

WORKSHOP 2: STUDENT SHEET 1

Modelling Primary Mineralisation

Copper Deposits at Ecton

The primary copper ores at Ecton were unusually rich, with up to 36% copper metal content. The mineral deposits were contained mainly in vertical pipes, as illustrated in Fig 2.3. There were also numerous veins scattered through the hill.

Enormous volumes of hydrothermal fluids, carrying the appropriate metal ions, must have travelled through the sites where the minerals were deposited. Under normal conditions of temperature and pressure, similar to those on the surface of the Earth, most of the primary minerals (mainly sulphides) have a very low solubility. Although solubility increases with increasing acidity and with increasing temperature, it is still very low. It has been calculated for zinc sulphide that, at pH 5 and 200^o C, 1 litre of solution would contain 2×10^{-5} g of zinc ions. (Introduction to Geochemistry by Konrad B. Krauskopf, McGraw Hill 1979 ISBN 0-07-035447-2)

It has been proposed that the deposits at Ecton were formed at depths of at least 2 km and at a temperature of 75 - 110^o C. Precipitation would occur when the concentrations of the metal ions required for a specific mineral were sufficiently high.

The timing of mineralization is generally thought to have been around the time of maximum folding pressure, i.e. very late Carboniferous, around 290 million years ago. It probably took place over several million years.

Question

The average copper content of the Earth's crust is 0.005%. Calculate the concentration factor necessary to produce the Ecton copper ores, assuming a copper metal content of 36% as above.

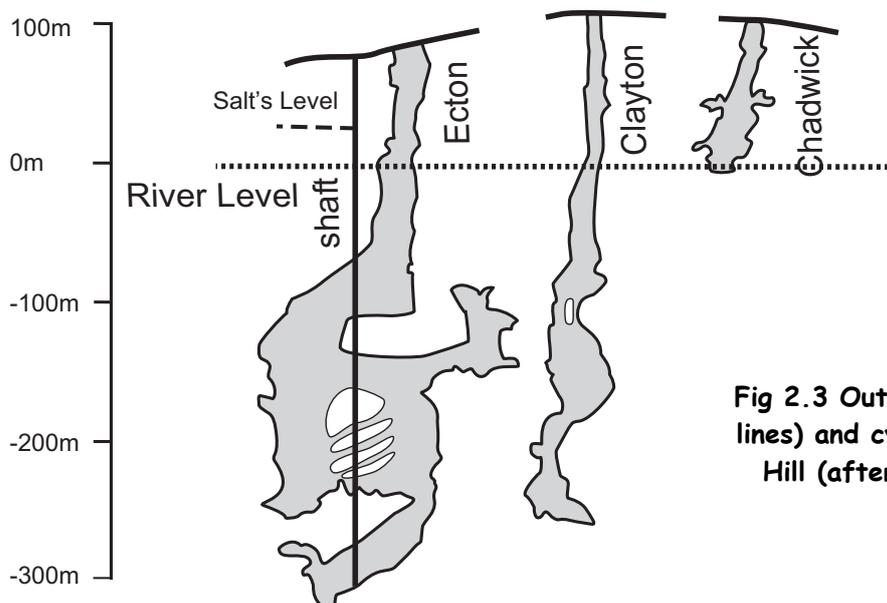
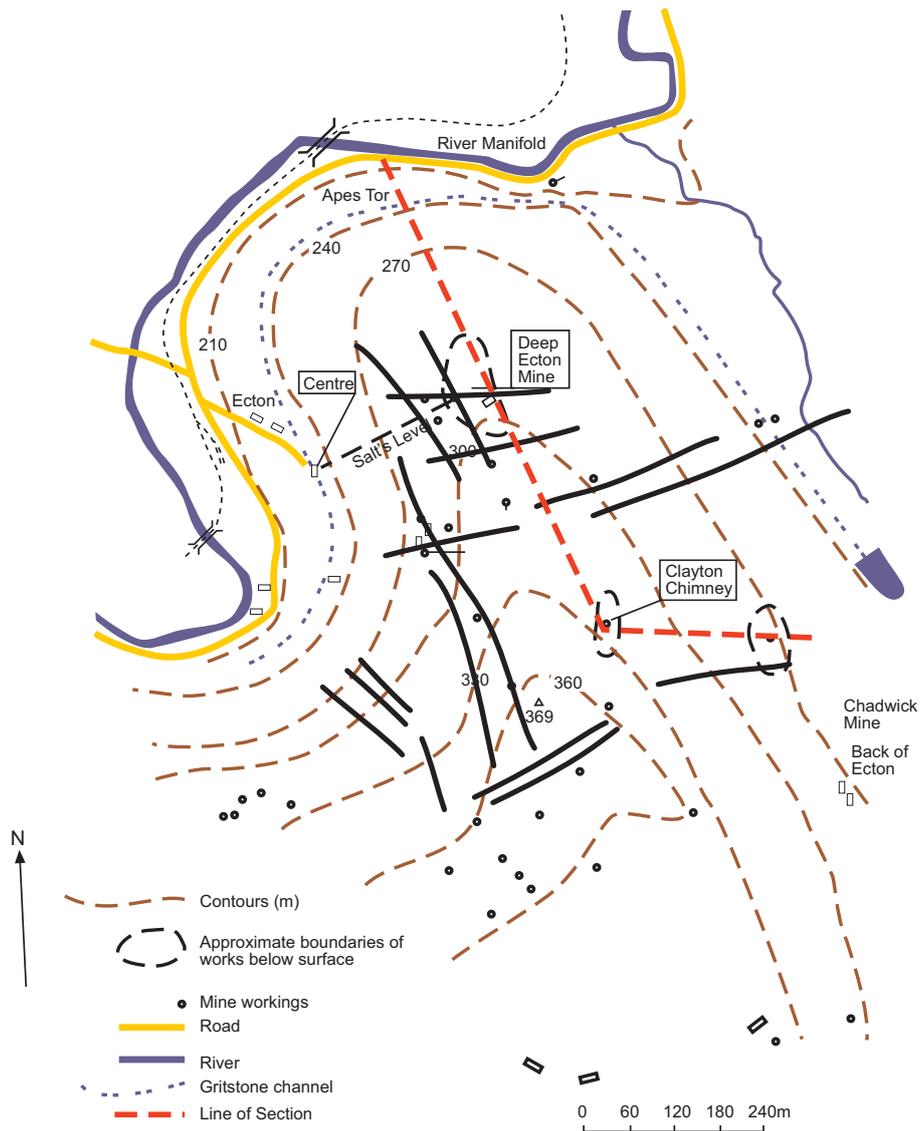


Fig 2.3 Outcrops of mineral veins (black lines) and cylindrical pipe veins at Ecton Hill (after Robey and Porter, 1972)