**OFFICE OF STRUCTURES**
**STRUCTURE HYDROLOGY AND HYDRAULICS DIVISION**

# CHAPTER 11 APPENDIX F

## SCOUR EVALUATIONS AND ASSESSMENTS FOR STATE AND COUNTY PROJECTS


May 2015

# CHAPTER 11 APPENDIX F
# SCOUR EVALUATIONS AND ASSESSMENTS FOR STATE AND COUNTY PROJECTS

SHA policy requires that a scour evaluation or assessment be performed and approved for any bridge or bottomless culvert over a waterway that is to be rehabilitated or replaced with Federal or State funds. Structures with paved bottoms (pipes, pipe arches, box culverts, etc,) do not require a scour evaluation. A scour evaluation is a detailed scour study to estimate scour depths at substructure foundations, and a scour assessment consists of a field and office review of plans and records to determine the degree of risk of scour damage. If the risk of scour damage is low, no further study is needed whereas if the risk is high, detailed scour evaluations or additional studies are needed. Action is needed to address and minimize the potential for scour damage and resulting risk to the public.

EVALUATING RISK

The evaluation of risk is an on-going process that is required for all bridges in Maryland (See the FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges; and the Office of Structures Guide for Completing Structure Inventory and Appraisal Input Forms – July 2003/currently under revision). Under the coding guide, structures currently coded as a 3 or lower for Item 113-Scour Critical Bridges would be considered as high risk, scour critical structures. Structures currently rated as a 5, 7 or 8 under Item 113-Scour Critical Bridges, may qualify as low risk structures, providing that the assessment process described on the following pages verifies that this rating is still valid and appropriate. In some cases, the installation of scour countermeasures, such as abutment riprap protection, may serve to permit a change in the classification of a structure to low risk. A summary of the item 113 codes is provided below:

Structures with the following code designations for Item 113 are not eligible for processing with a scour assessment:

- Scour critical bridges, Codes 0 – 3
- Temporary/ obsolete Code (T) – bridge over tidal waters
- Temporary/ obsolete Code (U) – non-Interstate bridge with unknown foundation conditions
- Temporary/obsolete Code 6 – Interstate Bridge with unknown foundation conditions.

Structures with the following code designations will not normally require a scour study:

- Code N –bridge not over waterway
- Code 9 – bridge foundations, including piles, on dry land well above flood waters.
- Code 8P – Bridge is a culvert-type structure with a paved bottom.

Structures with the following codes are determined to be stable and may be eligible for processing with a scour assessment:

- Code 4 (rare) – Structure determined to be stable but action is needed to protect exposed foundations. Scour assessment needs to address proposed measures to protect the exposed foundations.
- Codes 5A, 5B, 5C, and 8 – Structure determined to be stable due to a scour assessment or evaluation.
- Code 7 – Countermeasures have been installed to mitigate a previously existing problem with scour. Plan of Action has been implemented to reduce the risk to bridge users.

SCOUR EVALUATIONS

Chapter 11 of the OOS Manual of Hydrologic and Hydraulic Design provides detailed policies and procedures regarding the scour evaluation process and the design of scour countermeasures. The Manual is available on line at www.gishydro.eng.umd.edu. The latest version of the Manual and of associated computer programs is to be used in the conduct of the scour evaluation. Studies in support of the scour evaluation include:

- Hydrology Report
- Geomorphology Study
- Hydraulics (HEC-RAS) Study

The scope and content of these studies as well as the scour evaluation study itself should be comparable to the studies prepared by the OOS.

SCOUR ASSESSMENTS

For certain types of work such as deck replacements or minor superstructure rehabilitation projects which do not affect the foundations, a scour assessment, as compared to a scour evaluation, may be appropriate. This Appendix addresses scour assessments.

1. Purpose of the Scour Assessment: to obtain approval for use of Federal or State funds for certain types of work, such as a deck replacement or minor rehabilitation project, without having to conduct a full scour evaluation as set forth in Chapter 11 of the OOS Manual for Hydrologic and Hydraulic Design. The scour assessment serves to document and support a decision that the risk to the public of a structure failure due to scour is low.

2. Conduct of the Scour Assessment: The Office of Structures has developed Attachment 1 entitled "Scour Assessment Worksheet". It is applicable only to low risk projects where no previous detailed scour study has been made and where a full scour evaluation study is considered to be unnecessary by the bridge owner. It will need to be completed and submitted to the Office of Structures (along with appropriate supporting information) by the bridge owner with a determination that the risk of scour damage and resulting risk to the public is low. Concurrence by the Office of Structures is necessary prior to the start of any work on the project. The Office of Structures will normally arrange for a meeting with the representative of the bridge owner to review the scour assessment and the appropriate back-up information. Agreement should be reached as to the extent of back-

up information required prior to the meeting. In some cases, a meeting may not be necessary if the scour assessment clearly documents and verifies that there is no significant risk of scour damage associated with the structure.

The scour assessment worksheet serves to identify potential areas of concern common to most structures. For any particular structure, some of the items may not apply; conversely, there may be other items not listed that require assessment. The worksheet should be considered as addressing a minimum analysis for evaluating the risk of scour damage or failure of a bridge. For this reason, the worksheet lists items that **need to be addressed** in making a judgment about the stability and safety of a specific structure under review. Of particular interest are as-built plans and field inspections describing the foundation elements and the characteristics of the soil or rock supporting the foundations.

**A scour assessment may be submitted only for structures currently rated as 4, 5, 7 or 8 under Item 113-Scour Critical Bridges, of the National Bridge Inventory. A review of office records, followed by a field visit is to be conducted to verify that conditions have not changed and that a structure rating of 5, 7 or 8 is still appropriate. Use the Word.doc file on the attached CD to facilitate the responses to the worksheet items (See Attachment 1).**

3. If the scour assessment indicates that there is a significant risk of scour damage, a detailed scour evaluation, as discussed above, will need to be completed and approved prior to the start of any work on the project. If installation of scour countermeasures serves to minimize the potential for scour damage, this option may be considered in lieu of a scour evaluation.

ATTACHMENTS:

1. ATTACHMENT 1: Scour Assessment Worksheet
2. ATTACHMENT 2: Suggested Transmittal Letter for Submitting a Scour Assessment.

ATTACHMENT1
SCOUR ASSESSMENT WORKSHEET

DATE: _____

Please direct any questions you may have about the development and use of this worksheet to the Division Chief, Structure Hydrology and Hydraulics, telephone number 410-545- 8340

(Check and comment on each of the “boxes”; Use the Word.doc file on the attached CD to facilitate the responses to the worksheet items.)

1. **Detailed Description of Structure** (bridge, bottomless arch culvert, etc; Bridge Number; Highway route number, street name or other identifying nomenclature; Stream being crossed; Federal/State project number and location (county or city); Attach small scale location map.

**2. Records Reviewed** (check and comment on each item)

- ☐ Reviewers (See Item 11)
- ☐ Date(s) of Review
- ☐ Current and previous Inspection reports, including underwater inspections
- ☐ History of previous flood events, including the performance of the structure during these events (scour, overtopping, structural damage, etc.)
- ☐ Bridge plans and reports, including age of structure, information on type of foundations, elevations of spread footings, pile tip elevations, etc.
- ☐ Records of maintenance and repair work on foundations completed in the past
- ☐ Available soils borings, soil and rock classifications, thicknesses, etc.
- ☐ Description/photos of installed scour protection at piers and abutments
- ☐ Recent field Inspections of the structure and the stream being crossed.
- ☐ Other_____

**3. Field Inspection**

- ☐ Field Inspectors – See Item 11
- ☐ Date(s) of Field Visits
- ☐ Photographs – include date taken; structure number and location photographed (i.e. downstream headwall)
- ☐ Summary of findings and observations (include field inspection report)

**4. Highway classification and current ADT**

**5. Performance History of Structure** (check and comment on each item)

- ☐ Date built
- ☐ No record of the occurrence of or damage due to scour
- ☐ History of performance during previous flood events (overtopping, incidence of scour and scour damage to structure)
- ☐ Scour issues noted on current bridge inspection and underwater inspection reports

**6. National Bridge Inventory Rating Codes**

- ☐ Item 60 Substructure _____
- ☐ Item 61 Channel and Channel Protection_____
- ☐ Item 71 Waterway Adequacy _____
- ☐ Item 113 Scour Critical Bridges _____

**7. Foundation Plans Available** (check and comment on each item)

- ☐ Abutment and Pier details
- ☐ Pile type; pile tip elevations if available. (Indicate details for each substructure element if pile type varies)
- ☐ Soil and rock classifications and borings
- ☐ Unknown foundations, if applicable

**8. Substructure Elements – Abutment Foundations** (list each abutment separately; check and comment on each item)

- ☐ Scour-resistant rock
- ☐ Piles driven to rock
- ☐ Deep piles
- ☐ Presently protected with scour countermeasure (describe condition)
- ☐ Unknown foundations, if applicable
- ☐ Other _____

**9. Substructure Elements – Pier Foundations** (list each pier separately; check and comment on each item)

- ☐ Scour-resistant rock
- ☐ Piles driven to rock
- ☐ Deep piles
- ☐ Presently protected with scour countermeasure (describe condition)
- ☐ Unknown foundations
- ☐ Other _____

**10. Channel conditions** (check and comment on all that apply)

- ☐ Channel is stable
- ☐ Complex channel conditions including high velocity flow, angle of attack on substructure elements, confluences, etc.
- ☐ Channel instabilities. (Discuss: scour/erosion of riprap; lateral movement of channel; headcutting and long- term degradation of channel bed under or near the structure, etc.)

**11. Summary Comments in support of a finding of a low risk scour condition.**

Summary of Findings:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Previous NBI Rating Code for Item 113, Scour Critical Bridges_____

Revised NBI Rating Code for Item 113, Scour Critical Bridges_____
(If changed during the scour assessment process)

Person (Name and Title) who determined that the structure is low risk:

_____

Names and credentials of all reviewers (P.E.; Experienced Hydraulic Engineer, etc)

| Date | Office Review (Name and credentials) | Field Review (Name and credentials) |
|---|---|---|
| | | |

**12. Attachments**

- ☐ Field Inspection Reports, including findings of inspectors
- ☐ Photographs
- ☐ Office Review Report, including plans and office records in support of the findings included in Items 4 through 10 above.

ATTACHMENT 2

# Suggested Transmittal Letter for Scour Assessment

FROM: (Bridge Owner)

TO: (Office of Structures)

DATE:

SUBJECT**:** Scour Assessment Submission (Include highway route, bridge number street name or other identifying nomenclature and stream being crossed; Federal or State project number and location (county or city) for which funds are being requested)

My agency has conducted a scour assessment of the subject bridge in accordance with the procedures specified by the SHA Office of Structures. The Item 113 (Scour Critical Bridges) rating is ___. This corresponds to a low risk of scour damage and resulting safety hazard to the public. I request the concurrence of the Office of Structures in this determination. The Assessment Worksheet is attached, along with appropriate back-up information and details to support the conclusions presented in the scour assessment report.

_____
Name and title