Wisconsin Dam Failure - July 2024

Generated by slow moving storms, heavy rainfall fell in four Wisconsin counties on 5th July 2024. The greatest impacts occurred in Waupaca County in Manawa City where the lake overtopped Manawa Dam and eroded the right abutment. The dam had penstocks set daily according to weather forecasts and the inflows carried significant debris that reduced available outflow capacity. The failure wave occurred after the rain ceased and the gate releases had been brought back under control. Impacts included property flooding, potable water quality issues, and hazardous floodwaters. Post event issues included public safety with people sinking into the silt in the lakebed requiring rescue and the risk of wind-borne bacterial disease from entrained sediment.

The dam was 104 years old according to the Manawa City website. The 176-foot crest gravity earth dam was built across the Little Wolf River for hydroelectric and recreation purposes with a full supply level of 1078 acre feet (1329ML) and a max storage of 1270 acre feet (1577 ML), 17% greater than full supply level storage.

The catchment of the dam is 275 square miles, or 712km^2.

Resources available

- Rainfall data – unofficial
- Reservoir data - official
- Media coverage
- Timeline and Manawa City event presentation

Useful to

- Regulators
- Insurance
- Government
- Dam owners
- Critical infrastructure
- Disaster managers
- Boards

Right: Dam aerial post failure. (Credit Rails n things website) Below: Dam during failure event (Credit Al Kriesel via Wisconsin State Farmer)

Governance Questions

How do we rely on forecasts? Is there a risk if observed conditions are different? Is this within our risk appetite?

Do we have a policy for rainfall forecast use?

How does the asset perform if operational and design assumptions are materially different? Is this within our risk appetite?

How do we manage significant, but temporary increases in downstream risk?

Event learning examples

Category	Event	Learning/prevention activity
Sources for the event learnings are Manawa City (MC) presentation post event, media coverage (M), and data analysis (DA). Prevention activities are broader industry learnings inferred from the event.		
Operational risk	Operational processes required gates to be opened to a level based on daily rainfall forecasts. Gates were set for 1.25 inches of rain. 5.69 eventuated. (MC)	Understanding impact of forecast variability on reservoir level and asset performance is important. When relying on forecasts, understanding the answers to questions such as: What happens if there is significant variance from forecast conditions? Or How much time do we have to respond? maybe important.
Operational risk	Most of rain fell in 40 minutes (81mm) (DA)	Understanding of asset performance under different, or extreme conditions. Scenario testing to review design / operational residual risk under a variety of natural events can inform dam safety emergency response planning.
Operational risk	Debris blocked the penstocks reducing the outflow from the dam (MC)	Consideration of potential for debris load to impact asset performance is an important consideration for dam safety emergency response plans? Qld has seen shipping containers carried over dams in 2013. The potential impact on gated dams could be more profound for both dam safety and water security as a low likelihood, high consequence, compound event.
Crisis Planning	Dam owner had an event timeline available immediately to engage with the public. (MC)	Crisis management plans guide activity based on outcomes. In this case, the outcome was transparent engagement. Answering the 4 questions; What do we know? What don't we know? What are we doing? What we expect you to do? In-event record keeping allowed the quick response with empathy, mitigating some reputational impacts.
Public Safety	Exposed lakebed became a tourist attraction with individuals requiring rescue (MC)	A range of post failure issues that may emerge, such as public health/safety, are foreseeable and therefore it's a good idea to have a high-level plan on how this would be approached, and what resourcing/communication might be necessary.
Critical Infrastructure	The wastewater treatment plant was flooded leading to pollution and a lack of potable water. (M)	Understanding of compound risk on other critical infrastructure maybe relevant for dam owners, particularly when it's related to communication, or public health. Is there any risk reduction activity given these impacts are likely foreseeable.
Risk Appetite	Mid Western Rodeo was occurring in town with significant numbers of people in town (MC)	Risk = Hazard*exposure*vulnerability and this changes when significant influx of transient population occurs. Do we need to respond to any material increase in downstream risk, even temporarily? Does the organisational risk appetite change?