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A Holistic Framework for Progressively Constructing Stable Waste Storage Facilities

Andrew Baisley[1], Mike O'Kane[1], Paul Weber[2], Peter Scott[3] and Steven Pearce[3]

1. *O'Kane Consultants, Canada*
2. *O'Kane Consultants; New Zealand*
3. *O'Kane Consultant, Australia*

ABSTRACT

Advective gas transport represents an important mechanism controlling internal geochemistry of waste rock dumps (WRDs). Advective transport into WRDs can result in increased contaminants of concern production or create potentially life threatening air quality conditions. Advective transport is a global concern; being the mechanism documented as contributing to the Sullivan Mine fatalities (British Columbia, Canada), and elevated radon emissions from Wismut Uranium mine (Saxony, Germany). Residual pore gas and diffusion across landform outer surfaces post construction contribute less to WRD legacy liability compared to advective transfer. Being advection is a mechanism of substantial liability, can WRDs be constructed economically while managing advective flow?

This paper investigates material controls that manage advective transport during construction. Beyond geochemistry, geotechnical properties are examined in relation to lift heights, material segregation and subsequent advective transfer rates. Waste rock has been characterized for its propensity to segregate based on tip height and dumping methodology, and classified according advective tendencies. Through comprehensive material characterization and scheduling, progressive management of waste material is possible when mine plans and waste rock management plans interface properly. Potential for larger waste rock lifts of reactive material may be possible if waste scheduling highlights that material is of adequate texture to reduce air permeability within larger cells or lifts, for example. Investigation results are compared using Net Present Value (NPV) analyses highlighting value in progressive management of mine wastes in regard to seepage water quality and quantity (and potential for treatment in perpetuity). This paper will present a framework for more comprehensive waste characterization, planning and scheduling, such that WRDs can be constructed economically over the long-term without a strong reliance on developing cover systems as "last minute" mitigation measures. Rather, cover systems be utilized as contributing seepage management mitigation tools, with appropriate WRD construction as the primary contributing management tool.

**There is no full article associated with this abstract.*