Fact Sheet

A TIME DOMAIN REFLECTOMETRY-BASED SYSTEM FOR REAL-TIME BRIDGE SCOUR DETECTION AND MONITORING

PROBLEM

Bridge scour is a severe problem that can cost millions of dollars in terms of damage to infrastructure, required repairs and maintenance, and potential loss of life. Scour occurs during times of rapid river flow and especially under ice conditions when sediments, including rocks, gravel, and silt, are transported by the currents away from bridge piers and similar structures. If the event is severe enough, foundation materials below the pier footing may be eroded, leaving the structure unsupported and in jeopardy of collapse. Scour is dynamic; ablation and deposition can occur during the same high energy flow event, so deterioration of the structural foundation cannot be easily detected. The presence of ice in the river can deter efforts to detect scour.

HISTORY

Current methods of identifying bridge scour primarily rely on “after-the-fact” surveys using bathymetric radar or sonar systems to survey the extent of scour. Tethered neutral buoyancy “fish,” buried at known depths in the river bottom sediments, have provided some useful information on scour erosion and deposition during high energy events, but scour depth resolution is coarse.

SOLUTION

A time domain reflectometry-based system has been developed (patent pending) for continuous real-time dynamic detection and measurement of scour. The system employs a number of inexpensive, vertically oriented sensors that are securely anchored into sediments below the maximum expected depth of scour. It can detect changes in river sediment depths of less than 2.5 cm (1 in.). The system can easily be installed on new construction and retrofit to existing structures.

This invention has the following advantages:

- Effectiveness even with high energy flow
- Effectiveness under ice cover
- Unattended automatic operation
- All-weather, day-and-night operation
- High resolution of scour depth
- Real-time dynamic data
- Automatic reset, enabling measurement of multiple erosion/deposition events.

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