Designing for Closure: Fast-Track Permitting Through Better Mine Landforms and Cover Systems

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Abstract

Mining projects must demonstrate not only economic viability, but increasingly, credible long-term environmental stewardship and closure outcomes from the earliest stages of project development. At the same time, jurisdictions such as New Zealand are moving toward streamlined and fast-track permitting pathways for projects able to demonstrate regionally or nationally significant benefits while appropriately managing environmental and social risk.

This presentation argues that directionally correct mine landform design and closure planning must move upstream into project conceptualisation, preliminary economic assessments (PEAs), and feasibility studies, rather than remaining activities heavily focused on only later in mine life. Tailings storage facilities (TSFs), mine rock stockpiles (MRSs), open pits, and heap leach facilities are permanent landforms that will persist long after mining ends. Consequently, early strategic mine planning decisions should incorporate informed, yet practical, approaches to future land use, landform construction and geometry, material placement, drainage management, source control, and cover system conceptualisation. These early decisions fundamentally influence closure liability and long-term environmental performance, but also permitting confidence, stakeholder acceptance, and project execution timelines.

Drawing on nearly three decades of international mine closure and mine landform experience, the presentation explores how the principles of "designing for closure" can support more efficient project advancement while reducing future regret costs and long-term liabilities. The discussion focuses on integration of landform design, source control, unsaturated soil mechanics, and cover system conceptualisation into the earliest stages of mine planning. Particular attention is given to how proactive design approaches can manage acid and metalliferous drainage (AMD) risk arising from two foundational imbalances created by mining activity: a gravitational imbalance and a thermodynamic imbalance.

A key message is that "better" mine landforms often result in simpler, more resilient, and lower-risk closure cover systems. In many cases, the "best" cover system is the one that is not required to manage all risk at closure because the landform itself has been designed to minimise long-term liability. This requires shifting away from viewing cover systems as isolated "caps" applied at closure, toward understanding mine landforms, cover systems, and mine domains as components of an integrated system whose performance is strongly governed by site-specific climate, hydrogeology, operational sequencing, and material management.

The presentation further examines how integrated closure planning and co-developed closure visions can help align mine planning, engineering, environmental performance, Indigenous engagement, and regulatory expectations. As governments increasingly pursue

accelerated permitting frameworks for strategically important resource projects, proponents who demonstrate robust closure thinking, progressive reclamation planning, and long-term land stewardship, or more simply, “care for the land”, early in project development may be better positioned to achieve faster approvals, stronger stakeholder confidence, and more durable project outcomes.