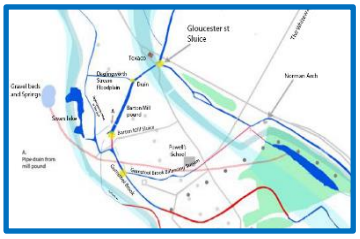
Citizen Monitoring Report October 2024



Friends of Gumstool Brook is a group of local people interested in Cirencester's Gumstool Brook and its associated streams. Visit our website at https://gumstool.org.uk

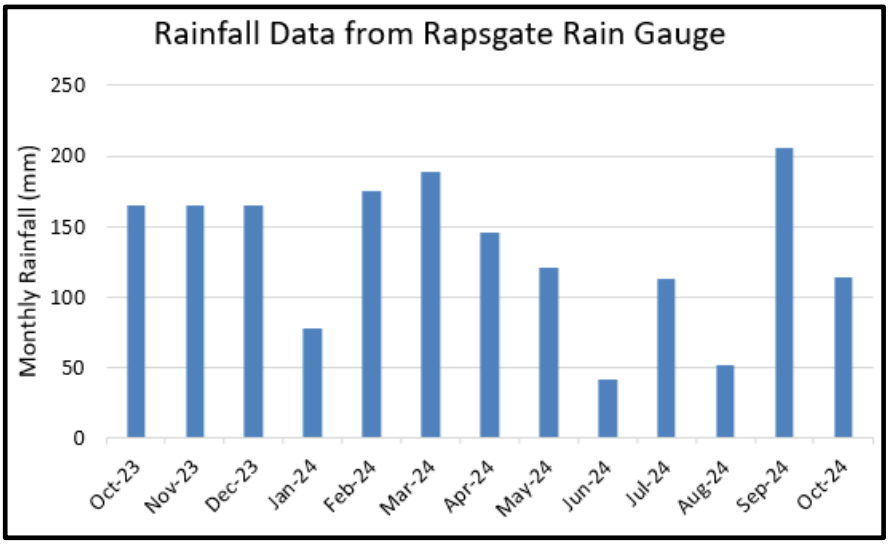
Summary

- October rainfall has been much less extreme than the exceptionally wet September. The total October rainfall was 113mm in the Churn catchment and 108mm in the Frome catchment to the west. These equate to 127% and 106% of their monthly averages.
- Groundwater in the Cotswold limestone aquifers continued to rise in early October, remaining exceptionally high for the time of year, but with the end of October being dry levels declined but were still notably high. Similarly, groundwater levels in the shallow Gravel aquifer remain high.
- At the end of October, the River Churn flow measured at the Environment Agency (EA) Cirencester gauging station was 171 Ml/day. This is an increase on the 128 Ml/day flow at the end of September, and significantly higher than the end of August flow of 14 Ml/d.
- The large sluice gate on the Churn at Gloucester Street was progressively opened during late September in response to heavy rainfall and rising river levels. All three sluice gates have remained fully opened during October.
- The flow into the Barton Mill Pound from the River Churn continues to be at a healthy level.
- The Daglingworth Stream is flowing at a healthy level along its full length, making a significant contribution to flow in the Gumstool Brook.
- Monitoring river health has been disrupted with high flows/levels preventing river fly sampling from being done safely. Water quality monitoring has continued in the Churn and Gumstool Brook showing low nutrient concentrations but with a rising trend that will be tracked. The water courses remain healthy when flow is not low but, working with Cirencester Wildlife Group, further ecological consideration is being given to how river health can be sustained.
- Flow through the Abbey Lake has also increased as a result of the rain and greater inflow to the lake from the Churn. These greater flows continue to appear adequate for its ecological health. Further monitoring of flow and ecological health would be required to develop this understanding.

If you would like to go straight to any of the following detailed topics, just Ctrl+Click on a heading

1. Weather Update & Water Situation Prognosis

Following a summer of variable rainfall in the upper Churn and Daglingworth Stream catchments, September was exceptionally wet, as can be seen on the graph below. September was the wettest September in the 40+ year record at the EA rain gauge at Rapsgate in the Churn catchment, which experienced 323% of the monthly average, as well as at the Miserden gauge in the Frome catchment, which experienced 273% of the September monthly average. October has experienced much less extreme rainfall. Although the rainfall of 113mm at Rapsgate was again above average at around 127% of the monthly average, Miserden rainfall at 108mm was only just above average at 106%.

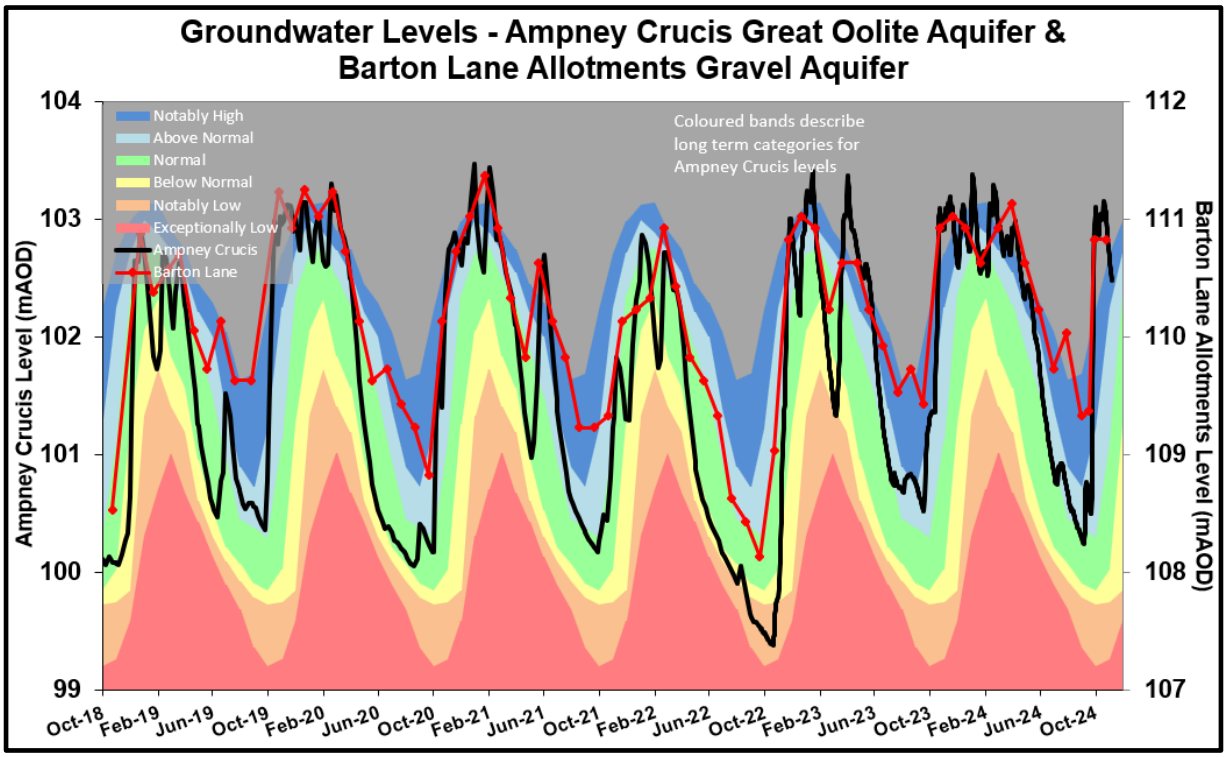


During the exceptionally wet September, soils across the upper Churn and Daglingworth catchments became wet, allowing aquifers to recharge, causing groundwater levels and river flows to increase and become much higher than those usually experienced in early autumn. These trends continued into October, with 97% of the monthly rainfall falling in the first 3 weeks. The dry end to October has, however, resulted in a slight decline in groundwater levels and river flows.

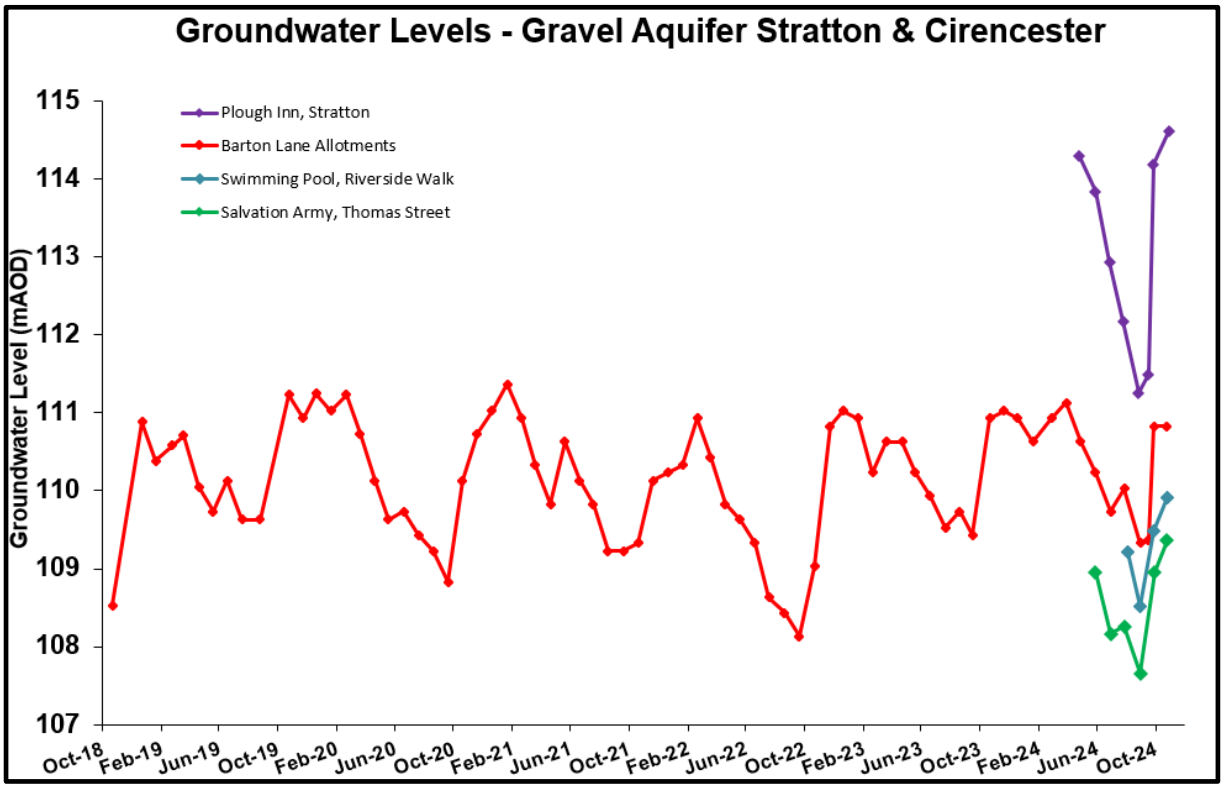
Looking ahead at the weather, the Met Office 3 month outlook from November to January 2025 for the whole UK is that the chances of a wet period remain similar to normal. Spells of wet weather are still to be expected, with the wettest weather more likely in the northern and western parts of the UK. There is also considered to be only a small chance of the whole period being cold, consistent with the previous outlook, with a reduced likelihood of cold weather towards the end of the November to January period. With the health of Cirencester's waterways always influenced by the weather, the early rises in groundwater levels and river flows driven by the exceptional September rainfall continued into October, then responded to the drier end of the month. Although groundwater levels and river flows have fallen in the last week or so of October, they remain above normal for the time of year. With these wetter catchment conditions occurring much earlier this year there could be an associated increase in flood risk this winter.

2. Groundwater Situation

As can be seen on the graph below, groundwater in the Great Oolite limestone aquifer rose rapidly and earlier in the autumn than in previous years, reaching exceptionally high levels in September. This was the result of the exceptionally wet weather at the end of September and, with much of the October rainfall falling in the first 3 weeks, groundwater levels continued to rise, remaining exceptionally high for the time of year. Because the Great Oolite aquifer can respond rapidly to changes in rainfall, especially in autumn and winter, the dry end to October has resulted in groundwater levels declining. Nevertheless, as is clear from the graph, groundwater levels in the Great Oolite aquifer at the end of October remain notably high for the time of year, although they are on a declining trend.



The graph above also shows that similar groundwater level trends have again been observed in the shallow Gravel aquifer at Barton Lane Allotments. Levels are unchanged from September, possibly reflecting the monthly monitoring frequency, with groundwater levels in the Gravel aquifer having risen and then subsequently declined. In contrast, at the other locations where the Gravel aquifer is being monitored, groundwater levels show a consistent rise between September and October. This has occurred at Stratton and in the northern areas of Cirencester, as can be seen on the graph below. Further monitoring is being planned to help establish the interactions between river/stream flow and groundwater in the shallow Gravel aquifer which underlies the River Churn and Daglingworth Stream in these areas.



3. Daglingworth Stream & Gumstool Brook Flows

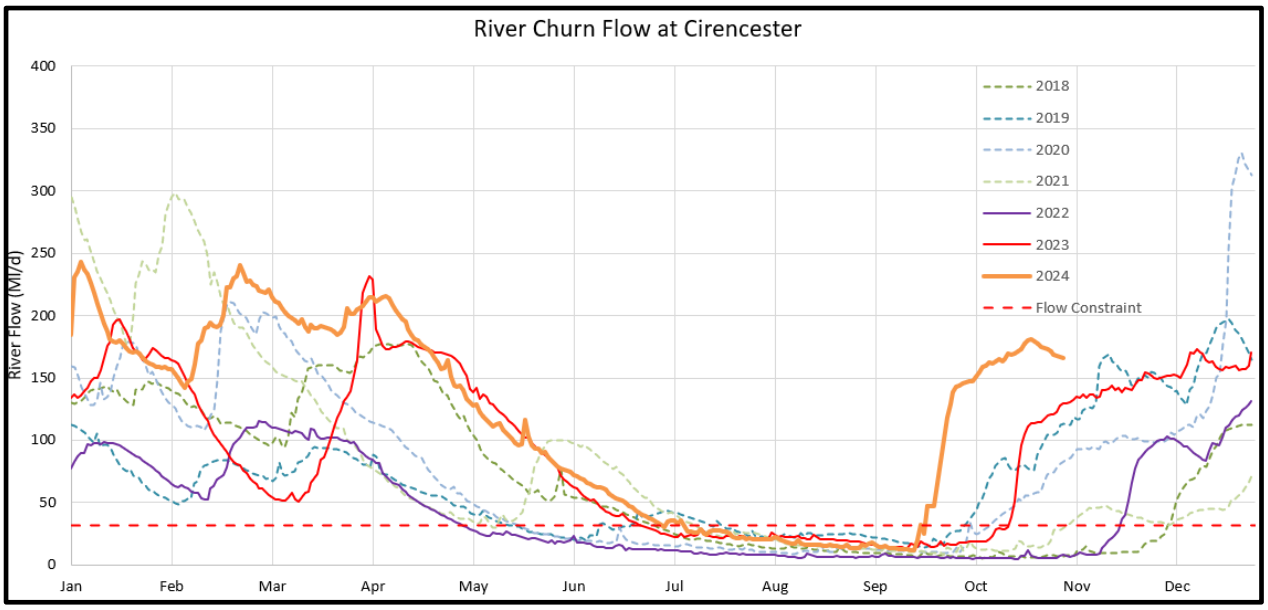
Flow in the Gumstool Brook, i.e. the Daglingworth Stream along Riverside Walk, was low in August while the Gumstool Brook Balancing Stream was recorded as dry. By the end of September, following the exceptionally wet weather, flow had increased in the Gumstool Brook, and the Balancing Stream was once again flowing. This increase in flow corresponds with an increase in groundwater levels in both the Great Oolite and Gravel aquifers, but the relationship between groundwater, stream flows, rainfall and Gloucester St sluice operation remains uncertain. As noted above, further monitoring is being planned to help establish the interactions between river/stream flow and groundwater in the shallow Gravel aquifer.

Citizen science tracking of flow in the Daglingworth Stream between Daglingworth and Stratton has continued. Flows in the Daglingworth Stream increased at School Hill and recommenced at Barn Way, Stratton at the end of September, persisting into October. The increase in flows at the end of September was in response to the exceptional rainfall, which also resulted in a rapid rise in groundwater levels. However, further assessment is required of the complex relationship between stream flow and groundwater levels, with runoff from the land during intense rainfall events also likely to play an important role.

4. River Churn Flow

As can be seen from the graph below, flows in the River Churn at the EA Cirencester gauging station at the end of August had declined to around 14 million litres per day (Ml/day). The river flow continued to decline during September, a normal early autumn trend, but with the exceptional September rainfall towards the end of that month, river flows increased significantly to 128Ml/d. With the bulk of October rainfall falling in the first 3 weeks, flow in the Churn continued to increase, reaching a peak of 180Ml/d on 25th October. As a result of the end of October being dry, the River Churn flow decreased slightly, ending the month at 171Ml/d. These patterns of river flow largely follow the trend in groundwater levels in the Great Oolite aquifer. These flows are higher than is normally expected for the time of year.

With the River Churn flowing higher than expected for the time of year, it is much higher than 32Ml/d. This is the River Churn flow trigger above which groundwater abstraction by Thames Water at Baunton can recommence. Whether groundwater abstraction at Baunton has re-commenced remains to be confirmed by Thames Water, but it will depend largely on their customer demand for water as well as the availability of the groundwater source at Latton and the reservoir at Farmoor in Oxfordshire. As noted in the September report, the September rainfall has resulted in the earliest exceedance of the 32 Ml/d trigger in the 16 years since it was put in place by the EA.

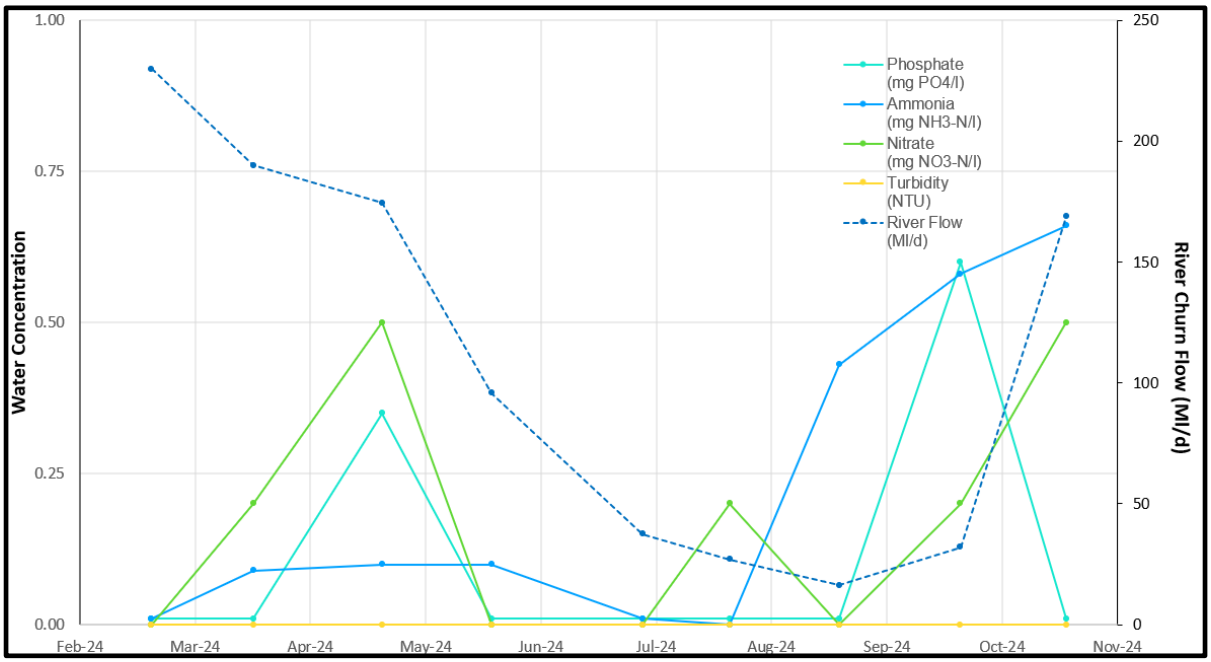


5. River Health

The health of the River Churn and Daglingworth Stream is being monitored via monthly monitoring of water quality and riverfly numbers. This is being done on the River Churn at Gooseacre Lane, just downstream of the Gloucester St sluices, and on the Daglingworth Stream (Gumstool Brook) along Riverside Walk. In addition, it is planned that environmental observations in and around the water courses will be recorded, including wildlife and plant growth.

a) River water quality

Monitoring of river water quality covers the nutrients, ammonia, nitrate and phosphate, and turbidity, a measure of how clear the water is. Sampling and analysis since February 2024 initially showed little evidence of persistent pollution by nutrients, but with intermittent elevated phosphate and nitrate concentrations detected in the Churn and in the Gumstool Brook. The graph below for the Churn shows these spikes, but also highlights ammonia and nitrate concentrations showing more persistent, increasing trends since the summer. It is possible that rainfall and particularly rainfall intensity is influencing the concentration spikes, with rising trends perhaps linked to increasing river flows. Although the nutrient concentrations are not particularly high, they will continue to be tracked over the coming months.

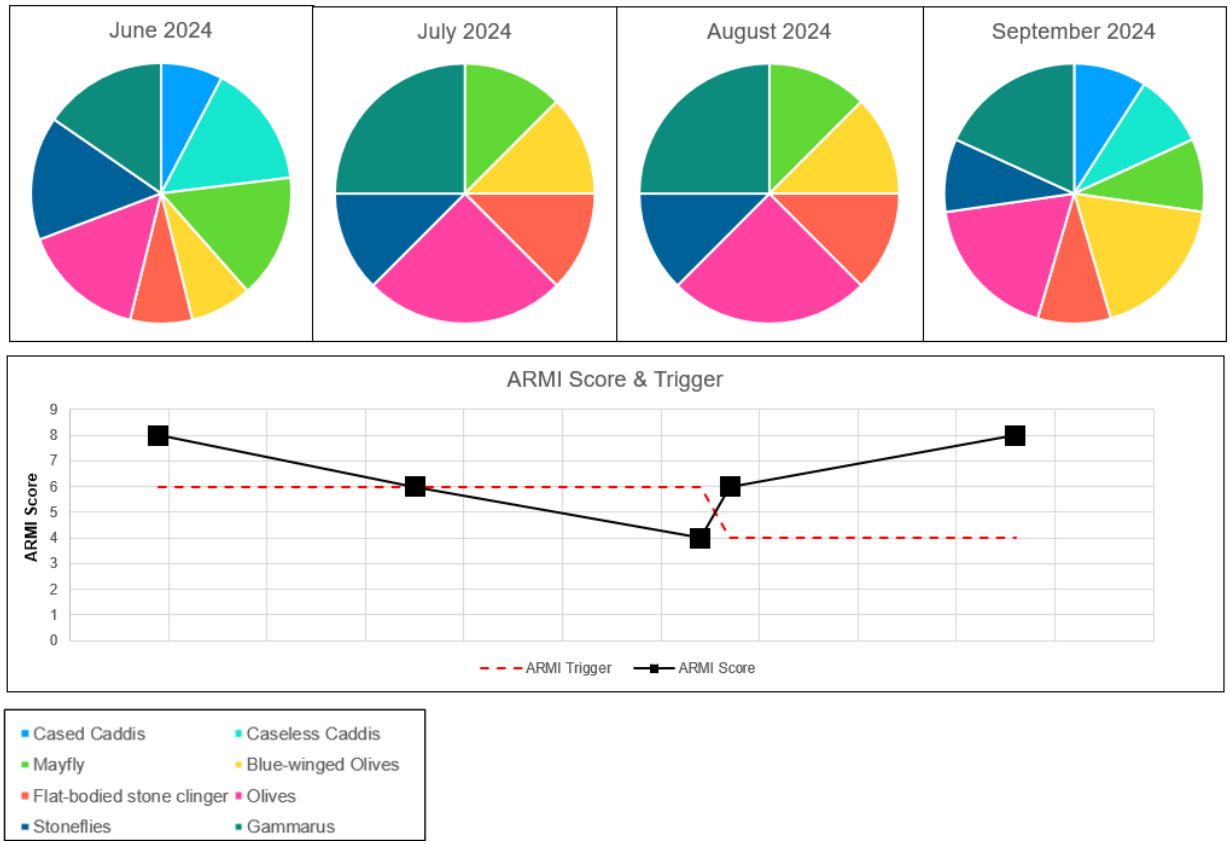


Monthly monitoring will continue to assess any river water quality trends.

b) Riverfly health

Monitoring of riverflies collected from the riverbed, via kick sampling within the watercourses, focusses on stoneflies, caddisflies, mayflies and other species, which are recognised as good indicators of water quality. No monitoring has been carried out in October owing to high river flow/level creating an unacceptable risk to citizen scientists undertaking the in-river sampling.

The graphic below for the River Churn shows the riverfly monitoring results from June to September this year with the pie charts indicating the number and diversity of species found. The graph shows how these results, expressed as an ARMI (Anglers Riverfly Monitoring Initiative) score, compare with an ARMI trigger that indicates poor river health. As the period of baseline data is limited to 4 months, an appropriate trigger level is yet to be confirmed; this will be done in conjunction with the Cotswolds' Rivers Trust. Nevertheless, riverfly sampling to date indicates that both the River Churn and the Gumstool Brook are healthy and are sustaining a riverfly population.



c) Environmental observations

A preliminary assessment of the ecological status of the Barton Mill Pound and the Gumstool Brook was completed by Cirencester Wildlife Group (CWG) in July 2024, with initial comments provided on the status and opportunities for environmental improvement during low flow conditions. A further survey carried out by CWG in early September has been written up and is in the final stages of being reviewed within CWG prior to being issued to FoGB.

6. Stream Monitoring Photographic Record

The Daglingworth Stream in the Duntisbourne valley down to Daglingworth village has reduced during October and is at a 'flowing' level.

Stream levels south of the Daglingworth area have also reduced during October and are at a 'flowing' level.

The flow in the river Churn has continued to increase during October and was at a flowrate of 180 Ml/day on the 25th of October when the picture record was taken.

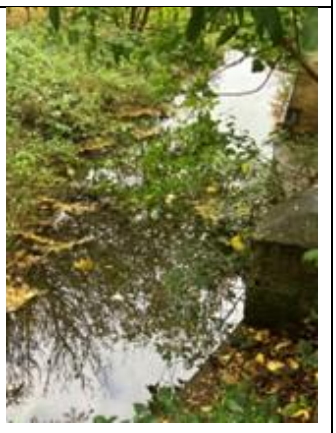
The large sluice gate at the Gloucester Street weir was opened progressively at the end of September and has remained fully open during October. The two small sluice gates also remain fully open. The stream into the Barton Mill Pound is flowing at a healthy rate.

A new 50cm gauge board has been installed on the gabions near to the riverside walk footbridge across the Barton Mill Pound (monitoring location 27).

The following set of monitoring pictures was collected on the 25th of October 2024 to record the status of the Daglingworth Stream and River Churn in the Cirencester area.

1a. Daglingworth Stream upper source north of Duntisbourne Abbots. The stream channel is muddy and there is some standing water. There is an indication of recent flows from surface water runoff.		1b. Duntisbourne Abbots village spring. Water is gently flowing.	
2. Duntisbourne Abbots Daglingworth Stream downstream of inferred confluence of spring sources. There is a normal stream flow in the channel.		3. Duntisbourne Leer ford, Daglingworth Stream. There is a normal flow across the ford that extends to within 5 bricks of the cobbled area.	
4. Middle Duntisbourne ford, Daglingworth Stream. A normal flow is observed that extends about one foot beyond the cobbled area of the south-west channel edge.		5. Duntisbourne Rouse ford, Daglingworth Stream. A normal flow is observed which extends about two feet beyond the SW paved boundary.	
6. Daglingworth Stream Grove Hill bridge. A normal flow is observed that fills one half of the field channel upstream of the road bridge.	 	7. Daglingworth Stream at Lower End road bridge. A normal flow is observed in the upstream garden, and the walled channel downstream of the bridge.	 

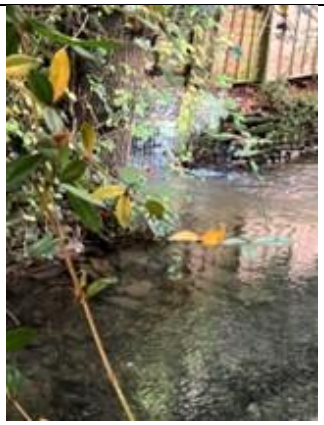
8. Wellhill Copse, Daglingworth Stream. In the fields upstream of Wellhill Copse, the stream is flowing within its banks. At the footpath stile the stream has a normal flow and the water is clear.	 	9. Daglingworth Place ford, Daglingworth Stream. A steady normal flow is observed at the ford over the pebble weir.	 
10. Grange Farm bridge, Daglingworth Stream. There is a steady flow into the farm channel. There is still standing water present in the horse fields north of Grange Farm adjacent to the stream.	 	11. School Hill bridge, Daglingworth Stream. The stream has a normal flow similar to that at Grange Farm.	
12. Stratton End (private road), Daglingworth Stream. There is a normal flow in the stream. The pool downstream of the bridge is filled with slightly muddy water.	 	13. Barn Way bridge, Daglingworth Stream. There is a normal flow of very clear water in the channel.	

15. Footpath at Lower Stratton, Daglingworth Stream. The stream is flowing at a normal rate. The stream level at this location is very high (close to the footbridge crest). This is believed to be due to heavy undergrowth and debris observed just downstream of this location.		16a. Daglingworth Stream at Barton Lane upstream of Bathurst Estate boundary wall A normal flow of clear water is observed.	
16b. Daglingworth stream at Barton Lane downstream of Bathurst Estate boundary wall. A normal flow of clear water is observed.		17. Gumstool Brook balancing stream at sluice gate. A normal clear flow is observed.	
18. Gumstool Brook alongside the Swimming Pool on the Riverside Walk. A normal flow is observed, and vegetation is still very thick.		20. Gumstool Brook at culvert trash screen. A normal flow is observed, and there is little debris present at the trash screen.	
21. Gumstool Brook Balancing Stream at Powell's School There is a normal flow and reduced vegetation		22a. Gumstool Brook Balancing Stream behind Salvation Army. A normal flow is observed.	

22c. Gumstool Brook Balance Stream at Powell's School at trash screen. There is a steady flow and reduced vegetation		23a. River Churn at Glos St bridge upstream of sluices A steady flow is observed.	
23b. River Churn at Glos St bridge sluices The large sluice gate is now fully open (~105cm). The two small sluice gates remain fully open.		23c. River Churn at the measuring gauge on Glos St bridge. The gauge is showing a level around 3.6 (0.36m) mark	
23d. River Churn Glos St bridge view towards the Mill Pound. There is a normal flow entering into the Mill Pound.		24. Mill Pound looking downstream from Glos St bridge. A normal flow is observed in the central channel. Significant vegetation is present around the stream channel.	
25. Mill Pound Overflow (New) A low flow is observed at the offtake. The Mill pound water level is halfway up the overflow pipe inlet, but leaf debris are partially blocking the flow.		26. Mill Pound Overflow (Old) A steady flow is audible, and water is observed in the field.	

27a. Mill Pound upstream of footbridge. A steady slow flow is observed. There are still extensive river plants in the mill pound. The new level gauge installed near the footbridge is reading 0.37m.	 	27b. Mill Pound downstream of footbridge. A steady flow is observed. Less algae is visible.	
33a. River Churn downstream of Glos St. sluice		33b. River Churn looking downstream towards Gooseacre Lane bridge	
35a. River Churn upstream of Spitalgate Lane bridge		35b. River Churn downstream of Spitalgate Lane bridge	

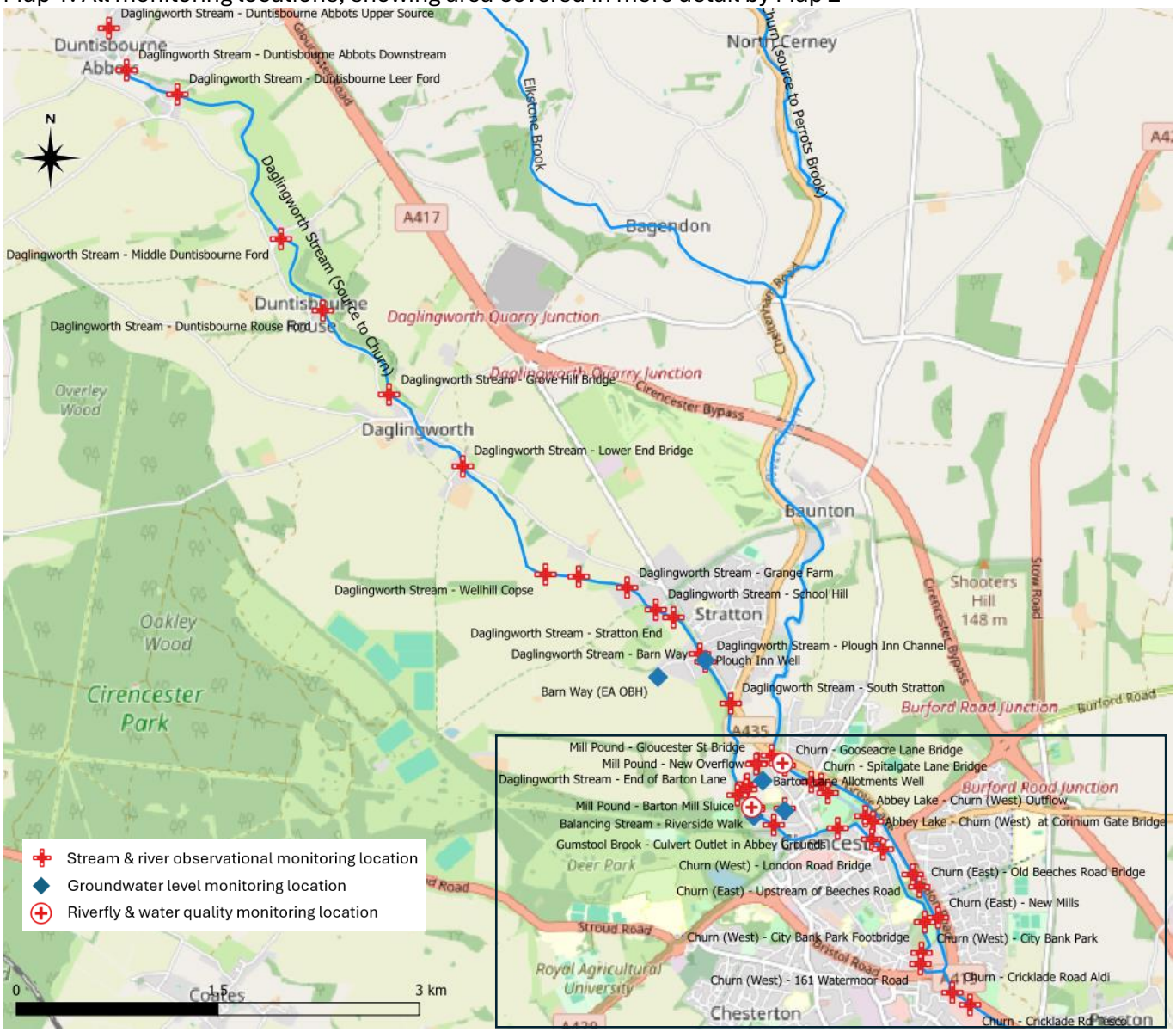
36a. River Churn at Hereward Road trash screen. There is a steady flow entering the culvert		36b. River Churn upstream side of Hereward Road bridge	
37. Abbey Lake – Churn (West) Inflow There is a normal flow.		38a. Abbey Lake weir – Churn (West) outflow. View upstream. There is a steady normal flow through the weir.	
38b. Abbey Lake outflow – Churn (West) View downstream from Corinium Gate footbridge There is a normal flow.		39 Abbey Lake outlet stream at Corinium Gate bridge – Churn (West) There is a normal flow.	
40. Gumstool Brook culvert outlet in Abbey Grounds There is a normal flow.		41a. Gumstool Brook - Confluence with Abbey Lake outlet (Waterloo carpark) Further upstream. There is a normal flow.	

41b. Gumstool Brook - Confluence with Abbey Lake outlet (Waterloo carpark) There is a normal flow.		42. River Churn (West) on the downstream side of London Road bridge There is a normal flow.	
43. River Churn (East) upstream of Old Beeches Road bridge There is a normal flow.		44. River Churn (East) at Old Beeches Road Bridge looking downstream There is a normal flow.	
45. New Mills weir discharge – Churn (East) Fast overflow from New Mills		46. River Churn (West) weir in City Bank glade. There is a normal flow.	
47. River Churn (West) at City Bank Park footbridge There is a normal flow.		48. River Churn (West) at 161 Watermoor End There is a normal flow.	

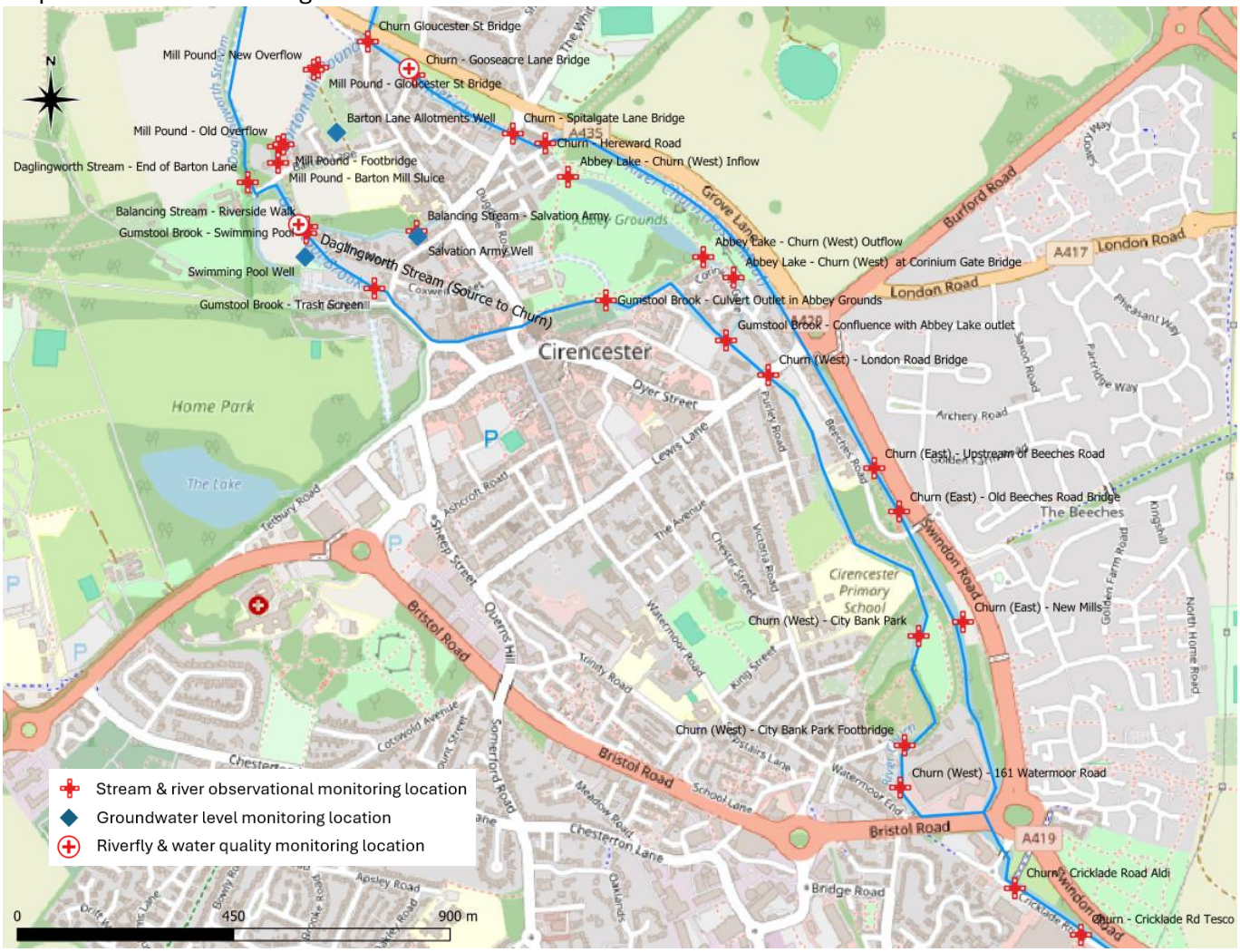
49 River Churn at Cricklade Road (opposite Aldi) The river level remains high, overflowing the banks in places.		50 River Churn at Cricklade Road (opposite Tesco) The river level remains high, overflowing the banks in places.	

7. Monitoring location maps

Map 1: All monitoring locations, showing area covered in more detail by Map 2



Map 2: Detail of monitoring locations in Cirencester



8. Details of the stream monitoring locations

No.	Location Name	Grid Reference	What3Words Link
1	Daglingworth Stream - Duntisbourne Abbots Upper Source	SO 97036 08089	https://w3w.co/winners.lamenting.energetic
2	Daglingworth Stream - Duntisbourne Abbots Springs	SO 97163 07783	https://w3w.co/league.teaching.adhesive
3	Daglingworth Stream - Duntisbourne Leer Ford	SO 97544 07599	https://w3w.co/thatched.northward.enclosing
4	Daglingworth Stream - Middle Duntisbourne Ford	SO 98134 06527	https://w3w.co/reporters.slower.axed
5	Daglingworth stream - Duntisbourne Rouse Ford	SO 98621 05995	https://w3w.co/flamenco.spines.openings
6	Daglingworth Stream - Grove Hill Bridge	SO 99117 05367	https://w3w.co/processes.swipes.grouping
7	Daglingworth stream - Lower End Bridge	SO 99662 04835	https://w3w.co/objective.verbs.shoving
8	Daglingworth stream - Wellhill Copse Stile	SP 00277 04034	https://w3w.co/automate.servicing.objecting
9	Daglingworth stream - Daglingworth Place Ford	SP 00529 04013	https://w3w.co/posed.emerald.bandstand
10	Daglingworth Stream - Grange Farm	SP 00890 03931	https://w3w.co/episodes.champions.keyboards
11	Daglingworth Stream - School Hill	SP 01102 03770	https://w3w.co/undercuts.winks.retiring
12	Daglingworth Stream - Stratton End	SP 01236 03714	https://w3w.co/nursery.jacuzzi.unearthly
13	Daglingworth Stream - Barn Way	SP 01427 03440	https://w3w.co/requiring.handfuls.powers
14	Daglingworth stream - Plough Inn Channel	SP 01468 03385	https://w3w.co/flap.grafted.cuts
15	Daglingworth Stream - South Stratton	SP 01657 03072	https://w3w.co/commutes.boom.narrates
16	Daglingworth Stream - End of Barton Lane	SP 01712 02392	https://w3w.co/hydrant.paces.underway
17	Balancing Stream - Riverside Walk Sluice	SP 01835 02300	https://w3w.co/oasis.eclipses.pythons
18	Gumstool Brook - Swimming Pool Entrance	SP 01832 02287	https://w3w.co/monks.factored.blazers
19	Gumstool Brook - Private Bridge	SP 02067 02394	https://w3w.co/catapult.prepared.watching
20	Gumstool Brook - Trash Screen	SP 01975 02171	https://w3w.co/unicorns.carbonate.ruling
21	Balancing Stream - Powells School	SP 02085 02301	https://w3w.co/marshes.batches.spectacle
22	Balancing Stream - Salvation Army	SP 02061 02290	https://w3w.co/conquests.cried.fewest
23	River Churn - Glos St Sluices	SP 01960 02684	https://w3w.co/stooping.height.palms
24	Mill Pound - Glos St Bridge	SP 01856 02630	https://w3w.co/unguarded.thousands.gifted
25	Mill Pound - New Overflow	SP 01847 02625	https://w3w.co/arrives.headings.crisis
26	Mill Pound - Old Overflow	SP 01775 02466	https://w3w.co/sample.fuzzy.composts
27	Mill Pound - Footbridge	SP 01785 02470	https://w3w.co/sharpness.heightens.assembles
28	Mill Pound - Barton Mill Sluice	SP 01773 02433	https;//w3w.co/yummy.rail.swan
29	Well - Barton Lane Allotments	SP 01896 02515	https://w3w.co/toasters.resettle.factoring
30	Well - The Plough Inn	SP 01469 03394	https://w3w.co/dote.teams.twitchy
31	Well - Salvation Army	SP 02070 02268	https://w3w.co/fine.unwraps.cowboys
32	Well - Open Air Swimming Pool	SP 01827 02237	https://w3w.co/veered.expansion.goad
33	Churn - Upstream of Gooseacre Lane	SP 02040 02633	https://w3w.co/idea.compacts.smashes
34	Churn - Gooseacre Lane Bridge	SP 02058 02615	https://w3w.co/moving.snaps.dentures
35	Churn - Spitalgate Lane Bridge	SP 02261 02493	https://w3w.co/vibrates.treetop.quirky
36	Churn - Hereward Road	SP 02329 02473	https://w3w.co/subject.enjoys.shackles
37	Abbey Lake - Stream Inlet	SP 02377 02404	https://w3w.co/silly.hairstyle.streak
38	Abbey Lake - Stream Outlet	SP 02658 02237	https://w3w.co/boater.rankings.scribble
39	Abbey Lake - Stream at Corinium Gate Bridge	SP 02721 02194	https://w3w.co/essay.goes.waltzed
40	Gumstool Brook - Culvert Outlet in Abbey Grounds	SP 02456 02147	https://w3w.co/agency.mascots.warping
41	Daglingworth Stream - Confluence with Abbey Lake outlet (Waterlo	SP 02706 02064	https://w3w.co/trinkets.inviting.dinosaur
42	Churn (West) - London Road bridge	SP 02792 01991	https://w3w.co/ranks.uncouth.perfected
43	Churn (East) - Upstream of Beeches Road	SP 03012 01797	https://w3w.co/blank.sheep.springing
44	Churn (East) - Old Beeches Road Bridge	SP 03064 01707	https://w3w.co/that.rephrase.necks
45	Churn (East) - New Mills	SP 03198 01478	https://w3w.co/stolen.recovery.sensible
46	Churn (West) - City Bank Park Weir	0	0
47	Churn (West) - City Bank Park Footbridge	SP 03077 01222	https://w3w.co/feelers.corrects.lucky
48	Churn (West) - 161 Watermoor Road	SP 03068 01134	https://w3w.co/tabs.wing.scout
49	Churn - Cricklade Road Aldi	SP 03305 00926	https://w3w.co/bucked.duck.mailboxes
50	Churn - Cricklade Rd Tesco	SP 03442 00829	https://w3w.co/drag.aimed.look

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