Little Marlow drainage strategy.

Work so far.

Thames Water

2019

Contents.

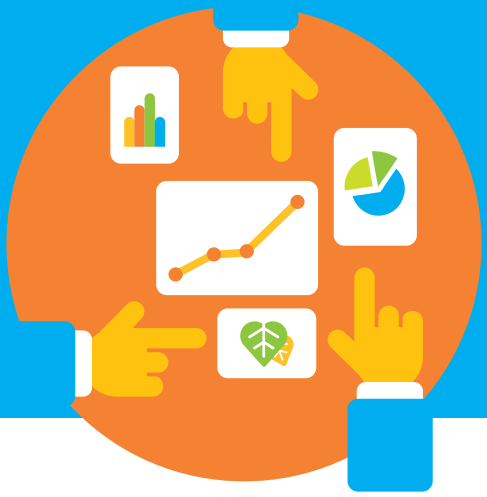
Summary.

We're working on how to reduce the risk of sewer flooding, pollution, blockages and restricted use of toilets and bathrooms in the Little Marlow area. For us, it's a priority. We'll continue to work with our customers and other stakeholders, such as Buckinghamshire County Council, Wycombe District Council and private land owners, to take action and make drainage improvements as quickly as possible.

Our drainage strategy work

We began our drainage strategy work in 2015 by carrying out research and regularly meeting with customers who had been affected by drainage issues, as well as stakeholders in the area.

Since 2016, we've carried out some detailed investigations which have helped us to understand more about the drainage problems in the Little Marlow area, and how they might be improved in the future.



What this means

Initialise/ prepare
Starting the process including gathering information and forming relationships with stakeholders

Risk assessment
Identifying the things that could prevent drainage improvements, and how to manage them

Options appraisal
Developing different options for making drainage improvements that work and are value for money

Intervention
Implementing selected drainage improvements based on their potential benefits outweighing their costs and their priority

* ofwat.gov.uk/publication/drainage-strategy-framework-for-water-and-sewerage-companies-to-prepare-drainage-strategies.

** The estimated delivery timeline is dependent on factors including weather conditions, risks and costs, and is, therefore, open to change.

Drainage strategy framework stages and timescales

The drainage strategy process

We've followed the guidance from our regulators, Ofwat and the Environment Agency, for our drainage strategy work. The good-practice process they recommend has four stages*. We completed the first stage in 2016, which included a range of background research into the drainage issues in the area.

Work so far

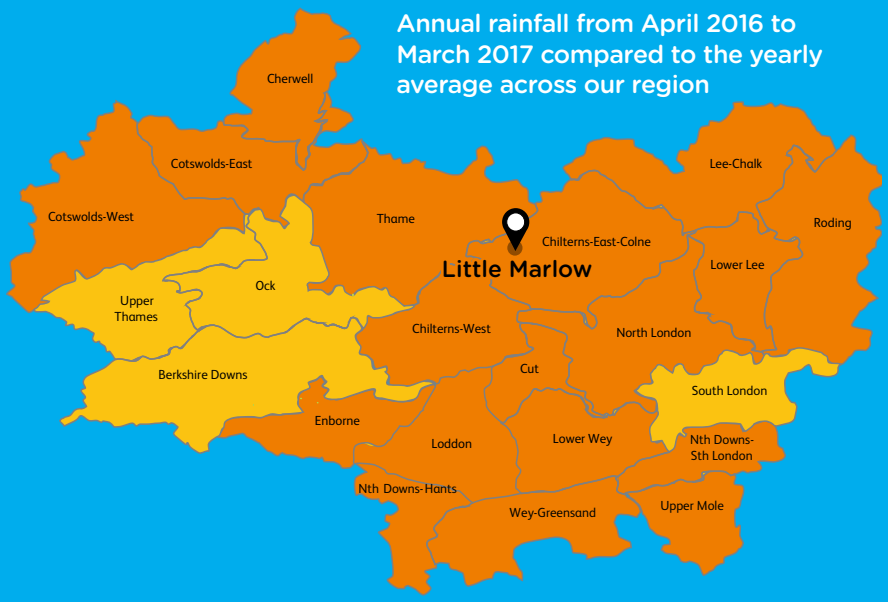
We've put together stages two and three of the drainage strategy process as their activities are closely linked. So far in this combined stage we've:

- Completed some detailed investigations in the Little Marlow area and identified the others that need to happen
- Started to assess the risks in the area and how we'll manage them, such as its growing population and rising groundwater levels
- Achieved some immediate drainage improvements through delivering some interventions ourselves, and by working with stakeholders to deliver others that are outside of our control.

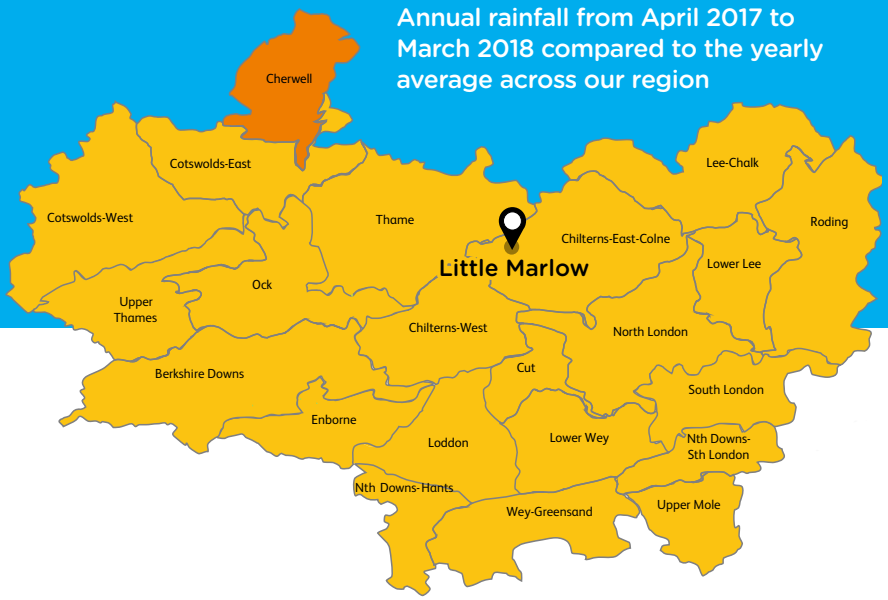
Unfortunately, we haven't been able to complete this combined stage for the Little Marlow area as we'd hoped to do at this time. This is because of the unusually dry winter weather experienced across the majority of our region between 2016 and 2017, and throughout the following winter of 2017 and 2018. During these periods rainfall was mainly at, or below, the yearly average for our region, as illustrated by the maps*.

The dry winter weather stopped us from carrying out a number of the investigations that we needed to fully understand the root causes of the drainage issues. Therefore, we've been unable to finalise our proposals at this time, to improve the drainage issues in the Little Marlow area for the long term.

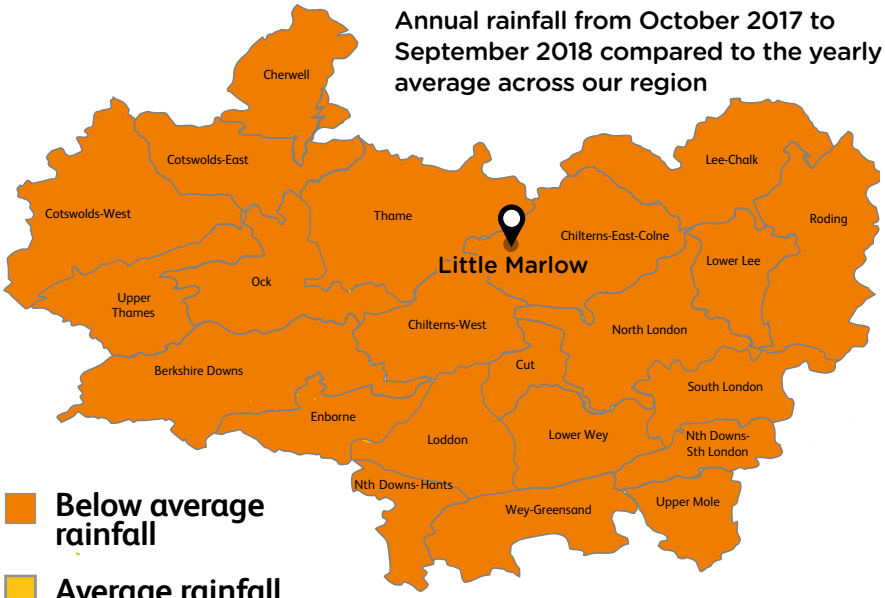
Annual rainfall from April 2016 to March 2017 compared to the yearly average across our region



Annual rainfall from April 2017 to March 2018 compared to the yearly average across our region



Annual rainfall from October 2017 to September 2018 compared to the yearly average across our region



Below average rainfall

Average rainfall (approximate)

Above average rainfall

Source: Thames Water, 2018, based on provisional and unverified data from the Environment Agency.

* For more information on current rainfall and groundwater conditions across our region please use this link: thameswater.co.uk/Help-and-Advice/Water-Quality/Where-our-water-comes-from/Reservoir-levels-and-rainfall-figures.

Our ongoing work

We're extending our drainage strategy work in the Little Marlow area. We'll continue to assess and respond to the drainage risks that we identify through our ongoing monitoring of rainfall and groundwater levels, together with the flooding trigger levels that we've developed to manage the volume of flows within our sewers.

If the weather is much wetter over the coming months, we'll also be able to finalise our investigations and drainage strategy for improving the drainage issues in the Little Marlow area for the long term. To develop this our first activity will be to assess all of our proposed long-term drainage interventions. As well as looking at their potential customer benefits and investment costs, we'll also assess how they support the fundamental aims of the 21st Century Drainage Programme*.

We've joined together with more than 40 organisations from across the water industry to support this groundbreaking programme. We all recognise the current and future challenges we face from factors including climate change and population growth, and we're committed to creating more resilient drainage systems to cope with them.

The 21st Century Drainage Programme has also highlighted the need for water companies to adopt a consistent approach to drainage and wastewater planning. In response, by 2022, and at regular intervals after that, each water company in England and Wales will produce a new document called a Drainage & Wastewater Management Plan (DWMP)*. This will build on the good-practice drainage strategy framework process we've been using, and the drainage work we've already carried out.

Our DWMP will detail the current and emerging drainage risks across our region, our customers' drainage issues and needs, the operational requirements we have and the technological and innovative advancements we'll use. Overall, our DWMP will detail the long-term interventions we propose to achieve safe and reliable drainage and wastewater services within our region, for many years to come.

Therefore, the long-term drainage interventions that we select for implementation in the Little Marlow area within our drainage strategy, will also feature in detail within our DWMP when it's introduced. The new planning process and DWMP documentation will then replace the existing drainage strategy process and documentation.

* You can find out more about the 21st Century Drainage Programme and Drainage & Wastewater Management Plans, by using the following link: water.org.uk/policy-topics/managing-sewage-and-drainage/drainage-and-wastewater-management-plans.

Our drainage investigations so far.

Since 2016, we've carried out a number of investigations in the Little Marlow area. They've helped us to understand more about the root causes of the area's drainage problems, and how they might be improved in the future.

So far our drainage investigations have included:

Customer and stakeholder consultations

We sent sewer-flooding questionnaires to our customers in the Little Marlow area. We wanted to hear their drainage views and experiences, and to pinpoint problem locations. We also met with Buckinghamshire County Council and Wycombe District Council, presented to the Hughenden Valley Drainage Improvement Group and gained feedback from other local stakeholder groups

Flow and asset surveys

We checked the performance of our sewer network and the main assets we operate in the Little Marlow area. We placed four rain gauges and 14 flow monitors within the sewers across the area. We also installed sewer rising main monitors at our sewage pumping stations, carried out manhole inspections and surveyed over 1,000 metres of the local sewer network, using CCTV.

This helped us to understand if our assets were contributing to the area's drainage issues.

Impermeable area surveys

We measured the size of the impermeable area that's connected to our sewers, including driveways made out of concrete or tarmacadam, and roofs. As rainwater flows from these areas into our network, rather than naturally draining away, it reduces the capacity and performance of our sewers and contributes to the drainage issues in the Little Marlow area.

This enabled us to identify areas in Little Marlow where the reduction or removal of impermeable areas is possible. In such instances sustainable drainage systems (often called SuDS*), could potentially be put in place in customers' homes. This would help to slow down the flow of rainfall that enters our sewers during wet weather, and reduce the risk of sewer flooding.

* SuDS are a range of drainage methods that can be used for slowing the speed at which surface water enters our sewer network, and/or redirecting surface water away from our sewers. Examples of SuDS include using water butts, planters and paving that allows water to pass through it.

Site walkovers

We investigated beyond our sewer network to find the root causes of other drainage issues in the area, such as flood water from rivers and surface water runoff from agricultural land that may find its way into our sewer manholes. To help us to do this we hosted ‘walkovers’ at flood sites with members of the Hughenden Valley Drainage Improvement Group.

Flooding 'trigger-levels' analysis

We analysed the groundwater levels and river levels that were recorded during periods when there was flooding and other drainage issues in the area. We wanted to use this information to help us define groundwater thresholds or ‘trigger levels’.

If these levels are reached in future, it could trigger our local response teams to carry out specific work to help prevent the flooding and drainage issues, such as removing excess water from our sewers using lorries that carry large water tanks, (we call them tankers).

Immediate drainage improvements.

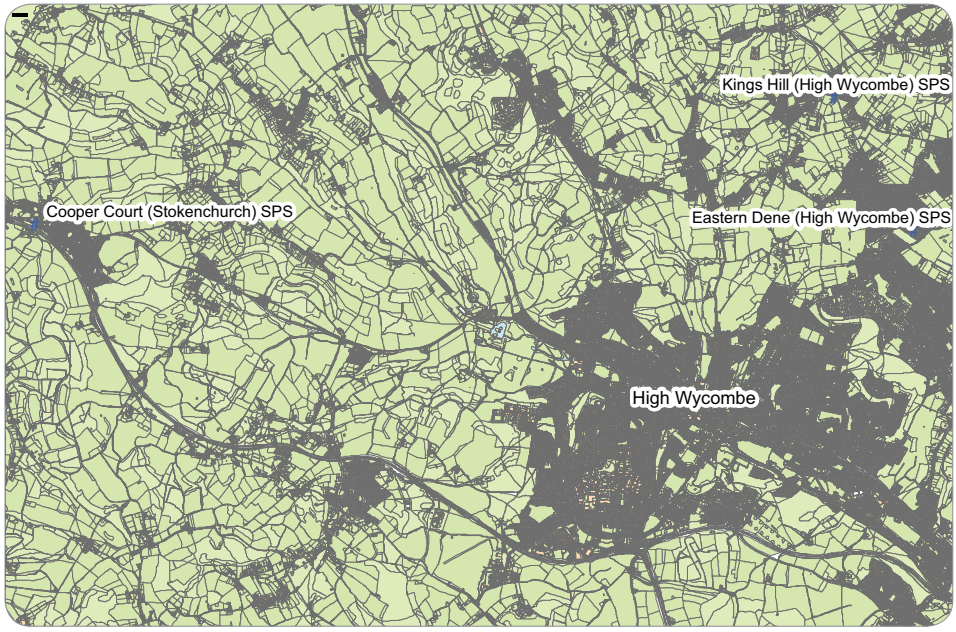
In carrying out our investigations in the Little Marlow area, we identified some actions that could achieve immediate drainage improvements. We've put a number of these in place already, and supported drainage stakeholders to deliver others, including:

Installation of sewage pumping station monitors

We've installed rising main monitors and supporting communication tools at three of our sewage pumping stations (SPS), in the Little Marlow area, as identified on the map.

This will help us to keep a close check on how our sewage pumping stations are working and alert us to any issues, so that we can reduce service disruptions for our customers.

Complete



Sewage pumping station monitor installation in the Little Marlow area.

Findings so far.

The drainage investigations that we've carried out so far have helped us to understand some of the root causes of the drainage issues in the Little Marlow area. We propose to carry out further drainage activities (we call these interventions), to improve the drainage issues we've found so far, in both the short and long term.

Our findings from the drainage investigations we've completed so far include:

Maintaining our assets

We found

Our assets such as sewers, manholes and pumps can be damaged in many ways, from age deterioration and blockages, to roadworks and tree roots. We've identified a number of defects that are allowing groundwater to enter our sewers. We'll continue to inspect our assets, and try to fix any problems we find that are causing significant drainage issues.

Our proposed interventions

- Reinforce sewer repairs with watertight lining.

Benefits of proposed interventions

- Increase the capacity of our sewers and reduce the risk of sewer flooding through repairing damaged pipework, sealing manhole covers and monitoring the operation of our sewage pumping station flows.
- Help us to maintain our wastewater services to customers in the Little Marlow area during wet weather.

Delivery timeframe

Proposed for 2018- 2025.

For more information on the 'Lift & Look' and CCTV surveys that we carried out as part of this work, please see the Appendix.

Rising ground-water levels

We found

Groundwater can enter our sewers when levels are high which reduces their capacity and increases their risk of flooding. There's a strong link between the rising groundwater levels across the Little Marlow area and the drainage issues some of our customers have experienced, including sewer flooding and restricted use of their toilets and bathrooms.

Our proposed interventions

- Monitor groundwater levels in our control centre and inform our response teams if thresholds are passed. The teams will carry out an action plan specifically designed for the area to reduce or remove the flooding issue, such as checking sewer water levels and using tankers to take away excess flows from our sewers.

Benefits of proposed interventions

- Give us the capability to predict and prevent some sewer flooding issues before they occur, through monitoring groundwater levels and sewage pumping station flows.
- Increase the capacity of our sewers and reduce the risk of sewer flooding when tankering is used to remove excess flows from our sewers.
- Help us to maintain our wastewater services to customers in the Little Marlow area during wet weather.

Delivery timeframe

Proposed for 2018- 2025.

For more information on the Flooding 'trigger-level' survey and analysis that we carried out as part of this work, please see the Appendix.

Rainwater from roofs

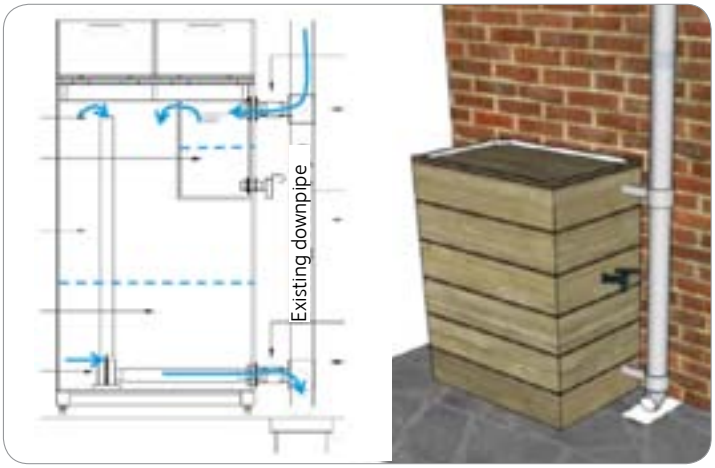
We found

Over time property roof downpipes may mistakenly become connected to our foul sewers. Misconnected property roofs are contributing significant volumes of rainwater into our sewer network. This is reducing the capacity of our sewers and adding to the area's drainage and flooding issues.

Our proposed intervention

Working with Buckinghamshire County Council and Wycombe District Council to:

- Investigate if roof drainage can be separated from our sewer network. It may be possible to do this jointly through customer campaigns and the installation of SuDS for our customers in affected areas. The type of SuDS we propose are planters, as illustrated, which would be connected to the downpipes of affected property roofs.



Proposed SuDS planters for misconnected roof drainage.

Benefits of proposed intervention

- Increase the capacity of our sewers and reduce the risk of sewer flooding by limiting the volume of water that enters our sewers from misconnected property roofs.
- Help us to maintain our wastewater services to customers in the Little Marlow area during wet weather.

Delivery timeframe

Proposed for 2020- 2025.

For more information on the Impermeable area survey that we carried out as part of this work, please see the Appendix.

Our next steps.

Our next steps are to extend our work in the Little Marlow area. Over the coming months, if this is a much wetter period, we'll be able to carry out further detailed investigations and finalise our proposals for improving the area's drainage issues for the long term.

This will be the core of our drainage strategy, and an essential part of the Drainage & Wastewater Management Plan (DWMP) that we'll produce for our whole region by 2022.

The long-term drainage interventions that we select for implementation in the Little Marlow area within our drainage strategy, will feature in greater detail within our DWMP when it's introduced.

The new planning process, and DWMP documentation outlining our proposals for achieving safe and reliable drainage and wastewater services within our region for many years to come, will then replace the existing drainage strategy process and documentation.

Over the coming months our work in the Little Marlow area will continue to be focused on:

Further drainage investigations

Carrying out further drainage investigations including checking the performance of our local pumping stations. We'll make sure that they're working at their best and not more than they should be, which can often mean water is entering our sewers that shouldn't be there. We'll investigate further any issues we find to help us to improve drainage in the Little Marlow area.

Flooding 'trigger-levels' plan

Improving the accuracy of our flooding warnings or 'trigger levels', and planning how we can best respond if they're triggered. This will help us to manage the flooding in the area and reduce other drainage issues.

Our next steps

Stakeholder engagement

Attending Buckinghamshire County Council meetings and Wycombe District Council meetings to regularly update on our findings and progress. We'll also offer advice on how everyone can help improve drainage.

Maintaining our sewers

Ongoing sewer inspections in the area and trying to fix any problems we find that are causing significant drainage issues.

Appendix.

‘Lift & Look’ and CCTV surveys

As part of our investigations we carried out a number of ‘Lift & Look’ and CCTV surveys in the Little Marlow area. We went down into our sewer network to inspect the condition of our sewers and to see how they were working.

During 2018 our ‘Lift & Look’ and CCTV survey work was particularly focused on the Hughenden Valley area. We surveyed over 740 metres of our sewer network in this location. ‘Lift & Look’ and CCTV surveys help us to find points where groundwater is entering our network, which shouldn’t be there, through cracks and other defects. When we find groundwater entering our sewers we class it as a: seeper, runner or gusher, with a gusher being the most severe and creating the biggest problem for our network’s performance. Our recent surveys, together with those we carried out in 2017, have increased our understanding of the performance of our sewer network in the Little Marlow area.

The main findings from our surveys so far include:

Valley Road

We found groundwater entering our sewer network through a manhole chamber in Valley Road, as identified by the green circle in Figure 1. We classified the level of groundwater seeping through this chamber as a ‘seeper’. Reducing the number of locations where groundwater enters our sewers, will help to increase capacity in the network to continue to transport wastewater safely, and reduce the risk of flooding incidents for our local customers. This defect will be repaired as a priority.

There were no further defects identified by our surveys along this road, or points where groundwater was found to be entering our sewer network. Our surveys also confirmed that the sections of sewer that we’d previously relined with watertight lining in Valley Road, continued to be working well. Figure 2 identifies in blue the locations where we carried out CCTV surveys in Hughenden Valley, during 2017 and 2018.

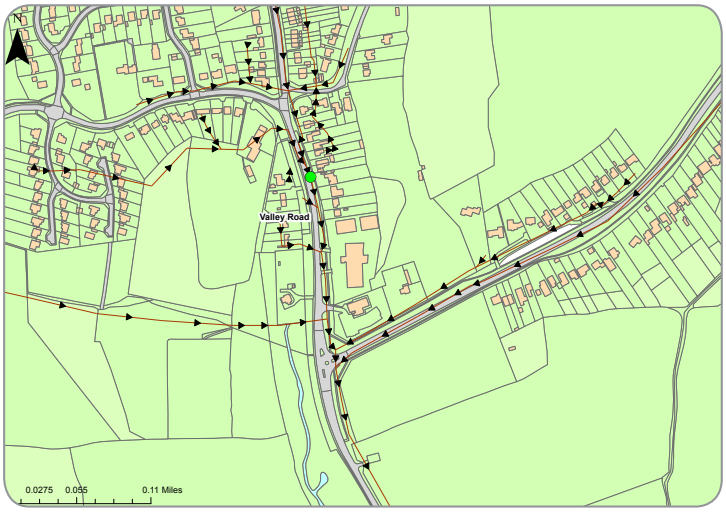


Figure 1 Locations where groundwater is entering our sewer network along Valley Road, in Hughenden Valley.

Figure 2 CCTV survey locations in Hughenden Valley.

Warrendene Road and Bryants Bottom Road

On Warrendene Road and Bryants Bottom Road, in the upper area of Hughenden Valley, our CCTV surveys found locations where tree roots had broken into our sewers through pipe joints. An example of this can be seen in Figure 3. The damage caused by the tree roots could lead to groundwater entering our sewer network, which reduces its capacity and performance, or to sewer collapses in the future. The sewer defects we've identified in this area will be repaired as a priority.

Figure 3 Examples of tree roots within our sewers in Hughenden Valley.

Impermeable area survey

Impermeable ground doesn't allow rainwater to drain through it naturally such as driveways made out of concrete or tarmacadam, and roofs. Instead the rainwater from these areas pools together and often flows into our sewer network.

This additional water reduces the capacity of our sewers, stops them from working properly and contributes to the drainage issues in the local area. Our survey measured the size of the impermeable area in the Little Marlow area and we investigated its impact on our sewer network.

Our survey in the Little Marlow area found:

- Examples of rainwater caught from the roofs of local properties flows into our sewer network, rather than draining away naturally. Most of the rainwater from roofs comes from properties in the Hughenden Valley area.

We propose to investigate the possibility of removing roof drainage from our sewer network with Buckinghamshire County Council and Wycombe District Council. This could increase capacity in our sewers and reduce the risk of flooding incidents for local residents.

An example of our impermeable area survey results can be found in Figure 4. The colour-coding represents the locations that surface water runoff currently drains to in the Little Marlow area, the red areas are currently draining into our sewer network.

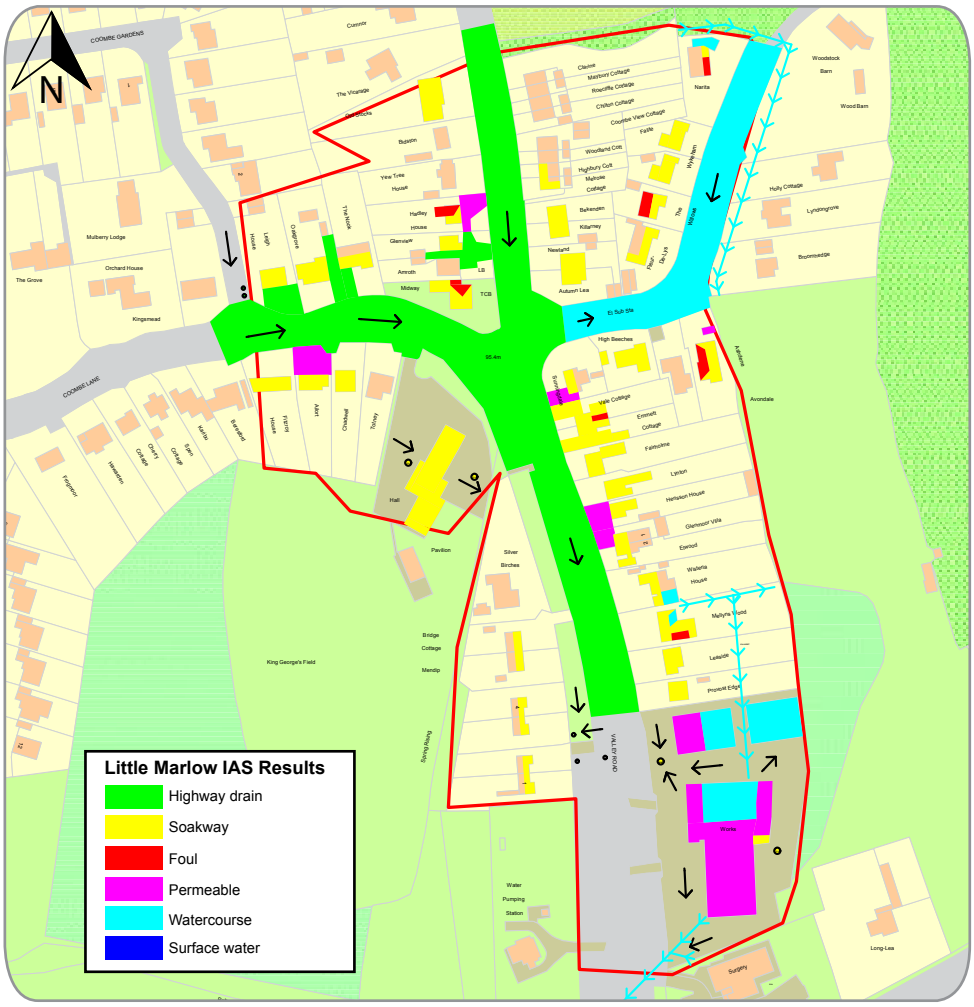


Figure 4 An example of impermeable area survey findings for the Little Marlow area.

Flooding ‘trigger-levels’ analysis

We analysed the groundwater levels and river levels that were recorded during periods when there was flooding and other drainage issues in the Little Marlow area. We wanted to use this information to set up groundwater warning signs or ‘trigger levels’ so that we could investigate the impact this groundwater has on our sewers.

We defined red and amber ‘trigger levels’, with red being the most critical warning sign. A red ‘trigger level’ tells us that sewer flooding is very likely and that rapid action is needed to reduce the drainage issues. An amber ‘trigger level’ warns that sewer flooding is possible.

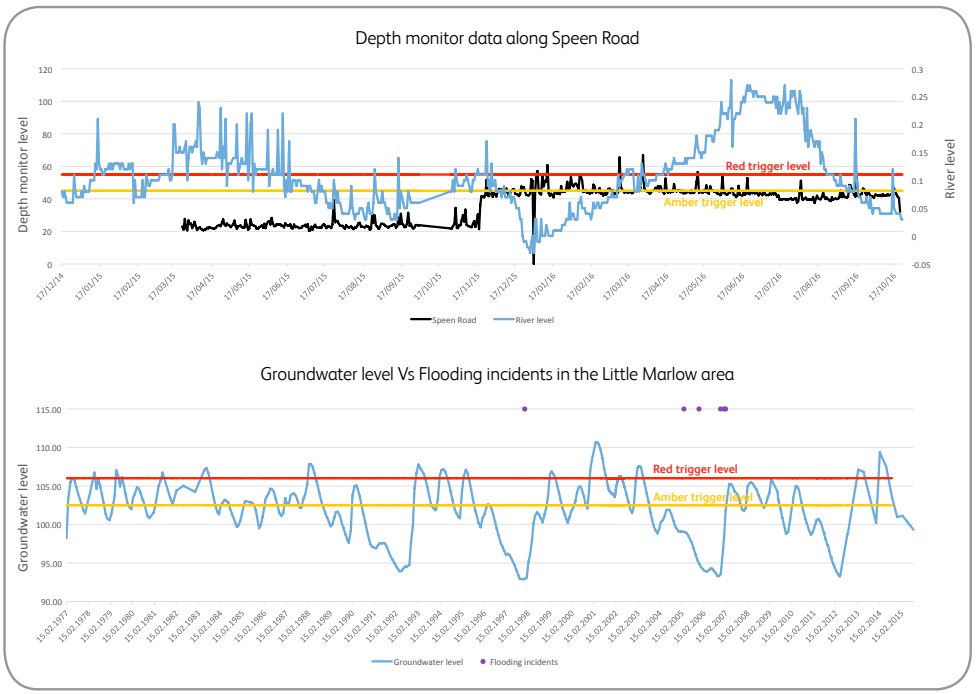
If an amber level is reached our local team will check for unusually high activity at our sewage pumping stations. This could be a sign of groundwater entering our sewer network which shouldn’t be there. If a red level is reached the team will lift manhole covers in areas known to flood, to make sure our sewers have a safe level of water in them, and we can reduce their risk of flooding.

Figures 5 and 6 are graphical illustrations of our flooding ‘trigger-level’ analysis for the Little Marlow area. Figure 5 uses a black line to illustrate the depth monitor data for Speen Road, and a blue line to indicate the local river level data. Figure 6 compares groundwater levels, represented by a blue line, against known sewer flooding incidents in the Little Marlow area, which are identified in purple.

Figures 5 and 6 demonstrate the relationship between sewer network issues and high groundwater levels, particularly when the red warning ‘trigger-level’ threshold has been reached.

We propose to continually check and refine these flooding ‘trigger levels’ to improve their accuracy, particularly when ‘trigger levels’ have been reached.

Ongoing monitoring will increase our understanding of how our sewer network copes with different weather patterns and groundwater conditions. This will help us to plan how we can further reduce sewer flooding and drainage issues for our customers in the Little Marlow area, now and in the future.



Figures 5 and 6 Little Marlow area flooding ‘trigger-level’ analysis.