

WSDOT 2023 Scour Training

5/30/2023 – 6/01/2023

Module 4: Scour Overview (Casey Kramer)

- **Q: Has there been any comparative analysis between using HEC-RAS and SRH-2D for scour calculations?**
 - A comparative analysis was completed when WSDOT was first piloting SRH-2D. There have been updates to both HEC-RAS and SRH 2D and a current comparison has not been completed by WSDOT. There are situations where WSDOT would allow the use of HEC-RAS however approval will be required from the State Hydraulics Engineer. Both a HEC-RAS 2D and SRH-2D model should produce the same hydraulic results for computing scour, given that both have an appropriately refined mesh for computing detail hydraulic through structures. It is also important to understand the hydraulic parameters for scour computation and how they are extracted from each model.
- **Q: For SMS scour coverages, does WSDOT have a standard for delineating the main channel vs. overbank for scour analysis? Or is that up to the engineer's judgement?**
 - The scour analysis should use the width of flow that transports sediment. Technically the toe-of-slope to toe-of-slope is most appropriate, assuming the banks are vegetated. However, this depends on channel geometry, meaning the top of bank could be applicable. Most importantly, this parameter should be consistent between the approach section and the contracted section. Consistency provides comparable unit discharges in each section. See module 7 for guidance on this topic.
 - Document and justify the used method in the hydraulic design report.
- **Q: I heard Casey talk about vertical scour profile based on pressure flow. Does the NCHRP method include that?**
 - No, NCHRP 24-20 does not include pressure flow. However, HEC-18 has a method for estimating scour under pressure flow.
- **Q: When we have pressure flow scour, contraction scour, and abutment scour, is it appropriate to add all the scour component depths up to be total scour?**
 - The NCHRP 24-20 method for calculating abutment scour includes contraction scour. Contraction scour and abutment scour are not additive in this case. Regarding pressure flow, the 24-20 method cannot account for pressure flow at this time. For existing structures with pressure flow, follow HEC-18 methods. If there is pressure flow in a new crossing, contact HQ hydraulics as this is not generally allowed.
 - Particularly, bend scour often does not coincide with the scour design and scour check floods, meaning maximum bend scour will possibly occur at a different flow event than the other scour component maximums. This will impact what scour components are compounding.
 - It is important to note that pressure flow and contraction scour are not additive. Pressure flow is a vertical displacement of the contraction scour, caused by the bridge deck obstruction.

- **Some scour estimate methods provide a scour depth with respect to the water surface elevation, how does this impact summing scour components?**
 - Some scour equations provide the flow depth with scour as measured from the water surface elevation, while others estimate from the bed elevation. As you add components together be mindful of the reference location and be sure to document this. Coordination with the geotechnical and structural engineers can help determine whether components of local scour are compounding and what the impacts for infrastructure design are.
- **Q: The "General Scour" term is no longer in HEC-18. Many other manuals/reports still use it. Is General Scour now "embedded" in long-term degradation? Long-term degradation refers to an equilibrium slope on a reach scale, whereas general scour would be associated with a flood event but would not necessarily be in an equilibrium state. There could be vertical adjustment during a flood not driven by contraction and not necessarily long-term.**
 - In general, HEC-18 should be followed for determining total scour. If erosion or scour is created by something besides a contraction, then it may be treated as either a local scour or long-term degradation component. If it is attributed to the contraction of flow, it is included in the contraction scour calculations. Since there are a variety of scour equations, careful attention to the processes causing erosion/scour needs to be understood as it relates to adding various scour components to determine total scour. One example is if working on a system with bedforms, a long profile is needed to determine bedform heights. In this case, the trough on the bedform should be used in determining a total scour elevation.
- **Q: Is there going to be a separate module on bend scour?**
 - Possibly in the future, however, see the bend scour spreadsheet for WSDOT bend scour procedure.
- **Q: will there be any discussion on wall scour?**
 - Possibly in the future