Reservoir Safety

Consultation on reservoir emergency on-site flood plans June 2020

Keswick Flood Action Group Submission

Question 3: KFAG role regarding reservoirs: Whilst we consider this safety review very necessary it has to be recognised that the greatest – and by far the most frequent - risk to life and property for those living below a reservoir is flooding exacerbated by poor water management regimes, particularly in the winter months, leading to excessive, uncontrolled overspilling at times when other rivers in the catchment are also peaking. **A safe reservoir is one which operates with storm capacity relevant to its catchment and its bespoke potential rainfall in a series of storm events.** Legislation is needed to ensure that reservoirs are managed for flood alleviation alongside their other roles for water supply, canal feed etc. The reliance and use of (in particular) aged reservoirs, some of which date back to the nineteenth century, requires a thorough review given recent high rainfall events and the predicted increases in rainfall from climate change forecasts. Ultimately our national water infrastructure needs to be upgraded, to be fully integrated to supply drought prone areas, whilst ensuring that water can be safely stored in rain rich areas where it does not put communities at risk of flooding.

Keswick is located approximately 7 miles downstream of Thirlmere Reservoir, operated by United Utilities (UU). The reservoir supplies ~ 240 Ml/d of water via a Victorian gravity feed aqueduct to the Manchester area. From 2022/23 it will provide ~ 60 Ml/d of water to some parts of West Cumbria. We understand that UU's abstraction license will not be changed so the volumes being sent south towards Manchester will be adjusted accordingly.

Whilst we respect the need for a balance in the reservoir's operation **Keswick has never flooded from the River Greta when there is storm capacity in Thirlmere.** When severe weather is forecast, it is hard to over emphasise the reduction in the fear factor in town knowing that there is space available in Thirlmere. Thirlmere represents ~28% of the catchment area of the River Greta above Keswick. The reservoir dam is a robust mass concrete and stone structure, 16.55m high with a single spillway which discharges into a tunnel which provides a restriction to flows over and above ~ 95cumecs. The single outlet arrangement also has the potential for blockages to reduce flow discharge rates. Flows of this magnitude were experienced in Storm Desmond (5/12/15). There are four valves. **The two upper scour valves are, we understand, dry tested from time to time but should, we believe, be upgraded so that they are fully operational and available, if required, to aid the management of water levels. The DEFRA guidance also implies that the valves should be fully operational and regularly fully tested.** The combined release capacity of these two upper valves is ~1,200 Ml/d.

Version 1 of DEFRA's On-Site Plan for Reservoir Dam Incidents report updated November 2009 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/603663/on-site-plan-for-reservoir-dam-incidents.pdf

states as part of Section 6.2 *"Testing Equipment: The routine testing of site equipment should form part of the statutory inspection process at a reservoir. Where necessary, additional testing should be included in the on-site plan so that the following testing is undertaken:*

- *the bottom outlet and other draw-down equipment - this would normally include **full opening of the bottom outlet at least once a year**;"*

Back in March 2010 UU offered to increase release rates from the two lower valves to their full capacity of ~750 Ml/d. The trial had to stop at releases of nearer 175 Ml/d because there was flooding of a walkway and electrical housing near the base of the dam. This clearly indicates that there had never been any full testing of these two lower valves as the flood problems were not anticipated by UU. The two lower scour valves and their outflow infrastructure has recently been upgraded to be able to achieve their combined total release capacity from around 140 Ml/d (which is routinely achieved to try to create some storm space in the reservoir) to 750 Ml/d. **UU are, we understand, ready to trial the full use of these valves this autumn but the fact remains that they seem never to have been fully tested for many years – if ever. How has this been allowed to go unchallenged? Whose responsibility is it to ensure such tests are undertaken**? Whilst we note there is a get-out clause under section 6.2 which states: " *This is only if it is safe to do so, and would not cause any damage downstream".* It is illogical that UU should be allowed to maintain a situation where risk of damage to its own infrastructure at the base of the dam is a possible reason for not testing fully open valves. The valves could have been tested individually to reduce impacts in the catchment. However, if any of the valves had been tested to full capacity then the volumes would have been fairly insignificant in terms of the flows experienced downstream when the reservoir overspills in storm situations.

It should also be noted that the full flow capacity from the four valves only applies until the level of upper scour valves is reached. Beyond that significant over pumping would need to be in place if the level of the upper valves was reached but the reservoir's water needed to be lowered further. If this incident occurred in a period when, nationally, many communities were at risk in a severe storm there would be competition for resources as rainfall would be over a wide area.

Given the Keswick community's flood risk (and, to a lesser extent, the communities in the lower catchment, including Cockermouth and Workington) is intrinsically linked to Thirlmere's level, particularly in a series of winter storms, we are concerned primarily in its operation for flood risk reduction. However, we have also had cause to question safety with regard to the "wave wall" along the road side which runs over the dam itself. Following Storm Desmond we produced a video of the condition of the wave wall and made enquiries about the safety inspection regime.

https://www.dropbox.com/s/zje275s01eq6s2d/Thirlmere%20Defects%20Survey.wmv?dl=0

Subsequently the wave wall has been considerably reinforced making the road over the dam wall incapable of taking two-way traffic any longer. The road has been closed for vehicle access ever since and is now only accessible for pedestrians and cyclists.

Due to restrictions we do not have access to any safety plans so the responses below can merely be questions as to whether points we think should be considered are being addressed. We are currently questioning the County's Resilience Forum's understanding of the situation at Thirlmere. Furthermore, we have been interested in the Toddbrook incident (https://keswickfloodactiongroup.co.uk/index_htm_files/A%20Note%20on%20Reservoir%20Safety%20Ed%20henderson%20August%202019.pdf), the flooding on the Don and the Severn and the contribution which overspilling reservoirs played in those flood events.

Question 4: Do you want to be kept informed about the outcomes from this consultation? Yes please

Managing and maintaining a flood plan

Question 5 Do you agree with the minimum information proposed for inclusion in a reservoir emergency plan? "*We consider that on-site flood plans should be proportionate to the type and classification of each reservoir and likely impact of flood risk from a breach".* Agreed. However, we

have concerns over the actual classification of these reservoirs as there appears to be a divergence in the categorisation:

The Local Resilience Forum consider (from DEFRA information to Cumbria County Council 29/3/10) Thirlmere to be a Lower Tier Reservoir (so does not require a Site Specific Off Site Plan)

We cannot find references to High or Lower Tier reservoirs in the Reservoirs Act, subsequent legislation or EA documents. The EA seems to use risk assessments from the Institute of Civil Engineers with categories A to D based on risk (A being the highest). We understand that Thirlmere is a category A High Risk reservoir because of the potential risk to life.

The designation of a reservoir has implications for the level of safety requirements so the system should ensure that there is a shared understanding of risk/a single classification.

We agree with the list of areas which you propose plans should consider. **We feel it is important that the release infrastructure for a reservoir should be fit for purpose and of adequate capacity to enable the level of water to be lowered within a reasonable period.** As explained above we consider that the two upper scour valves at Thirlmere (these are two 36" outlet pipes circa 30ft long with a valve on the inner and outer face) should be required to be fully upgraded and operational in order for UU to be able to fully test them, rather than currently just a "dry test" opening up the inlet/closing it/then opening the outlet. It does not inspire confidence that these valves are truly adequate and the fear remains that a water company will rely on old equipment and only invest when forced by regulations to do so. (n.b. EA guidance notes appear to recommend that scour valves are fully opened, at circa 6 month intervals, to ensure clear passage and lack of fouling to the valve mechanisms.) These valves are 7.16m below the spill weir and were designed as an initial emergency release mechanism. They cannot completely drain the reservoir. Access to over-pumping equipment would clearly also be needed (and should be planned for) but that should not detract from our view that these valves are outdated and inappropriate for today's environment. We were told on a visit to Thirlmere on 11/1/07 that there were concerns that if the valves were fully opened then it might not be possible to close them again. We do not have written evidence to support this statement BUT as UU do not routinely fully test the valves it leads us to believe the comment was valid**. It may be the case that if UU has any concerns about the viability of fully operating the valves that this could influence any decisions required during developing emergency situations.**

The Toddbrook incident would have been much worse had the reservoir been located some way from the community. It's being in full view ensured that a problem was noticed reasonably quickly. **Consideration should be given to requiring increased 24 hour camera monitoring to ensure that any problems are quickly identified, especially at reservoirs like ours in remote locations.**

Reliable telemetry is also key to ensuring the safety of the community at risk of flooding.

Ensuring that staff adequately monitor levels in a storm event is also important - as is the public's access to such data. An alarm system would enable attention to be drawn to a situation and give time for actions.

During Storm Desmond (5&6/12/15) we understand that nobody in authority checked the reservoir although UU staff did go to the base of the dam to ensure that WTW chemical pollution did not occur. Given the level of water at the peak of the storm that poses questions:

- Access to Thirlmere from a distance during Storm Desmond was hazardous due to landslides and flooded roads (local access was possible).

- Would it have been safe to be up on the road over the dam given that the water level was 19 cms above the road level and there was a considerable wave reach the length of the reservoir blowing spray over the wave wall?

A safety measure cannot be actioned if it is unsafe! In section 3.4 Access to reservoir – On site Plan for Reservoir dam Incidents, DEFRA Guidance on reservoir Emergencies August 2009.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/603663/on-site-plan-for-reservoir-dam-incidents.pdf"

weight is given to available access to the Reservoir; the whole of this section was compromised during Storm Desmond, local operational surveillance was missing, access to the site was very severely restricted by the conditions, water levels recording was impacted when the EA system went down, the river gauge below the reservoir went so far out of gauge that the EA took the reading down – in disbelief? – there was no redundancy in the observational control of the reservoir to enable continued surveillance. **This is not acceptable**

Was anyone in Gold Command able to appreciate the implications for the reservoir being so full during that storm? The condition of the wave wall at the time? The potential for the tunnel spillway to be restricted/blocked by tree debris etc.? **These should all be well documented and understood by those in control of and during an emergency.**

Later investigation revealed that circa 105cumecs was released via the Thirlmere spillway. The impact of such overspill rates on bridge capacity downstream is severe. Threlkeld New Bridge just ~3miles downstream of Thirlmere reservoir survived although its parapet overtopped in places, and the bridge acted as a "leaky" dam. On the River Greta, 4miles downstream, two other heavy old railway bridges were washed away and packhorse bridges were damaged. All this adds to safety risk from surges following bridge collapse.

Bridge capacity in the downstream catchment should also be factored into any decisions over safe releases of water.

Weather reports, likely frequency of storms and catchment saturation all impact greatly on reservoir levels**. Communities face greater risks if reservoir levels cannot be adjusted enough to recover storm space in-between a series of Atlantic storms which are a regular feature of the autumn and winter months in western UK. The requirement to plan releases days before storms so that the outflow does not peak at the same time as other rivers in a catchment is vital for flood prevention.**

The 40cm space in Thirlmere at start of Ciara earlier this year clearly demonstrated this, separating peak flows experienced at Greta Bridge, Keswick from Thirlmere and the rest of the catchment by several hours. We were fortunate to miss the worst of Storm Ciara otherwise that 40cm buffer might not have been enough to prevent the town being flooded again.

Question 6 How frequently should an on-site flood plan be updated for a high-risk reservoir? The proposals to review High Risk reservoirs annually and every 2 years for other large raised reservoirs is appropriate. It should also be done immediately any alterations/modifications are completed to any reservoir's structure. **However, this has to be more than a tick the box exercise. The results need to be shared with those who have responsibility for safety in an emergency (Local Resilience Forum possibly) and it should form a key part of any training for new staff. see above.**

Question 7 How frequently should an on-site flood plan be updated for a non-high risk reservoir. The agenda for non-high risk reservoirs will change as a result of climate change, review periods need to reasonably short to ensure changing rainfall volume and frequency does not impinge on the safety evaluation of these lower risk assets.

Question 8 What changes or events might mean the on-site flood plan should be updated sooner? There should be a full review after every flood to make sure lessons learned are incorporated into plans. The plan should also be reviewed whenever significant modifications are made.

Question 9 How frequently should a flood plan be tested? How often do personnel change? We would say minimum of every year as a tabletop exercise, and maybe more often. The key to emergency response is training and familiarity for those charged with its implementation.

https://www.gov.uk/government/publications/reservoir-emergencies-on-site-plan

Question 10 What aspects of the current guidance are not clear? Seemed ok

Question 11 What is missing from the current guidance? No further comment

Question 12 Do you have any further comments on how the guidance for preparing on-site flood plans might be improved? As an external body we do not currently have the opportunity to fully read and comment on the quality and relevance of the on-site flood plans. Given our experience and understanding of the local situation, it is an error in the system that such local interaction and engagement is absent.

Question 13 Do you agree that training for undertakers and their staff, engineers, local authority emergency planners and emergency services is necessary? Yes

Question 14 If Yes - What should be included in the training? The training should include a full site visit so that there is a clear understanding of the situation plus a tour of the off-site key areas of concern downstream.

Question 15 Who should be responsible for developing and delivering the training? Local Resilience Forum working with the reservoir operator.

Question 16 In what format should the training be made available? Actual visits alongside opportunity for presentation eg PowerPoint in a meeting where ideas can be discussed and questions raised with back up written instructions

Question 17 Could/should training be added/ linked to existing continuing professional development (CPD) courses? If so please state which courses. No comment

Question 18 If you have any further comments you wish to make, please add them here and submit your response