NJDOT Bridge Scour Program

1. General Scour Background Info for New Jersey
2. Scour Plan Of Action
3. Scour Monitoring
4. Scour Countermeasures
5. Scour Research
General Scour Background Info

• In 2005 completed Stage I & Stage II Scour Evaluation – Identified 165 State Owned Bridges as Scour Critical out of ~2600 State Owned Bridges (313 County Owned Bridges out of ~2600 County Bridges)

• At FHWA request developed two items:
  1. Scour Plan Of Action (POA)
  2. Scour Countermeasure Program
NJDOT Scour Plan Of Action

• Structural Evaluation monitors the USGS website for real time flood data from their flow gauges http://waterdata.usgs.gov/nj/nwis/

• E-mail Reg. Maint. Engineers alerting them to streams/rivers in flood stage, and identify bridges need to be monitored.

• Maint. staff monitor bridges every two (2) hours until told the waterway is no longer at flood stage.

• Structural Evaluation reviews each data record to determine if a follow-up field inspection is warranted.
NJDOT Scour Plan Of Action (POA)

<table>
<thead>
<tr>
<th>ROUTE</th>
<th>BRIDGE NO</th>
<th>DATE</th>
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**FLOOD MONITORING PROGRAM**

<table>
<thead>
<tr>
<th>CRITICAL</th>
<th>NON-CRITICAL</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>8</td>
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<tr>
<td>2</td>
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<table>
<thead>
<tr>
<th>Time</th>
<th>Weather</th>
<th>Inspect. Initials</th>
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**REMARKS**

Director of Roads, Bridges and Engineering (908) 788-1227 (o) (908) 996-4821 (m)
NJDOT Scour Monitoring

• Recognized some extraordinarily sensitive streams
• Recognized scour modeling tends to “over-predict”
• Countermeasures too environmentally intrusive
• Partnered with New Jersey’s USGS office to monitor some bridges which are over sensitive streams & have no history of observed scour
NJDOT Scour Monitoring

- 10 Bridges began monitoring in 2008
- 8 Additional bridges began in 2010
- Post Countermeasure Stream X-sections
- Partnering with Rutgers University and their Center for Advanced Infrastructure Technology and the LTBPP team to test new scour monitoring technology proposed by Dr. Farad Ansari of UIC on three (3) bridges
NJDOT Scour Monitoring
NJDOT Scour Countermeasures

- Initiated a Scour Countermeasure Installation Program
- Utilize four QBS consultants to develop individual designs & permits for bridges – Status:
  1. 25 Bridges – Scour Countermeasures Installed
  2. 25 Bridges – In the Design “pipeline”
- Additionally new bridges designed w/ countermeasures included (or on piles) – 5 Bridges
NJDOT Scour Countermeasures
NJDOT Scour Countermeasures
NJDOT Scour Research

- NJDOT entered into a scour research agreement with New Jersey Institute of Technology
- Existing Scour Models over predict based on two facts actual flows and varying stream bed materials
- Developing a New Jersey specific risk based model based on hydraulic factors & geologic factors
NJDOT Scour Research

Overall Concept

Input Bridge Data
including age, span, configuration, foundation details, ADT, scour history

Geotechnical Assessment
Low Risk Med Risk High Risk

Hydraulic/Hydrologic Assessment
Low Risk Med Risk High Risk

Enter Risk Decision Matrix

Geotechnical Risk
High Med Low

Hydraulic/Hydrologic Risk
High Med Low

Install Countermeas. or Monitor
Conduct Additional Evaluation
Remove from Scour Critical List

Recommended Actions
Low-Low
Remove from Scour Critical List

Low-Med
Increase inspection or new geotech. sampling or reanalyze or remove from list

Med-Med
New geotech. sampling or erosion monitoring or analyze by alternate methods and reassess risk

Med-High
Install countermeasures or erosion monitoring

High-High
Install countermeasures
# NJDOT Scour Research

<table>
<thead>
<tr>
<th>Erosion Class</th>
<th>Predominant Texture &amp; Description</th>
<th>Scour Depth Evaluation Procedure</th>
<th>Do HEC 18 Eqs. Apply?</th>
<th>Occurrence by Physio. Province</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. High Erosion Resistance</td>
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<tr>
<td>A1. Competent Rock</td>
<td>Includes granite, gneiss, basalt, diabase, dolomite, limestone, slate, siltstone sandstone, and related rocks that exhibit an average RQD of 70% and recovery of 90%. Also includes mudstone and shale with an average RQD of 70% and recovery of 90%, and a Slake Durability Index (SDI) of 90.</td>
<td>Design scour depth shall be assumed to coincide with the top of rock elevation. Spread foundations shall be placed directly on a prepared rock surface that is free of soil or surface weathering. Blasting is NOT permitted for rock excavation for footings.</td>
<td>No</td>
<td>Highlands, Ridge &amp; Valley, and parts of Piedmont</td>
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<tr>
<td>A2. Extremely Coarse Granular Soil</td>
<td>Includes coarse granular soil with significant cobble- and boulder-sized pieces. Must contain 30% or more particles classifying as cobble-size or larger. (&gt;100 mm diam.).</td>
<td>Recommended minimum scour depth is 4 ft.</td>
<td>No</td>
<td>Highlands, Ridge &amp; Valley, and parts of Piedmont</td>
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- Bridges <50 years old: Use the requirements for new bridges.
- Bridges >50 years old: Review field inspection and erosion monitoring reports, and Stage II study, if available. If the review does not indicate significant field scour issues, then maximum scour shall be reduced to the depth of the existing footing, and the bridge designated as “Low Risk.”
NJDOT Bridge Scour Program

• In Summary:
• Scour POA
• Scour Monitoring
• Scour Countermeasures
• Scour Research

Any Questions & Contact Info:
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