

Heap Leach Piles as Ore Bodies: Applying Block Model Methodology to Characterize, Classify, and Optimize Unrecovered Metal Inventories

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Heap leach piles (HLPs) are engineered stacks of low-grade, metal-bearing ore and differ from natural deposits in that they are intentionally constructed. These structures contain quantifiable characteristics, including grade, tonnage, and mineral variability, that can enable a more effective visualization of HLPs as deposits. This paper proposes to treat HLPs as geological bodies by demonstrating how a geostatistically derived 3D block model can serve as a practical management tool.

Traditionally, evaluating a primary ore body employs a structured methodology of drilling, assaying, geostatistical interpolation, and modeling to understand deposit structure and continuity. This paper adapts a similar workflow to HLPs by incorporating spatio-temporal data, such as residual metal grades, porosity, and permeability, into a block model. This approach provides operators with an evolving, three-dimensional representation of the leach pad. By utilizing this digital twin, scenario planning can be enhanced by simulating operational decisions, such as stacking sequences according to mineralogy or irrigation schedules, thereby improving production forecasting and optimizing leaching cycles.

A secondary benefit to this model is that it can facilitate resource classification and technical disclosure. The block model used to form operational decisions can also provide a foundation for formal resource estimation under international reporting codes. Applying the geological discipline used on greenfield deposits to these man-made ore bodies can provide the industry with a clearer understanding of how to operate leach piles and a better path to recovering them.