# About Bongate Weir

**Length:** 81.6m

**Max height:** 1.4m

**Width:** 7.0m

**Fish easement:** 7.3 x 4m extending downstream from the foot of weir.

**Bongate Weir, Appleby was originally built to deepen the River Eden, possibly to aid navigation. Later on, it was used to guide water into the adjacent corn mill.**

Over the years the mill became unused. The mill wheels were removed and the mill race was filled in. A fish easement was added to enable fish to migrate upstream. This has now collapsed.

Ad hoc repairs have taken place over many years, but almost none have been carried out in the last 10 years (apart from some emergency work carried out by the Environment Agency in 2018 in response to an accident).

## History

A weir is reputed to have been present from the Roman period, built to enable the sailing of supplies to the fort at Brough, but no definitive evidence for this exists.

The fording point to the north of the weir may have been used in the Roman period or earlier, and was recorded in the early medieval period.

It is also possible that the weir was constructed or consolidated during that time as a fishery, or to enable the fording point to be more accessible.

A corn mill belonging to the castle is recorded at Bongate in the 13th century.

In the 19th century the weir is recorded in conjunction with Bongate Mill, with the water used to power the mill wheels.

At the time of its listing in 1951, the mill was no longer in use, the wheels having been removed. This meant that the weir was no longer used as part of the mill operation. This is the situation today.

The post-medieval weir contributes to the setting of the mill with which it is directly associated. Source: Heritage Assessment report. Durham University. Nov 2018.

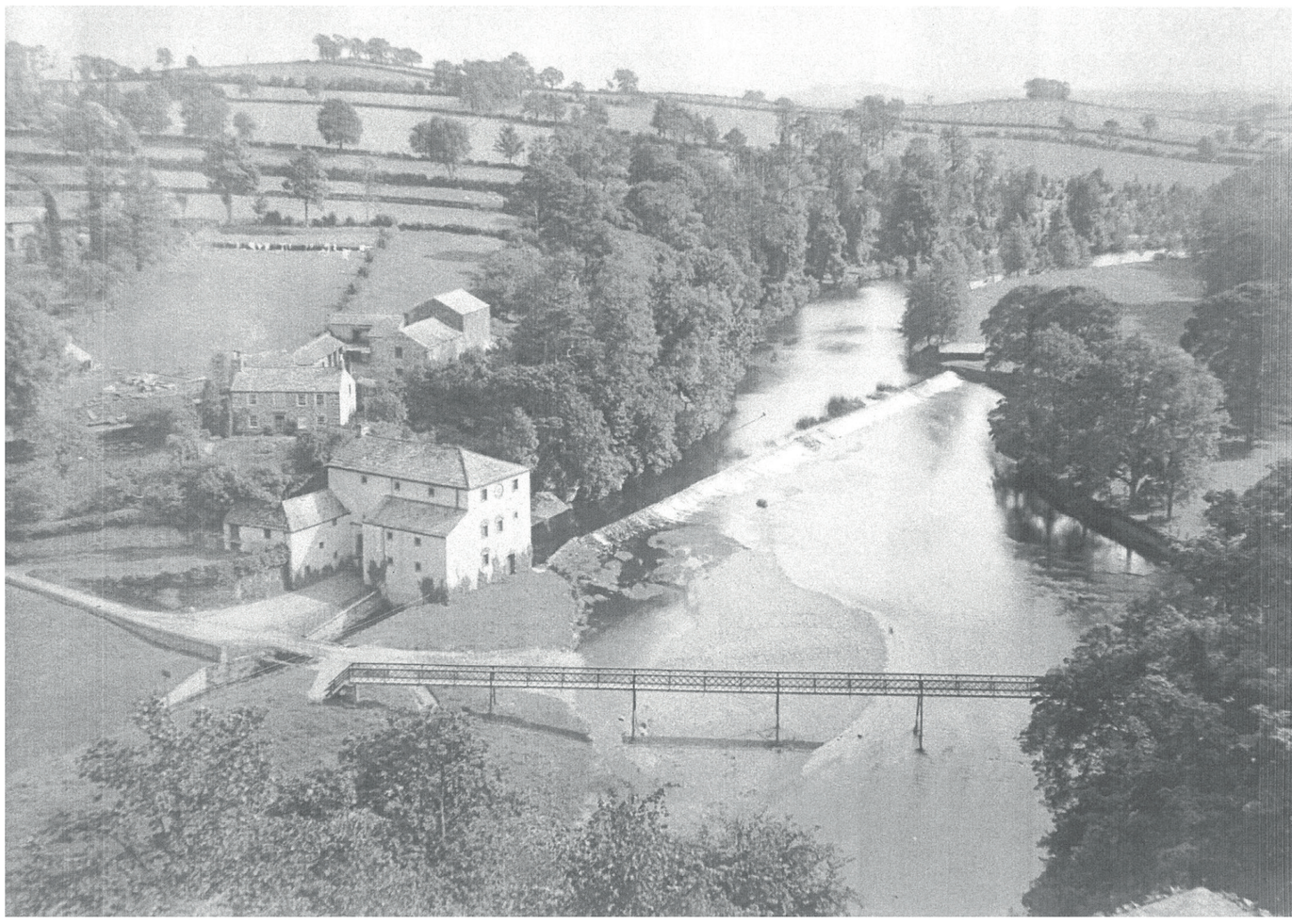
## Construction

Originally a timber frame filled with loose rocks and clay.

The gaps between the stones have been filled with concrete over the years and the upper part and crest is laid with bonded stonework.

South side of the fish easement: large stone slabs bonded together with wrought iron straps with some concrete bagwork repairs.

North side: steel mesh layer, covered in cobbles and infilled with concrete.



Bongate weir mill race from Appleby Castle

# What's the problem?

## Bongate weir on the River Eden currently poses a significant risk to the safety of river users.

Since 2001, there have been two serious accidents involving children getting stuck in the weir.

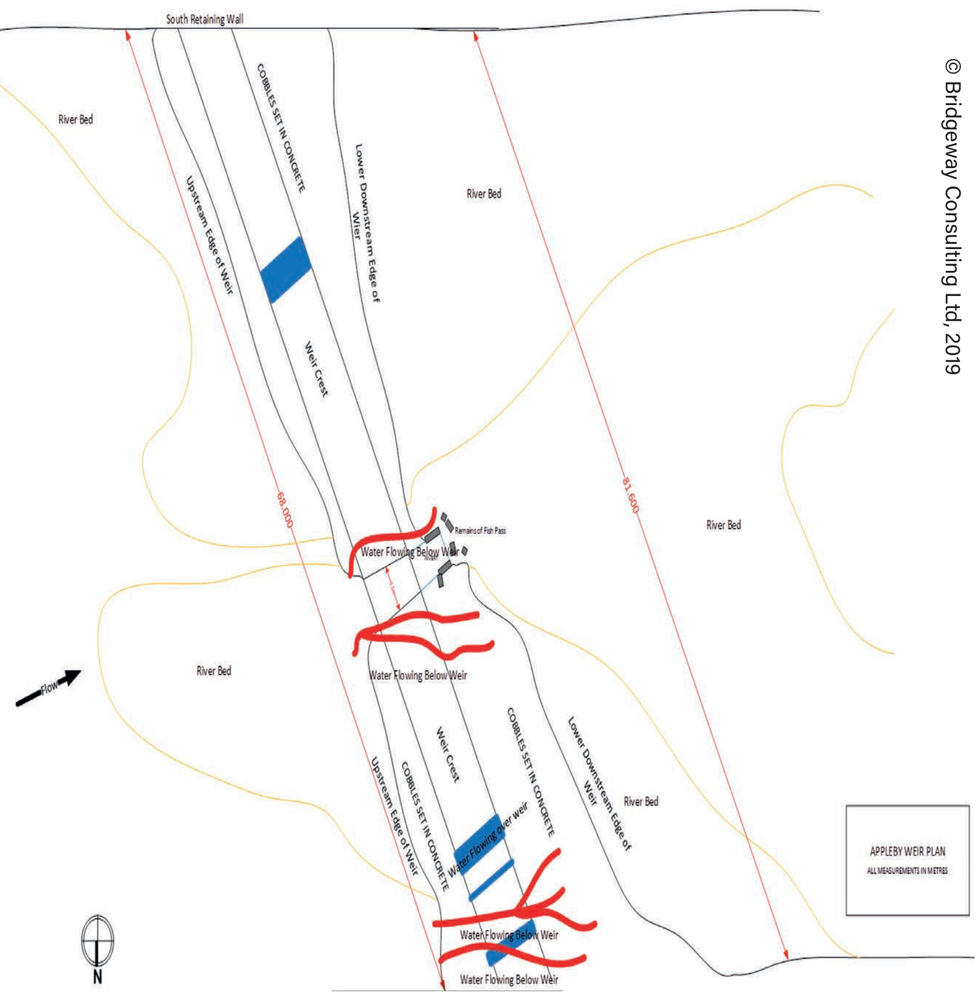
An independent underwater examination of the weir carried out in 2019 found it to be in poor condition.

Parts of it are unstable and in danger of collapse. There are also large holes in the weir and dangerous currents in the pool below.

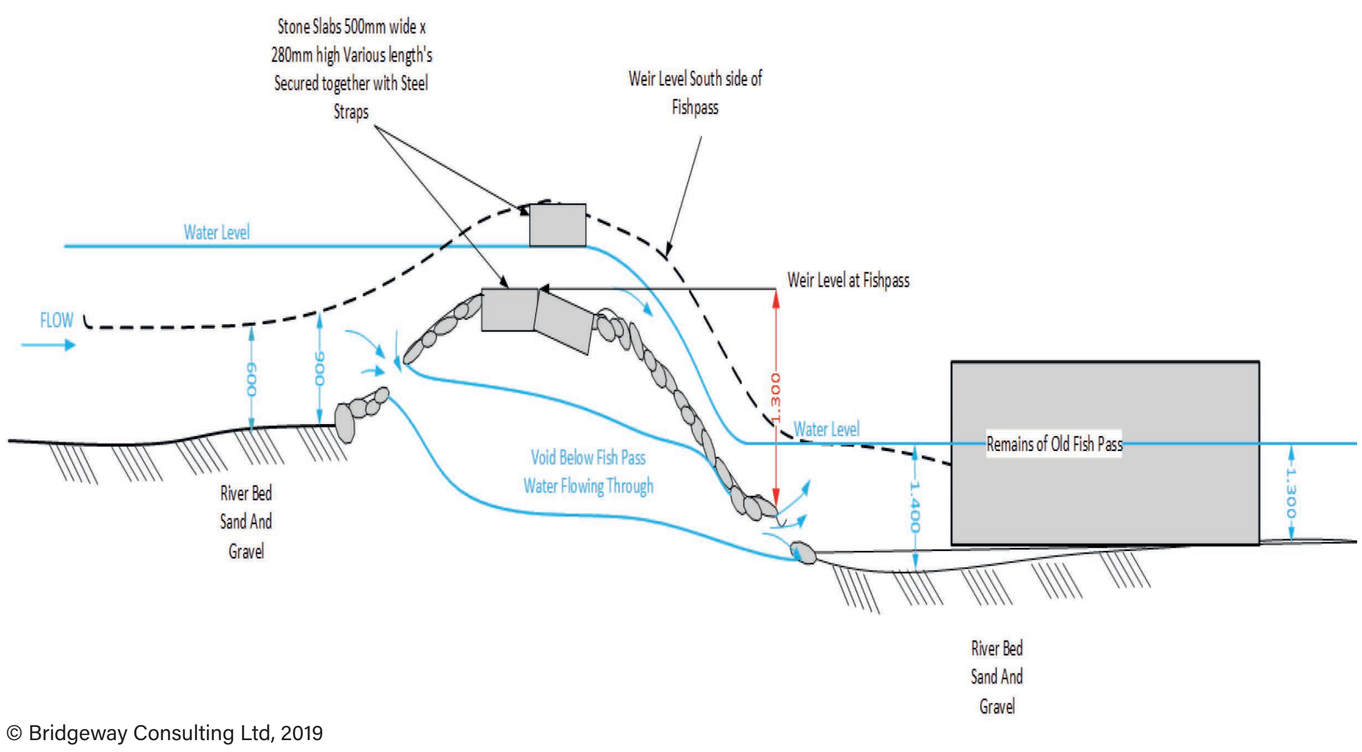
Concerns have been raised by the public for something to be done to make it safe.

The Environment Agency (a member of the Bongate Weir Group) commissioned three reports to understand the weir's history, its structural issues and hydromorphology (how it affects natural river processes).

**Locations of major damage identified in the underwater examination report** (Bridgeway Consulting Ltd, 2019)








**Cross-section through Bongate weir fish pass (42m from the riverbank)**

- The work undertaken in 2000 to repair the original breach in the centre and lower the weir to aid fish passage is now broken and undercut.
- Much of the concrete is now scattered in the river below the weir.
- Water is being channelled around the remains of the structure and through it.
- There are two large holes at the river bed level (1.4m deep by 10x60cm) and (1m deep by 20x50 cm) with fast flowing water being forced through them.

> "The holes within the weir structure are causing the water flow to be unnaturally drawn through the weir and not over it, causing differential pressure to be created [this means that the water is flowing through the holes much faster than over the top].
>
> This is potentially dangerous for anyone who accidentally fell into the water. They could get stuck within the holes and it would be difficult to extract them, due to the differential pressure and downward drag of the water flow.
>
> We [Bridgeway Consulting] have been made aware that there have been previous incidents of this nature in the recent past and if remedial action or removal of the weir does not happen soon, then these types of incidents could increase as the weir structure deteriorates."



# Option 1: Repair

## For

- The historic structure would remain, and would continue to form an important part of the setting of the Grade II Listed Bongate Mill.
- If a fish easement is constructed as part of the repair, then migratory species such as salmon and eel would be able to progress up/down-stream.

## Against

- The weir has been breached on the Bongate Mill side (unknown owner) on at least four occasions in the last 50 years. Each has required costly interventions funded principally by the tax payer.
- The Bongate Mill half of the weir is in very poor condition, with large underwater holes. Major repairs are required to make it safe. A fish/eel easement is likely to be required as part of the repair.
- Full repair and the creation of a new fish/eel easement could cost up to £400,000.
- Costs may increase due to unforeseen issues within the structure. These won't be known until the weir can be fully accessed.
- No owner has been identified for the Bongate Mill half of the weir, so no-one can give permission or take on the liability for any accidents caused by any works carried out. It is possible that future liability for any accidents caused by repair work on this half of the weir may fall on the organisation or individuals that decide to undertake the repair work.
- Ongoing financial investment will be required for future maintenance.
- Fishing restrictions would remain in place.
- No funding has been identified by the Group to undertake this option.

## Estimated cost

**£400,000** (estimate, 2020)

**£?** ongoing maintenance

## History of repairs

**1968** Centre of the weir breached by flood. Repairs by Mr Hogg in the 1970s cost £1200 (anecdotal).

**1970s?** Substantial breach to the mill race sluice arrangement. Mill race and part of the mill pool infilled, possibly by Eden District Council. Cost unknown.

**1990s** Centre was badly damaged with tunnelling underneath. Coping stones were missing, large voids had appeared on the downstream face, there were unstable sections and foundations and water was seeping through the structure on the Bongate Mill side.

**2000** WS Atkins carried out a Structural Survey on behalf of Appleby Alliance.

Recommendations:

- Structural repairs to whole structure,
- New stone to exposed locations,
- Install a sluice gate to allow the pool upstream to be lowered so that the structure can be inspected for any ongoing damage,
- Construct a fish pass, and
- Grout the internal structure to prevent water seeping through.

Appleby Alliance was quoted £354,000 for full repair of the weir. However, only £59,000 was raised for repairs and £15,000 for a structural survey and project management.

This meant that only reduced repairs could be carried out. The central breach was repaired and lowered to aid fish passage, minor repairs were undertaken to the weir crest and a fish pool/leap was constructed in front of the weir.

**2015** Breach caused by Storm Desmond and other storms. Repairs undertaken in 2000 have disintegrated and water is flowing around, and under, the remaining material and other cracks on the Bongate Mill side.

# Option 2: Partial Removal

## For

- The more robust section on the Castle (left-hand) side would probably remain. Everything from the middle of the weir to the Bongate Mill side (including the broken fish easement) would be removed, as it is in very poor condition.
- Part of the historical structure is retained for the future.
- Future maintenance would be the landowner's responsibility.

## Against

- Even in good condition, weirs are dangerous places to boat, swim or paddle. The long-term safety issue will remain.
- The retained section would require extensive work to make the exposed end safe and robust.
- If the retained section did collapse in the future, or a decision was taken to leave the remaining section to deteriorate, broken pieces of metalwork and large boulders would be a safety hazard both at the site of the weir and further downstream.
- The total cost is estimated to be the same as full removal (£80-£100,000). **However, it could be more as we do not know the structural condition of the inside of the weir.**
- The remaining structure would require ongoing financial investment by the landowner to maintain it in a good, safe condition.
- It would be difficult to predict what may happen to natural river processes (bank erosion) if it does collapse in the future.

### Estimated cost

**£80-100,000**

**£?** ongoing maintenance required by landowner.

# Option 3: Do nothing

## For

- No immediate cost, except for safety signs.
- The historic structure would remain and would continue to form an important part of the setting of the Grade II Listed Bongate Mill ... until it collapses, taking any historical evidence with it.

## Against

- Immediate and long-term safety will remain a major concern; the weir will continue to deteriorate and could collapse, potentially causing serious accidents.
- Future collapse will leave hazardous stone, concrete and metal debris in the river that could cause future accidents and would look unsightly.
- It would not be possible to predict what may happen to natural river processes once it does collapse.
- The weir would continue to be a partial barrier to fish and eel movement and disrupt natural river processes.
- This will create understandable public frustration that no-one is doing anything about their safety concerns.

### Estimated cost

**£minimal**

**£?** if it collapses and creates a safety hazard

**The Bongate Weir Group came together because each organisation felt it has a duty of care to the safety of the public – doing nothing does not remove the safety issue.**

# Option 4. Full removal

## For

- Full removal removes the safety, maintenance, repair, liability, fish/eel passage and fishing issues resulting from this weir.
- The cost has been estimated at between £80,000 and £100,000.
- Funding has been identified to remove the weir from the Environment Agency's Cumbria River Restoration Programme. This money is available to remove the weir in summer 2020.
- The bulk of the concrete, metal and stone would be taken off site for recycling.  Some large, rounded boulders may be used to create small rapids and riffle areas.
- Once removed, the river's appearance would be changed, but the river would quickly look more natural and provide a greater area and diversity of riverside habitat for insects, fish, otters and birds.
- The fishing byelaw restricting angling activities immediately downstream of the weir during the upstream fish migration period would be removed, allowing anglers better fishing access.
- The historical story of the weir, including its archaeology will be able to be recorded and interpreted.
- It will have no noticeable impact on flood risk downstream.

## Against

- The loss of a historical structure from the river and town landscape.
- Liability for any issues arising from the weir's removal would remain with the one known landowner and the organisation that oversees the weir removal.

## About the Cumbria River Restoration Programme

It is a successful partnership between the Environment Agency, Eden, South and West Cumbria Rivers Trusts, Natural England, National Trust and RSPB.
They are working together to improve habitat, allow rivers to function more naturally and reduce flood risk.

## How weirs affect wildlife

- Fish, especially our iconic wild Atlantic salmon and European eel, will have an easier journey upstream without this obstacle in their way.
  Although large salmon are able to leap over Bongate weir, the extra energy they are using to jump could prevent them from reaching their spawning ground and reduce their chances of spawning successfully.
- The bottom of the weir (where fish wait to leap) creates an 'all you can eat' buffet for predatory species, such as cormorants. This adds to the threat to our already declining salmon population.
- The barrier holds back water, causing sediment to settle on the riverbed on top of the clean, loose gravels needed by salmon and trout to lay their eggs.
- Weirs separate populations of White-clawed crayfish (the UK's only native crayfish and a European protected species), reducing genetic diversity.

## Estimated cost

**£80-100,000**

**£0** ongoing maintenance

## Conclusion

**Having weighed up the arguments for and against the four options: removal, partial removal, repair or do nothing, the Bongate Weir Group believe that full removal is the *only* option that deals fully with the short-term and long-term safety issues.**

**Funding has been identified to undertake the work. If there is public support for the weir's full removal, Eden Rivers Trust could remove the weir in Summer 2020.**