

# MINING METHODS, MINE DESIGN AND UNIT OPERATIONS

## SURFACE MINING

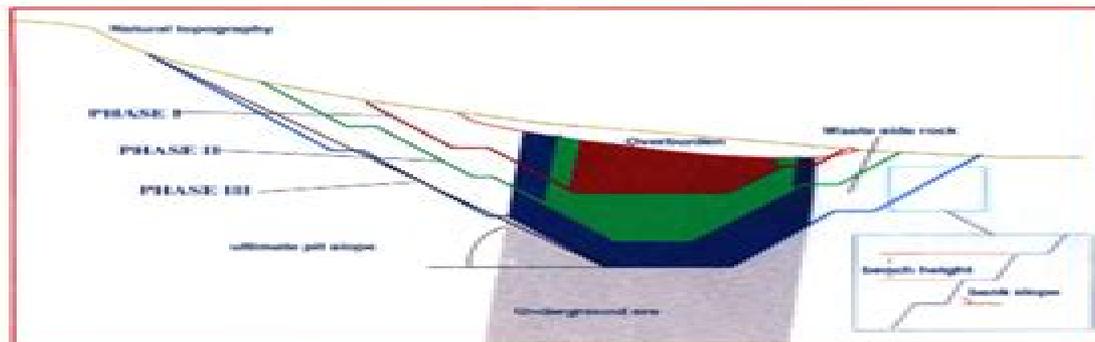
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### 1 INTRODUCTION

Mining is about extracting valuable rock material (mineral) out of the ground and marketing it at a profit. An economically mineable mineral is referred to as ore and the measure used to distinguish ore from waste is the cut-off grade, commonly expressed in terms of metal content (e.g. gold in grams per ton or copper in % by weight).

In most cases, ore is not sold directly by the mine to its customers. To save transport cost it is usually processed to remove as much waste material as possible. This processing involves crushing and milling, followed by separation of ore mineral from waste minerals.

Open-pit, open cast or open cut mines and quarrying, all refer to surface mining operations which are mine workings or excavations open to the surface. Many open pits are started along an outcrop and are continued downward until the thickness of overburden or waste side rock prevents further economic exploitation, Figure 1. Underground mining involves the exploitation of deep seated ore bodies which are reached by access routes (shafts, drifts, etc.) and are extracted using various stoping techniques.



**Figure 1.** A typical pit cross section - Phases I, II and III are designed using a decreasing cut-off grade thus increasing the volume of ore mined economically (Modified after Bohnet, 1990).

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