



## **Overtopping Potential for 550 Dams: Considering Storm Events with Varying Duration and Return Period**

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During both Hurricane Matthew and Hurricane Florence, flooding and damages in North Carolina were exacerbated by the overtopping of multiple dams in the Cape Fear, Neuse, and Lumber River Basin's. As a result, the Program initiated overtopping studies in the affected basins, which eventually grew to include most of NC's major river basins. The initial study for the affected basins was funded entirely by the State from its Disaster Relief funds and the additional basins were funded by House Bill 200. In total, 550 dams of various hazard and size classification were selected for evaluation. The results of this study were compiled into an ArcGIS Online WebApp where point features represent dams included in the study and the associated attributes contain the results. Results can be filtered by the hazard classification, predicted rainfall accumulation and amount of freeboard, or overtopping for a selected storm. This study evaluated the potential for overtopping at the selected dams during a series of 36 pre-selected storm events of varying duration and return period. For each selected dam, Hydrologic Engineering Center - Hydrologic Modeling System (HEC-HMS) models were created, and automated reports generated that would eventually be shared to the public. The reports summarized the Hydrologic and Hydraulic (H&H) performance of the dam and evaluated the potential for overtopping with respect to the accumulation and duration of rainfall. Both North Carolina Department of Environmental Quality (NCDEQ) and North Carolina Emergency Management (NCEM) worked together to compile the results of this study and by utilizing weather forecasts for a given hurricane or storm, we can identify dams at risk of overtopping and implement early mitigation measures to protect life and property. The results of this study were already implemented during Hurricane Ian in 2022 and helped guide NC Dam Safety and the Regional Office Staff to the dams that were of the most concern based on the data models. Thanks to the Overtopping Study, NC Dam Safety was able to prepare for the incoming hurricane days in advance and notify dam owners and engineers of the increased risk, as well as provide details on what they could do in advance of the storm to mitigate the potential for overtopping.



## **So You Have an EAP.....Now What??? Tips and Best Practices for Dam Owners for Proactive Emergency Management**

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Emergency Action Plans are an essential tool for dam owners in terms of having an understanding of how to prepare for and respond to potential dam issues or failures. Creation and adoption of these plans have increased significantly across the United States (especially for high hazard dams) over the past two decades, driven partly by regulatory requirements by state dam safety agencies and in some cases, proactive actions by responsible dam owners. However, there is often not enough attention paid to what happens after an EAP is developed – in terms of EAP training for dam operators and emergency response agencies, frequency and method of providing EAP updates, enhancements made to the EAP to address evacuation needs of the communities downstream (mobility challenged and underserved populations in particular), and individualized communication and coordination methods with local emergency management agencies, who can be key partners and stakeholders with the dam owner. In this presentation, we will summarize research performed on current best practices and trends in emergency action planning and emergency management, combined with lessons learned and EAP enhancements from our own experience and observations in EAP management from across the U.S. through conducting numerous EAP exercises and drills. The presentation will focus on EAP enhancements that can be made that are not really cost prohibitive but can result in a more usable plan, greater coordination and cooperation with local emergency management agencies, more clarity in emergency and/or mitigation response methods and techniques, and a better-informed dam owner with regards to risk mitigation strategies. The overall goal of presenting this research and our experience is for attendees, in particular dam owners, to walk away with suggestions, tips, and best practices that they can apply in their day-to-day responsibilities in the operation and maintenance of their dam assets and annual or periodic updates to their EAPs.