



Consequence Assessment of Catastrophic Water Main Failures

Jane Hancock, GHD

Nick Deeks, GHD

ABSTRACT

Hunter Water owns and operates water and wastewater assets in the greater Newcastle region of Australia, serving a population of approximately 600,000 people. After a series of catastrophic water main failures in the Hunter Water network resulting in significant damage and disruption to the local community, including a health and safety near miss, Hunter Water were looking for a proactive approach to managing bursts. To do this, they were seeking a method to assess the consequences on communities of a major burst. While there are well developed methods for determining the consequence in terms of interruption to supply, assessments of community health and safety hazards caused by flooding from bursts are not regularly completed. This led to Hunter Water working with GHD to develop a novel method for quantifying the consequence of flood hazards caused by catastrophic water main failures.

Recent advances in computing hardware and software facilitated the development of a novel approach of simulating catastrophic watermain failures at a broad scale. This new method consisted of building more than 57,000 flood hazard models using TUFLOW to predict the overland flow path from bursts on large water mains at 5 m intervals. A heavily parallelised compute solution was used to run the models and Python scripting and GIS processes were used to process the billions of results generated against a number of key measures, including maximum depth and hazard at each building and population at risk. Outlier results and a cross section of results were checked and validated against site visits to build confidence in the results. This provided Hunter Water with a consequence score for each section of water main.

To understand overall risk, this consequence score was combined with a likelihood score of a burst occurring, to provide an overall risk factor for each section of Hunter Water's major pipelines. This allowed Hunter Water to understand where major issues were and develop mitigation strategies for managing the risk. The development of a dashboard to view the information easily and spatially allowed Hunter Water to effectively communicate the risk within their organisation and guide conversations with the regulator. This enabled them to prioritise investment and make savings by reducing investment in areas of low consequence.

This presentation will use this case study to discuss in more detail the methodology developed for completing consequence assessments of catastrophic water main failures. The presenter will also touch on how this can be combined with other data to determine an overall risk score. Finally, ideas will be shared around how this method can be applied to similar situations.