

**Reservoir flood risk in relation to planning
application 22/P/0459/OUT**

30 June 2023

Dear Sirs

You have appointed me to advise on the flood risk from Blagdon Reservoir on the proposed housing development under the above planning application which is located in Congresbury approximately 6.7km downstream of the reservoir.

Government-produced maps of reservoir flood risk indicate that part of the proposed development area may be at risk in the event of a breach at the Blagdon dam either in normal conditions ('dry day' breach) or during high fluvial flood conditions ('wet day' breach) as shown in Figure 1. It can be seen that less than half of the proposed area is affected. The government reservoir flood risk maps can be viewed at: [Reservoirs Flood App \(data.gov.uk\)](https://data.gov.uk). All of the drawings contain the warning notes reproduced in Figure 1. Note 4 is of relevance as it explains that the maps were primarily intended for emergency planning, i.e. for the emergency services to know which areas to evacuate in the case that dam failure was imminent. As such, the specification for the breach hydrograph derivation was based on conservative assumptions of dam erodibility so that the number of evacuated persons would be more than needed rather than less. It follows that the extent of flooding shown in the maps exaggerates the likely true extent of flooding although it is possible that some small fraction of the development site may be at risk from reservoir failure.

Blagdon is a statutory reservoir under the provisions of the Reservoirs Act 1975. Statutory reservoirs which pose a risk to human life in the event of failure are designated as 'high risk' under the Act. This applies to Blagdon Reservoir and as such the reservoir is periodically inspected. I know this to be the case because I routinely work with Bristol Water but the risk to life at residential and commercial buildings is self-evident by looking at the flood inundation mapping as well as the risk to those using the roads crossing the Congresbury Yeo. Blagdon is also classified as a Category A dam in the guidance provided in 'Floods and Reservoir Safety' (ICE, 2015) meaning that it is assessed as posing a threat to lives in a community. As such the flood safety of the reservoir is managed to the highest level. The dam should not fail under the Probable Maximum Flood, i.e. the flood event for which the exceedance probability is negligible. The overall annual probability of failure will be in the order of 10^{-5} (i.e. a 1 in 100,000 chance of failure in each year). I know this as I completed a qualitative risk assessment for this reservoir about 15 years ago. This chance of failure is quite typical of large regulated dams in the UK. Clearly the chance of flooding the residents in the area of proposed development due to reservoir breach is around

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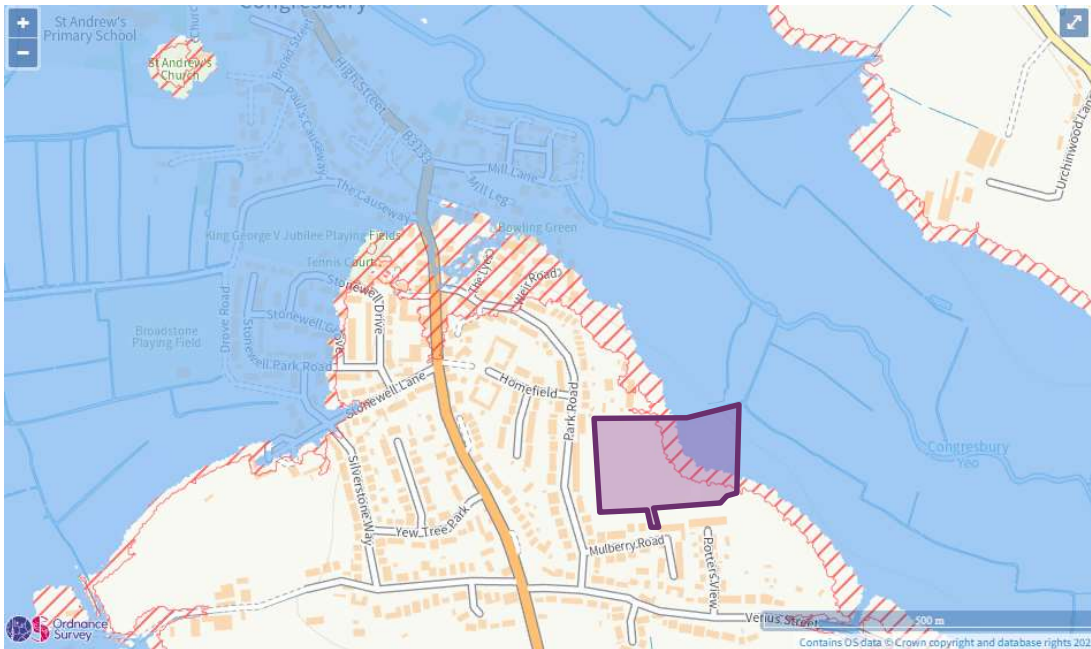
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three orders of magnitude lower than the chance of the rare fluvial flood events which are normally considered for planning purposes (typically with an average frequency of 1 in 100 years). Reservoir flood risk is not normally considered in planning as the societal risk associated with dam failure is very low and in this respect is similar to developments near other potentially high hazard infrastructure such as nuclear power stations and airports. However I understand that planners must now consider reservoir flood risk through revised planning guidance.

Figure 1. Reservoir flood risk map from Blagdon Reservoir at the approximate proposed development site indicated by the purple shaded area



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5. The information contained in this map DOES NOT in any way reflect the structural integrity or likelihood of failure of the dam.
6. This map gives an indication only of the areas that may be flooded if the dam completely failed. The flood extent is best estimate for multi-purpose use. It is based on a simplified modelling approach. Actual reservoir failure may give rise to conditions (flood extents) which vary from those indicated.
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New housing developments can have an impact on reservoir owners as increasing the hazard posed by dam failure can affect the level of safety that has to be provided at the dam. In terms of flood safety Blagdon is already in the highest hazard category so the development would not have any impact on the spillway provisions. In consideration of quantitative risk assessment [guidance](#), it is conceivable that Bristol Water may have to carry out other risk reduction measures to maintain the overall risk of dam failure to be 'as low as

reasonably practicable' (ALARP) in light of the additional hazard in terms of the likely loss of life and economic damages. However, given that the actual likely loss of life and economic damage associated with the proposed development will be a very small proportion of the existing hazard already posed by the dam, I consider this very unlikely. Objections from reservoir owners would more commonly occur when new housing is planned downstream of the reservoir for which the existing hazard is very low (e.g. only farmland).

In summary;

- The available government maps overestimate the flood risk extent that can be anticipated as a result of failure of Blagdon dam due to conservative assumptions used in the specification for the hydraulic modelling. I cannot say that there is no reservoir flood risk to the development area but only a small fraction of the area could conceivably be affected.
- The annual probability of the risk occurring at the site is in the order of 1 in 100,000 which is not a societal risk normally considered as a constraint to housing development. Societal expectations of the government in keeping people safe from flooding does not usually extend to consideration of events of such low probability.
- There is a theoretical risk that the development could impose a requirement for safety improvements at Blagdon dam which would lead to costs being incurred by Bristol Water. That is a matter for Bristol Water to consider. I anticipate that the chance of the development materially affecting the safety management of the reservoir would be virtually nil given the existing high level of hazard posed by the reservoir and the very small additional hazard associated with the development.

I was appointed by Bristol Water as the Supervising Engineer under the Reservoirs Act 1975 for Blagdon Reservoir many years ago and I have worked closely with their reservoir safety team over the last 30 years. I am therefore very familiar with the asset and how its safety is managed.

I trust the above information is of use to you in consideration of the above planning application and I will be happy to address any questions you may have.

Yours sincerely



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