Dam Failure Consequence Assessment
“Until we understand the consequences of dam failure, we can’t quantify the risks of dam failure or how to mitigate these risks effectively.”

Whether a dam or basin is used for water supply, energy storage, flood mitigation, or mining purposes, it is subject to enormous forces, with huge potential energy of water. Failures can be catastrophic, and a threat to life and property.

Changes to the dam structure, dam operations, dam catchment, climate, and downstream land use all contribute to an altered dam risk profile. Urban sprawl and population growth can dramatically alter the consequence of a dam failure. Dam owners and operators are under acute regulatory and community pressure to understand the dam risk profile and operate the dam to limit risks to an acceptable level.

By understanding the consequence of dam failure, including where the people and property are at risk, the timing and hazard of the risk, how the hazard changes over time, and what warning time is available, plans can then be made for mitigating the risk, such as operating procedures and emergency procedures.

Services

Hydrology: GHD’s hydrologists analyse the catchment properties and route hydrographs through the catchment to predict runoff rates and volumes arriving at the dam, and any coincident hydrographs arriving downstream of the dam. Using hydrologic models, we simulate past flood events, design flood events or theoretical events such as the Probable Maximum Flood.

Breach formation: Depending on the level assessment required, our dam engineers use a variety of empirical and deterministic methods to estimate the breach formation of the dam itself, main spillway, auxiliary spillway or other location.

Inundation mapping and consequence assessment: Inundation mapping and consequence assessment methods are scaled to suit the risk level. When a comprehensive assessment is required, we use advanced hydraulic models such as TUFLOW and MIKE Flood to simulate the breach flood wave and any coincident hydrographs, and map inundation and flood hazard, taking account of topographic, vegetative and human made obstructions, surface roughness, and hydraulic structures.

Where applicable, empirical methods are used to estimate the consequence of dam failure. For more complicated scenarios, where empirical methods are less applicable, programs such as LifeSim and HEC-FIA are used to combine flood data with data describing property, roads, routes, and destinations to predict the population at risk and PLL. Agent based modelling and traffic modelling of people and their movements can help identify those most at risk.

Hydraulic modelling outputs combined with property and infrastructure data and damage curves, enable an economic assessment of failure consequences. We also use a variety of methods for assessing social and environmental consequences.

Emergency Planning: Armed with information on dam failure flood behaviour and population at risk, we work with the dam operator or owner, police and emergency services to develop emergency response plans that detail roles and responsibilities, communications and warning systems, preventative actions, and ongoing documentation and reviews.

Benefits

When the consequences are high, dam owners and operators need a trusted advisor that understands all aspects of dam engineering, hydrology and hydraulics. By understanding the risks, safety upgrades, storage limits, operating procedures, monitoring procedures, and emergency procedures can be meaningfully defined.

What you can expect from us

When engaging GHD for consequence assessments, you can expect:

- Listening over talking, as we seek to thoroughly understand your needs
- A customised solution tailored to suit your needs and meet regulatory requirements
- Access to a range of local and global personnel, offering both value and experience
- Access to complementary professionals in geotechnics, geology, hydrogeology, civil engineering and community consultation
- Communicative and responsive project managers

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