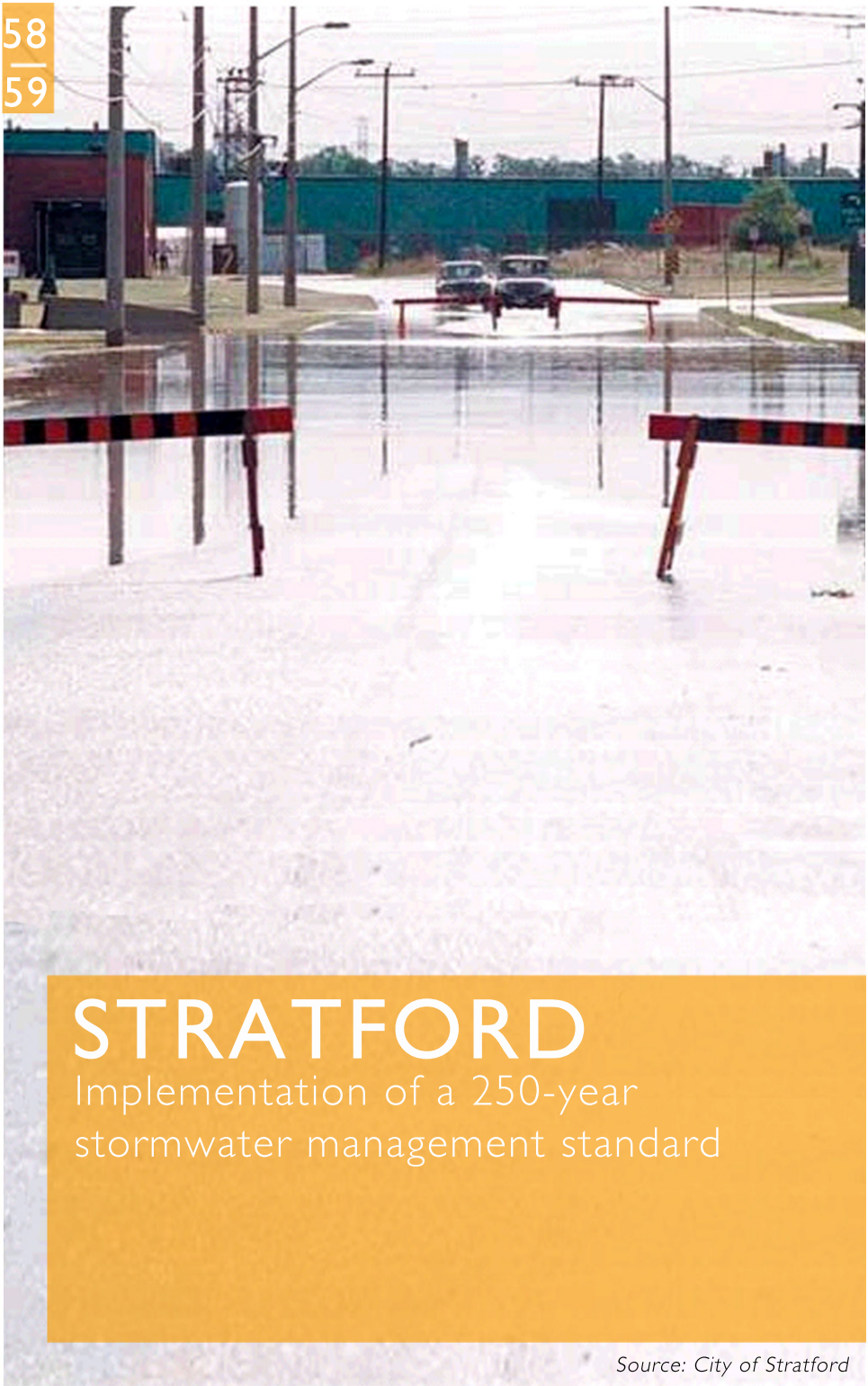

STRATFORD

Implementation of a 250-year stormwater management standard

Source: City of Stratford

THE SCIENCE

Most developments in Canada built after the 1970s are protected from flooding caused by extreme rainfall events in two ways: An underground stormwater management system that conveys water from relatively frequent events (i.e. the minor system), and an overland flow system to protect homes from very severe rainfall events (i.e. the major system). In most communities, the major system of overland stormwater management is designed and managed to cope with stormwater flows likely to occur once every 100 years. Even more severe events are possible, but are rare.

New subdivisions are built with both a major and a minor stormwater system. The minor system consists of a pipe network, plus gutters and inlets which provide a conveyance system to rapidly move storm runoff away from roads. The major system typically conveys volumes of water expected for a one in 100 year rainfall event that would exceed the capacity of the minor system. The major system mostly relies on overland drainage conveyance elements.

More common events, like a 20-year storm or a 50-year storm, may be disruptive to transportation or other aspects of daily life due to flows and ponding in streets, but they should not result in damage to well maintained homes and public infrastructure. Rainstorms that overwhelm sanitary and stormwater systems should be rare events, and they should seldom result in damage to homes and infrastructure in communities with major and minor systems. Unfortunately there have been many extreme rainfall events over the past five to 10 years that have resulted in extensive damage to homes and infrastructure.

Moreover, there has been an increase in the frequency and severity of extreme rainfall events. This is projected to increase over the next few decades as a result of climate change. By 2100, the storm of the century design standard of the past may occur five to 10 times a century.

THE TRIGGER

In 2002, an extreme rainfall event overwhelmed Stratford's stormwater management system. The storm resulted in major damages and significant costs for the City. There was extensive basement flooding in hundreds of homes.

This unprecedented flood event also resulted in a class action lawsuit against the City. The mediated settlement provided compensation totalling $7.7 million to more than 800 homeowners. The flooding was a trigger to develop a new stormwater management plan for Stratford. Prior to the 2002 flood, a sanitary sewer master plan was initiated to analyze the sanitary collection system, identify problems and suggest potential solutions. The plan evaluated existing and future developments and arrived at a conclusion that $35 million should be invested in priority projects and $16.5 million for other strategic projects. In addition, the Sanitary Sewer Master Plan recommended to conduct a stormwater study that resulted in the creation of a City Wide Storm System Master Plan.

Figure 16 : Stormwater management pond built in Stratford to accommodate surcharging of local systems.
(Source: City of Stratford)

THE APPROACH

The City Wide Storm System Master Plan was completed in October 2004 and presented a comprehensive action plan for Stratford to develop and implement the required changes and improvements to the storm system infrastructure to meet current and future needs. It evaluated the performance of the existing storm system, reviewed and updated city drainage policies and created a city-wide computer model. Additional activities were also carried out such as the review of the city's drainage policies and standards, the development of a system improvement strategy, the implementation of a sewer flow monitoring program and a drainage system inventory. Assessments of storm sewer capacities, major drainage system flow and ponding areas was also conducted.

Through the development of the Storm System Master Plan, a Court Drain Subwatershed study was conducted in 2002 and resulted in the introduction of a 250 year storm standard for the City of Stratford. This proposed new standard would lead the City to upgrade its infrastructure to accommodate the rate of runoff that would occur in a one in 250 year rainfall event. As previously discussed, a one in 100 year return period is a widely accepted standard used across Canada in the design of stormwater management systems. However, Stratford decided that looking at the past was no longer sufficient and that a 250 year storm standard would be more appropriate to prepare for future storms. The implementation of a 250 year design standard implied that the City had to change the design of its storm system so it could support a 15 percent increase in peak flows.

THE OUTCOME

The City of Stratford has spent $70 million to retrofit its stormwater management infrastructure to comply with the new 250 year design standard. Infrastructure such as stormwater management ponds, overland flow routes and oversized trunk storm sewers were built to accommodate surcharging of local systems. Stratford also established two incentive programs: one to replace old sanitary laterals in order to reduce inflow and infiltration into the sanitary system and another to assist with installing sump pumps for storm laterals to reduce the risk of surcharging storm mains.

A WORD FROM STRATFORD

According to Ron Shaw, Stratford's Chief Administrative Officer, "It became evident shortly after the flood that the problem was not only related to the sanitary system and that a more global approach was needed to prevent similar events from happening in the future." The City of Stratford undertook major sanitary and storm sewer upgrades after the storm and is now considered a leader in basement flood prevention. As most Canadian Municipalities tend to plan for 'the flood of the century', Stratford has decided to improve its management of basement flooding risk by establishing a safer flood standard.