



# LONDON

Disconnecting weeping tiles

## THE SCIENCE

Wet weather sanitary sewer overflows and sewer backups are often the result of excessive inflow and infiltration overwhelming sanitary sewers. The risk of excessive inflow increases when roof drain leads, foundation drains and drainage catch basins are connected to sanitary sewers. For several decades, most communities have prohibited the connection of weeping tiles in new homes to the sanitary sewer system, but this practice was common in the past and remains present in many homes.

## THE TRIGGER

Over the past decade or two, the City of London has experienced a number of extreme rain events that resulted in extensive basement flood damage to homes. Some neighbourhoods have experienced recurring flooding. In the City of London, connection of weeping tiles to sanitary sewers was a common practice for homes built prior to 1985. Some neighbourhoods, like Sherwood Forest, were mostly developed in the late 1970s and early 1980s and now experience chronic basement flooding because the sanitary sewers become overwhelmed with foundation drainage water during heavy rainfall events.

Sherwood Forest's vulnerability to basement flooding is enhanced by clay soil conditions resulting in poor rainwater absorption. Lot grading in this area has also settled over time and homes are close to each other reducing the neighbourhood's drainage capacity due to a relatively high percentage of impervious surface area.

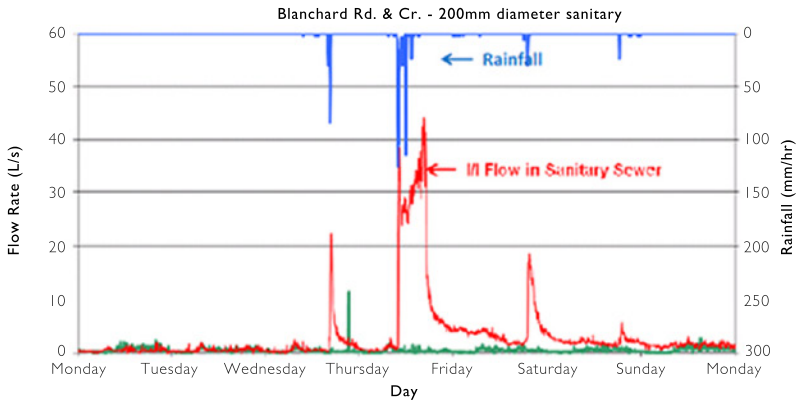
## THE APPROACH

The City of London assessed source control and infrastructure alternatives to reduce the risk of damage from basement flooding in Sherwood Forest. Research commissioned by the City found that a \$2 million investment in source control would achieve greater protection than a \$10 million investment in protective infrastructure.

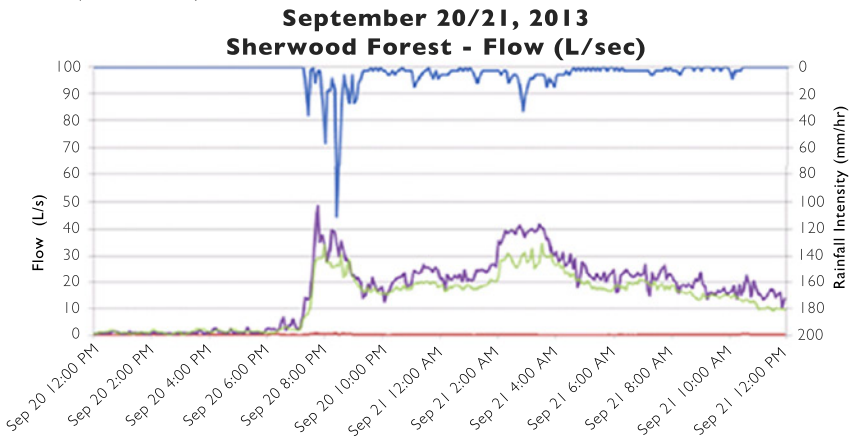
The City launched a source control pilot project to disconnect weeping tiles from the municipal sanitary sewer system. "On top of the cost savings, it was simply a better option," says Kyle Chambers, Wastewater and Drainage Engineer for the City of London. "By adopting this approach, the City did not have to worry about the sizing of new infrastructure. Disconnecting weeping tiles also represented a sustainable option since it contributed to reduced sewage pumping and treatment costs at municipal facilities."

The City of London implemented a sump pump program more than 20 years ago. The level of grant funding was initially set at 50 percent of the eligible cost, and increased in 2009 to 75 percent. Even with this increase, the program has experienced a very low uptake rate, highlighting the need for further mitigation actions. The City decided to work directly with homeowners in Sherwood Forest to reduce inflow at the source by disconnecting household weeping tiles from private sanitary sewer connections.

The pilot project for Sherwood Forest



**Figure 13:** In this graph, the blue line represents the amount of rain received in mm/hour, the red line represents the flow inside the sanitary sewer in L/s and the green line represents a week's worth of flow in the sanitary sewer with no rainfall in L/s in the Blanchard Crescent Area. This graph highlights the fact that there is a direct correlation between the amount of rain received (approximately 80mm during the rainfall event) and high flow in the sanitary sewer, evidence of Inflow and Infiltration. (Source: City of London)



**Figure 14:** On September 21 2013, after the pilot project resulted in the disconnection of 50% of the weeping tiles on Blanchard Crescent, a rainfall of approximately 99mm occurred in the neighbourhood. Flow monitoring (red line for Blanchard Crescent) during the storm revealed that weeping tile disconnection has resulted in a surprising reduction of extraneous flow in the sanitary sewer system. The difference in flows is also highlighted by the comparison with Ardsley Crescent (purple line) and Aldersbrook Road (green line) where no disconnection was in place. (Source: City of London)

targeted 65 homes. Through computer modeling, the City was able to determine that it was necessary to disconnect weeping tiles for at least 50 percent of the homes to ensure that enough excess foundation drainage water was removed from the sanitary system to reduce sanitary sewer backup risk for the neighbourhood. Several methods were used to reach out to households to encourage participation in the program. Public meetings were organized and homeowners were contacted

by mail and phone. Once homeowners signed up, the City met with each of them to explain the pilot project in more detail, and assessed each basement to determine retrofit feasibility. In order to get a high uptake rate, the City covered all the costs associated with the retrofit and provided an additional \$1,000 payment for future maintenance.

## THE OUTCOME

32 of the 65 households participated in the full pilot program, while five more houses installed a private storm sewer lateral. The Weeping Tile Disconnection Pilot Project presented the City with several challenges. First, it required working directly with homeowners on private property and inside homes. This brought a number of legal challenges for the City, including the need for police record checks for all contractors and their staff, additional requirements for liability insurance, and comprehensive insurance coverage for all employees. Coordination with the City's Building Division was also necessary to obtain building permits for each house.

Working directly with homeowners also implied that several individual agreements needed to be signed prior to each retrofit, and that contractors were able to work under a flexible schedule.

Since the weeping tiles were disconnected there has been a dramatic decrease in the flow of water within the sanitary sewer system during extreme rainfall events.

Moreover, there has been no sewer back up damage in participating homes, despite the occurrence of extreme rainfall events.

## A WORD FROM LONDON

When asked for his thoughts on the Weeping Tile Disconnection Pilot Project, Mr. Chambers said that he believed it was a great program for homeowners willing to buy into the solution. As anticipated, scheduling was a challenge as it was difficult to coordinate the work with homeowners' work schedules. However, they proved to be flexible and accommodating, and most adapted their schedules to coordinate with City workers. Mr. Chambers mentioned that if he had to go through the process again, he would probably have spent more time explaining the project to homeowners. "When doing the work, some people asked us to repair the sidewalk or repave parts of their streets. I think it is very important to be clear and set realistic expectations about what we are doing and not doing from the beginning", said Mr. Chambers. Overall, homeowners that took part in the project were very cooperative and pleased with the work that had been done. Monitoring done by the City showed that the project was a success, with a significant reduction of excess flow in the sanitary sewer system. The City will be able to draw more conclusions out of this pilot study after the next significant rain event in the neighbourhood.