



Sandia
National
Laboratories

Environmental Program



Alternative Landfill Cover Demonstration

Technology Need

An Environmental Protection Agency (EPA) study of 163 randomly selected landfills determined that current landfill technologies need improvement. Minor to major problems were discovered at 146 of these sites. Problems included elevated chemical concentrations in on-site ground water to severe contamination of ground water at water supply well fields, surface water contamination, ecological impacts to local flora and fauna, and forced changes in the water supply for impacted communities where federal/state drinking water contamination standards were exceeded. All areas of the country have experienced some form of water contamination due to leaking leachate from landfills.

Current cover design criteria emphasizes barrier layers that block infiltration of water through the cover into the waste. Saturated hydraulic conductivity is the measurement device chosen by the EPA to define the effectiveness of the barrier layer (e.g., the lower the hydraulic conductivity, the better the layer is). This is not a practical solution in arid and semi-arid regions because saturation of cover soil layers is rarely, if ever, achieved.

The saturated hydraulic conductivity method can actually be detrimental to covers in arid and semi-arid regions. In order to achieve the low saturated hydraulic conductivity required by the EPA, the barrier soil must be remolded by compacting it 'wet of optimum' which eventually leads to the soil drying, shrinking, and cracking leaving the barrier layer ineffective. These cracks provide pathways for the infiltration of water. This defeats the original purpose of creating a barrier layer to block the infiltration of water into the waste.

Objective

The Alternative Landfill Cover Demonstration (ALCD) is developing technology to improve upon current landfill cover systems. The project will provide alternatives to the EPA's landfill cover designs that will work more effectively and be easier and less expensive to install in arid and semi-arid climates. It is also working to improve regulatory acceptance of alternative landfill cover designs across the DOE complex.



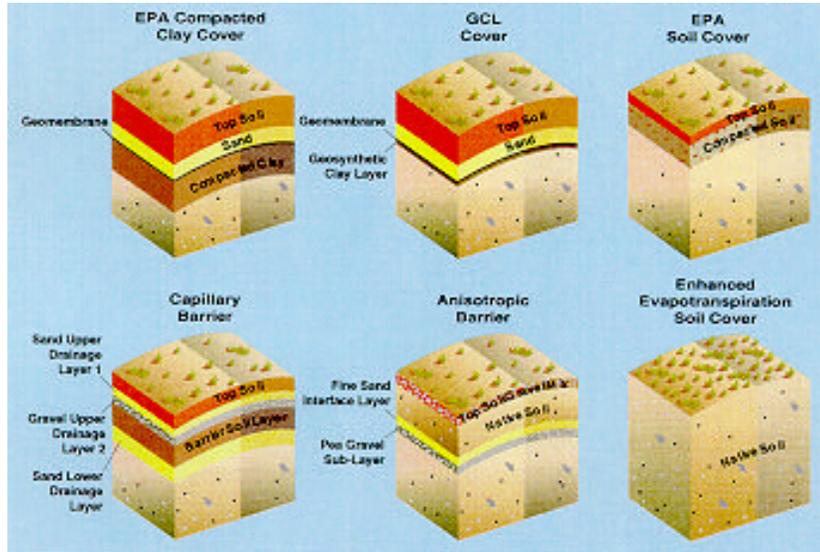
Aerial view of test covers in Alternative Landfill Cover Demonstration.

Project Description

The ALCD is testing innovative landfill covers using currently accepted EPA cover designs as baselines. These covers are installed and instrumented in a side-by-side demonstration. Each test plot is 300 feet long; peaked in the middle with 150 feet sloping at 5% toward the west and the other 150 foot half sloping at 5% towards the east. The eastern half of each test plot will be evaluated under ambient

conditions and the western side evaluated under "stressed" conditions controlled by a rain simulation system. The covers will be evaluated and compared based on construction, cost, and performance criteria.

Some of the alternative designs will emphasize such things as unsaturated hydraulic conductivity, increased water storage potential to allow for eventual evaporation, and increased transpiration through engineered vegetative covers. The alternative covers were designed to take advantage of local materials



Side-by-side comparison of EPA cover designs and alternative cover designs.

to allow for easier construction of the covers at substantial cost savings.

The key to gaining general acceptance of any new environmental technology is obtaining regulatory acceptance. The ALCD is addressing this issue by involving the EPA and environmental divisions from the western states in the project. This is key in obtaining acceptance of the new technologies and is encouraging interstate cooperation. The Western Governors' Association and Committee to Develop On-Site Innovative Technologies (DOIT) have worked with Sandia to promote this interstate cooperation.

Advantages

This effort should result in effective landfill cover designs that are longer lasting and less expensive for arid and semi-arid regions.

Costs

The ALCD costs should be less expensive than current systems because this effort should result in more efficient landfill cover designs tailored to specific site requirements by a decision support system. The use of native soils will greatly reduce costs normally associated with clays and membranes which are required by the EPA. However, this effort is in the design and development stages. Specific cost information is currently not available.

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