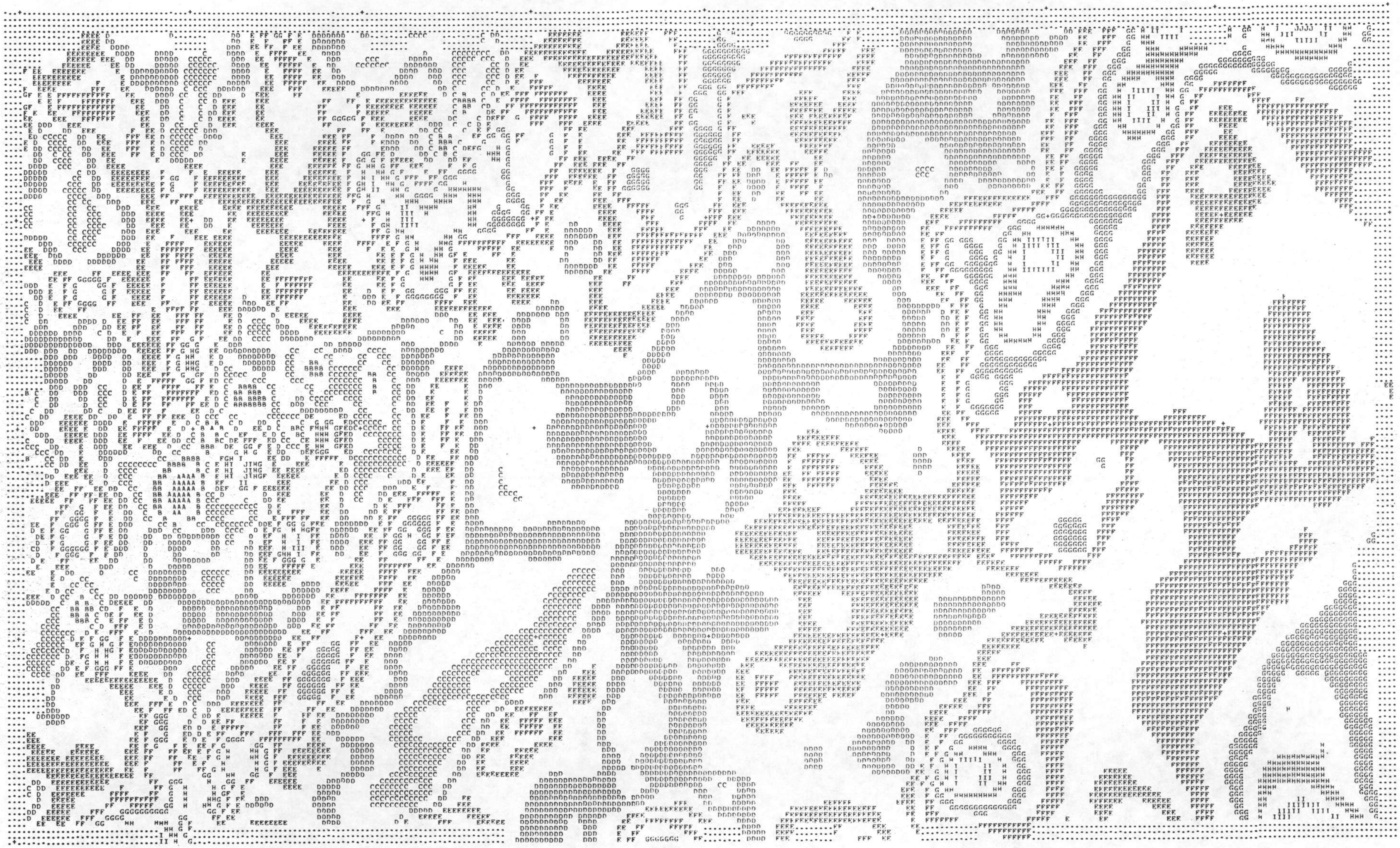
TL/K

AIV-6 Line Printer Contour

GEODATA INTERNATIONAL, INC.
DALLAS, TEXAS

A< 5.3	10.5<B< 15.8	21.0<C< 26.3	31.5<D< 36.8	42.0<E< 47.3	52.5<F< 57.8
	63.0<G< 68.3	73.5<H< 78.8	84.0<I< 89.3	94.5<J< 99.8	105.0<K< 110.3

CONTOUR INTERVAL= 50.00 ROCKY MOUNT/MANTEO LAT 35.000 LONG -78.000 R Mag



AIV-7 Line Printer Contour

GEODATA INTERNATIONAL, INC.
DALLAS, TEXAS

A< -1000. -950.<B< -900. -850.<C< -800. -750.<D< -700. -650.<E< -600. -550.<F< -500.

-450.<G< -400. -350.<H< -300. -250.<I< -200. -150.<J< -100.

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