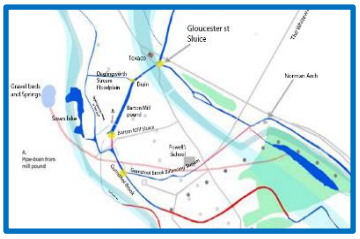
Citizen Monitoring Report December 2024



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

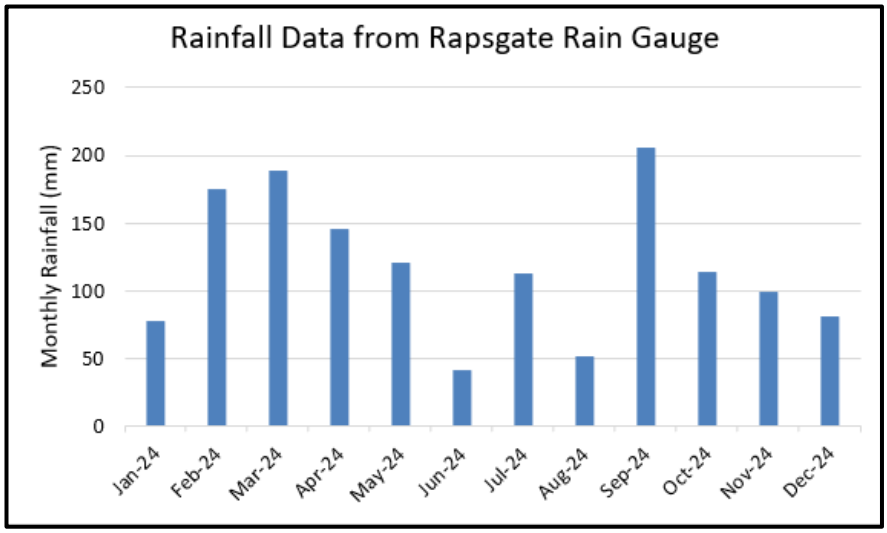
Summary

- The total December rainfall was about 81mm in the Churn catchment and 81mm in the Frome catchment to the west. These equate to 105% and 85% of their monthly averages. Most of the December rainfall fell in the first half of the month, with noticeably drier weather towards the end. For the upper Churn and Daglingworth Stream catchments, 2024 ranked as 1st to 3rd wettest in the 40+ year record.
- Groundwater in the Cotswold limestone aquifers mostly followed a declining trend during December, falling from exceptionally high to normal levels for the time of year. During Storm Bert, groundwater levels rose rapidly with exceptionally high levels recorded at the end of November. Similar groundwater level trends occurred in the shallow Gravel aquifer.
- At the end of December, the River Churn flow measured at the Environment Agency (EA) Cirencester gauging station was 159 Ml/day, which is above normal for the time of year.
- All three sluice gates on the Churn at Gloucester Street have remained fully open during December.
- 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 all the way to Barton Mill and is providing a significant flow into the Gumstool Brook within Cirencester.
- Monitoring river health continues to be disrupted by high flows/levels, preventing riverfly sampling from being done safely. Water quality monitoring has continued in the Churn and Gumstool Brook, generally showing low nutrient concentrations but with significant spikes of higher concentration. Links with river flow rates and rainfall intensity will be investigated.
- Flow through the Abbey Lake has reduced as a result of lower flow in the River Churn. Further monitoring of flow and ecological health would be required to develop an understanding of how it responds to periods of high and low flow.
- The water courses continue to remain healthy when there is good flow but, working with the Cirencester Wildlife Group and other stakeholders, further ecological consideration is being given to how the health of the river, streams and lake can be enhanced.

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

1. Weather Update & Water Situation Prognosis

Following an exceptionally wet September in the upper Churn and Daglingworth Stream catchments, the monthly rainfall totals for October, November and December were progressively drier, as shown on the graph. This accounts for Storm Bert which brought around 50mm of rain on the 23rd and 24th November, while the November rainfall total reported for the Miserden rain gauge in the Frome catchment has been updated, increasing from 97% to 118% of the monthly average. As a result, the November rainfall in the upper Churn and Daglingworth Stream catchments was around 15% above average. The December rainfall total at the Rapsgate rain gauge in the Churn catchment was 81mm, with 81mm also recorded at Miserden, equating to 105% and 85% of their monthly averages, respectively. Although December rainfall was around average, about 70mm of the 81mm total fell in the first 18 days of the month, with noticeably drier weather occurring over the remainder of the month. Considering 2024 as a whole, the data indicates that it was the wettest year in the 41 year record for the Rapsgate gauge, and the 3rd wettest year in the 44 year long record for Miserden.



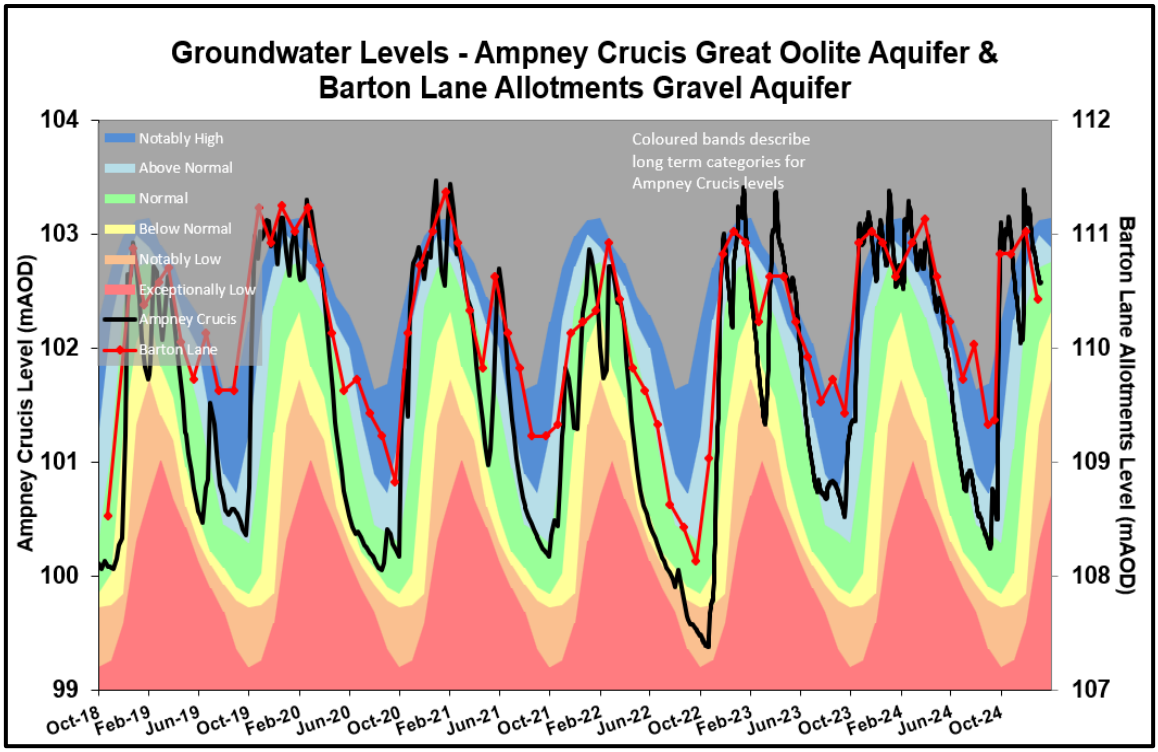
Since the exceptionally wet September monthly rainfall totals have decreased to around average in December but despite this, soils across the upper Churn and Daglingworth catchments have remained wet, allowing aquifers to recharge when sufficient rain falls.

Looking ahead at the weather, the Met Office 3 month outlook from January to March 2025 for the whole UK is that there is a higher than normal chance of the period being wet. This is particularly the case during February and March, although the likelihood of wetter than normal weather across southern UK is less certain. The Met Office also considers that the overall January to March period is unlikely to be cold but that shorter-lived cold spells remain possible and particularly in January.

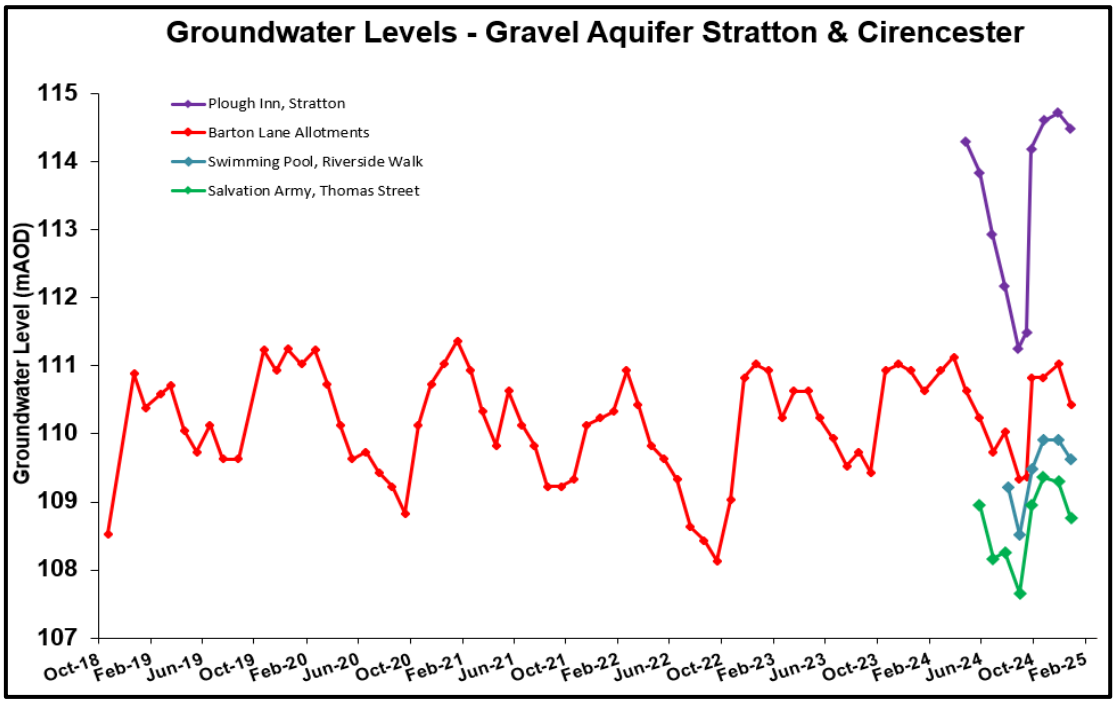
With the health of Cirencester's waterways always being influenced by the weather, groundwater levels and river flows have responded and declined with the dry end of December. Although groundwater levels are normal for the end of December, flow in the Churn is above normal for the time of year. With soils across the catchment continuing to be wet, groundwater levels and river flows are likely to respond to wet weather and increase, with an associated increase in flood risk within the Churn catchment. This is of note because of the Met Office outlook for an increased chance of wet weather, which may be more likely during February and March.

2. Groundwater Situation

Groundwater in the Great Oolite limestone aquifer rose more rapidly and earlier to exceptionally high levels this autumn, because of the exceptionally wet end to September. Levels remained exceptionally high for much of October but as a result of relatively dry weather from mid-October until the arrival of Storm Bert, groundwater levels declined, although they remained above normal. Significant rainfall during Storm Bert resulted in groundwater levels rising rapidly to exceptionally high levels, as can be seen from the graph below. After some wet weather at the start of December, the drier weather has been accompanied by a decline in groundwater levels with levels in the Great Oolite aquifer at the end of December being normal for the time of year.



The graph above also shows a similar groundwater level trend in the shallow Gravel aquifer at Barton Lane Allotments. Levels rose in November in response to Storm Bert, then subsequently declined in response to the drier end of December. As shown on the graph below, there are similar trends in Gravel aquifer at The Plough Inn well, as well as the shallow wells at the Swimming Pool and Salvation Army. This consistency in the trends suggests that similar rainfall and aquifer recharge processes are operating, with subtle differences in groundwater level responses between the wells perhaps reflecting differences in the degree of connection between the aquifer and the adjacent watercourses. The overall progressive decline in groundwater from high levels at The Plough Inn well to the lowest levels at the Salvation Army well reflects the natural groundwater gradient from north-west to south-east in the shallow Gravel aquifer.



3. Daglingworth Stream & Gumstool Brook Flows

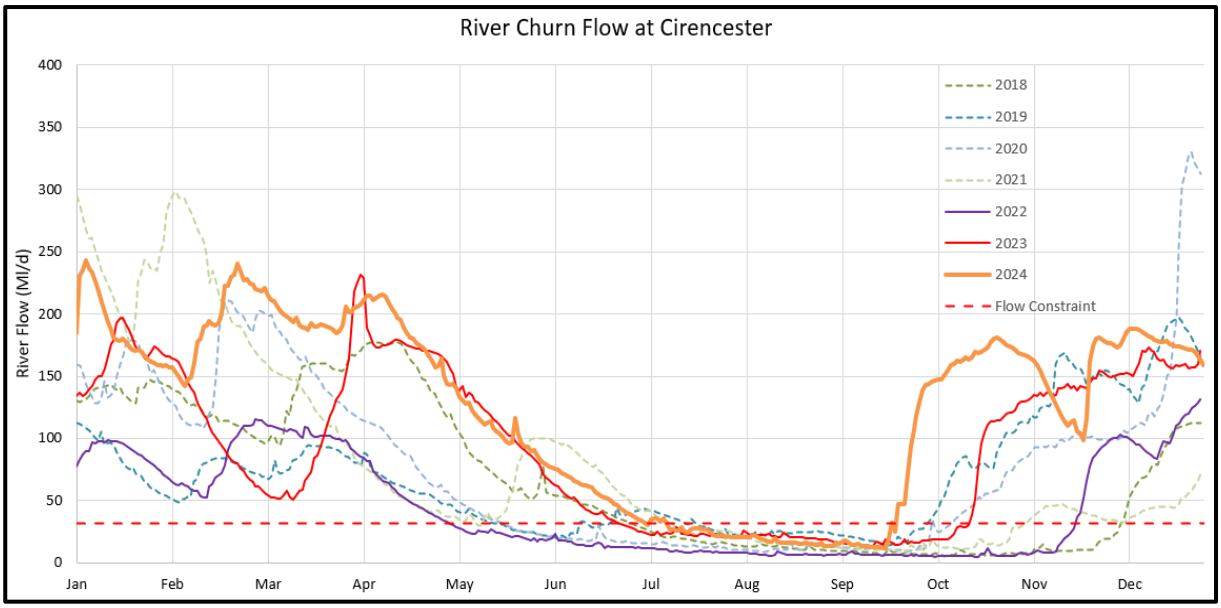
During 2024, flow in the Daglingworth Stream was measured at multiple locations from its source in Duntisbourne Abbotts downstream, through Daglingworth and into Cirencester. These flow measurements were carried out in spring, summer, autumn and winter, made possible by funding from The Winstone Trust. The data collected shows, as expected, that the Daglingworth Stream flow varies seasonally, with higher flows in spring and winter. The data also shows that the flow does not increase progressively from the stream source to its confluence with the River Churn. Rather, on each occasion of flow measurement, there are flow increases along some sections of the stream and decreases along others. Of particular note is the stream between Daglingworth and Stratton where, for example, it dried up in spring but showed the biggest increase in flow during winter. The data also shows the important contribution to flow in the Daglingworth Stream and Gumstool Brook that is made by the River Churn via the Barton Mill pound and sluices.

Analysis of the flow measurements collected will continue and complement the citizen science tracking of flow in the Daglingworth Stream between Daglingworth and Stratton. Since the end of September, flow has been continuous at School Hill and Barn Way, Stratton although flows decreased until Storm Bert resulted in exceptionally high groundwater levels and high stream flows. Subsequently, flow has decreased, linked to the drier weather at the end of December.

Assessment of the complex relationship between Daglingworth Stream flows, groundwater levels and rainfall runoff from the land is continuing. In addition, monitoring of water levels in watercourses adjacent to wells in the shallow Gravel aquifer is in progress, to help understand the relationship between groundwater, stream flows, rainfall and Gloucester St sluice operation.

4. River Churn Flow

As a result of the exceptional September rainfall, flow in the River Churn at the EA Cirencester gauging station increased rapidly from the typical low summer and autumn flows, although this increase occurred much earlier than normal. As can be seen from the graph below, the flow peaked at 180 Ml/d towards the end of October, then decreased steadily in response to the drier weather until Storm Bert occurred. The heavy rainfall resulted in a rapid increase in flow from 98 Ml/d to just over 181 Ml/d in the space of 5 days. The relatively wet start to December resulted in a further increase in river flow, peaking at 188 Ml/d, but with the noticeably drier end to December flow in the Churn again decreased progressively to 159 Ml/d at the end of the month.



As noted in previous reports, the trends in river flow largely follow those recorded in the Great Oolite aquifer, with groundwater flow out of the aquifers contributing significantly to the River Churn flow. This is especially the case when groundwater levels are exceptionally high, but even

with groundwater declining to normal levels by the end of December, the river flow is still above normal for the time of year.

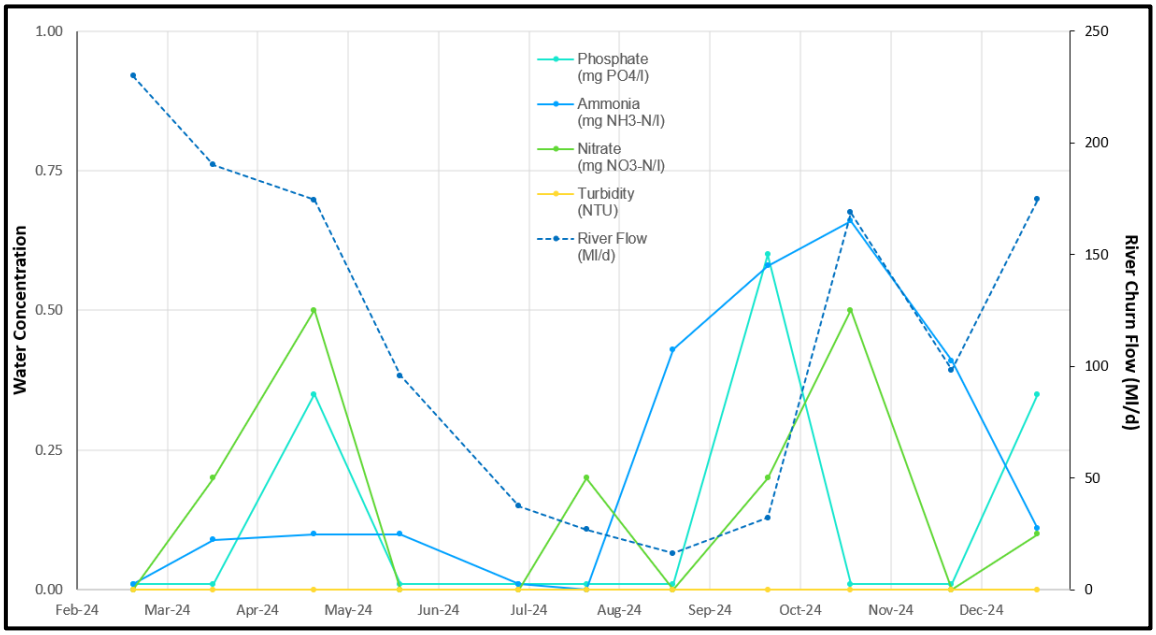
With the River Churn flow above normal for the time of year, it remains well above the 32Ml/d trigger, above which groundwater abstraction by Thames Water at Baunton can operate. Although the river flow rose above this trigger towards the end of September, groundwater abstraction did not commence until early November following a period of maintenance at the Baunton site.

5. River Health

The health of the River Churn and Daglingworth Stream is being monitored via measurement 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 Gumstool Brook (Daglingworth Stream) along Riverside Walk. The aim is to carry this out monthly when river flow conditions allow monitoring to be carried out safely. 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. During 2024 there was little evidence of persistent pollution by nutrients, but intermittent elevated phosphate and nitrate concentrations have been detected in the Churn and Gumstool Brook. The graph below for the Churn shows these spikes in concentration as well as evidence of more persistent increasing trends in ammonia and, to a lesser extent, nitrate from summer into early autumn. These trends are not apparent in the Gumstool Brook. It is possible that rainfall and particularly rainfall intensity influences these spikes, with rising trends perhaps linked to increasing river flows. With the River Churn flow decreasing between the October and November monitoring rounds, and the November water quality results showing a decrease in ammonia and nitrate, there is further evidence for a connection between river flow and its quality. It is clear however, that the controls on water quality are complex, because higher flow in the River Churn in December is associated with a further decrease in ammonia concentration but increases in nitrate and phosphate concentrations. The increase in phosphate concentration in the Gumstool Brook is particularly apparent with the 2 mg PO_4/l concentration being double the previous highest concentration. Apart from these phosphate concentrations, the nutrient concentrations are not particularly high, although appropriate nutrient concentrations reflecting good quality will need to be defined.



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 possible since September owing to high river flow/level creating an unacceptable risk to citizen scientists undertaking the in-river sampling.

Previous results from June to September 2024 have been presented graphically for the River Churn, comparing the riverfly data, expressed as an ARMI (Anglers Riverfly Monitoring Initiative) score, with a provisional ARMI trigger. The data collected from 2024 shows most results above the trigger suggesting that both the River Churn and the Gumstool Brook are healthy and are sustaining a riverfly population. When monitoring can be recommenced, the data will be presented in updated graphics.

c) Environmental observations

The Cirencester Wildlife Group (CWG) environmental survey of the waterways within Cirencester, with recommendations for environmental improvement, continues to be shared with other stakeholders to promote further discussion, agreeing actions, roles and responsibilities.

FoGB volunteers continue to clear vegetation and small trees from the banks of the Barton Mill pound as recommended by the CWG rivers report to increase the light on the stream.

6. Stream Monitoring Photographic Record

A set of monitoring pictures (table below) of the Daglingworth Stream and River Churn in the Cirencester area was collected on the 30th of December 2024. From these photographs, the following visual assessments have been made.

- The Daglingworth Stream in the Duntisbourne valley down to Daglingworth village has reduced slightly but is still at a steady 'flowing' level.

- The flow in the Daglingworth Stream south of the Daglingworth area has decreased during December and is at a 'steady flow' level from Wellhill Copse through to Barton Mill.

- The flow in the River Churn has steadily reduced during December. Having started the month at 177 Ml/d it peaked at 188 Ml/d on 9th December, reducing to around 163 Ml/d on the 30th of December when the photographic record was taken

- All of the sluice gates at the Gloucester Street weir have remained fully open during December. The flow into the Barton Mill Pound from the River Churn continues at a healthy rate.

- On the 30th of December, the River Churn and Gumstool Brook were flowing with strong flows through the town. Downstream of the confluence of its two branches, the River Churn is no longer overspilling onto its floodplain in the area alongside the old Cricklade Road.

1a. Daglingworth Stream upper source north of Duntisbourne Abbots. The stream channel is muddy and there is some standing water on the downstream side of the road.	 	1b. Duntisbourne Abbots village spring. There is a gentle flow of very clear water in the spring.	
2. Duntisbourne Abbots Daglingworth Stream downstream of inferred confluence of spring sources. There is a normal clear flow of water in the channel.		3. Duntisbourne Leer ford, Daglingworth Stream. There is a normal flow across the ford that extends to within 6 bricks of the cobbled area.	
4. Middle Duntisbourne ford, Daglingworth Stream. A normal flow is observed that extends to within 9 bricks of the cobbled area of the south-west channel edge. The water depth has dropped significantly since last month. Possibly due to flow restriction last month now removed?		5. Duntisbourne Rouse ford, Daglingworth Stream. A steady flow is observed, which is within the SW paved boundary (recently repaired).	

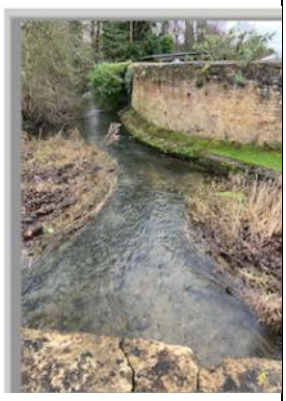
6. Daglingworth Stream Grove Hill bridge. A normal flow is observed that fills one half of the channel in the field upstream of the road bridge. Downstream of the road, the stream is almost filling the full depth of the channel, up to a few centimetres from the underside of the private stone footbridge.	 	7. Daglingworth Stream at Lower End road bridge. A normal flow of clear water 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 steady flow and the water is slightly muddy.		9. Daglingworth Place ford, Daglingworth Stream. A steady flow of slightly muddy water is observed at the ford over the pebble weir.	 
10. Grange Farm bridge, Daglingworth Stream. There is a steady flow of slightly muddy water into the farm channel. There is no standing water present in the horse fields upstream of Grange Farm adjacent to the stream.		11. School Hill bridge, Daglingworth Stream. The stream has a steady flow of slightly muddy water similar to that at Grange Farm.	

12. Stratton End (private road), Daglingworth Stream. The pool downstream of the bridge has a steady flow of muddy water.		13. Barn Way bridge, Daglingworth Stream. There is a steady flow of slightly muddy water in the channel.	
15. Footpath at Lower Stratton. The stream is flowing at a steady rate. The stream level at this location is still 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 steady flow of clear water is observed.	
16b. Daglingworth stream at Barton Lane downstream of Bathurst Estate boundary wall. A steady flow of clear water is observed.		17. Gumstool Brook balancing stream at sluice gate. The stream is flowing with clear water.	
18. Gumstool Brook alongside swimming pool on the Riverside walk. A steady flow of clear water is observed.		20. Gumstool Brook at culvert trash screen. A steady flow of clear water is observed. There is no significant debris at the screen.	

22a. Balancing Stream behind Salvation Army. The stream channel is flowing with clear water.		22b. Balance stream at Powell's School at trash screen. The stream is flowing with clear water.	
23a. River Churn at Glos St bridge upstream of sluices The river has a high flow with limited vegetation present.		23b. Glos St bridge sluices All sluice gates are open and there is a high flow, with vegetation visible in the river.	
23c. Glos St bridge downstream of sluices There is a high flow with no significant vegetation.		24d. River Churn at the measuring gauge on Glos St bridge. Water level is 0.23m (2.3 on the gauge board)	
24e. Glos St bridge downstream view from sluices. There is a steady flow into the mill pound.		24c. Mill Pound looking downstream from Glos St bridge. There is a steady stream flow between the vegetation.	

25. Mill Pound Overflow (New) There is a steady flow of water from the overflow pipes.		26. Mill Pound Overflow (Old) There is water visibly flowing from the overflow.	
26a Gauge by footbridge Water level is 0.26m (2.6 on gauge)		27a. Mill Pound upstream of footbridge There is a slow flow of clear water. Some surface vegetation still present.	
27b. Mill Pound downstream of footbridge. There is a slow flow of clear water. Some sub-surface vegetation still present.		34. River Churn upstream side of Gooseacre Lane bridge The river has a high flow of clear water.	
35. River Churn upstream of Spitalgate Lane bridge The river has a high flow of clear water. There is no significant flooding into the adjacent park.		35b. River Churn downstream north of Spitalgate Lane bridge The river has a high flow of clear water.	

36a. River Churn at Hereward Road trash screen. There is a steady flow into the culverted stream feeding to the Abbey Lake.		36b. River Churn upstream side of Hereward Road bridge The river has a high flow of clear water.	
37. Stream flowing into Abbey lake There is a steady flow of clear water.		38a. Weir at stream outlet from Abbey Lake The weir has a steady flow of clear water.	
38b. Footbridge at stream outlet from Abbey Lake There is a steady flow of clear water.		39 Abbey Lake outlet stream at Corinium gate bridge There is a steady flow of clear water.	
40. Gumstool Brook culvert outlet in Abbey grounds There is a steady flow of clear water.		41a. River Churn (W branch) – Looking upstream towards Abbey Lake. There is a steady flow of clear water.	

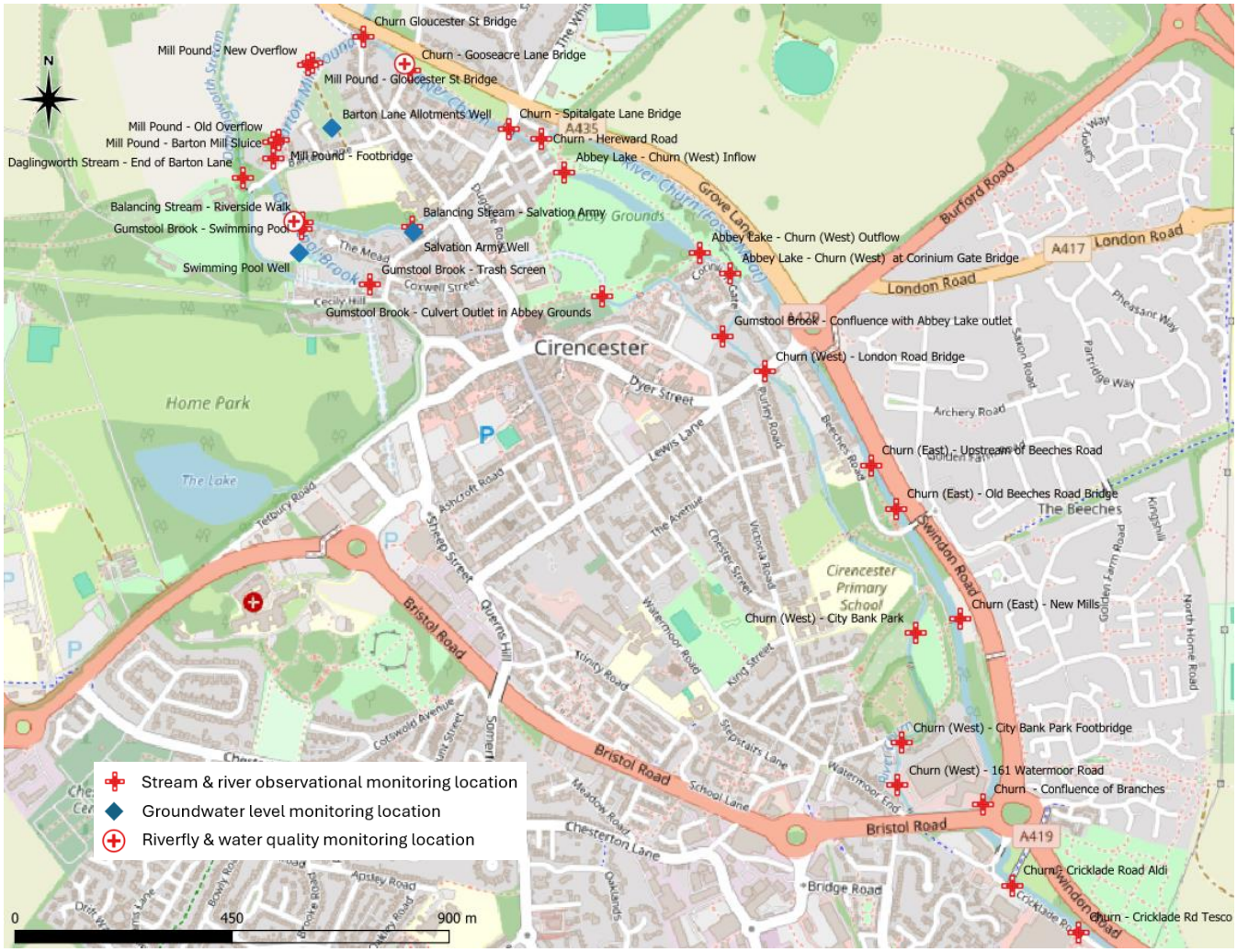
41b. Gumstool Brook - Confluence with Abbey Lake outlet (Waterloo carpark) There is a steady flow of clear water.		42a. River Churn (W branch) on downstream side of London Road bridge There is a steady flow of clear water.	
42b. River Churn (West branch) looking downstream from London Road bridge, upstream of Beeches Road The river has a high flow.		44. River Churn (East branch) at Old Beeches Road Bridge The river has a high flow.	
45. River Churn (West branch) – weir in City bank glade The stream has a steady flow.		46. River Churn (east branch) at New Mills	
47. River Churn (West branch) at City Bank Park footbridge The stream has a steady flow.		48. River Churn (West branch) at Watermoor Point Car park The stream has a steady flow of clear water.	

49 River Churn at Cricklade Road (opposite Aldi) The river has a high flow, but within its banks.		50 River Churn at Cricklade Road (opposite Tesco) The river has a high flow, but within its banks.	

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 (Waterloo carpark)	SP 02706 02064	https://w3w.co/trinkets.inviting.dinosaur
42	Churn (West branch) - 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 branch) - City Bank Park Weir	SP 03116 01480	https://w3w.co/roadblock.cloth.blaze
47	Churn (West branch) - City Bank Park Footbridge	SP 03077 01222	https://w3w.co/feelers.corrects.lucky
48	Churn (West branch) - 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