

Side-Slope Considerations For Above-Grade Earthen Covers

A.L. Ward, G.W. Gee

Battelle, Pacific Northwest National Laboratory
Richland, Washington, USA

Above-grade earthen covers are often used at newly constructed waste sites and for waste left in place at toxic-waste landfills, both to minimize worker health risks and reduce excavation costs. Side slopes are critical to the overall performance of such covers and traditionally have been used to stabilize cover extremities. Because protective slopes may occupy over half the footprint of covers at small waste sites (< 5 ha), they can potentially influence the overall water balance. Yet, there is no consistent design standard to optimize hydrologic performance. A multi-year test, comparing two side slope designs, was recently initiated at the Department of Energy's Hanford Site where a field-scale prototype cover was placed over a radioactive waste trench. Results show that side slopes play an important role in a cover's water balance. Essentially all measured drainage from the cover was due to net infiltration into the coarse-gravel and rock side slopes. As much as 30 percent of annual precipitation intercepted by the side slopes has been captured and diverted through passive and active lateral drains. Advective loss from wind action on the rock surfaces reduces, but does not eliminate, drainage from the rock slopes. These data suggest that in arid or semiarid climates, consideration of slope design and the impacts of lateral diversion on adjacent waste sites must be a top priority. The ideal side slope design should minimize water accumulation and intrusion along the extremities. Design considerations might include water harvesting by terraced vegetated strips on side slopes.