Basic Details

Publish Date

02 September 2025

Case ID#

3264

Title

Sinkhole from long term seepage due to low-level outlet operation

Nation

England

Regulator Reference No.

526

Legal Status

Statutory

Reservoir Type

Impounding

Reservoir Capacity

25,000 - 99,999m3

Year of Construction

< 1800

Main Construction Type

Earth fill embankment

Dam Height

2 - 4.99 metres

Dam Flood Category

B

Hazard Class

High-risk reservoir

Reservoir Use

- Recreation or general amenity

Owner Type

Clubs and associations

Incident Details

Date & Time of Incident

05 January 2024 - 12:00

Date Incident Closed

06 January 2024

Observations that Caused the Incident to be Declared

- Slope or face deformation (slippage, cracking, slumps, mounds, depressions)
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Describe the Incident

A fisherman reported a large sinkhole to the undertaker. The undertaker attended site with the supervising engineer and remedial works planned. The undertaker increased the surveillance frequency and prepared to pump if required. This was not required. Examining historic 'as-built' information suggested reasons for the most likely mechanism responsible for the sinkhole forming. This was likely internal erosion associated with the low-level / scour draw-off facility. The condition seemed to have worsened with increased use of the draw-off. A small hole in the same location had been previously identified but assumed as mole activity. It became apparent that material from within the embankment near the low-level outlet culvert has been eroded over many years. The outlet culvert is a brick structure through the downstream shoulder. The most likely process for the erosion is the perforation of the culvert (loss of joint material between brick units) or that it has partially collapsed. Surveillance is very good, by the undertaker and members of the fishing club using the site. The QCE has advised the undertaker to carry out a CCTV inspection to confirm the cause. This is being planned.

Supporting Photos

Causes and Impacts

Natural Processes which Initiated or Contributed to the Incident

- None

Main Contributing Factors to the Incident Occurring

Dam Factors

- Deterioration of materials

External Factors

- None

Shortcomings

- Design shortcoming

Root Cause of the Incident

Impacts on the Reservoir

- Internal erosion (fill deterioration)
- Internal erosion (adjacent to structures)

Supporting Photos

Supporting Contributions and Studies

Human Factors which Influenced the Incident

Very good surveillance is a feature of the site, carried out routinely by the Undertaker, and also with members of the fishing club on site at most times both day and night throughout the year. It was a fisherman who first noticed the issue as the sinkhole was forming in January 2024, bringing it promptly to the attention of the Undertaker.

Instrumentation at the Reservoir

Was Instrumentation Effective?

Not Applicable

Assistance by External Parties and Impacts on Downstream Population

None

Summary of Studies or Investigations Undertaken

A careful examination of historic 'as-built' information provided clues as to the most likely mechanism associated with the internal erosion / formation of the sinkhole. However, further investigations are needed to establish properly the cause and any residual internal issues. The Undertaker has been advised to carry out a CCTV inspection from the downstream end of the culvert. This has not yet been carried out. This may be in part because the downstream end of the culvert is on land outside the ownership of the Undertaker. The Undertaker may need further encouragement to address the access issues and have the CCTV survey undertaken. In the meantime the Undertaker has been advised not to operate the low-level outlet. As noted above. Initial remedial works have been completed to address the sinkhole. Further investigations are required to determine whether there are other residual defects / issues internally associated with the low-level outlet culvert. This will require a CCTV inspection.

Lessons Learnt

Lesson 1

- Surveillance and Monitoring

Good surveillance has been shown to be a critical aspect of the proper and safe management of reservoirs: good surveillance in this instance quickly identified a developing issue.

Lesson 2

- Infrastructure Age

Greater consideration should be given to the nature and condition of low-level outlet facilities on aging / historic dams. We normally advise Undertakers to regularly exercise these facilities to ensure they remain reliably available for emergencies. In this instance, it appears that the regular testing of the low-level outlet has resulted unwittingly in damage internally within the dam. Consideration should be given to internal inspections of these facilities as far as possible on a more regular basis, possibly not just associated with a S10 inspection, and in particular on older dams.

Closing Comments

Supporting Photos

Information provided has been sent from reservoir owners and engineers, and cleansed of personal information by the enforcement authority. We cannot guarantee the accuracy of the data, but if you find an error please contact the relevant enforcement authority.