

**DESIGN MANUAL FOR SEDIMENTATION CONTROL
THROUGH SEDIMENTATION PONDS AND
OTHER PHYSICAL/CHEMICAL TREATMENT**

**U.S. Department of the Interior
Office of Surface Mining**

By

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EXECUTIVE SUMMARY

This report is a design manual to guide the design engineer and/or operator in the design and maintenance of sedimentation ponds for the control of sediment from surface mine operations.

The first chapter is an introduction presenting the present status of sedimentation pond application. The primary concern is that sedimentation ponds have been previously designed based on storage volume and specific detention time requirements. However, many ponds designed according to these criteria did not meet regulatory effluent requirements. The design methodologies presented in this manual address the meeting of effluent quality criteria.

Before attempting the design of a sedimentation pond, it is important to have an understanding of the watershed characteristics affecting soil erosion, location of sediment sources associated with surface mining, and the various types of sedimentation ponds used. The major watershed characteristics affecting soil erosion are climatology, geology, soils, vegetation, topography and hydrology. There are four main sources of sediment associated with surface mining: (1) haul and access roads, (2) areas of active mining, (3) areas being cleared for mining activities, and (4) areas in process of reclamation. There are various types and combinations of sedimentation ponds of which a dam embankment located on or off the main drainage is most common. Chapter II gives a discussion of the preliminary design considerations to sedimentation pond design.

Chapter III presents the design methodologies for meeting effluent water quality regulations. Design for the removal of sediment is mainly based on ideal settling. For ideal settling the main criteria is particle size or particle size distribution. Selection of a design particle size to be removed should be done carefully and conservatively. Although, the pond design is based on ideal settling several aspects of sedimentation ponds cause variations from ideal settling resulting in reduced pond efficiency. The main causes of variation from ideal settling are short circuiting, flow currents, turbulence, and scour and resuspension of settled sediments. These causes have been identified in studies evaluating the performance of sedimentation ponds. Several publications have identified and recommended measures to

control the various conditions of nonideal settling. These control methods are related to various components of the pond, entrance to the pond, spillway outlet, and pond configuration. Along with these methods, proper maintenance of sediment storage volume, inlets, and outlets is mandatory to maintain proper operating conditions. Chapters IV and V present various modifications to pond components and proper maintenance measures.

Although several methods to improve pond performance have been recommended by others and presented in this manual, there is a significant lack of information on their proven ability to increase the removal efficiency of the pond. Thus, there is a definite need for further investigation and research to evaluate the various pond components and modifications, specifically on a comparative basis, to enable a quantitative comparison of different methods for selection during sedimentation pond design.

The final chapter of the manual presents one possible step-by-step procedure for the design of sedimentation ponds. It should not be considered as the only method available but rather used as a guide. Again, even following the steps presented, meeting effluent quality regulations is not guaranteed. However, following these methods will help reduce the effects of surface mining and sedimentation on the hydrologic balance of the particular watershed being considered.