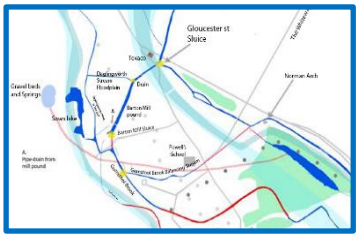
Citizen Monitoring Report November 2024



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

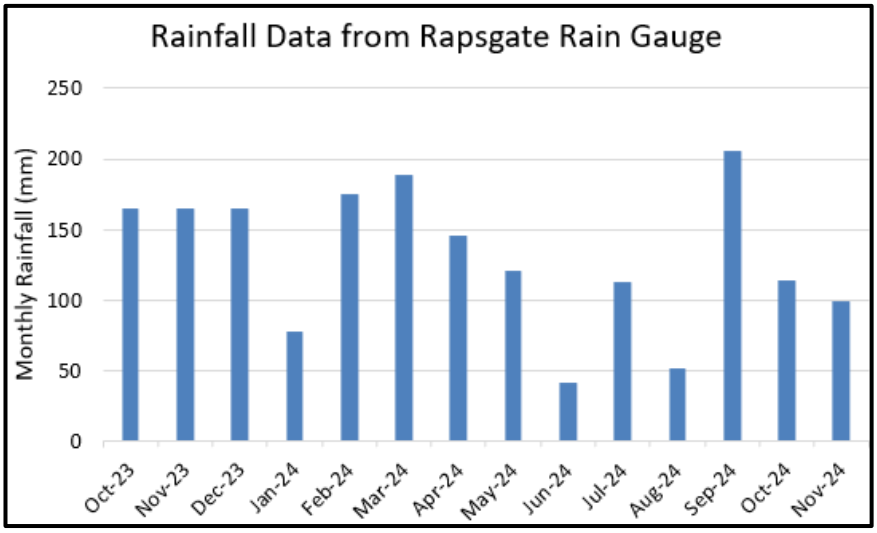
Summary

- Despite Storm Bert bringing a total of around 50 mm of rain to the area on the 23rd & 24th November, rainfall for the whole month was close to average. The total November rainfall was about 99mm in the Churn catchment and 87mm in the Frome catchment to the west. These equate to 114% and 97% of their monthly averages.
- Groundwater in the Cotswold limestone aquifers declined in early November but remained above normal for the time of year. In response to rainfall during Storm Bert, groundwater levels rose rapidly with exceptionally high levels recorded at the end of November. Similarly, groundwater levels in the shallow Gravel aquifer are notably high.
- At the end of November, the River Churn flow measured at the Environment Agency (EA) Cirencester gauging station was just over 176 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 November.
- 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 in its upper reaches, increasing significantly downstream of Daglingworth. This results in the Daglingworth Stream providing a significant flow into the Gumstool Brook within Cirencester.
- Monitoring river health has been disrupted with high flows/levels continuing to prevent riverfly sampling from being done safely. Water quality monitoring has continued in the Churn and Gumstool Brook showing low nutrient concentrations with evidence of a link with river flow.
- Flow through the Abbey Lake has increased as a result of greater inflow from 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 remain healthy when there is good flow but, working with the Cirencester Wildlife Group, 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, October experienced much less extreme rainfall. Around 127% of the monthly average fell at the EA rain gauge at Rapsgate in the Churn catchment and 106% at the Miserden gauge in the Frome catchment. Although Storm Bert was a notable event in November, bringing a total of around 50mm of rain on the 23rd and 24th November, rainfall for the whole month was close to average. As shown on the graph, total rainfall at Rapsgate for November was 99mm, with around 87mm recorded at Miserden, equating to 114% and 97% of their monthly averages, respectively. With Storm Bert contributing around 50% of November's rainfall in two days, the relatively normal monthly rainfall reflects the dry start to the month, with less than 4mm of rain falling in the first two weeks of November.

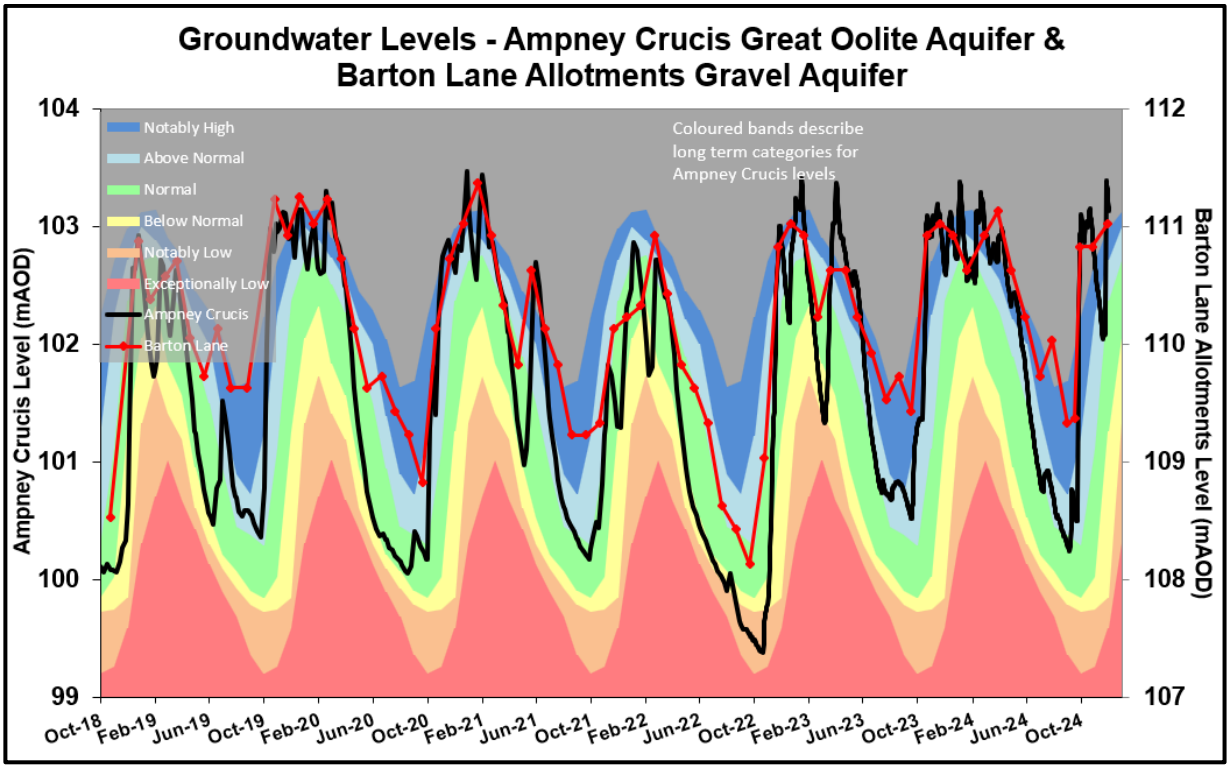


During the exceptionally wet September, soils across the upper Churn and Daglingworth catchments became wet, allowing aquifers to recharge, causing significant groundwater level and river flow increases. Despite the end of October and much of November being dry, with groundwater levels and river flows falling, soils remained wet resulting in a rapid groundwater and river response to heavy rainfall during Storm Bert.

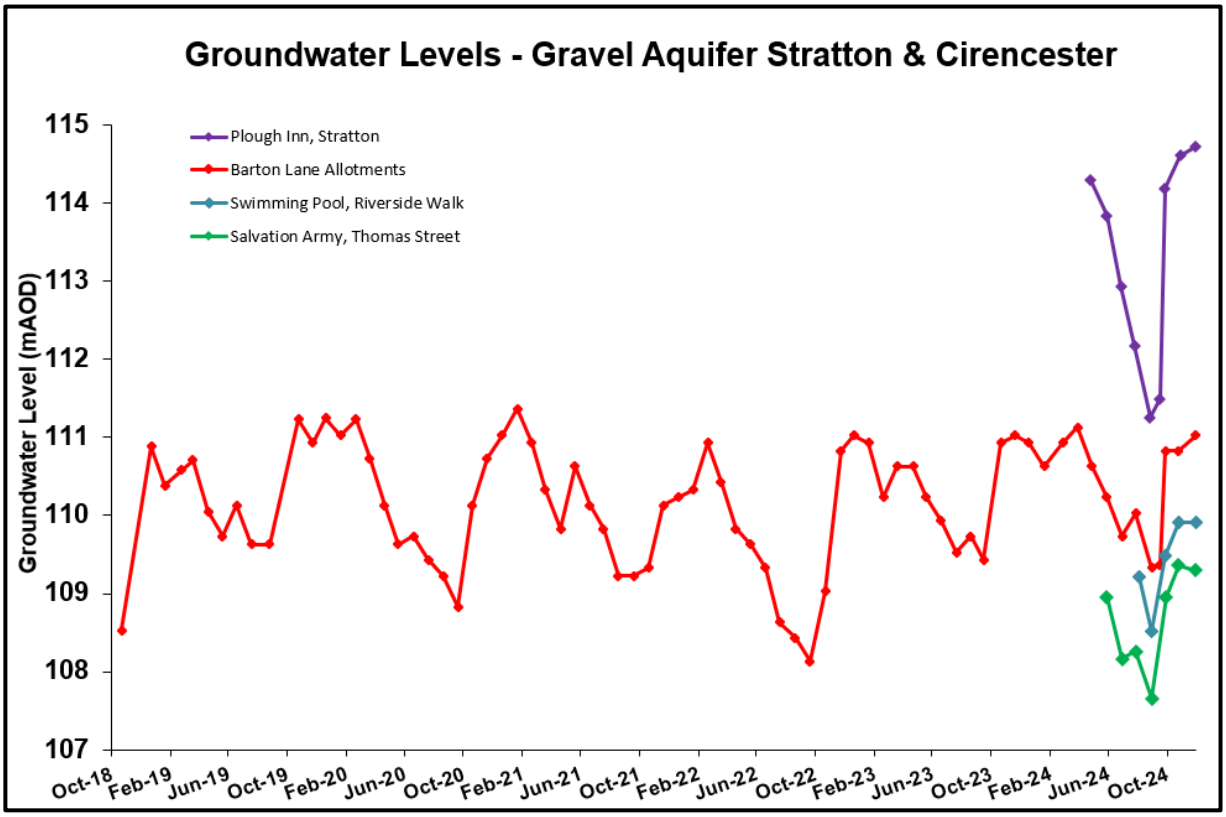
Looking ahead at the weather, the Met Office 3 month outlook from December to February 2025 for the whole UK is that there is an increased chance of winter being wetter than normal. Although December could be drier than normal, spells of wet weather can be expected at any time, with the wettest weather more likely in the northern and western parts of the UK, especially in January and February. The Met Office also considers that the chance of the winter being cold is smaller than normal, which is consistent with the previous two outlooks. Although there remains the possibility of cold spells, the likelihood of cold weather in January and February is reduced. With the health of Cirencester's waterways always being influenced by the weather, groundwater levels and river flows have responded noticeably to the dry start of November and the rainfall impact of Storm Bert. At the end of November, with soils across the catchment continuing to be wet, groundwater levels being exceptionally high and river flows above normal, there remains an associated increase in flood risk within the Churn catchment this winter. This is especially the case with the Met Office outlook for an increased chance of winter being wetter than normal.

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, remaining there for much of October. As the Great Oolite aquifer can respond rapidly to changes in rainfall, especially in autumn and winter, the dry end to October resulted in groundwater levels declining, which continued into November until Storm Bert arrived. As result of the significant rainfall brought by this storm event, it can be seen from the graph below that groundwater levels rose rapidly from above normal to exceptionally high levels for the time of year.



The graph above also shows a similar groundwater level trend in the shallow Gravel aquifer at Barton Lane Allotments, having risen by the end of November in response to rainfall during Storm Bert, reaching the joint highest November level in the 6 years of monitoring. As shown on the graph below, a similar trend has been observed in Gravel aquifer at The Plough Inn well, with a higher groundwater level recorded in November. In the shallow wells at the Swimming Pool and Salvation Army, November groundwater levels were either the same as or lower than those recorded in October. This may reflect differences in the degree of connection between the aquifer and the adjacent watercourse. Water levels in watercourses at a number of locations are now being measured to compare with groundwater levels, which should help understand their interconnection.



3. Daglingworth Stream & Gumstool Brook Flows

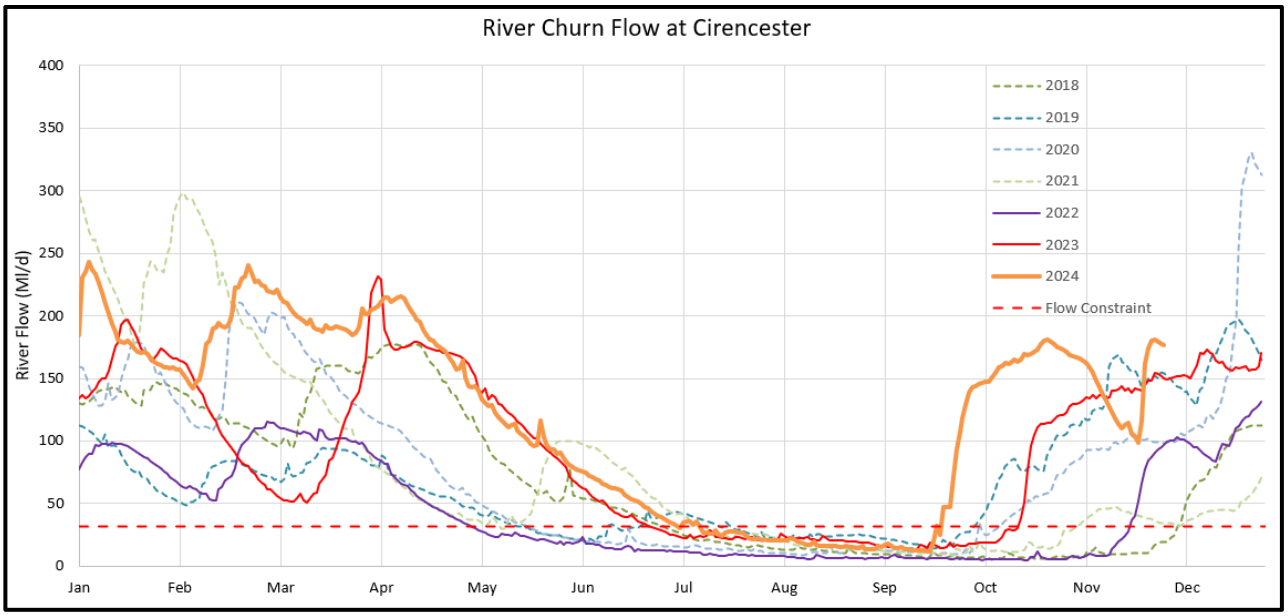
As a result of the exceptionally wet September and groundwater level increases in the Great Oolite and Gravel aquifers, significant flow was recorded in the Gumstool Brook, i.e. the Daglingworth Stream along Riverside Walk, and the Balancing Stream. Flows fluctuated during October and November in response to an extended period of dry weather followed by the intense rainfall during Storm Bert. At the end of November, flow in the Gumstool Brook appears normal for the time of year. To help understand the relationship between groundwater, stream flows, rainfall and Gloucester St sluice operation, monitoring of water levels in watercourses adjacent to wells in the shallow Gravel aquifer has commenced.

Citizen science tracking of flow in the Daglingworth Stream between Daglingworth and Stratton has continued. This is a section of the stream that can dry up, but has been flowing continuously at School Hill and Barn Way, Stratton since the end of September. At the end of November, with exceptionally high groundwater levels in the Great Oolite aquifer, significant flow is expected to continue. Assessment will continue of the complex relationship between stream flow, groundwater levels and runoff from the land during intense rainfall events.

4. River Churn Flow

As can be seen from the graph below, flow in the River Churn at the EA Cirencester gauging station responded rapidly to the exceptional September rainfall, increasing to 128 million litres per day (Ml/d). Flow continued to increase, reaching a peak of 180 Ml/d towards the end of October. With the dry weather at the end of October continuing well into November, flow in the River Churn decreased steadily over a period of 4 weeks to 98 Ml/d. In response to rainfall during Storm Bert towards the end of November, flow in the Churn again increased rapidly to just over 181 Ml/d in the space of 5 days, decreasing slightly to just over 176 Ml/d at the end of the month. These trends in river flow follow those recorded in the Great Oolite aquifer, with the exceptionally high groundwater levels at the end of November corresponding with the Churn flow being higher than is normally expected for the time of year.

With the River Churn flowing higher than expected for the time of year, it continues to be much higher than 32Ml/d. This flow rate is the River Churn 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 recommence until early November following a period of maintenance, but it has been operational since then.

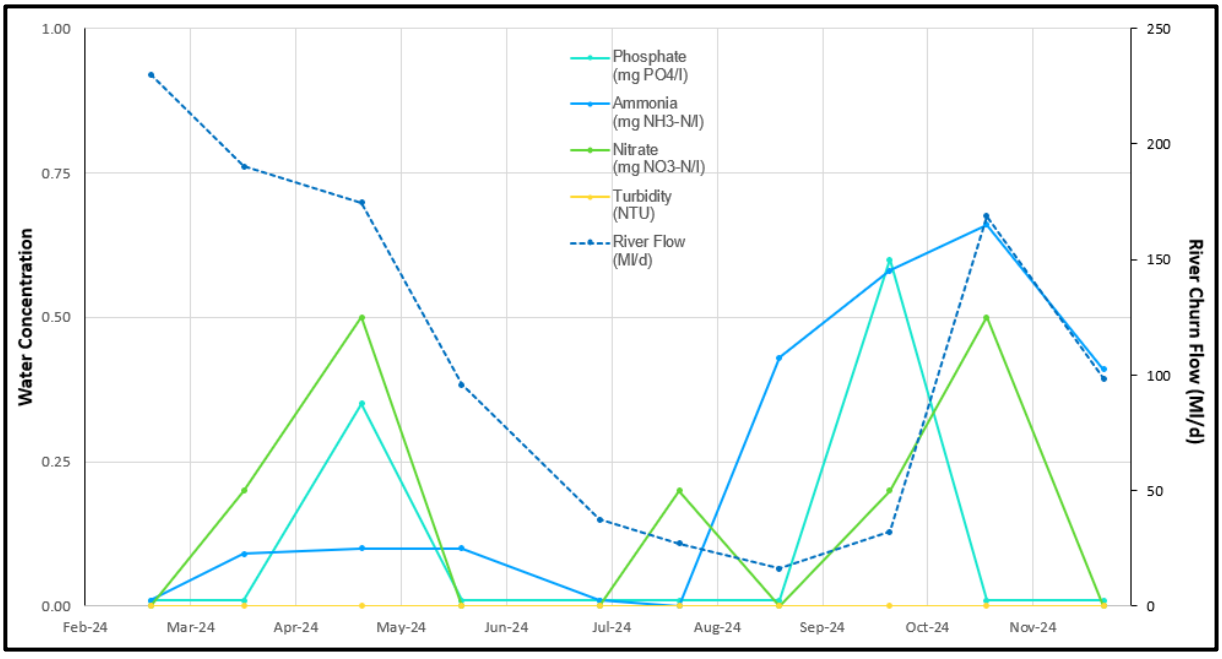


5. River Health

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 out monthly monitoring 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. Results initially showed 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, but also evidence of more persistent increasing trends in ammonia and nitrate from summer into early autumn, which 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 flow in the River Churn 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. As the November monitoring preceded Storm Bert, short term impacts from increased river flows are unlikely to be detected in the next round of monthly monitoring. Although the nutrient concentrations are not particularly high, they will continue to be tracked.

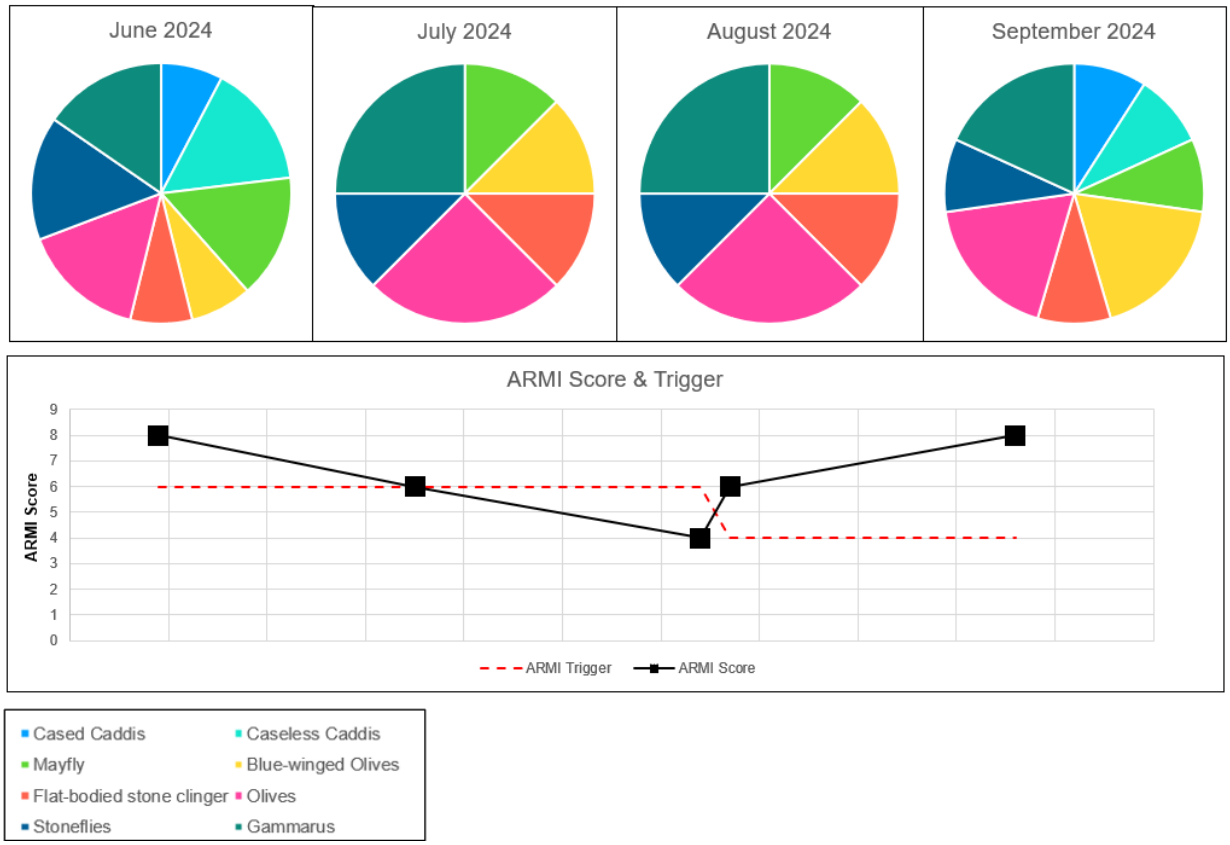


b) Riverfly health

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 in October or November 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 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

Cirencester Wildlife Group (CWG) has carried out a more extensive river survey within Cirencester and issued an extensive report including recommendations for environmental improvement. This report has been issued to the FoGB website in November and shared with other stakeholders for further discussion.

FoGB volunteers have continued 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

The Daglingworth Stream in the Duntisbourne valley down to Daglingworth village has stayed at a normal 'flowing' level during November similar to the previous month.

The flow in the Daglingworth Stream south of the Daglingworth area has increased during November and is at a 'high flow' level from Wellhill Copse through to Barton Mill.

The flow in the River Churn reduced during November to around 98 Ml/d then increased to a peak of just over 181 Ml/d towards the end of the month, subsequently decreasing slightly to around 177 Ml/d on the 1st December when the photographic record was taken.

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

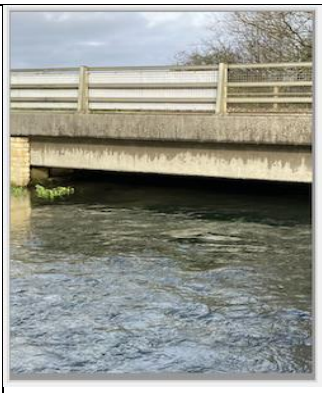
The River Churn and Gumstool Brook have experienced high flows through the town with debris building up at a few bridges. Downstream of the confluence of its two branches, the River Churn continues to overspill onto its floodplain in the area alongside the old Cricklade Road.

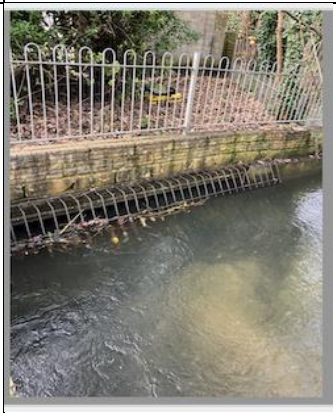
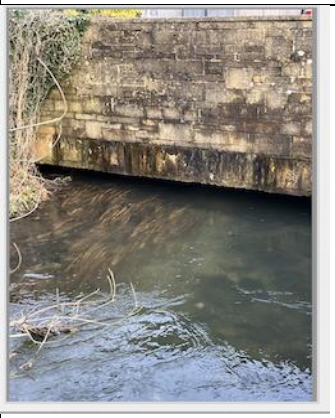
The following set of monitoring pictures was collected on the 1st of December 2024 to record the status of the Daglingworth Stream and River Churn in the Cirencester area.

1a. Daglingworth Stream upper source north of Duntisbourne Abbots. The stream channel is muddy and there is some standing water on the upstream side of the road. Downstream of the road, there is a small flow from surface water runoff.	 	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 4 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 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 the underside of the private stone footbridge.		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 outside of its banks. At the footpath stile the stream has a normal flow and the water is clear.	 	9. Daglingworth Place ford, Daglingworth Stream. A high 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 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 high flow similar to that at Grange Farm.	
12. Stratton End (private road), Daglingworth Stream. There is a very high flow in the stream. The pool downstream of the bridge has clear water which is overspilling into the adjacent field.		13. Barn Way bridge, Daglingworth Stream. There is a high flow of very clear water in the channel.	

15. Footpath at Lower Stratton, Daglingworth Stream. The stream is flowing at a high 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 high flow of clear water is observed.	
16b. Daglingworth stream at Barton Lane downstream of Bathurst Estate boundary wall. A high flow of clear water is observed.		17. Gumstool Brook balancing stream at sluice gate. The stream is flowing with clear water.	
18. Gumstool Brook adjacent to the swimming pool on Riverside Walk. The stream has a high flow, and less vegetation is present.		20. Gumstool Brook at Thomas Street culvert trash screen. A large amount of vegetation was cleared in the preceding 1-2 days	
22a. Balancing Stream behind Salvation Army. The stream channel is flowing almost full, with clear water.		22b. Balancing Stream at Powell's School looking upstream to Salvation Army The stream is flowing with clear water.	

22c. Balance Streaming at Powell's School looking downstream to trash screen. There is a steady flow, with less vegetation in the stream following significant recent vegetation clearance from the trash screen by the site manager.		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.		24a. River Churn measuring gauge on Glos St bridge. Water level is 0.34m (3.4 on gauge)	
24b. Glos St bridge looking downstream towards the Mill Pound. There is a steady flow with much vegetation still present.		25. Mill Pound Overflow (New) There is a high flow from the new overflow.	
25. Mill Pound Overflow (Old) There is water visibly flowing from Mill Pound old overflow. The surrounding field has standing water.		27. Barton Mill Footbridge Measuring gauge. Water level is 0.36m (3.6 on gauge)	
27a. Mill Pound upstream of the 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.		34a. River Churn downstream side of Gooseacre Lane bridge The river has a high flow.	
35. River Churn north of Spitalgate Lane bridge, looking upstream The river has a high flow, with flooding onto its floodplain having occurred.		35b. River Churn, looking downstream towards Spitalgate Lane bridge There is a buildup of debris at bridge	
36a. River Churn at Hereward Road trash screen. There is a significant flow into the culverted stream feeding to the Abbey Lake.		36b. River Churn upstream side of Hereward Road bridge The stream has a high flow.	
37. Churn flowing into Abbey grounds Lake is flowing onto its floodplain at various places in the Abbey grounds.		38a. Weir at outlet from Abbey Lake. High flow with the weir almost drowned.	

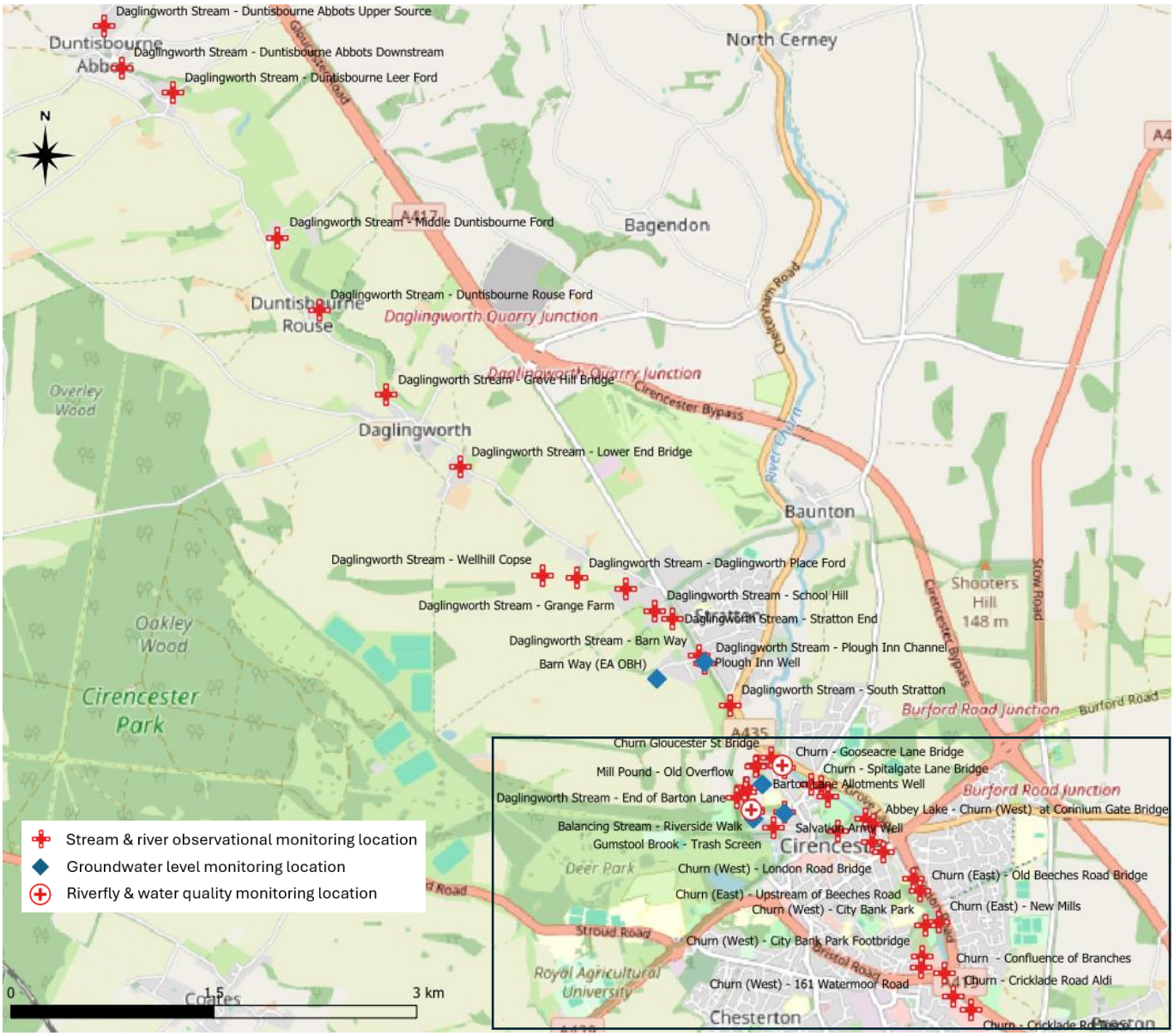
38b. Footbridge at downstream stream outlet from Abbey Lake. There is a clear high flow.		39 Abbey Lake outlet stream in Corinium Gate looking upstream. There is a clear high flow.	
39 Abbey Lake outlet stream at Corinium gate bridge looking downstream. The stream has a high flow.		40. Gumstool Brook culvert outlet in Abbey grounds. There is a high flow of clear water, and some debris in the trash screen.	
41a. Gumstool Brook – Looking upstream to Abbey grounds There is a high stream flow.		41b. Confluence of Gumstool Brook (Daglingworth Stream) & Churn outflow from Abbey Lake in Waterloo car park. The stream has a high flow.	
42. River Churn (West), south side of London Rd Bridge looking upstream. The stream has a high flow.		42a. River Churn (West), looking downstream from London Road bridge. The stream has a high flow.	

43. River Churn (East) upstream of Old Beeches Road Bridge. There is a medium flow.		44. River Churn (East) at Old Beeches Road Bridge, looking downstream to the road bridge. The stream has a high flow.	
45. River Churn (East) Overflow from New Mills The overflow has a high flow.		46. River Churn (West) weir at City Bank Glade The stream is flowing fast.	
46a. City Bank Park - Furnes Hole overflow from New Mills Pound to River Churn (West) Some pooled water and mud is present.		47. River Churn (West) at City Bank Park footbridge The river has a high flow.	
48. River Churn (West) Brook at Watermoor Point. The river has a high flow.		49 River Churn at Cricklade Road (opposite Aldi) The river has flooded onto its surrounding floodplain.	

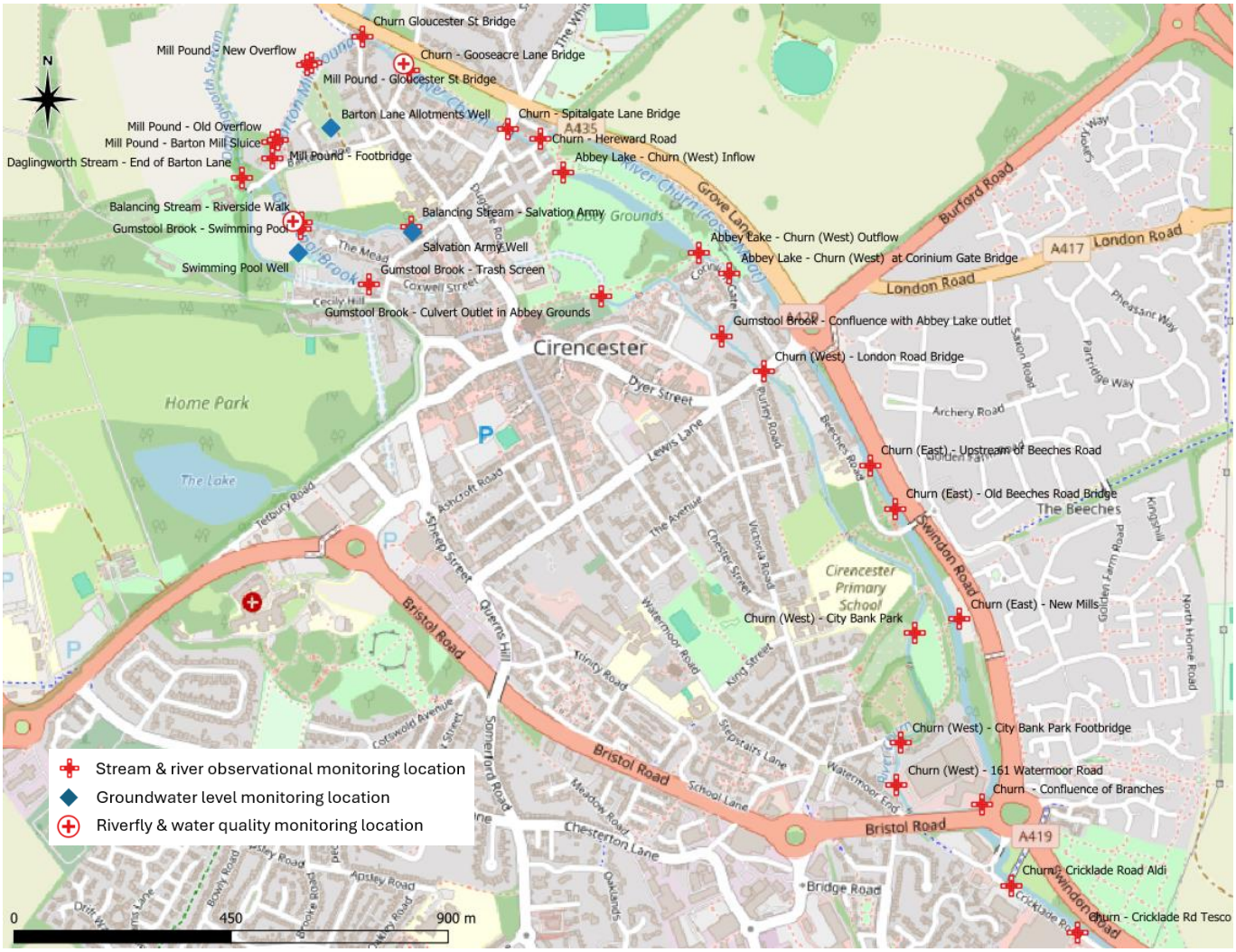
50. River Churn at Cricklade Road (opposite Tesco) The river has flooded onto its surrounding floodplain.			

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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