



SCOUR

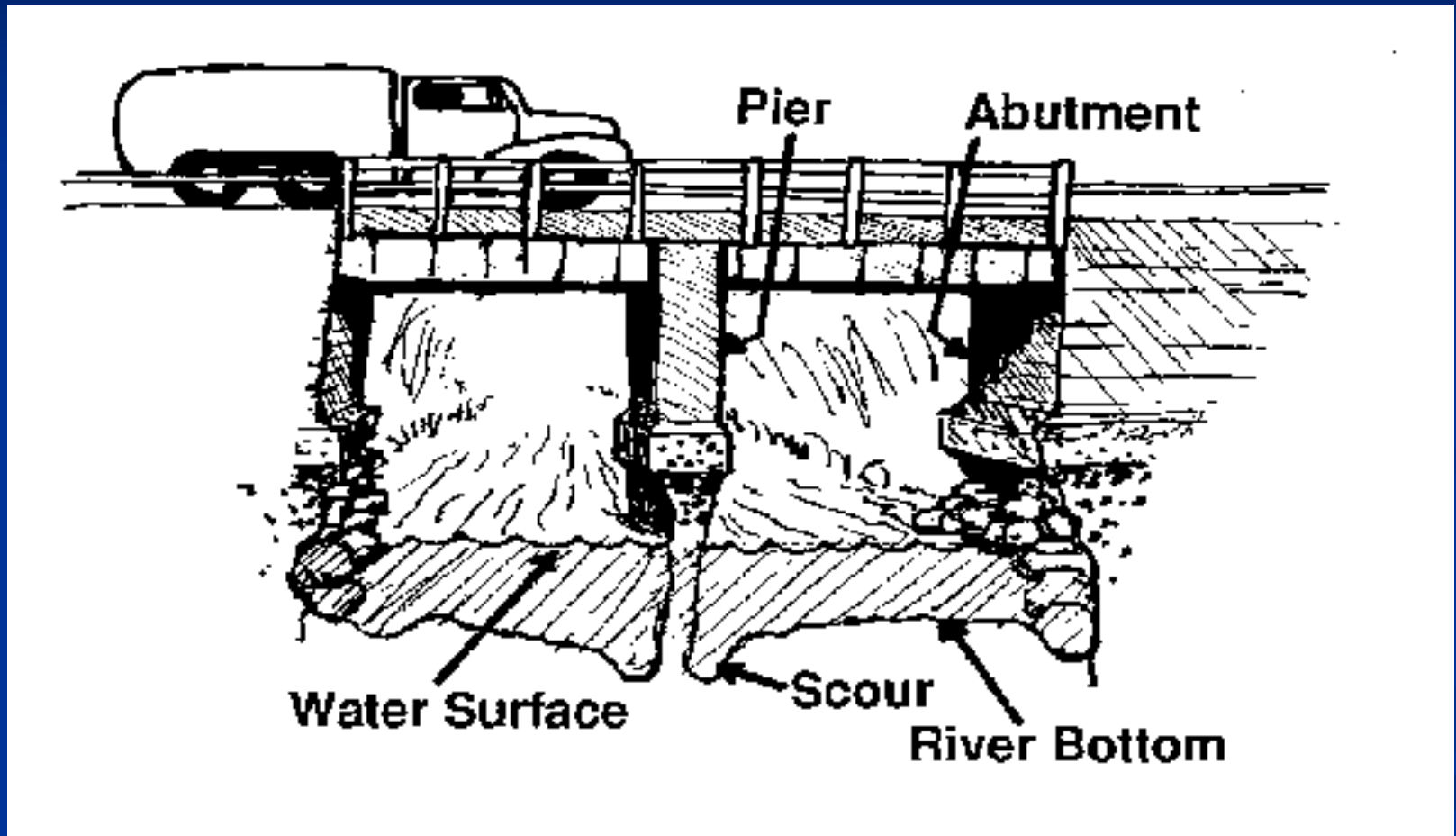
Babbling Brook



Just Add Water



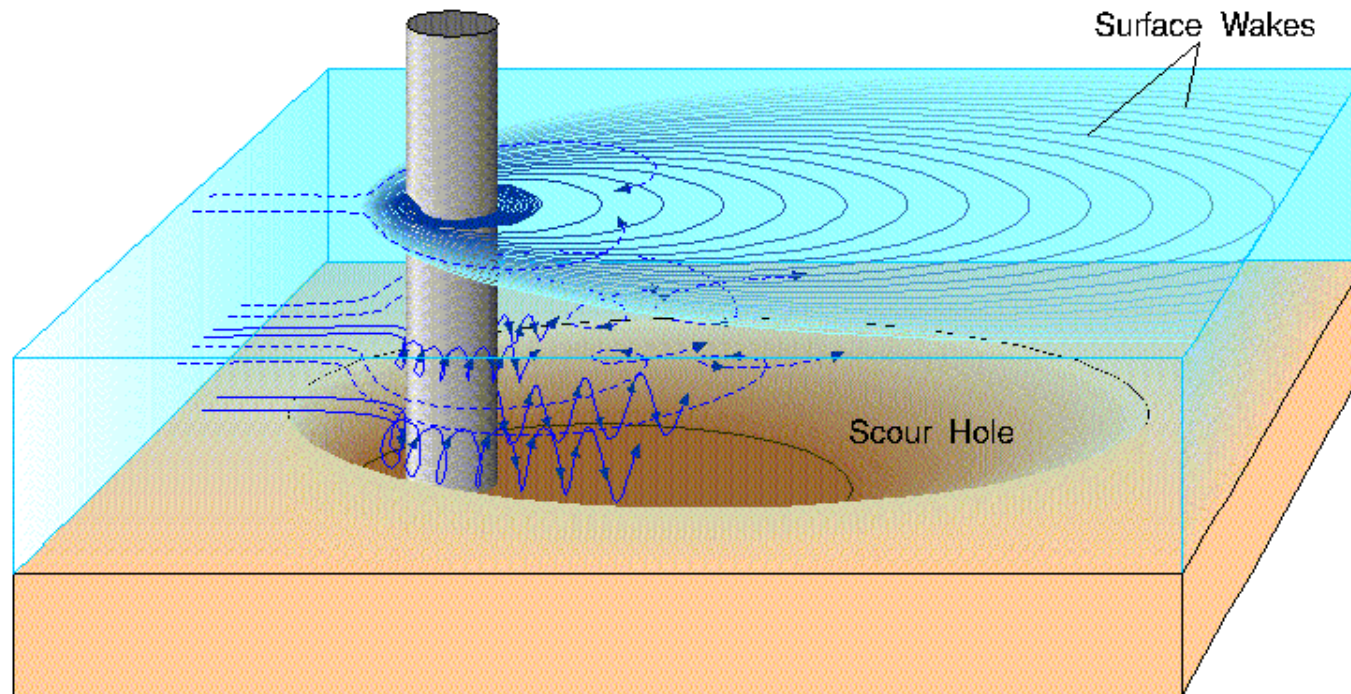
Definition of Scour



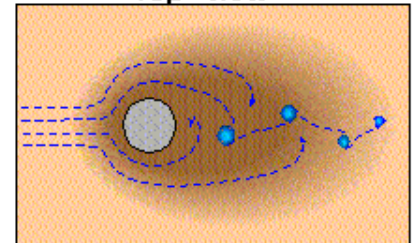
Scour: Loss of material under a bridge's foundation

Local Scour at Pier

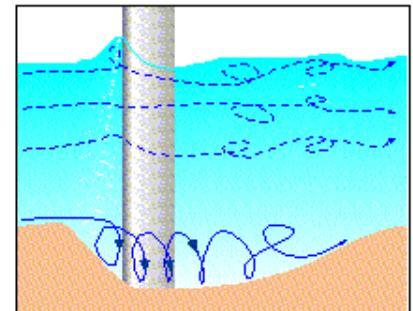
Horseshoe and Wake Vortices around a Cylindrical Element



Top View



Side View

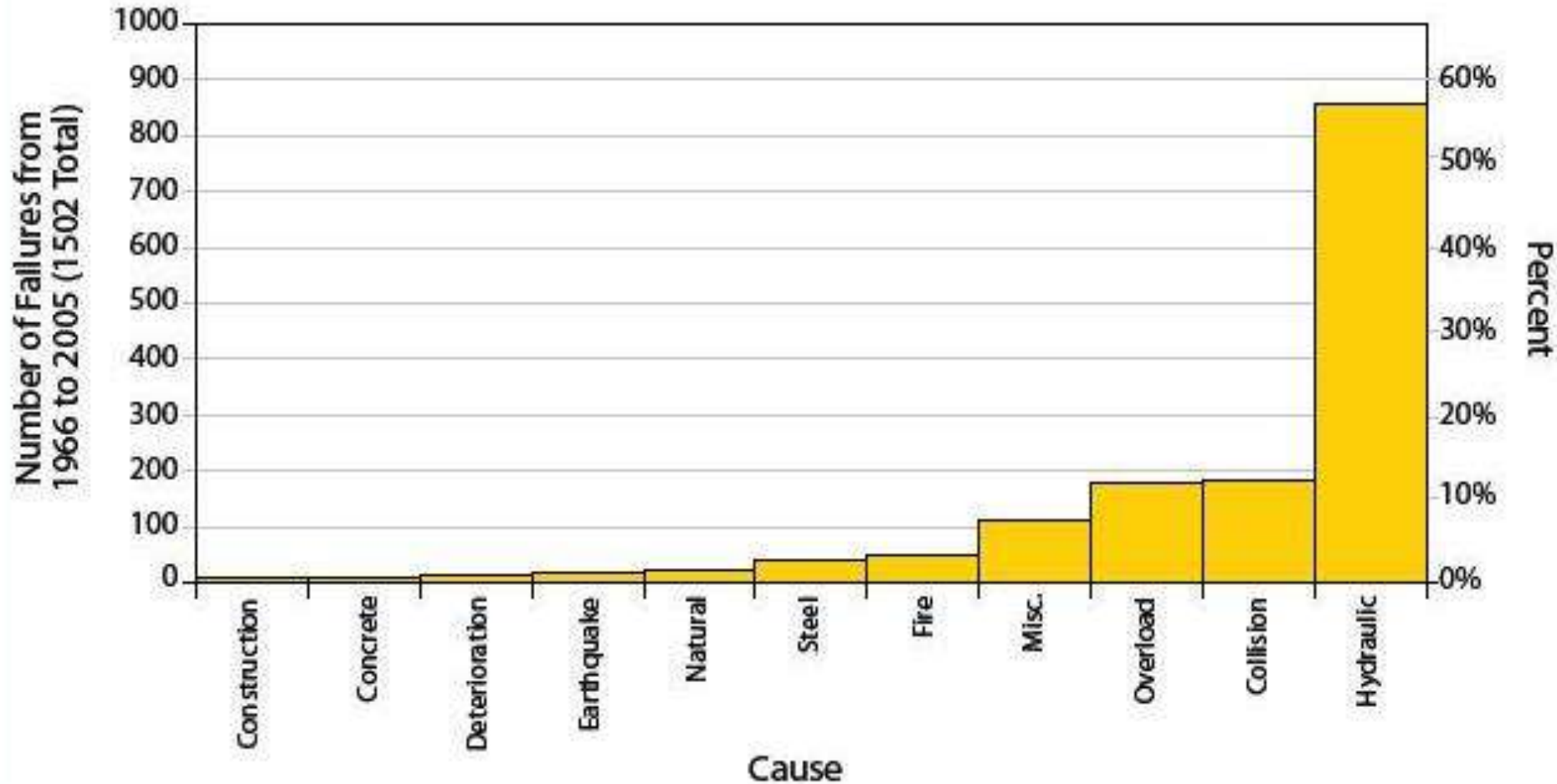


- Horseshoe Vortex
- - -→ Wake Vortex

Pier Scour



Bridge Failure Statistics



**Bridge and Culvert Failures
in Maine
due to Scour**

Carrabassett Valley, Brackett Brook Bridge #5347 Hurricane Irene - August 28, 2011

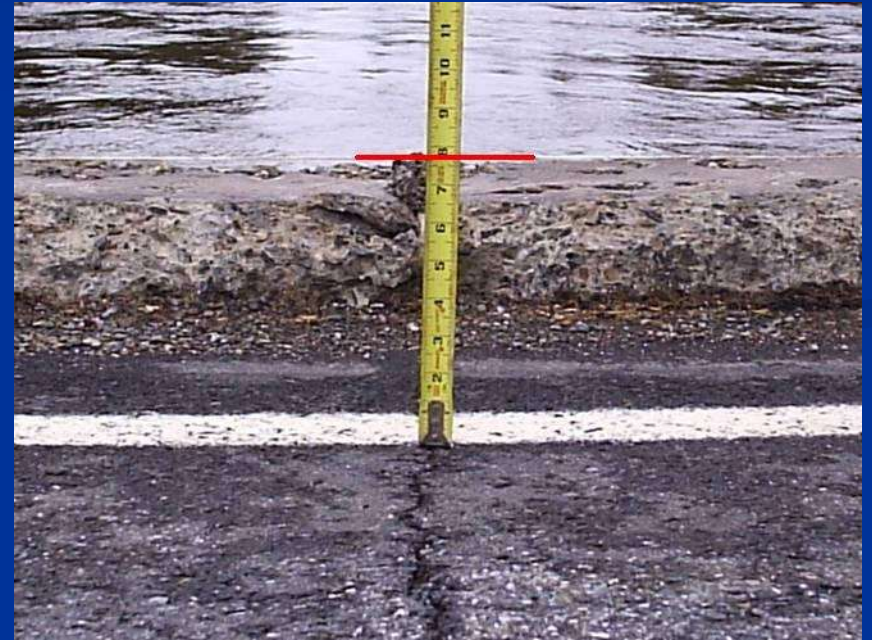


Carrabassett Valley, North Branch Bridge #5346 Hurricane Irene August 28, 2011



Moro Plantation, Tucker Br. #5027

May 1, 2008



8 inch drop at pier

Moro Plantation, Tucker Bridge Looking upstream



York, Passaconway Br. # 5176

May 14, 2006 (Mother's Day Flood)



BEFORE FLOOD



AFTER FLOOD
(15 inches of rain in 36 hours)

Ogunquit - Wells, Sherburne Br. #6122

May 14, 2006 (Mother's Day Flood)



Freeport, Mast Landing Br. #5805

October 11, 1998



Farmington, Fairbanks Br.#2271 April 1, 1987 (April Fool's Day)



Abbot, Page-Carr Br. #5725

1987

- April 1, 1987 flood creates deep scour holes under pier footings
- Installed 1335 cy of riprap as emergency repair

MaineDOT Maintenance

Grout bag repairs

- 1987 to 2011
- 83 undermined bridges repaired
 - 21 using Private Contractors
 - 62 by MDOT Dive Team



Winslow, Mile Brook Bridge Pre Dam Removal



Fort Halifax Dam Removal (2008) Winslow, Mile Brook



Scour Plans of Action (POA)

- POA's include the following:
 - When to start monitor a bridge during an event
 - When to close a bridge to traffic
 - Q10, Q25 or Q50 event
 - Or other trigger (USGS gaging station)
 - When can a bridge can be reopened to traffic
 - How to reopen a bridge
 - Recommendations for scour countermeasures

Scour POA Implementation



What Do I Look For?

- Pavement cracking behind bridge
- Abutments rotated
- Piers tilted
- Slumping behind wings
- Irregular or misaligned bridge rail
- Water and/or debris against bridge

Scour Warning Sign

Red – Close Bridge

Yellow – Monitor Bridge



Looking up stream



Typical collision damage to approach and bridge rail.



Down stream West wing wall



Down stream East wing wall

2607

Wiscasset

New Road

11-23-2011

Scour Countermeasures

Scour Countermeasure Projects

- Item 113 rating is changed from 3 or less to a rating of 7
- Need properly design countermeasure
- 2012-2013 Work Plan
 - 24 Projects
 - \$3,800,000+/- Total Cost
- Pre 2012
 - Prospect – Verona
 - Portland, Tukey's Bridge
 - Waterville, I95 over Messalonskee Stream



Good Rip Rap



Scour Countermeasure Options



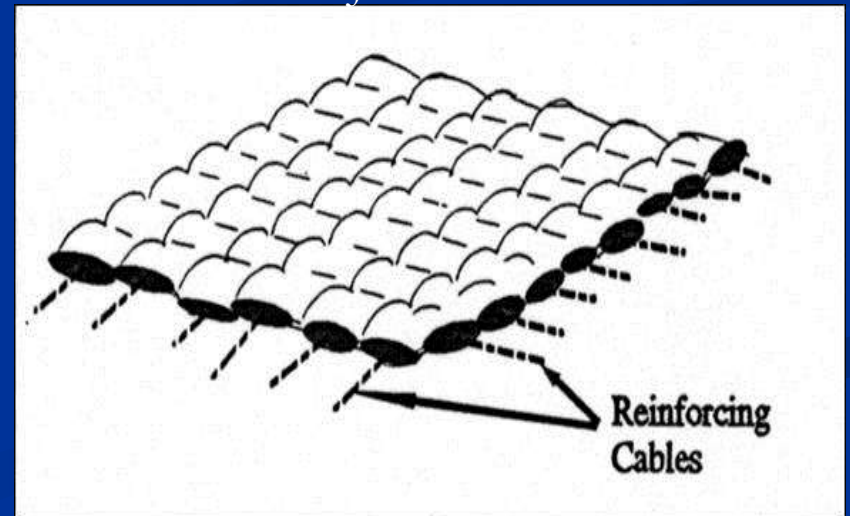
Articulate concrete block mat



A Jacks



Partially Grouted Riprap



Concrete filled mattress



Questions/Comments