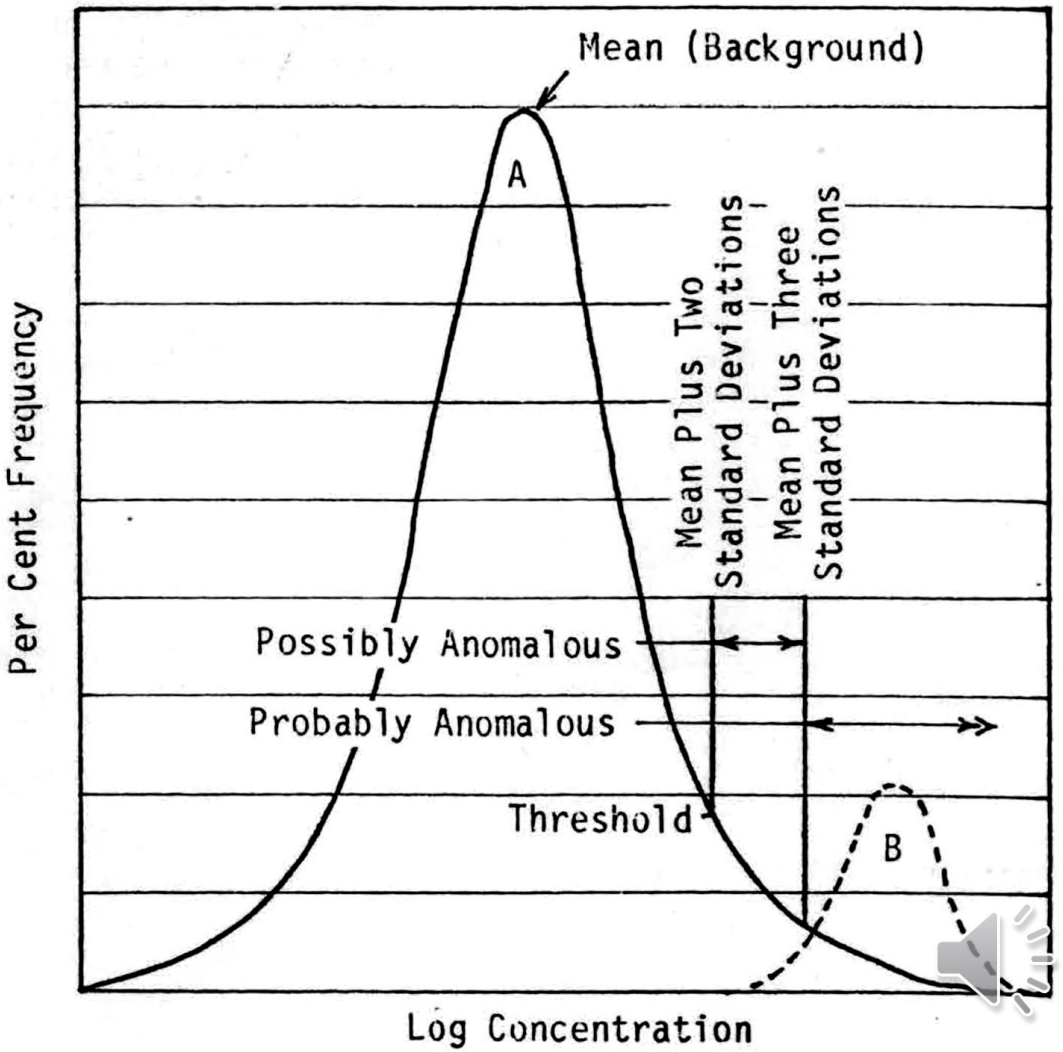
GEOCHEMICAL STATISTICAL TERMINOLOGY

If large enough sampling population exists, the results of a geochemical survey can be interpreted statistically.

The natural distribution of values in nature is log normal rather than normal



The Frequency Distribution of Two Populations of Geochemical Data

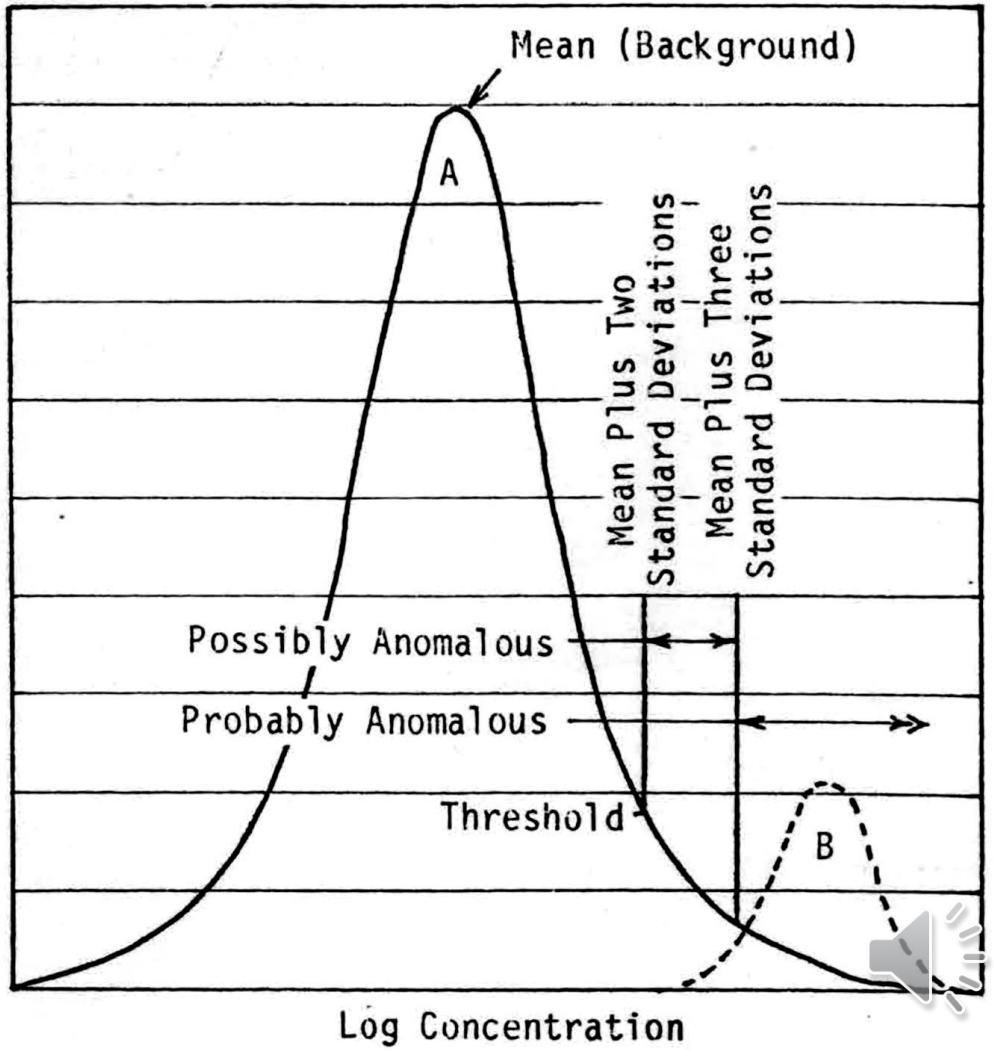
Background

- **It is the "normal" abundance of an element in barren Earth material including rock, soil, water, stream sediment and air**

Approximate Median Abundances of Some Elements in Rocks (ppm)

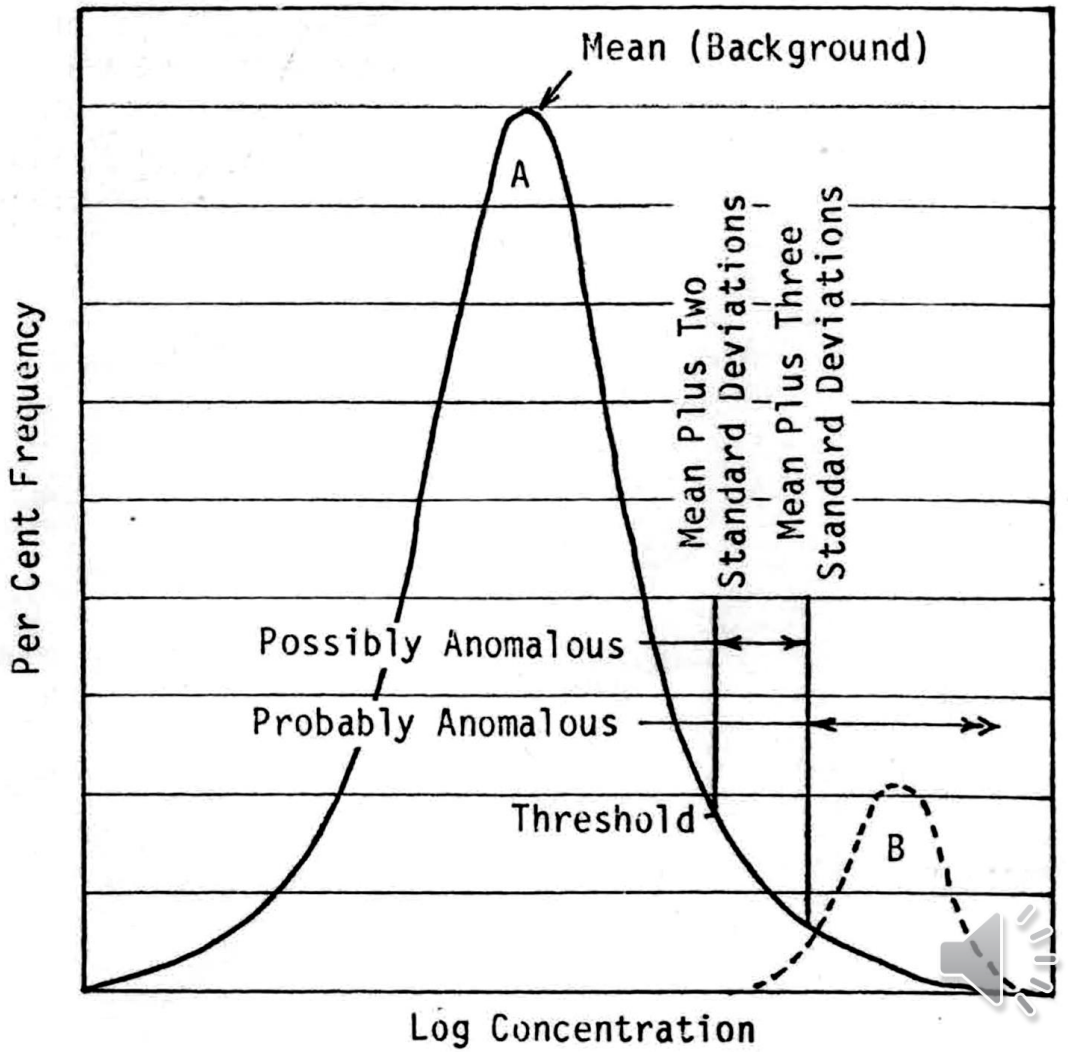
Element	Igneous Rocks			Sedimentary Rocks		
	Granites	Mafic	Ultramafic	Limestones	Sandstones	Shales
Chromium	4	170	2980	11	35	90
Cobalt	1	48	110	0.1	0.3	19
Copper	12	72	42	5	10	42
Gold	0.0023	0.0032	0.0032	0.005	0.005	0.004
Iron	14,200	86,500	94,300	3800	9800	47,000
Lead	18	4	1	5	10	25
Nickel	4.5	130	2000	20	2	68
Silver	0.037	0.1	0.06	0.1	0.25	0.19
Sulfur	300	300	300	1200	240	2400
Tin	3	1.5	0.5	0	0.6	6
Uranium	3.9	0.53	0.03	2.2	1.7	3.7
Zinc	51	94	58	21	40	100

Data from Rose, Hawkes and Webb, 1979.



Anomaly

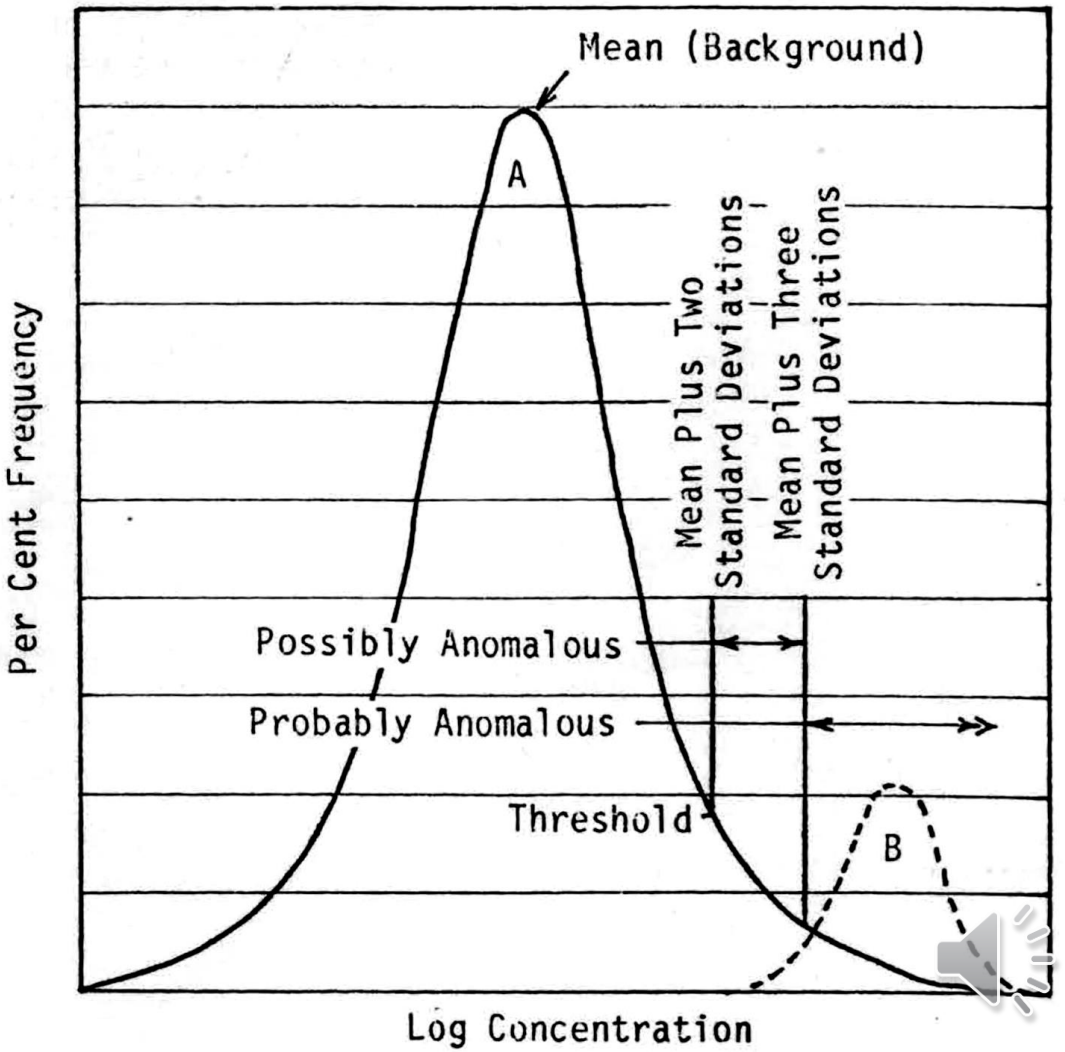
- It is a deviation from the norm, or background.
- It can be either positive or negative
- The more valuable anomalies in mineral exploration are positive
- Not all positive anomalies indicative of target mineralization



Anomaly

False anomalies can be produced by many factors:

- Preferential leaching by plants
- Adsorption of elements by iron/manganese oxides in Reducing conditions.



Threshold

It is the upper limit of normal background fluctuations

Two types of threshold are commonly recognized:

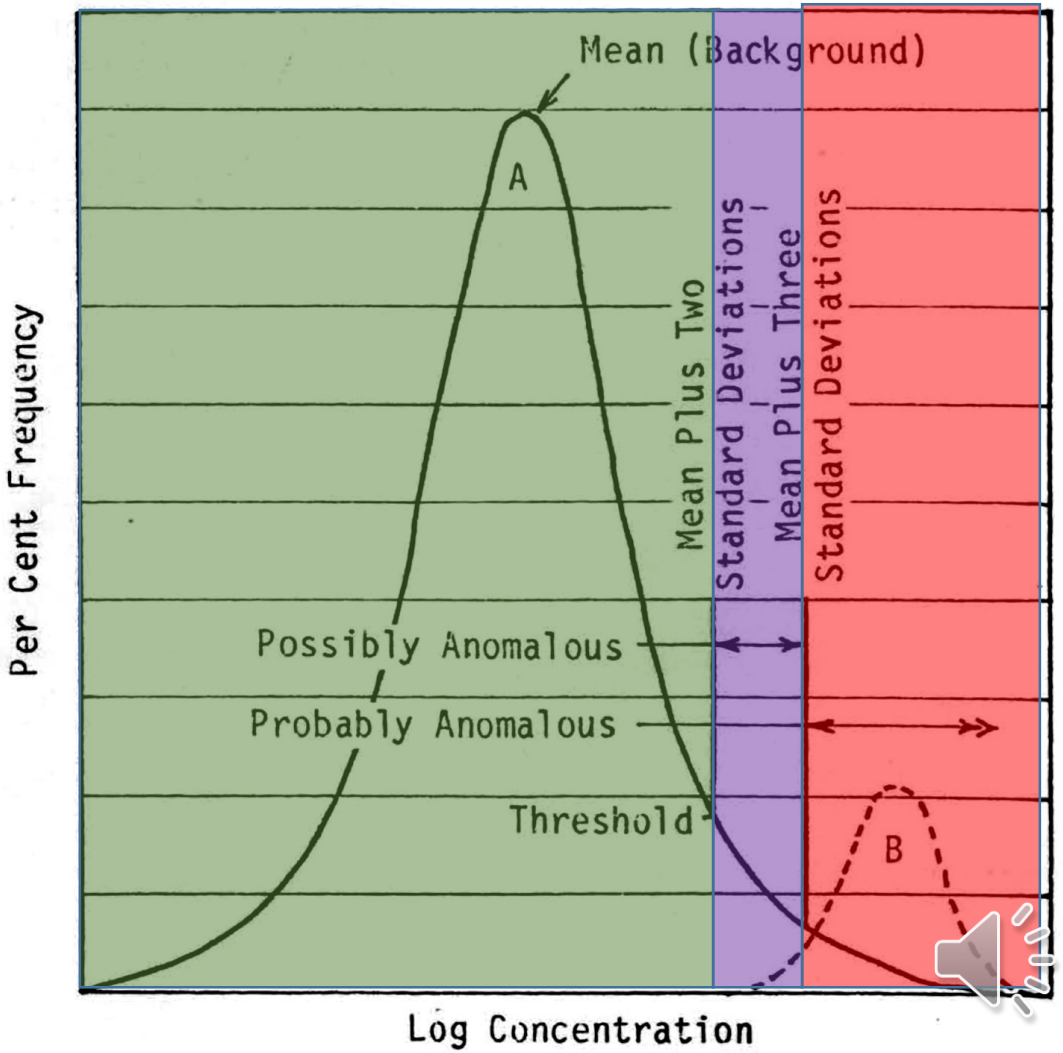
- **Regional thresholds**

The *upper* limit of the *regional* background values

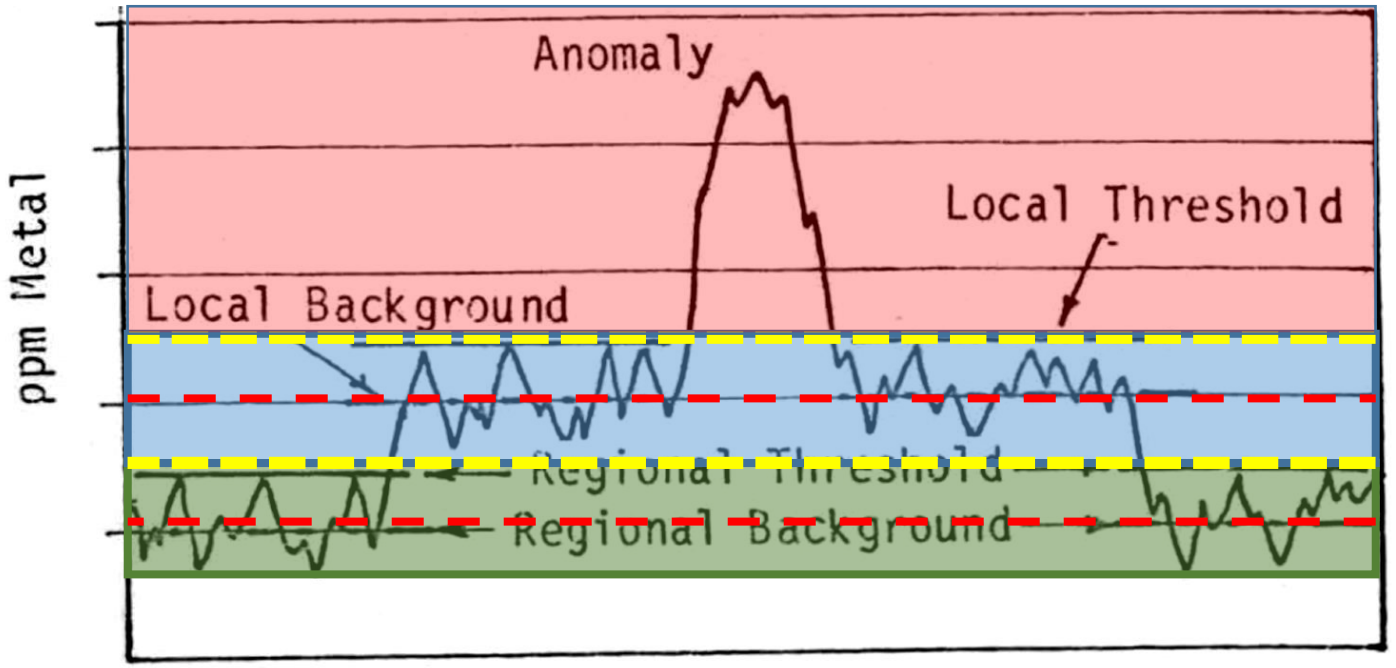
- **Local thresholds**

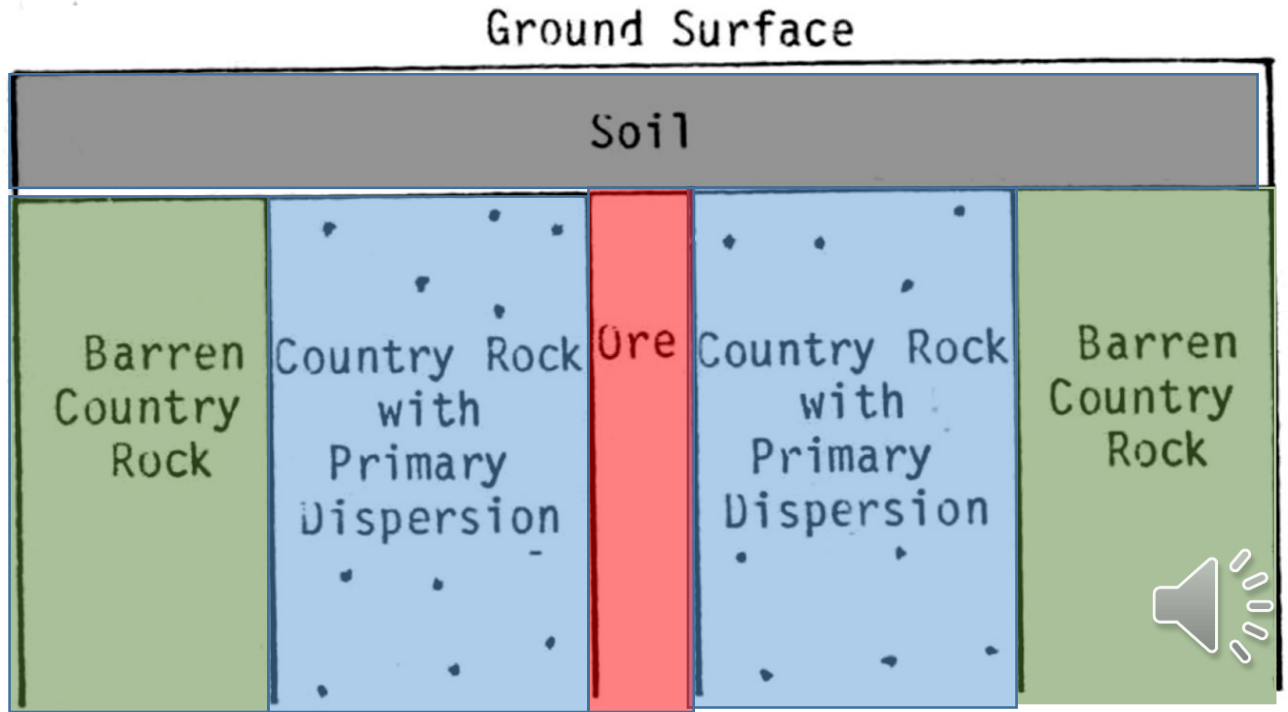
The *upper* limits of *local* background values.

due to the weak mineralisation halo which often surrounds a mineral deposit due to primary dispersion.



Regional and Local Background Values

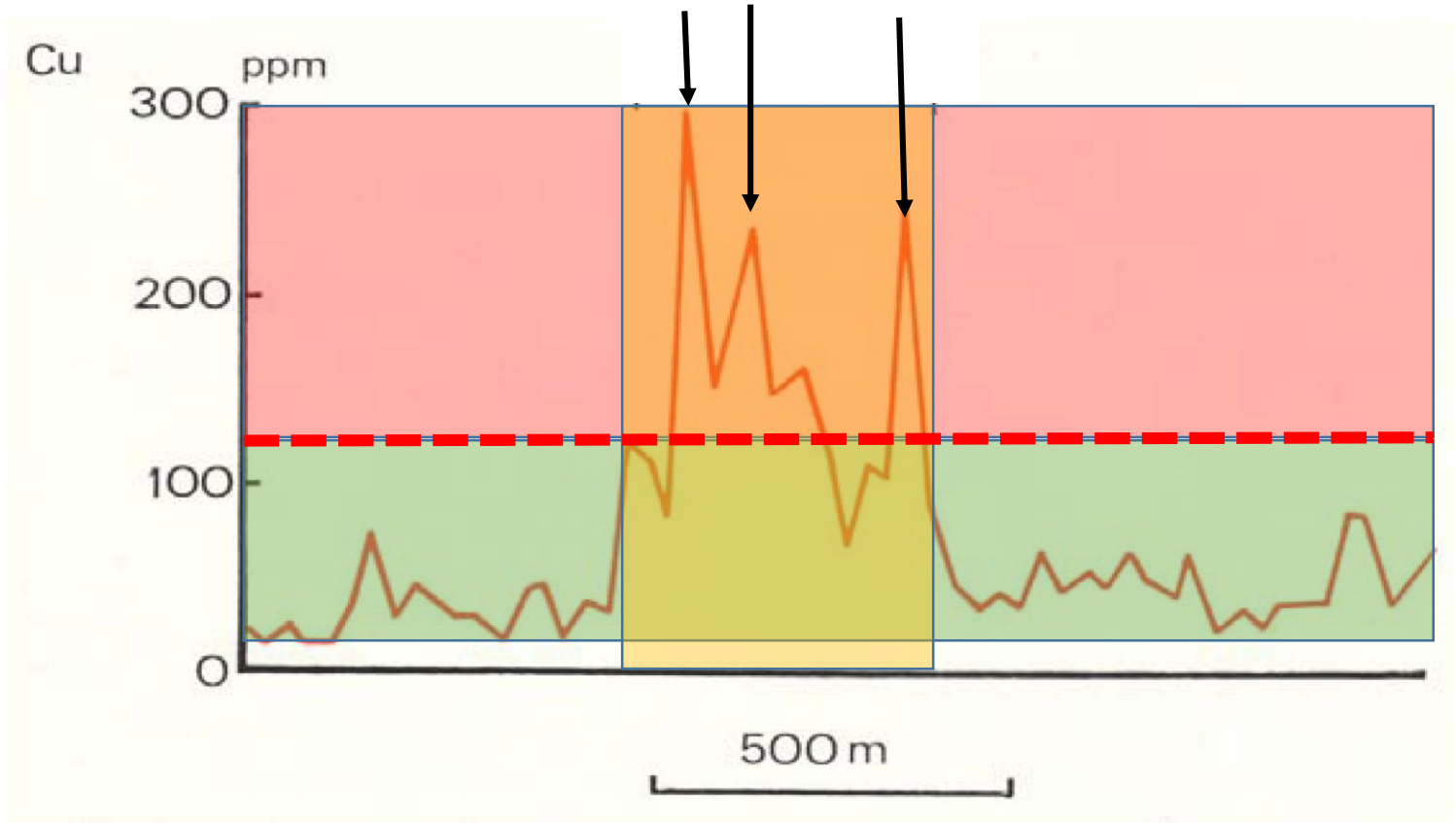




Contrast

- Contrast is the relative difference between the anomalous and the background values.
- Factors which affect the contrast are:
    - 1. The primary contrast between the mineralization and the country rock
    - 2. The relative mobility of the elements
    - 3. Dilution of anomalous values by barren material
- So, the contrast in any area may vary with size fraction, soil horizon or extraction technique.

This figure shows some chemical analyses of copper (Cu) in surface soil along a line called by Applied Geochemists ‘transect’ or ‘traverse’. Study this figure carefully and try to answer the following questions:



What is the approximate range of geochemical background values in ppm? **20 - 120**

What is the approximate range of geochemically anomalous (or anomalous) values in ppm? **120 - 300**

What is the ratio of highest anomalous value to the (approximately) average background? **300 : 70**

Where would you place threshold limit on this figure ?

Where would you dig for your deposit?