Bridge Scour:

Understanding the Leading Cause of Bridge Failure

Bridge scour is the removal of sediment from around bridge foundations by flowing water and is the leading cause of bridge failure in the U.S. Effective design requires integrating hydroulics, sediment transport, and engineering judgment.

The Mechanics of Scour

The #1 Cause of U.S. Bridge Failure

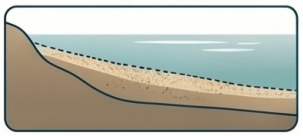
Most bridge collapses are driven by turbulence-sediment interaction rather than mean flow.

The Pier Vortex System

Total Scour Components

Total Scour = **Long-Term Scour** + **Contraction Scour** + **Local Scour**

Long-Term Scour



Basin-scale aggradation or degradation

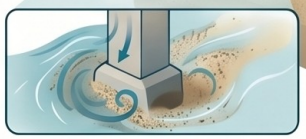
Time Scale: Decadal

Contraction Scour

Increased velocity due to reduced flow area

Time Scale: Event-based

Local Scour



Vortices and downflow at piers/abutments

Time Scale: Event-based

Prediction and Protection

The HEC-18 Prediction Equation

Scour Depth $\approx$ Pier Width, Flow Velocity, Depth

Engineers estimate local scour depth based on pier width, flow velocity, and depth.

Common Scour Countermeasures

Climate Change Vulnerability

Increased flood magnitudes and higher velocities are making existing bridges under-designed.