

## Bagstone and Tytherington Infiltration Reduction Plan Summary

This provides an update on the last year's groundwater situation, what mitigation actions, if any, were taken and a summary of our action plan to prevent flooding due to groundwater infiltration of our sewer network.

### **April 2021 – March 2022**

Winter groundwater levels across the region were relatively low, with peak levels comparable to the winters of 2014/15 and 2016/17. Following high groundwater levels during the preceding winter, groundwater levels rose again in May 2021 with a monthly rainfall 66% above the long-term average (LTA) (fourth highest UK May rainfall on record). This particularly affected areas in the north of the region. During the autumn, heavy rainfall in October (33% above the LTA) caused groundwater levels to rise. However, below-average rainfall between November 2021 and March 2022 meant that most catchments were not severely affected by infiltration. The Bagstone and Tytherington catchments were inundated for extensive periods during the year, particularly during late May and late October, causing the Operational Mitigation Action Plans (OMAPs) to be initiated. Bagstone was more severely affected, with the OMAP also required to be in place in early January, and from mid-February into early March.

### **Action Plan**

#### Annual activity

- Review asset and operational data and update annual reports.
- Continue monitoring system performance using telemetry, rainfall records and local groundwater levels.
- Communicate with other authorities during times of elevated groundwater levels and promote a multiple agency approach.
- Pro-active maintenance of vulnerable sewers including routine jetting.

#### Completed to date

- Procedure for recording, investigating and resolving incidents in place.
- Undertook proactive inspection using CCTV of vulnerable sewers.
- Sewage pumping station surveys completed, and assets updated where necessary.
- Analysed inspection data to identify infiltration.
- Analysed flows in the sewers using flow surveys and modelling.
- Undertook infiltration sealing where cost effective.
- Identified areas of infiltration in private drainage.
- Reviewed existing boreholes in the area.
- Reviewed telemetry and compared it with data collected from the area to assess residual levels of infiltration.
- Wessex Water infiltration [video](#) added to website.
- Considered the construction of local boreholes to monitor groundwater levels.

- Monitored local watercourse data and groundwater levels during periods of inundation to inform OMAPs.
- Liaise with the Environment Agency about their groundwater warning service.
- Use of cameras to monitor areas of high frequency maintenance.

	2015-20	2020-21	2021-22
<b>Length of sewer inspected (m)</b>	6131	1606	167
<b>Length of sewer sealed (m)</b>	2769	-	-

#### Short term

- Undertake rehabilitation work based on the survey findings where cost beneficial.
- Investigate watercourse monitoring in the local area.
- Analyse flows in the sewers using flow surveys and modelling where appropriate.
- Investigate the use of Artificial Intelligence to code CCTV footage, increase survey efficiency and help identify defects and hotspots.
- Use of machine learning and rainfall forecasting to predict flows in sewers.

#### Medium term

- Identify road gullies and other impermeable areas connected into the foul sewers and remove them where cost effective.
- CCTV and targeted infiltration studies according to analysis from previous surveys and telemetry data.
- Commission pump station surveys where necessary.
- Further infiltration sealing according to study findings.

#### Long term

- Inspection of private gullies, drains, and manholes.
- Remedial works of private assets.
- Monitor and regulate surface water deposal to prevent foul sewer infiltration.
- Consider sustainable solutions.

### Current Performance

This graph shows incidents against the river level (as measured at Frampton Cotterell) and the flow at Bagstone Sewage Pumping Station (SPS). Despite extensive infiltration sealing taking place in 2018 and 2019, the pumping station continues to become inundated when the river level is high. The initiation of the OMAP during these periods has reduced the number of incidents relating to sewer flooding and loss of service in the catchment.

