

# **Scour and Deposition Around Partially Buried Mines**

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## **LONG-TERM GOALS**

The long-term goal of our research is to understand and be able to predict the transport and fate of sediments and contaminants associated with them. This includes field measurements of sediment erosion rates, laboratory investigations of the parameters that govern erosion rates, and the numerical modeling of the transport and fate of sediments for a wide range of environmental conditions.

## **OBJECTIVES**

The purpose of this research is to develop and apply an accurate numerical model of the scour and deposition of sediments around partially buried mines and other objects. The main effort is the development of the numerical model; limited field and laboratory investigations of sediment erosion will be done in support of this. The emphases will be on (1) bed armoring, (2) erosion of stratified sediments, (3) deposition of scoured sediments, and (4) effects of slope on scour.

## **APPROACH**

As part of our previous research on sediment transport, we have developed an accurate and predictive numerical model of sediment transport (Jones and Lick, 2001 a, b). This model includes erosion rate data from Sedflume, three or more size classes of sediments, a uniformly valid description of bed load as well as suspended load, bed coarsening as well as erosion rates dependent on bed coarsening, and deposition rates dependent on flow rate and particle size. The sediment dynamics described in this model are presently being included in CFD 2000 so as to more accurately describe the hydrodynamics and sediment transport around partially buried objects. Numerical investigations of bed armoring, erosion of stratified sediments, deposition of scoured sediments, effects of slope on scour, and the resultant effects of these processes on mine burial will then be made.

Effects of sediment slope on critical stress and erosion rates are quite substantial. This will be investigated by means of laboratory experiment using Sedflume. Sediments from the field test sites will also be brought back to the laboratory for testing of erosion and consolidation rates.

## **WORK COMPLETED**

This research was initiated in May, 2001. Preliminary calculations of scour around a cylindrical pier have been made. Effects of water depth, changes in bottom topography due to scour, and sediment

slope have been investigated. The completed calculations have only included erosion (clear-water scour) but have not included deposition.

Experiments on the effect of sediment slope have been initiated by running Sedflume (and the sediment-water interface) at an angle.

## **RESULTS**

Only preliminary results have been obtained.

## **IMPACT/APPLICATIONS**

A realistic numerical model of scour and deposition around partially buried mines will be developed. The model will be used to determine effects of flow conditions, sediment characteristics, and object characteristics on the scour and/or burial of the mines.

## **TRANSITIONS**

None

## **RELATED PROJECTS**

Erosion and Deposition Rates of Mixed Sediments, funded by the U.S. Army Corps of Engineers. A basic investigation of erosion and deposition rates of real sediments (both cohesive and non-cohesive) and the parameters that govern these rates.

## **PUBLICATIONS**

Jones, C., and W. Lick, 2001. "Sediment Erosion Rates: Their Measurement and Use in Modeling," Proceedings Texas A & M Dredging Seminar.

Jones, C., and W. Lick, 2001. SEDZLJ, A Sediment Transport Model, Report, Department of Mechanical and Environmental Engineering, University of California, Santa Barbara, CA 93106.

## **PATENTS**

None