

New Facility Will Test Disposal Cell Cover Renovation

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The U.S. Department of Energy (DOE) Office of Legacy Management (LM) constructed a test facility at the Grand Junction Disposal Site to evaluate a method for renovating a conventional, low-permeability cover. The purpose of the study, the Renovated ET [evapotranspiration] Cover Assessment Project (RECAP), will demonstrate an inexpensive way to improve long-term surveillance and maintenance (LTS&M) of disposal cell covers. LM believes that cover renovation may also lead to a reduction in risk over the long term.

Improve Performance and Reduce Risk

Conventional disposal cell covers at many LM sites rely on compacted soil layers (CSLs) to limit water percolation into underlying waste. LTS&M follow-up investigations have shown that the permeabilities of CSLs are often much higher than design targets, sometimes by several orders of magnitude. For example, at the Lakeview, Oregon, Disposal Site, the saturated hydraulic conductivity of the CSL averages 3.0×10^{-5} centimeters per second (cm/s) (the design target was less than 1×10^{-7} cm/s). Percolation rates since 2005 have been greater than 200 millimeters per year (mm/yr), and the tailings remain saturated all year.

These findings are not unique to LM; results of a nationwide U.S. Environmental Protection Agency (EPA) study were similar. Causes for greater-than-expected permeability include (1) unanticipated ecological consequences of designs that encourage biointrusion, desiccation, and freeze-thaw cracking, (2) differences between laboratory and field measurements of hydraulic conductivities, and (3) retention of borrow soil structure (clods) during construction, and natural soil formation processes after construction.

Studies by DOE, EPA, the U.S. Nuclear Regulatory Commission, and others have shown that alternative ET covers work well at arid and semiarid sites. ET covers consist of thick, fine-textured soil layers that store precipitation in the root zone where it can be removed seasonally by plants. For example, LM monitoring has shown that percolation of rainwater through the ET cover at the Monticello, Utah, Disposal Site has averaged less than 0.6 mm/yr (the EPA design target was less than 3.0 mm/yr). The climate, soils, and plant ecology of the Monticello and Lakeview disposal cells are similar. The ET cover at Monticello has performed much better than the conventional cover at Lakeview. Alternative covers are now advocated by many federal and state regulators.

Reduce LTS&M Costs

LTS&M at many LM sites includes herbicide spraying to control plant establishment and root intrusion on disposal cell covers. Costs of herbicide spraying have increased at many sites and will likely continue to do so as ecological conditions become more favorable for plant growth. Without intervention, ecological succession and soil development processes will, over time, effectively transform existing low-permeability covers into ET-type covers. LM is currently acquiring information to decide whether to continue spraying, to stop and allow plant succession to progress, or to accelerate the natural transformation to ET-type covers—cover renovation. The

goal would be to accommodate ecological processes and, thereby, sustain a high level of performance and reduce long-term maintenance costs.

Cover Renovation Study

The RECAP study is evaluating a renovated cover design for the Grand Junction Disposal Site. The existing cover consists of four layers (Figure 1): a low-permeability radon barrier (compacted soil layer, or CSL), a frost protection layer, a sand and gravel bedding layer, and a layer of durable basalt riprap. A preliminary LM study found that the permeability of the CSL is almost 1,000 times higher than the design target. Also, the cost of controlling vegetation continues to increase as the cover becomes a more favorable habitat for growth of fourwing saltbush and other plants—the riprap layer acts as a mulch, and windblown soil has filled the voids in the rock.

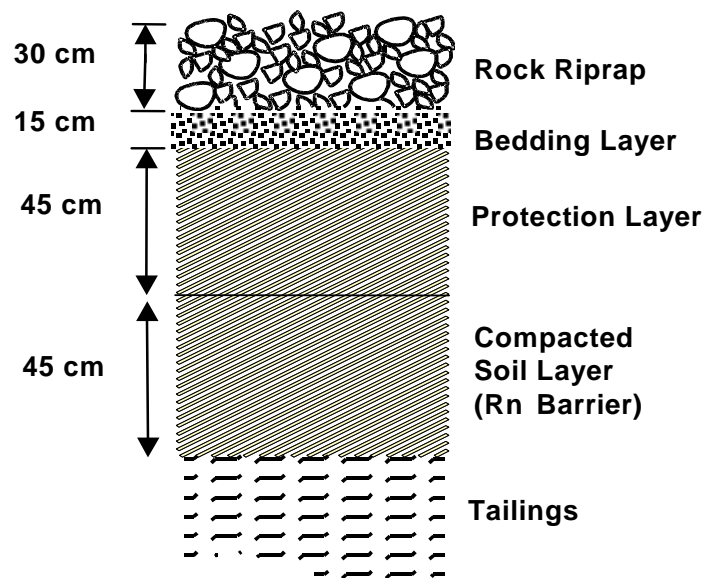
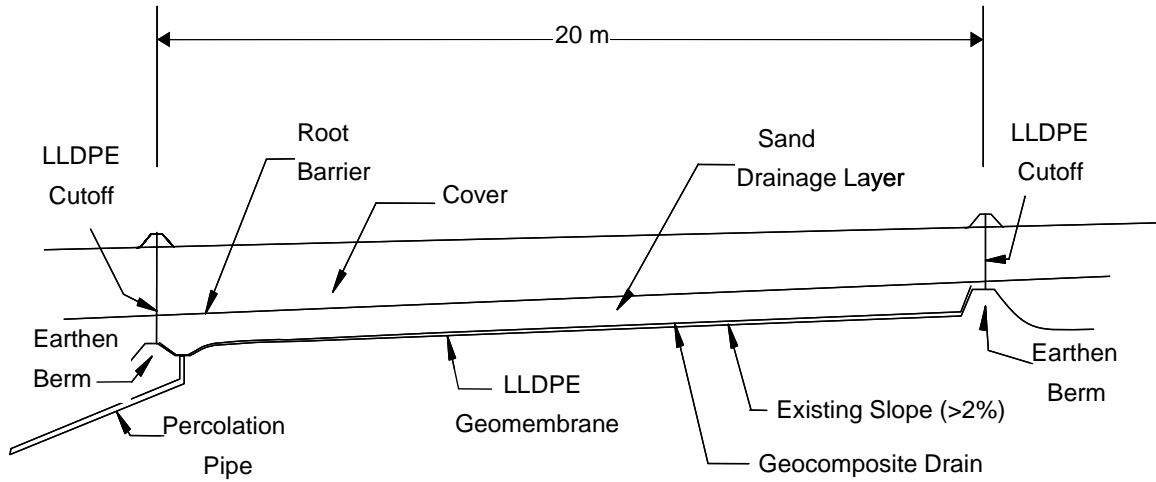


Figure 1. Cross Section of the Existing Cover at the LM Grand Junction, Colorado, Disposal Site

The RECAP test facility consists of two large lysimeters (Figures 2 and 3). Lysimeters are swimming pool-sized containers filled with cover materials and instrumented to measure all components of the soil water balance (precipitation, runoff, soil water storage, percolation, and evapotranspiration). Construction of test covers in the lysimeters closely followed as-built designs for the Grand Junction disposal cell, including the use of similar heavy equipment. The renovation treatment, to be imposed on one of the two lysimeters after baseline hydrologic conditions have been established, will involve ripping and mixing the rock, drainage, and frost protection layers, and planting native shrubs in the rip rows. After several years of monitoring and comparing the original design with the renovated design, LM will weigh the results of the study in future LTSM decisions for Grand Junction and other sites with conventional covers.



*LLDPE = Linear low-density polyethylene.

Figure 2. Cross Section of a Drainage Lysimeter Constructed at the RECAP Test Facility at the Grand Junction, Colorado, Disposal Site

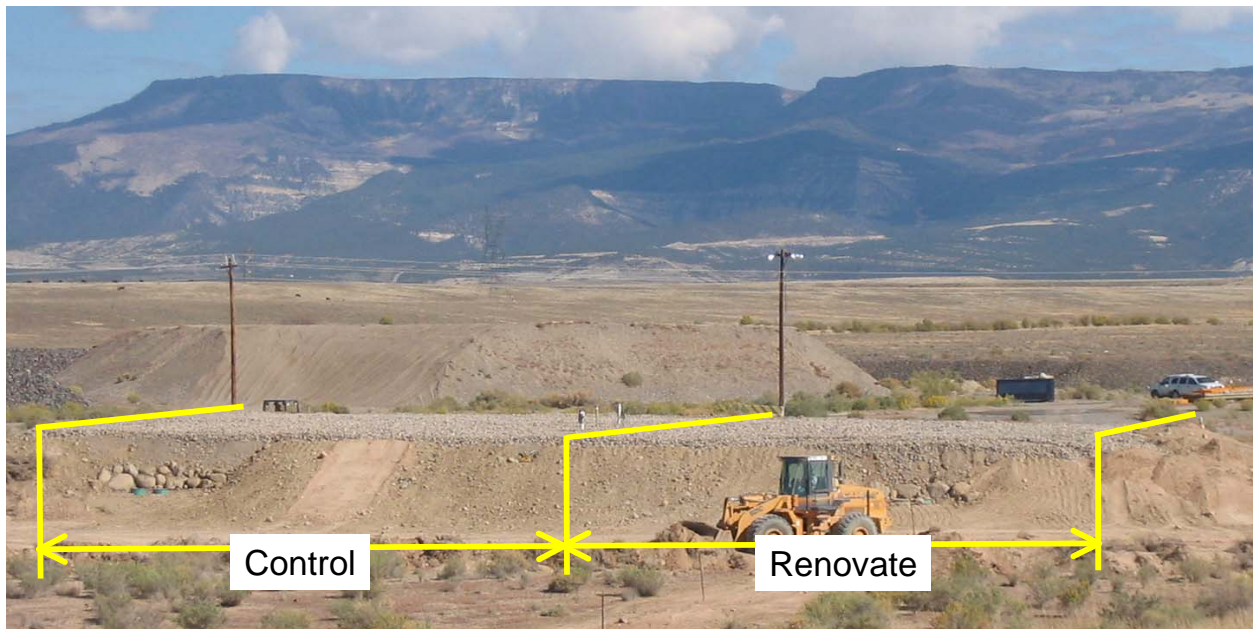


Figure 3. RECAP Lysimeter Test Facility under Construction at the Grand Junction, Colorado, Disposal Site.