Groundwater Impacted System Management Plan

Bourton-on-the-Water, River Windrush

January 2021

Version control

Version	Date	Amendment	Author	Checked	Reviewed
1-d1	Nov 2020	Draft for EA	NW and AJ	DJ	APH
1-d2	Jan 2021	Final Draft for EA	DJ	APH	JO
1-V1	Jan 2021	Version 1	DJ	APH	JO
1-V2	July 2021	Update to introductory text and infiltration potential figures	DJ	APH	JO
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Annual Update 2021	October 2021	Addition of the Annual Update 2021	DJ	APH	JO
Annual Update 2022	October 2022	Addition of Annual Update 2022	MB/JH	DJ	DJ
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Annual Update 2024	October 2024	Addition of the Annual Update 2024	MW/CW	DJ	DJ
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Introduction

This document sets out Thames Water's approach to the management of groundwater infiltration in sewerage systems where the influence of groundwater infiltration is viewed as significant likely leading to the sewerage system, on occasion, to become overwhelmed.

All sewerage systems combined and separate will experience some groundwater infiltration[1] and a nominal allowance in design will be made for this. However, in some catchments the impact of groundwater infiltration can be considerable leading to impacts on service during periods of high groundwater, typically during the winter.

Groundwater can enter the sewerage system through the pipes and manholes, this may occur at a defect (crack, hole, displaced joint) or on a normal joint on the sewer or in the manhole. A key point to note is that where infiltration occurs it is not necessarily an indicator that the sewer is in poor structural state simply that jointing techniques used are not completely watertight.

Ingress of groundwater is not limited to the public system that Thames Water owns and maintains but potentially the private drains, manholes and sewers that connect to our system.

Preventing and reducing the impact of groundwater infiltration is predominately achieved through the lining of sewers and sealing of manholes. This entails the application of a synthetic liner within the pipe that creates a contiguous membrane for the length of the pipe or possibly section if the source of ingress can be narrowed down. For manholes it will typically entail sealing in a similar manner.

To line all sewers and manholes within most catchments would be prohibitively expensive to do so. Our approach to date has been centered on a 'find and fix' basis which has involved monitoring and investigating the networks in periods of high groundwater to identify sources of ingress and fix as we find them. This approach is constrained for the reason that investigations are typically limited to periods of high groundwater and when high groundwater occurs there are limited windows of time in which investigations can be successfully undertaken before flows either subside or the system is fully surcharged meaning CCTV surveys are not possible[2]. Once sections of sewers have been lined, it will be a case of waiting until high groundwater levels reoccur to assess the effectiveness of the work undertaken, which may not be the subsequent winter but several years later.

It is recognised that the 'find & fix' approach to date lacks a degree of certainty of resolution and for this reason Thames Water in 2020 undertook a different approach for long term management of groundwater, which is covered within this

1 Sewers for Adoption makes an allowance for 10% of peak wastewater flow to allow for unaccounted flows such as groundwater infiltration.

2 On occasions it is possible to over-pump between manholes to isolate sections of sewer to survey, this is not always feasible when the flows involved are simply too great to over-pump or the location prohibits this approach.

document under the plan section. These plans require significant investment which Thames Water will seek to secure through the price review process as service enhancement. In the meantime, we will continue to investigate sources of infiltration when it occurs and where feasible, undertake the work through our capital maintenance budgets. We refer to these as 'minor works' opportunities i.e. where we have high degree of certainty of reducing point sources of infiltration and can do so with reasonable costs and time.

The structure of this document has been created with input from the Environment Agency. Sections covered in this document include our 'Outline Plan' with timescales, Mitigation i.e. how we intend to manage the risk until our plan is fully implemented and when we will publish future updates on progress against this plan.

Brief description of Bourton-on-the-Water catchment

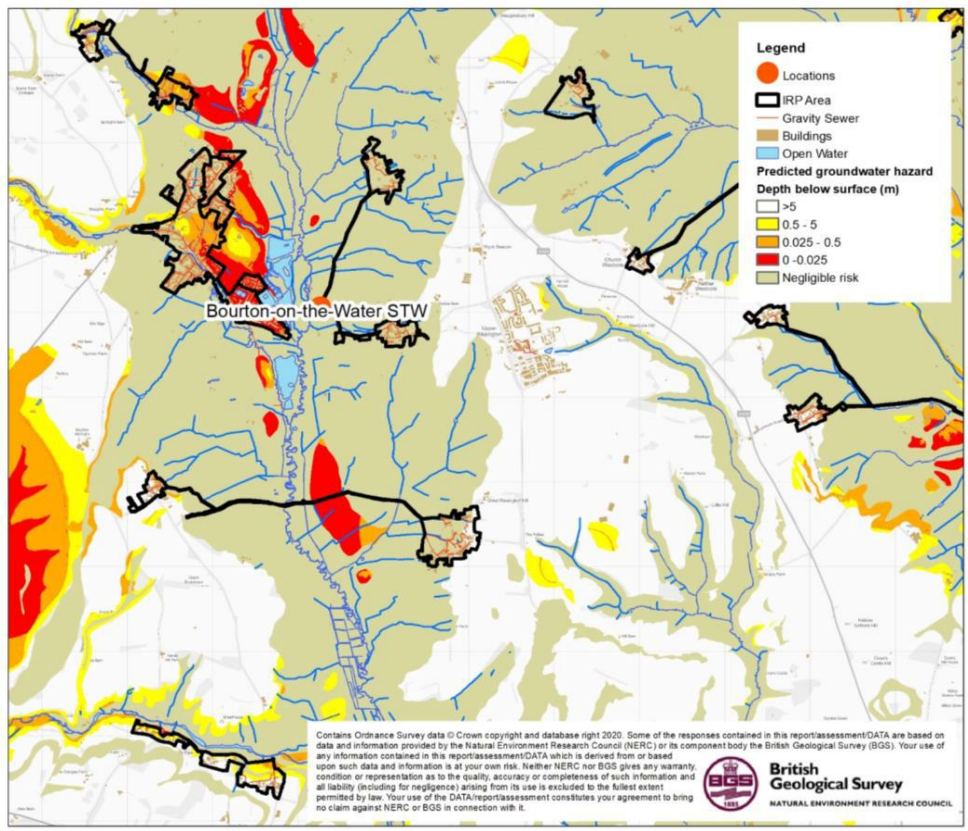


Figure 1.0 – Bourton-on-the-Water catchment

Bourton-on-the-Water lies on the River Windrush in Gloucestershire, England, 4 miles South of Stow-on-the-Wold and 14 miles East of Cheltenham. Bourton-on-the-Water serves a population equivalent[3] of 4,790 with a predominantly separate sewerage network totaling some 41 km in length excluding private drains and sewers. The extent of the catchment is shown in Figure 1.0 above.

Problem Characterisation

Groundwater has potential to enter our sewers when levels are high which reduces their capacity and increases their risk of the network becoming overwhelmed. There's a strong link between the rising river levels that cause rising groundwater levels, particularly adjacent to the River Windrush, and the drainage issues some of our customers have experienced, including sewer flooding and restricted use of their toilets and bath- rooms.

[3] Population equivalent based on unit per capita loading (PE), in waste-water treatment is the number expressing the ratio of the sum of the pollution load produced during 24 hours by industrial facilities and services to the individual pollution load in household sewage produced by one person in the same time.

In recent years the foul sewerage system in the Bourton-on-the-Water catchment has become overwhelmed for weeks or even months at a time, following prolonged and heavy rainfall and raised groundwater levels. This has resulted in certain properties suffering from sewer flooding and restricted toilet use. The sewerage system is identified on the public sewer records as being a separate foul system, rather than a combined system. It should therefore, in theory, only be accepting foul drainage rather than the combination of foul and surface water, however, there are a limited number of public surface water sewers in the area.

Key to managing the flood risk to properties in the area is a permitted land treatment area and overflow to the River Windrush which is situated on the network upstream of Bourton-on-the-Water SPS (Sewage Pumping Station). This permitted overflow from the network is located to the south of Bourton-on-the- Water and takes excess flows approximately 800m downstream to a land treatment area before discharging them to the River Windrush. On occasions, where the incoming flow has exceeded network capacity for sustained periods, the land treatment area is utilised and spill to river has occurred on both wet and dry days.

The permit for the overflow to the Land Treatment Area states: *"The discharge shall only occur when and only for as long as the flow passed forward is equal to or greater than the overflow setting indicated due to rainfall and/or snowmelt'.*

We believe that the foul system has surcharged historically because of a combination of groundwater infiltration, surface water run-off from saturated fields, surface water inundation from highways and public spaces, surface water misconnections and flooding from the River Windrush.

Leak detection and CCTV surveys of the local sewer network have identified issues and defects at, or near, Victoria Street, Clapton Row, High Street, Upper Slaughter and Lower Slaughter where unwanted flow is entering the sewer network. Sewer defects in the main sewer located in Victoria Street have been repaired and the sewer relined with watertight material, significantly reducing the amount of groundwater entering our network.

The root causes of sewer surcharges are therefore numerous and resolution of issues complex, requiring all stakeholders responsible for drainage in the catchment to work together to resolve them. The Bourton-on-the-Water STW includes a balancing tank to handle excess flows above the flow to full treatment during storms, which returns the flows to the filter distribution chamber for treatment.

In recent years the problems associated with wet weather events and high groundwater levels have led to surcharging sewers causing spills out of many public manholes and restricted toilet use, pollution caused by surcharging sewers, and a burst rising main (Lower Slaughter sewage pumping station).

The Flood and Water Management Act 2010 places a responsibility on Lead Local Flood Authorities (LLFAs), to manage flood risk from surface and groundwater, plus a duty on all Risk Management Authorities (RMAs), to cooperate regarding flood risk. In our role as an RMA, Thames Water will work with Gloucestershire County Council as lead

local flood authority, Gloucestershire County Council and Cotswold District Council as planning authorities, and the Environment Agency to ensure that a collaborative approach can be developed to address the problems.

Thames Water also has a statutory obligation to comply with environmental legislation. The Water Framework Directive establishes a strategic approach to managing the water environment, which the Environment Agency achieves through River Basin Management Plans and setting environmental objectives for groundwater and surface water. The environment is also protected from adverse effects of discharges of urban wastewater through the Urban Wastewater Treatment Directive, which requires us to improve and extend the sewerage system according to section 94 of the Water Industry Act (1991).

Anticipated unavoidable discharges

Within recent years there have been unavoidable sewage escapes in the network as a result of surcharging manholes.

We anticipate that this situation may continue until such time we are able to implement a long-term solution. No mitigation in the form of temporary overflows has been undertaken in this system.

General outline plan & timescale

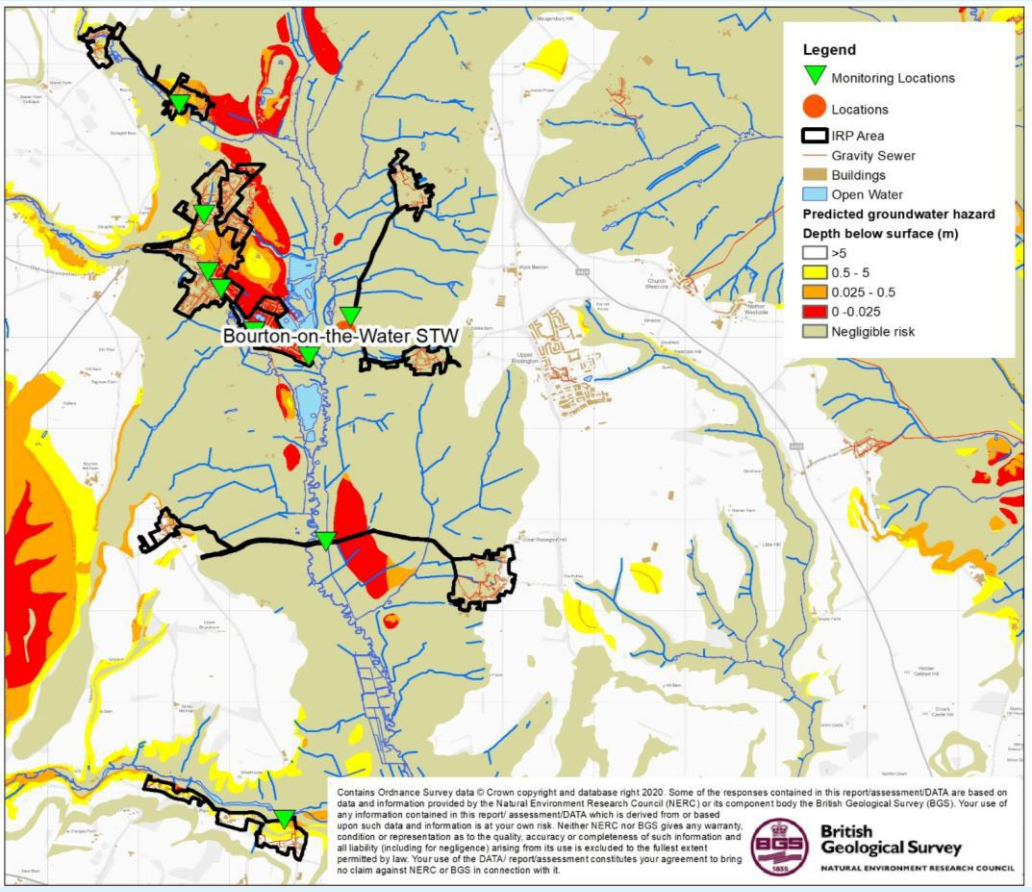


Figure 2.0 – Bourton-on-the-Water monitoring and infiltration zones

Key to bringing the impact of groundwater infiltration under control will be an enhanced monitoring regime. We have identified and have installed several telemetered depth monitor locations around the Bourton-on-the-Water system – see Figure 2.0.

Complementing the flow [at the treatment works] and depth measurement [in the sewer network] we will use pumping station run time data, rainfall data, river level data, and groundwater level data to create a full picture of movement and source of flows around the catchment.

Zones of Groundwater Risk

We engaged with JBA Consulting to develop plans for Bourton-on-the-Water that identify zones of groundwater risk, see Figure 2.0. These zones are modelled areas where the groundwater has been determined to be above the sewer and hence pose a potential risk for groundwater ingress.

The sewer depth monitors referred to earlier are being sited in and around these zones to verify and calibrate the risk in each of the zones.

If following the proposal to the sealing in part or wholly[4] of the high-risk zones, should it be required, the system is found to be still experiencing excessive infiltration we would then look to potentially seal 'private' laterals and/or drains along with starting to seal the medium to low-risk zones.
This document sets out an unconstrained approach to resolving the impact of groundwater infiltration within the system.

Investment to address infiltration will be assessed and prioritised against other drivers e.g. STW upgrades, both in the catchment and across the region at each price review.

With this plan we remain committed to minimising the impact of groundwater on the sewerage system in Bourton-on-the-Water.

Our general medium-to-long-term plan is therefore to apply a hierarchy to sealing the sewer as follows:

Activity	When	Description
Model Zones	2020/21	JBA have been engaged to undertake modelling activities to identify the areas to be targeted for sealing in the 56 systems identified as being impacted by infiltration.
Install monitors	2020 to 2023	Monitors installed in the zones to help calibrate and validate the zones. Each year completeness / coverage monitors will be reviewed and added to / or modified, as necessary.
Calibrate zones	Refined each year	Following each winter, we intend to review the data from the monitors and if necessary, redefine the zones.
Look & Lift	Each winter	The look & lift surveys have two purposes, firstly to complement the monitoring and secondly to identify 'quick fixes' that we would address through our normal capital maintenance.
CCTV	2020-2023	Required to confirm sewer condition and provide information to assist with costing any sewer lining.

[4] Decisions regarding the extent of sealing will be based on outcomes of works undertaken to date, result of monitoring and successful submission of our plans for investment.

Activity	When	Description
Minor works	2020-2023	As mentioned, if we detect minor works being required, we would look to resolve these as and when we find them.
PR24 / Price Review	2023/24	Ideally through monitoring and on-going investigations work towards managing the infiltration risk, in AMP7, will be successful. However, in the absence of evidence justifying the need not undertake sealing of the high-risk zone this is to be included as part of PR24 investment plan. This work will be subject to Cost Benefit Analysis and Best Technical Knowledge Not Entailing Excessive Cost (BTKNEEC) assessments.
High risk zone sealing	2025-30	Sealing of high-risk zone undertaken subject to need being demonstrated.

Bourton-on-the-Water Infiltration Management Plan

As detailed above infiltration causes a range of issues.

As part of our current investment plan, we have projects to increase the flow to full treatment Bourton-on-the-Water STW and storm tank capacity at the last line overflow upstream of the STW. This work is programmed to be completed by 31/03/2023.

In the intervening period we intend to continue to monitor the network for potential sources of infiltration that may improve the performance prior to upgrade of the sewage treatment works and reduce the frequency of spill to the consented land treatment area and River Windrush.

High level approach statement

For Bourton-on-the-Water our approach to tackling infiltration will be undertaken as follows:

1. Our programme for implementation of the upgrades to Bourton-on-the- Water STW and the last in line overflow is completion by 2023.
2. In parallel to the progression of the STWs solution to deal with the infiltration received we will investigate the network with a view to identifying sources of ingress of infiltration that are cost effective[6] to address. To investigate the network, we/will:

- Have undertaken a desktop analysis to determine infiltration high to low-risk zones (October 2020);
- Installed additional monitoring to back up the analysis and to aid focusing of locations for identification of infiltration (2020 to 2023). Each year we will assess the completeness of monitoring and if required add to or modify the current locations.
- Undertake sample CCTV in the high to low-risk zones to assess the general asset health of the sewers and manholes (ongoing).
- Review results of Winter 2019/20 and 2020/21 with historic data to build up evidence to support interventions in the network (Summer 2021).

3. If significant investment is identified as being required, then this will need to be considered in terms of relative need compared to other systems being investigated for infiltration reduction. However, where viable op- portunities are identified these will be included in our AMP9 (2030-35) pro-gramme of investment. Significant investment needs may need to be included in our future investment cycles.

6 Assessment of cost effectiveness is based on assessment of the ratio of the cost of a solution to the monetised benefit gained from implementing the solution i.e. reduction in flood/pollution risk and/or reduced operating costs.

Investigations

As mentioned above JBA Consulting have been supporting by undertaking an exercise involving assessing groundwater elevation data to determine which areas of the network are potentially below the groundwater table during high groundwater periods.

Site investigations undertaken by Dene- Tech and our Customer Field Services (Thames Water Operations) have included 'look & lift' surveys, CCTV and where necessary dye tracing to confirm connectivity.

A table of the work undertaken is included in the appendix to this report.

Monitoring

Sewer Depth Monitors will be installed in the catchment in 2020/2021 (see Figure 2.0). These devices are telemetered and provide real time data on the level of flow in the sewer. The purpose of these units is to act as alerts for high groundwater impact in the sewer, calibration of the zones of infiltration risk and to demonstrate benefit gained from work undertaken to reduce infiltration.

To provide evidence in the future of further need to manage the impact of infiltration.

Mitigation

On occasions to avoid flooding of properties or to manage the risk of damage to the environment we may undertake tankering from (manholes) points on the network, make use of pumps to manage flows or deploy settlement tanks to part treat sewage before release to the environment.

With regard to Bourton-on-the-Water we do not envisage needing to undertake mitigation work within the network.

Updates

Work on the Groundwater infiltration management plan will continue, and we will aim to provide updates annually by the end of October each year.

Appendix

Investigations & remedial work undertaken since 2019/20 and future plans

The three tables summarise the findings of the survey and implementation work identified in the 2019/20 period. The final table summarises our current known plans for remediating groundwater infiltration issues.

No new surveys of the sewer network have been completed for the area during this period, as the groundwater conditions were not suitable to identify infiltration points. Surveys will be prioritised for Winter 2020/21 where groundwater conditions allow. The table below presents a summary of the JBA groundwater infiltration analysis which identifies the sewers and manholes which are likely to be vulnerable to groundwater infiltration.

Sewer Length by Groundwater Infiltration Risk Zones

Risk category	Description	Length (km)	Percentage
High	Predicted groundwater extreme >1m above pipe invert	7.45	20.6
Medium	Predicted groundwater extreme 0-1m above pipe invert	0.96	2.7
Low	Predicted groundwater extreme 0-1m below pipe invert	1.73	4.8
Very Low	Predicted groundwater extreme >1m below pipe invert	25.97	71.9
Total		36.11[6]	100.0

In addition, the table below presents the surface water flood risk classification for manholes within the catchment

Manholes by Surface Water Inundation Risk Category

Risk category	Description	Number	Percentage
High	Inundation risk in 3.3% AEP fluvial or pluvial event	128	11.8
Medium	Inundation risk in 1% AEP fluvial or pluvial event	66	6.1

[6] Total of sewer length is for length of mapped sewers only and will not include unmapped S105a transferred sewers in all cases.

Risk category	Description	Number	Percentage
Low	Inundation risk in 0.1% AEP fluvial or pluvial event	122	11.3
Very Low	All other manholes	765	70.8
Total		1,081	100.0

2019/20 Implementation Works

Activities	Value	Comment
Sewer Lining Length (m)	1,185m	The focus of this period was investigations to identify the location of implementation works required.
Infiltration Points Targeted (no.)	44	
Manhole Sealing (no.)	1	

Future Works

	Priority 2020/2021	Known follow On Work
Survey	Lining due to be complete in 2019/20 was not fully completed (334m of leak tight lining still to be completed) out of the Drainage Strategy lining scope. We will be returning to locations in Bourton-on-the-Water in May 2021 to complete these planned works. Further survey is currently ongoing, results from this survey will be available in future iterations of this document.	
Sewer Lining		
Manhole Sealing – Infiltration Ingress		
Manhole Sealing – Pluvial and Fluvial Ingress		
Sewage Treatment Works Upgrade	See main text	

Glossary of terms

AEP – Annual Exceedance Potential

AMP – Asset Management Plan

CCTV – Closed Circuit Television

EA - Environment Agency

IRP – Infiltration Reduction Plans

MH – Manhole

STW – Sewage Treatment Works

WINEP – Water Industry National Environment Programme

Addendum – Annual Update 2021 Table of contents

Introduction

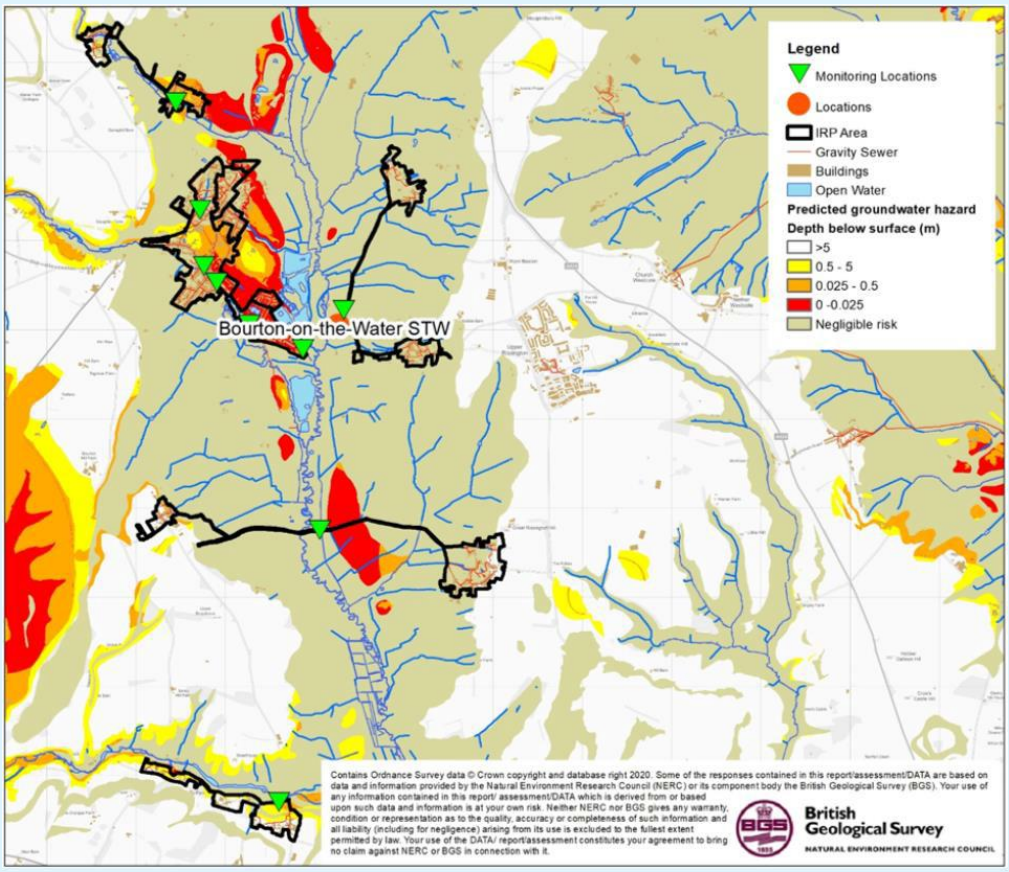


Figure 1 – Bourton-on-the-Water monitoring and infiltration zones

This addendum to the Bourton-on-the-Water Groundwater Impacted System Management Plan 2020 (GISMP) provides an update on performance/work undertaken in the period from September 2020 to September 2021 (the UK Hydrological Year [1]) key points covered include

Hydrological Conditions

How the sewerage system has performed over this period

Mitigation / remedial measures progressed over the last year and being planned.

Summary and next steps

[1] Happy New Water Year! | National River Flow Archive (ceh.ac.uk)

2020-21 Hydrological Review

This section summaries the hydrological conditions at Bourton-on-the-Water in the period.

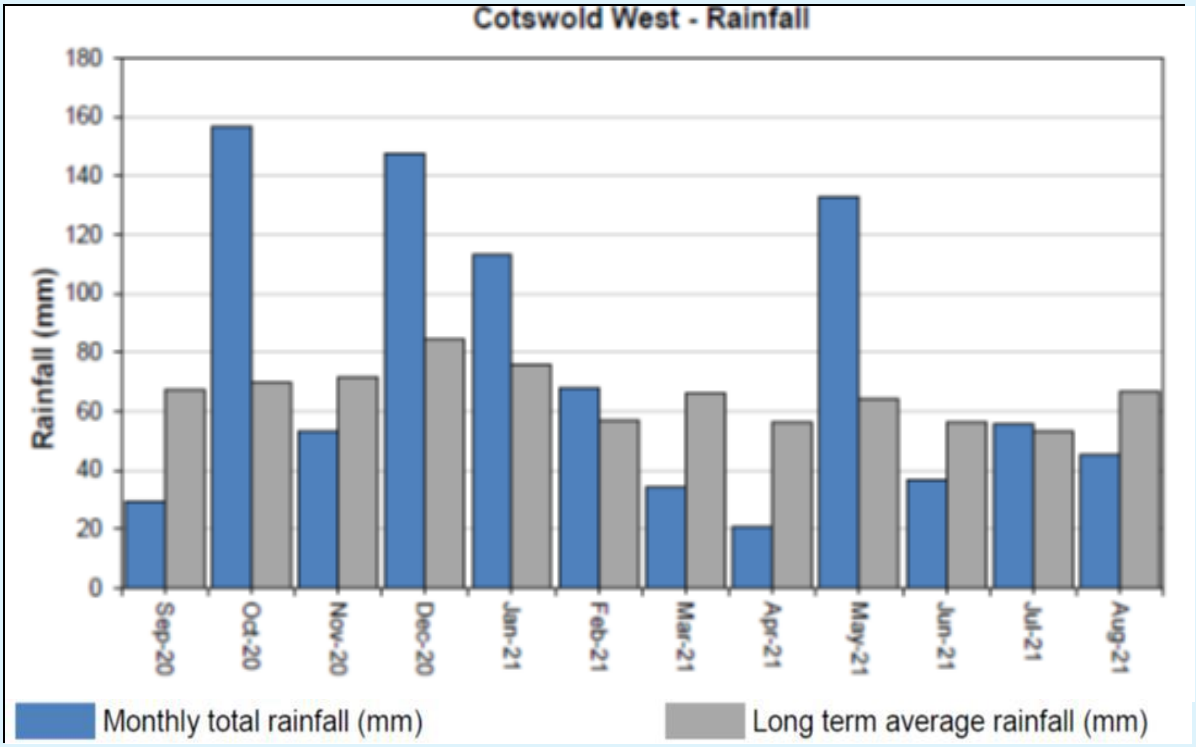


Figure 2 – Monthly rainfall depths local to the system

Bourton-on-the-Water is situated in the Cotswold West water resources area. Figure 2 shows the monthly rainfall total depths against the long-term average rainfall in the location of Bourton-on-the-Water over the period taken from the *Environment Agency Water Situation Report August 2021.*[1]

The graph indicates that monthly rainfall at times in the last year has significantly exceeded long-term averages, this was especially notable in the winter period.

Figure 3 shows the location of the British Geological Survey (BGS) monitoring borehole at Ampney Crucis which has been recording groundwater levels since 1959. Figures 4 and 5 show river levels in the River Windrush at Bourton-on-the-Water which are a good indication of the local groundwater levels over time. Figure 6 and 7 show the last two and ten years of groundwater level data overlain on expected ranges. This shows how recent groundwater levels have compared against the expected range, they show that generally over the last two winters groundwater levels have been notably higher, with the peak groundwater levels close to or within the exceptional high range.

[1] *Environment Agency Water Situation Report August 2021* *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1016481/Thames_Water_Situation_Report_August_2021.pdf*).

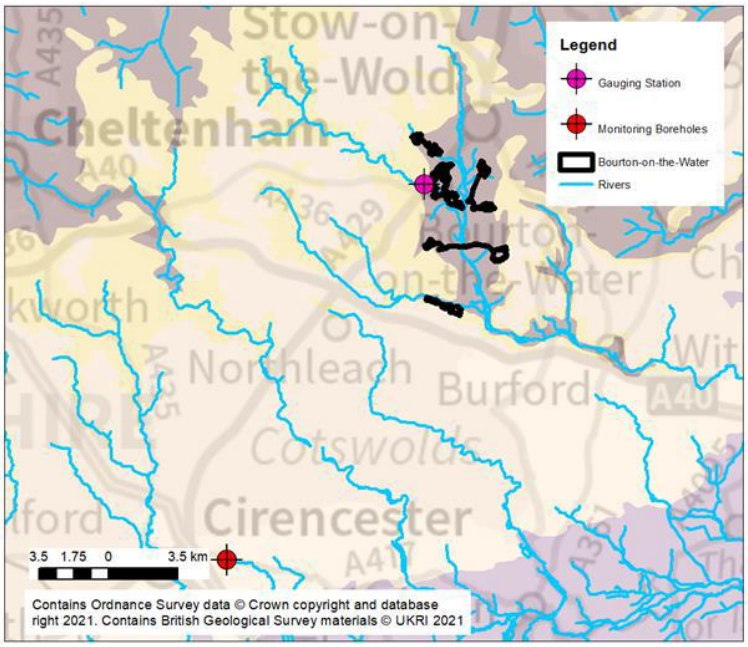


Figure 3 – Location of Ampney Crucis Monitoring Borehole Relative to Bourton-on-the-Water

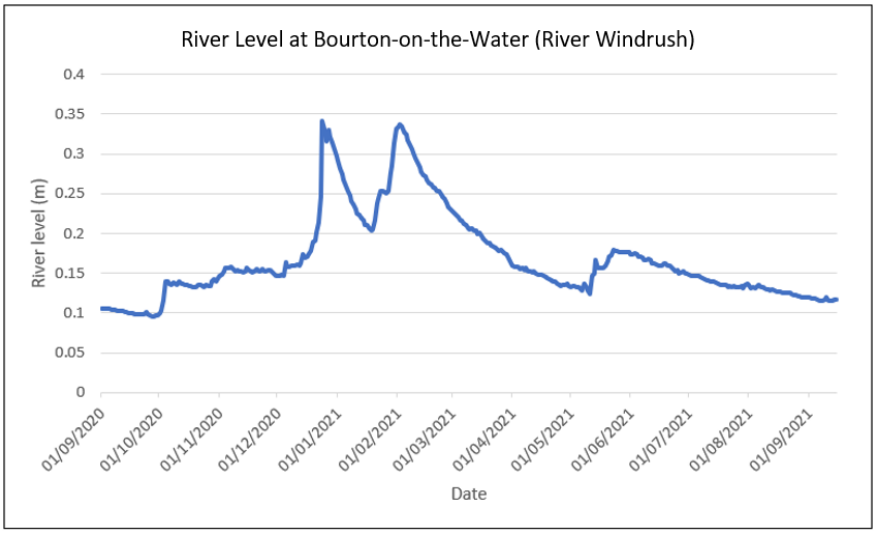


Figure 4 – 2020/21 River levels at Bourton-on-the-Water (River Windrush) – River Levels UK (riverlevels.uk)

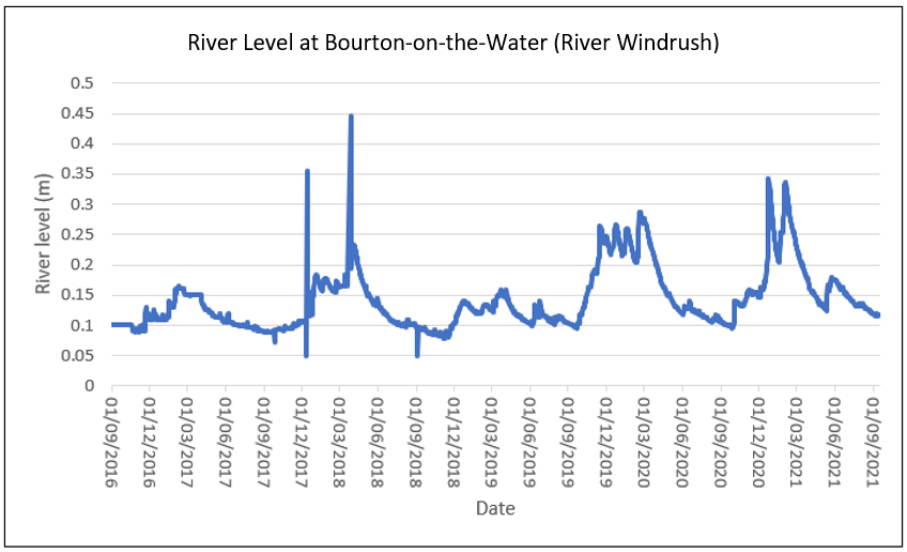


Figure 5 – 2016-2021 River levels at Bourton-on-the-Water (River Windrush) – River Levels UK (riverlevels.uk)

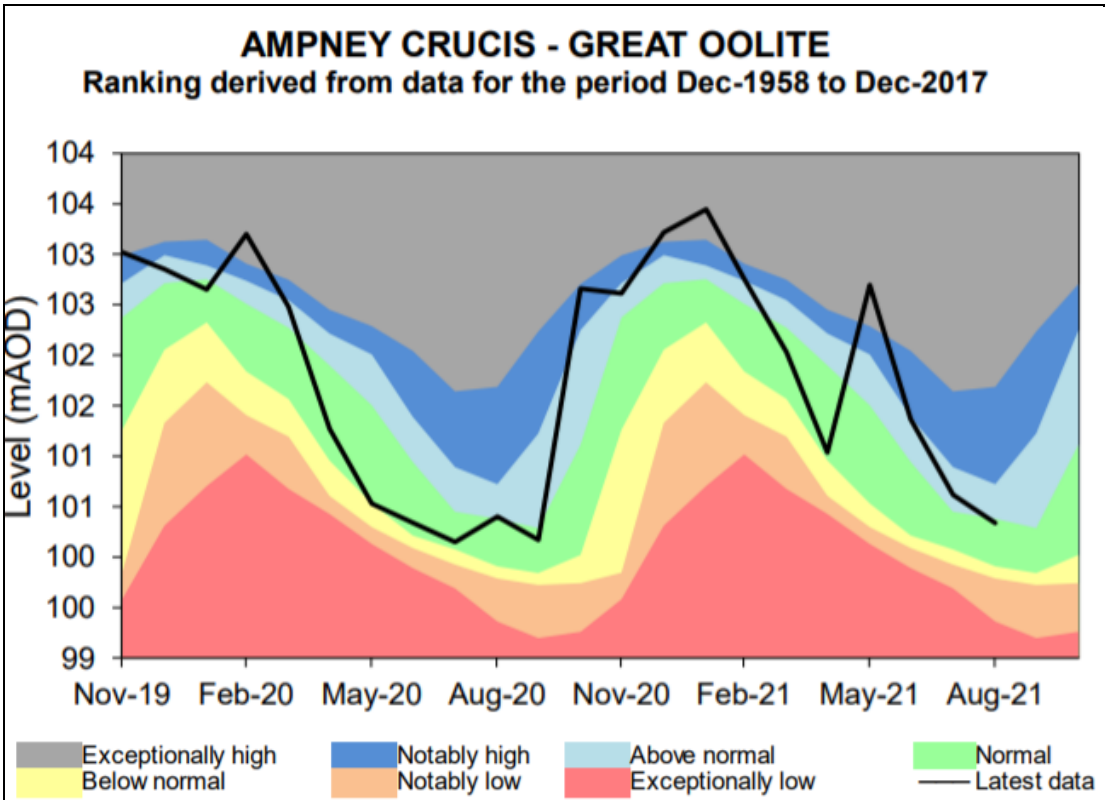


Figure 6 – 2019-2021 Groundwater levels at Ampney Crucis. (*Environment Agency Water Situation Report August 2021)*

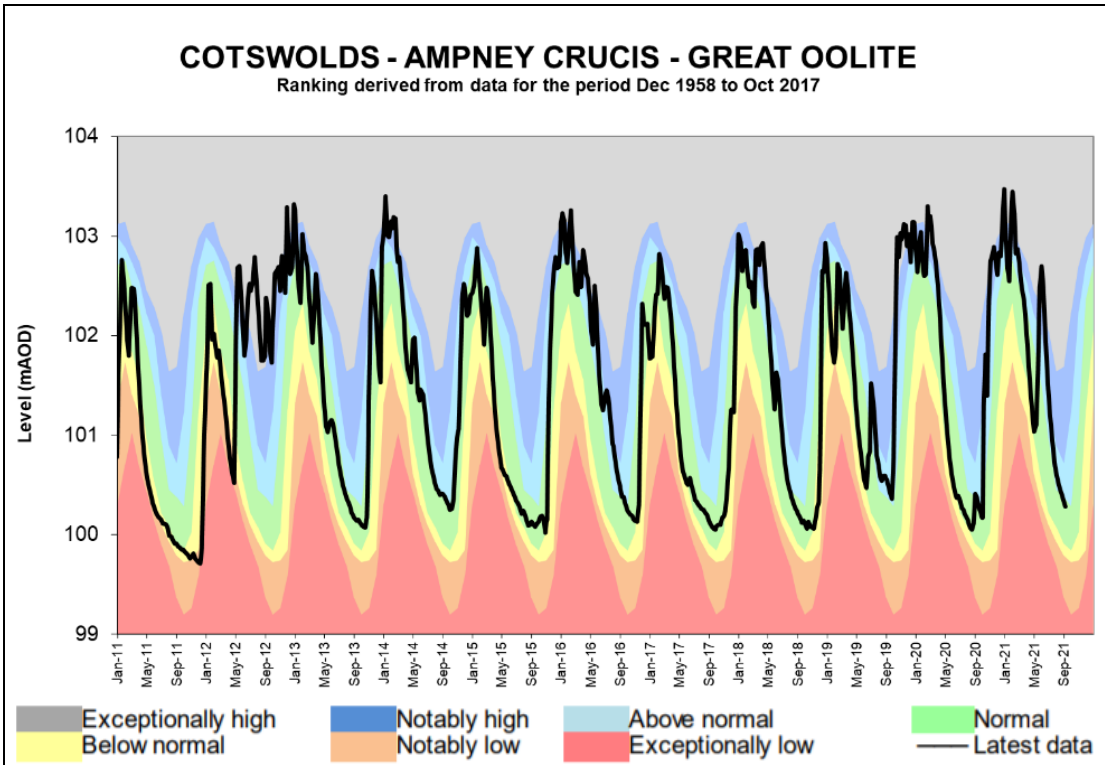


Figure 7 – 2011-2021 Groundwater levels at Ampney Crucis. (*Environment Agency Water Situation Report August 2021)*

(*Environment Agency Water Situation Report August 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1016481/Thames_Water_Situation_Report_August_2021.pdf*

Investigations & remedial work undertaken in the period and future work

The three tables below in summary provide an update on recent survey and remediation work undertaken during the period.

Additional Survey Statistics

Elements		Units	Value	Comment
Planned Survey (all)		m	2577	CCTv supported by Look and Lift surveys
Survey Completed		m	2465	
		%	95	
		Lengths (No.)	97	
Clear Flow Observed		m	2191	From above.
		%	85	
Sewer Infiltration Locations Identified	Infiltration Gushing	No.	0	These locations are in addition to the ones identified in the original report (2020).
	Infiltration Gushing at Joint		20	
	Infiltration Running		0	
	Infiltration Running at joint		16	
	Infiltration Dripping		0	
	Infiltration Dripping at joint		4	
	Infiltration Seeping		0	
	Infiltration Seeping at joint		0	
	Grand Total		40	

Elements		Units	Value	Comment
Manhole Infiltration Locations Identified	Infiltration around pipe	No.	0	These locations are in addition to the ones identified in the original report (2020).
	Infiltration through benching		0	
	Infiltration through chamber wall		0	
	Gushing		2	
	Running		10	
	Dripping		1	
	Seeping		0	
	Grand Total		13	
Monitoring Locations Active		No.	11	Existing telemetered sewer depth monitors
Details of other Surveys			-	

Remediation works in period

Activities	Value	Comment
Sewer Lining Length (m)	244m (a further 90m to be completed by November 2021).	Remaining work subject to site conditions being suitable.
Manhole Sealing (no.)	0	

Future works

Activity	Planned work in 2021/22	Known follow On Work
Survey	Surveying included for as part of the extensive lining planned in the area.	To be confirmed
Sewer Lining	5km of sewer lining to be undertaken as part of the Green Recovery Project. 15 sewer locations to be lined as a result of recent survey requested by Lower Slaughter Parish Council.	To be confirmed
Manhole Sealing – Infiltration Ingress	213 manholes for the Green Recovery project* 2 manholes as a result of recent survey requested by Lower Slaughter Parish Council.	To be confirmed
Manhole Sealing – Pluvial and Fluvial Ingress	176 manholes as part of the Green recovery project*	
Sewage Treatment Works Upgrade	As part of our current AMP7 investment plan, we have projects to increase the flow to full treatment at Bourton-on-the-Water STW and investment at the Land Treatment Area to improve water quality performance. This work is programmed to be completed by 31/03/2023.	

**Scope and procurement of this element of work is being finalised therefore final numbers to be delivered may change slightly.*

2020-21 Infiltration Review

This section looks at the impact of infiltration in Bourton-on-the-Water over the period.

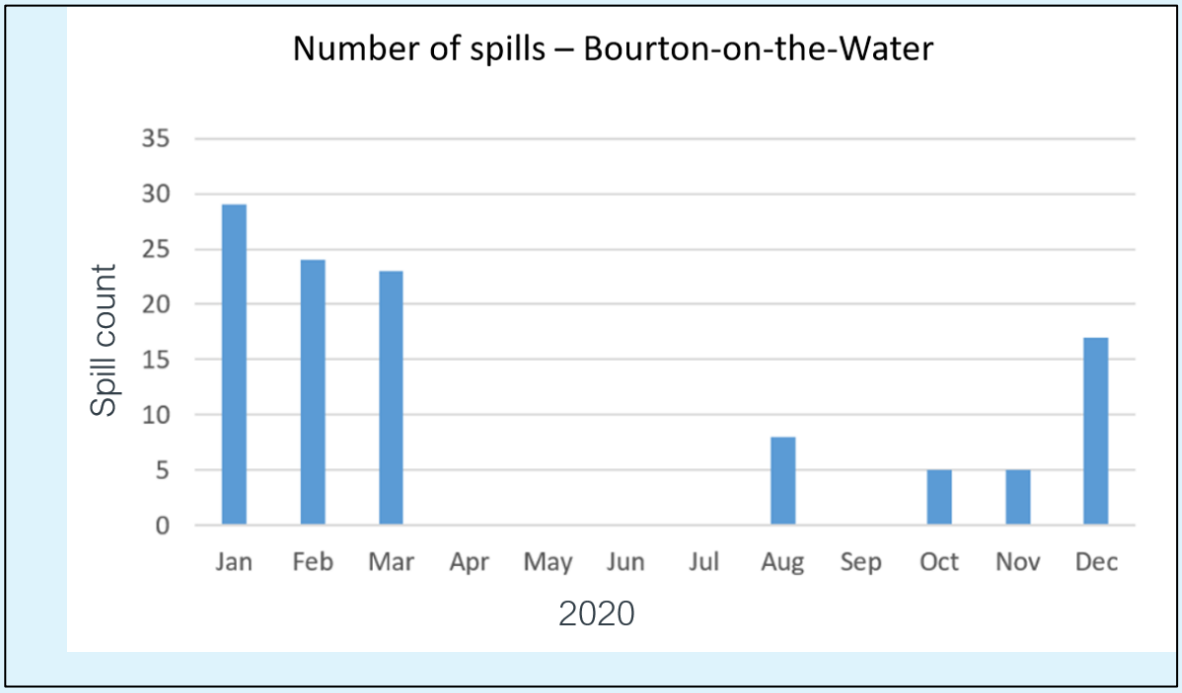


Figure 8 – Number of spills (discharge count) at Bourton-on-the-Water Land Treatment Area (taken from Event Duration Monitor (EDM) Data).*

Figure 8 shows the number of spills per month from the Bourton-on-the-Water Land Treatment Area (upstream of the STW where our storm permit for the system applies). January to March and December experienced the greatest number of spills. In the summer, with the exception of August, no spills were recorded highlighting the influence of groundwater infiltration/winter flows on the system. This Combined Sewer Overflow location has met the trigger for the EA's Storm Outfall Overflow Assessment Framework (SOAF) and is currently under further investigation with regards to root cause and impact.

Some parts of the system in Bourton-on-the-Water were impacted during the winter period, tankering was implemented to manage the risk of property flooding. There were also reports of riverbanks being breached and ingress into the foul system occurring in the public and private network in the Lower Slaughter area were this flood water overwhelmed the drainage system. Manhole sealing is being investigated in these locations.

*2020 verified and audited EDM data. before being published. 2021 calendar year data is awaiting verification

The Green Recovery

The Bourton-on-the-Water system has been selected to be the focus of an accelerated programme of work to reduce escapes/spills to the environment.

This programme of work is part of the Green Recovery involving additional investment beyond our AMP7 planned investment.

The focus in Bourton-on-the-Water in AMP7 is to reduce groundwater infiltration (to sewers), surface water inundation [pluvial and fluvial] from impacting sewers and mapping of both surface and foul sewerage systems to detect cross connections.

The upper reach of the River Windrush has been specifically selected such that any improvement in receiving river water quality as a result of this work should be easily identifiable. The pilot will be used to provide supporting evidence for expanding the approach to other systems and inclusion as part of building our future investment plans for AMP8 (2025 -2030) onwards.

A package of sewer lining, manhole chamber lining and manhole cover sealing borne out of the GISMP has commenced (pre lining surveys) and the full project is planned for completion in 2022.

Summary

In the reporting period, average monthly rainfall depths have tended to be above the long-term trends, particularly during the winter months. This has resulted in higher than typically expected groundwater levels and associated groundwater infiltration rates observed in the sewers. Whilst it is unfortunate that this has impacted performance of the sewerage system it has helped to provide valuable insight into where and how the system has been impacted, furthering our knowledge of the system.

During the reporting period further investigations have taken place and as we find defects allowing groundwater ingress, we have continued to remediate the defects to tackle the groundwater infiltration problem. Examples of such investigations are included below in the reference to the Lower Slaughter area.

Localised surveys carried out after additional insight from meeting Lower Slaughter Parish Council have identified several manholes and sewers that require priority remediation. Works have been approved at these locations and are being briefed to our delivery teams. These locations will be delivered in early 2022.

Bourton-on-the-water is one of a number of systems that Thames Water is investigating as part of a 'Green Recovery project'. Green recovery is about going further with remediating systems/ catchments to remove sources of unwanted flow that lead to the escape of untreated sewage as spills or causes of flooding. This work, which we are looking to use to evidence the benefits of such approaches in future investment plans, will see significant lengths of sewer lining undertaken as well as manhole sealing both below ground to protect against groundwater infiltration and manhole cover sealing to prevent ingress of surface water from above ground.

The permanent monitoring, we installed as part of the earlier investigations is to be used test the effectiveness of this remedial work. It should however be noted that as groundwater levels fluctuate year on year it may be a number of winters before we are able to fully capture all the benefits achieved.

During the next period of investigation, we are looking to develop dashboards that provide live up to date data on the performance of flow in the sewers. This is subject to IT interfaces being developed but should serve to give greater transparency on the work being undertaken.

In addition to remediation in the network as part of our current investment plan, we have ongoing projects to increase the flow to full treatment at Bourton-on-the-Water STW and storm tank capacity at the last line overflow upstream of the STW. This work is programmed to be completed by 31/03/2023.

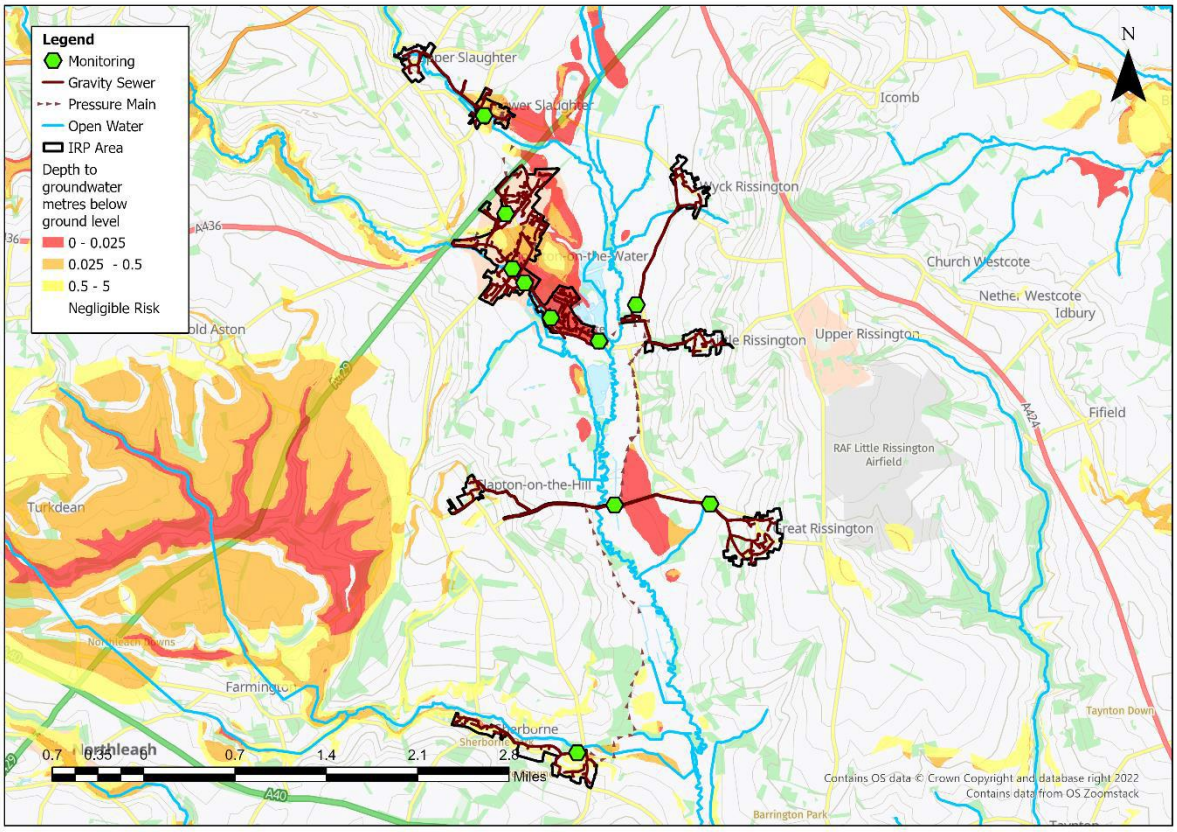
Addendum – Annual Update 2022 Table of contents

Overview

This addendum to the Bourton-on-the-Water Groundwater Impacted System Management Plan 2021 (GISMP) provides an update on performance/work undertaken in the Hydrological Year October 2021 to September 2022. The key points covered include:

- Hydrological conditions
- How the sewerage system has performed over this period
- Mitigation / remedial measures progressed over the last year and being planned
- Summary and plan for 2022/23

Figure 1 – Bourton-on-the-Water Monitoring Plan



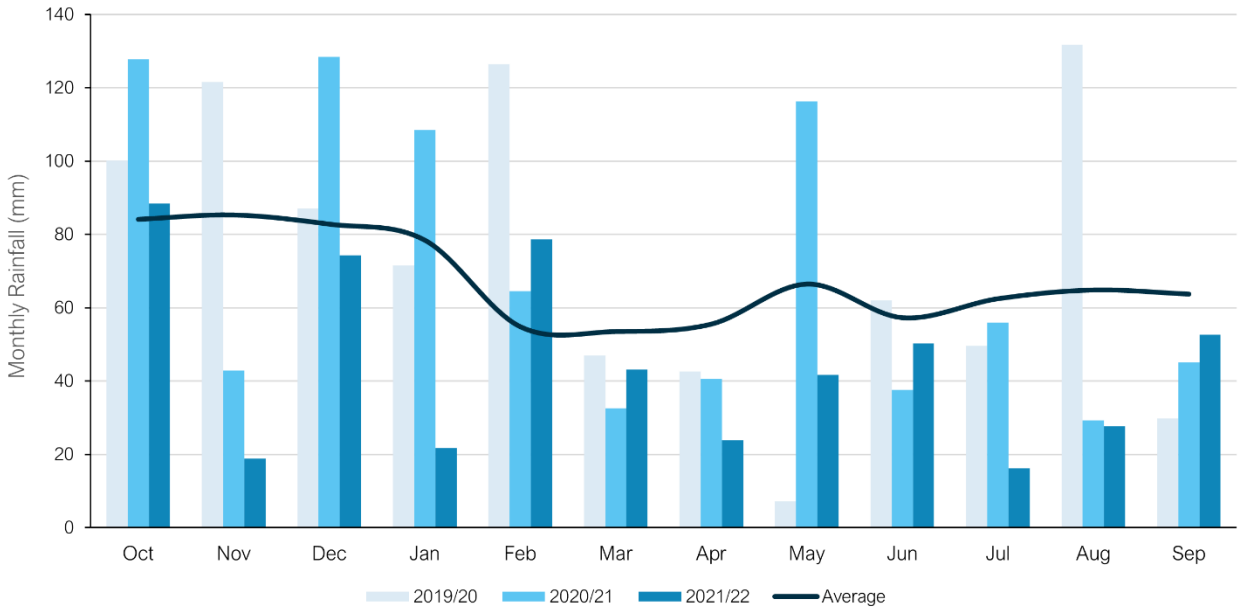
Hydrological Review – 2021-2022

This section summaries the hydrological conditions within the Bourton-on-the-Water catchment within the period under investigation and provides comparison against previous year's performance to put the annual performance into context. The hydrological review has been undertaken based on the Hydrological Year which runs October 1st to September 30th.

Catchment Rainfall

Representative Radar rainfall has been used to generate monthly data at catchment level for comparison with average data generated by local Met Office Weather Station Records. Figure 2 presents the comparison of this data for the last three hydrological years to support longer term trends within the local system.

Figure 2 – Monthly Rainfall Performance



Average Values taken from Met Office Weather Station at Little Rissington based on the period 1991-2020

The total rainfall for the 2021/22 hydrological year is 33% below the annual average total. Total rainfall values are presented in Table 3 below.

Table 3 –Total Rainfall Based on Hydrological Year

Average (mm)	2019/20 (mm)	2020/21 (mm)	2021/22 (mm)
810	877	829	544

Groundwater / Local River Level

The Bourton-on-the-Water catchment is situated in the Cotswold West water resources area. It primarily sits in the Charmouth Mudstone Formation of coarse to fine grained sediments forming interbedded sequences. This is not a designated principal aquifer within the UK.

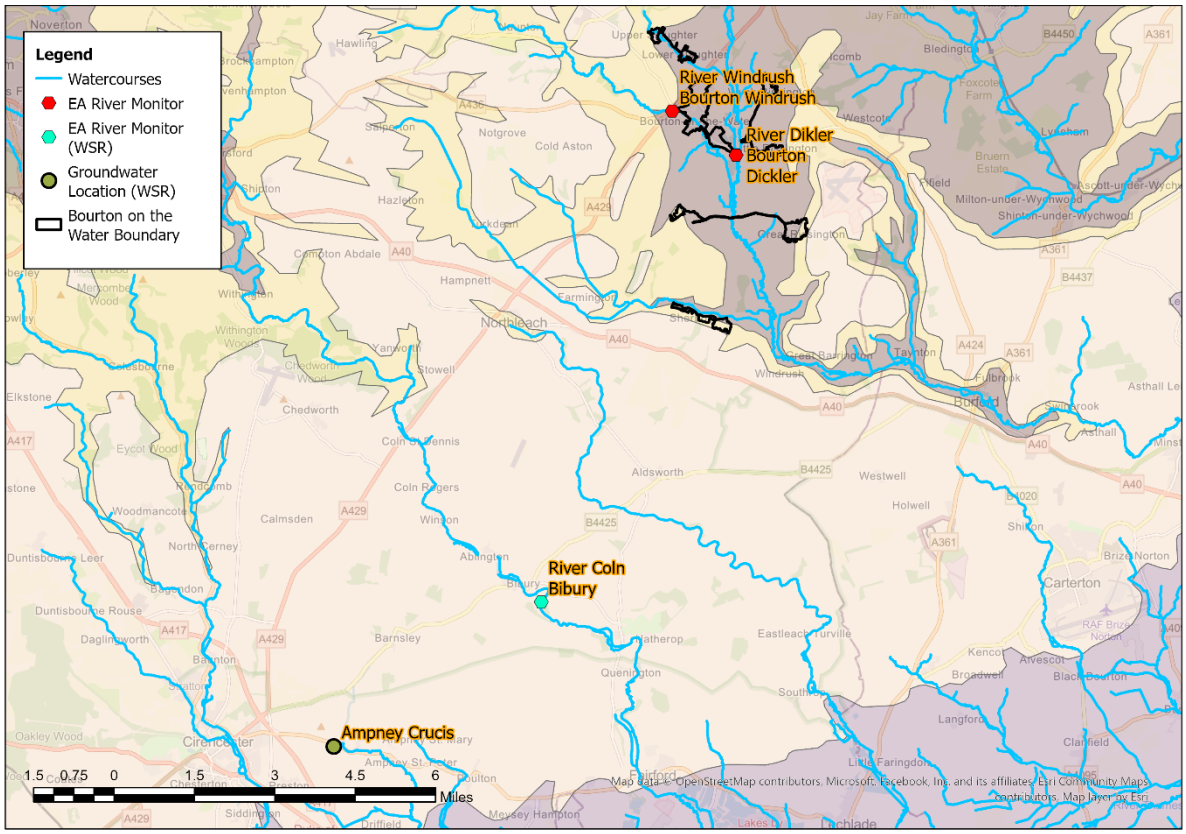
The Environment Agency has gauging stations on local watercourses measuring stage and observation boreholes measuring groundwater levels locally to the catchment which can be used to provide indicative local groundwater performance.

From previous investigations we have identified the following sites are good indicators of groundwater levels within the catchment.

- River Windrush, Bourton Windrush
- River Dickler, Bourton Dickler

These sites are illustrated in the figure below, alongside the closest groundwater reference station and closest gauging station from the Water Situation Report.

Figure 4 – Local Monitoring Stations



The following figures represent the last three hydrological years of level information at the indicator sites to build a picture of the relative conditions prevalent in the current year. It is presented against both the daily total rainfall values for the catchment and a rolling 15-day total rainfall.

Figure 5A – Windrush, Bourton Windrush

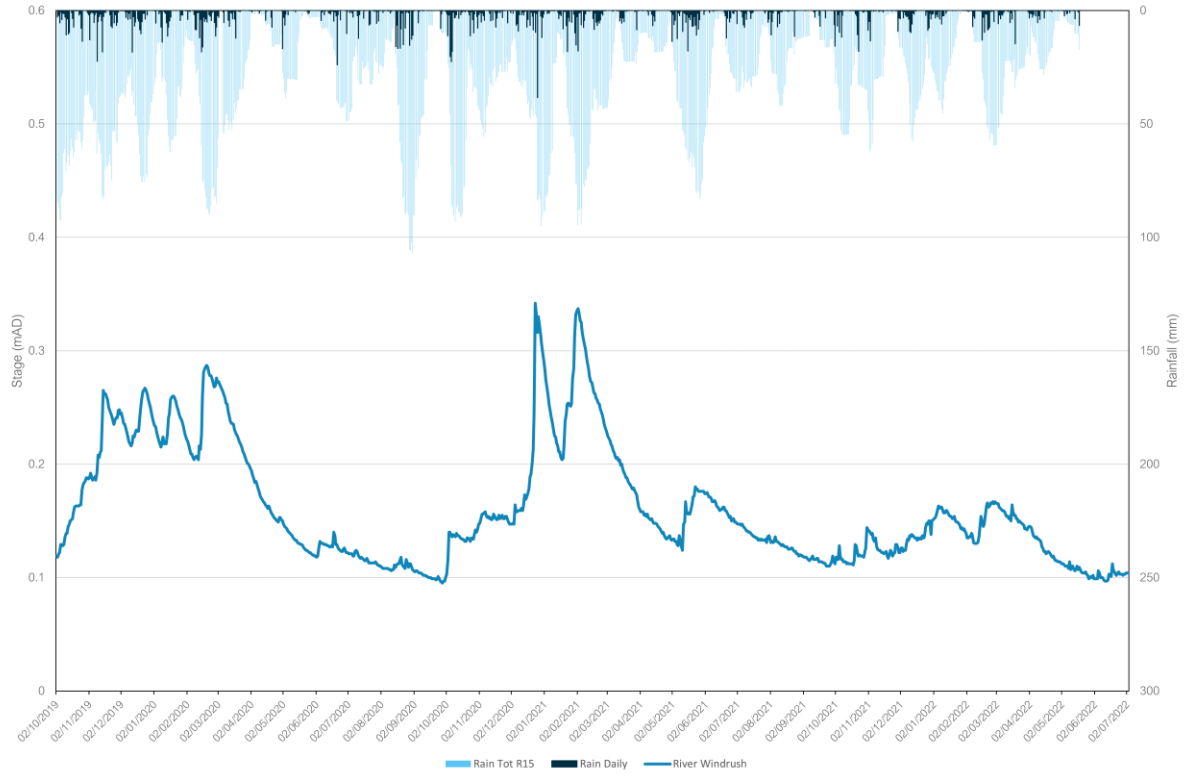
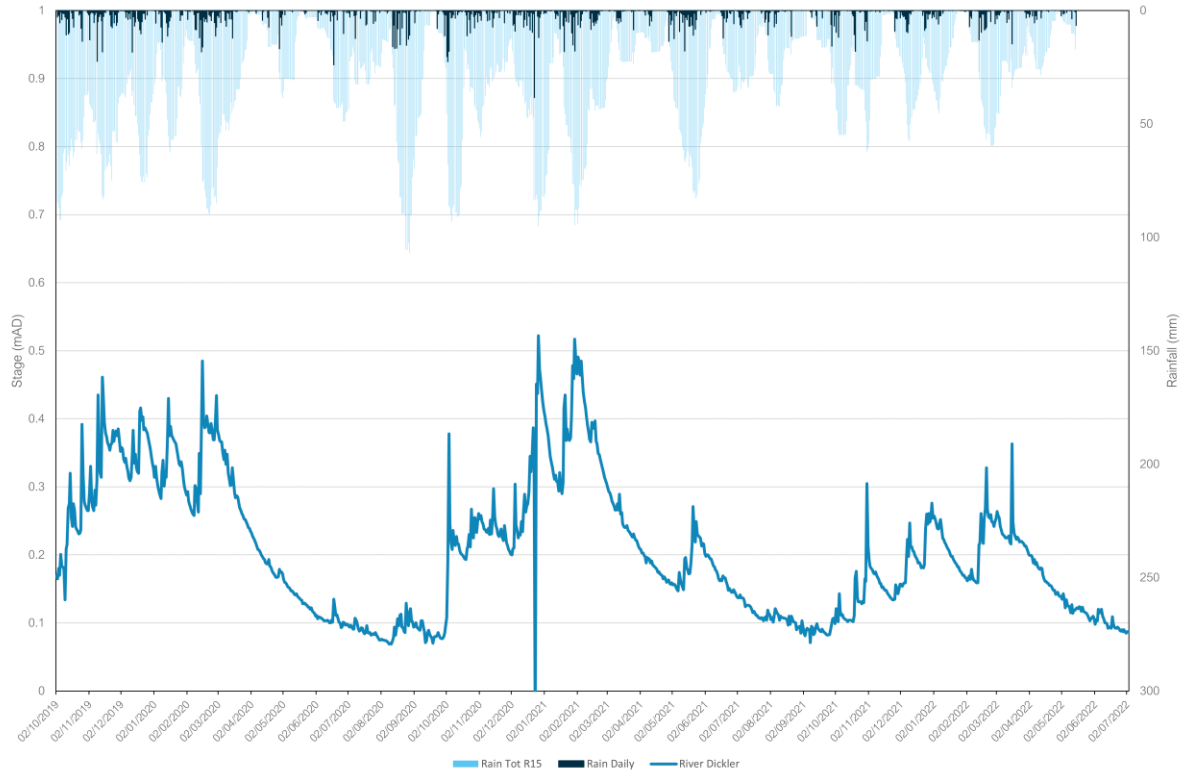
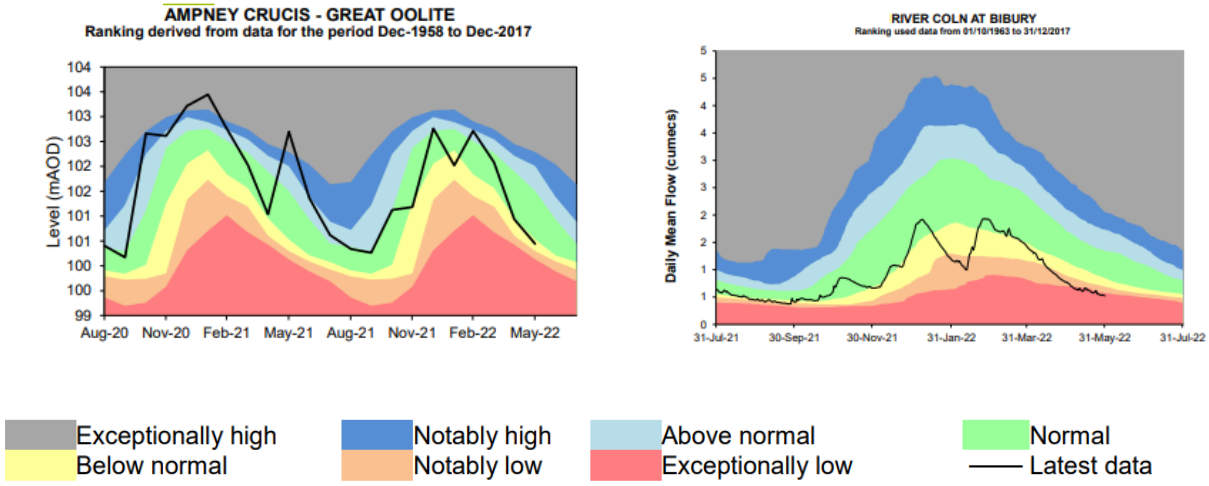


FIGURE 5B – Dickler, Bourton Dickler



In addition to these specific stations, the wider groundwater context is illustrated in the Water Situation Report for Cotswold West. The nearest groundwater reference station is Ampney Crucis. This site shows generally lower overall groundwater than the previous year, particularly evident during the winter months. This can be seen in the figure below alongside the river indicator location at Bibury on the River Coln.

Figure 6 – Water Situation Report



Extract from - [Water Situation Report (publishing.service.gov.uk)]

Network Performance

Within the Bourton-on-the-Water catchment there is one site detailed within the Environment Agency Consents Database which has an Event Duration Monitor (EDM) fitted.

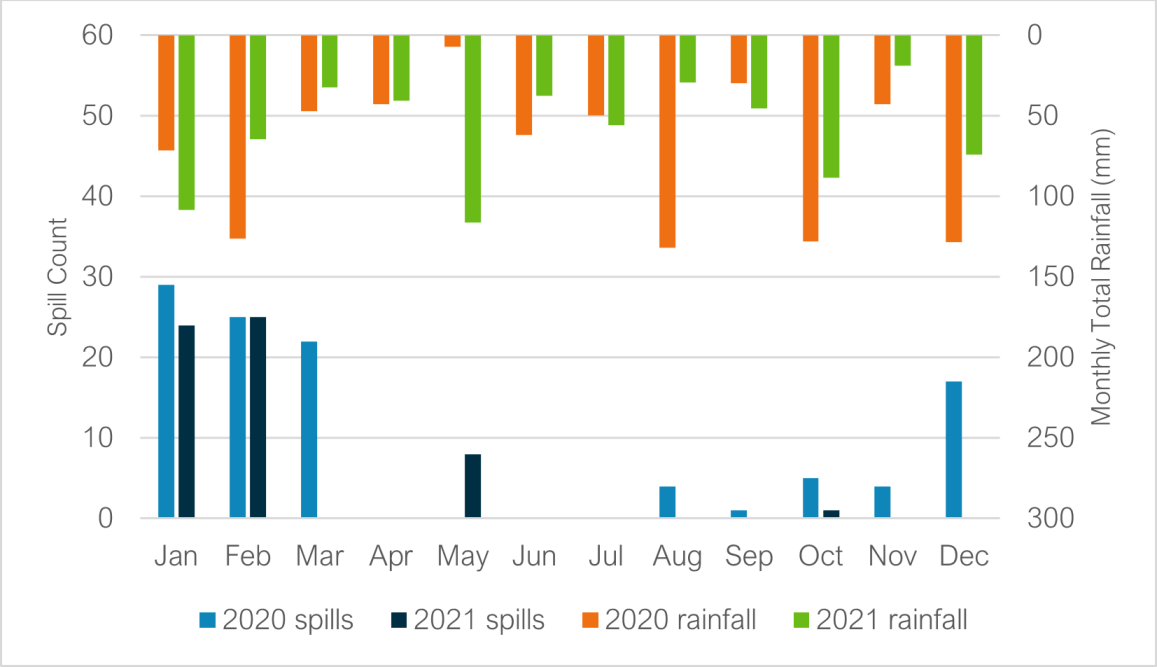
Table 7 below details the last 2 years performance of overflows within the catchment.

Table 7 – Event Duration Monitoring

Overflow	2020		2021	
	Spills	Duration (hours)	Spills	Duration (hours)
Bourton-on-the-Water STW	107	1636.10	58	1085.22

A critical part of the assessment of EDM performance and its relation to groundwater inundation is to review the month-on-month spill performance, against previous years and the monthly total rainfall values to give context to the performance. Figure 8 below presents the EDM performance trend and rainfall for recent years. Note that in 2021, the EDM was only operational for 87% of the year, which may have affected the recorded spill frequency in 2021.

Figure 8 – EDM Monthly Performance



The trend in spill performance across the two recorded years does show variation in spills, with a focus on spills during the autumn and winter months. The data suggests a wider relationship between rainfall, elevated groundwater levels and spill frequency, with a slower tail off in spills evident within the first half of 2020, when the River Windrush and River Dickler indicator sites suggest groundwater levels in the catchments were higher than within the first half of 2021.

Investigations & Interventions

This section details the activities that have been undertaken within the catchment within the Hydrological Year 2021-22.

Monitor Installations

The sewer depth monitor (SDM) programme supports long term groundwater understanding within GISMP catchments. Currently, there are a total of 10 monitors installed within the Bourton -on-the-Water catchment. There are currently no further monitor installs planned.

The data from these will be cross-referenced with other long-term records (where available) within the catchment.

Remediation Works Undertaken this Hydrological Year

Table 9 below provides a summary of the investigations and remediation works undertaken or planned within the Bourton-on-the-Water catchment in the 2021-22 Hydrological Year.

Table 9 – Works Undertaken in the 2021/22 Hydrological Year

Investigation/ remediation type	Number/ length undertaken
CCTV survey	N/A
Look and lift survey	N/A
Sewer lining	4.123 km completed, further 2.75 km planned by end of November 2022
Patch lining	N/A
Manhole sealing	219 manholes completed, further 33 planned by end of November 2022
Manhole sealing plates	N/A
Manhole covers and frames replaced	119 manholes

As the River Windrush is an environmentally sensitive chalk stream, Bourton-on-the-Water has been identified as a priority catchment to reduce unwanted flows in the sewer network. This is reflected in the extensive sewer lining undertaken in the catchment during the 2021/22 hydrological year, undertaken as part of the Green Recovery project. When groundwater levels become elevated during a wet winter, this will allow the impact of the interventions on overflow spills to be assessed.

Summary

Rainfall in the Bourton-on-the-Water catchment over the 2021/22 hydrological year has been below average, with groundwater levels in the aquifer beneath Bourton-on-the-Water not reaching the levels seen in previous years which triggered groundwater ingress into the sewerage network and elevated flow/depth readings at monitoring sites. However, as Bourton-on-the-Water has been identified as a priority catchment to reduce unwanted flows into the sewer network, extensive sewer re-lining is on-going in the catchment this hydrological year, due to be completed by the end of November 2022.

Lift and look and CCTV surveys will continue throughout the remaining wet winter periods with the aim of finding further priority locations for remediation and investigating/justifying the need for future larger scale lining as part of our Price Review (PR) process if required.

Addendum - Annual Update 2023

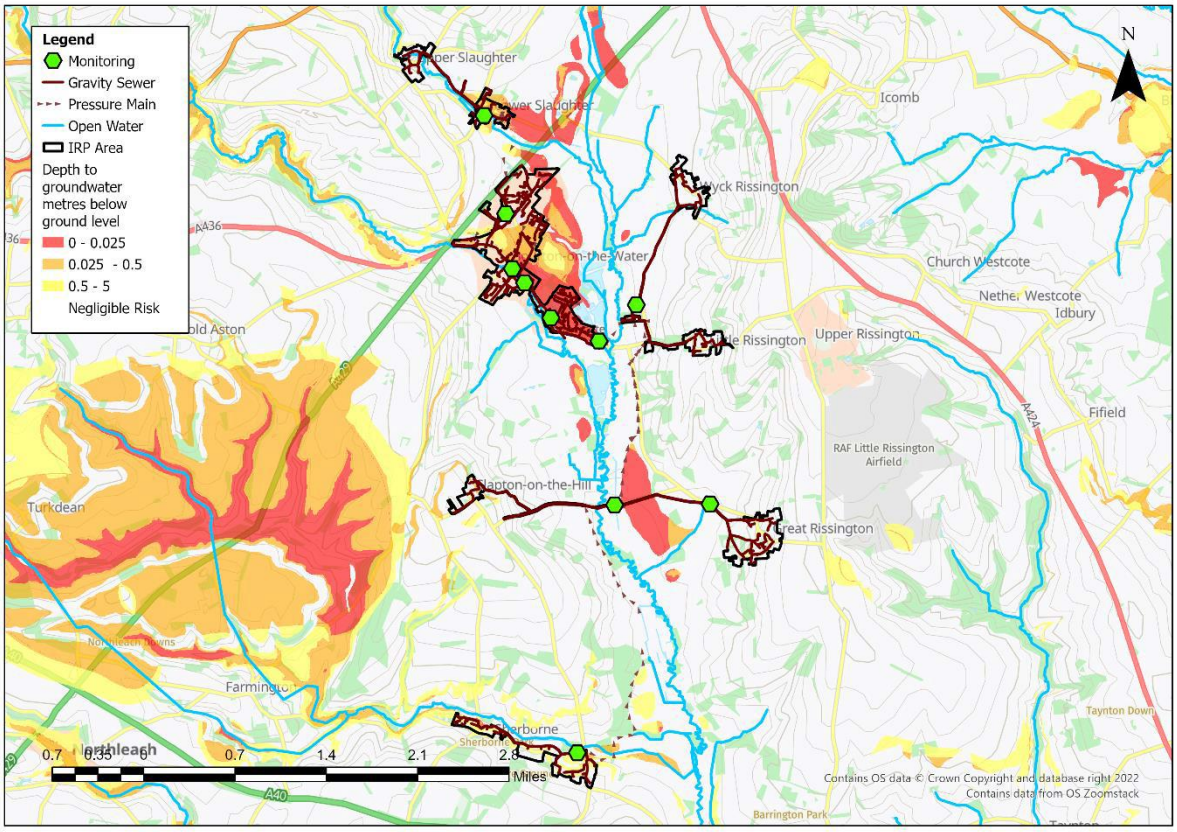
Table of contents

Overview

This addendum to the Bourton-on-the-Water Groundwater Impacted System Management Plan 2021 (GISMP) provides an update on performance/work undertaken in the Hydrological Year October 2022 to September 2023. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year and being planned
- Summary and plan for 2023/24

Figure 1 – Bourton-on-the-Water Monitoring Plan



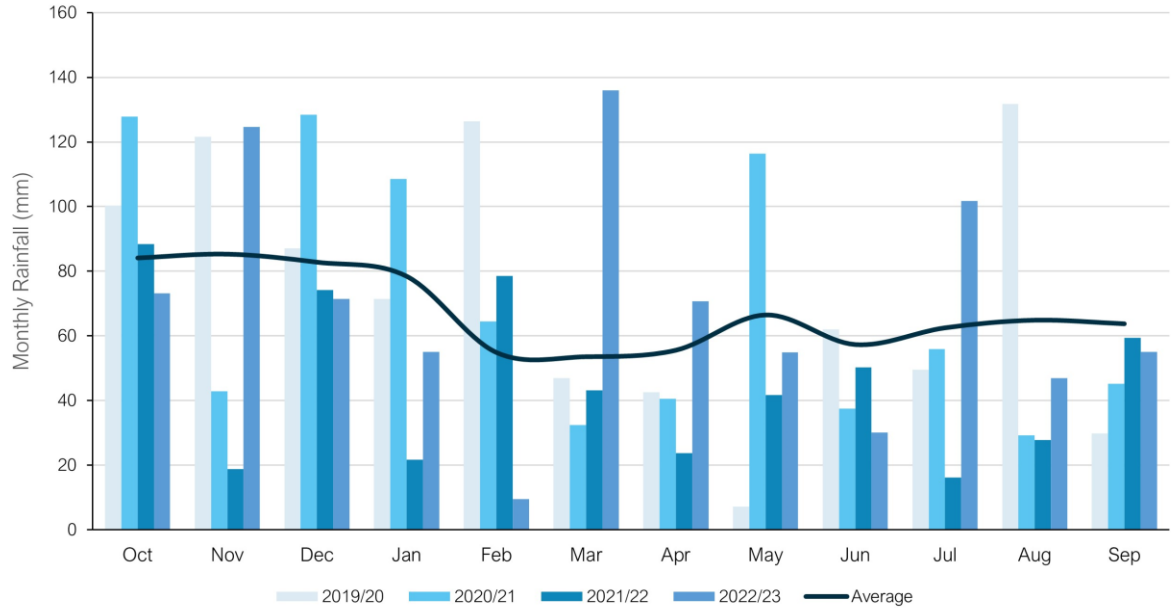
Hydrological Review – 2022-2023

This section summaries the hydrological conditions within the Bourton-on-the-Water catchment within the period under investigation and provides comparison against previous year's performance to put the annual performance into context. The hydrological review has been undertaken based on the Hydrological Year which runs October 1st to September 30th.

Catchment Rainfall

Representative Radar rainfall has been used to generate monthly data at catchment level for comparison with average data generated by local Met Office Weather Station Records. Figure 2 presents the comparison of this data for the last four hydrological years to support longer term trends within the local system.

Figure 2 – Monthly Rainfall Performance



Average Values taken from Met Office Weather Station at Little Rissington based on the period 1991-2020

The total rainfall for the 2022/23 hydrological year is 2% above the annual average total. Total rainfall values are presented in Table 3 below.

Table 3 –Total Rainfall Based on Hydrological Year

Average (mm)	2019/20 (mm)	2020/21 (mm)	2021/22 (mm)	2022/23 (mm)
810	877	829	544	829

Groundwater / Local River Level

The Bourton-on-the-Water catchment is situated in the Cotswold West water resources area. It primarily sits in the Charmouth Mudstone Formation of coarse to fine grained sediments forming interbedded sequences. This is not a designated principal aquifer within the UK.

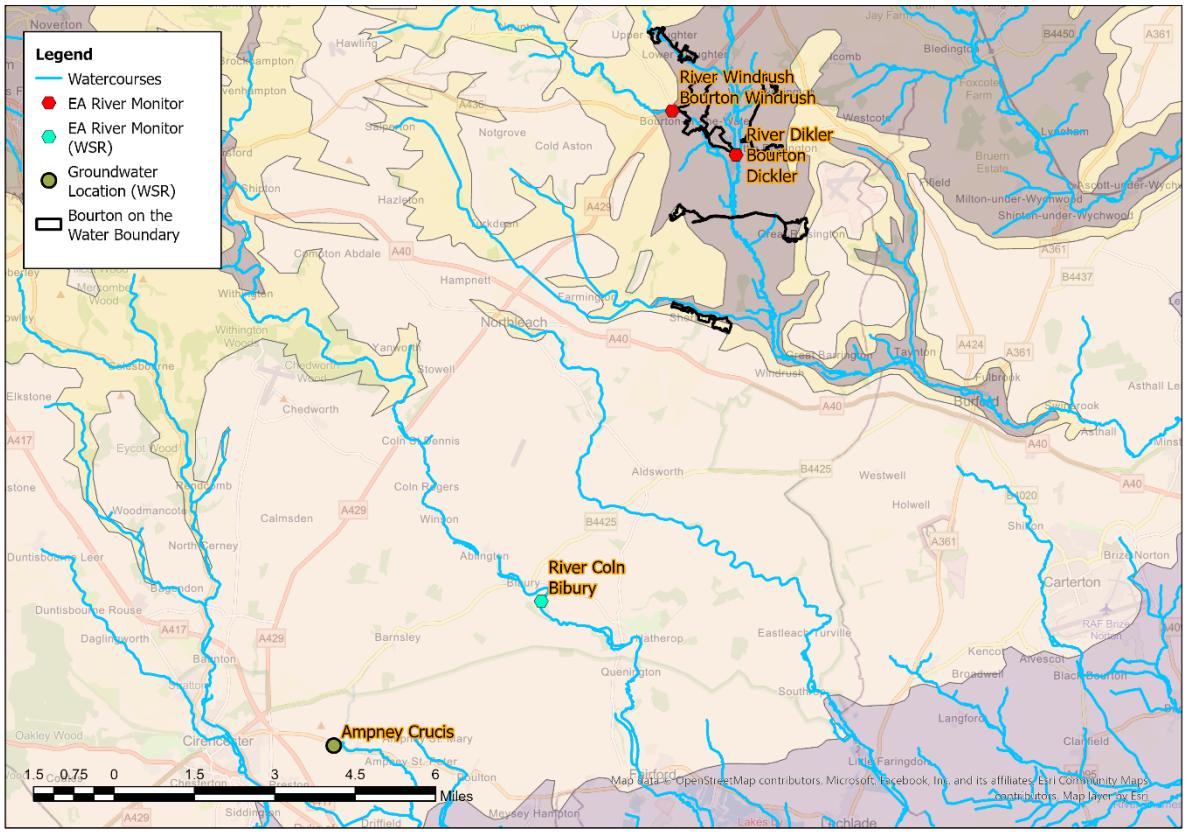
The Environment Agency has gauging stations on local watercourses measuring stage and observation boreholes (OBH) measuring groundwater levels locally to the catchment which can be used to provide indicative local groundwater performance.

From previous investigations we have identified the following sites are good indicators of groundwater levels within the catchment.

- River Windrush, Bourton Windrush
- River Dickler, Bourton Dickler

These sites are illustrated in the figure below, alongside the closest groundwater reference station and closest gauging station from the Water Situation Report.

Figure 4 – Local Monitoring Stations



The following figures represent the last three hydrological years of level information at the indicator sites to build a picture of the relative conditions prevalent in the current year. It is presented against both the daily total rainfall values for the catchment and a rolling 15 day total rainfall.

Figure 5A – Windrush, Bourton Windrush

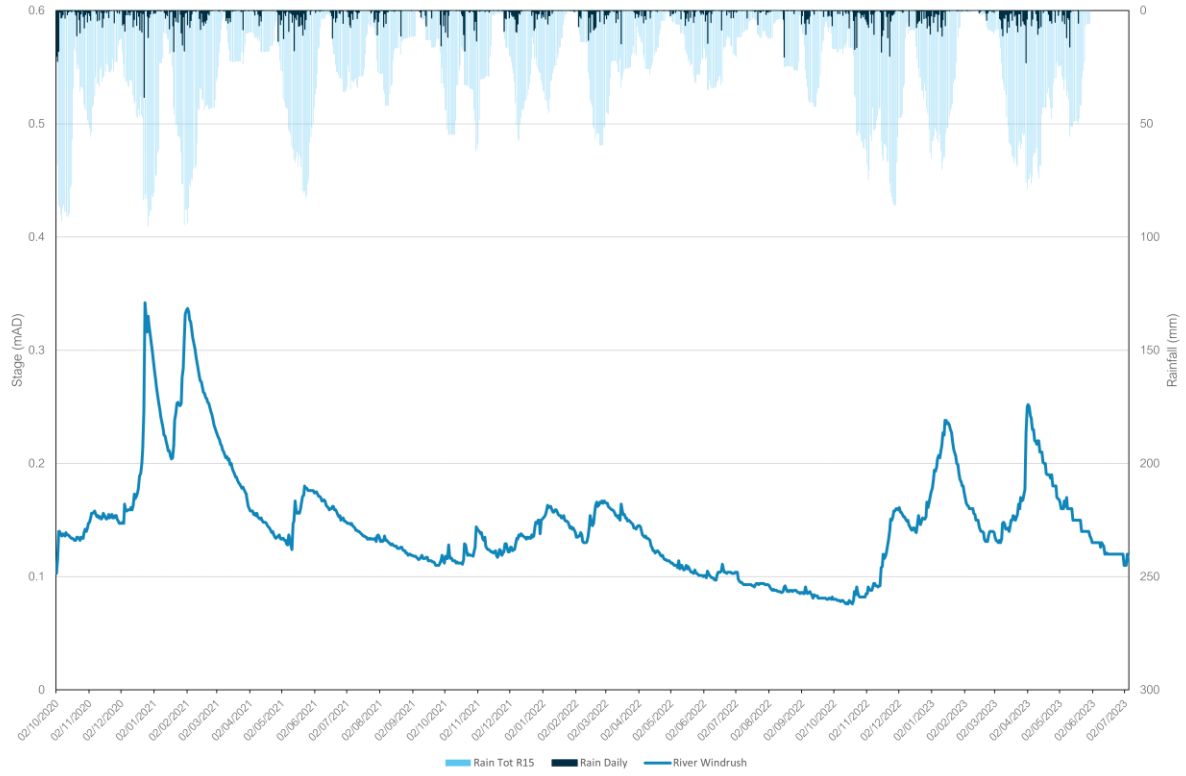
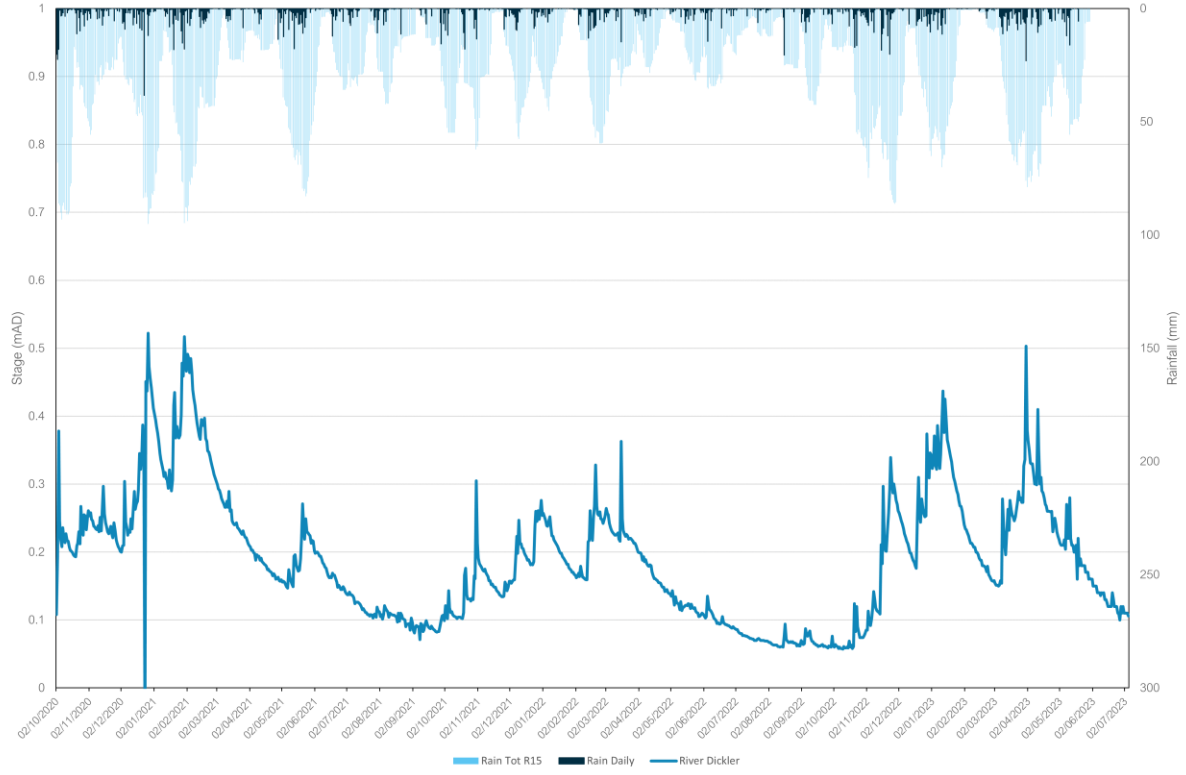
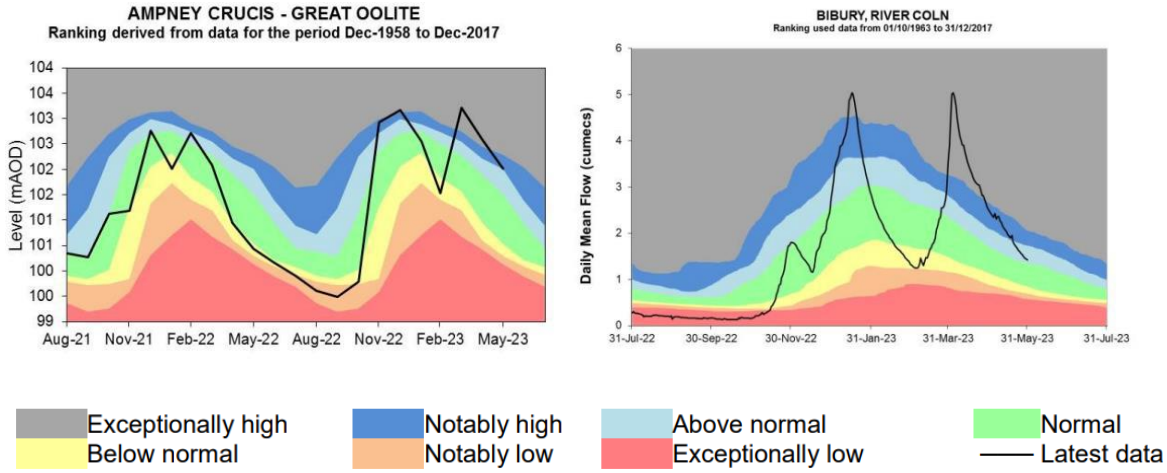


Figure 5B – Dickler, Bourton Dickler



In addition to these specific stations, the wider groundwater context is illustrated in the Water Situation Report for Cotswold West. The nearest groundwater reference station is Ampney Crucis. This site shows that groundwater levels have generally been higher this hydrological year than the previous hydrological year, with periods of above normal and notably high groundwater levels. This can be seen in the figure below alongside the river indicator location at Bibury on the River Coln.

Figure 6 – Water Situation Report



Extract from - [Water Situation Report (publishing.service.gov.uk)]

Network Performance

Within the Bourton-on-the-Water catchment there is one site detailed within the Environment Agency Consents Database which has an Event Duration Monitor (EDM) fitted.

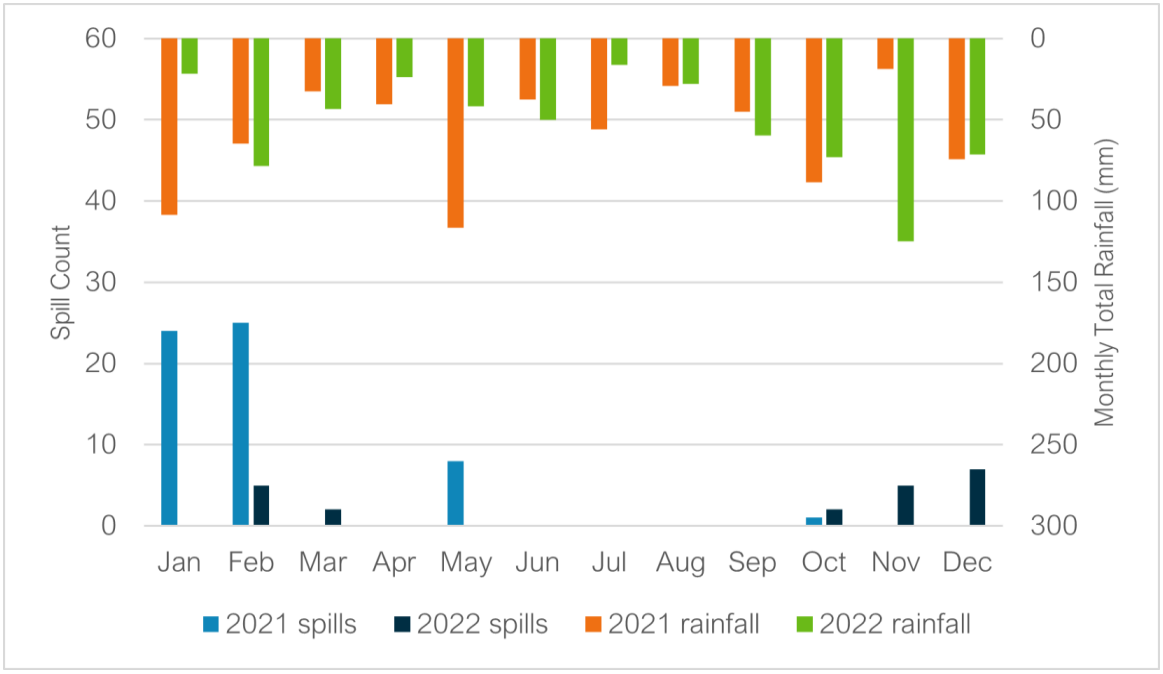
Table 7 below details the last 2 years performance of overflows within the catchment.

Table 7 – Event Duration Monitoring

Overflow	2021		2022	
	Spills	Duration (hours)	Spills	Duration (hours)
Bourton-on-the-Water STW	58	1085.22	21	168.06

A critical part of the assessment of EDM performance and its relation to groundwater infiltration is to review the month-on-month spill performance, against previous years and the monthly total rainfall values to give context to the performance. Figure 8 below presents the EDM performance trend and rainfall for recent years. Note that in 2021, the EDM was only operational for 87% of the year, which may have affected the recorded spill frequency in 2021. In 2022, the EDM was only operational for 80% of the year, which may have affected the recorded spill frequency. Note also, the reported spill frequency of twenty-one is, is one higher than the value of twenty stated in the Annual Return. The spill count has been revised/ re- validated and the value of twenty-one is the revised value.

Figure 8 – EDM Monthly Performance



The trend in spill performance across the two recorded years does show variation in spills, with a focus on spills during the autumn and winter months. The data suggests a wider relationship between rainfall, elevated groundwater levels and spill frequency. Despite broadly similar rainfall totals, significantly more spills were recorded at Bourton-on-the-Water STW in February 2021 compared to February 2022. The indicator sites shown in Figure 5, suggest groundwater levels in the catchment were higher in February 2021 compared to February 2022.

Investigations & Interventions

This section details the activities that have been undertaken within the catchment within the Hydrological Year 2022-23.

Monitor Installations

The sewer depth monitor (SDM) programme supports long term groundwater understanding within GISMP catchments. Currently, there are a total of 10 monitors installed within the Bourton -on-the-Water catchment. There are currently no further monitor installs planned.

The data from these will be cross-referenced with other long-term records (where available) within the catchment.

Remediation Works Undertaken this Hydrological Year

Table 9 below provides a summary of the investigations and remediation works undertaken or planned within the Bourton-on-the-Water catchment in the 2022-23 Hydrological Year, as well as works undertaken in the 2021-22 Hydrological Year.

Table 9 – Works Undertaken in the 2022/23 Hydrological Year & in the 2021/22 Hydrological Year

Investigation/ remediation type	Number/ length undertaken 2021/22	Number/ length undertaken 2022/23
CCTV survey	N/A	1.617 km*
Look and lift survey	N/A	N/A
Sewer lining	4.123 km	2.347 km**
Patch lining	N/A	N/A
Manhole sealing	219 manholes	27 manholes**
Manhole sealing plates	N/A	4
Manhole covers and frames replaced	119 manholes	N/A

**Included sewers previously lined to check integrity of previous works completed, and sewers classed as at low risk of groundwater infiltration, to help verify the risk zones.*

***Further work detailed as planned in last year's report and completed this hydrological year.*

As the River Windrush is an environmentally sensitive chalk stream, Bourton-on-the-Water was identified as a priority catchment to reduce unwanted flows in the sewer network. As part of the Green Recovery Project, extensive lining of high-risk sewers was undertaken in the catchment during 2022. Further work completed is detailed in the 2021/22 Report Addendum and the planned lining of high-risk sewers is now complete. Following the lining and sealing works, investigations have been undertaken in the catchment this hydrological year to identify unmapped lateral/ private connections in the catchment, in order to help inform potential future lining works, as well as identify unwanted surface water contributions to the foul sewer network.

Significant sewer lining has been undertaken in the catchment, however most of this was undertaken very recently, during 2022. To help assess whether the works undertaken have significantly reduced levels of groundwater infiltration into the network, will require comparison of spill frequencies over wet winter periods with elevated groundwater levels post-lining, to previous wet winter periods with elevated groundwater levels, for example using EDM data for 2023 once this has been processed and validated. This data will be used to help assess benefit from lining high risk zones, to begin to understand whether sewers in medium and/or low risk zones may also need to be lined.

An upgrade is also planned for Bourton-on-the-Water STW. This work will provide a major increase in treatment capacity, reducing the need for untreated discharges to the environment. The project is expected to be completed in 2024.

Summary

Indicator site data suggests groundwater levels in the Bourton-on-the-Water catchment were generally lower in 2022 than in 2021, with trends in EDM data indicative of the role of groundwater infiltration on spills in the catchment. This hydrological year (October 2022- September 2023), groundwater levels have generally been higher than the previous hydrological year, and EDM data for 2023 will be analysed once available to continue to examine the relationship between groundwater levels and overflow spills, as well as to begin to understand if sewer lining in the catchment has significantly reduced levels of groundwater infiltration, helping to inform if future lining works may be needed.

Lift and look and CCTV surveys will continue throughout the remaining wet winter periods with the aim of finding further priority locations for remediation and investigating/justifying the need for future larger scale lining as part of our Price Review (PR) process if required.

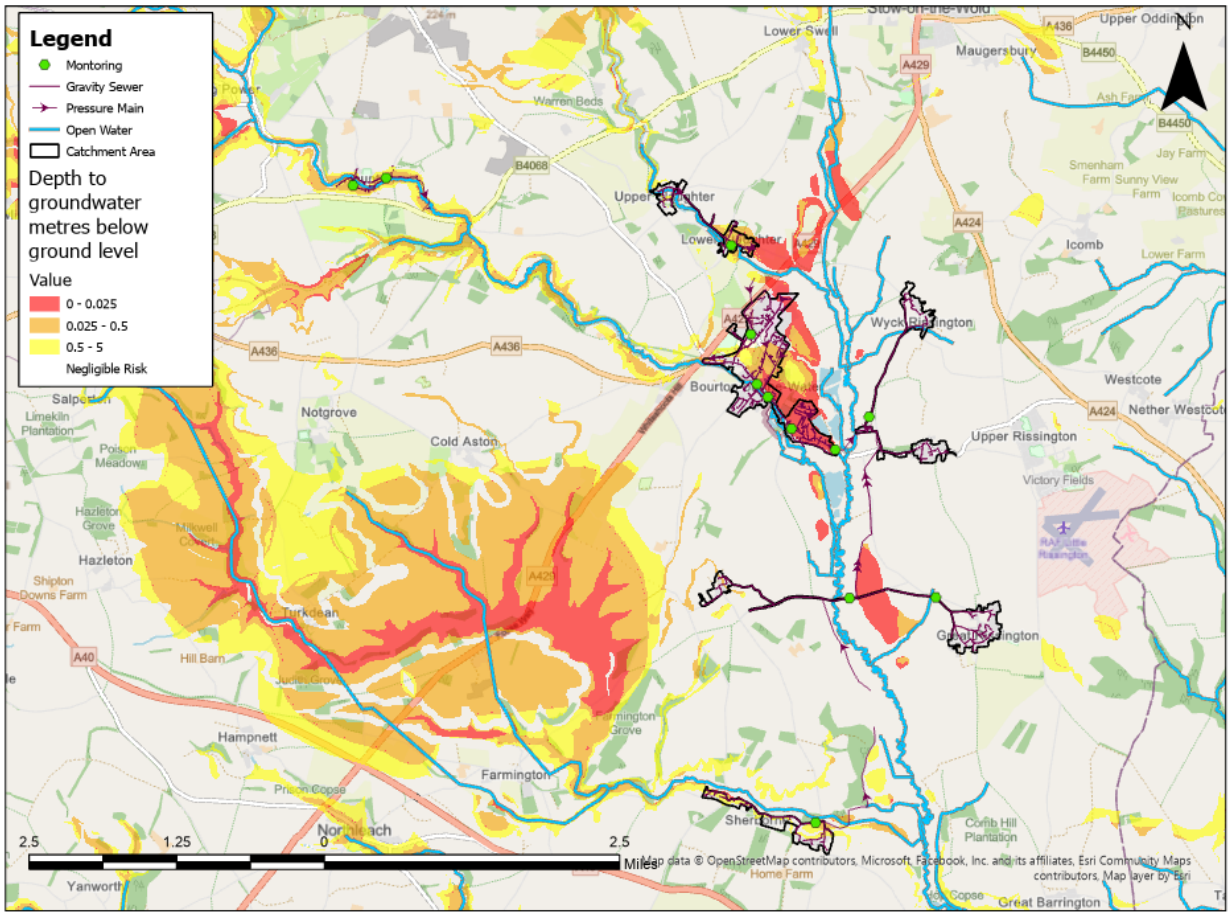
Addendum - Annual Update 2024 Table of contents

Overview

This addendum to the Bourton-on-the-Water Groundwater Impacted System Management Plan 2021 (GISMP) provides an update on performance/work undertaken in the Hydrological Year October 2023 to September 2024. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year and being planned
- Summary and plan for 2024/25

Figure 1 – Bourton-on-the-Water Monitoring Plan



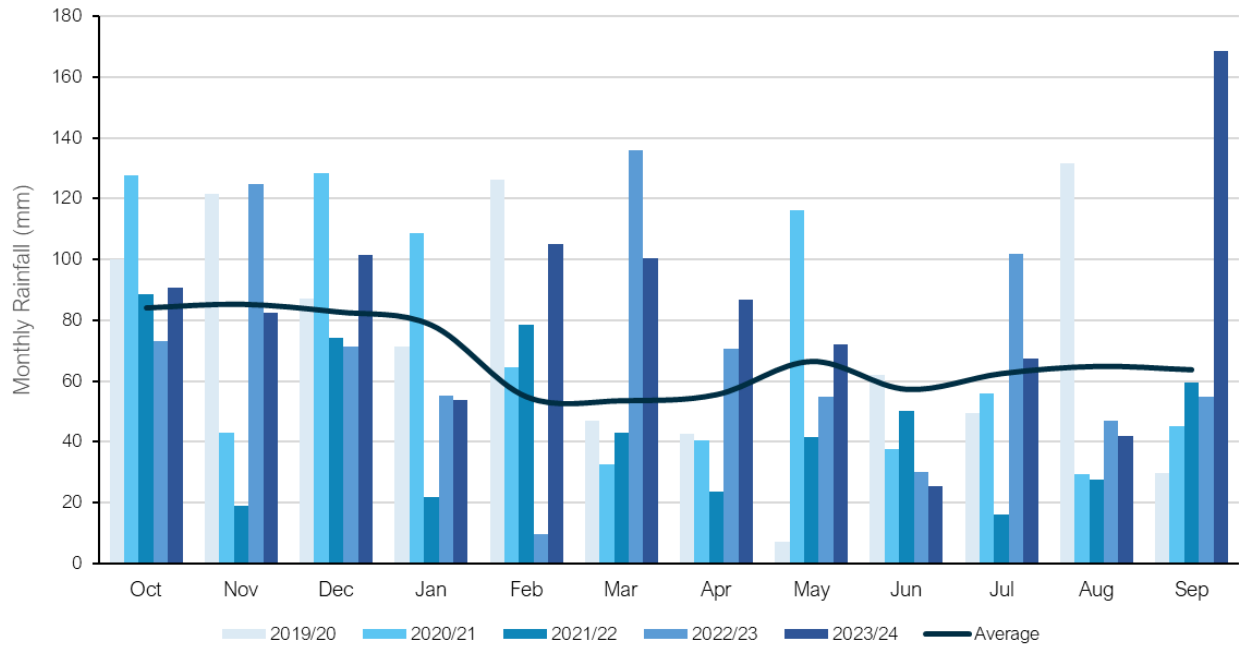
Hydrological Review – 2023-2024

This section summarises the hydrological conditions within the Bourton-on-the-Water catchment within the period under investigation and provides comparison against previous year's performance to put the annual performance into context. The hydrological review has been undertaken based on the Hydrological Year which runs October 1st to September 30th.

Catchment Rainfall

Representative Radar rainfall has been used to generate monthly data at catchment level for comparison with average data generated by local Met Office Weather Station Records. Figure 2 presents the comparison of this data for the last five hydrological years to support longer term trends within the local system.

Figure 2 – Monthly Rainfall Data



Average Values taken from Met Office Weather Station at Little Rissington based on the period 1991-2020

The total rainfall for the 2023/24 hydrological year is 23% above the annual average total. Total rainfall values are presented in Table 3 below.

Table 3 –Total Rainfall Based on Hydrological Year

Average (mm)	2019/20 (mm)	2020/21 (mm)	2021/22 (mm)	2022/23 (mm)	2023/24 (mm)
810	877	829	544	829	996

Groundwater / Local River Level

The Bourton-on-the-Water catchment is situated in the Cotswold West water resources area. It primarily sits in the Charmouth Mudstone Formation of coarse to fine grained sediments forming interbedded sequences. This is not a designated principal aquifer within the UK.

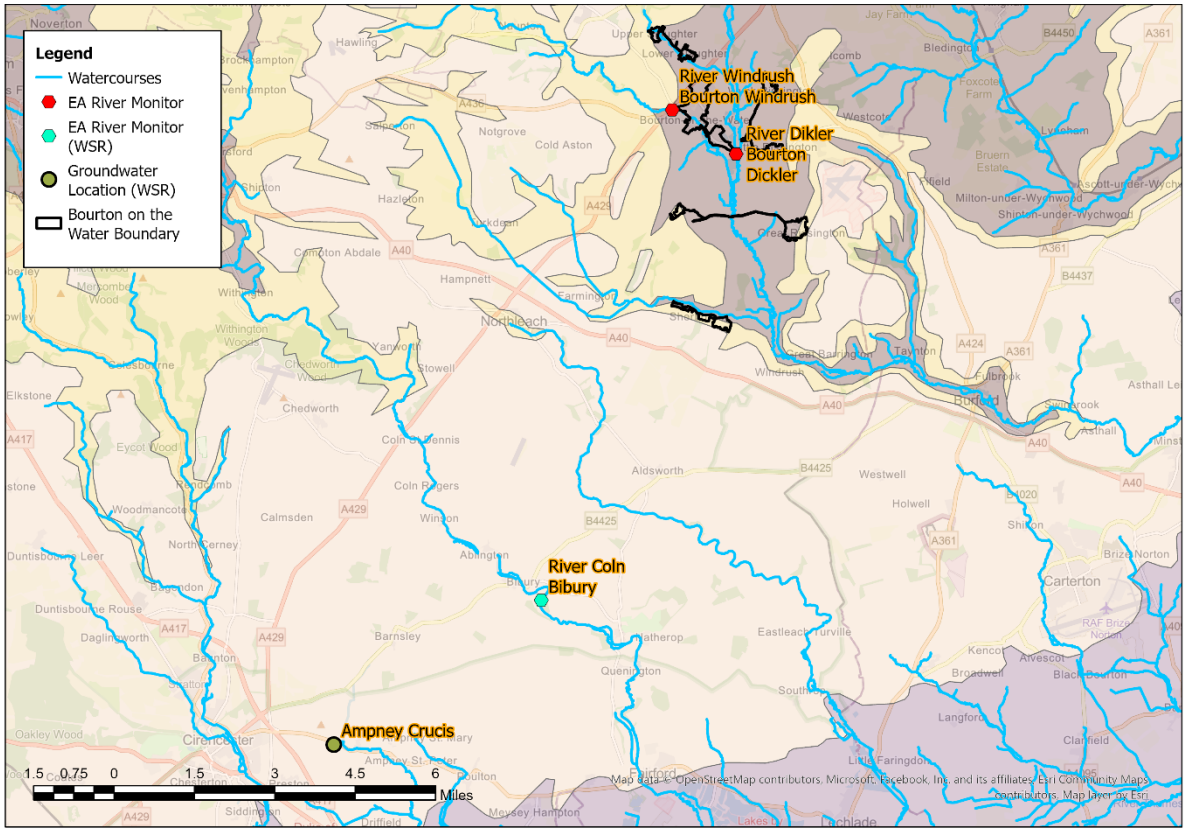
The Environment Agency has gauging stations on local watercourses measuring stage and observation boreholes (OBH) measuring groundwater levels locally to the catchment which can be used to provide indicative local groundwater performance.

From previous investigations we have identified the following sites are good indicators of groundwater levels within the catchment.

- River Windrush, Bourton Windrush
- River Dickler, Bourton Dickler

These sites are illustrated in Figure 4, alongside the closest groundwater reference station and closest gauging station from the Water Situation Report.

Figure 4 – Local Monitoring Stations



Figures 5A-5B represent the last three hydrological years of level information at the indicator sites to build a picture of the relative conditions prevalent in the current year. It is presented against both the daily total rainfall values for the catchment and a rolling 15 day total rainfall.

Figure 5A – Windrush, Bourton Windrush

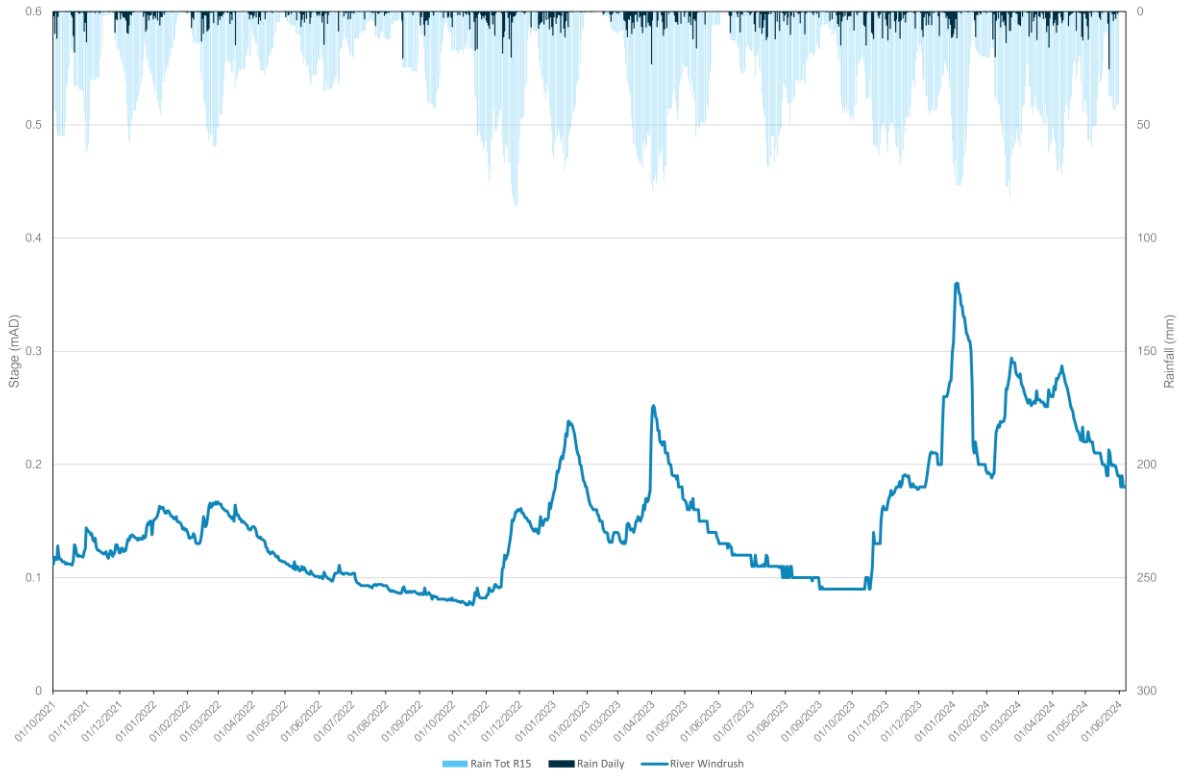
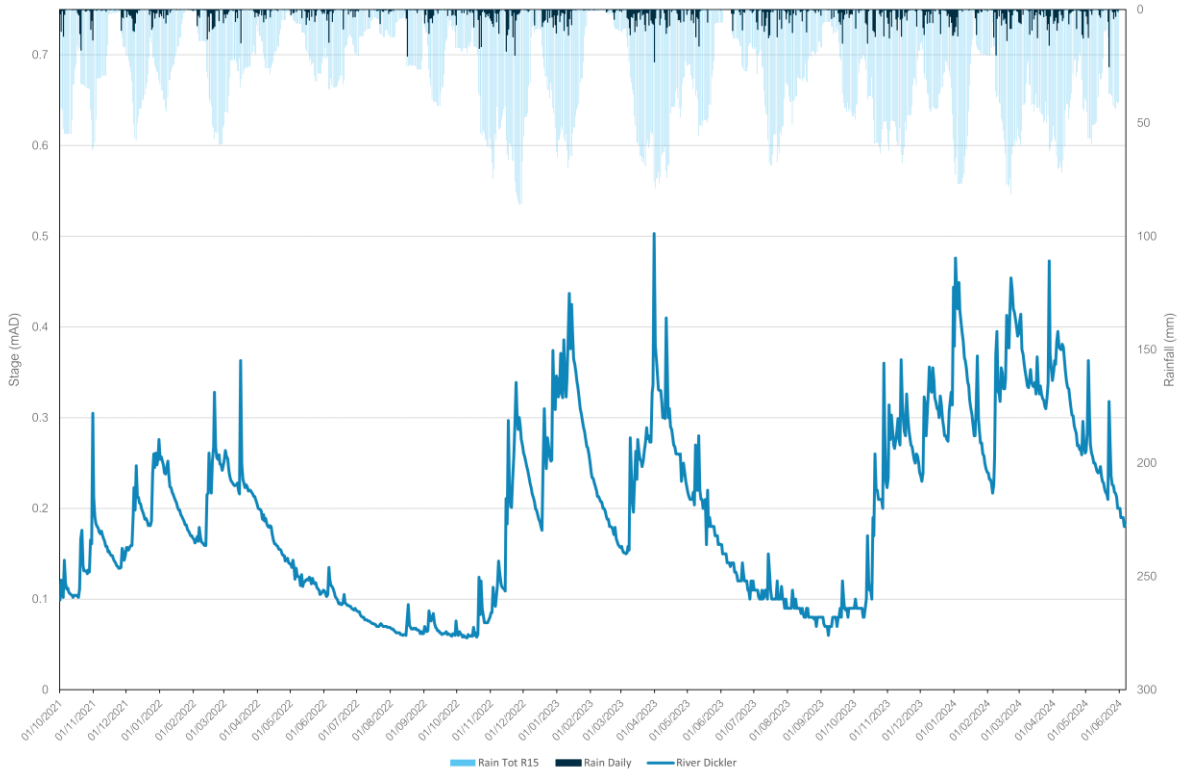
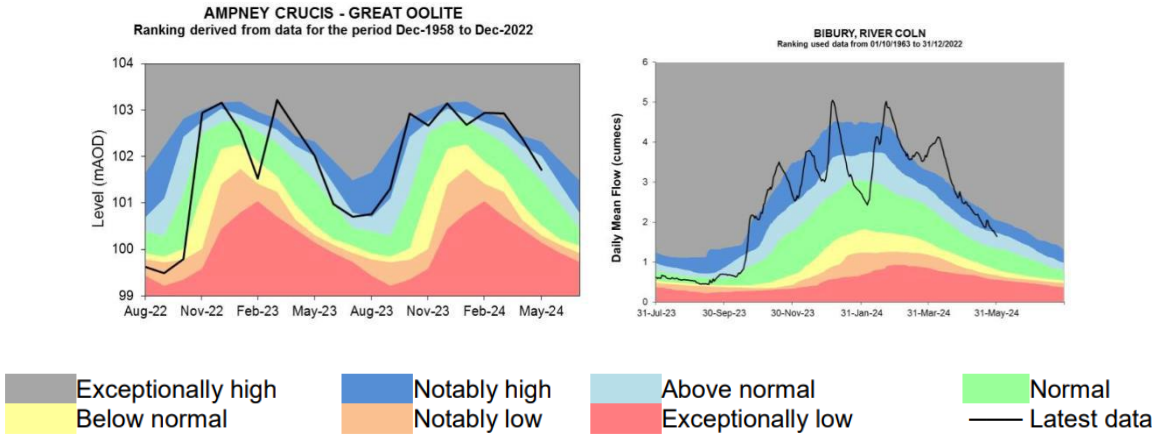


Figure 5B – Dickler, Bourton Dickler



In addition to these specific stations, the wider groundwater context is illustrated in the Water Situation Report for Cotswold West. The nearest groundwater reference station is Ampney Crucis. This site shows groundwater levels to consistently be at above normal / notably high levels in the first half of 2024, briefly reaching exceptionally high levels. This can be seen in Figure 6 alongside the river indicator location at Bibury on the River Coln.

Figure 6 – Water Situation Report



Extract from - [Water Situation Report (publishing.service.gov.uk)]

Network Performance

Within the Bourton-on-the-Water catchment there is one site detailed within the Environment Agency Consents Database which has an Event Duration Monitor (EDM) fitted.

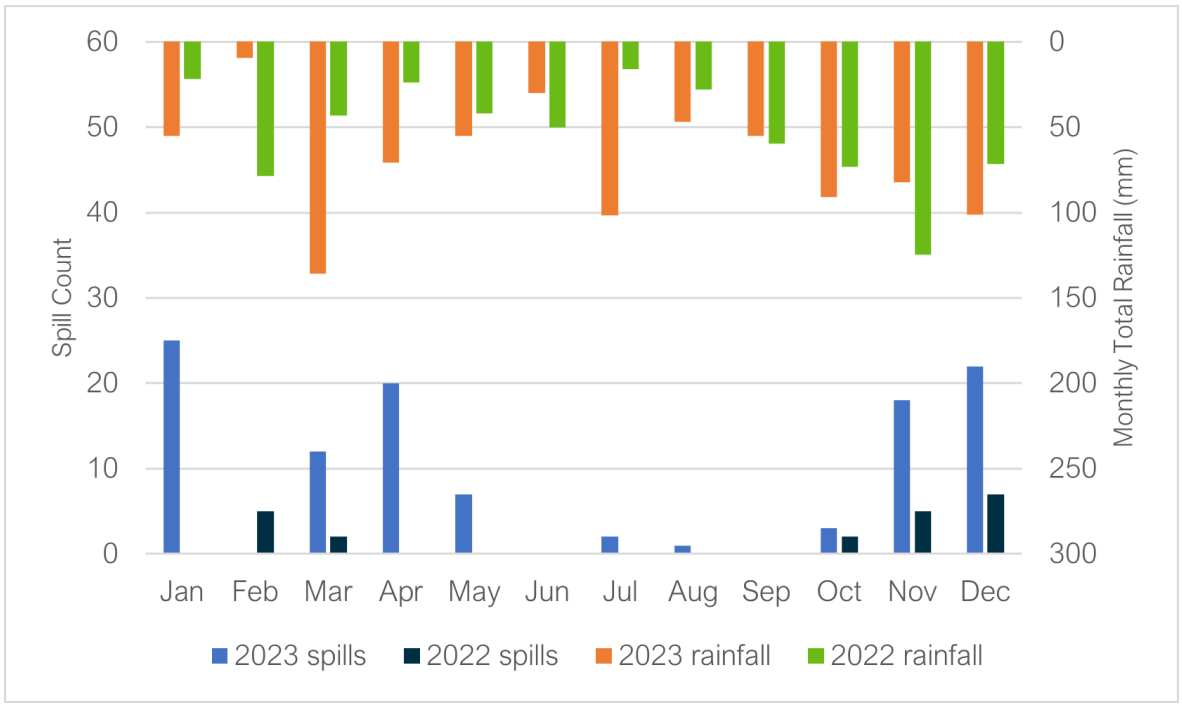
Table 7 below details the last 2 years performance of overflows within the catchment.

Table 7 – Event Duration Monitoring

Overflow	2022		2023	
	Spills	Duration (hours)	Spills	Duration (hours)
Bourton-on-the-Water STW	21	168.06	110	1565.25

A critical part of the assessment of EDM performance and its relation to groundwater infiltration is to review the month-on-month spill performance, against previous years and the monthly total rainfall values to give context to the performance. Note that in 2022, the EDM was only operational for 80% of the year, which may have affected the recorded spill frequency. Note also, the reported spill frequency of twenty-one, is one higher than the value of twenty stated in the Annual Return. The spill count was revised/ re-validated and the value of twenty-one is the post-validation value. Figure 8 below presents the EDM performance trend and rainfall for recent years.

Figure 8 – EDM Monthly Performance



The trend in spill performance across the two recorded years does show variation in spills, with a focus on spills during the autumn and winter months. The data suggests a wider relationship between rainfall, elevated groundwater levels and spill frequency. For example, despite a higher rainfall total in November 2022, significantly more spills were recorded in November 2023. The indicator site data shown in Figures 5, suggests that groundwater levels in the catchment were more elevated in November 2023. Similarly, a high number of spills were recorded in January and April 2023, when the indicator site data shown in Figures 5 and 6 suggests that peaks in groundwater levels occurred in the catchment.

Investigations & Interventions

This section details the activities that have been undertaken within the catchment within the Hydrological Year 2023-24.

Monitor Installations

The sewer depth monitor (SDM) programme supports long term groundwater understanding within GISMP catchments. Currently, there are a total of 10 monitors installed within the Bourton- on-the-Water catchment. There are currently no further monitor installs planned.

The data from these will be cross-referenced with other long-term records (where available) within the catchment.

Remediation Works Undertaken this Hydrological Year

Table 9 below provides a summary of the investigations and remediation works undertaken or planned within the Bourton-on-the-Water catchment in the 2023-24 Hydrological Year, as well as works undertaken in the previous two hydrological years.

Table 9 – Works Undertaken in the 2023/24, 2022/23 & 2021/22 Hydrological Year

Investigation/ remediation type	Number/ length undertaken 2021/22	Number/ length undertaken 2022/23	Number/ length undertaken 2023/24
CCTV survey	N/A	1.617 kilometres*. Additional 139 metres.	1.177 kilometres complete. Additional 304 metres planned.
Look and lift survey	N/A	N/A	61 manholes**
Sewer lining	4.123 kilometres	2.347 kilometres	N/A
Patch lining	N/A	N/A	N/A
Manhole sealing	219 manholes	27 manholes	N/A
Manhole sealing plates	N/A	4	N/A
Manhole covers and frames replaced	119 manholes	N/A	N/A

* These surveys were not undertaken as priority was made to survey the manholes in the catchment to determine the efficacy of previous remediation works in the 2022-2023 hydrological year.
**The purpose of these surveys was to determine the efficacy of previous lining / sealing works carried out across high-risk network. Survey data recently received from the survey contractor and will be analysed.

Tables 10 below summarises the lift and look surveys of manholes undertaken in Bourton-on- the-water in the 2023-24 Hydrological Year and gives details on the infiltration identified. From the manholes surveyed, no points of infiltration were identified.

Table 10 – Total number of manholes surveyed by lift and look in the 2023-2024 hydrological year

Investigation	Length (m)
Planned Lift and look surveys	61
Survey Completed	38
Total surveyed with clear flow	7

In addition to investigations previously detailed, 139 metres of CCTV survey was undertaken in the catchment over the summer 2023 period. The purpose of these surveys was to assess the structural condition of sewers predicted to be at high risk of groundwater infiltration, rather than

to identify locations of groundwater infiltration into the network. All surveyed network was identified as being in a good structural condition.

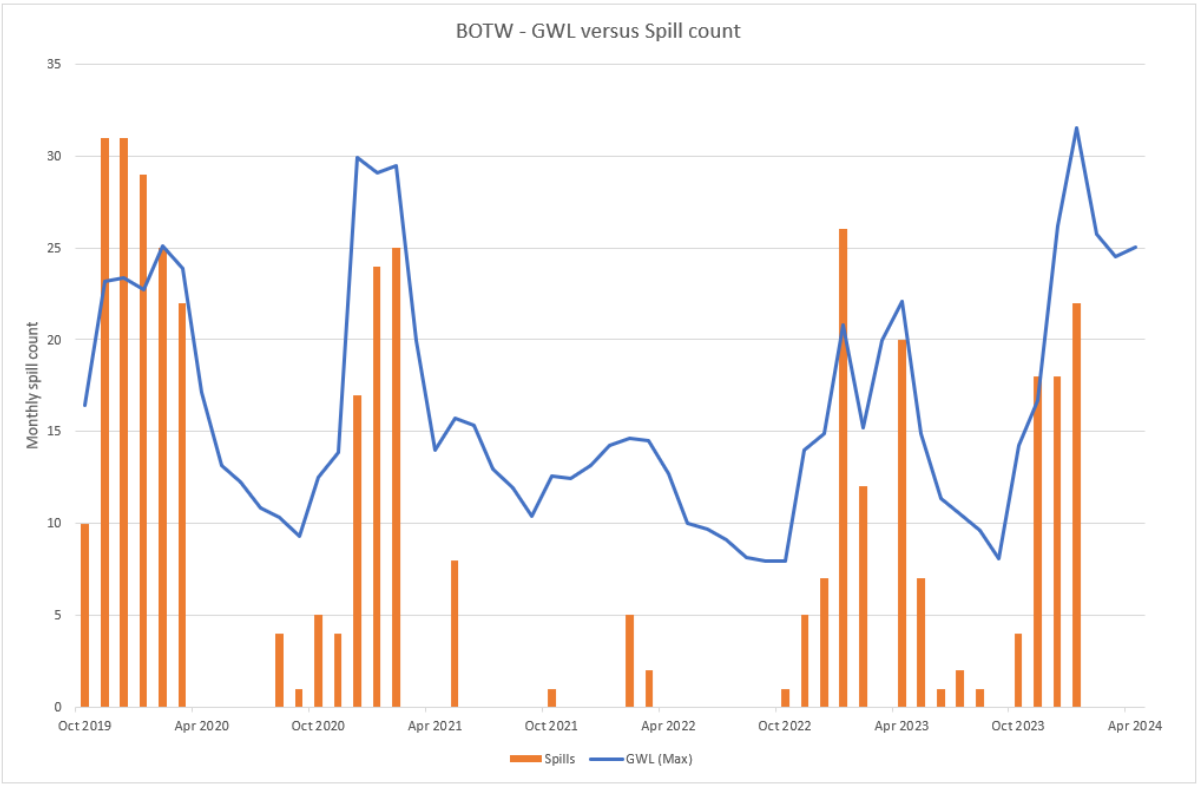
Tankering was required within the Bourton-on-the-Water catchment during the 2023/24 Hydrological Year. One day of flow management was undertaken at Lower Slaughter SPS.

As the River Windrush is an environmentally sensitive chalk stream, Bourton-on-the-Water was identified as a priority catchment to reduce unwanted flows in the sewer network. As part of the Green Recovery Project, extensive lining of high-risk sewers was undertaken in the catchment during 2022. The planned lining of high-risk sewers in the catchment is now complete. Future lining works may be undertaken in the catchment, for example lining of unmapped lateral and private connections. In addition, investigations are ongoing to identify unwanted surface water contributions to the foul network in the catchment.

To date, we have sealed ~10% of the system (high risk sewers) and achieved a 50% reduction in spill duration in an extreme year. We expect the benefit to be greater in non-severe winters. In terms of assessing the impact of the lining and sealing works completed in the catchment on spill frequency, some initial analysis has been undertaken in order to better understand this.

Figure 10 presents monthly spill frequency plotted against maximum groundwater level locally to the catchment. This shows that despite groundwater levels peaking in January 2024, the total number of spills recorded November 2023 – January 2024, was much lower than the number recorded November 2019 – January 2020, when groundwater levels reached lower levels. The EDM data for 2024, will provide improved insight into the performance of the network during a period when the indicator site data shown in Figures 5 and 6, suggests that groundwater levels in the catchment remained high for sustained periods.

Figure 11 – Groundwater levels and overflow spill counts for the Bourton-on-the-Water catchment from October 2019 – December 2023



An upgrade is also planned for Bourton-on-the-Water STW. This work will provide a major increase in treatment capacity, reducing the need for untreated discharges to the environment. The project is expected to be completed in 2025. Note, delivery dates are being managed at a programme level, delivery dates stated are based upon current views and are subject to change.

It is expected that the Bourton-on-the-Water catchment will meet all government targets for storm overflows by 2035 – 2040.

Summary

Indicator site data suggests groundwater levels in the Bourton-on-the-Water catchment were generally higher in 2023 than in 2022, with trends in EDM data indicative of the role of groundwater infiltration on spills in the catchment. This hydrological year (October 2023- September 2024), groundwater levels have been significantly higher than the previous hydrological year, and EDM data for 2024 will be analysed once available to continue to examine the relationship between groundwater levels and overflow spills. In addition, to better understand if sewer lining in the catchment has significantly reduced levels of groundwater infiltration, helping to inform if future lining works may be needed.

Lift and look and CCTV surveys will be undertaken in remaining wet winter periods if conditions allow and subject to funding and available capacity. The aim of this is to find further priority locations for remediation and investigating/justifying the need for future larger scale lining as part of our Price Review (PR) process if required, as well as understand the efficacy of previous lining and sealing works completed.

Addendum – Annual Update 2025

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Cotswolds river basin summary

The Thames Water region covers the length of the River Thames from its source down to Tilbury including all its tributaries. The sewer network has overflows that discharge along the River Thames and its associated tributaries. The role of storm overflows in the network is to protect against property flooding from the sewerage system. Storm overflows, which may be augmented with settlement tanks, are employed to optimise the split between wastewater treatment and the management of rainfall. Storm separation is typically designed in accordance with regulatory guidance.

Aligned with our Drainage and Wastewater Management Plan (DWMP) approach, the Thames Water region has been split into River Basins, each contains a varying number of localised sewer networks. Taking this approach allows alignment to the different drivers in each river basin and provides and efficient way to investigate, tackle performance and protect the environment. This report covers the performance of the sewer networks within the Cotswolds River Basin which are heavily influenced by groundwater infiltration into the network.

The Cotswold River Basin covers the upper reaches of the River Thames including its associated tributaries and streams. The river basin contains ten heavily groundwater impacted Thames Water localised sewer systems that interact with various rivers and streams forming the tributaries to the River Thames. Each localised sewer system contains one or more storm overflows located at sewage treatment works (STW) and/or in the network. Figure 1 shows the relationship between the sewer systems and the associated rivers and streams. Figure 2 shows the location of each localised sewer system within the Cotswold River Basin with an insert showing the location of the Cotswold River Basin in relation to the Thames Water Region.

Sewer System	Associated River / Stream	Relationship to the River Thames
Bourton-on-the-Water STW	River Windrush	Direct tributaries of the River Thames
Broadwell STW	Broadwell Brook	Indirect tributary of the River Thames via Great Brook
Carterton STW	Shill Brook, River Windrush	Shill Brook indirect tributary of the River Thames via Great Brook. River Evenlode direct tributary of the River Thames.
Chadlington STW	River Evenlode	Direct tributary of the River Thames
Clanfield STW	Clanfield Brook	Indirect tributary of the River Thames via Broadwell Brook then Great Brook.
Faringdon STW	Faringdon Brook	Indirect tributary of the River Thames via the River Ock
Milton-Under-Wychwood STW	River Evenlode	Direct tributary of the River Thames
Moreton-in-Marsh STW	River Evenlode	Direct tributary of the River Thames
Standlake STW	River Windrush	Direct tributary of the River Thames
Witney STW	River Windrush	Direct tributary of the River Thames

Figure 1: Relationship of the Sewer Systems to Associated Rivers

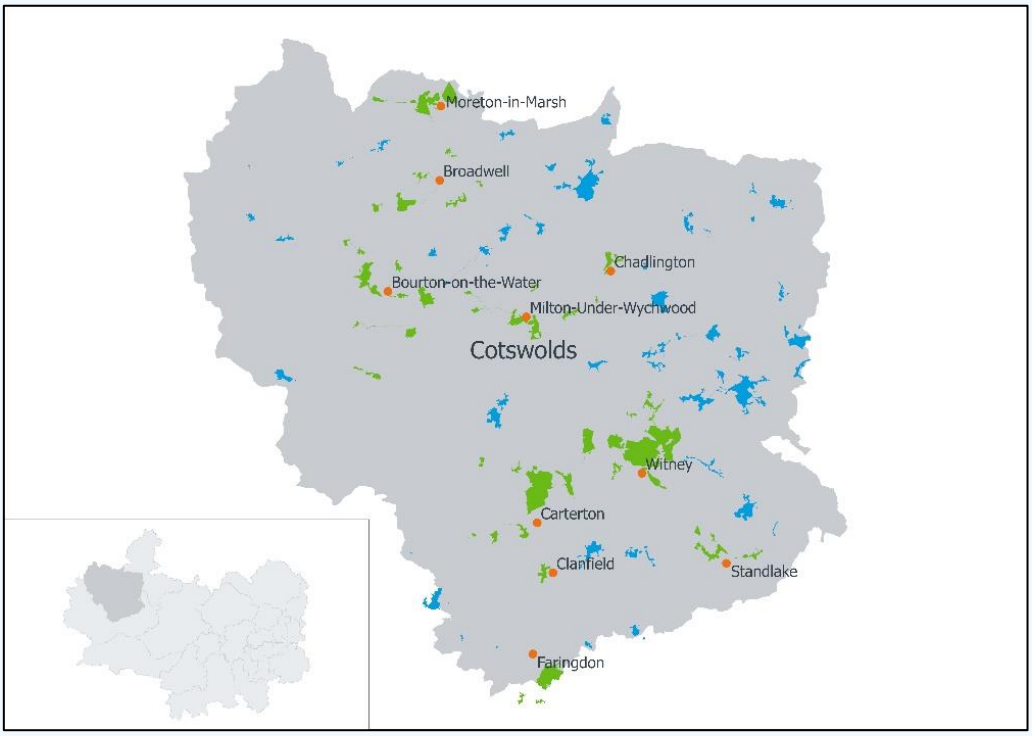


Figure 2: Location of Sewer Systems Within the Cotswold River Basin

Bourton-on-the-Water

Bourton-on-the-Water lies on the River Windrush in Gloucestershire, approximately 4 miles South of Stow-on-the-Wold and 14 miles East of Cheltenham.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Bourton-on-the-Water sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 5 illustrate the relationship between rainfall and CSO spills. As shown in Figure 1, the decrease in rainfall from 2023/24 to 2024/25 correlates with reduced river levels (Figures 2 and 3), as well as a decline in the number and duration of CSO spills shown in Figure 5.

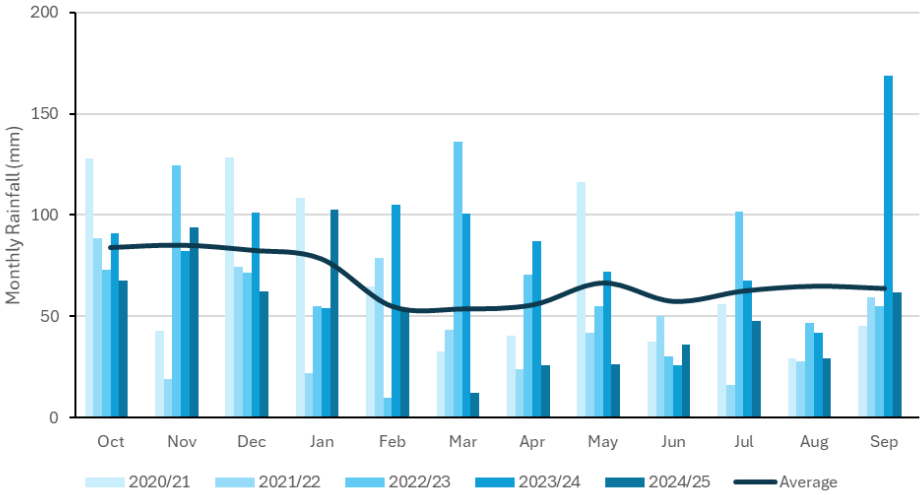


Figure 1: Monthly rainfall data 2020/21 to 2024/25

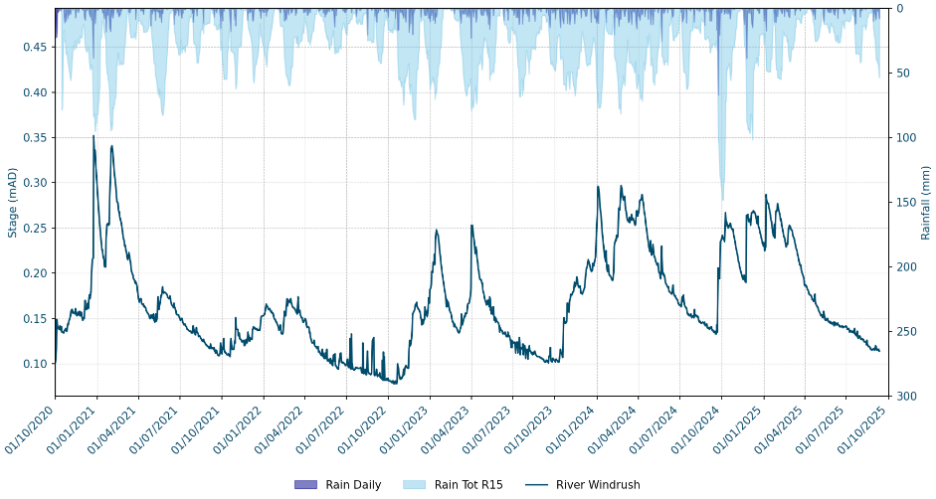


Figure 2: River Level data for Windrush, Bourton Windrush

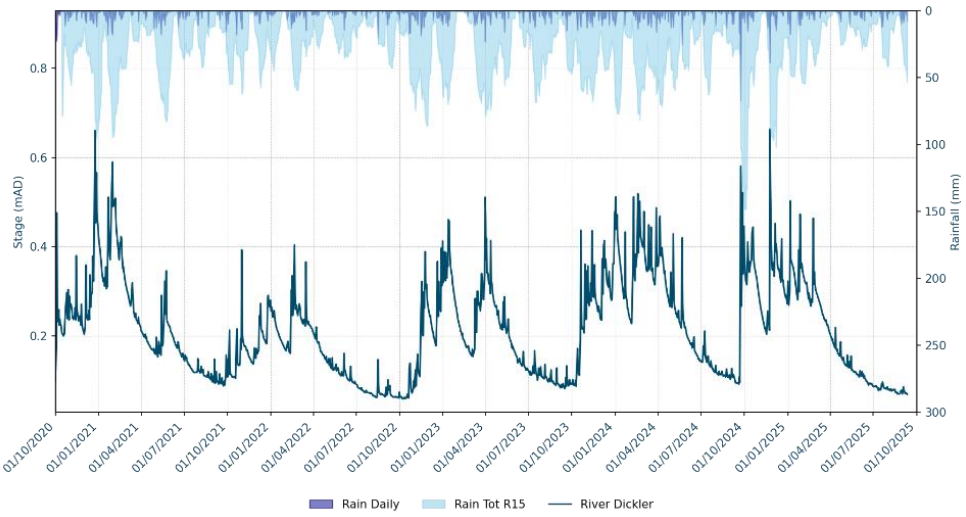
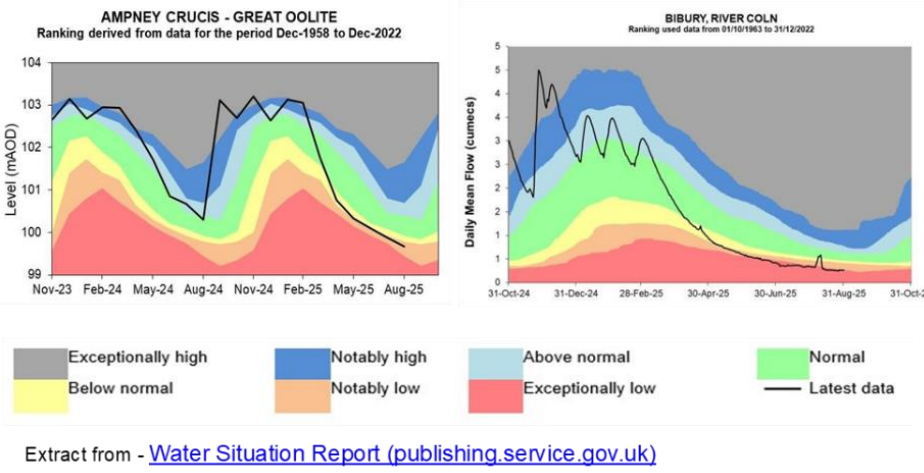


Figure 3: River Level data for Dickler, Bourton Dickler



Extract from - Water Situation Report (publishing.service.gov.uk)

Figure 4: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 5.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Bourton-on-the-Water STW	110	1565.25	153	2583.15

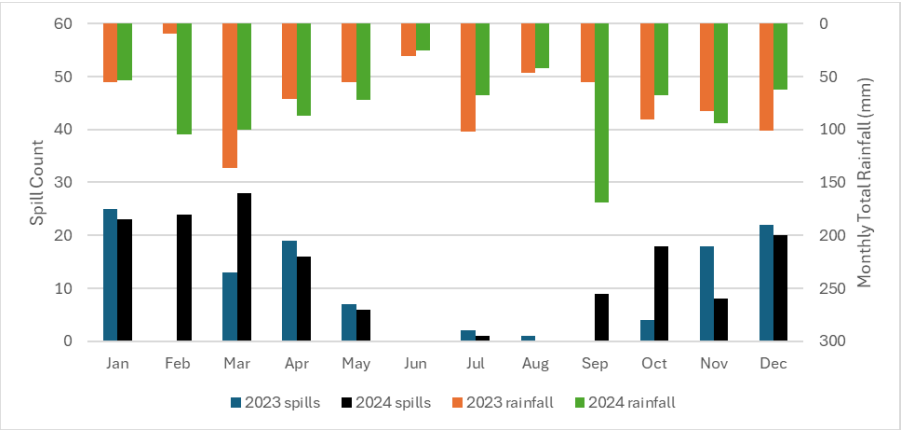


Figure 5: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Bourton-on-the-Water STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	1,756m	1,177m	-
Look and lift surveys	-	-	-	61	-
Sewer lining	-	4,123m	2,347m	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	338	31	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has increased compared to previous years. The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills and river levels could be a result of the increased rainfall in 2024 (seen in Figure 5). Moreover, groundwater levels for 2024/2025 have stayed relatively similar to the groundwater levels of the previous year, but the effect of this will be analysed when 2025 spill data is published.

Broadwell

Broadwell is located in Gloucestershire, approximately 2 miles south of Moreton-in-Marsh and 2 miles west of Chipping Norton.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Broadwell sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 and 2 illustrate the relationship between rainfall and spills at CSOs. Figure 1 displays the reduced rainfall recorded in 2024/25 compared to 2023/24. Figure 2 represents a decreased number and duration of CSO spills from 2023/24 to 2024/25

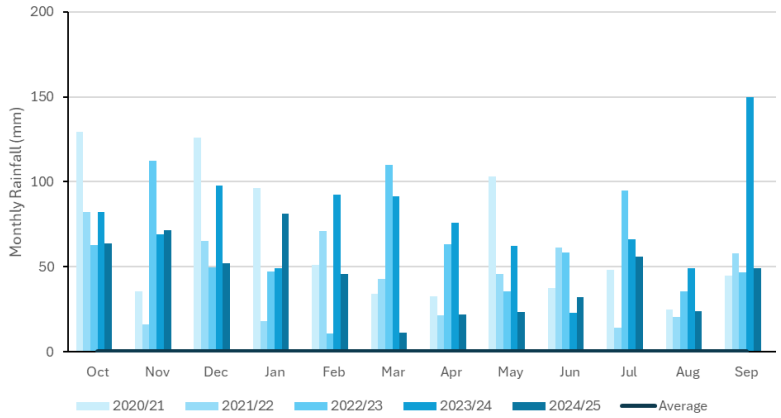


Figure 1: Monthly rainfall data 2020/21 to 2024/25

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 2.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Broadwell STW	48	634.25	58	755.30

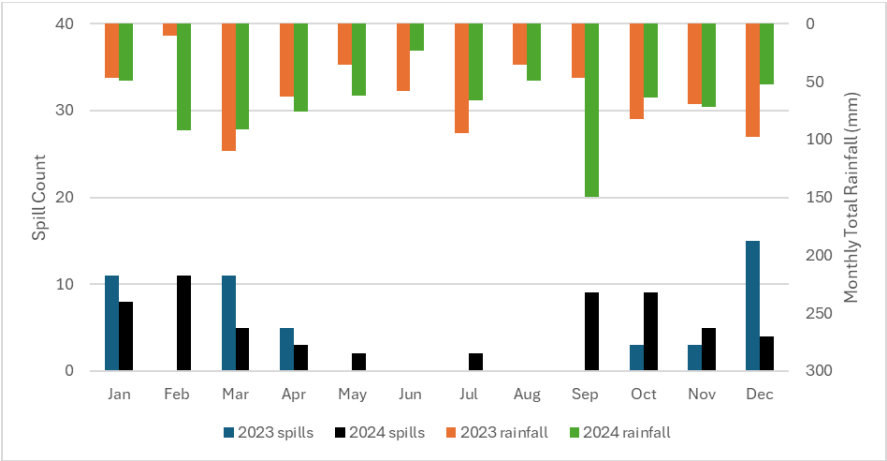


Figure 2: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Broadwell STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2023/24	2023/24	2024/25
CCTV surveys	-	-	-	600m	-
Look and lift surveys	-	-	-	-	-
Sewer lining	-	-	-	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills could be a result of the increased rainfall in 2024 (seen in Figure 2). This suggests that rainfall directly correlates to spill events. However, there is insufficient evidence to support the validity of this correlation, as the spills are spread out throughout the year, with February having the higher number of spills 2024, but not being the wettest month.

Carterton

Carterton is located in West Oxfordshire, approximately 4 miles south-west of Witney.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Carterton sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 5 illustrate the relationship between rainfall and CSO spills at indicator sites. As shown in Figure 1, the decrease in rainfall from 2023/24 to 2024/25 correlates with the decline in the number and duration of CSO spills shown in Figure 5. However, river and groundwater levels (Figures 2 and 3) have remained consistent with previous years.

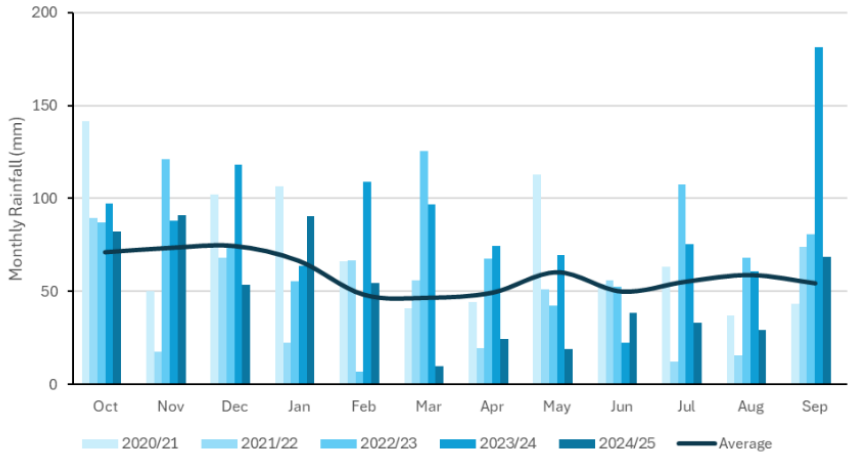


Figure 1: Monthly rainfall data 2020/21 to 2024/25

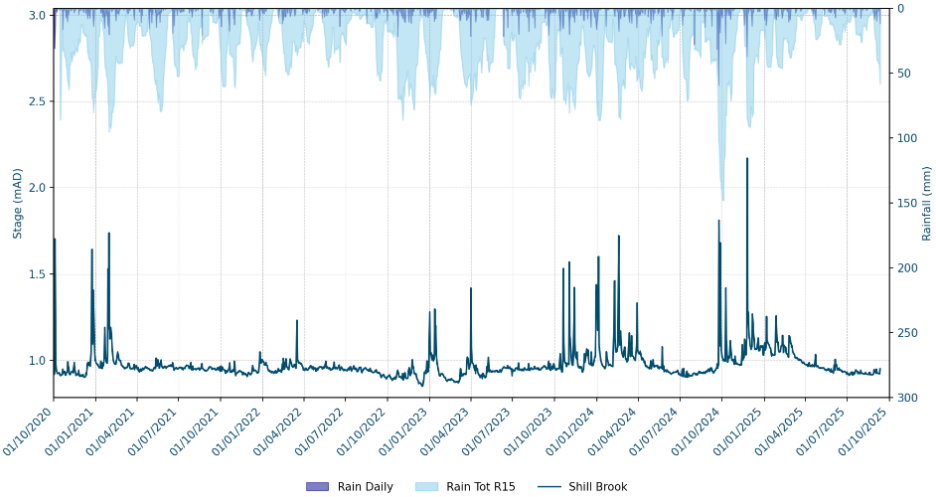


Figure 2: River Level data for Shill Brook, Bampton

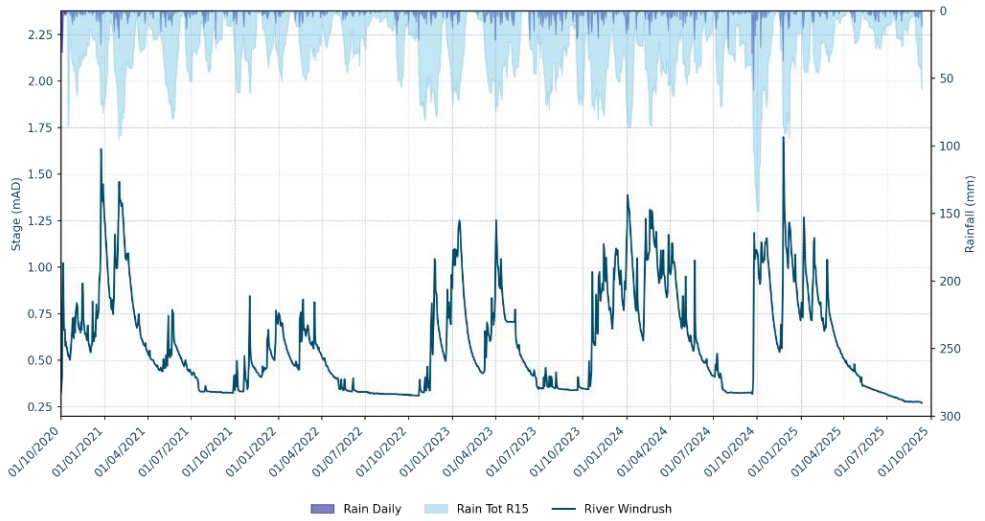
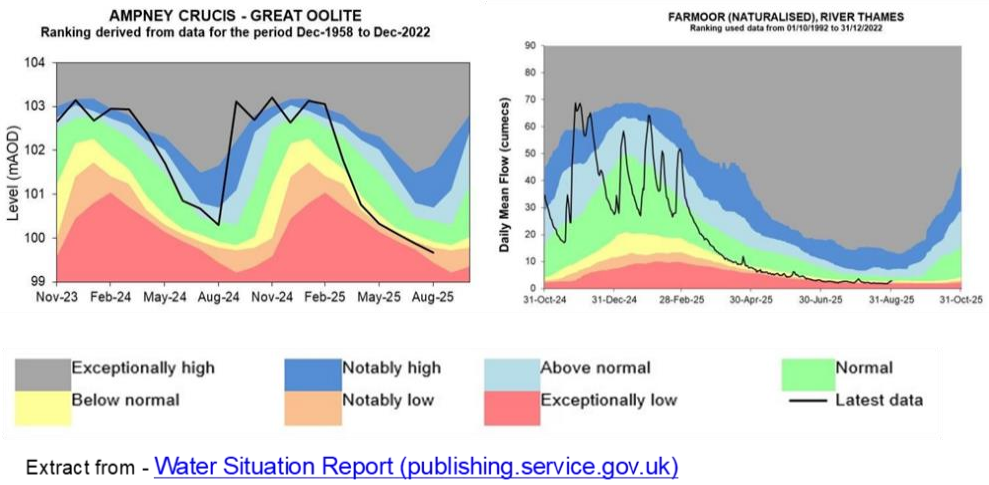


Figure 3: River Level data for River Windrush, Worsham



Extract from - Water Situation Report (publishing.service.gov.uk)

Figure 4: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 5.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Carterton STW	61	1046.25	57	1057.30

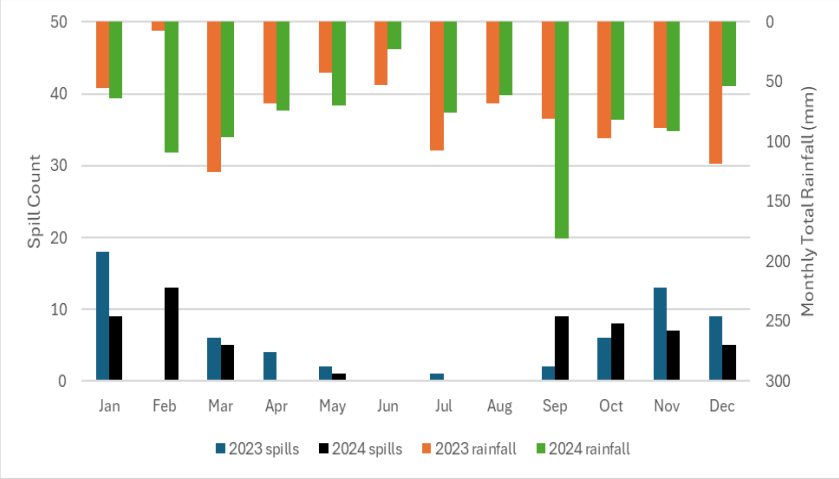


Figure 5: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Carterton STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	-	530m	700m
Look and lift surveys	-	-	-	3	11
Sewer lining	-	-	-	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/2024 shows a similar pattern being followed compared to previous years, including the average rainfall in 2023 staying fairly consistent compared to 2024 (see Figure 5). The lower number of annual spills could be a result of the rainfall and river levels staying consistent. Moreover, groundwater levels for 2024/2025 have stayed relatively similar to the groundwater levels of the previous year, but the effect of this will be analysed when 2025 spill data is published.

In the reporting year, we have undertaken CCTV survey of our sewers network, covering some 700 metres. These CCTV surveys help us monitor the condition of sewer network as well as identifying potential defects that could allow groundwater infiltration. In conjunction with the CCTV, we have undertaken 11 Lift and Look surveys, this type of visual inspection allows for quicker and more extensive checks on performance of the system but lacks the point source observations that CCTV can yield.

Chadlington

Chadlington is located in Evenlode valley, approximately 3 miles south of Chipping Norton.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Chadlington sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 and 2 illustrate the relationship between rainfall and spills at CSOs. There is a decrease in rainfall from 2023/24 to 2024/25 shown in Figure 1; this broadly correlates to fewer and shorter spills at the CSOs, shown in Figure 2.

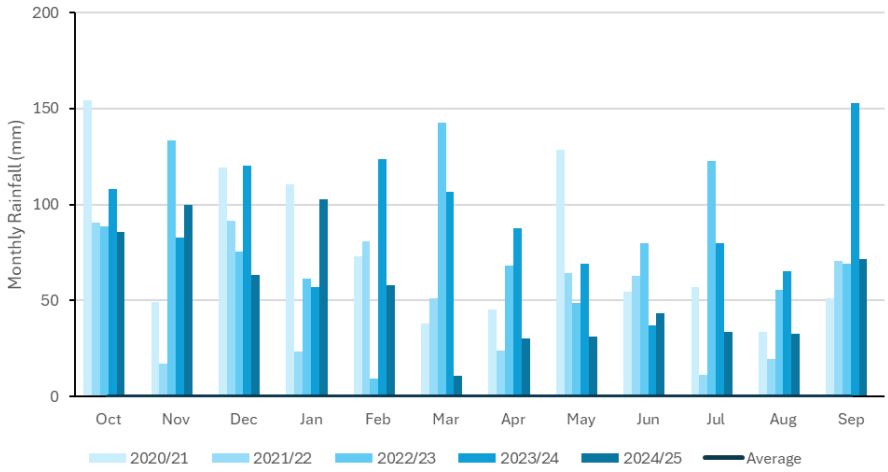


Figure 1: Monthly rainfall data 2020/20 to 2024/25

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 2.

Event Duration Monitoring	2024		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Chadlington STW	64	668	84	1311.30

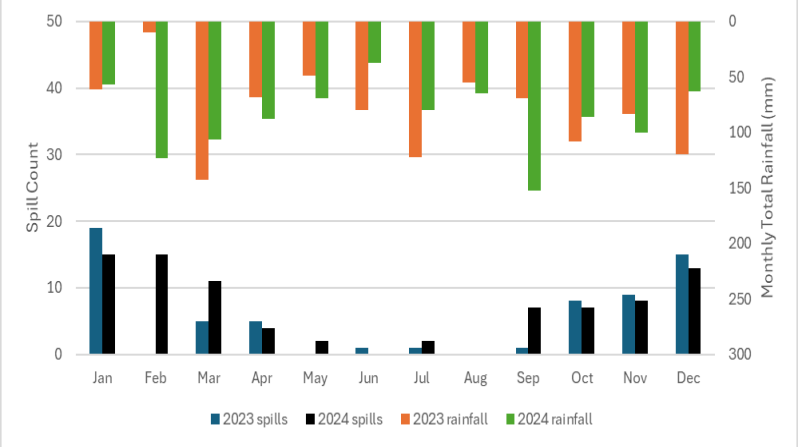


Figure 2: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Chadlington STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	-	30m	-
Look and lift surveys	-	-	-	-	-
Sewer lining	-	-	-	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

The number and duration of spills have increased in 2024 compared to 2023. The average rainfall has stayed fairly consistent between 2023 and 2024. Rainfall usually directly correlates to spill events. However, there is insufficient evidence to support the validity of this correlation, as the spills do not occur during summer season, which is usually the hottest months of the year, and dryest, August (2024) had the same rainfall as December but no spills, whereas December (2024) had some spills with the same rainfall.

Clanfield

Clanfield is located in the district of Oxfordshire, approximately 3 miles South of Carterton and 15 miles West of Oxford.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Clanfield sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 6 illustrate the relationship between rainfall and CSO spills at indicator sites. As shown in Figure 1, rainfall decreases from 2023/24 to 2024/25, however river levels remain fairly consistent (Figures 2 to 4). There is a reduction in both the frequency and duration of CSO spills shown in Figure 6.

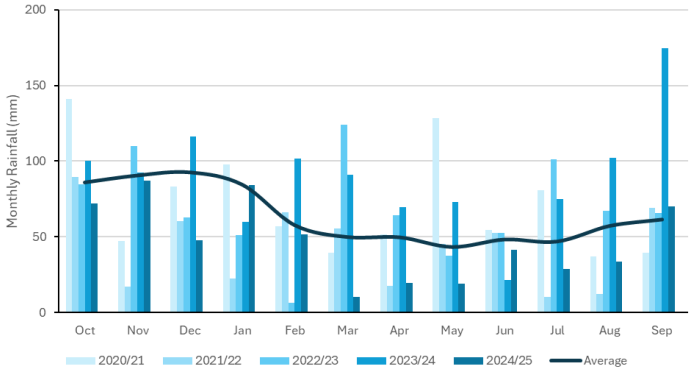
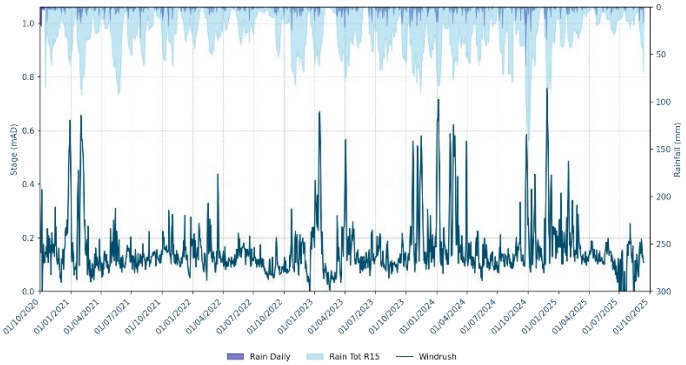


Figure 1: Monthly rainfall data 2020/21 to 2024/25



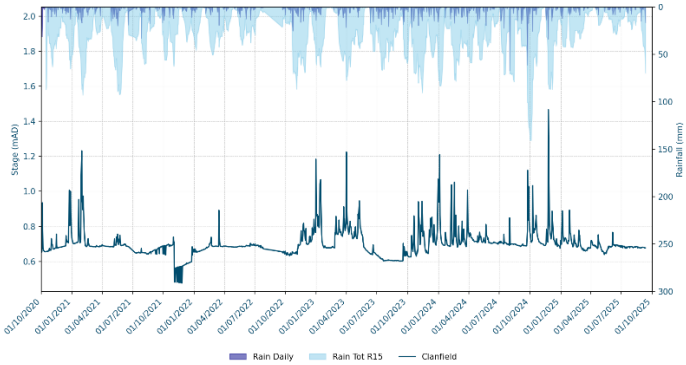


Figure 2: River Level data for Windrush at Worsham / Figure 3: River Level data for Clanfield Brook at Clanfield

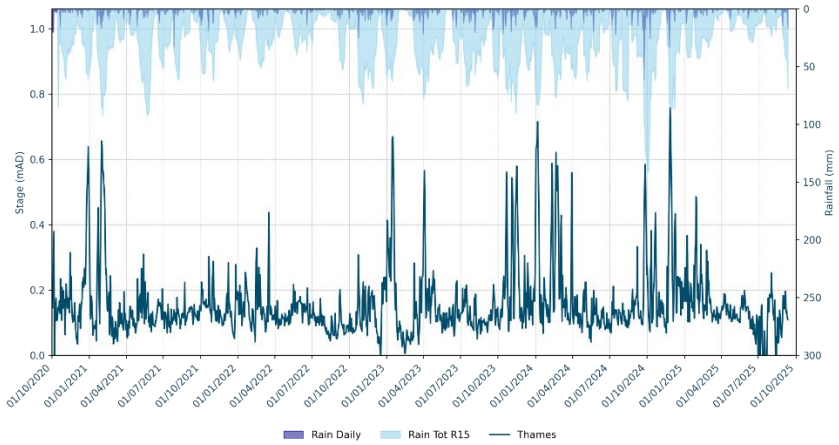
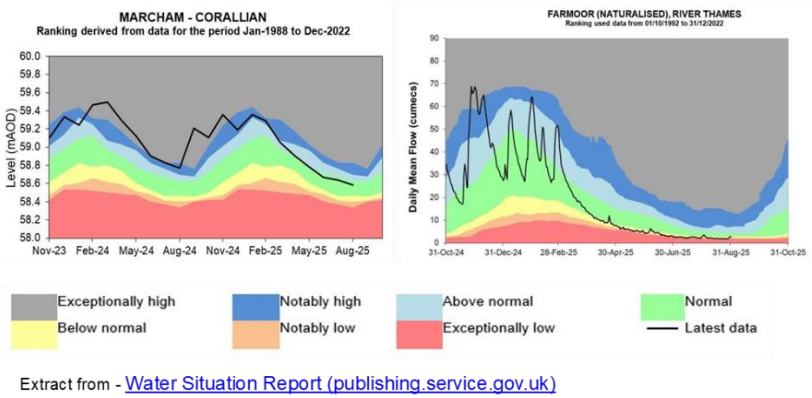


Figure 4: River Level data for River Thames at Radcot Lock



Extract from - Water Situation Report (publishing.service.gov.uk)

Figure 5: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 6.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Clanfield STW	150	3156	172	3402.45

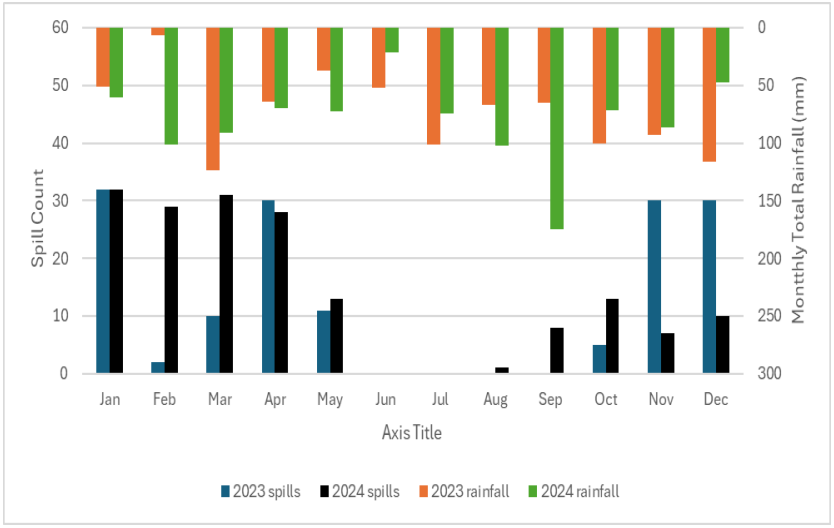


Figure 6: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Clanfield STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	136m	-	9,105m	-
Look and lift surveys	-	3	2	-	-
Sewer lining	-	281	-	1,743m	2,783m
Patch lining	-	-	2	1,725m	996m
Manhole sealing / plates / covers and frames replaced	-	1	-	296	24
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has increased compared to previous years. The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills and river levels could be a result of the increased rainfall in 2024 (seen in Figure 6). Moreover, there is a slight drop in groundwater levels for 2024/2025 compared to the groundwater levels of the previous year, but the effect of this decrease will be analysed when 2025 spill data is published.

Thames Water delivered a wastewater treatment enhancement scheme in 2022 which has increased treatment capacity, reducing the likelihood of storm discharges. The extensive GISMP strategic manhole and sealing works also have a bearing on the reduction in spills.

Faringdon

Faringdon is located in Oxfordshire, approximately 18 miles southwest of Oxford.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Faringdon sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 2 illustrate the relationship between rainfall and spills at CSOs. Figure 1 shows a decrease in rainfall from 2023/24 into 2024/25, correlating to fewer and shorter spills at the CSOs, shown in Figure 2.

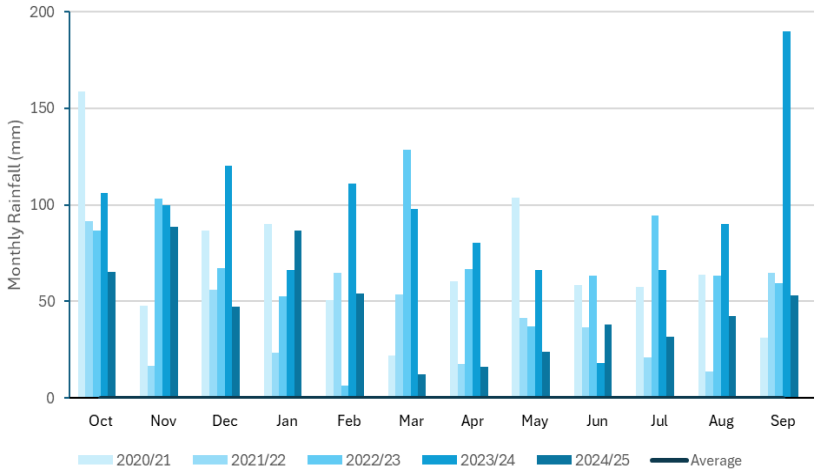


Figure 1: Monthly rainfall data 2020/21 to 2024/25

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 2.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Faringdon STW	116	527	138	790.15

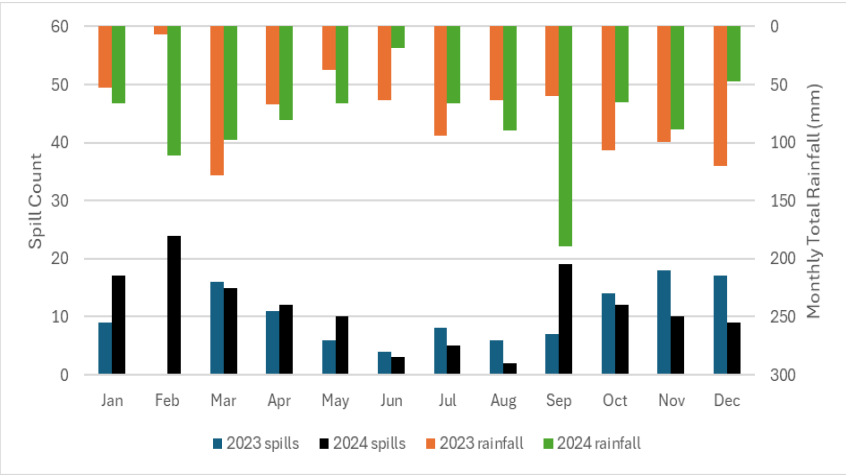


Figure 2: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Faringdon STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	-	360m	120m
Look and lift surveys	-	-	-	-	-
Sewer lining	-	-	-	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills could be a result of the increased rainfall in 2024 (seen in Figure 2). This suggests that rainfall directly correlates to spill events. However, there is insufficient evidence to support the validity of this correlation, as the highest number of spills for 2024 (February) does not occur during one of the wettest months.

In the reporting year, we have undertaken CCTV survey of our sewers network, covering some 120 metres. These CCTV surveys help us monitor the condition of sewer network as well as identifying potential defects that could allow groundwater infiltration.

Milton-under-Wychwood

Milton-under-Wychwood is located on the River Evenlode, in Oxfordshire, approximately 11km northwest of Witney.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Milton-under-Wychwood sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 and 4 illustrate the relationship between rainfall and CSO spills at indicator sites. As shown in Figure 1, the decrease in rainfall from 2023/24 to 2024/25 correlates with decrease in the number and duration of CSO spill events shown in Figure 4. River levels remain consistent between 2023/24 and 2024/25 observing Figure 2.

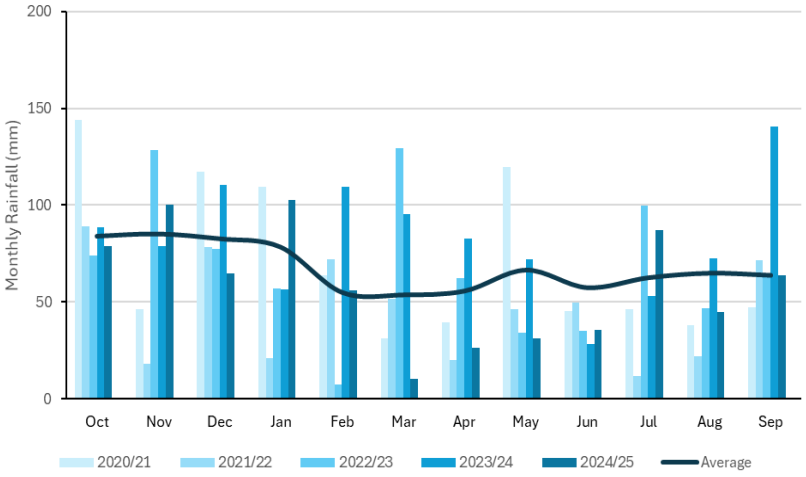


Figure 1: Monthly rainfall data 2020/21 to 2024/25

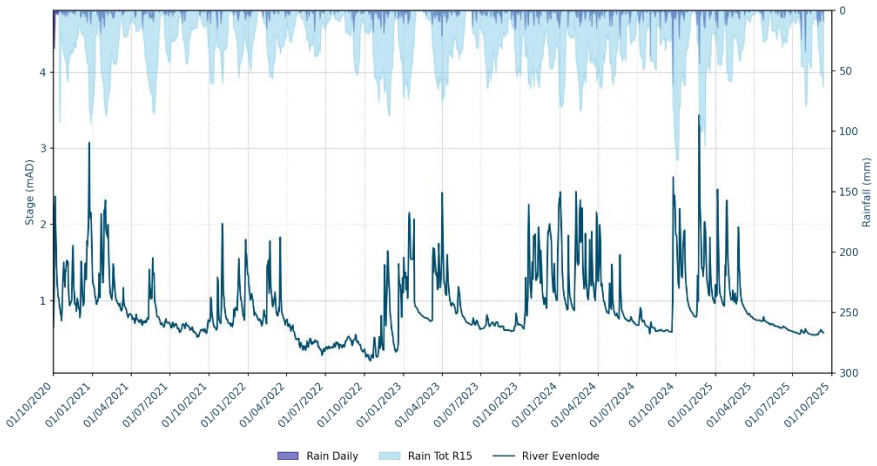


Figure 2: River Level data for River Evenlode, Shipton

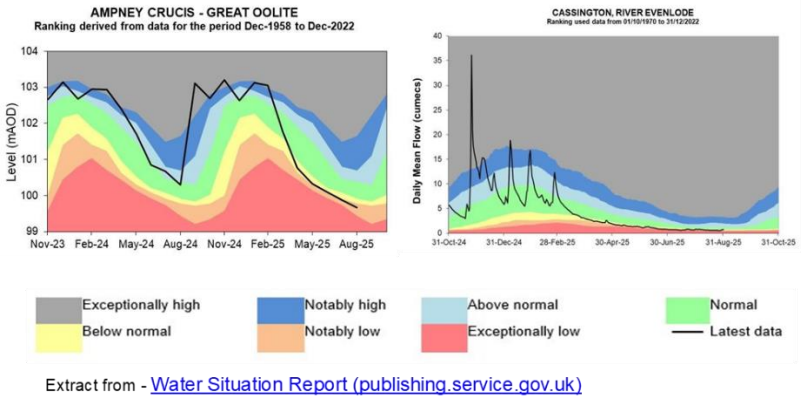


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Figure 3: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 4.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Milton-under-Wychwood STW	126	2141.75	152	2657.15

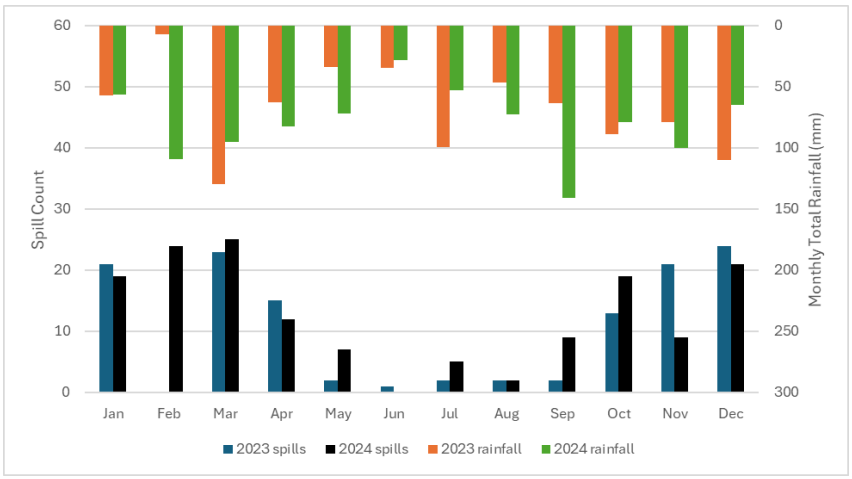

Figure 4: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Milton-under-Wychwood STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	-	1,893m	-
Look and lift surveys	-	-	-	-	-
Sewer lining	-	-	-	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has remined consistent compared to previous years. The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills could be a result of the increased rainfall in 2024 (seen in Figure 4). Moreover, groundwater levels for 2024/2025 have remained consistent compared to the groundwater levels of the previous year, but the effect of this will be analysed when 2025 spill data is published.

Moreton-in-Marsh

Moreton-in-Marsh is located on the River Evenlode in Gloucestershire, approximately 6km north of Stow on the Wold.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Moreton-in-Marsh sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 6 illustrate the relationship between rainfall and CSO spills at indicator sites. As observed in Figure 1, there decrease in rainfall from 2023/24 to 2024/25. However, recorded river level data follows a similar profile between 2023/24 and 2024/25 observing Figures 2 and 3. Additionally, there is no spills data for 2025.

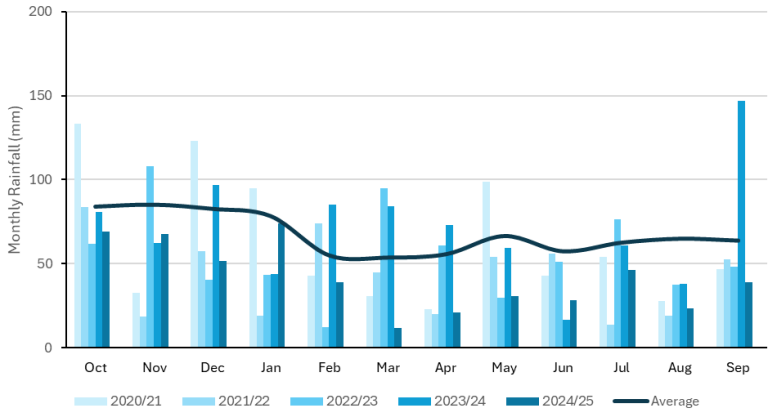

Figure 1: Monthly rainfall data 2020/21 to 2024/25

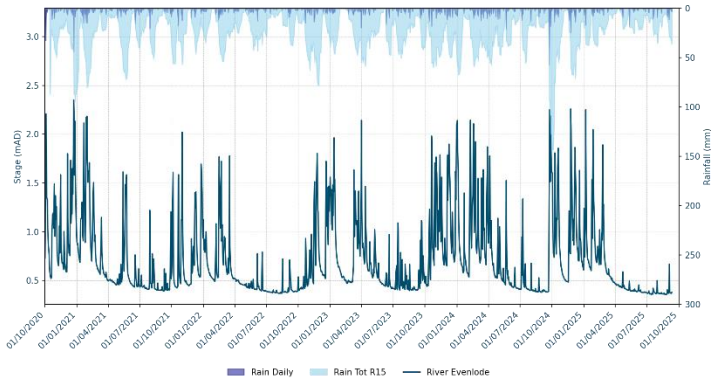

Figure 2: River Level data for River Evenlode, Evenlode Bridge

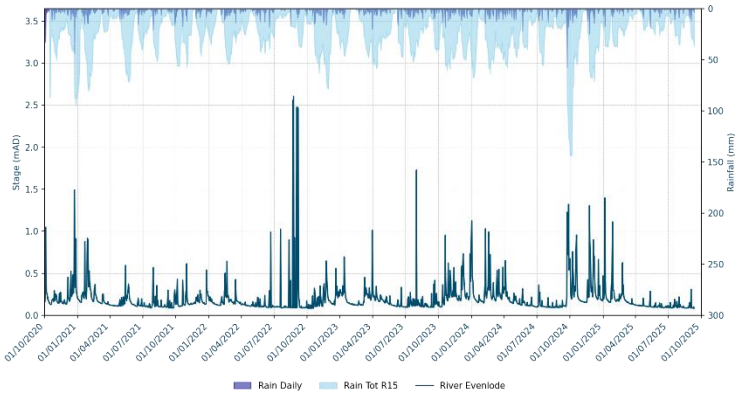

Figure 3: River Level data for River Evenlode, Moreton-in-Marsh

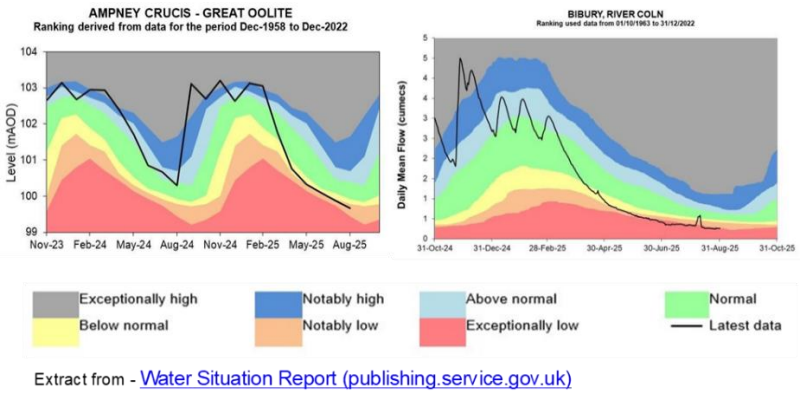

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Figure 4: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 5 and 6.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
CSO at Moreton in Marsh SPS	4	20.7	26	157.45
Storm Sewage Irrigation Area (Primrose Court SPS)	128	2012.50	138	2055.45

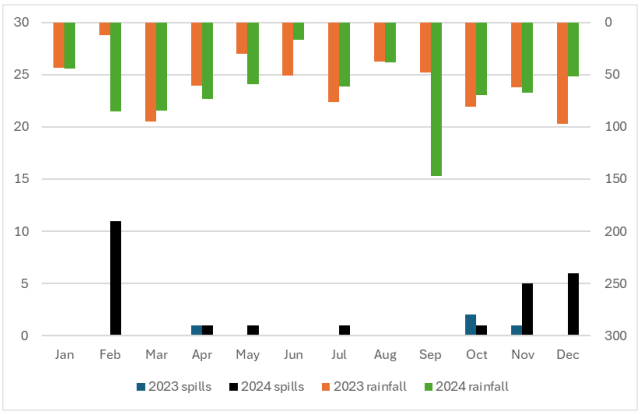

Figure 5: EDM Monthly Performance – CSO at Moreton in Marsh SPS

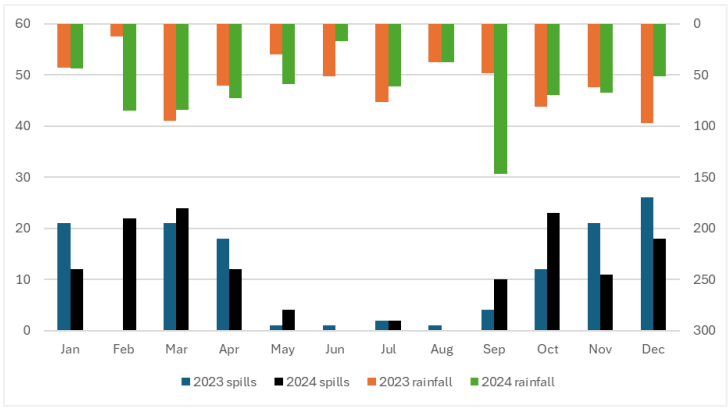

Figure 6: EDM Monthly Performance – Storm Sewage Irrigation Area (Primrose Court SPS)

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	-	-	-
Look and lift surveys	-	-	-	-	-
Sewer lining	-	-	36m	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has remined consistent compared to previous years. The number and duration of spills have increased in 2024 compared to 2023 for CSO at Moreton in Marsh SPS and Storm Sewage Irrigation Area (Primrose Court SPS). The higher number of annual spills could be a result of the increased rainfall in 2024 (seen in Figure 5 & 6). Moreover, groundwater levels for 2024/2025 have remained consistent compared to the groundwater levels of the previous year, but the effect of this will be analysed when 2025 spill data is published.

Standlake

Standlake is located on the River Windrush, in West Oxfordshire, approximately 8km southeast of Witney.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Standlake sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 4 illustrate the relationship between rainfall and CSO spills at indicator sites. As shown in Figure 1, the decrease in rainfall from 2023/24 to 2024/25 correlates with fewer CSO spills, as shown in Figure 4. Observing the river levels in Figure 2, there is a slight decrease in 2024/25 from 2023/24.

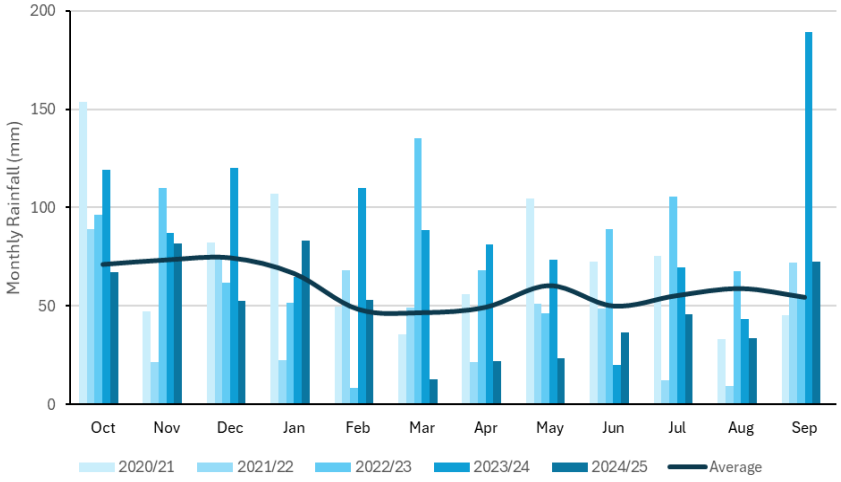

Figure 1: Monthly rainfall data 2020/21 to 2024/25

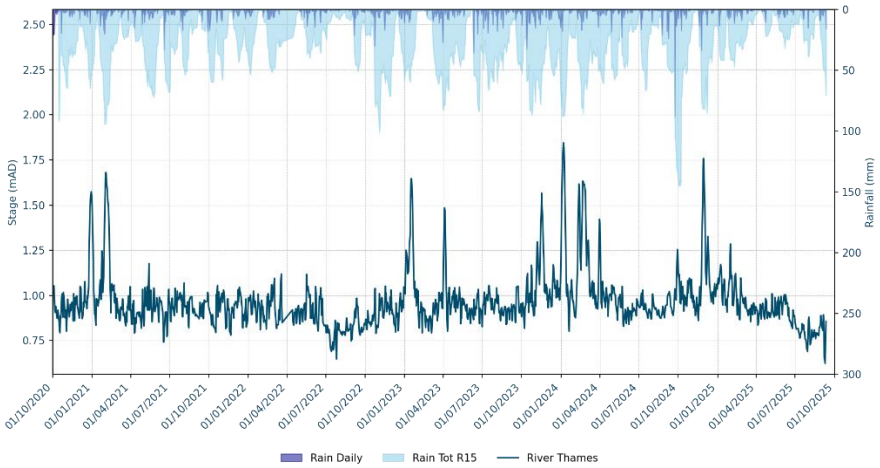

Figure 2: River Level data for River Thames, Farmoor

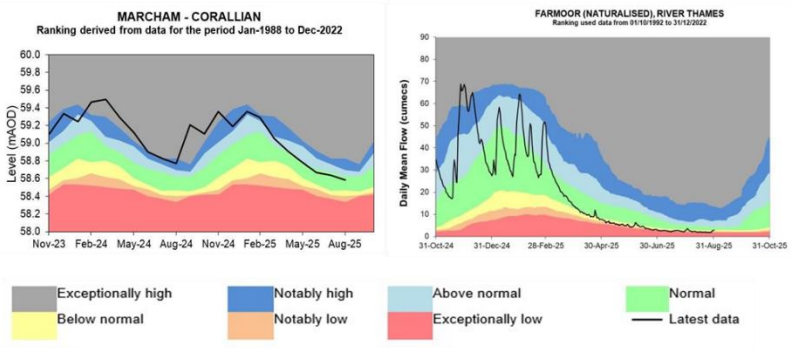

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Figure 3: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 4.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Standlake STW	131	2769	180	3967.45

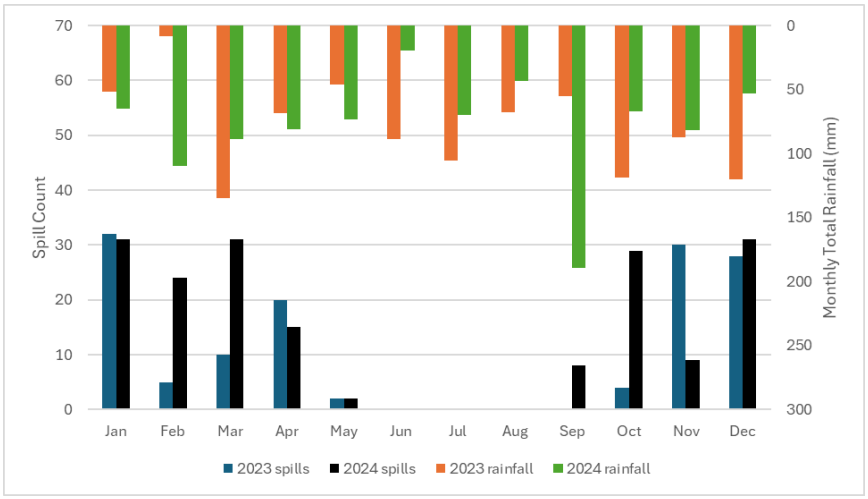

Figure 4: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Standlake STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	350m	2,007m	1,200m	-
Look and lift surveys	-	-	3	2	-
Sewer lining	-	-	-	-	-
Patch lining	-	2	3	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has increased compared to previous years. The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills and river levels could be a result of the increased rainfall in 2024 (seen in Figure 4). Moreover, there is a slight drop in groundwater levels for 2024/2025 compared to the groundwater levels of the previous year, but the effect of this decrease will be analysed when 2025 spill data is published.

Witney

Witney is located on the River Windrush in Oxfordshire, approximately 12 miles West of Oxford.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Witney sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 5 illustrate the relationship between rainfall and CSO spills at indicator sites. As shown in Figure 1, the decrease in rainfall from 2023/24 to 2024/25 correlates with fewer CSO spills, as presented in Figure 5. River levels (Figures 2 and 3) remained consistent.

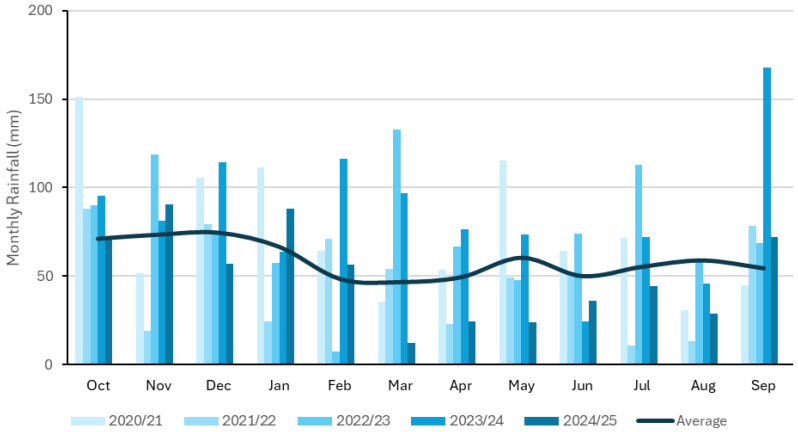

Figure 1: Monthly rainfall data 2020/21 to 2024/25

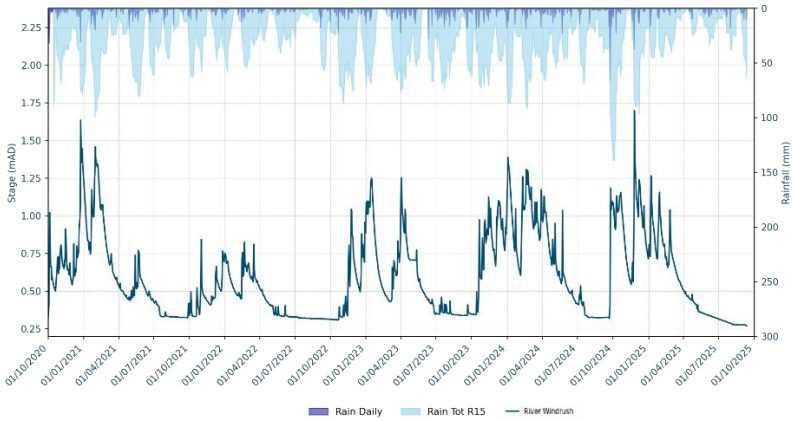

Figure 2: River Level data for River Windrush, Worsham

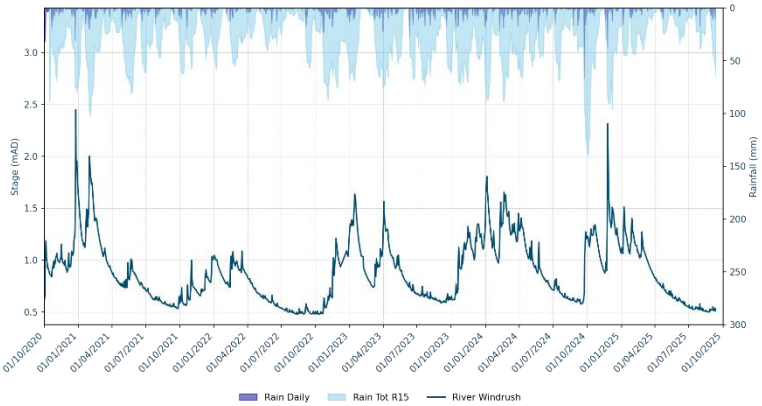

Figure 3: River Level data for River Windrush, Witney

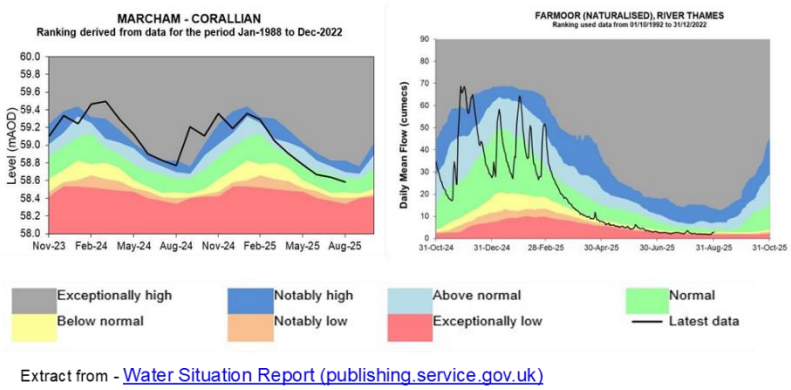

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Figure 4: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 5.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Witney STW	119	2206.5	141	2800

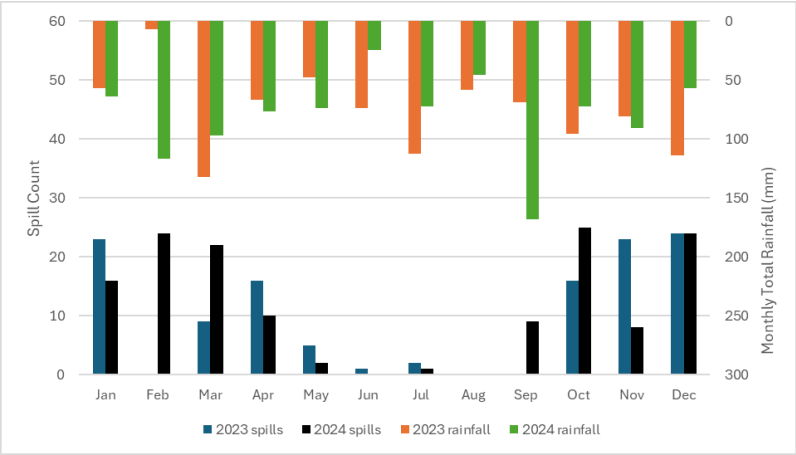

Figure 5: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Witney STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2023/24	2023 /24	2024 /25
CCTV surveys	-	4,963m	1,437m	555m	-
Look and lift surveys	-	-	4	4	-
Sewer lining	-	10m	1,182m	24	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	5	4	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has remained consistent compared to previous years. The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills could be a result of the increased rainfall in 2024 (seen in Figure 5). Moreover, there is a slight drop in groundwater levels for 2024/2025 compared to the groundwater levels of the previous year, but the effect of this decrease will be analysed when 2025 spill data is published.


Thames
Water