



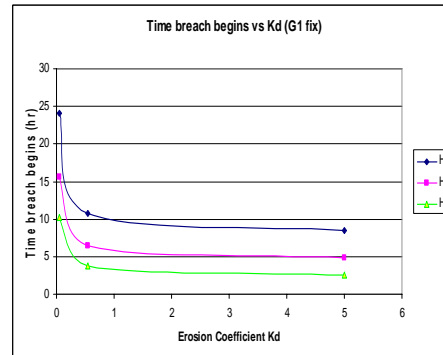
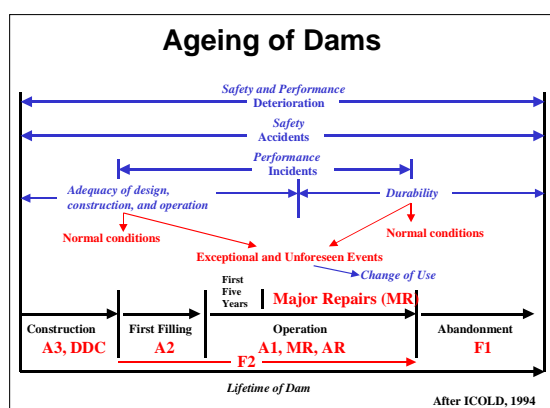
US Army Corps  
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## Water Resources Infrastructure R&D Program

# Analysis for Embankment Dam Breaching Prediction

### Description

The Breaching Mechanics for Embankment Dams Work Unit, previously under the Flood and Coastal Storm Damage Reduction Research Program, conducted a review of earthen dams operated by the U.S. Army Corps of Engineers (USACE). This review, summarized in TR-05-20, provides a comprehensive listing of known incidents that have affected USACE dams. The database of incidents was compiled in part to provide a basis for comparing the performance of dams operated by the USACE with similar dams operating internationally. This work provided the basis for estimating the risk of USACE dams experiencing an incident of piping or excessive seepage.



The results of this research are presented in a technical report (TR-07-13), which documents piping and excessive seepage incidents associated with large embankment dams operated by the USACE. As a main objective, the study modeled how incident probabilities can be estimated using both, the Foster et al. (1998) record of global incidents and the database of USACE incidents. Probability estimates and comparisons between the University of New South Wales and the USACE databases were performed. The databases were combined using Bayesian updating to provide the probability of dam accidents or the probability of dam incidents. Dams constructed on glacial deposits were also identified for this study. It was determined the piping incidents occurred with increased frequency (2-times more likely than average) in glacial foundations compare to other foundation types.

Relating incidents to foundation material may eliminate or greatly reduce future problems with dam integrity.

In FY09, the Breaching Mechanisms for Embankment Dams Work Unit was moved under the Water Resources Infrastructure R&D Program. The focus for FY09 is to conduct a parametric study to better understand the influence and importance of breaching caused by overtopping erosion. Overtopping erosion from the protected side of a dam is a relatively new failure mode analysis. The mechanisms of backside erosion are quite complex and, because of this, there is limited research on how it initiates and progresses toward a crest-breaching failure. This proposed research will provide the required parameters needed to fully evaluate the contributing factors in the occurrence or acceleration of a dam breach.

This research is divided into several tasks: Task 1 (FY09) includes using the U.S. Dept of Agriculture overtopping computer model, Simplified Breaching Analysis (SIMBA) to identify and prioritize parameters in assessing dam breach potential. Task 2 involves conducting a logistic regression analysis based on data output in Task 1. Fragility curves used in evaluating the performance of breaching will be generated in Task 3 from the refinement and engineering assessment in the previous tasks.

**Benefits** The results of this research would greatly contribute to a better understanding of breaching mechanisms supporting a system wide, risk-based approach. These data also provide valuable input to the USACE Dam Overtopping Erosion Toolbox.

**Status** A partnership has been developed with the USDA-ARS to study the applicability of their overtopping model, Simplified Breaching Analysis (SIMBA) to the USACE needs. This work unit has also leveraged with the Unlined Spillway Erosion Work Unit and the USACE Portfolio Risk Analysis.

**Distribution Source(s)** Copies of the available reports can be obtained by contacting the point of contacts below.

**Available Documentation** TR-05-20, "Dam Incidents Involving US Army Corps of Engineers Structures"; TR-07-13, "Estimating the Risk of Embankment Dam Incidents Related to Seepage Based on Historical Records of Prior Incidents".

**Available Training** There is no applicable training regarding this research.

**Available Support** If applicable, support regarding this research can be obtained by contacting the point of contacts below.

**Application** The compilation of Corps Structures performance can facilitate Risk Assessment among Corps Structures. A continue effort to understand dam and levee breaching mechanisms will directly assist in preventing failure of critical Corps structures. This research will also increase safety through geotechnical understanding of Corps flood control structures.

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