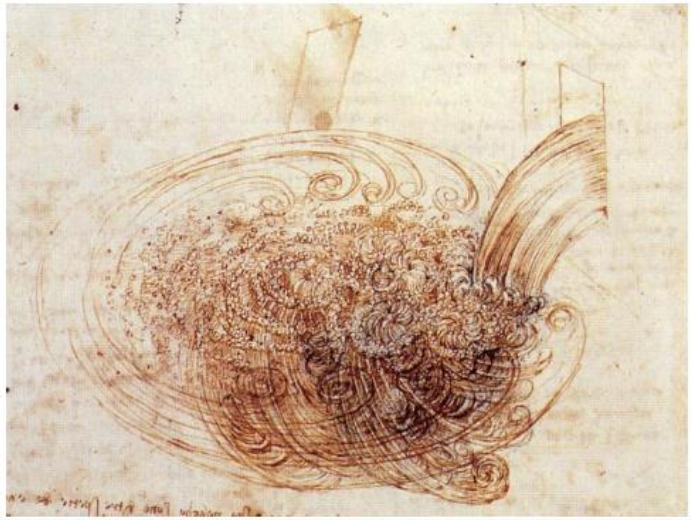
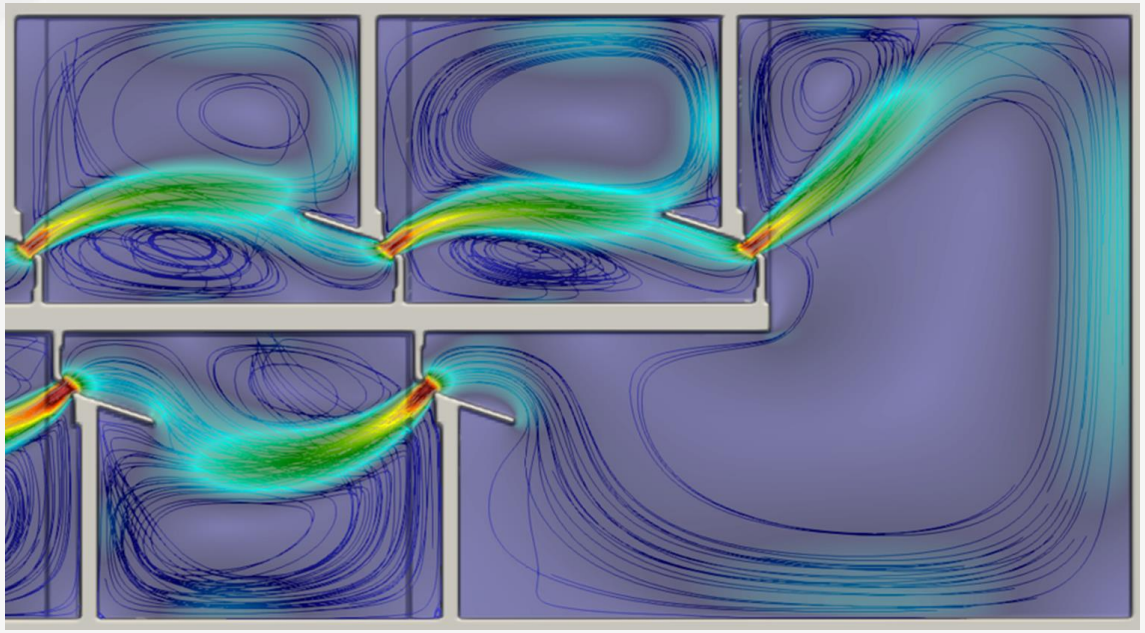
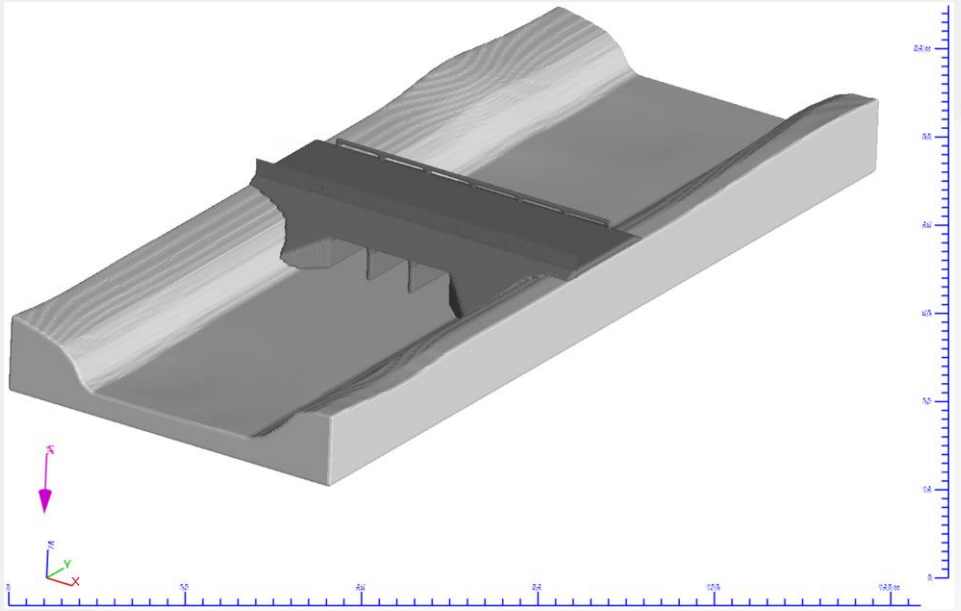
What is CFD Modelling?

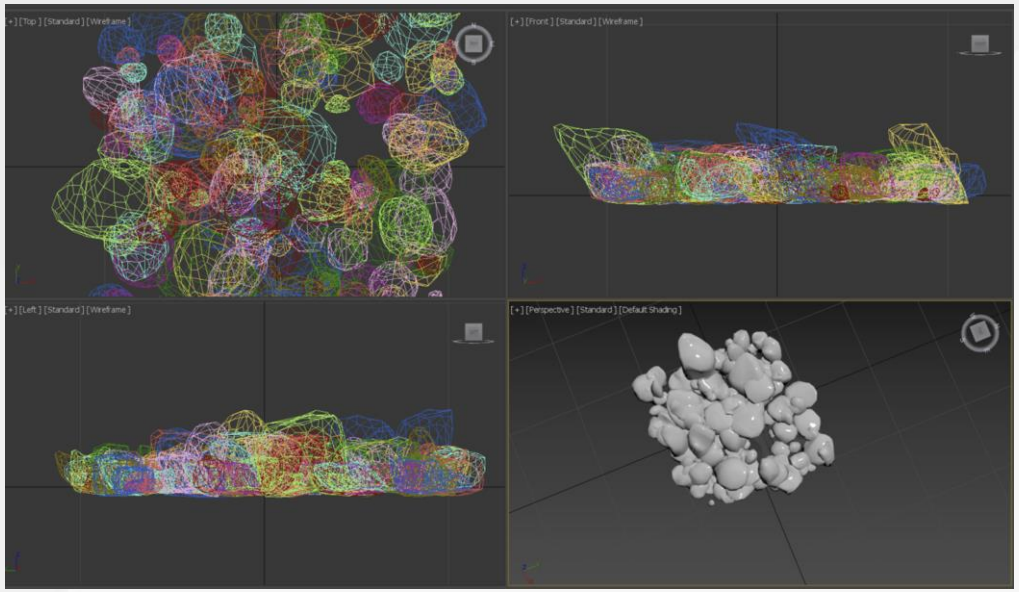
- Numerical analysis to quantify seemingly chaotic and random fluid behaviour
- Attempts to predict / resolve turbulence, velocity, pressure ect as a gradient
- Used to simulate interaction between fluid, other phases (fluids, gases and solids)

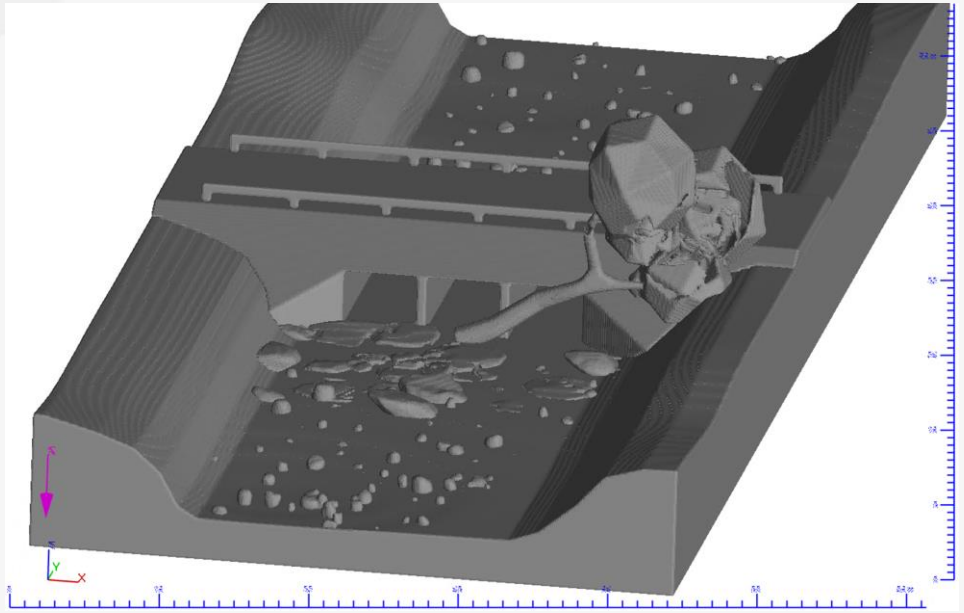




CFD modelling is scalable with its complexity

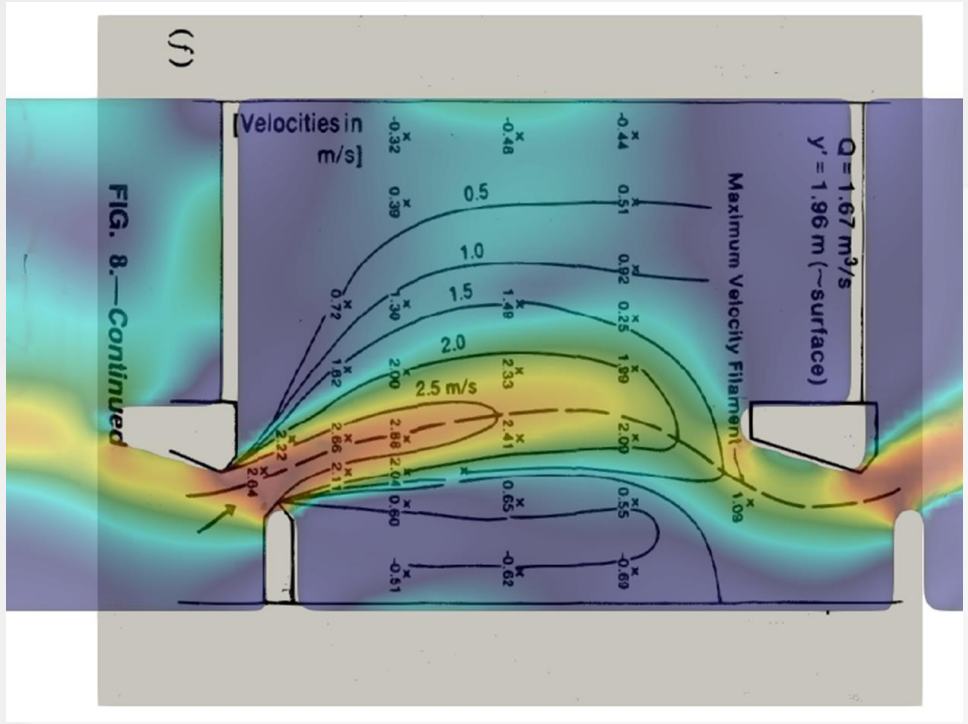


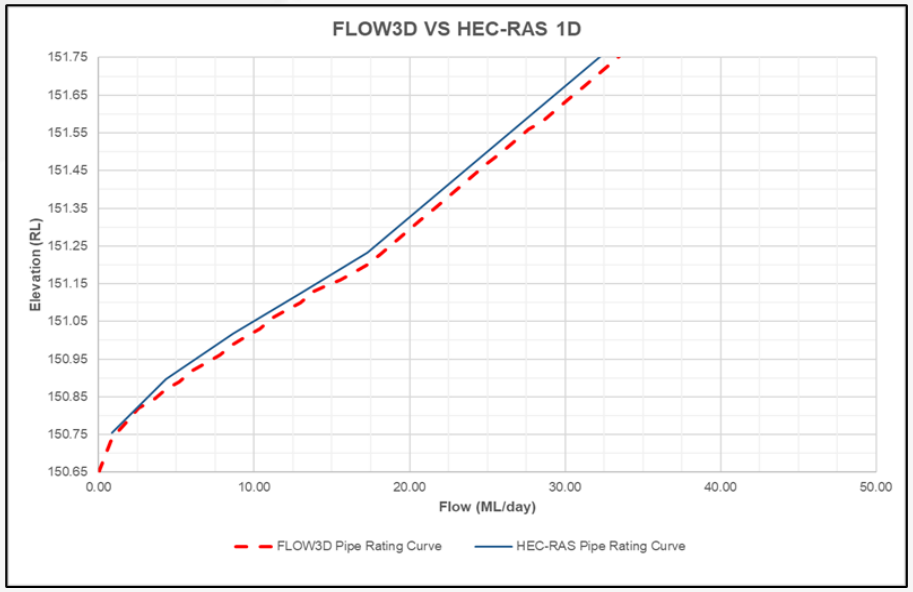


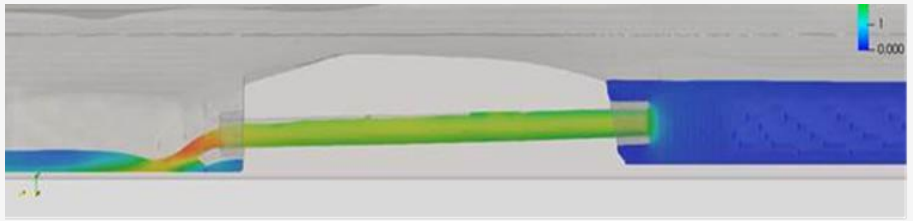


Validation of a CFD model?

- Does the CFD model replicate first principals behaviour?
- Are there studies or physical model outcomes to compare?
- Anecdotal evidence from specialised advisors?

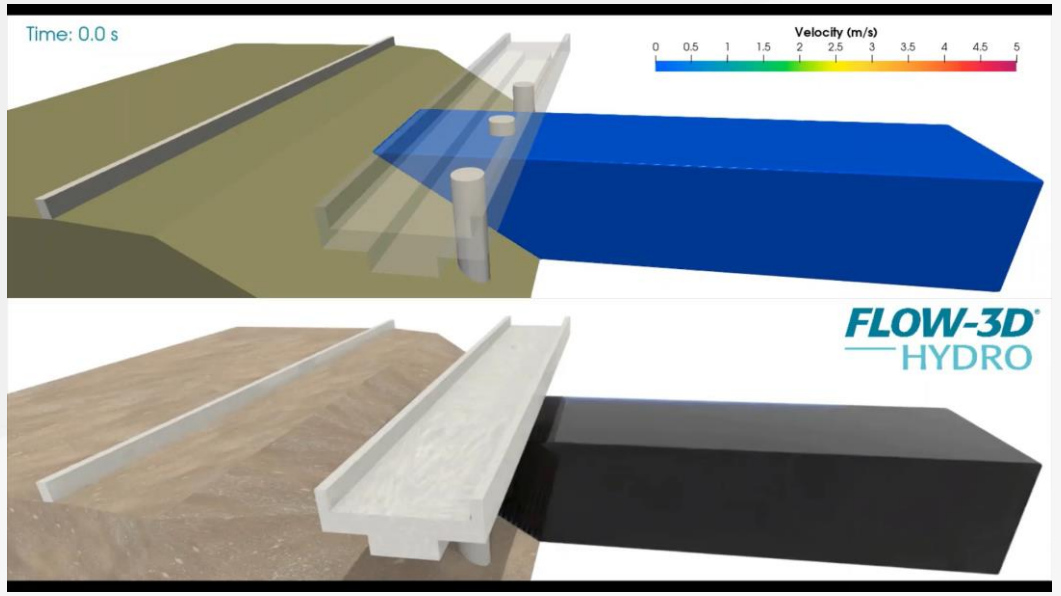


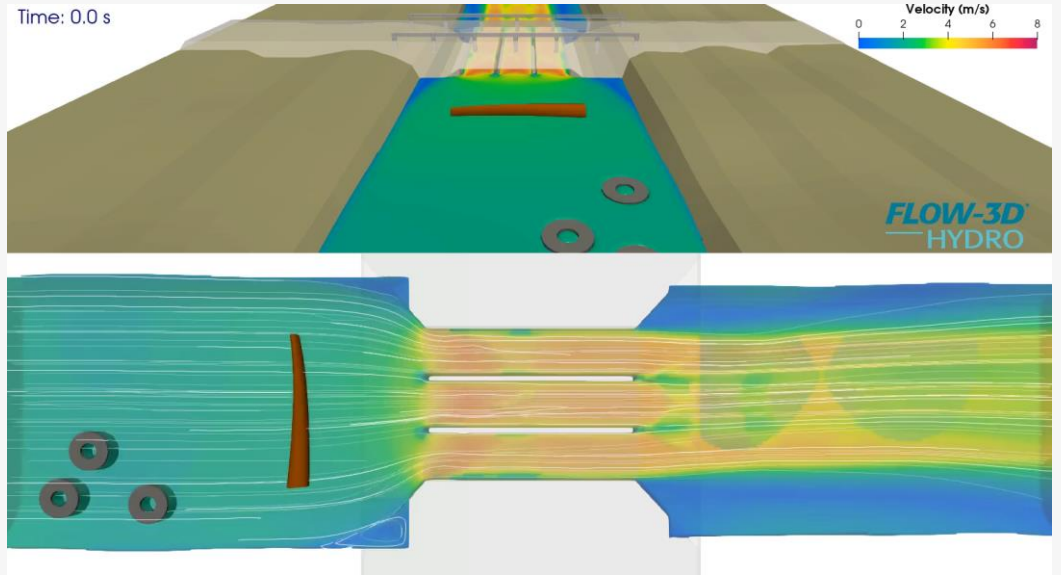




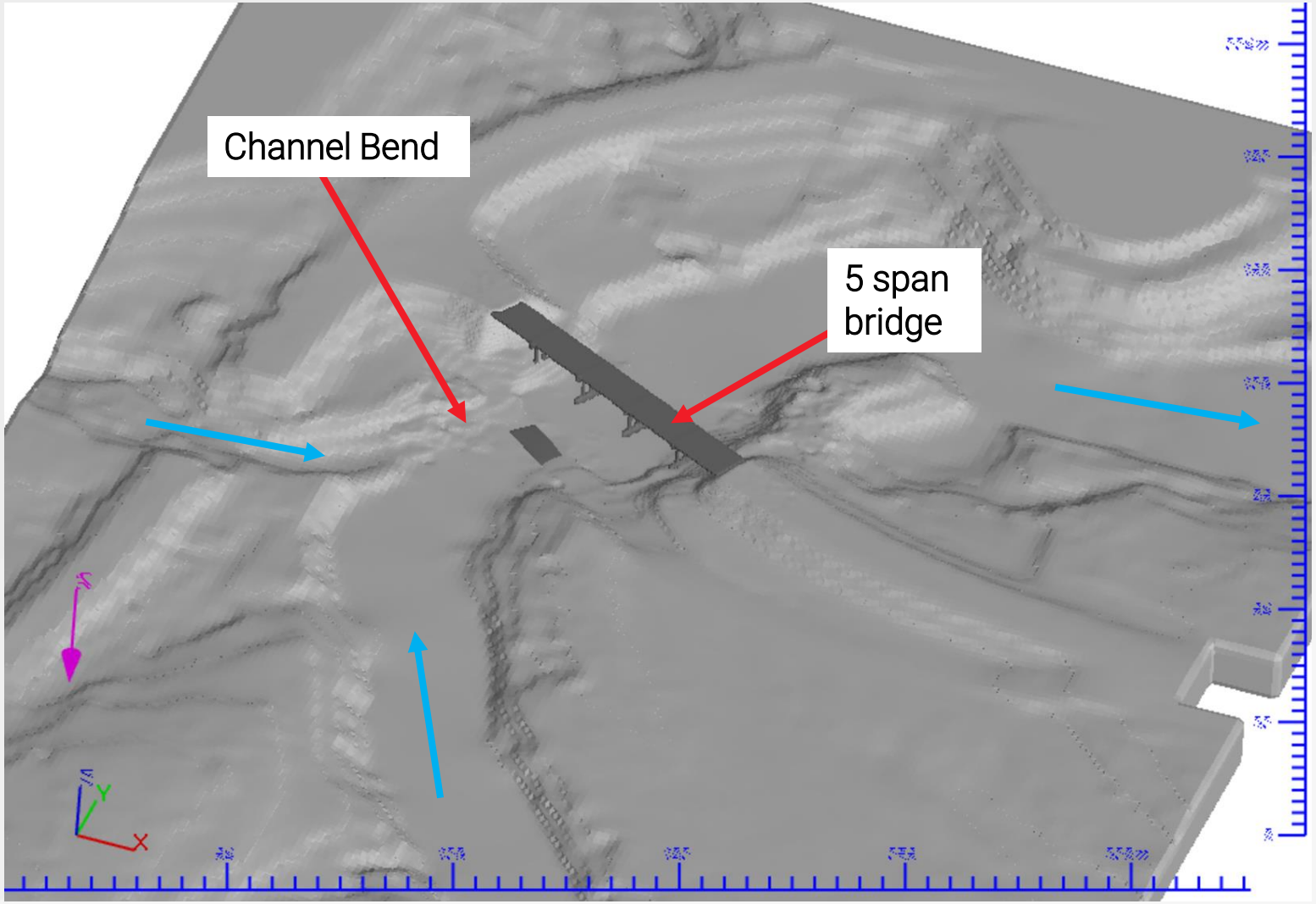
Considering bridges and other crossings…

- From AS5100.1:
  - “Consideration shall be taken of the corresponding scour at the relevant floods. **Any scour protection, if provided for the SLS, shall not be relied upon at the ULS”**
  - “the bridge shall not collapse under any flood up to and….**including the effects of debris and scour**.”





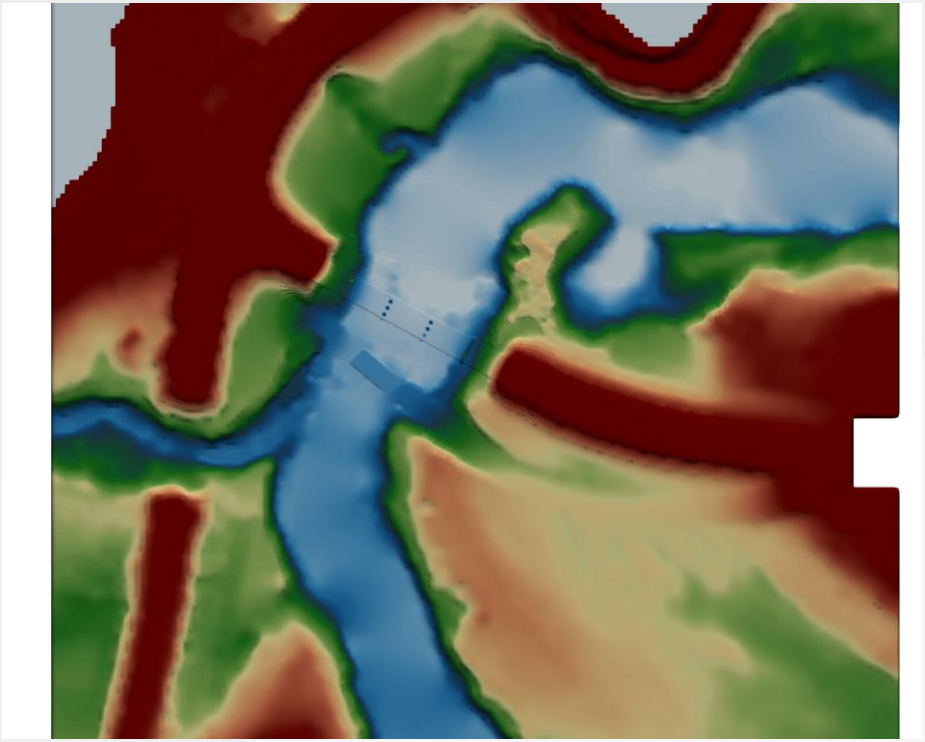
Considering bridges and other crossings…



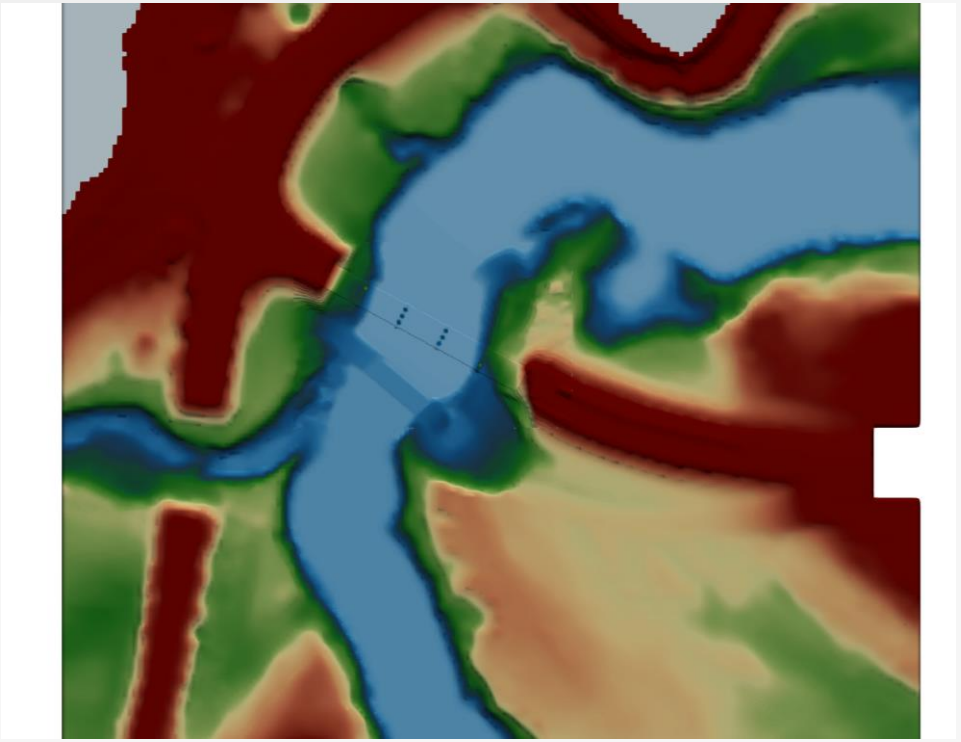
A demonstrative example based on a fictitious event with real data

Considering bridges and other crossings…

Pre Flood



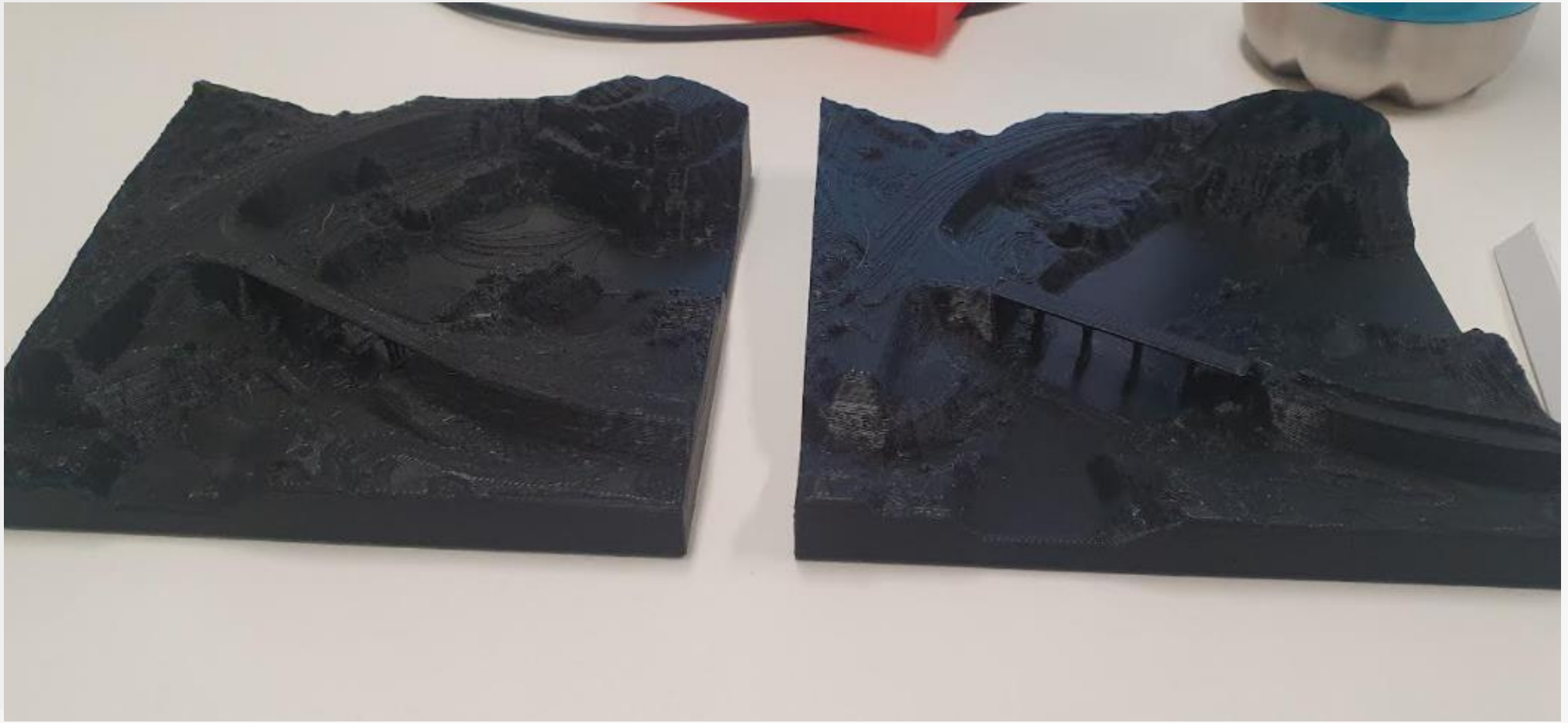
Post Flood



Considering bridges and other crossings…

Pre flood 3d print

Post flood 3d print

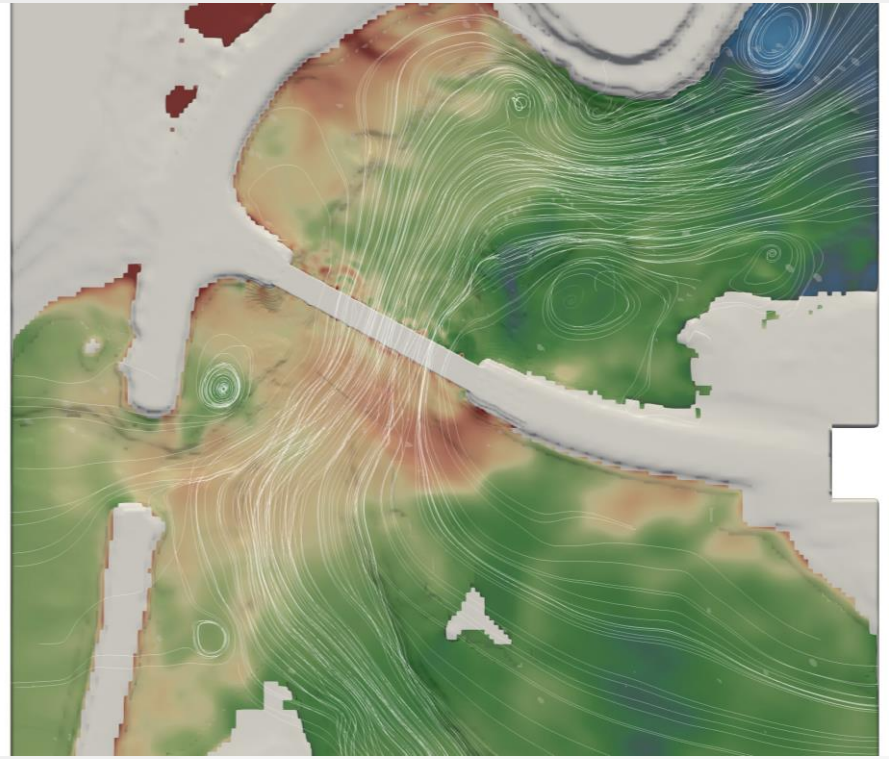


Considering bridges and other crossings…

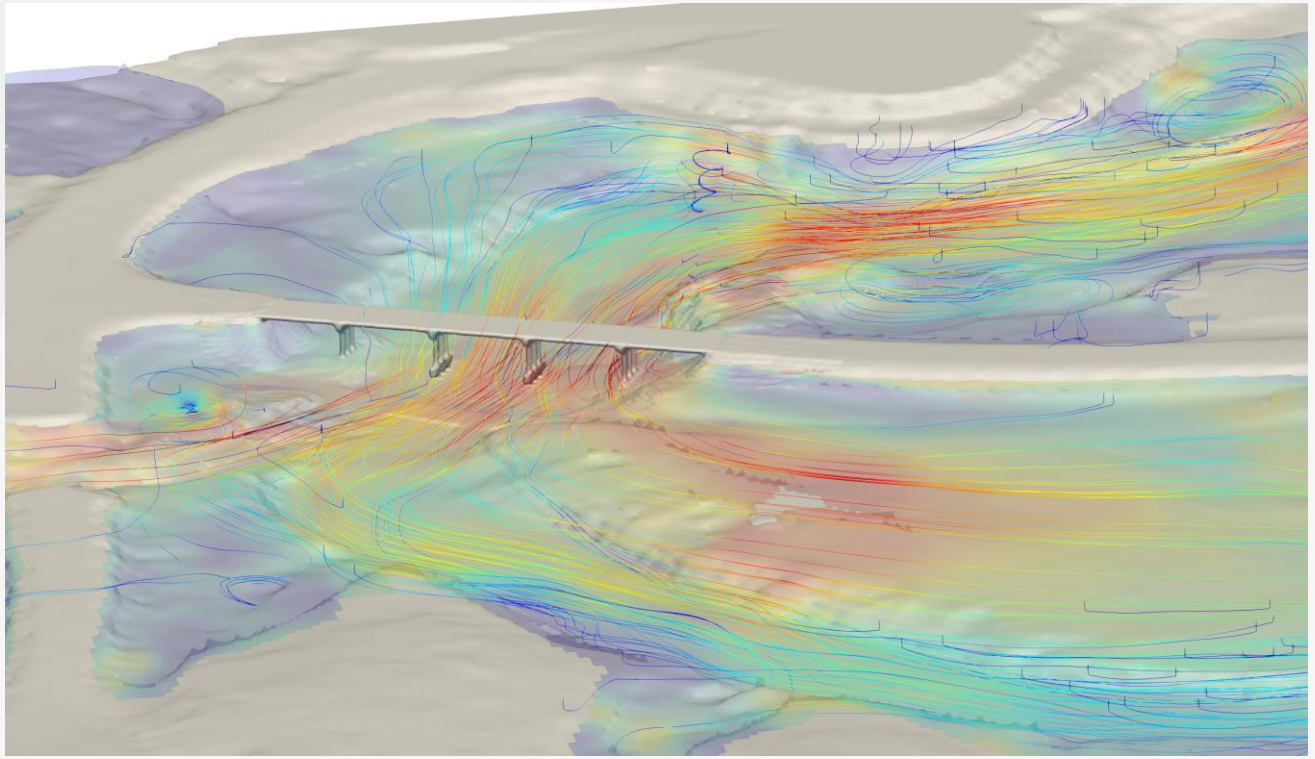
Observed embankment scouring

Considering bridges and other crossings…

Super Elevation at the bend

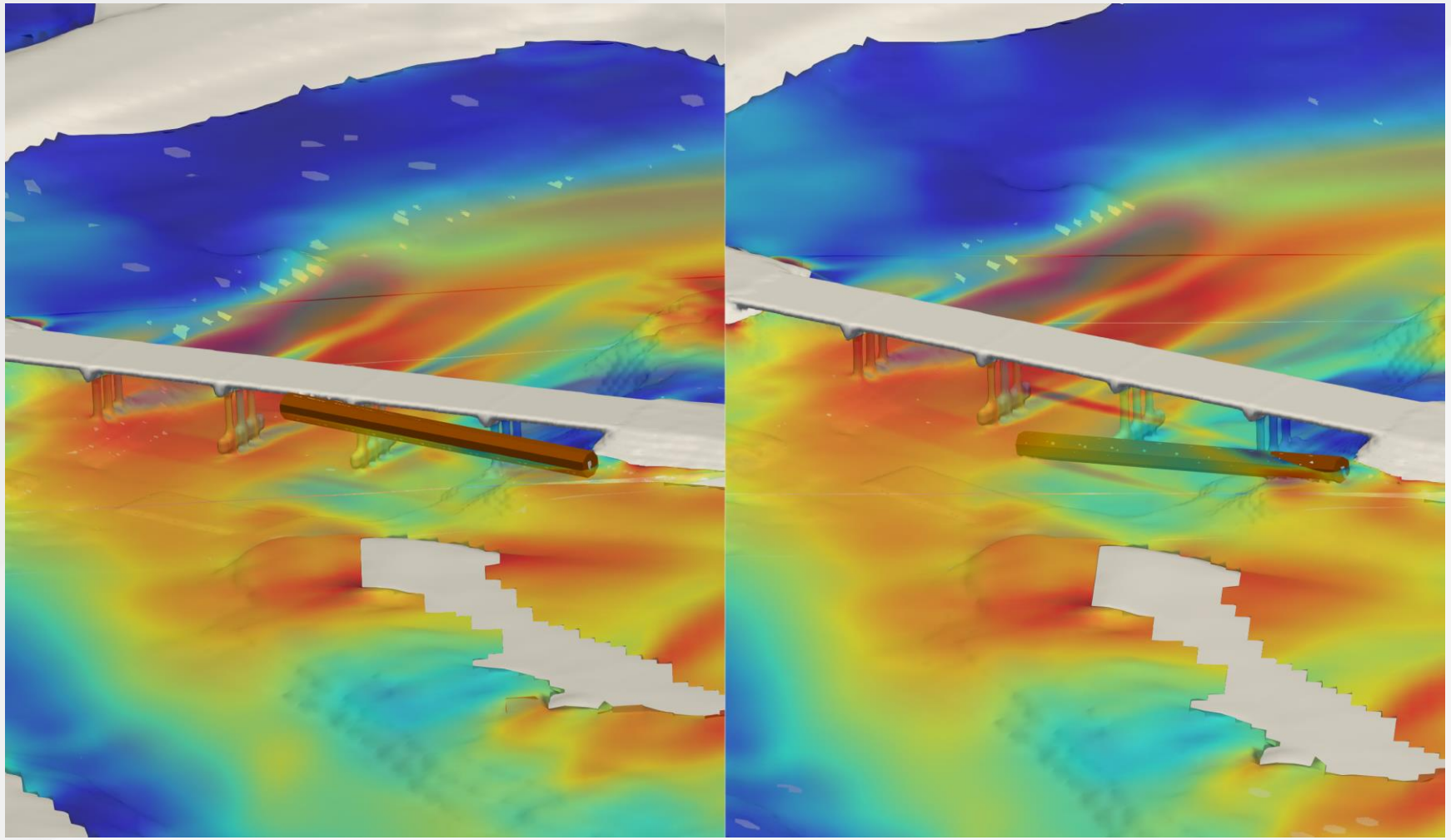


High velocities at the embankments

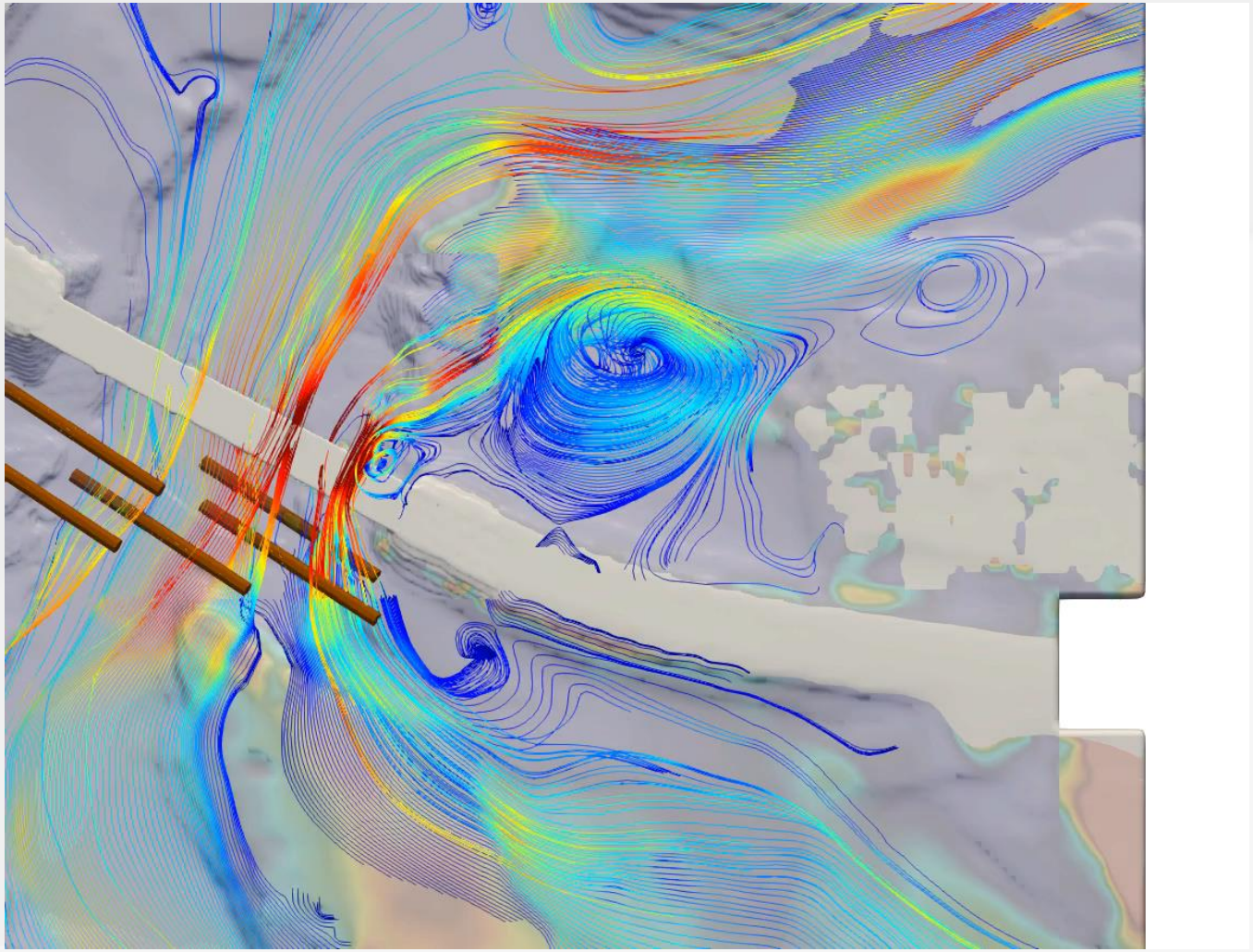


Considering bridges and other crossings…

Modelling of dynamic debris impacts

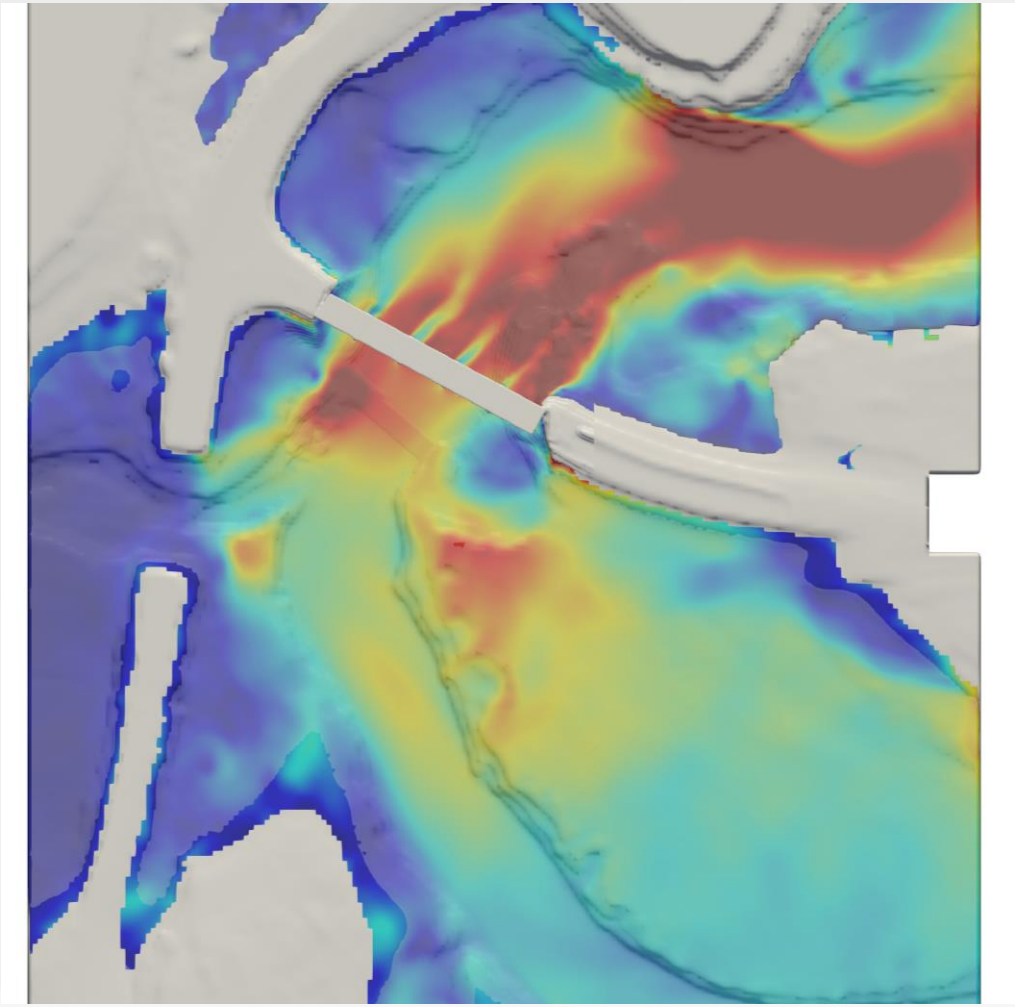


Considering bridges and other crossings…

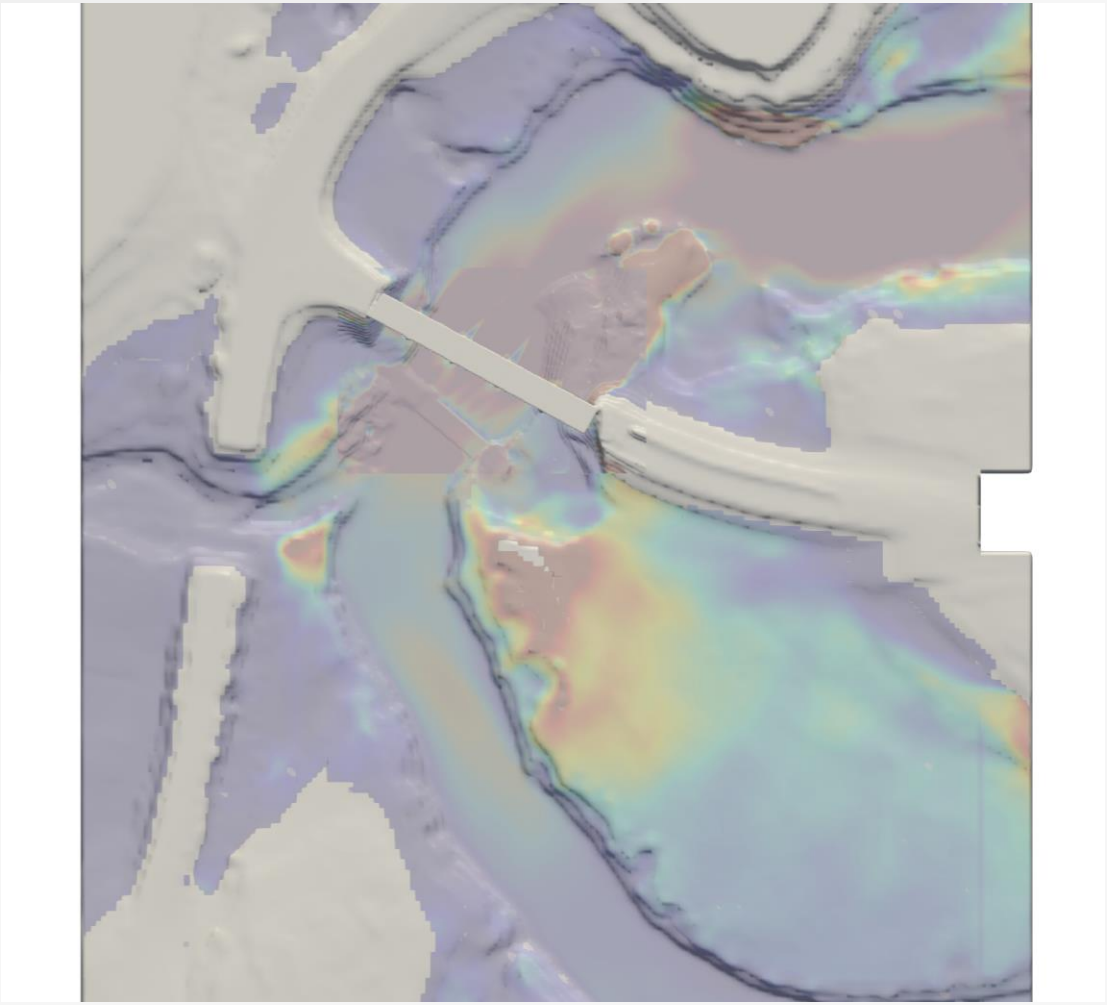


Considering bridges and other crossings…

Post flood velocities



Post flood shear stresses



Thanks AWS!

Contact Kyle Thomson for more info:
kyle.thomson@watermodelling.com.au