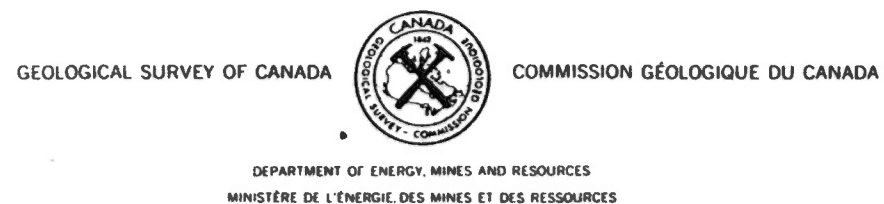


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AIRBORNE GEOPHYSICAL SURVEY  
1986

SHIP HARBOUR AREA  
NOVA SCOTIA  
NTS 11D/15 (part of)

Gamma Ray Spectrometric Colour Maps  
and VLF-EM Profile Maps

Geological Survey of Canada Open File 1472



Canada

OPEN FILE  
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**1472**

GEOLOGICAL SURVEY OF CANADA  
COMMISSION GÉOLOGIQUE DU CANADA  
OTTAWA  
1987

## AIRBORNE GAMMA RAY SPECTROMETRIC AND VLF ELECTROMAGNETIC MAPS

In the summer of 1986 a multi-parameter geophysical survey was flown in the Ship Harbour 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. VLF electromagnetic data were also recorded and compiled as profile maps.

Data are presented as a set of eight 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)).

Two 1:50 000 scale VLF profile maps and a 1:50 000 scale flight line map are also included along with a 1:50 000 scale transparent topographic overlay. 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 VLF profiles are plotted on a zero line which is an approximation of the true flight path.

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  $^{40}\text{K}$ , 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  $^{214}\text{Bi}$ , and thorium, from 2.62 MeV photons emitted by  $^{208}\text{Tl}$ . The energy windows used are as follows:

Total Count		0.41-2.81 MeV
Potassium	$^{40}\text{K}$	1.36-1.56 MeV
Uranium	$^{214}\text{Bi}$	1.66-1.86 MeV
Thorium	$^{208}\text{Tl}$	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 contour 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 as shown on the contoured maps are usually considerably lower than the concentrations in the bedrock. However, the radioelement distribution shown by the contour 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

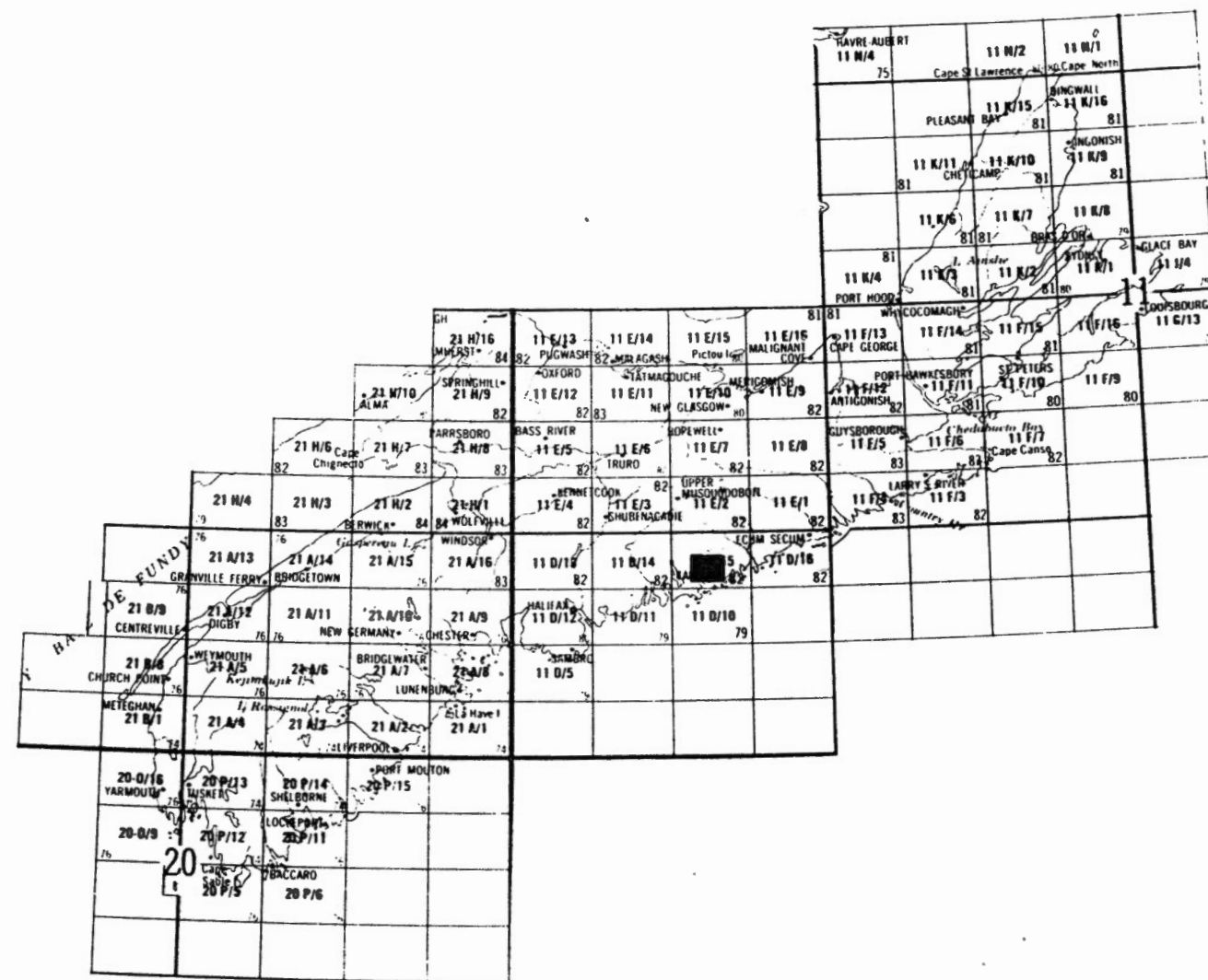
Total count measurements are presented as units of radioelement concentration (Ur), as defined in International Atomic Energy Agency Technical Report Series No. 174, 1976.

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 and VLF-EM survey  
flown and compiled by Geological Survey of Canada  
as a

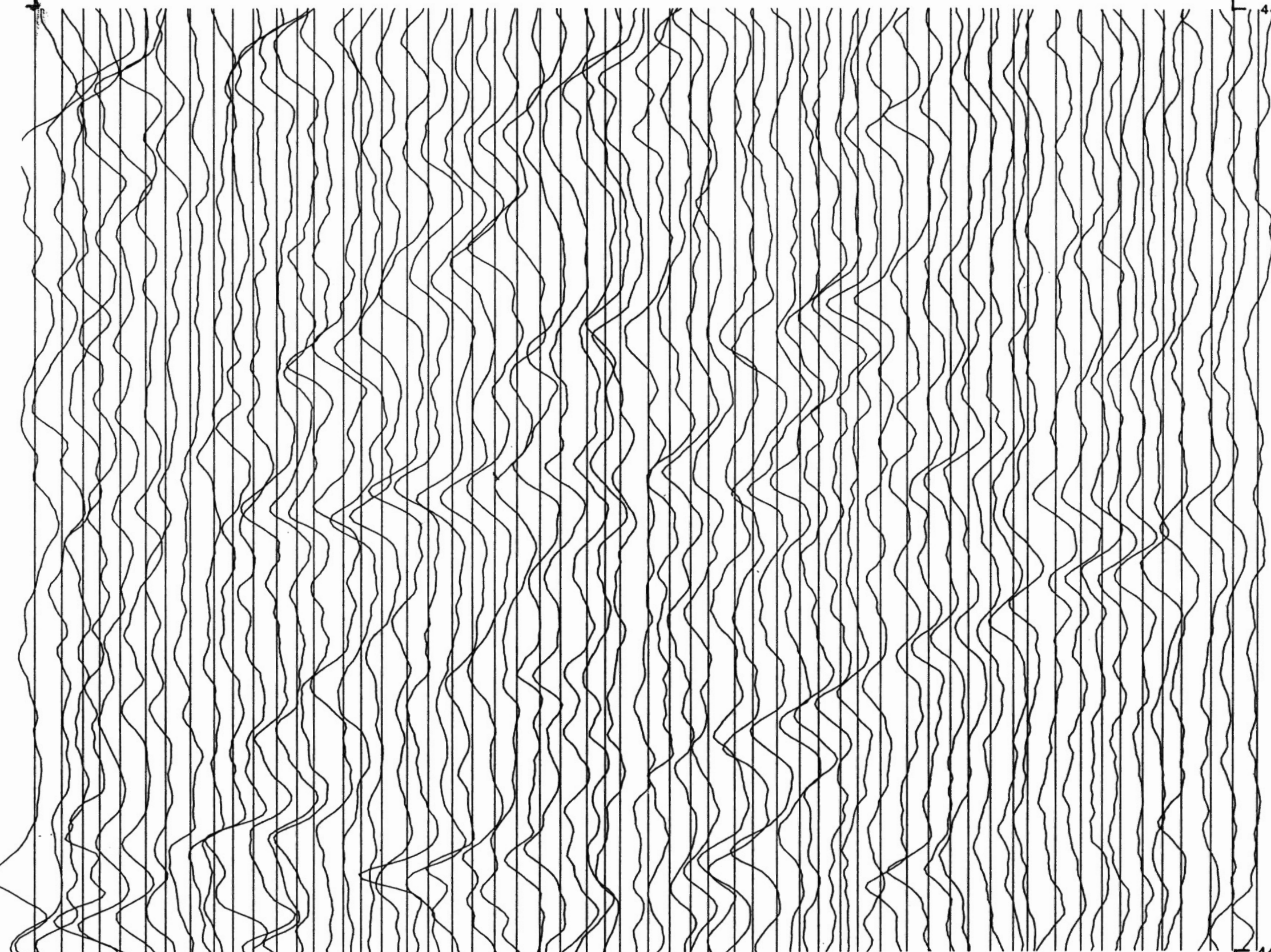
Contribution to Canada-Nova Scotia  
Mineral Development Agreement 1984-89  
a subsidiary agreement under the  
Economic and Regional Development Agreement



62 53 15

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**VLF - TOTAL FIELD**

**VERTICAL SCALE 15%/CM**

**SHIP HARBOUR**

**NOVA SCOTIA**

**11D/15 (Part of)**

**Scale - 1:50,000**

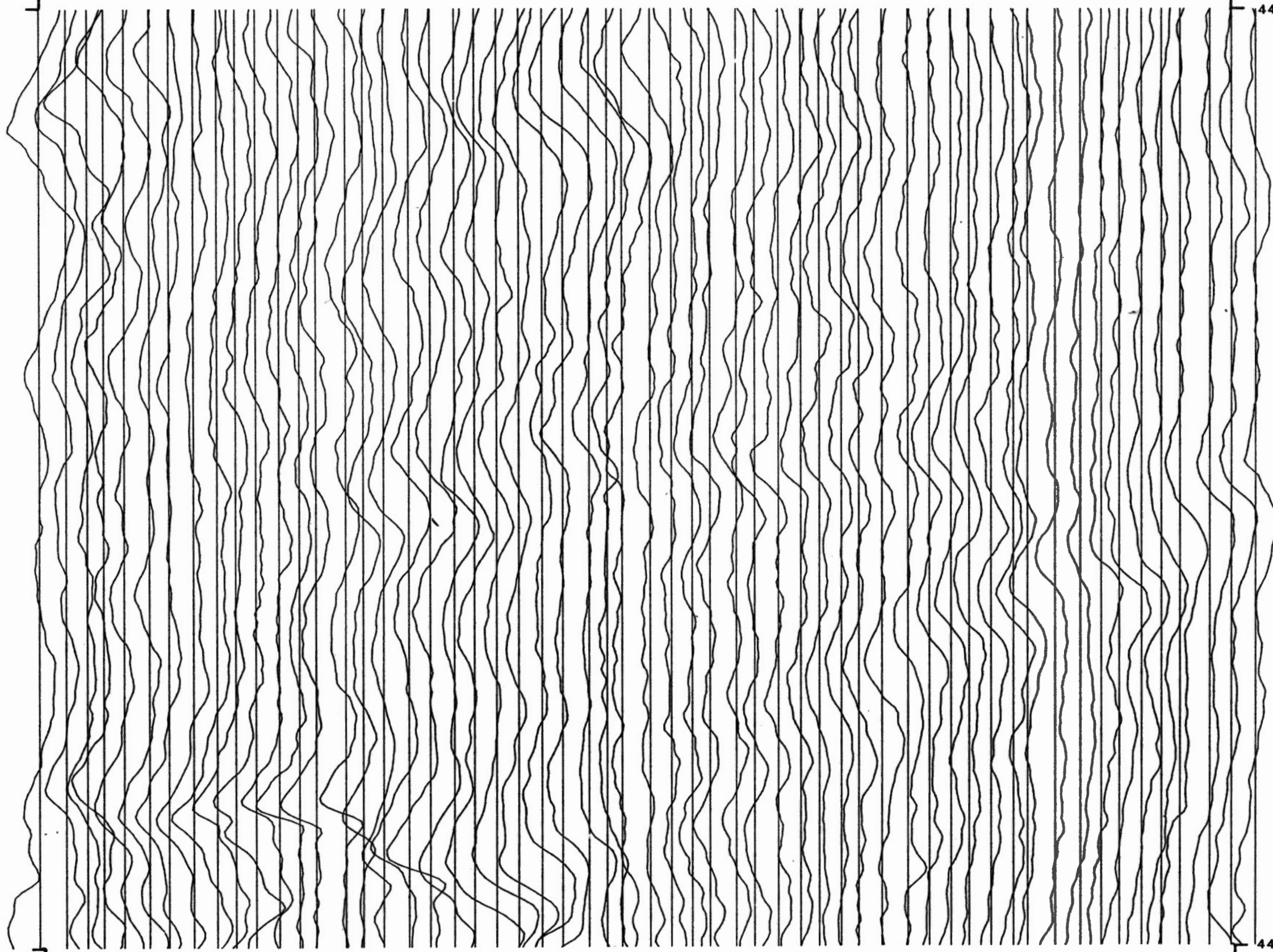
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**VLF - QUADRATURE**

**VERTICAL SCALE 15%/CM**

**SHIP HARBOUR**

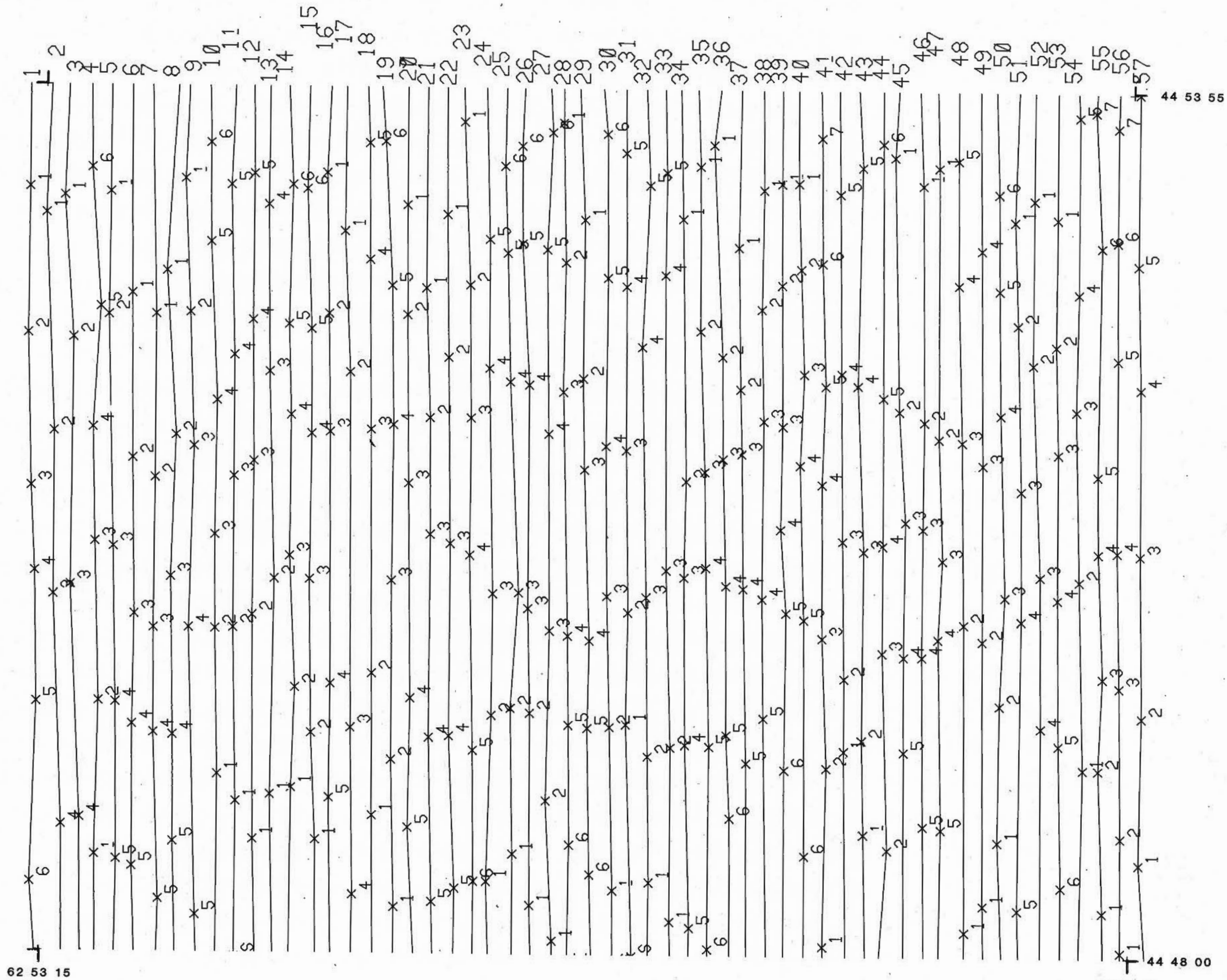
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**11D/15 (Part of)**

**Scale - 1:50,000**

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SHIP HARBOUR

NOVA SCOTIA

11D/15 (Part of)

Scale - 1:50,000

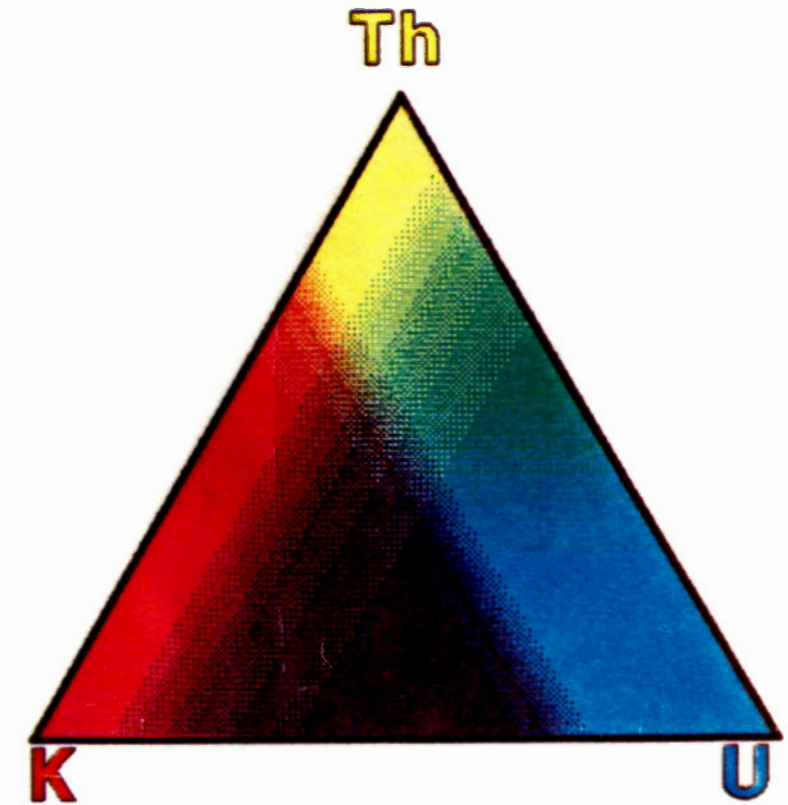
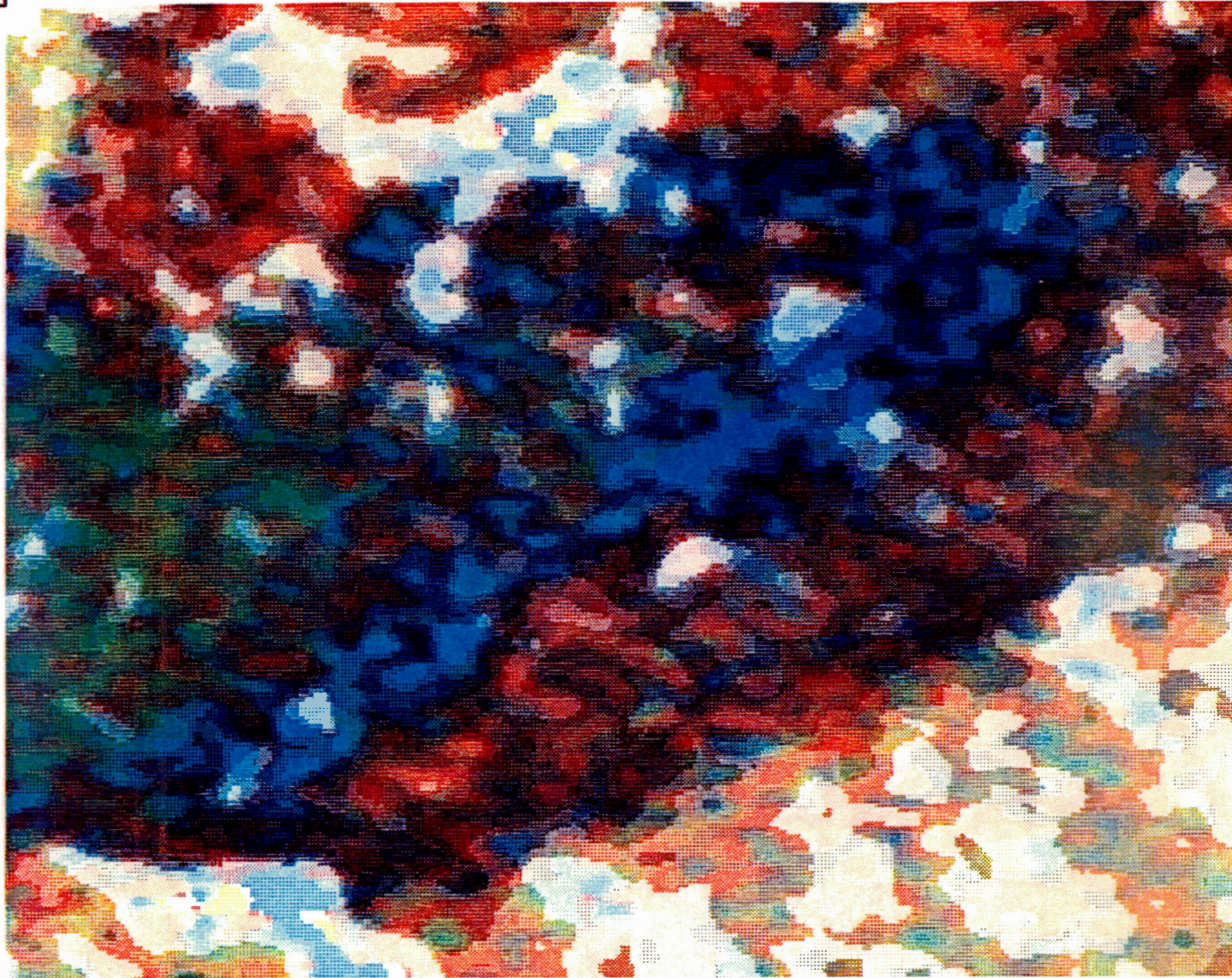




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SHIP HARBOUR, N.S., 11D/15 (Part of)  
Ternary Radioelement Map  
Scale - 1:50,000  
(Line Spacing 250M)

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

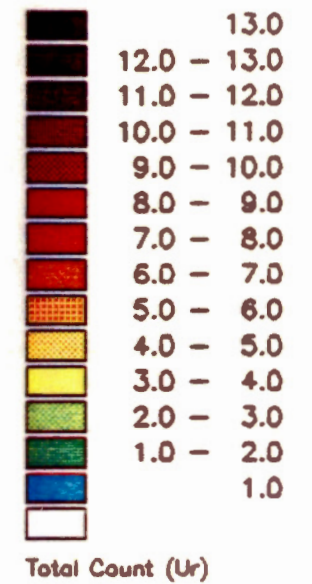
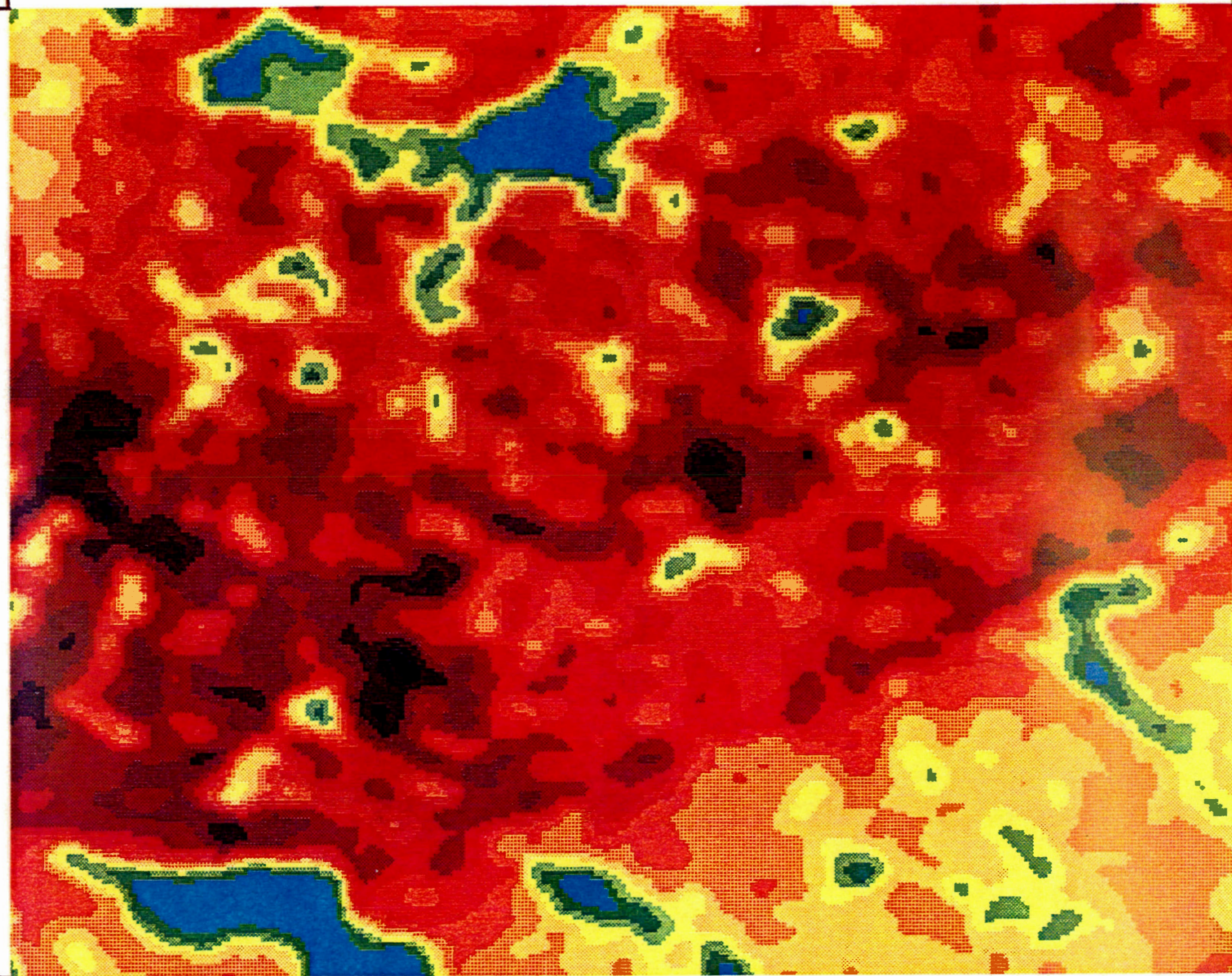
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**SHIP HARBOUR**

**NOVA SCOTIA**

**11D/15 (Part of)**

**Scale - 1:50,000**

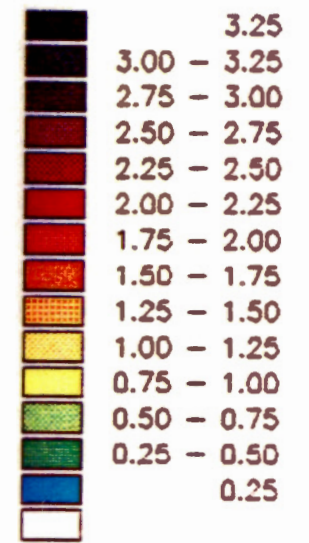
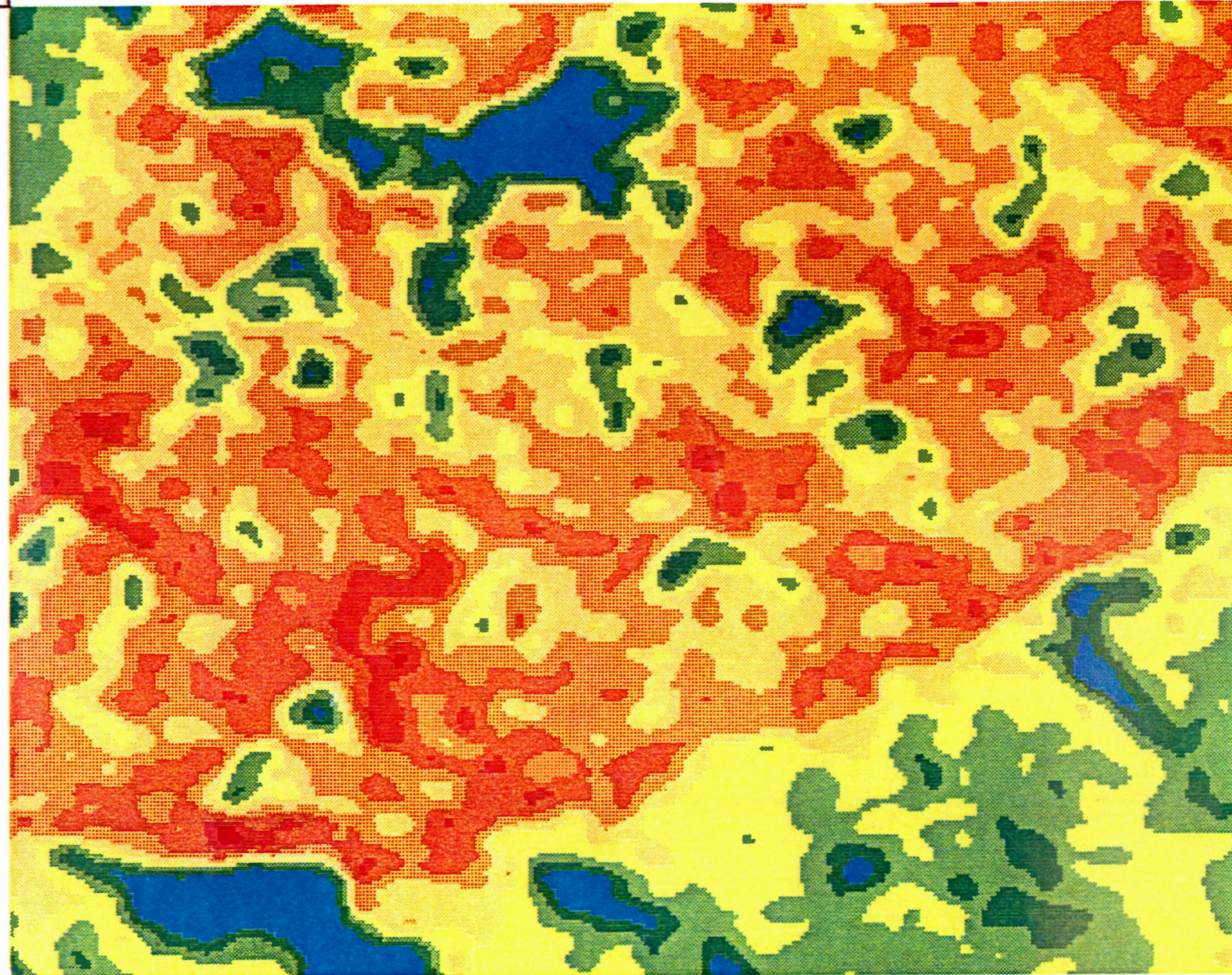
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Potassium (percent)

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**11D/15 (Part of)**  
**Scale - 1:50,000**

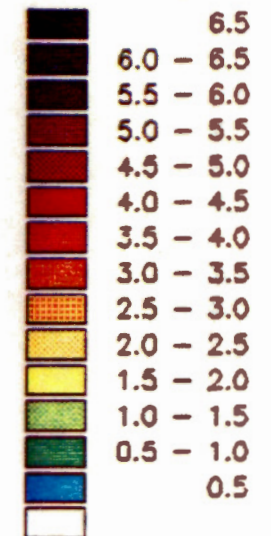
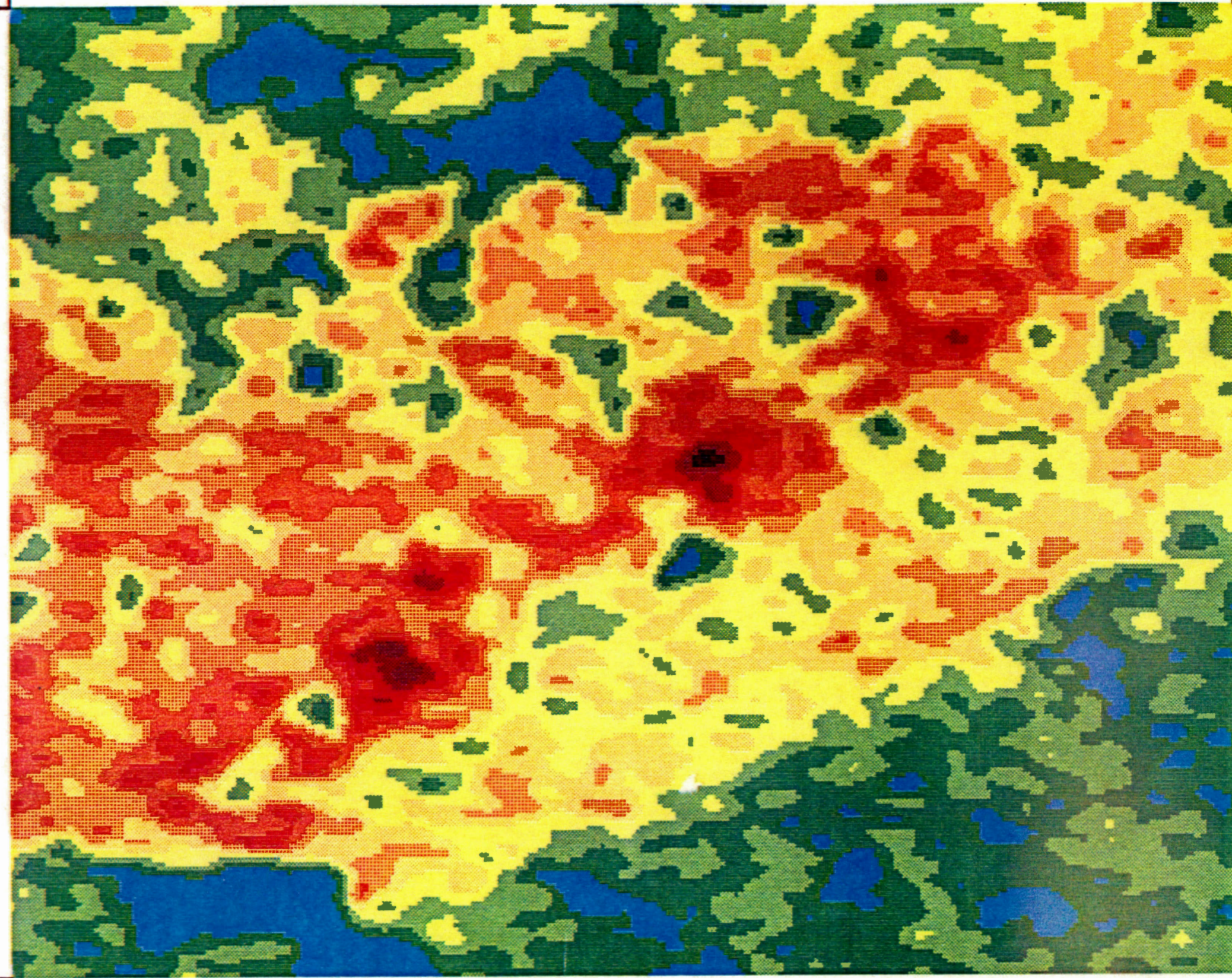
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equivalent Uranium (ppm)

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**Scale - 1:50,000**

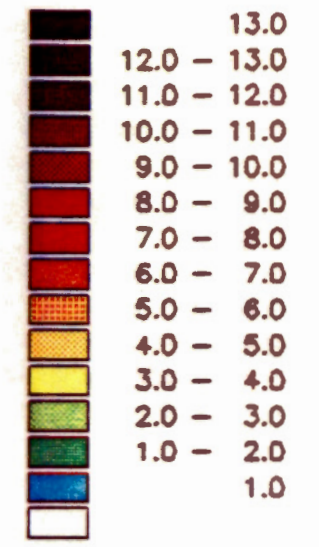
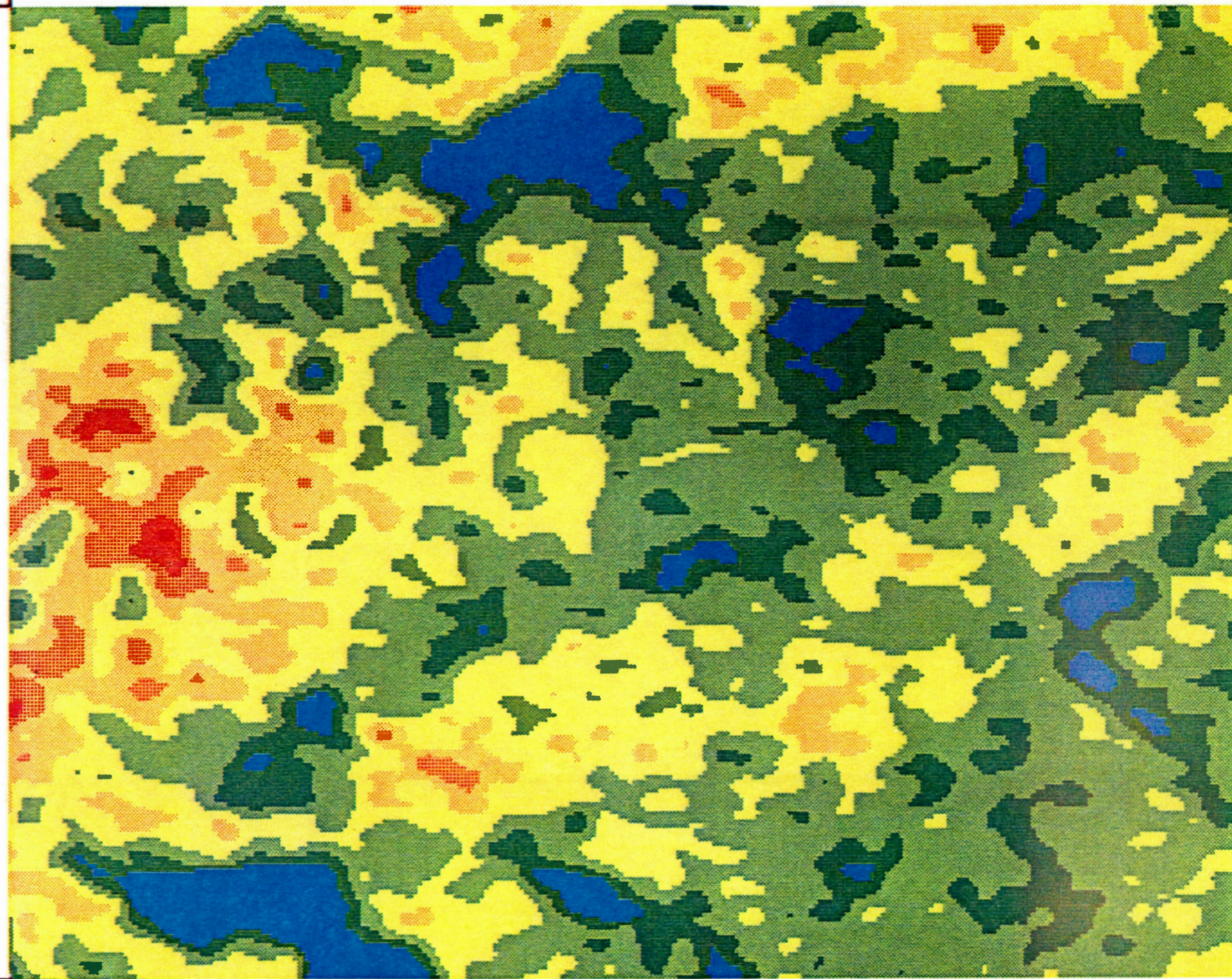
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equivalent Thorium (ppm)

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**11D/15 (Part of)**  
**Scale - 1:50,000**

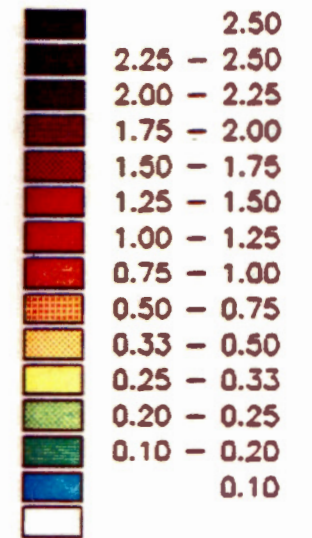
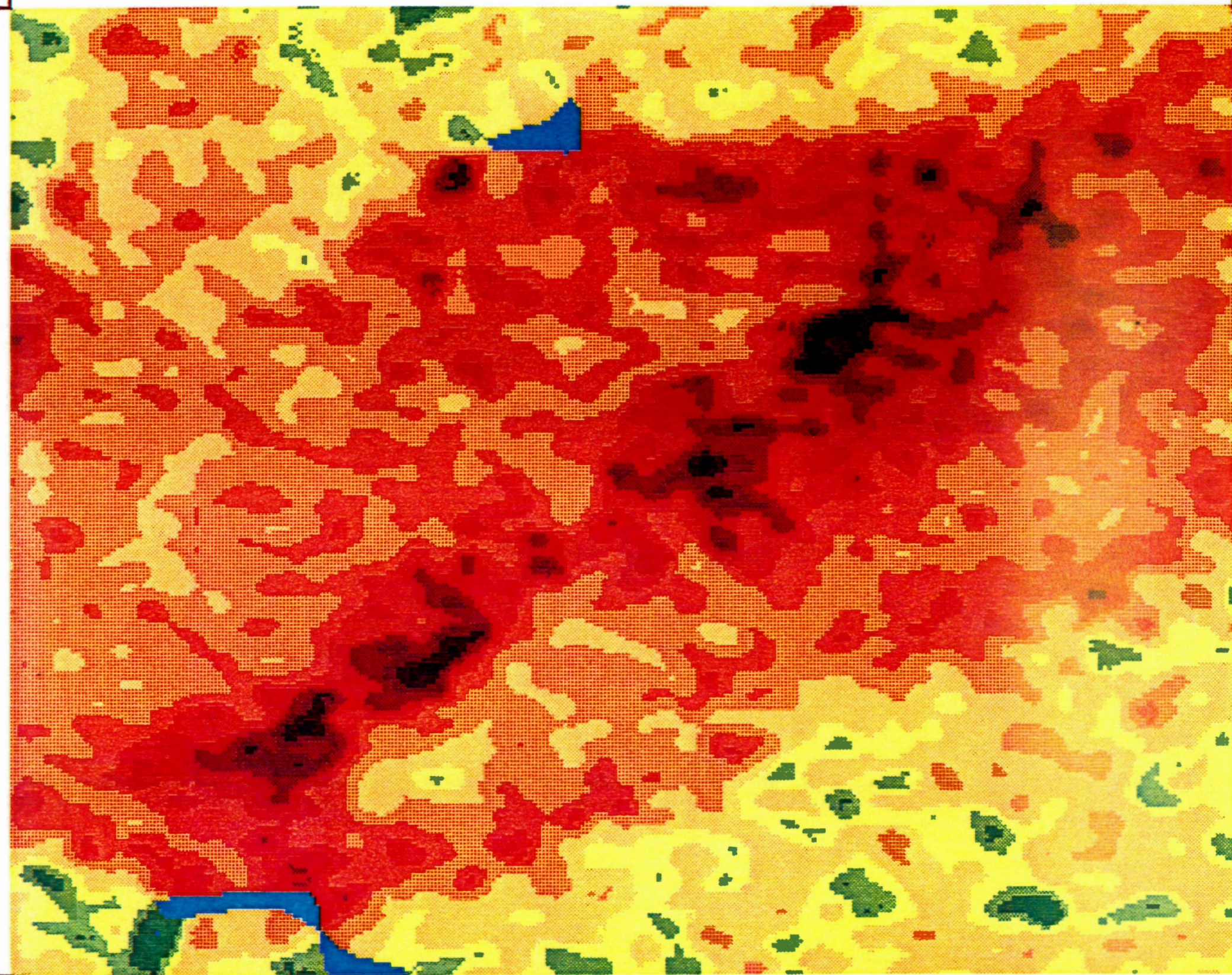
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Uranium/Thorium (ratio)

### SHIP HARBOUR

NOVA SCOTIA

11D/15 (Part of)

Scale - 1:50,000

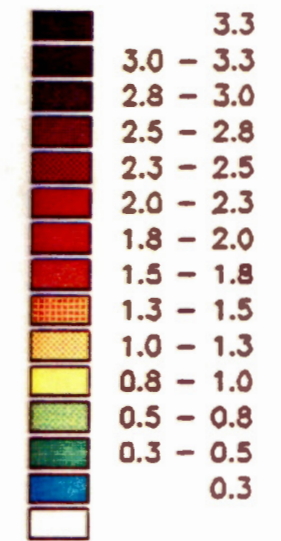
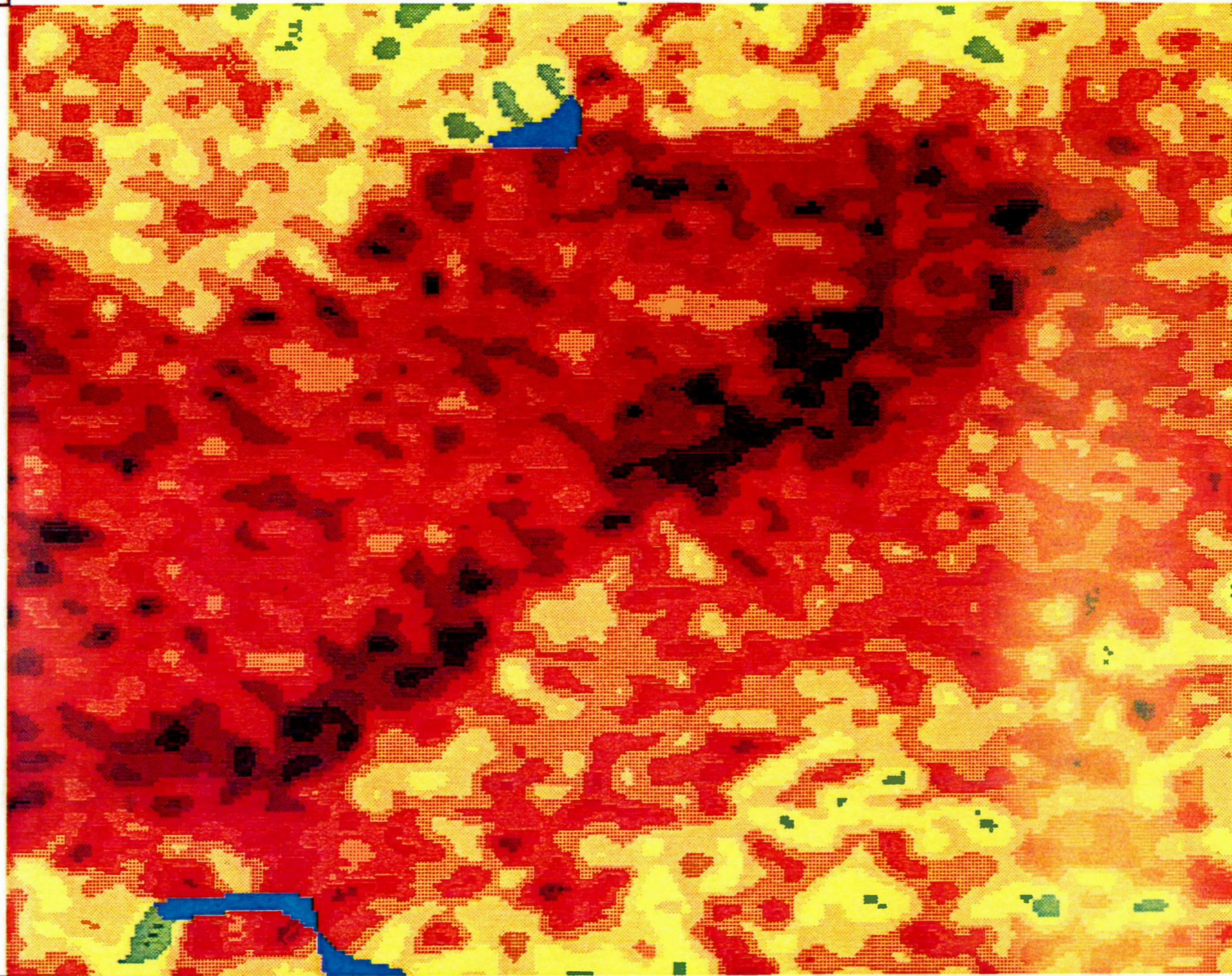
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Uranium/Potassium (ratio)

### SHIP HARBOUR

NOVA SCOTIA

11D/15 (Part of)

Scale - 1:50,000

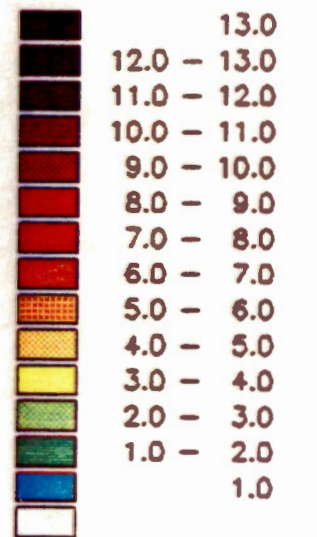
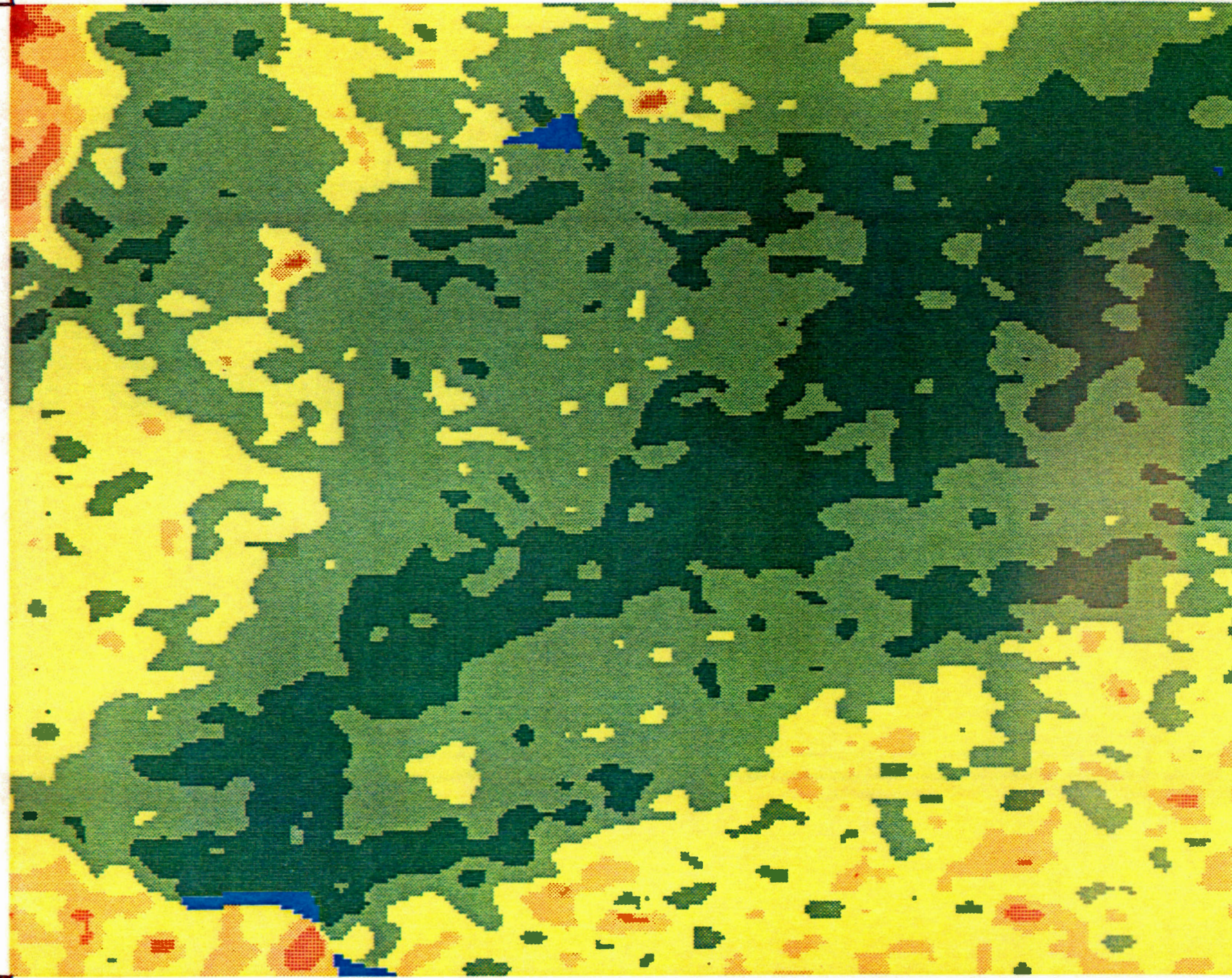
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Thorium/Potassium (ratio)

**SHIP HARBOUR**  
**NOVA SCOTIA**  
**11D/15 (Part of)**  
**Scale - 1:50,000**

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