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GEOLOGICAL SURVEY OF CANADA



COMMISSION GÉOLOGIQUE DU CANADA

DEPARTMENT OF ENERGY MINES AND RESOURCES
MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES

AIRBORNE GEOPHYSICAL SURVEY
1986

GIBRALTAR HILL AREA
NOVA SCOTIA
11D/14 (part of)

Gamma Ray Spectrometric Colour Maps
and VLF-EM Profile Maps

Geological Survey of Canada Open File 1476



Nova Scotia
 **Department of
Mines and Energy**

 **Energy, Mines and
Resources Canada** **Énergie, Mines et
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1476

GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA

OTTAWA

1987

**AIRBORNE GEOPHYSICAL SURVEY - GIBRALTAR HILL AREA
NOVA SCOTIA**

In the summer of 1986 a multi-parameter geophysical survey was flown in the Gibraltar Hill area of Nova Scotia. The area surveyed is shown on the index map. The main purpose of the survey was to produce quantitative gamma ray spectrometric information to assist with the identification of various phases of a composite suite of granitic rocks, and using radioelements as indicator or pathfinder elements, to aid exploration for granophile element mineralization.

Data are presented as a set of eight 1:50 000 radioelement colour maps (total count, potassium, equivalent uranium and equivalent thorium concentrations, the eU/eTh, eU/K and eTh/K ratios, and the ternary radioelement map (J. Broome, J.M. Carson, J.A. Grant and K.L. Ford, 1987, A Modified Ternary Radioelement Mapping Technique and its Application to the South Coast of Newfoundland, GSC Paper 87-14)) Accompanying the colour maps are two 1:50 000 VLF profile maps, with flight lines and a topographic base of the survey area.

The airborne VLF measurements were obtained using a Herz Totem 1A airborne VLF system. The primary electromagnetic field is generated by VLF station NSS at Annapolis, Maryland, which transmits at 21.4 kHz. The secondary field is generated by eddy currents flowing in near-surface conductors. The profiles presented are the total field value (vector sum of the horizontal and vertical components) and the quadrature (out-of-phase) component of the vertical field. The total field is expressed in percent of the local primary field and the quadrature in percent of the along-track component. The mean values of the total field and quadrature component were removed along each flight line. The quadrature which depends on the flight line directions, was inverted for lines flown from north to south. A 5 point filter was applied to both total field and quadrature data for final presentation. Anomalies over conductors produce positive peaks on the total field trace and are of the cross-over type (negative to positive) on the quadrature trace.

All data were sampled at 1 second intervals. The airborne radiometric measurements were made using a 256 channel spectrometer, with twelve 102x102x406 mm NaI (Tl) detectors, flown at a mean terrain clearance of 125 m at 190 km/h. North-south flight lines were at 250 metre line spacing.

Potassium is measured directly from the 1.46 MeV gamma ray photons emitted by ⁴⁰K, whereas uranium and thorium are measured indirectly from gamma ray photons emitted by daughter products in their decay chains. Uranium is monitored by means of gamma ray photons at approximately 1.76 MeV from ²¹⁴Bi, and thorium, from 2.62 MeV photons emitted by ²⁰⁸Tl. The energy windows used are as follows:

Total Count		0.41-2.81 MeV
Potassium	⁴⁰ K	1.36-1.56 MeV
Uranium	²¹⁴ Bi	1.66-1.86 MeV
Thorium	²⁰⁸ Tl	2.41-2.81 MeV

Total count, uranium, thorium and potassium counts have been corrected for dead time, ambient temperature changes, background radiation, spectral scattering and deviations of terrain clearance from the planned survey altitude. In areas of extreme topographic variations accurate terrain corrections are difficult. Thus, estimates of radioelement concentrations may be inaccurate in these areas. The computer programs used to produce the contour maps and profiles are modified from Geological Survey of Canada Open File 109 "Airborne Gamma Spectrometry Data Processing Manual".

The values for the radioelement concentrations shown on the maps are "average surface concentrations", that is, an average for the area on the ground viewed by the spectrometer, an area which may contain varying amounts of outcrop, overburden and surface waters. As a result the concentrations shown are usually considerably lower than the concentrations in the bedrock. However, the radioelement distribution shown by the maps reflects the relative distribution of the elements in the bedrock.

Factors for converting airborne measurements to element concentration were determined by relating the corrected airborne count rates over a test strip in the Ottawa area to the known ground radioelement concentrations (R.L. Grasty and B.W. Charbonneau, 1974, Gamma-Ray Spectrometry Calibration Facilities, G.S.C. Paper 74-1B, pp. 69-71).

The conversion factors used are those listed below:

1 Ur Total Count	161 cps
1% K	91.0 cps
1 ppm eU	9.1 cps
1 ppm eTh	7.0 cps

Total count measurements are presented as units of radioelement concentration (Ur), as defined in International Atomic Energy Agency Technical Report Series No. 174, 1976.

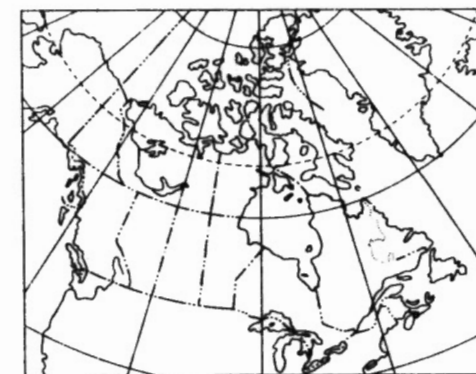
Information regarding the availability of this Open File release may be obtained from: Geological Survey of Canada, 601 Booth St., Ottawa, Ontario, K1A 0E8. Telephone (613) 995-4342.

Base map material supplied by Surveys and Mapping Branch

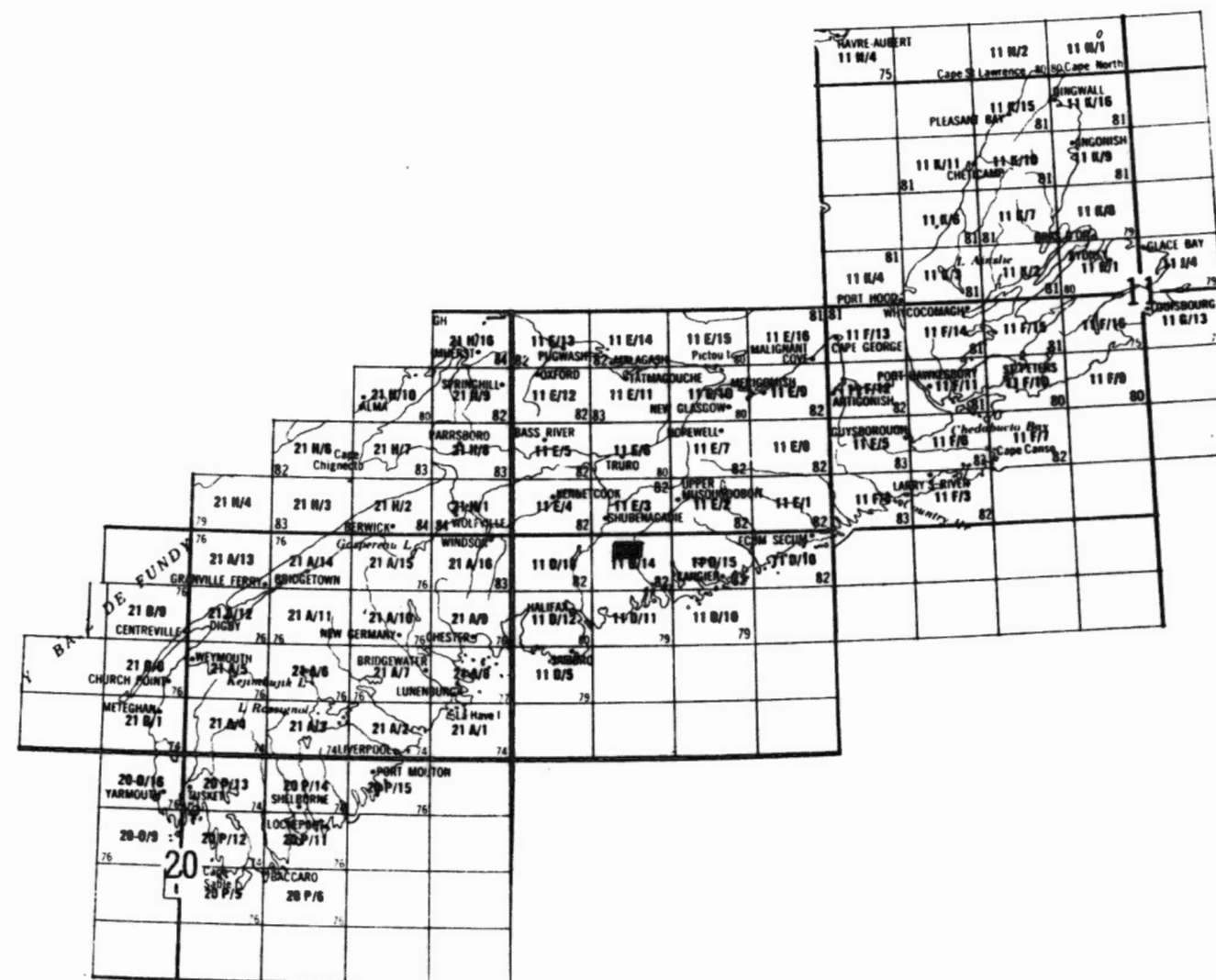
Airborne gamma ray spectrometric, VLF and magnetic survey flown, compiled, and funded by Geological Survey of Canada

as a

Contribution to Canada-Nova Scotia
Mineral Development Agreement 1984-89
a subsidiary agreement under the
Economic and Regional Development Agreement



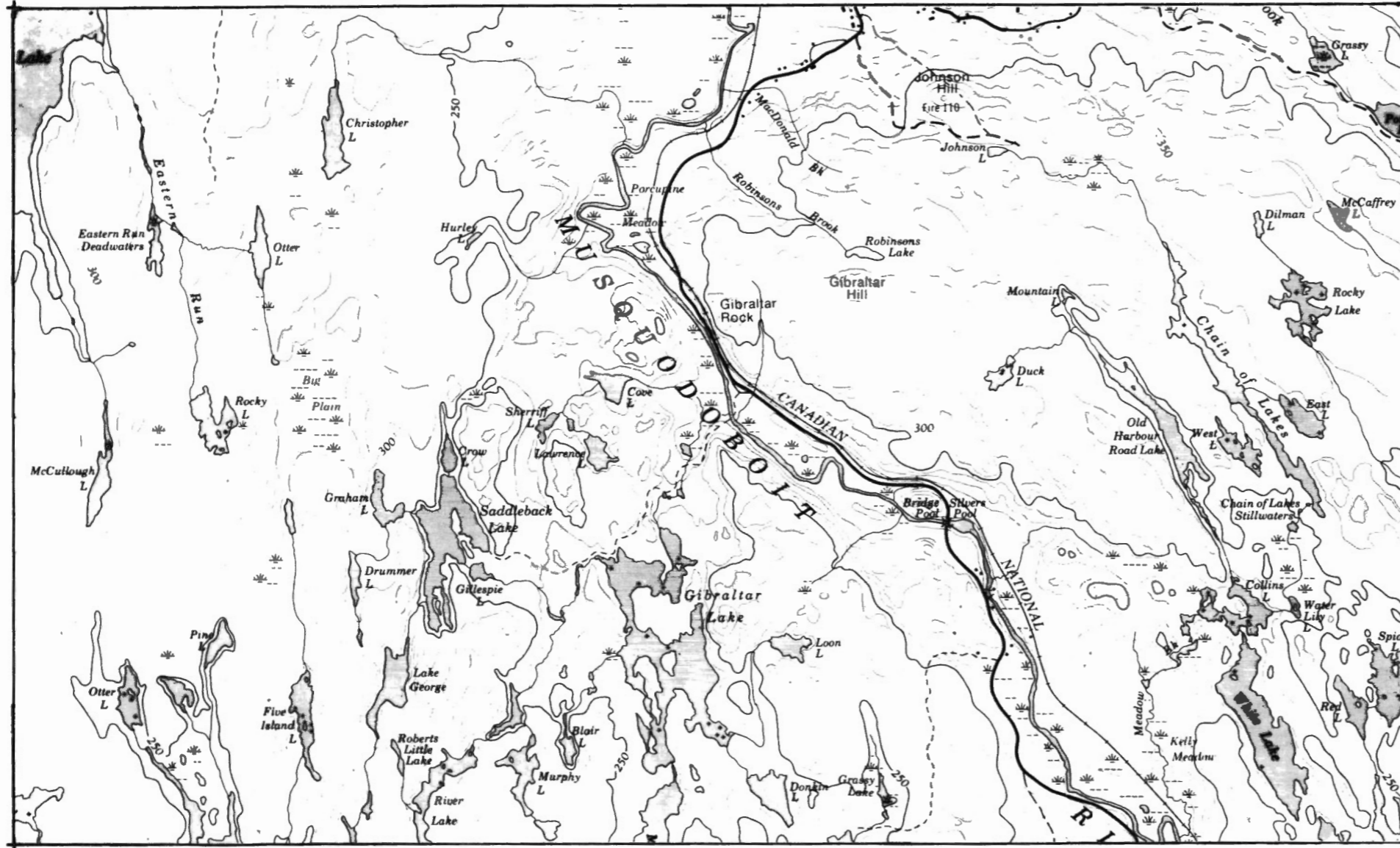
INDEX MAP



63 19 40

63 10 10

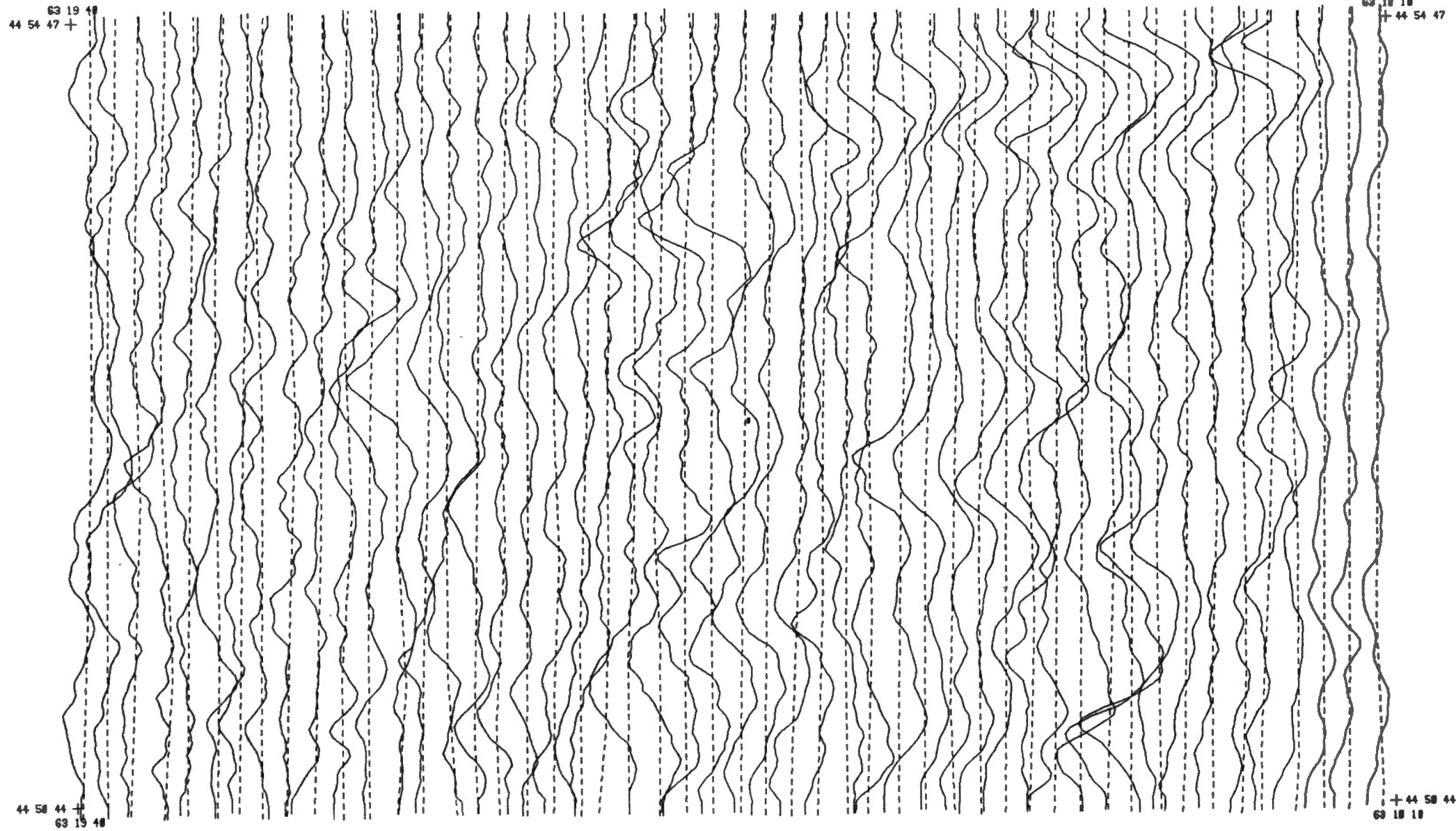
44 54 47



Gibraltar Hill
Nova Scotia
11 D/14 (parts of)



44 50 44



VLF TOTAL FIELD

Scale : 15.0 % / cm

---- Flight Track

Gibraltar Hill

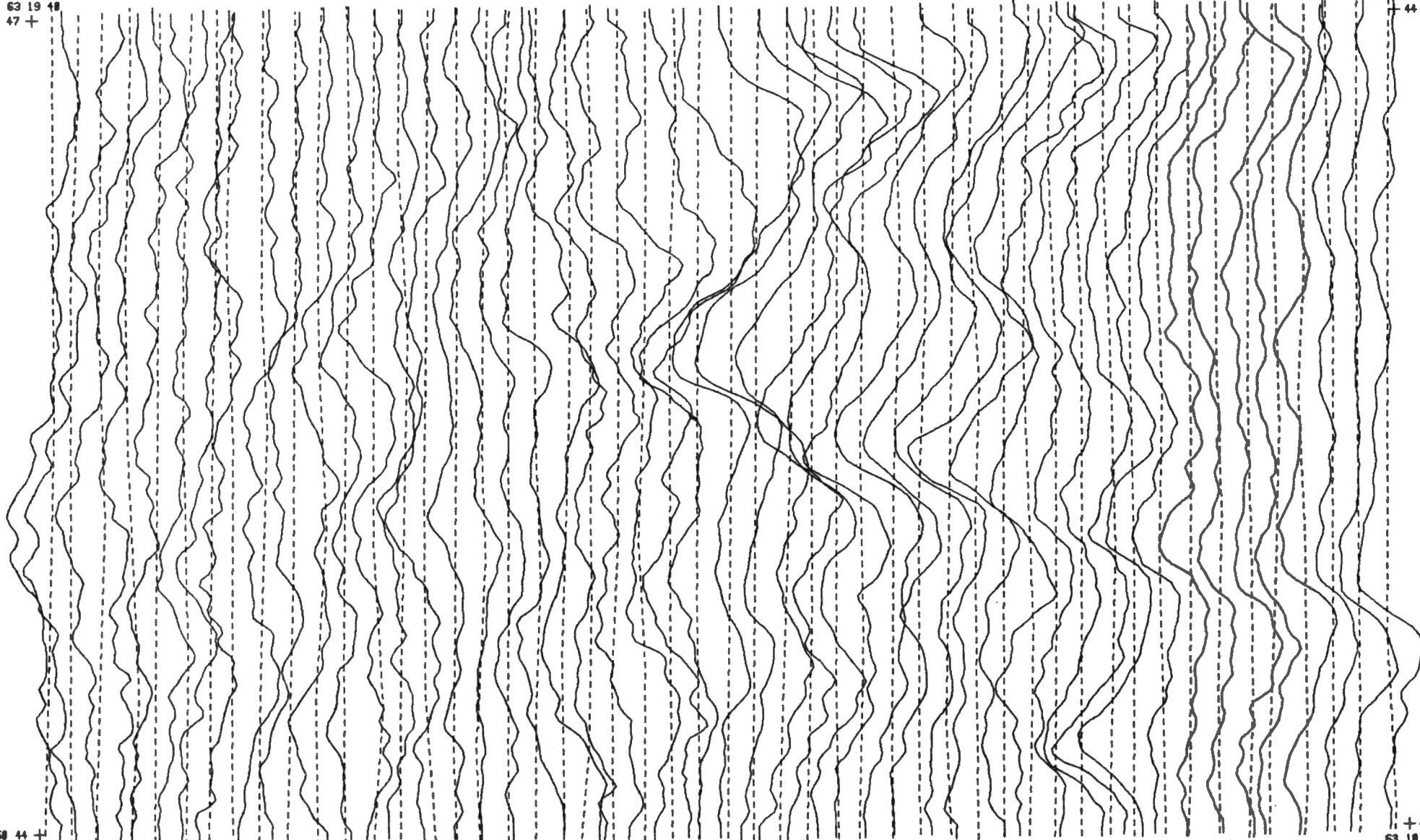
Nova Scotia

11 D/14 (part of)



63 19 48
44 54 47 +

63 18 18
44 54 47



VLF QUADRATURE

Scale 10.0 % / cm

---- Flight Track

Gibraltar Hill

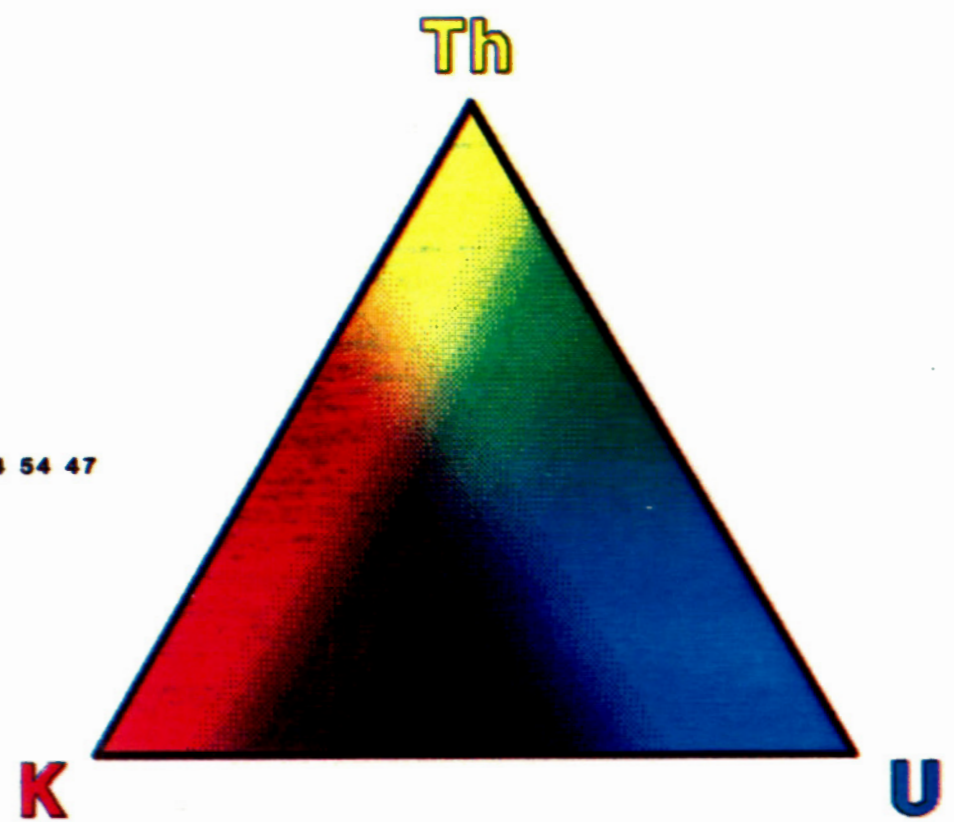
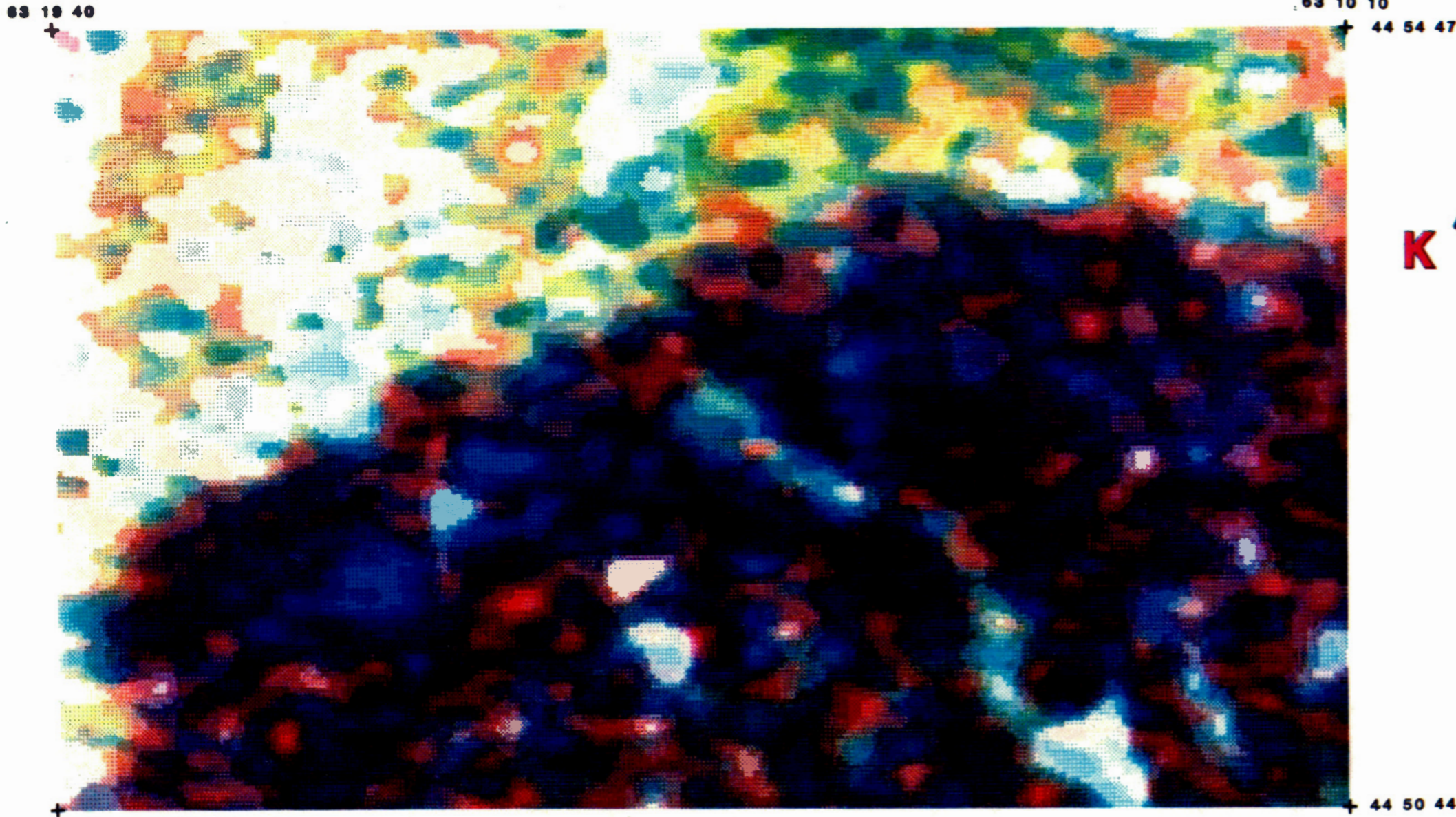
Nova Scotia

11 D/14 (part of)

44 58 44 +
63 19 48

+ 44 58 44
63 18 18

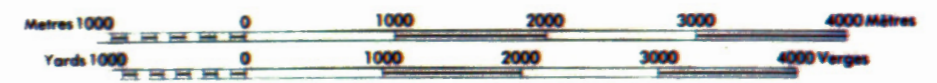




Ternary Radioelement Map

Software developed by : J. Broome
 Lithospheric Geophysics Section
 Lithosphere and Canadian Shield Div.
 Data compiled by : K. Ford
 Airborne Geophysics Section
 Mineral Resources Division
 Geological Survey of Canada

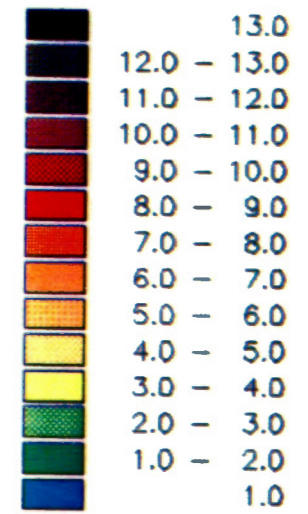
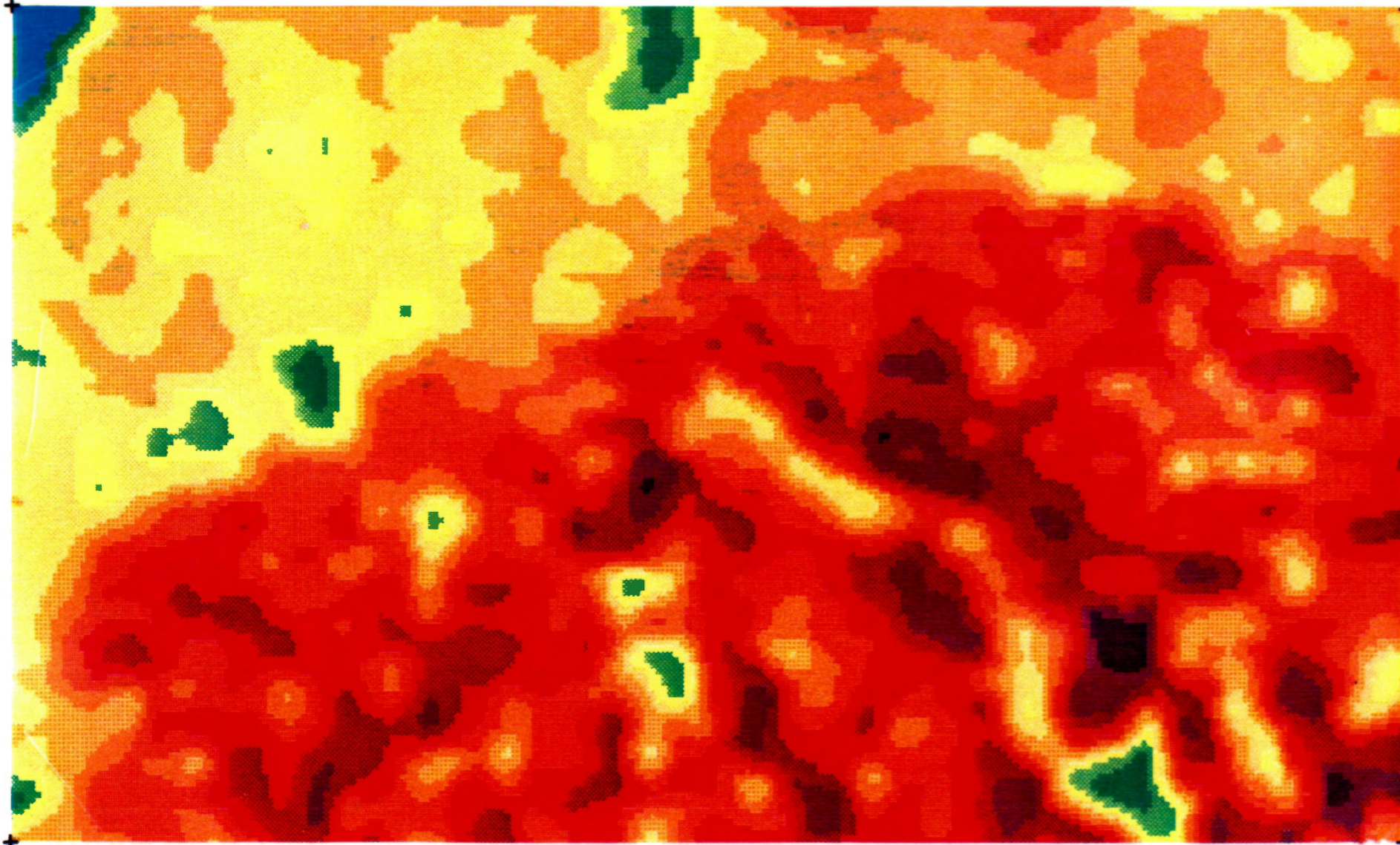
**Gibraltar Hill
 Nova Scotia
 11 D/14 (parts of)**



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Total Count (Ur)

Gibraltar Hill
Nova Scotia
11 D/14 (part of)

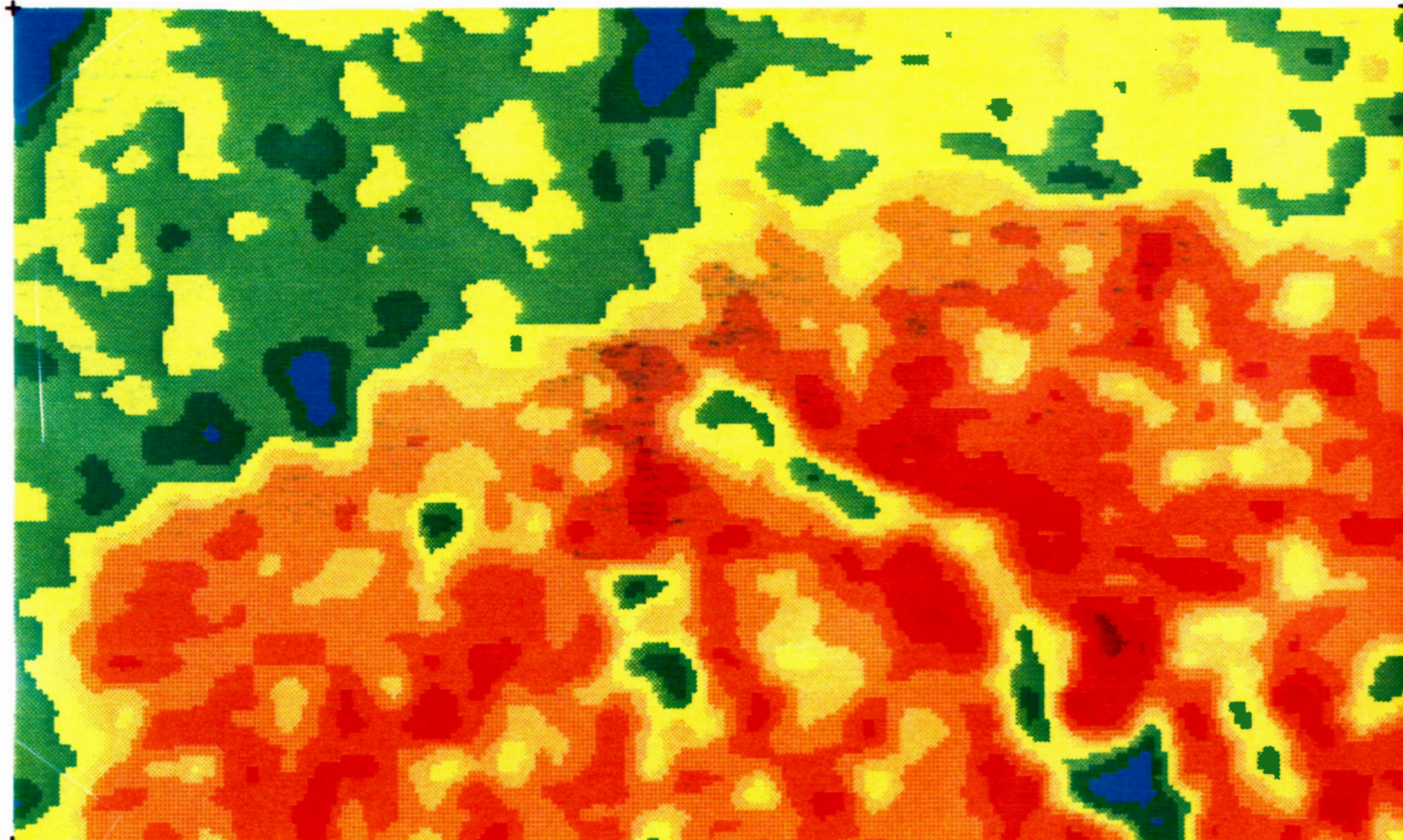


44 50 44

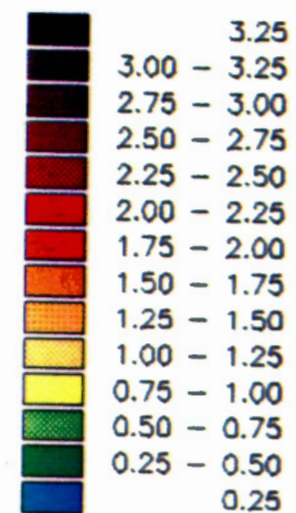
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63 10 10

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44 50 44



Potassium (percent)

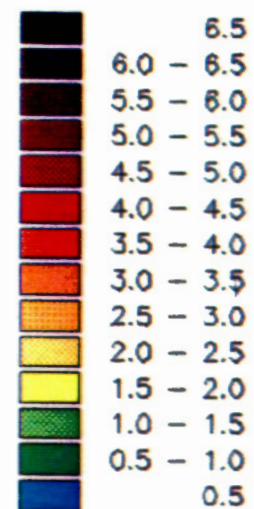
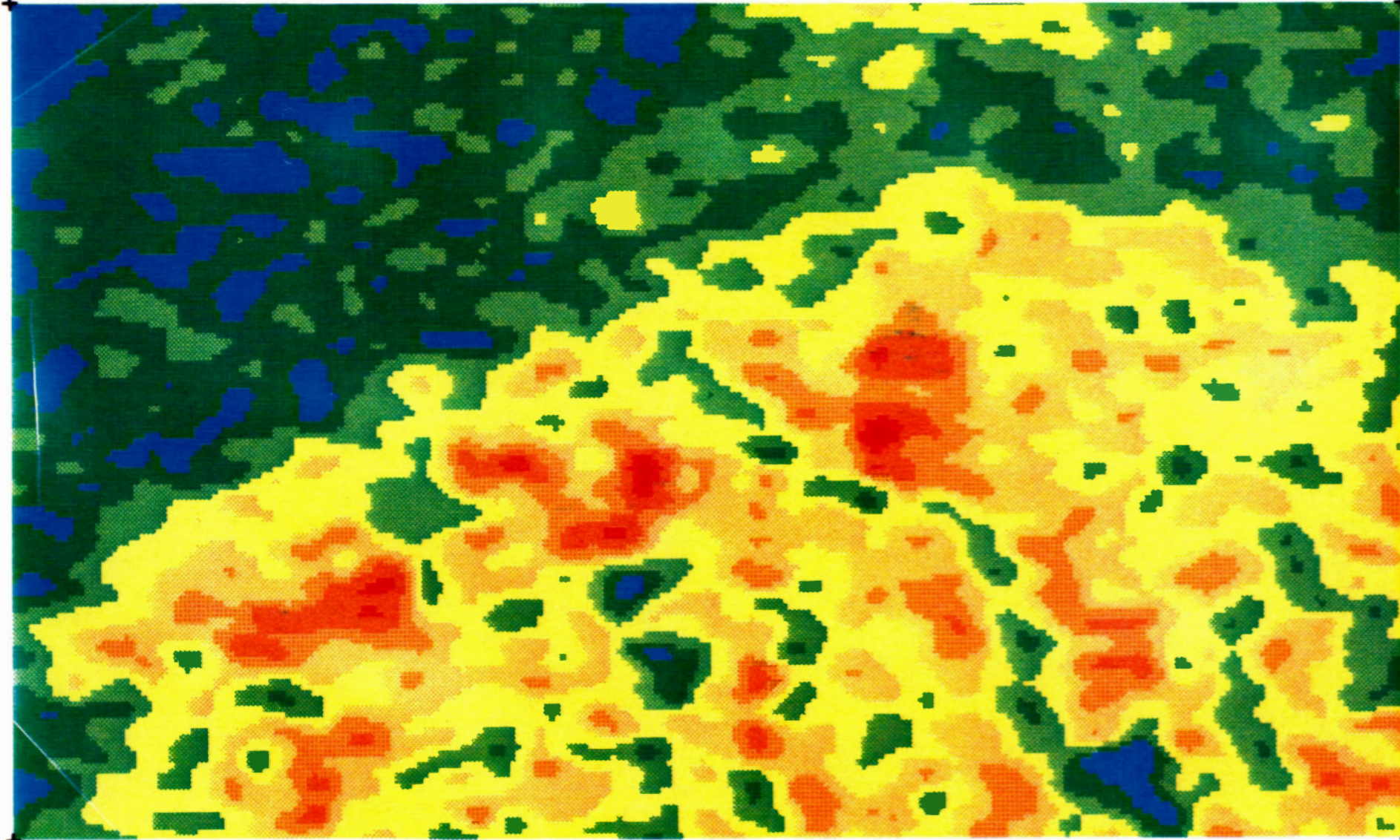
Gibraltar Hill
Nova Scotia
11 D/14 (parts of)



63 19 40

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44 54 47



equivalent Uranium (ppm)

Gibraltar Hill

Nova Scotia

11 D/14 (parts of)

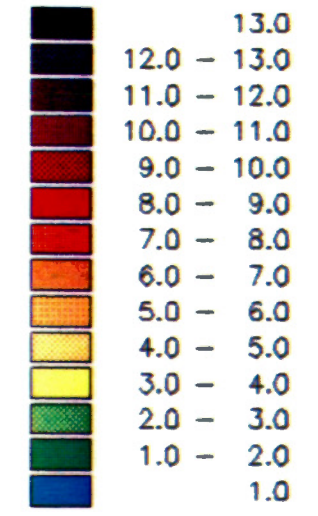
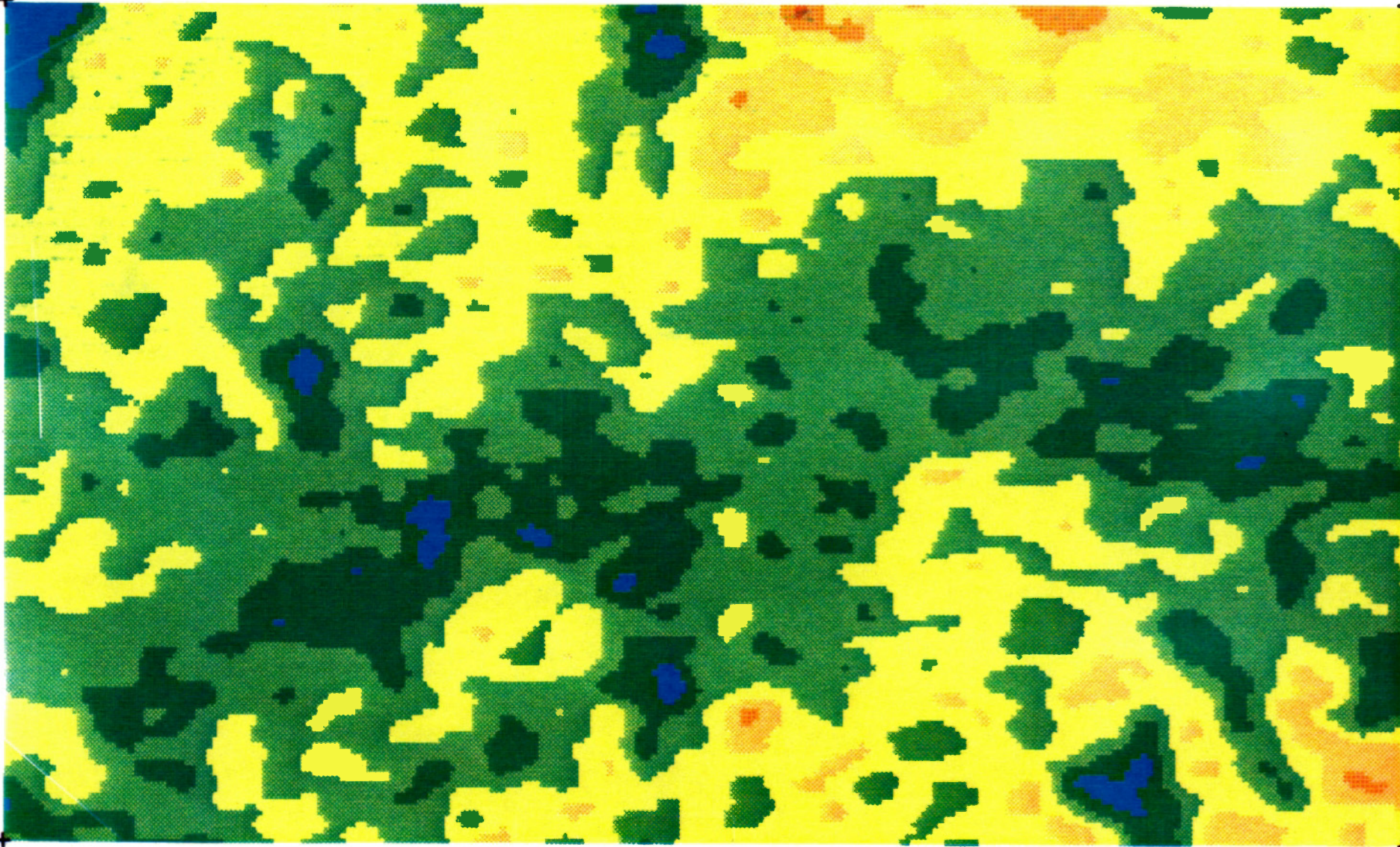


44 50 44

63 18 40

63 10 10

+ 44 54 47



equivalent Thorium (ppm)

Gibraltar Hill
Nova Scotia
11 D/14 (parts of)

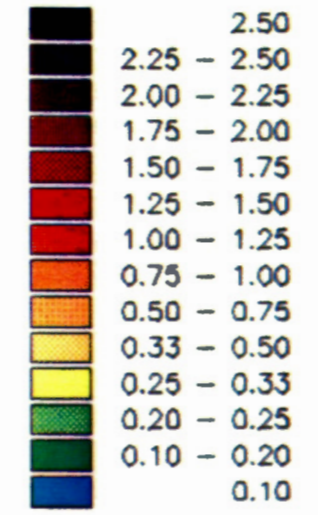
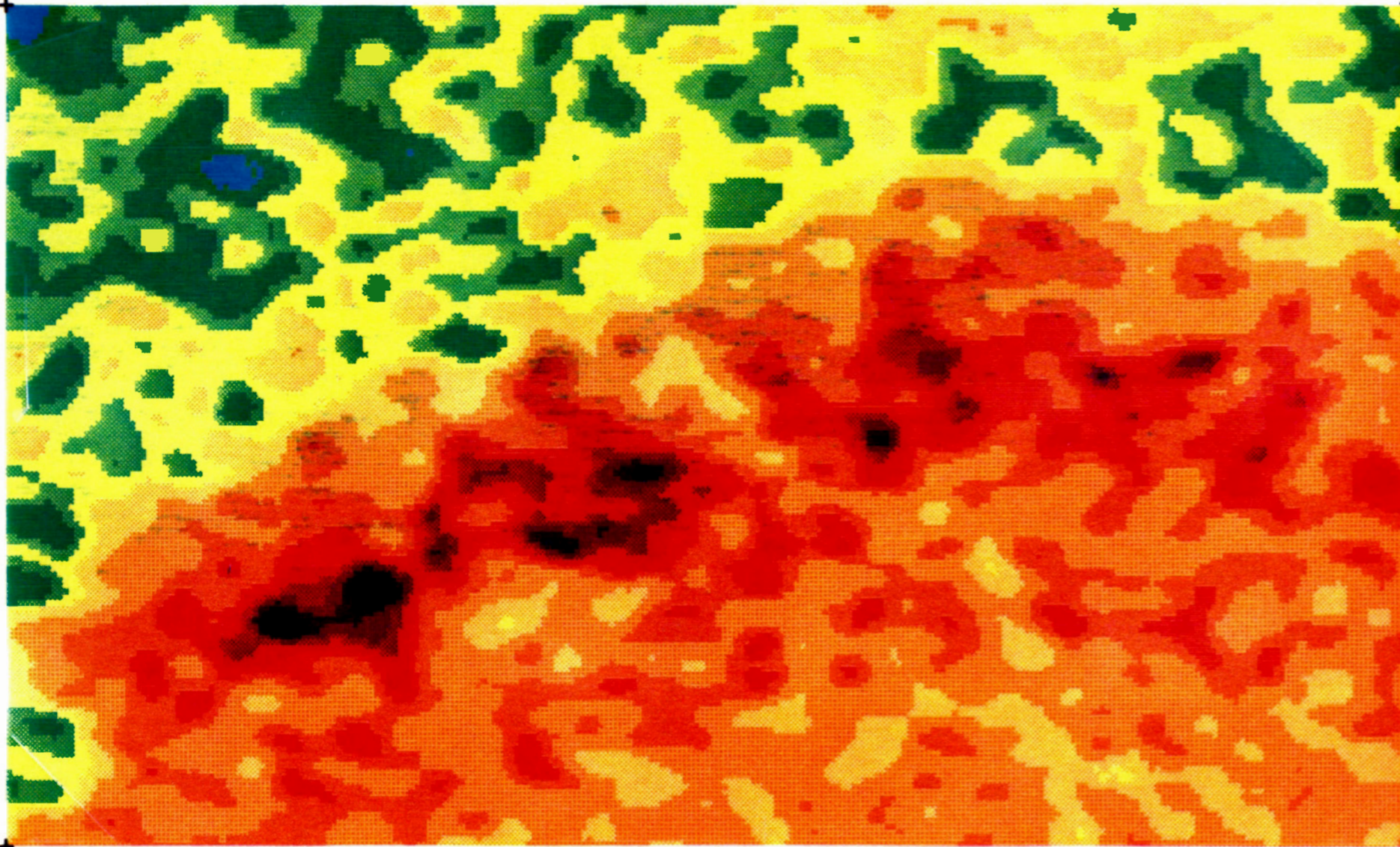


+ 44 50 44

63 10 40

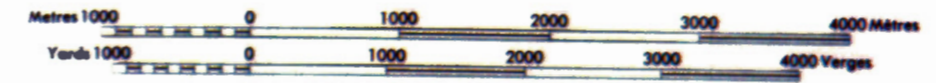
63 10 10

+ 44 54 47



Uranium/Thorium (ratio)

Gibraltar Hill
Nova Scotia
11 D/14 (parts of)

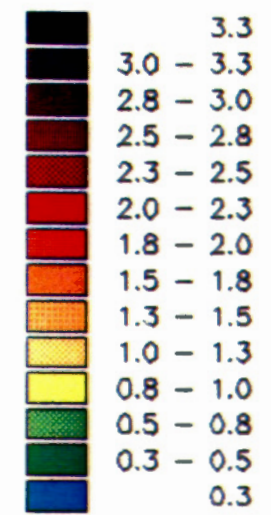
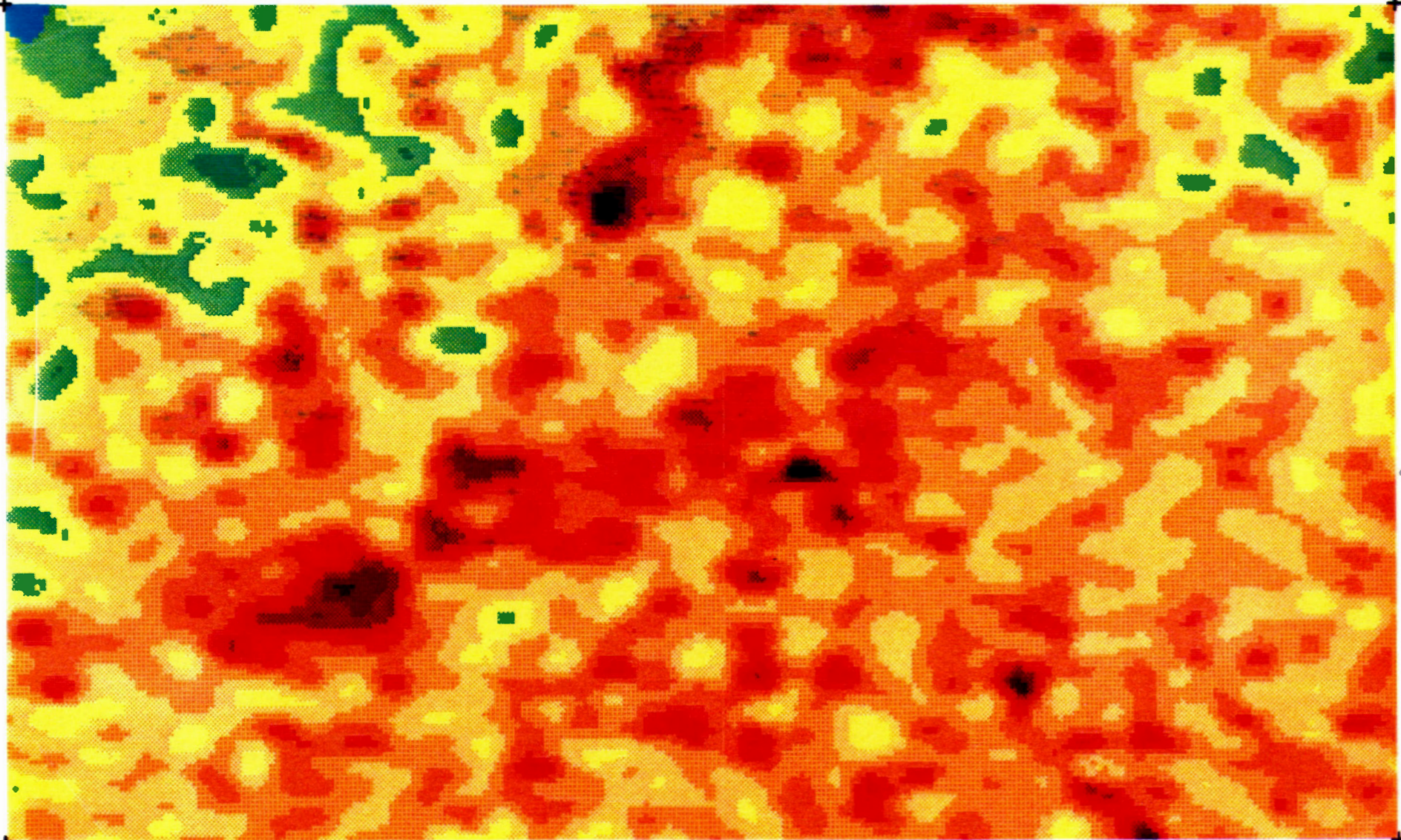


+ 44 50 44

63 18 40

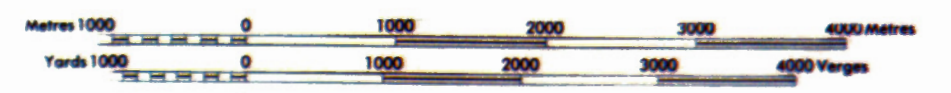
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Uranium/Potassium (ratio)

Gibraltar Hill
Nova Scotia
11 B/14 (parts of)

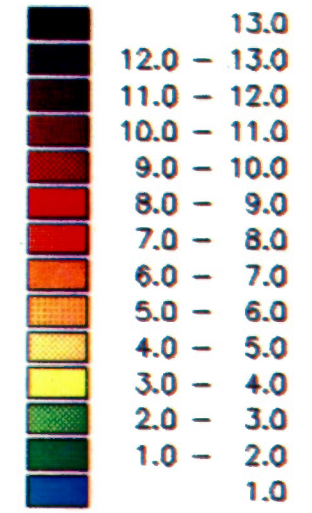
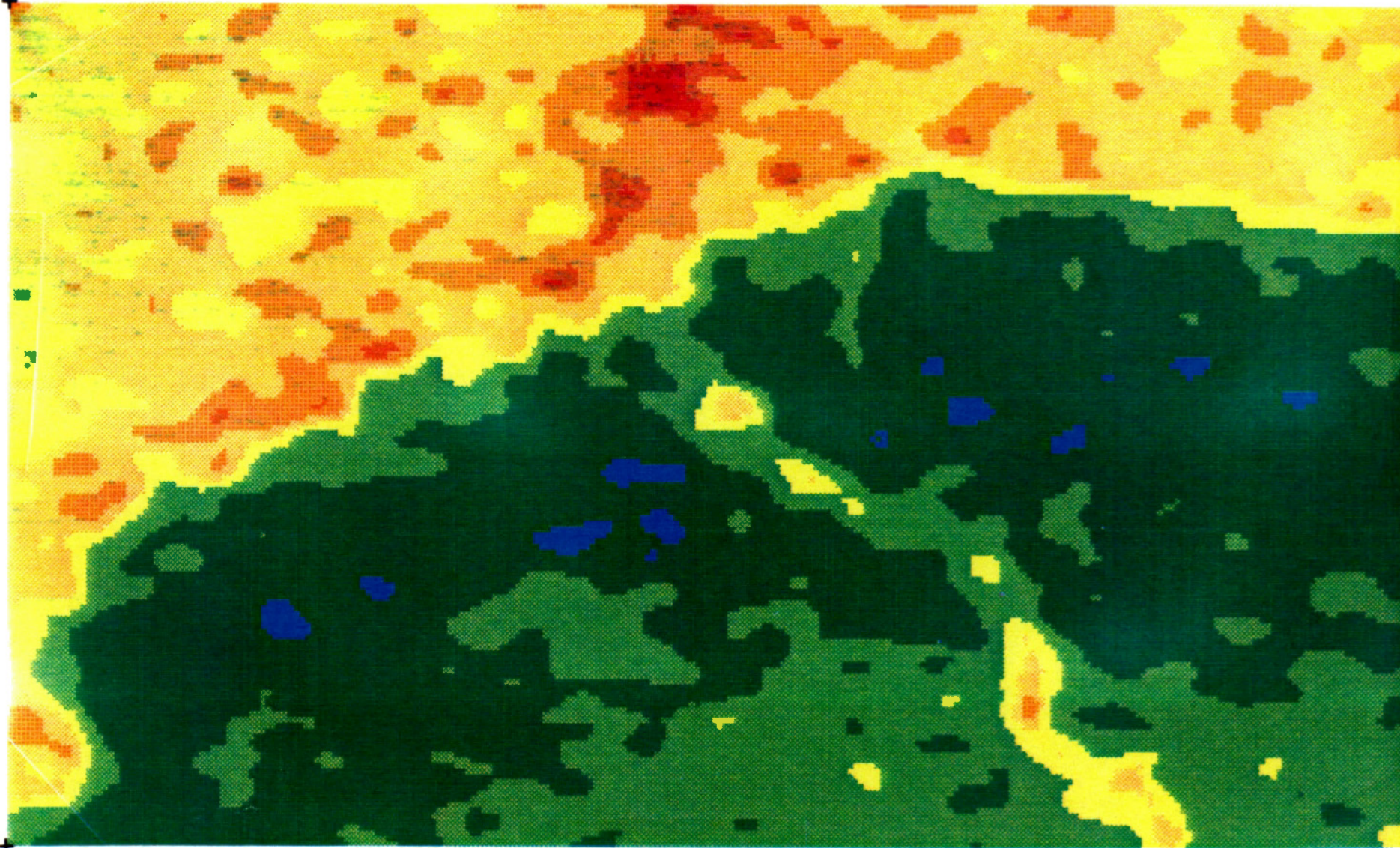


44 50 44

63 19 40

63 10 10

+ 44 54 47



Thorium/Potassium (ratio)

Gibraltar Hill
Nova Scotia
11 D/14 (part of)



+ 44 50 44