Infiltration Reduction Plan

Hursley

July 2024

Version 5

from Southern Water

Contents

Document Control

Version	Date
V1.0	December 2014
V2.0	January 2015
V3.0	June 2016
V3.1	September 2021
V4	January 2024
V5	July 2024

Glossary

AMP – Asset Management Programme
CCTV - Closed-circuit television
EA - Environment Agency
GW – Ground Water
IRP - Infiltration Reduction Plans
l/s - litres per second
MH – Manhole
RPS - Regulatory Position Statement
SW – Southern Water
WaSC - Water and Sewerage Companies
WC – Water Closet
WPS - Wastewater Pumping Station
WTW - Wastewater Treatment Works

1. Background

This Infiltration Reduction Plan (IRP) for Hursley in the Chickenhall Eastleigh WTW catchment has been prepared in response to the Environment Agency's (EA) Regulatory Position Statement (RPS). SW has been carrying out work for many years to survey and repair sources of infiltration in the catchment for Chickenhall Eastleigh Wastewater Treatment Works (WTW) in Hampshire.

Figure 1.1 shows that flows gravitate from the north of Hursley to South End Close WPS, where it is then pumped to Chickenhall Eastleigh WTW via Main Road WPS, Hursley WPS and Chestnut Avenue WPS.

This IRP covers the village of Hursley.

The repairs carried out by SW improve the integrity of the sewerage system. SW has been working with the following organisations and is dependent on their support to achieve the objective of reducing non-sewage flows into the sewers.

- Environment Agency,
- Hampshire County Council
- Winchester City Council
- Hursley Parish Council
- National Flood Forum
- Hursley Flood Action Group

Southern Water will continue to consult with representatives of these parties as part of the IRP development and implementation.

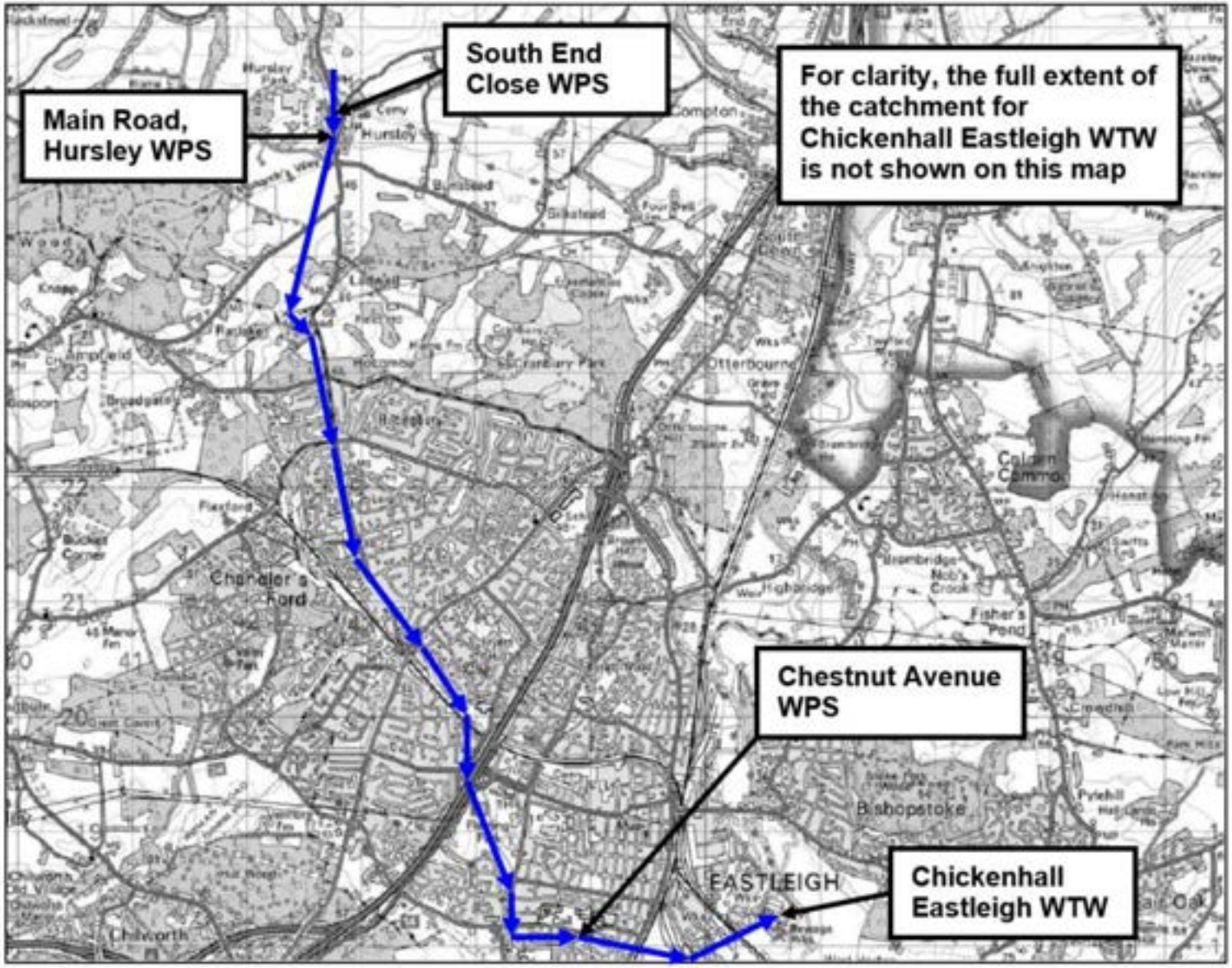

Figure 1.1 – Representation of the sewerage system for the Chickenhall Eastleigh WTW catchment

2. Groundwater Infiltration at Hursley

2.1. The significance of groundwater infiltration.

Hursley is one of a number of areas in Southern Water's operating area where, during excessively wet winters, customers have been inconvenienced by the effects of groundwater infiltration into sewers. Such effects can include flooding and restricted toilet use (RTU).

Southern Water strives to maintain services for customers by a programme of investigation, repair, maintenance and mitigation. Mitigation measures include the use of tankers to remove excess groundwater. Such mitigation measures are not sustainable and are disruptive to communities, so during the last seven years SW has invested in carrying out major improvements to the integrity of the sewers and manholes in the vicinity of Hursley in order to minimise the occasions on which mitigation measures are required.

2.2. What would happen if Southern Water did not take action?

Despite the significant groundwater flow through the valley during these conditions, incidents of sewer flooding have been relatively infrequent. Table 2.1 below shows reported incidents of external flooding since 2011.

In some catchments, SW has hydraulic models of the sewers which can be used to predict the locations where the sewers are expected to flood during certain storm conditions. Hursley is covered by the hydraulic model for the Chickenhall Eastleigh catchment. However, from experience, SW is aware of the locations which are likely to suffer first from the effects of flooding.

Table 2.1 – Reported Flooding Incidents in Hursley

Year	External Flooding (Properties/gardens)	External Flooding (Highways/Other)	Internal Flooding	Restricted Toilet Use	Total
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	6	1	0	0	7
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	2	0	0	2
2021	0	0	0	0	0
2022	0	0	0	0	0
2023	0	0	1	0	1
2024	0	3	0	0	3
Totals	**6**	**6**	**1**	**0**	**13**

3. Investigation & repairs

3.1. Outline Plans to Investigate Sources of Infiltration

The Generic Plan describes Southern Water's Infiltration Reduction process. The specifics of the investigations and repairs at Hursley are captured in Section 3.2 below, and includes the following elements:

- Manhole Inspections and CCTV Surveys
- Manhole and Sewer Repairs
- Follow-Up Surveys and Repairs

3.2. Investigation and Repairs in Hursley

Groundwater infiltration into sewers has been a long-running issue for Hursley. SW has been making significant investments over many years to minimise infiltration and the need for tankering.

SW recently completed a major programme of survey and repairs to the sewers in the Hursley catchment. The investigations and repairs followed the process set out in the Generic Plan. The timing and status of each step is in Table 3.1 below.

Table 3.1 – Summary of Survey and Repairs at Hursley

Step.	Description	Approx Date	Status
1.	Manhole lifting followed by CCTV Investigation (320m of sewer surveyed)	Spring 2014	Completed
3.	Determination of required repairs	Summer 2014	Completed
5.a.	Dry Weather Flow Survey	Not appropriate	Not carried out
4.	Repairs (80m of sewer and 7 manholes repaired)	January – April 2015	Complete
5.b.	Wet Weather Flow Survey	Not appropriate	Not carried out
6.	CCTV survey	January – February 2018	Completed
7.	Sewer Rehabilitation	April 2018	Completed
8.	Ongoing monitoring	Commenced January 2015	Ongoing
9.	Electroscan surveys	2023/24	Completed
10.	Further sealing	Post 2024	Dependent on step 9

In 2014 SW lifted strategic manhole covers, resulting in sewer lengths totalling over 300 metres being identified for detailed survey by mobile CCTV camera. The survey identified ground and surface water infiltration in a number of manholes and sewer lengths. Significant clear water flows were also identified in some customers' private laterals. Work took place between January 2015 and April 2015 to seal 80m of sewers in the Meredun Close, South End Close and Main Road areas.

Further CCTV Investigations were carried out from January 2018 to February 2018, which led to Sewer rehabilitations in April 2018. The extent of the repairs is shown in the plans in Appendix A. Despite there being no reported customer impacts since 2014, the sewerage system remains reactive to high groundwater. This impacts the operational cost of providing a sewerage service due to the ongoing mitigation activity such as tankering. Further surveys utilising a new technique called electroscan have been completed during 2023/24. The results of these surveys are now being reviewed t9o identify further sealing work on the public system that may be required. Any further sewer sealing work will be undertaken After April 2025.

In addition to physical investigations on site, SW has instigated a long-term monitoring programme at critical locations, including Hursley. Details are given in Section 5.5.

4. Mitigation measures

4.1. Circumstances that lead to mitigation

Since 2013, SW has made significant investment to reduce infiltration into the public sewerage system and to protect specific properties at risk of flooding. The objective is to reduce the frequency of discharges to watercourses and the disruption caused by the need to tanker flows from the system to larger wastewater treatment centres.

Once groundwater levels have risen to a point where the sewerage system is below the water table groundwater will enter the system through leaking joints in both the public and private pipes and manholes. To ensure the sewerage system continues to function this excess flow must be removed from the network. This is done by deploying tankers to the villages to extract flow and to tanker this, primarily groundwater, to larger WTW sites with capacity to treat the flow.

The requirement for tankering at Hursley will be driven by levels in the manholes locally. Based on groundwater levels from 2014 and to allow time for investigation and preparation, SW is using lower 'trigger levels' in the winter planning report. A trigger level of 32.0m is currently being used for tankering.

Figure 4.1 and Figure 4.2 shows the groundwater level at King's Somborne borehole over the last eight years. The repair programme was completed in March 2015. Prior to that tankering was required from 24/01/2014 and stopped on the 25/03/2014; and pumping was required from 14/02/2014 to 30/04/2014. Tankering was required between 11th March and 14th April 2020. Tankering was not required in the winter of 2020/21. Tankering was required in the winter of 2023/24.

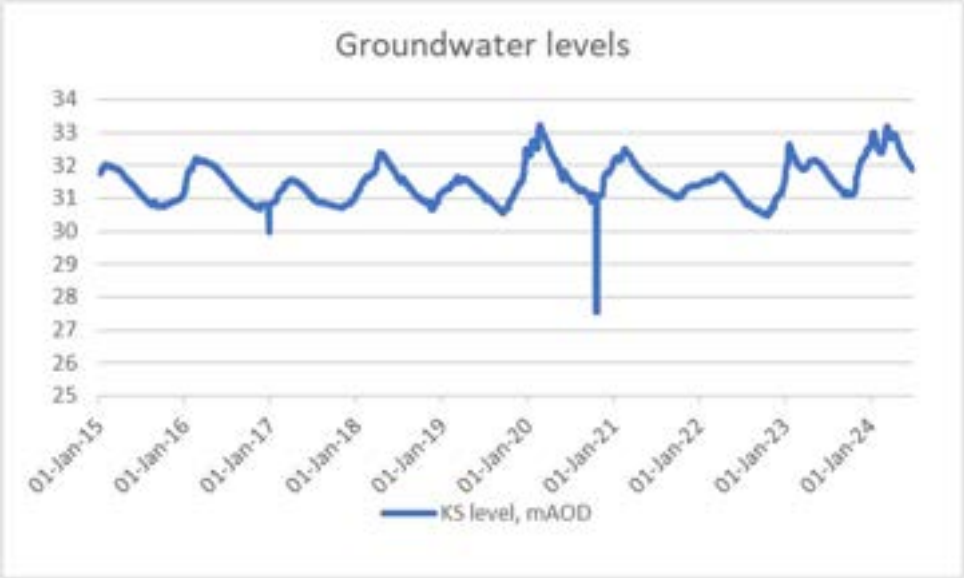

Figure 4.1 – Groundwater levels from 2015 to 2024

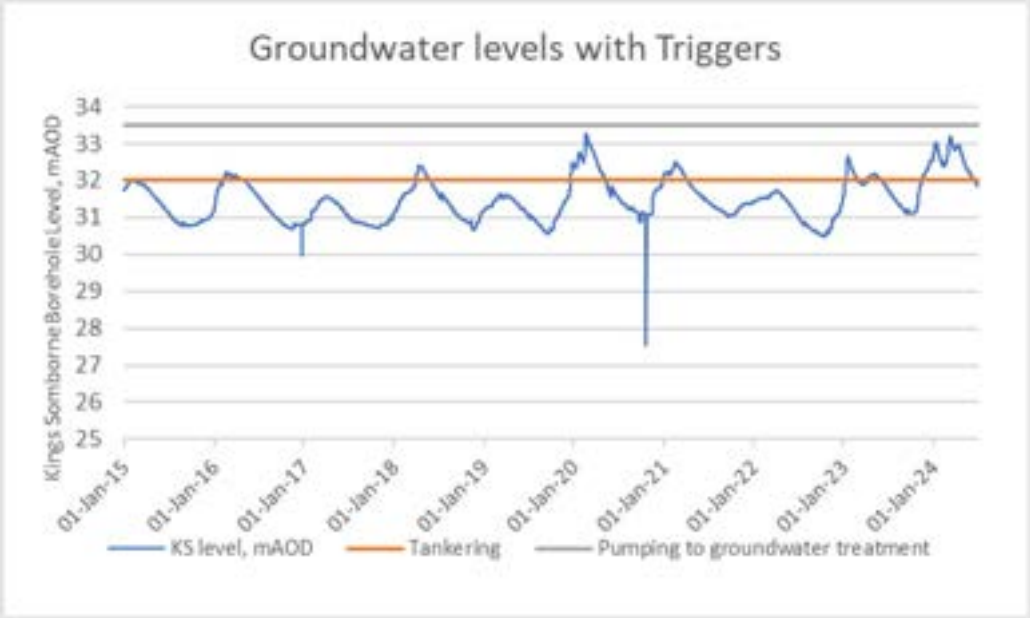

Figure 4.2 – Groundwater levels with trigger points

The tankering point for Hursley is given in Appendix B.

4.2. Steps to prevent discharges to the environment

The Generic Plan details the typical activities that Southern Water undertakes to minimise the requirement for discharges to watercourses. Since 2013, SW has undertaken extensive surveys and repaired sewers and manholes where infiltration had been found (the extent of the work is shown in Appendix A). This built on the repairs that had been carried out in previous years (shown in Appendix A).

The location where tankering has been used in recent years is shown in Appendix B. This location has been effective in restoring service to customers and is the default location should the situation re-present itself. Dates of historic tankering are also provided in Appendix B.

4.3. 3rd Party Communications

Since the start of the Infiltration Reduction Programme in 2013, Southern Water has been active in communicating with stakeholders and customers about planned and completed work to improve the integrity of the sewerage system. Stakeholders have been kept informed of progress on survey and sealing work via emails and or face-to-face meetings. However, we recognise there is more to do in this area to keep everyone informed of the mitigation measures that may be required and informing when we have deployed the measures.

SW will attend and convene meetings with local groups to ensure progress against the plan and the on-site mitigation activity is clearly communicated. Meetings that have been held over the last 10 years with local council and EA representatives have been influential in helping to shape the IRP. The latest version of the IRP approved by the EA, will be published on SW's website.

From time to time, SW updates stakeholders about completed and planned work, as part of stakeholder meetings with the local councils.

4.4. Monitoring quality of the downstream watercourse

The Generic Plan provides details of water quality monitoring that will be undertaken.

5. Options to Reduce Infiltration

5.1. Sewer Rehabilitation Programme

Infiltration reduction is an on-going process. Since 2013, SW has undertaken surveys and repairs at Hursley. In 2014 SW lifted strategic manhole covers, resulting in sewer lengths totalling over 300 metres being identified for detailed survey by mobile CCTV camera. The survey identified ground and surface water infiltration in a number of manholes and sewer lengths. Work took place between January 2015 and April 2015 to seal 80m of sewers in the Meredun Close, South End Close and Main Road areas. Major improvements were also made at the Main Road pumping station with a new pump fitted in the summer of 2014 to improve the station's resilience.

However, on a company-wide basis, to ensure that benefit continues to be gained from the work that has been done, SW continued the programme of infiltration reduction investment across its region for AMP6 (2015 – 2020). Further CCTV Investigations were carried out from January 2018 to February 2018, which led to Sewer rehabilitations in April 2018.As no customer issues have been reported since the sealing was completed we are now in a monitoring phase with no further surveys or sealing planned unless triggered by future high groundwater events. Table 5.1 below summarises the work undertaken in the system since 2014 with an annual breakdown in Table 5.2. As infiltration only causes issues in this system very occasionally the amount of sewer sealing work here has been a lower priority than other areas which have received a much greater focus. This is evident by the low volume of work delivered post 2018.

Work type	
Length surveyed	1.14km
Length with no work required	0.97km
Length sealed	0.2km
Length to be sealed	0.02km
Manholes sealed	5

Table 5.1 – summary of work done in the catchment

Year	Surveyed (km)	Sewers sealed (km)	Manholes sealed
Pre 2014	0.03	0	0
2014	0.7	0	0
2015	0.3	0.1	4
2016	0	0	0
2017	0	0	0
2018	0.1	0.1	1
2019	0	0	0
2020	0	0	0
2021	0	0	0
2022	0	0	0
2023	0	0	0
2024	0	0	0

Table 5.2 – annual summary of work completed

5.2. Property Level Protection

Non-return valves have always been part of SW's armoury for dealing with infiltration, but they are only effective if infiltration is under control on both the lateral and the main sewer. Whilst there are no plans currently to install non-return valves, the potential benefit of property level protection on Main Road, Hursley will be investigated, if it is deemed appropriate.

5.3. Local Flow Control

As noted in Section 4.1 tankering was required from 24/01/2014 and stopped on the 25/03/2014. Groundwater treatment was required from 14/02/2014 to 30/04/2014. Tankering was required between 11th March and 14th April 2020. Tankering was not required in the winter of 2020/21. Tankering was required during the winter of 2023/24.

5.4. Pumping Stations

In order to minimise infiltration, SW is continuing to ensure that design discharges are maintained at pumping stations. This will help to ensure that the design discharge continues to be reliably delivered.

5.5. Monitoring

The Hursley catchment is one of ten locations, where groundwater levels have been monitored via electronic data since January 2015. This monitoring helps inform SW's response, in terms of when tankering is required. The Generic Plan has more detail on the overall monitoring strategy.

The graph in Figure 4.2 is used to predict the timing of an operational mitigation activity to reduce the risk of flooding and pollution incidents.

In addition to the groundwater flooding forecasts explained above, SW is also looking at longer-term trends to monitor the effectiveness of the completed rehabilitation work.

Figure 5.1 is a graph showing the result of analysing the last 7 years of data groundwater and pump activity. This compares pump run times in Hursley pre and post 2020. It can be seen that between 2017 and 2020 the pumps ran for longer at the same groundwater levels than post 2020. This demonstrates that the sealing completed to date has been effective in reducing infiltration flow into the system. Figure 5.1 also highlights that between 2020-2024 the borehole experienced higher groundwater levels than 2017-2020, frequently exceeding 32.5mAOD. During these periods of high groundwater between 2020 and 2024, pump run time was typically increased. Overall, this graph shows that when groundwater levels are regular, completed sewer rehabilitation work has contributed to reducing pump run time. However, it also displays the fact that an unusually high groundwater level remains likely to increase pump run times despite recent rehabilitation work. Generally it Cn be concluded that groundwater levels now need to be between 1 and 1.5m higher to have the same impact on the sewerage system before sealing work commenced.

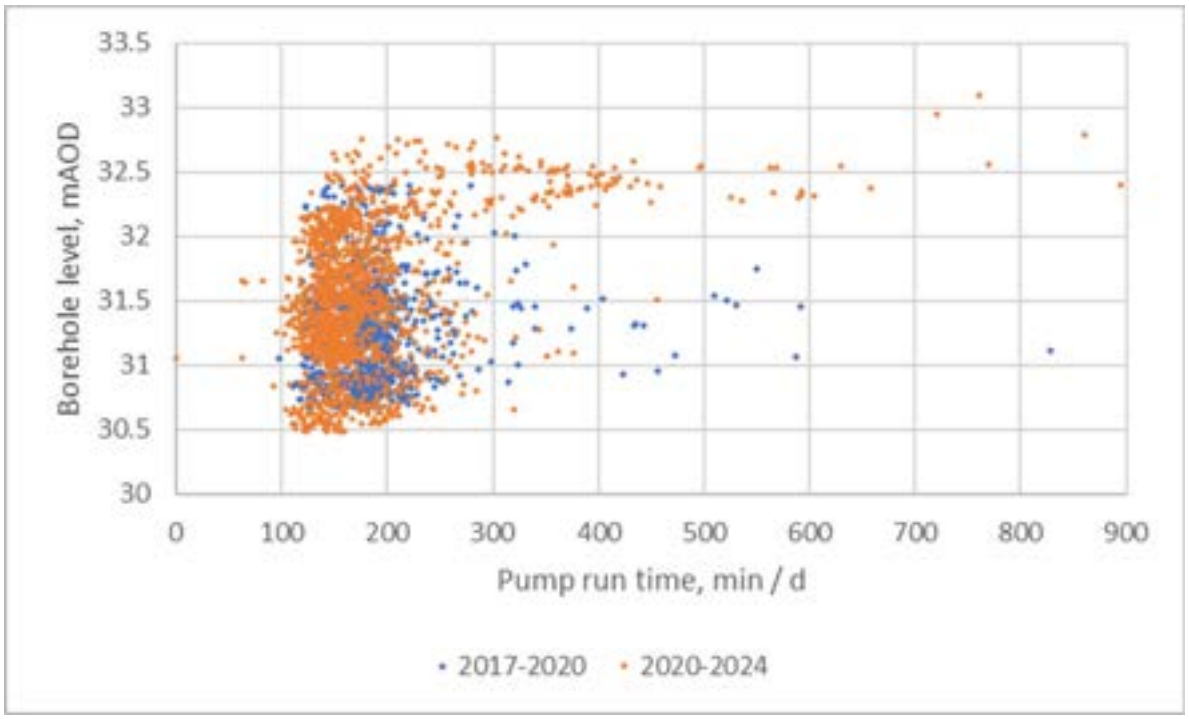

Figure 5.1 – Long Term Monitoring 2017-2024

6. Action Plans

A significant amount has been achieved in the Chickenhall Eastleigh WTW in the last ten years. Some actions are ongoing which reflects the continuous improvement process for dealing with infiltration due to groundwater. To make it easy to track progress, the following tables set out the actions to reduce infiltration and also to mitigate the effects of it, if the infiltration cannot be controlled at economic cost. Tables 6.1 and 6.2 cover the actions by SW and by other parties, respectively, to reduce infiltration. Tables 6.3 and 6.4 cover mitigation of the effects of flooding (Communication and other activities).

SW is committed to continuing to pursue infiltration to reduce the frequency of tankering. This IRP describes the work that has been done by SW to improve the situation. In addition, it also describes what is being done to monitor flows, the 'winter preparation' work to be carried out to ensure assets are operating correctly, and the work to be developed with other agencies to improve an integrated plan to address flooding.

Colour coding of actions in tables:

- Green – completed
- Orange – imminent action required
- Red – overdue
- White – on-going actions with no specific end dates.

Table 6.1 – Southern Water Current Activities to Reduce Groundwater Infiltration

Ref.	Item	Actions	Timescale and Status	Outcomes
1.1	Develop an approach for reduction of infiltration and maintenance of reduced levels of infiltration.	Refer to Section 3 above and the report in Appendix A.	SW, Summer 2013. Complete	The steps have been followed to deliver results.
1.4	CCTV etc. survey of sewers	Identify Strategic Manholes, survey manholes to identify clear flow and infiltration. Carry out CCTV survey where clear flow was identified.	SW, Summer 2014. Complete	Sources of high Infiltration identified by the 2014 CCTV surveys have been repaired.
1.5	Carry out sewer rehabilitation work	Use various techniques to seal infiltration points in manholes and sewers	SW, Repairs carried out from January 2015 – March 2015. Complete	Restored structural integrity of the sewers.
1.6	Further surveys (CCTV or alternative techniques), if required, where 'wet weather' flow surveys show areas of high infiltration remaining	Further surveys in areas where high infiltration flows remain.	Monitoring reveals further surveys not currently required. Review in Spring 2017. January – February 2018 – Completed	N/A
1.7	Further sewer rehabilitation work, if required, in areas where surveys carried out.	As above, use various techniques to seal infiltration points in manholes and sewers	April 2018	Rehabilitation will restore structural integrity of the sewers.
1.8a	Maintain IRP as a live document	Review text of the IRP and update if appropriate to describe work carried out and/or developments	SW, Annually – on anniversary of EA approval	Up-to-date IRP.

Ref.	Item	Actions	Timescale and Status	Outcomes
1.8b	Maintain IRP as a live document	Review Tables 6.1 to 6.5 and as appropriate amend to show progress on individual activities.	SW, Quarterly (December, March, June, September)	Keep the Environment Agency informed of progress on a regular basis
1.9	Consider alternative solutions that involve some risk	Investigate unconventional options such as vacuum sewers or consider conventional combined sewer overflows	2020	Complete.
1.10	Monitor Flows	SW carry out pre-winter checks and monitor sewer flow to identify significant increases in inflows.	SW, Autumn 2016.	Preparation for winter responses.
1.11	Over-pumping Sites: improve effluent quality	Investigate potential for improved screening and basic treatment at points of discharge into watercourse.	SW, 2014. Complete for previously used sites.	Improved arrangements for discharges when required.
1.12	Over-pumping Sites: minimise flow	Add level control to pumps to reduce durations for pumping	SW, 2014. Complete.	Minimises volumes of discharge if seasonal discharge(s) are necessary in order to maintain use of sewerage services for customers during periods of very high groundwater levels.
1.12	Standards for emergency discharges	SW to discuss with EA about best practice set up for over-pumping arrangements.	SW, 2014. Complete.	Agreed with EA acceptable standards for discharges and acceptable flow rates.
1.13	Flow, location, screening arrangements for emergency discharges	Determine potential flow rates and screening arrangements and most appropriate locations,	SW, 2016. Included in this IRP. Complete.	Agree with EA, and inform HCC and Parish Council acceptable arrangements for future emergency discharges.

Ref.	Item	Actions	Timescale and Status	Outcomes
1.14	Action Plans	Develop SW action plans documenting set up of pumps, tankers, etc. for emergency situations.	SW, Summer 2014. Complete.	Action Plan available for planning sessions with other authorities in preparation for repeat flooding events. Engagement with the local community about the potential arrangements for dealing with excess flows into sewers to mitigate disruption to customers.
1.16	Identification of lengths of sewer to survey or resurvey in the period 2021-25	Review sewer records with available ground water profile date	2023	complete
1.17	Surveys by CCTV or electroscan lengths of sewer potentially at risk	Compare historical survey coverage with results of 1.15 and produce a survey schedule.	2023/24	Complete
1.18	Survey result review	Review results of surveys undertaken in 1.16 to determine sewer sealing work.	2024	In progress
1.19	Undertake required sewer sealing	Seal sewers and manholes by most appropriate technique	Post 2024	Dependent on survey findings
1.20	Review effectiveness of any sealing work	Analyse monitoring data and groundwater data to determine benefit of investment	Post 2024	Planned
1.21	Review further options for property protection	Consider further improvements.	Post 2024	Planned

Table 6.2 – Multi-Agency Activities to Reduce Groundwater Infiltration

Ref.	Item	Actions	Owner, Timescale and Status	Outcomes
2.1a	Strategy for infiltration via private drains	Southern Water to propose a strategy for dealing with infiltration via private drains*	SW supported by EA and local Parish Councils, Summer/ Autumn 2014. Completed 2014.	Southern Water objective is to improve awareness of the significance of infiltration into private drains and the importance for customers to ensure infiltration is repaired when it is discovered.
2.1b	Long-term Monitoring	SW will monitor sewer flow to identify significant increases in inflows.	Ongoing	Early identification of areas where infiltration has increased
2.2a	Investigate highway 'misconnections'	Where non-sewage flow is identified, check highway drainage relative to sewers to ensure road drainage is not a source of flow into the SW sewers	Hampshire County Council with support from SW. To be pursued as and when required.	Reduced flow of surface water (if connections are found).
2.2b	Investigate groundwater infiltration on domestic drains	Where non-sewage flow is identified from domestic properties, investigate to identify source of flow into SW sewers	SW, with assistance from Winchester City Council where required, as appropriate, if connections are identified. To be pursued as and when required.	Reduced flow of surface water (if connections are found).
2.3	Consider effects of proposed new developments on infiltration.	District Council to continue to consult with SW on development applications.	Winchester City Council, Ongoing.	Developments in areas which would be detrimental to sewer flooding, to have conditions recommended by SW and applied, as appropriate, by the Borough Councils.
		SW to determine threshold above which they require to be consulted.	SW, Ongoing. SW wish to be consulted on all	

Ref.	Item	Actions	Owner, Timescale and Status	Outcomes
			proposed development.	
		Sewerage materials for new developments	SW, Borough Council, when developments are at planning approval stage. Ongoing.	

*Note: Southern Water does not have powers to require residents to repair private drains. Hence the support of the other agencies is required. It is acknowledged that customers may not be aware of infiltration in their private drains, so SW will consider ways of obtaining information to demonstrate the presence of infiltration. District Councils would only be able to instigate action under Section 59 of the Building Act where proof/evidence is provided of the defect.

Table 6.3 – Publicity / Communication Activities to Reduce / Mitigate the Effects of Groundwater Infiltration.

Ref.	Item	Actions	Owner, Timescale and Status	Outcomes
3.1	Public meetings about reducing groundwater infiltration into sewerage system	Attend public meetings with other agencies as appropriate.	SW, as required	Inform stakeholders of progress and planned activities and receive feedback.
3.2	Communication from SW to stakeholders about reducing groundwater infiltration into the sewerage system	Send comms at regular intervals to communicate progress and planned activities	SW, as required	Inform stakeholders of progress and planned activities
3.3	Multi-Agency Group meetings	Discuss and agree actions to reduce requirements for tankering and emergency discharges to watercourses.	All Parties, Discussed and actions agreed in 2013 and 2014. To be discussed in future as required.	Improved understanding and appreciation of issues. Agreement to actions to help reduce the need for tankering and emergency discharges to watercourses
3.4	Communicate with stakeholders about optimum arrangements for emergency discharges	Explain potential flow rates and screening arrangements and most appropriate locations.	SW, ongoing. SW will communicate further when further emergency discharges are required.	Agree with EA acceptable arrangements for future emergency discharges. Notify HCC and Parish Council.

** SW can provide base information to councils to include in articles publicising the role that everyone can play in minimising non-sewage flows into sewers, and the importance of doing so to reduce the incidence of restricted toilet use during periods of high groundwater.

Table 6.4 – Activities to Mitigate the Effects of Groundwater Infiltration/ Other Flood Protection Mechanisms

Ref.	Item	Actions	Owner, Timescale and Status	Outcomes
4.1	Early Warning system	Joint continuous monitoring of groundwater levels and sewer levels/flows.	SW, EA, 2014. Ongoing. Commenced Jan 2015. Re-commenced annually	Develop trigger levels by comparing historic customer complaints and tankering with BH levels (or other reference). Note trigger levels should vary as a consequence of rehabilitation. Also they will need to reflect groundwater reaction times.
4.2	Tankering arrangements	Investigate options for improving location of tankers and over-pump units for future events. e.g. by use of longer hoses/ pumping	SW, Spring 2014, Complete	Potentially less disruption to residents when tankering / pumping is essential.
4.4	Flooding Management Plan	Develop plan to address the flooding issues caused by high groundwater. Implement recommendations. This is being addressed by the Hursley Flood Action Group.	Hampshire County Council & Winchester City Council with inputs from SW, EA and Parish Councils.	Plan including actions for participating authorities that in unison will reduce the extent of flooding and the impact of flooding.
4.5	Maintenance of watercourses	Riparian owners to carry out their responsibilities to maintain adequate flow through watercourses by clearing vegetation, desilting, etc	Riparian owners with input from District and Parish Councils – ongoing responsibility	Maximise the flow along watercourses in order to minimise surface flooding, which results in inundation of manholes to the sewerage system.

7. Appendix

A Survey Findings and Completed and Planned Rehabilitation

B Mitigation Measures