

Executive Summary

In April 2007, a routine bathymetric survey at Mel Price Lock and Dam detected scour holes immediately upstream of the dam piers. This prompted a survey at Lock and Dam 24 which revealed the formation of multiple scour holes; the deepest occurring at Pier 4 reaching approximately 4 ft below the pier base (8.5 ft below the design elevation of the stone bed protection). Due to the reoccurring nature of the scour at Mel Price Lock and Dam and the discovery of similar scour problems at Locks and Dams 24 and 25, physical and numerical modeling efforts were conducted in an attempt to determine the cause and to test possible solutions.

Testing was done using a scale hydraulic model located at the Corps of Engineer's Engineering Research and Development Center (ERDC) Coastal and Hydraulics Lab (CHL). The physical testing identified the buildup of ice in front of the lock gates as the primary cause of the upstream scour. The primary recommendation from the model testing was to lower the design elevation of the upstream stone bed protection 5 feet. The solution found from the Mel Price lock and dam testing was not constructible at Lock and Dam 24 because the dam sill at Mel Price is 14 feet thicker than at Lock and Dam 24.

A scale hydraulic model was constructed to examine the upstream scour conditions with respect to ice buildup upstream of Lock and Dam 24. The physical modeling again supported the assertion that the buildup of ice upstream of the dam gates is a significant factor in causing upstream scour. The test results indicated that opening the two gates adjacent to the three center gates used for ice passage 5 ft would alleviate scour adjacent to the piers. A second recommendation of the model testing is to extend the upstream scour protection 30 ft to reduce both upstream and near-pier scour. Two additional recommendations are to conduct regular surveys of the upstream stone bed protection and to minimize upstream ice buildup.