STRATEGIES FOR DEVELOPING A PLAN OF ACTION

LESSON 9
LEARNING OUTCOMES

• Describe the purpose of a Plan of Action (POA) for a scour critical bridge

• Identify strategies for developing a Plan of Action (POA)
PLAN OF ACTION (POA)

• Should be developed for each existing bridge found to be scour critical per FHWA guidance contained in Technical Advisory T 5140.23, “Evaluating Scour at Bridges” dated October 28, 1991
HIGHLIGHTS OF CHANGES TO ITEM 113

• Description changed to emphasize that:
  - Rating factor of 2 or below requires revising Item 60 and other affected items (load ratings and superstructure rating)
  - Plan of Action should be developed for each scour critical bridge
  - Coding is based on an engineering evaluation, which includes consideration of NBIS field inspection findings
A Scour Critical bridge is one with foundation elements that are determined to be unstable for the calculated and/or observed stream stability/scour conditions.
CODE 8

• Expanded guidance for a bridge foundation determined to be stable:
  - Assessment - *bridge foundations on rock formations determined to resist scour within the service life of the bridge*
  - Calculations
  - *Installation of properly designed countermeasures*
• Countermeasures installed to *mitigate* an existing scour problem and to *reduce the risk* of bridge failure during a flood event

• Instructions in a *Plan of Action* have been *implemented* to reduce the risk to users from a bridge failure during or immediately after a flood event
CODE 5

• Foundation determined to be stable for the *assessed* or calculated scour condition

• Scour within the limits of footings or piles based on an *assessment*, calculation, or *installation of properly designed countermeasures*
GOAL OF POA

- Provide guidance for Inspectors and engineers that can be implemented before, during, and after flood events to protect the traveling public
ELEMENTS OF POA

- Management strategies
- Inspection strategies
- Closure instructions
- Countermeasure alternatives and schedule
- Other information
MANAGEMENT STRATEGIES

• Location and identification of bridge
• Type of foundation and foundation material
• Source of scour critical rating
• Importance of roadway to the transportation network
• Programmed for replacement (may suggest a risk-based analysis)
INSPECTION STRATEGIES

• Type and frequency of inspection
• Need for continuous monitoring
  – When to start
  – When to stop
• What constitutes a scour critical condition
• Instructions for action when the scour critical condition is reached
GUIDANCE FOR INSPECTORS

- Discharge measurement
- Stage measurement
- High water marks
- Flood watch
CLOSURE INSTRUCTIONS

• Can be load restrictions, lane closure or complete bridge closure

• Criteria for closure should be established by Scour Team

• Identify authority for closing and reopening a bridge
  – Communication and coordination
• Availability and description of alternative routes
• Scour vulnerability of bridges along detour route
COUNTERMEASURE
ALTERNATIVES

• Alternatives considered
  – More intense monitoring can be one of the alternatives

• Preferred alternative

• Engineering feasibility

• Schedule for timely design and construction
OTHER INFORMATION

• Author and sign–off on POA
• Media alert instructions
• Sources of emergency repair materials
• Detour instructions
GENERIC POA

- Bridge Identification: _____; Location of Bridge: _____; Year Built: _____; Replacement Plans (if scheduled): _____
- Foundation Type: ____________________________ Foundation Soils Types: _______________________________
- ADT: _____________; Service to Emergency Facilities or Evacuation (Y/N): ____________________________
- Sources of scour critical rating (Assessment, Analysis, and/or Observation): _______________________________
- Comments about rating (e.g., analysis did not account for erosion resistant material; emergency riprap placed after last flood, etc.): _______________________________________
- Inspection and Monitoring:
  - Increase inspection frequency: _________________________________________________________________
  - Types (Probing, diving, inspection of banklines): _________________________________________________
  - Special Inspection Criteria (after bankfull events, during major events): ___________________________
- Monitoring Type (Fixed instrumentation, Portable instrumentation): _________________________________
- Criteria for monitoring: _____________________________________________________________________
- Closure Plans (Limit loads; Lane closure; Full closure): ____________________________________________
- Criteria for Closure (Discharge; Floodwater Elevation; Flood Forecast; Scour Soundings): ____________
- Authorization for Closure (Bridge Maintenance engineer; Inspector; Police; Statewide Bridge Closure Procedure): _________________________________________________________________
- Detour Route: __________________________________________________________
- Criteria for reopening bridge: __________________________
- Countermeasures considered: (1) ___________________________________________; Cost: $ ____________
  (2) ___________________________________________; Cost: $ ____________
  (3) ___________________________________________; Cost: $ ____________
- Countermeasure Recommended: ___________________________________________; Status: __________
- Author(s) of POA: ___________________________________________; Date: _________________________
- Concurrences on POA: _______________________, _______________________, _________________________
POA EXAMPLES

- Oregon DOT
- Florida DOT
Scour Assessment (Item 113) shows the structure is SCOUR CRITICAL?

Is the Foundation Material HIGHLY ERODIBLE?

(N) Is there evidence of on-site localized scour?

(Y) Have SCOUR COUNTERMEASURES been installed?

(Bent/Pier Soundings during high water events.

- Maintenance Personnel check during high water events.
- Diver Inspection of bents located in Non-Wadable water after high water events or at least annually.
- Check and Update the X-Channel Profile at least every 2 years.

(Y) The bridge has a History of DRIFT ACCUMULATION?

(N) Is there evidence of on-site localized scour?

(Y) Maintenance Personnel check during high water events.

- Diver Inspections annually.
- Check and Update the X-Channel Profile at least every 4 years.

(N) Maintenance Personnel check during high water events.

- Diver Inspection of bents located in Non-wadable water at least every 2 years.
- Check and Update the X-Channel Profile at least every 4 years.
SR 44 BRIDGE OVER ST. JOHN’S RIVER - POA EXAMPLE

- **Bridge #:** 110063
- **Location:** SR 44 over St. John’s River
- **Foundation:** Pile
- **Scour Mode:** Riverine
- **Status:**
  - Phase I: Data Collection and Qualitative Analysis → Final
  - Phase II: Hydrologic Assessment for Scour Analysis → Final
  - Phase III: Geotechnical & Structural Scour Assessment → Final
  - Phase IV: Recommended Plan of Action → Final
- **Scour Rating:** 3 → Critical
**SR 44 BRIDGE OVER ST. JOHN’S RIVER - POA EXAMPLE**

**POA SUMMARY**

- To mitigate active scour, riprap was recently installed from Bent 5 to the west side of bascule Pier 1
- Riprap in conjunction with a monitoring program will reduce the risk from scour
- If monitoring finds significant degradation below the elevation of the riprap-lined channel, a structural countermeasure may be warranted
## SR 44 BRIDGE OVER ST. JOHN’S RIVER - POA EXAMPLE

### COUNTERMEASURE ALTERNATIVES

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Permanent Monitoring</td>
<td>$313 per monitoring event</td>
</tr>
<tr>
<td>Program / Portable Instrument</td>
<td></td>
</tr>
<tr>
<td>2. Permanent Monitoring</td>
<td>$18,500</td>
</tr>
<tr>
<td>Program / Fixed Instrument</td>
<td></td>
</tr>
<tr>
<td>3. Install Crutch Bents</td>
<td>Not feasible, riprap in vicinity</td>
</tr>
</tbody>
</table>
SR 44 BRIDGE OVER ST. JOHN’S RIVER - POA EXAMPLE

• Plan Developer
  – XYZ Engineering, A. Smith, P.E., 01/30/98

• Consultant Recommendation
  – Alternative #1

• Action taken by FDOT
  – Routine monitoring/riprap already in place

• Work Program
  – 238328 (2-98); Project file 8
SR 44 BRIDGE OVER ST. JOHN’S RIVER - POA EXAMPLE

CLOSURE PLAN

• If a scour condition develops, it may be necessary to close the bridge

• If bridge closure necessary, immediately implement District bridge closure plan for state bridges
LEARNING OUTCOMES

• Describe the purpose of a Plan of Action (POA) for a scour critical bridge

• Identify strategies for developing a Plan of Action (POA)