



Groundwater Impacted System Management Plan

Alton, Caker Stream

November 2021



It's everyone's water

Version control

| Version | Date | Amendment | Author | Checked | Reviewed |
|--------------------|--------------|--------------------------------|--------|---------|----------|
| 1-d1 | 29/10/2021 | Draft for EA | SS/NW | AJ | SE |
| 1-d2 | 23/11/2021 | Final Draft for EA | SS/NW | SE | DJ |
| 1-V1 | 30/11/2021 | Version 1 | SS/NW | SE | DJ |
| Annual Update 2022 | October 2022 | Addition of Annual Update 2022 | MB/JH | DJ | DJ |
| Annual Update 2023 | October 2023 | Addition of Annual Update 2023 | MB | DJ | DJ |

Table of contents

| | |
|--|----|
| Introduction | 4 |
| Brief description of Alton catchment | 6 |
| Problem characterisation | 6 |
| General outline plan & timescale | 9 |
| Alton Infiltration Management Plan | 12 |
| High level approach statement | 12 |
| Investigations | 13 |
| Monitoring | 13 |
| Mitigation | 13 |
| Updates | 13 |
| Appendix | 14 |
| Groundwater infiltration potential analysis | 14 |
| Investigations & remedial work undertaken since 2019/20 and future plans | 15 |
| Addendum - Annual Update 2022 | 17 |
| Addendum - Annual Update 2023 | 27 |

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 excessive and likely to be the source of uncontrolled escape of untreated or partially treated sewage.

All sewerage systems combined and separate will experience some groundwater infiltration¹ 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 possible². 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 approach to date lacks a degree of certainty of resolution and for this reason Thames Water has in 2020 undertaken a different approach for the medium to long-term management of groundwater, which is covered within this

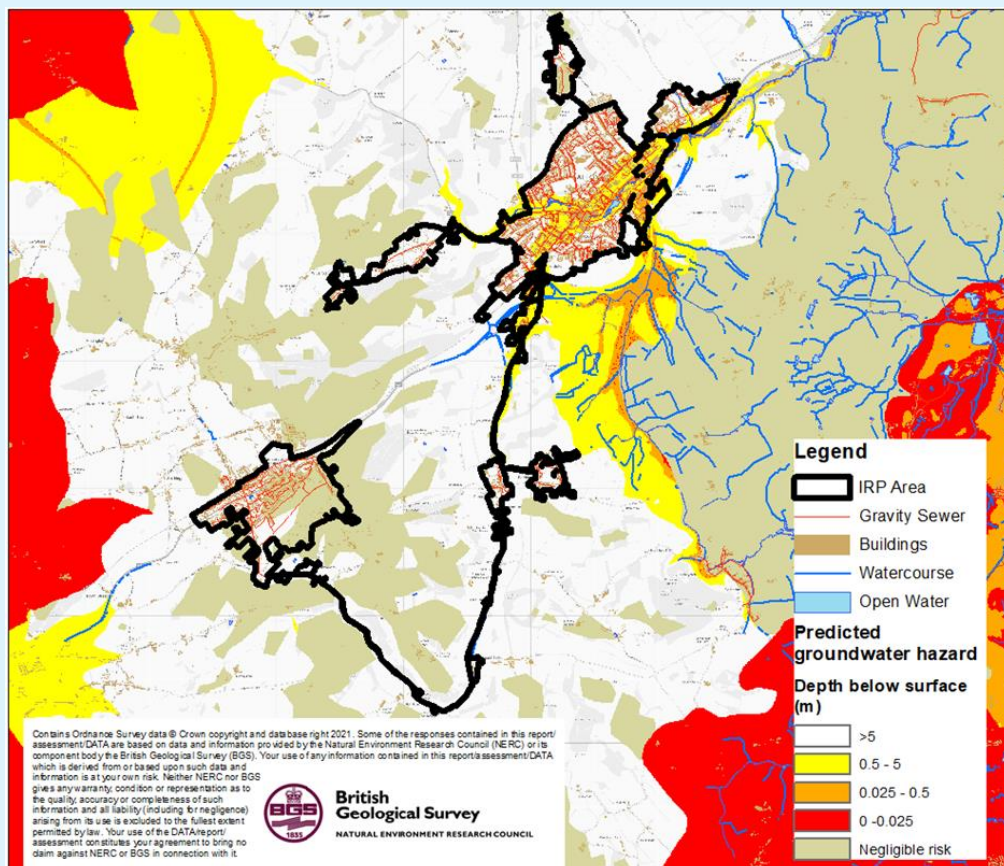
¹ Sewers for Adoption makes an allowance for 10% of normal wastewater flow to allow for unaccounted flows such as groundwater infiltration.

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. 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 Alton catchment



1.0 – Alton catchment

Alton is located in Hampshire, England, approximately 12km south-east of Basingstoke at the source of the River Wey. Alton serves a population equivalent³ of 31,804 with a predominantly separate sewerage network totaling some 226 km in length excluding private drains and sewers. The extent of the catchment is shown in Figure 1.0 above.

Problem characterisation

Groundwater can enter our sewers when levels are high and a positive head above the soffit of the sewer is created. Significant groundwater ingress can impact sewer capacity and increase the risk of flooding.

On occasion, prolonged, heavy rainfall and raised groundwater levels have resulted in extensive groundwater flooding to properties and highways, and the overwhelming of the local drainage systems; including the public foul sewer network. This is exacerbated by surface water entering the system during prolonged, heavy rainfall.

³ Population equivalent or 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.

The sewerage system is identified on the public sewer records as being a partially separate foul system, rather than a combined system, as there is a small amount of surface water network in the area.

We believe that significant volumes of surface water runoff from surrounding saturated fields and built-up land have entered the foul sewerage network during recent wet winters, causing the network to become overloaded and surcharge (mainly through submerged manholes). In past years there have been localised sewer repairs and installation of low-leak manhole covers.

Short-term flow sewer surveys, CCTV surveys and monitoring we have carried out have detected that there is some evidence of groundwater infiltration into the foul sewer network when groundwater levels are high. Surface water inundation from highways, public spaces and properties and fluvial flooding from local watercourses have also been detected.

Causes of this include urban creep, climate change and population growth. Surface water misconnections (i.e. down pipes from roofs into the sewer network) are also suspected to be a contributing factor, hence further analysis is required to determine the extent to which this has contributed to sewer flooding.

A limited number of our sewerage systems include for overflows, these structures are there to protect against sewer flooding as a result of rainfall or equipment failure where appropriate. Discharges from these structures should not be impacted by excessive infiltration as detailed by the EA Regulatory Position Statement on groundwater impacted sewerage systems.

The use of storm sewage overflows is accepted by our regulators, subject to conditions.

In the winter of 2020/21, there was one pollution incident and no flooding incidents in the network. Although there has been past flooding which has since been actioned through flooding clean up, tankering to protect at risk properties and maintenance and cleaning of wet wells at Newman Lane and Holybourne sewage pumping stations (SPS).

Groundwater impact in the Alton system is localised and therefore does not have a significant impact on spills from the STW. Alton STW is a 'treat all' site so does not have storm separation or a storm permit.

Our permit conditions for Holybourne SPS state:

"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 snow melt."

Our permit conditions for Newmans Lane SPS state:

"The discharge from a Pumping Station Emergency Overflow ('PSEO') shall not occur other than in an emergency and when the sewage pumping station is inoperative as a result of one or more of the following:

(i) electrical power failure or electronic control failure not due to the act or default of the Permit Holder, its agents, representatives, officers, employees or servants;

(ii) mechanical breakdown of duty and standby pumps;

(iii) rising main failure;

(iv) blockage of the downstream sewer not due to the act or default of the Permit Holder, its agents, representatives, officers, employees or servants;

and it is not reasonably practicable to dispose of the sewage otherwise.”

The site is also permitted as a storm overflow, “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 snow melt....on-line storm storage must be fully utilised before a discharge occurs”.

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 East Hampshire District Council as Lower Tier 1 and Hampshire County Council as the Higher Tier Council, Lead Local Flood Authority and Planning Authority, in addition to 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 unplanned unconsented unavoidable discharges in the network as a result of surcharging manholes causing pollution. This has been as a direct result of the influence of groundwater infiltration.

We anticipate that this situation may continue until such time we are able to implement a long-term solution.

General outline plan & timescale

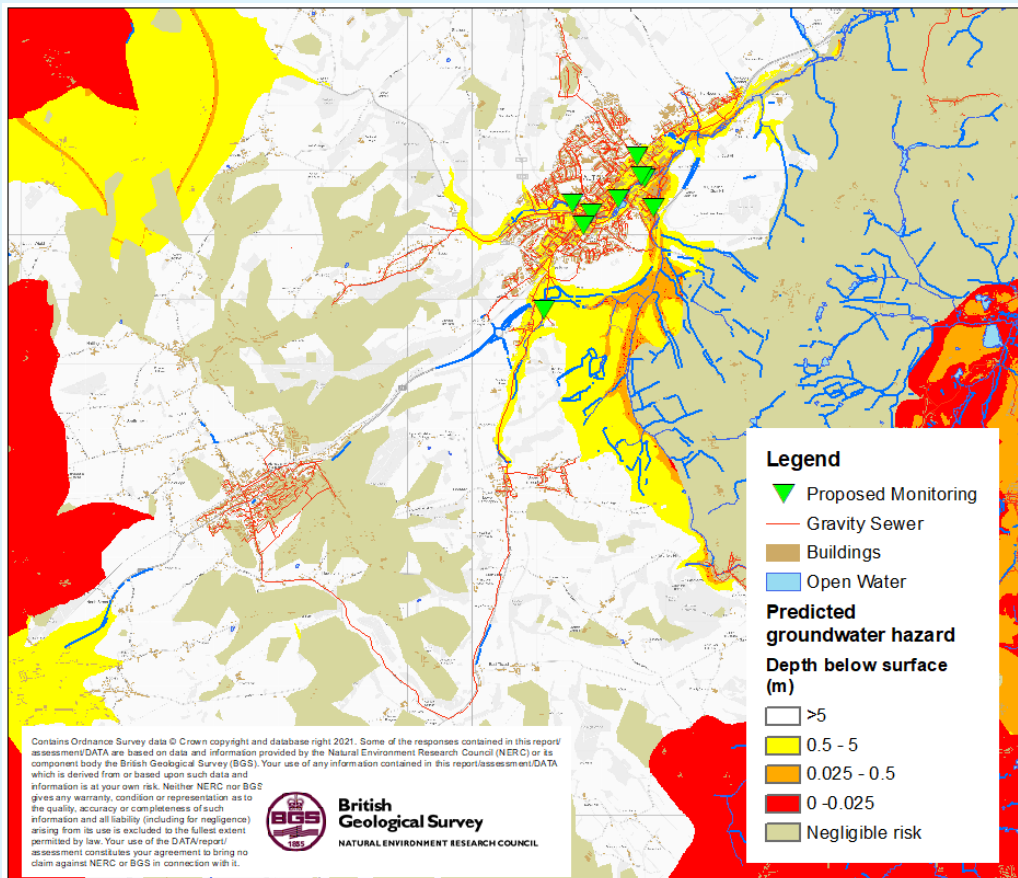


Figure 2.0 – Alton monitoring plan area and infiltration zones

Key to bringing the impact of groundwater infiltration under control is an enhanced monitoring regime. We have identified zones and areas over which telemetered depth monitoring will be installed. Figure 2.0 presents a plan of currently proposed installation locations.

Complimenting 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 Alton 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 will be 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 wholly⁴ of the high risk zones in AMP8⁵, 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. The decision on this will be based on information obtained from the monitors and depending on the scale of further work required this may need to form part of PR29⁶ investment planning.

The monitors are also to be used to monitor change within the system hence even should we determine that infiltration

has been brought under control, we will continue to monitor for potential trends in infiltration suggesting the need for further work. We also anticipate monitoring the response of the catchment to surface water and where appropriate will use the monitor data to address this source of storm flow.

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

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 (zones) to be targeted for sealing in the 56 systems identified as being impacted by infiltration in the Thames Water region. |
| Install monitors | 2021-2023 | Monitor plans are being developed to help calibrate and validate the zones. Each year completeness / coverage of 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 compliment 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 Decision of extent of sealing will be based on outcomes of works undertaken in AMP7, results of monitoring and successful submission of our plans for investment for AMP8.

⁵ Asset Management Plan 8 – covering work between 2025-2030

⁶ Price Review 2029

| Activity | When | Description |
|------------------------------|-----------|---|
| Minor works | 2020-2023 | As mentioned, if we detect minor works being required, we will look to resolve these as and when we find them. |
| PR24 | 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 to 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). |
| Storm Tank Capacity Upgrades | 2020-2025 | Increasing storm tank capacity at Newman Lane SPS. |
| High risk zone sealing | 2025-2030 | Sealing of high-risk zone undertaken subject to need being demonstrated. |

Alton Infiltration Management Plan

As detailed above the impact of infiltration is experienced mainly in the network.

Our approach to the resolution of infiltration impacting the Alton sewerage system is outlined below.

High level approach statement

For Alton our approach to tackling infiltration will be undertaken as follows:

1. We will investigate the network further with a view to identifying sources of ingress of infiltration that are cost effective⁷ to address. To investigate the network, we have:
 - Undertaken a desktop analysis to determine infiltration high to low risk zones (October 2020);

To investigate the network, we will:

- Install monitoring to back up the analysis and to aid focusing of locations for identification of infiltration (2021 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).

We will also review results of Winter 2019/20 and 2020/21 with historic data to build up evidence to support interventions in the network (Autumn 2021).

2. Where interventions can be undertaken as part of normal sewer maintenance activities these will be communicated and progressed.
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 and need. Significant investment needs may need to be included in our next investment planning cycle at PR24.

⁷ 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 we have commissioned JBA Consulting to undertake an exercise involving 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) will include '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 between 2021 and 2023. 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. They will also 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 within the network, make use of pumps to contain flows or deploy settlement tanks to part treat sewage before release to the environment.

With regard to Alton we do not envisage needing to undertake mitigation work beyond tankering within the network and upgrades to the storm tank at Newman Lane SPS.

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

Groundwater infiltration potential analysis

The sewer network classified by the groundwater infiltration risk zones. The lengths of sewers within these zones are presented in the table below.

| Risk category | Description | Length (km) | Percentage |
|---------------|--|-------------|------------|
| High | Predicted groundwater extreme >1m above pipe invert | 5.47 | 5.1 |
| Medium | Predicted groundwater extreme 0-1m above pipe invert | 3.63 | 3.4 |
| Low | Predicted groundwater extreme 0-1m below pipe invert | 7.02 | 6.6 |
| Very Low | Predicted groundwater extreme >1m below pipe invert | 90.48 | 84.9 |
| Total | | 106.60 | 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 | 274 | 8.1 |
| Medium | Inundation risk in 1% AEP fluvial or pluvial event | 160 | 4.7 |
| Low | Inundation risk in 0.1% AEP fluvial or pluvial event | 480 | 14.2 |
| Very Low | All other manholes | 2460 | 72.9 |
| Total | | 3374 | 100.0 |

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

Lift and Look and CCTV surveys have not yet commenced in the Alton system. A summary of findings will be provided in the next update of this report.

Glossary of terms

AEP – Annual Exceedance Potential

AMP – Asset Management Programme

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 2022

Table of contents

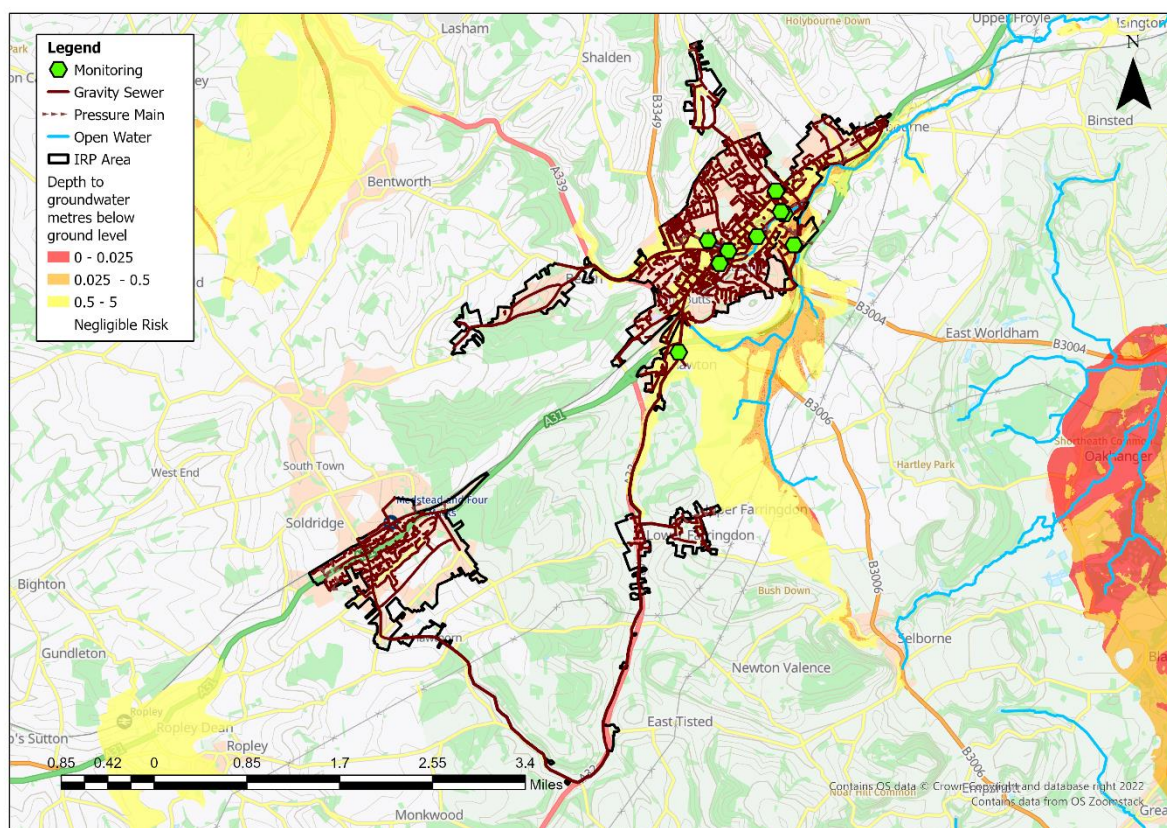
| | |
|--------------------------------|----|
| Overview | 2 |
| Hydrological Review – 2021-22 | 3 |
| Network Performance | 7 |
| Investigations & Interventions | 9 |
| Summary | 10 |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

Overview

This addendum to the Alton 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 – Alton Monitoring Plan



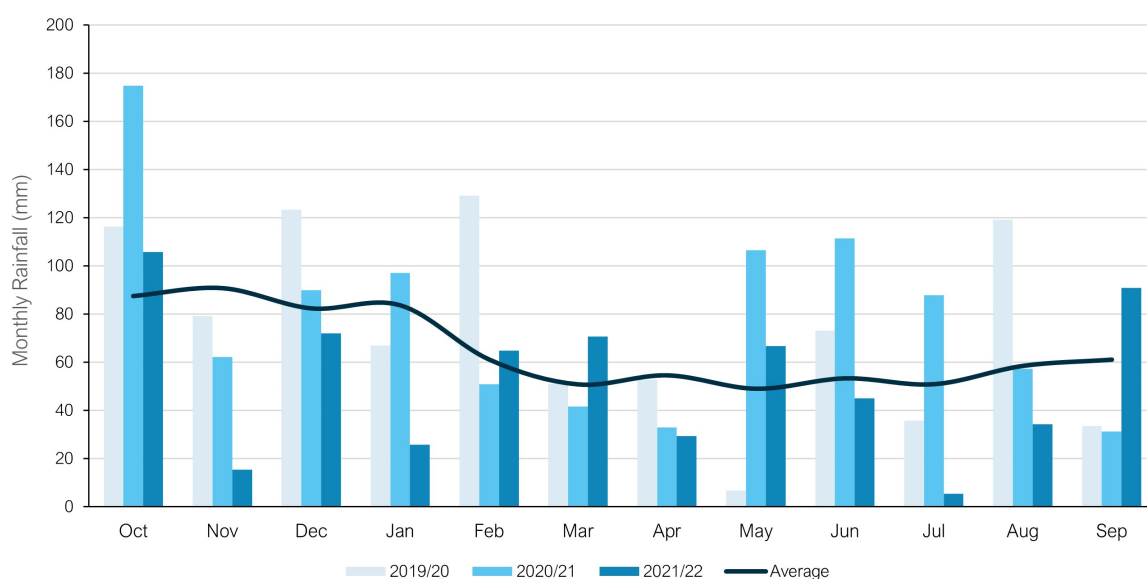
Hydrological Review – 2021-2022

This section summarises the hydrological conditions within the Alton 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 Odiham based on the period 1991-2020

The total rainfall for the 2021/22 hydrological year is 20% 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) |
|--------------|--------------|--------------|--------------|
| 783 | 887 | 943 | 626 |

Groundwater / Local River Level

The Alton catchment is situated in the North Downs – Hampshire water resources area. The extended Alton catchment is situated across a number of different rock types within its base geology; however the predominant rock type is sedimentary bedrock within the Seaford, Zig Zag, and Holywell Nodular Chalk formations. All of the extended Alton catchment and its subsequent base geology is part of a principal aquifer within the UK.

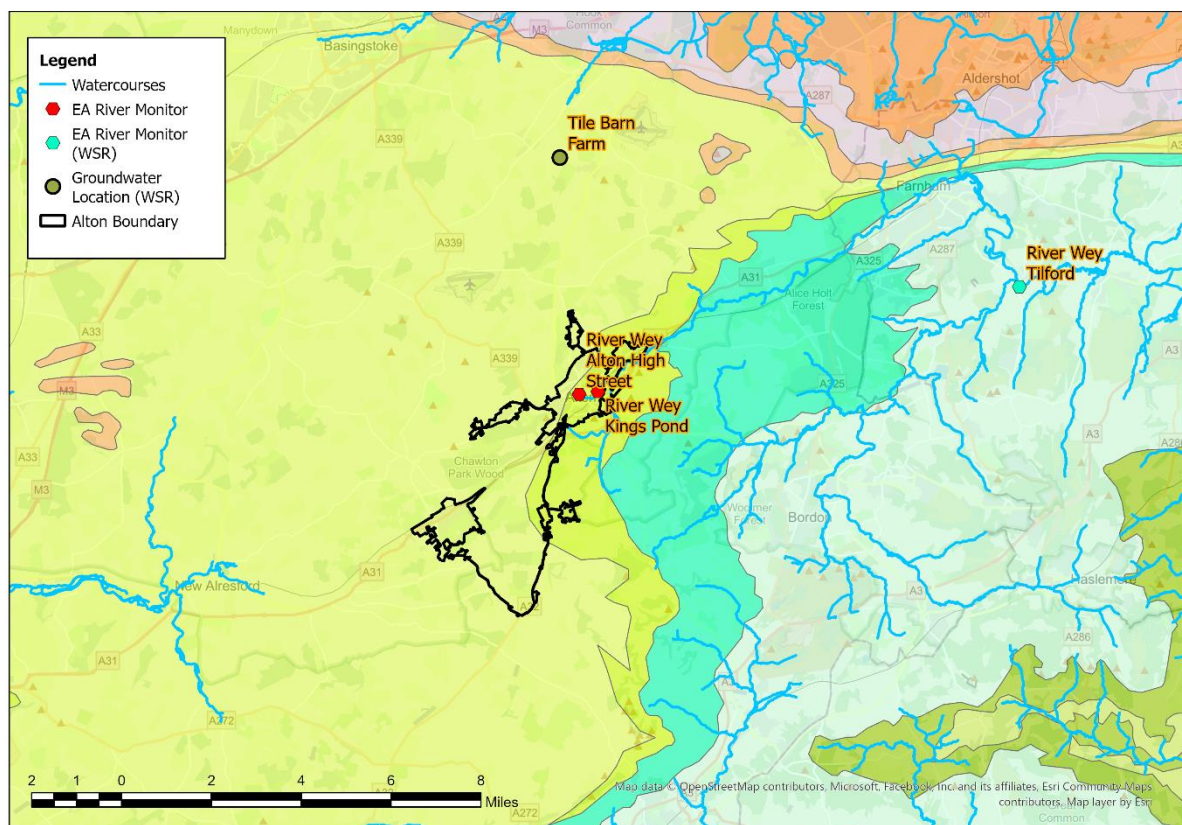
The Environment Agency has gauging stations on local watercourses measuring stage and observation boreholes measuring groundwater levels locally to the catchment which can be used to provide indicative local groundwater performance.

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

- River Wey, Kings Pond
- River Wey, Alton High Street

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 – River Wey, Kings Pond

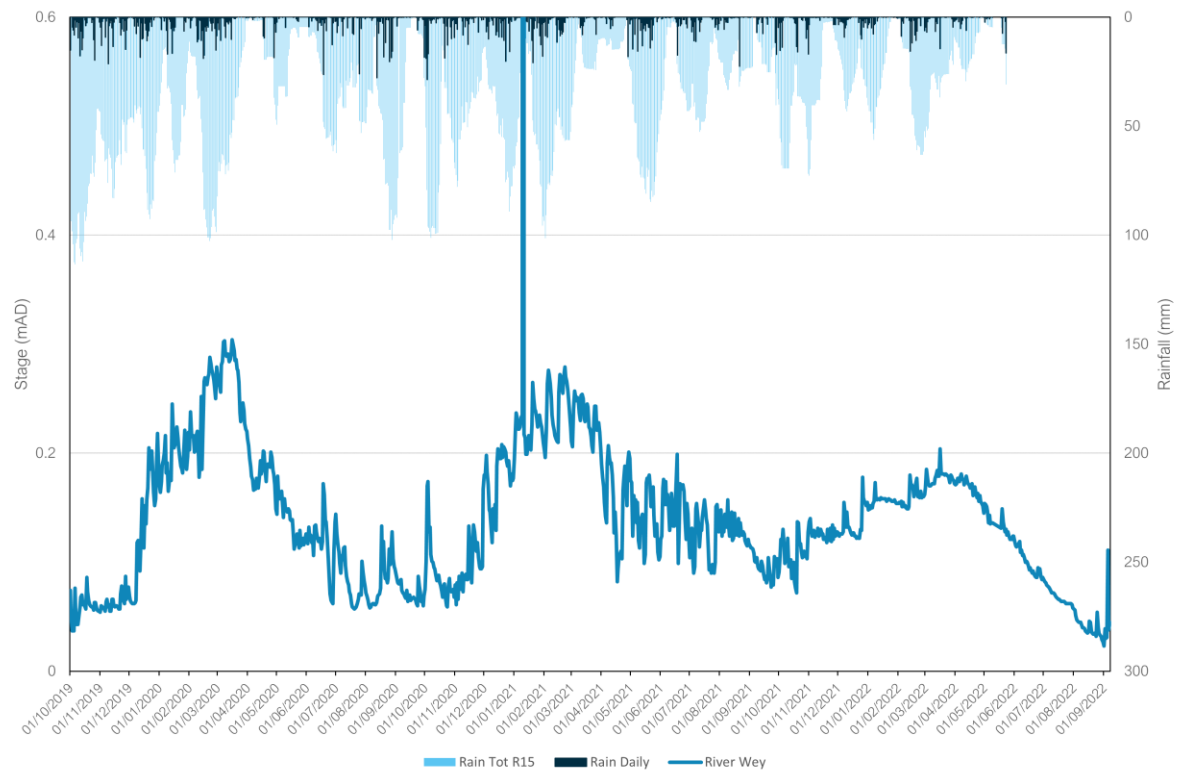
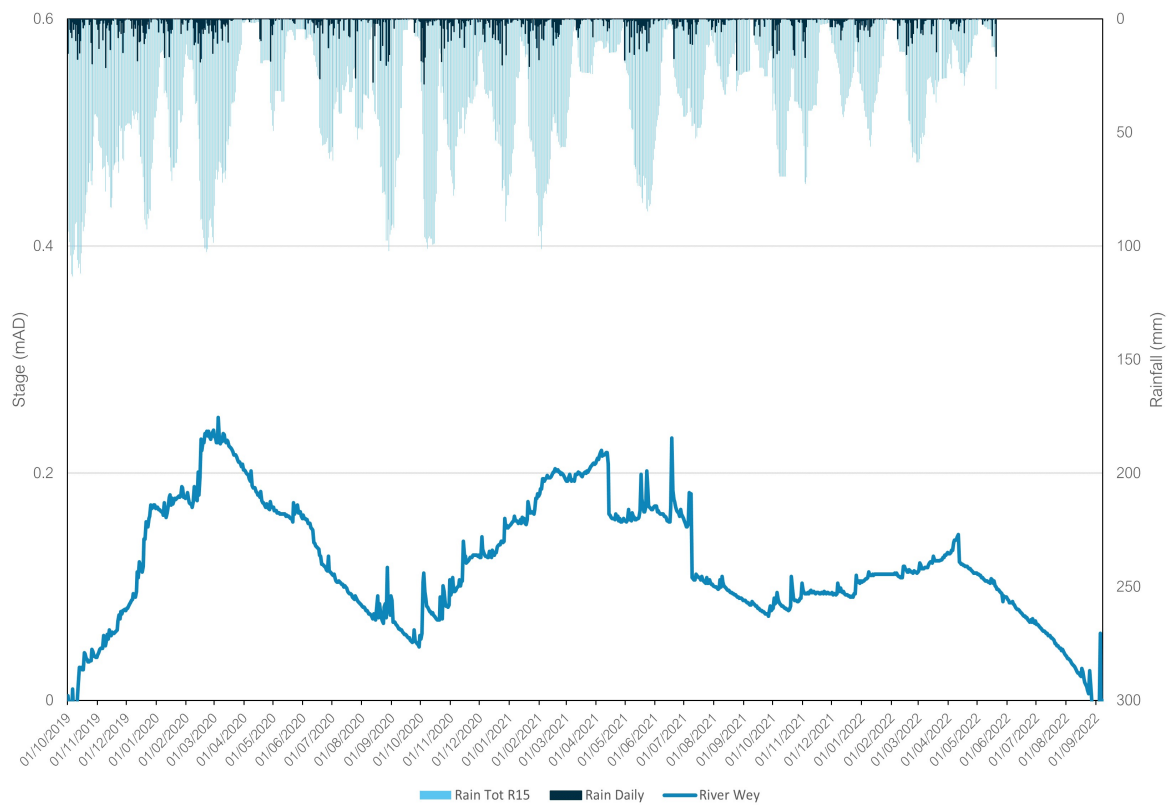
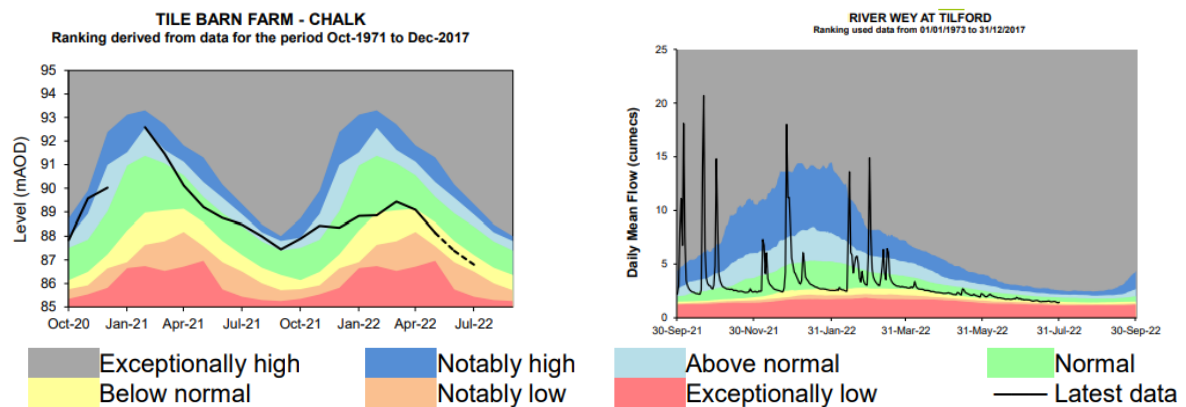


Figure 5B – River Wey, Alton High Street



In addition to these specific stations, the wider groundwater context is illustrated in the Water Situation Report for North Downs – Hampshire. The nearest groundwater reference station is Tile Barn Farm. This site shows significantly lower overall groundwater than the previous year. This can be seen in the figure below alongside the river indicator Tilford on the River Wey. Note recent groundwater levels at Tile Barn Farm have been estimated based on nearby boreholes due to site monitoring issues.

Figure 6 – Water Situation Report



Extract from - [Water Situation Report \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

Network Performance

Within the Alton catchment there are two sites detailed within the Environment Agency Consents Database which have an Event Duration Monitor (EDM) fitted.

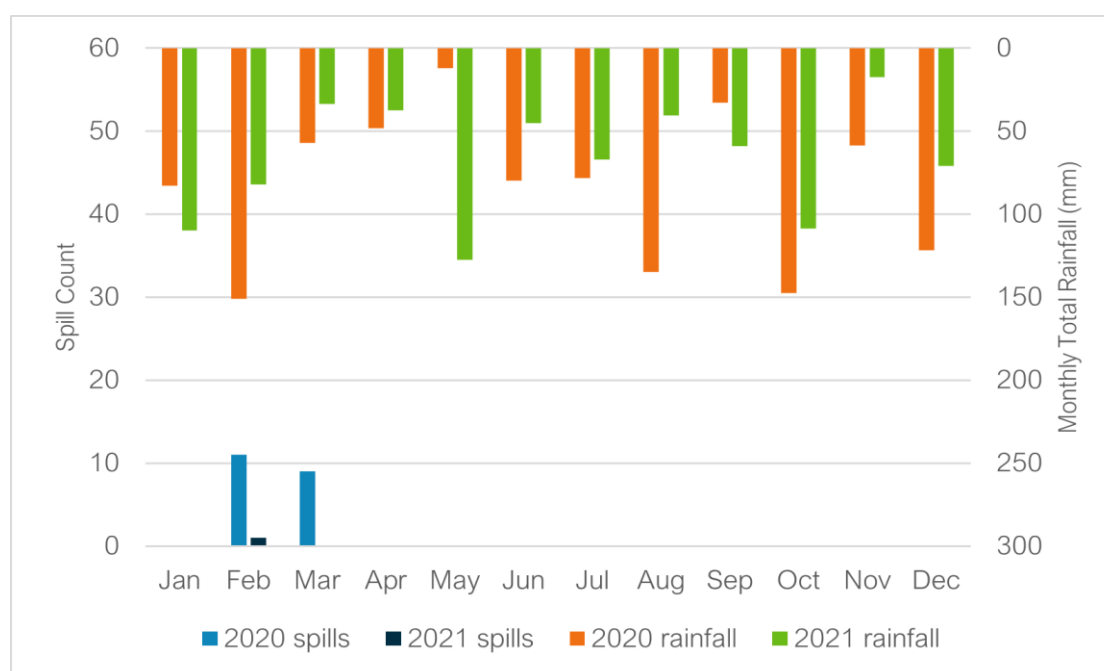
Table 7 below details the last 2 years performance for overflow 'Holybourne SPS'.

Table 7 – Event Duration Monitoring, Holybourne SPS

| Overflow | 2020 | | 2021 | |
|----------------|--------|------------------|--------|------------------|
| | Spills | Duration (hours) | Spills | Duration (hours) |
| Holybourne SPS | 20 | 346.14 | 1 | 4.98 |

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.

Figure 8 – EDM Monthly Performance, Holybourne SPS



The data suggests a wider relationship between rainfall, elevated groundwater levels and spill frequency. There is a focus on spills in February and March 2020, when the indicator sites shown in Figure 5 suggest groundwater levels in the catchment were particularly elevated. Despite significantly lower rainfall in March 2020 compared to February 2020, the spill count for March is equal to February, indicative of the role of groundwater infiltration as the indicator sites shown in Figure 5 suggest groundwater levels in the catchment remained high through most of March 2020.

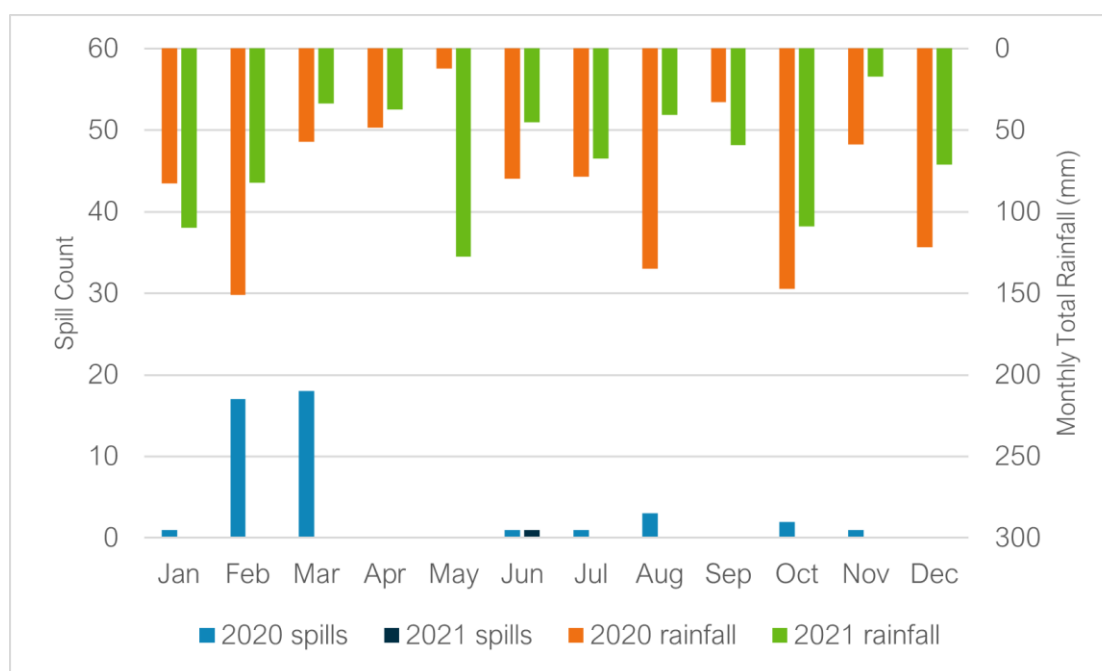
Table 9 below details the last 2 years performance for the overflow 'Newmans Lane SPS'.

Table 9 – Event Duration Monitoring, Newmans Lane SPS

| Overflow | 2020 | | 2021 | |
|------------------|--------|------------------|--------|------------------|
| | Spills | Duration (hours) | Spills | Duration (hours) |
| Newmans Lane SPS | 44 | 697.21 | 1 | 8.26 |

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 10 below presents the EDM performance trend and rainfall for recent years.

Figure 10 – EDM Monthly Performance, Newmans Lane SPS



As per the data for overflow 'Holybourne SPS', presented in Figure 8, the data suggests a wider relationship between rainfall, elevated groundwater levels and spill frequency. The trend in spill performance is similar to that shown for 'Holybourne SPS', with a focus on spills in February and March 2020, when the indicator sites shown in Figure 5 suggest groundwater levels in the catchment were particularly elevated. Despite significantly lower rainfall in March 2020 compared to February 2020, the spill count for March is higher than for February, indicative of the role of groundwater infiltration as the indicator sites shown in Figure 5 suggest groundwater levels in the catchment remained high through most of March 2020.

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 5 monitors installed within the Alton catchment. There are currently 4 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 11 below provides a summary of the investigations and remediation works undertaken or planned within the Alton catchment in the 2021-22 Hydrological Year.

Table 11 – 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 | N/A |
| Patch lining | N/A |
| Manhole sealing | N/A |
| Manhole sealing plates | N/A |
| Manhole covers and frames replaced | N/A |

With the seasonal trends in groundwater being low in comparison with previous years and the SDM installations ongoing, the larger scale survey, identification and remediation of the sewerage network has not been possible within the 2021/2022 hydrological year.

Summary

Rainfall in the Alton catchment over the 2021/22 hydrological year has been below average, with groundwater levels in the aquifer beneath Alton not reaching the levels seen in previous years which triggered groundwater ingress into the sewerage network and elevated flow/depth readings at monitoring sites.

Lift and look and CCTV surveys will continue throughout the remaining wet winter periods within this AMP7 period (2020- 2025) with the aim of finding further priority locations for remediation and investigating/justifying the need for future larger scale lining as part of our 2024 Price Review (PR) process if required.

Addendum - Annual Update 2023

Table of contents

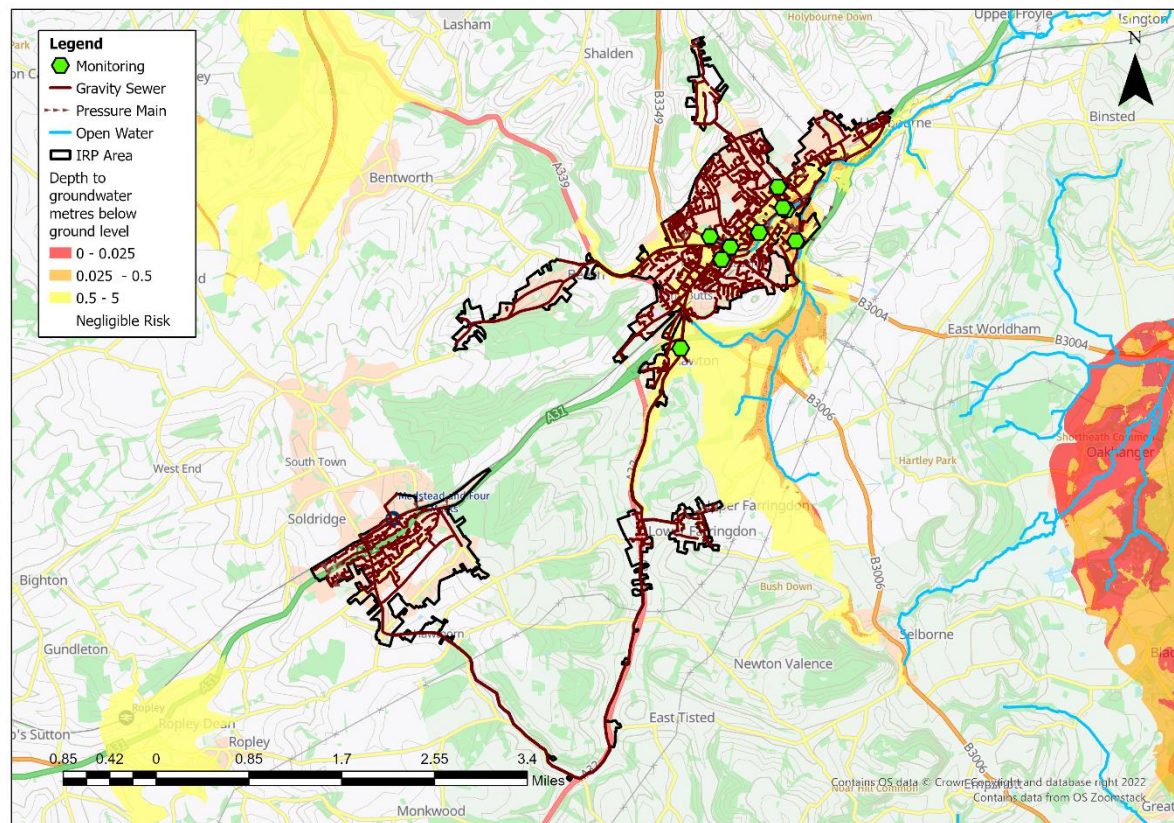
| | |
|--------------------------------|----|
| Overview | 2 |
| Hydrological Review – 2022-23 | 3 |
| Network Performance | 7 |
| Investigations & Interventions | 9 |
| Summary | 10 |

Overview

This addendum to the Alton 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 – Alton Monitoring Plan



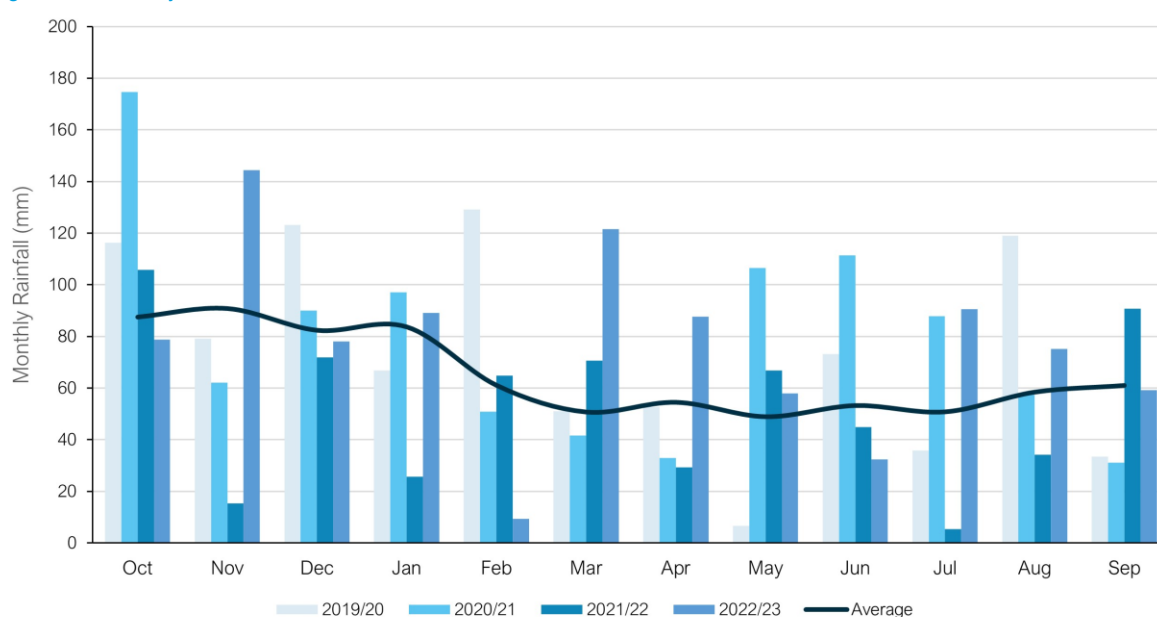
Hydrological Review – 2022-2023

This section summarises the hydrological conditions within the Alton 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 Odiham based on the period 1991-2020

The total rainfall for the 2022/23 hydrological year is 18% 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) |
|--------------|--------------|--------------|--------------|--------------|
| 783 | 887 | 943 | 626 | 925 |

Groundwater / Local River Level

The Alton catchment is situated in the North Downs – Hampshire water resources area. The extended Alton catchment is situated across a number of different rock types within its base geology; however the predominant rock type is sedimentary bedrock within the Seaford, Zig Zag, and Holywell Nodular Chalk formations. All of the extended Alton catchment and its subsequent base geology is part of a principal aquifer within the UK.

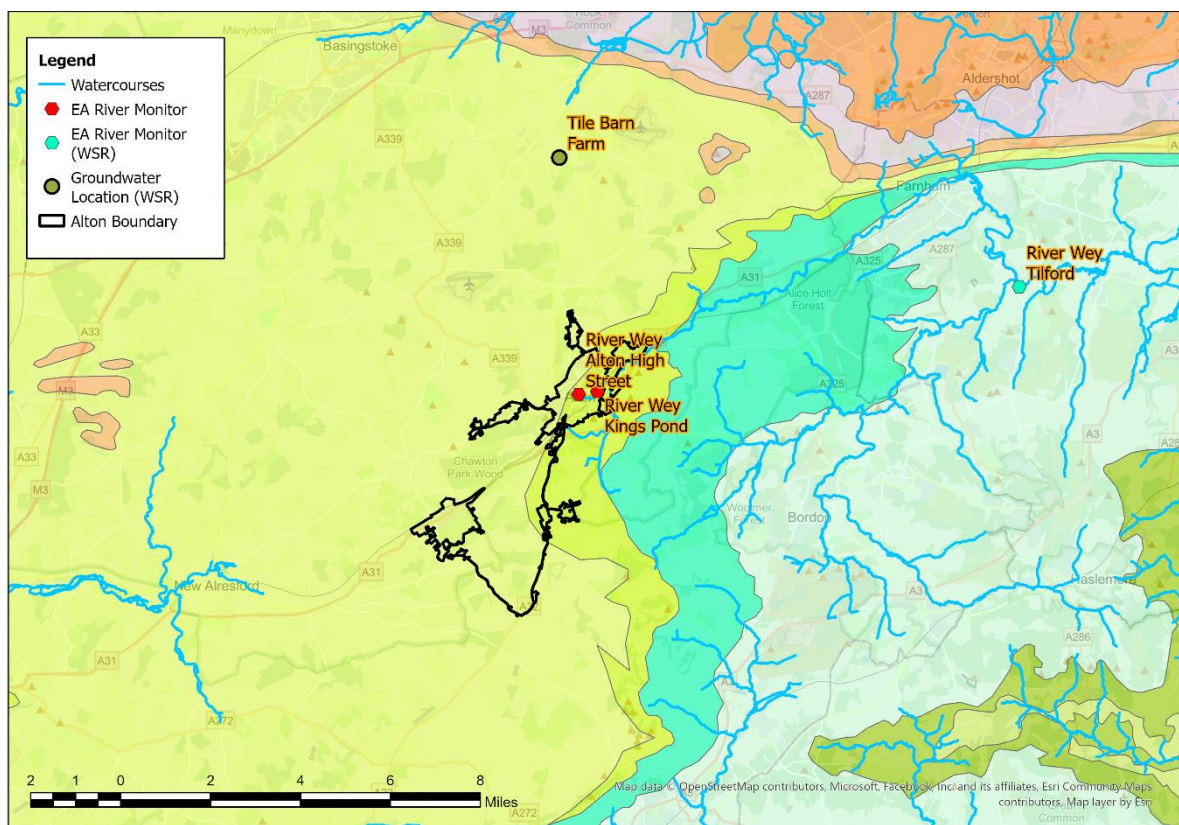
The Environment Agency has gauging stations on local watercourses measuring stage and observation boreholes (OBH) measuring groundwater levels locally to the catchment which can be used to provide indicative local groundwater performance.

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

- River Wey, Kings Pond
- River Wey, Alton High Street

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 – River Wey, Kings Pond

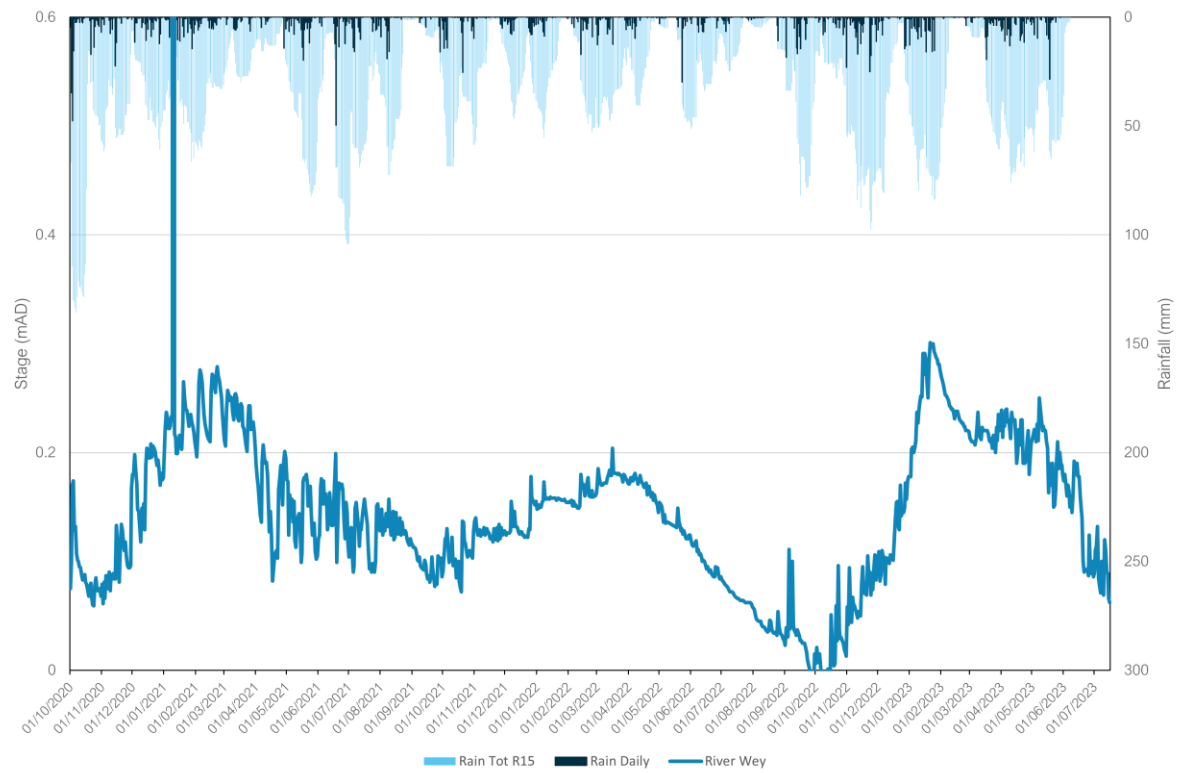
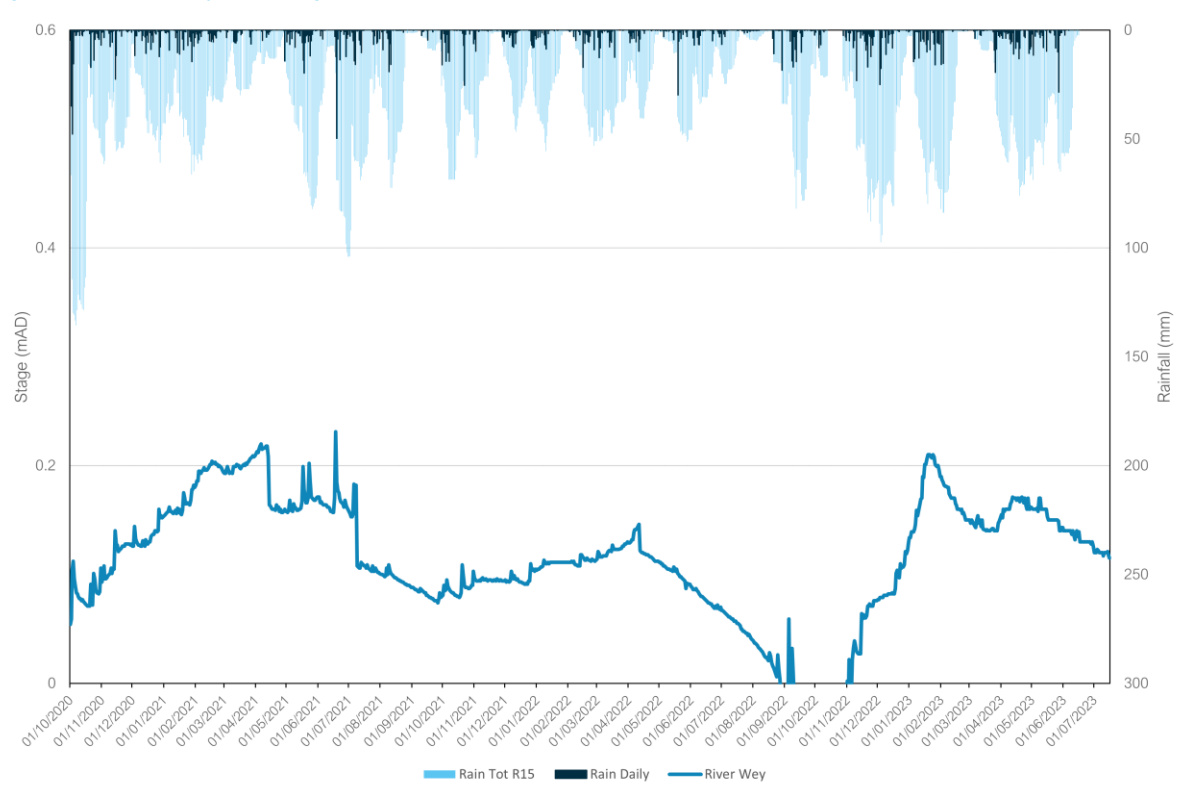
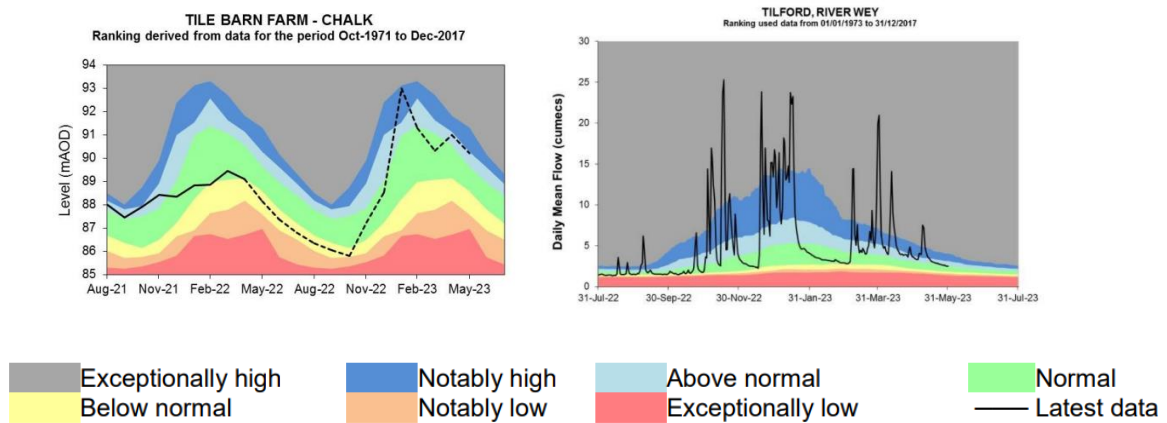


Figure 5B – River Wey, Alton High Street



In addition to these specific stations, the wider groundwater context is illustrated in the Water Situation Report for North Downs – Hampshire. The nearest groundwater reference station is Tile Barn Farm. This site shows groundwater levels at normal or below normal in the year 2022. Groundwater levels rise towards the end of 2022 and are observed at normal, above normal, and notably high levels in 2023. This can be seen in the figure below alongside the river indicator Tilford on the River Wey. Note recent groundwater levels at Tile Barn Farm have been estimated based on nearby boreholes due to site monitoring issues.

Figure 6 – Water Situation Report



Extract from - [Water Situation Report \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

Network Performance

Within the Alton catchment there are two sites detailed within the Environment Agency Consents Database which have an Event Duration Monitor (EDM) fitted.

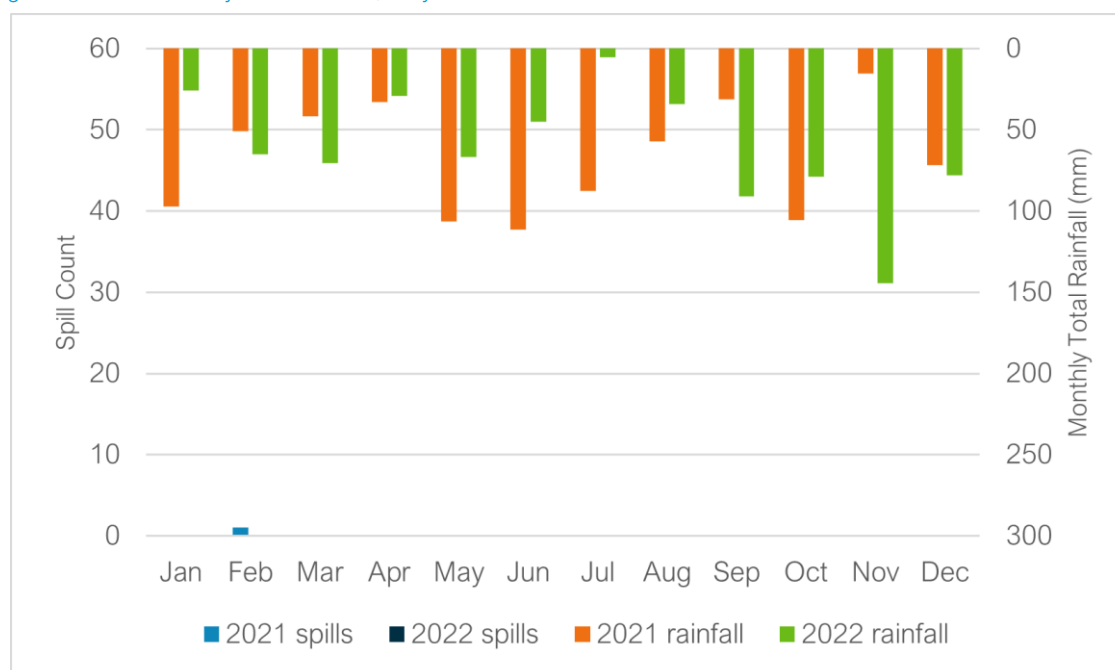
Table 7 below details the last 2 years performance for overflow 'Holybourne SPS'.

Table 7 – Event Duration Monitoring, Holybourne SPS

| Overflow | 2021 | | 2022 | |
|----------------|--------|------------------|--------|------------------|
| | Spills | Duration (hours) | Spills | Duration (hours) |
| Holybourne SPS | 1 | 4.98 | 0 | 0 |

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.

Figure 8 – EDM Monthly Performance, Holybourne SPS



The data suggests a wider relationship between rainfall, elevated groundwater levels and spill frequency. Only one spill was recorded was recorded at Holybourne SPS across the two years, in February 2021, when the indicator site data shown in Figure 5 suggests groundwater levels in the catchment were particularly elevated, and higher than in the same period in 2022.

See last year's Addendum Report, included in this PDF document, for further discussion regarding patterns and trends evident in the EDM data for Holybourne SPS, indicative of the role of groundwater infiltration on spills in the catchment.

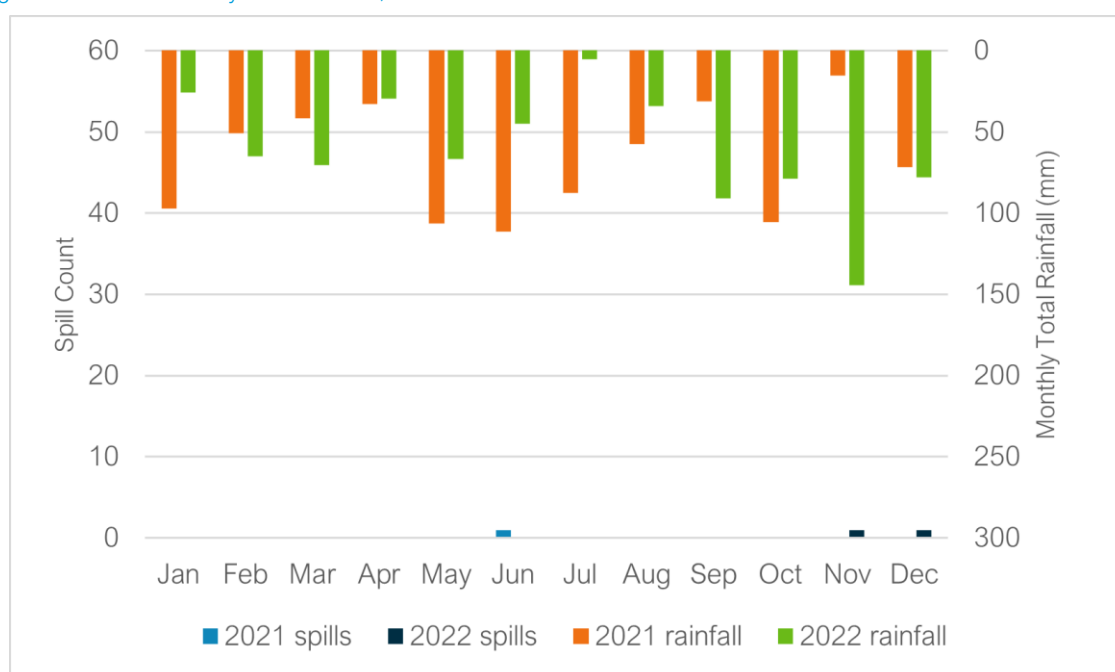
Table 9 below details the last 2 years performance for the overflow 'Newmans Lane SPS'.

Table 9 – Event Duration Monitoring, Newmans Lane SPS

| Overflow | 2021 | | 2022 | |
|------------------|--------|------------------|--------|------------------|
| | Spills | Duration (hours) | Spills | Duration (hours) |
| Newmans Lane SPS | 1 | 8.26 | 2 | 5.30 |

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 10 below presents the EDM performance trend and rainfall for recent years. Note that in 2022, the EDM was only operational for 16% of the year, which may have impacted recorded spill frequency.

Figure 10 – EDM Monthly Performance, Newmans Lane SPS



Due to the low number of spills recorded at the overflow in 2021 and 2022, the utility of the data to suggest a wider relationship between rainfall, elevated groundwater levels and spill frequency is limited. However, the occurrence of spills outside of periods of significantly elevated groundwater levels, as suggested by the indicator site data shown in Figure 5, does indicate some spills at the site occurring as a direct response to intense rainfall events, outside of periods of significantly elevated groundwater levels.

See last year's Addendum Report, included in this PDF document, for discussion regarding patterns and trends evident in previous EDM data for Newmans Lane SPS, indicative of the role of groundwater infiltration on spills in the catchment.

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 9 monitors installed within the Alton 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 11 below provides a summary of the investigations and remediation works undertaken or planned within the Alton catchment in the 2022-23 Hydrological Year, as well as works undertaken in the 2021-22 Hydrological Year.

Table 11 – Works Undertaken in the 2022/23 Hydrological Year & in the 2021/22 Hydrological Year

| Investigation/ remediation type | Number/ length undertaken 21/22 | Number/ length undertaken 22/23 |
|------------------------------------|---------------------------------|---------------------------------|
| CCTV survey | N/A | N/A |
| Look and lift survey | N/A | N/A |
| Sewer lining | N/A | N/A |
| Patch lining | N/A | N/A |
| Manhole sealing | N/A | N/A |
| Manhole sealing plates | N/A | N/A |
| Manhole covers and frames replaced | N/A | N/A |

No interventions/ investigations were carried out in the catchment in the 2022/23 Hydrological Year. However, the catchment will continue to be monitored and investigations/ interventions carried out as appropriate and when conditions allow.

The storm tanks at Newmans Lane Pumping Station are also being upgraded at a cost of over £5 million, which will reduce the need for untreated sewage discharges to the environment. The scheme is due for completion in late 2023.

Summary

Indicator site data suggests groundwater levels in the Alton catchment were generally higher in 2021 than in 2022, with EDM data indicative of the role of groundwater infiltration on spills in the catchment. This hydrological year, indicator site data suggests 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.

Lift and look and CCTV surveys will be undertaken in remaining wet winter periods if conditions allow, within this AMP7 period (2020- 2025). 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 2024 Price Review (PR) process if required.



It's everyone's water