

## **Studies of Pit Lake Formation After the Completion of Mining**

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### **ABSTRACT**

Many open pit mines are excavated below the zone of saturation of ground water. These open pits will fill with water after the completion of mining. The elevation to which pit lakes will fill, the time necessary to reach the final pit lake equilibrium, and the quality of water during filling and after reaching equilibrium, are questions that have to be answered prior to mine closure. The potential for formation of the pit lake, after the completion of mining, should be known in the early stage of mine planning. The presence of a pit lake with poor water quality may not be acceptable to the regulatory agencies, and the necessary remediation could be quite expensive. In many cases, the pit water quality may require long-term treatment, or it may be necessary to at least partially backfill the pit, to prevent pit lake formation. The time of pit filling and the pit lake equilibrium level can be estimated by using a simple water balance method, by applying analytical calculations, or by using a more complex numerical ground water flow model. All of these methods have to be based on knowledge of local climatic, hydrologic (surface water), and hydrogeologic (ground water) characteristics, and on the geometry of the open pit. Pit filling specifically depends on precipitation, surface water runoff, ground water inflow, evaporation, and, in some cases, on seepage out of the pit lake. The quality of water in the pit lake depends on the quality and quantity of surface and ground water inflows, evaporative concentrations of solutes in the lake, residence time of lake water, limnologic characteristics of the lake, and other chemical and biological processes. Geochemical models are typically used to assess the long-term pit lake water quality. This paper presents the basic methods of pit filling calculations and geochemical modeling. Several case histories are also discussed.

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