FACT SHEET AUGUST 2023

# CHICHESTER DAM SAFETY REVIEW

**AS PART OF OUR COMMITMENT AS A RESPONSIBLE DAM OWNER, HUNTER WATER HAS COMPLETED ITS FIVE-YEARLY RISK ASSESSMENT TO INFORM OUR 15-YEARLY DAM SAFETY REVIEW.**

## Background

Constructed between 1915 and 1926, Chichester Dam was the first dedicated drinking water storage for the Lower Hunter. Located at the top of the Williams River catchment, it contributes around 35 per cent of the Lower Hunter's drinking water supply.

The safety, health and wellbeing of our people and our community is Hunter Water's highest priority. As part of our commitment as a responsible dam owner, Hunter Water has completed its five-yearly risk assessment to inform our 15-yearly safety review for Chichester Dam.

## Chichester Dam Safety Program

Our dedicated team of dam caretakers undertake daily inspections at Chichester Dam, monitoring for any changes and ensuring the dam is operating as it should.

In addition to daily inspections, Chichester Dam's monitoring and assessment program includes the following actions in accordance with the Dams Safety Regulation 2019, and as part of our commitment as a responsible dam owner:

1. Annual detailed inspections undertaken by both internal and external engineers and experts to ensure Hunter Water is maintaining and operating the dam correctly.
2. Five-yearly surveillance inspections are undertaken by external engineers and experts.
3. 15-yearly safety reviews are completed to assess the safety of the dam using a standards-based approach in accordance with the most current engineering and scientific techniques or methods at that point in time.

In addition to the routine inspections outlined in points 1, 2 and 3, the new Dams Safety Regulation requires the completion of the following:

4. Annual Dam Safety Management System audits to be completed both internally by Hunter Water, as well as by the Dams Safety regulator, to ensure we are managing our dams with safety front of mind. Annual audits also ensure we are compliant with the Dam Safety Regulation and legislative requirements.
5. Five-yearly risk assessments which are undertaken by an independent review team of engineers and experts.

6. 15-yearly safety reviews that will now take place in conjunction with every third five-yearly risk assessment or when there is a change to the accepted technology or methods used in the design criteria for dams.

The Chichester Dam Safety Program is completed in line with our obligations under the Dams Safety Regulation 2019 and as part of our commitment as a responsible dam owner.

## Role of the regulator

Dams Safety NSW was established under the *Dams Safety Act* 2015 as an independent regulator responsible for ensuring dam owners manage the safety of declared dams in the state. Its compliance audit program assesses requirements under the *Dams Safety Act* 2015 and the Dams Safety Regulation 2019.

NSW Dam Safety legislation requires certain reviews to be undertaken annually, every five years and every 15 years.

Hunter Water's most recent review forms part of our routine assessment program and the five-yearly risk assessment, as per the revised requirements under the Dams Safety Regulation.

## What the five-yearly risk assessment involves

To ensure dam owners are prepared for all foreseeable hazards that may compromise the safety of the dam, the five-yearly risk assessment considers two aspects, that is the **likelihood** of an event occurring and the **consequence** if it were to occur. Where the failure of a large dam is concerned, the likelihood is usually low, but the consequence is significant. Many 'failure modes' or different ways that the dam could feasibly fail (break), were considered during the five-yearly risk assessment.

The assessment is done through a combination of desktop analysis and detailed onsite investigations led by Hunter Water, with advice from an independent Expert Review Panel.
The investigations seek to apply modern engineering and scientific techniques to ensure our dams are managed to the highest possible standard.

**Assessment considerations**

Over time our understanding of how dams respond to extreme conditions such as major flooding events and major earthquakes has improved.

New techniques, guidelines and technology such as 3D computer modelling is helping us improve our modelling of different scenarios, particularly how the dam may respond during rare, very rare and extreme events. This new information helps us assess the risk that these events may pose to downstream communities and provides our engineers and independent expert review panel with new insights.

This means that we can continue to be proactive in the planning and delivery of safety upgrades for our dams and enhance our emergency response plans and 'disaster readiness' for all foreseeable hazards that may compromise the safety of the dam.

## Assessment report findings

Chichester Dam remains safe for day-to-day operations and continues to operate as it has for almost 100 years under normal conditions.

Given the advancement in dam technology over time, adapting to climate change and the risk of extreme weather events and the appropriate thorough nature of these risk assessments, it is not unexpected that actions are needed to ensure Chichester Dam continues to operate safely for many decades to come.

When considering the many 'failure modes' or ways that the dam could feasibly fail (break), those considered to be credible or feasible for Chichester Dam include:

- Prolonged high rainfall over months or years leading to re-activating a historical landslide on the relatively steep northern side of the dam, which results in the dam failing. The annual probability has been calculated to be about 1 in 10,000.
- Flooding of different types, that places considerable stresses on the dam, leading to failure in the structure of the dam. There are seven calculated failure modes from flooding, due to the number of possible areas in the dam where a break could commence. The highest annual probability

has been calculated to be approximately 1 in 500.
- Earthquake that weakens the dam structure, so that when a flood or large rainfall event happens later, the dam fails. There are three calculated failure modes resulting from an earthquake. The highest annual probability out of these has been calculated to be about 1 in 40,000.

**You can view the report on our website: www.hunterwater.com.au/Chichester**

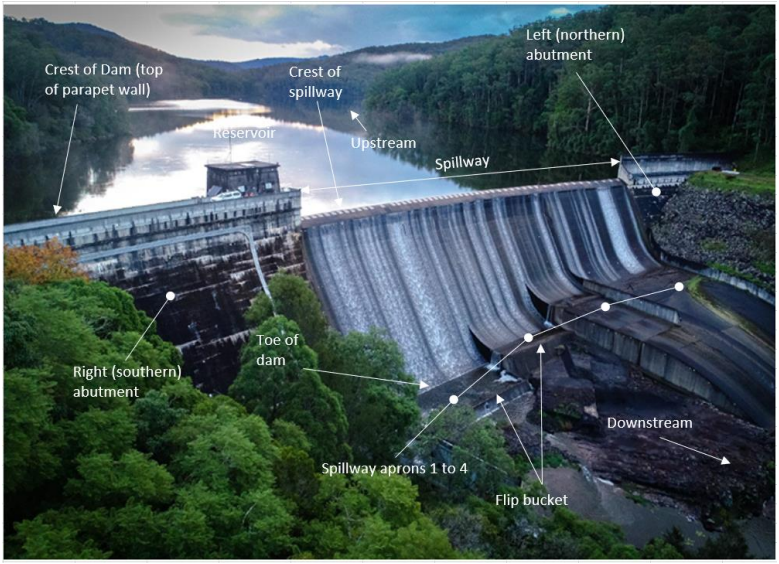


**Figure** Error! No text of specified style in document. **- Chichester dam**

## Report recommendations and next steps

We are now actively working through the report recommendations, and have commenced interim works.

We will continue our construction investigations to determine the right options for long-term solutions at the dam so we bring the identified risks below the safety threshold for these very rare scenarios. Long term options could take between five and 10 years from initial investigations to construction.

You might see more activity and works at the dam over the coming months including:

- upgrading concrete on spillway aprons as detailed in the report recommendations
- increasing flushing frequency of pressure relief drains and further enhanced monitoring
- installing additional modern monitoring equipment
- hydrologic (converting rainfall to runoff) and hydraulic (flow / movement of water) modelling
- site surveys and geotechnical investigations, including boreholes, to collect and test soil samples.

In addition to onsite works to reduce the **likelihood** of an issue, we will also be working to reduce the potential **consequence** of any issues. This includes working with the SES to update and refine existing evacuation protocols and procedures, and engaging directly with downstream property owners.

We will be sure to keep you informed as these works progress towards reducing Chichester Dam's risk level in rare to extreme conditions, ensuring the dam continues to operate safely for many decades to come.

## What the report means for Chichester Dam

Chichester Dam remains safe for day-to-day operations and continues to operate as it has for almost 100 years under normal conditions.

This is the first time that a risk assessment has been carried out in this particular way, under the new Dam Safety regulations. Our understanding of these risks has improved as a result of new technology and techniques.

Dam safety reviews always identify opportunities for improvement. As a responsible dam owner, Hunter Water has historically invested in upgrading our dams after every safety review and we will continue to do so. In 1984 we installed anchors inside the Chichester Dam wall with subsequent works in 1995 and 2003. We will be sure to keep you informed as we work through this most recent review's recommendations.

Given the report findings relating to very rare conditions, we are also actively reviewing our existing Dam Safety Emergency Plan to ensure we continue to be well prepared for these very rare events.

## Historical Dam Safety Upgrades

Since its construction, Chichester Dam has been extensively upgraded and modified to meet changing demands and to ensure safety and reliability of water supply.

**1926**
Original construction of Chichester Dam completed

**1963**
Flood of record at the dam. Overtops original spillway wall and causes erosion on left abutment.

**1967**
Crest level lowered and drains installed to improve stability of the dam and spillway capacity.

**1978-1982**
Investigations and design of safety upgrade to dam and potential for raising of dam for increased water storage.

**1984**
Completion of upgrade at dam, including reinstatement of original dam crest level, anchoring of dam and construction of spillway aprons. Initial investigation of landslide mass completed.

**1992**
Geotechnical investigation of landslide mass adjacent to dam.

**1995**
Installation of secant pile wall on left abutment to provide seepage cut-off through landslide mass.

**2001**
Previous Dam Safety Review completed, identified issues with stability and flood capacity.

**2003**
Left abutment parapet wall raised and construction of drains on right abutment and spillway to improve flood capacity and stability of dam. Additional aprons installed below right abutment.

**2016**
Latest flood hydrology assessment completed. Probable maximum flood estimates increased from previous studies.

**2017**
Latest dambreak and consequence assessment completed.

**2018-2019**
Stage 1 Structural assessment of the dam.

**2021-2023**
Stage 2 refined structural and geotechnical assessment of the dam. Review of historical landslide information. First quantitative risk assessment completed for the dam..

## Dam Safety Emergency Plan

The Dam Safety Emergency Plan (DSEP) describes emergency procedures for Chichester Dam, and provides information for emergency services and Hunter Water employees, in the event of any dam emergency or alert condition.

We review and update our emergency plans every year, as well as undertake a full review and rewrite of those plans every five years to ensure they are current and fit-for-purpose.

We also undertake routine exercises like the upcoming emergency simulation to prepare our people as best we can for rare, but major incidents. Importantly this includes information sharing with emergency response agencies like the SES and Police, to assist in communicating with our communities during an emergency.

If you are a resident, business or property owner immediately downstream of Chichester Dam and are unsure of what to do in the event of an emergency, please contact one of our project team to discuss on **1300 657 657** or email chichester.dam@hunterwater.com.au.

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