

# Horizontal and Vertical Erosion Flume

Sandia National Laboratories' Defense Waste Management Programs designed and built a one-of-a-kind testing facility which uses surrogate WIPP waste materials.

## A One-of-a-Kind Testing Capability

In WIPP Performance Assessment scenarios, an exploration borehole is hypothesized to penetrate the repository sometime in the future. Drilling fluid flowing up the borehole would apply a hydrodynamic shear stress to the material comprising the borehole wall. If the wall material is made up of TRU waste degraded to the point it could be eroded off the wall and carried uphole with the drilling fluid, radionuclides could possibly escape the repository. To address this scenario and obtain data to model the amount of waste material that could potentially be transported to the surface, a one-of-a-kind testing facility was designed and built in which surrogate WIPP waste materials are eroded with a vertically flowing fluid. The desired material property to be obtained is the critical shear stress at which erosion of the surrogate WIPP waste material begins to erode.

The facility advances the state-of-the-art flume capabilities by including computer (data acquisition system, DAS) controlled specimen movement and fluid flow rate. Also monitored are the fluid pressure in the erosion channel and water quality in terms of temperature and specific conductance.

The flume is presently designed for flows at angles that range between

vertical and horizontal. The system can generate hydrodynamic shear stresses up to 6 Pa. By utilizing a larger pump, shear stresses as high as 12 Pa can be obtained, which corresponds to the worst storm events.

Modifications to the flume are planned so that experiments can be performed that simulate bank erosion of stream channels. In this configuration, the fluid flow would be horizontal, however the sample face would be vertical with the sample being pushed in from the side.

With or without the planned modifications, the vertical positioning of the specimen represents a capability unique to this flume. Research using this facility could lead to better quantification of critical shear strengths of materials under actual conditions. This in turn will lead to better predictive models of both ocean and stream channel erosion, and of the WIPP underground environment.

## Publication

Herrick, C.G., M.D. Schuhen, D.M. Chapin, and D.C. Kicker. (2012). Determining the Hydrodynamic Shear Strength of Surrogate Degraded TRU Waste Materials as an Estimate for the Lower Limit of the Performance Assessment Parameter TAUFAIL. ERMS 558479. WIPP Records Center, Sandia National Laboratories, Carlsbad, NM.



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