Advances in Risk-Informed Dam Breach Modeling

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Dam breach hydraulic modeling is a critical component to an overall dam safety strategy. It reveals consequences due to a dam breach event, it informs emergency action personnel on emergency action procedures, both planned and in real-time. It assists in future planning for upgrades and enhancements to dam infrastructure, and it can help inform the need to decommission an aging dam. Traditional deterministic dam breach modeling at its core is a very uncertain exercise. Strictly speaking we just don’t have the wealth of empirical data and theoretical knowledge needed to accurately predict the peak and duration of a dam breach flood hydrograph. Probabilistic dam breach modeling is a risk-informed procedure that not only addresses the uncertainty in dam breach modeling, but provides owners, regulators, and the public the context and understanding needed to fully explain the potential consequences from a hypothetical dam breach event. This paper will cover the methods and processes used to conduct a probabilistic dam breach modelling exercise. It will explain the benefits to the dam safety community of a risk-based approach to dam breach modeling. Case study examples will be shown to demonstrate the ease-of-use of probabilistic dam breach modeling tools like McBreach for several case studies, demonstrating the significant value-added benefits to a dam safety program. It will cover the state of probabilistic dam breach modeling—where we are and where we need to go and specifically address why there is a need for more research in establishing statistical distributions of breach parameters. It will also cover the limitations probabilistic modeling poses with regard to computing power and resources, and how this is being overcome with creative solutions like cloud-based and peer-to-peer services.