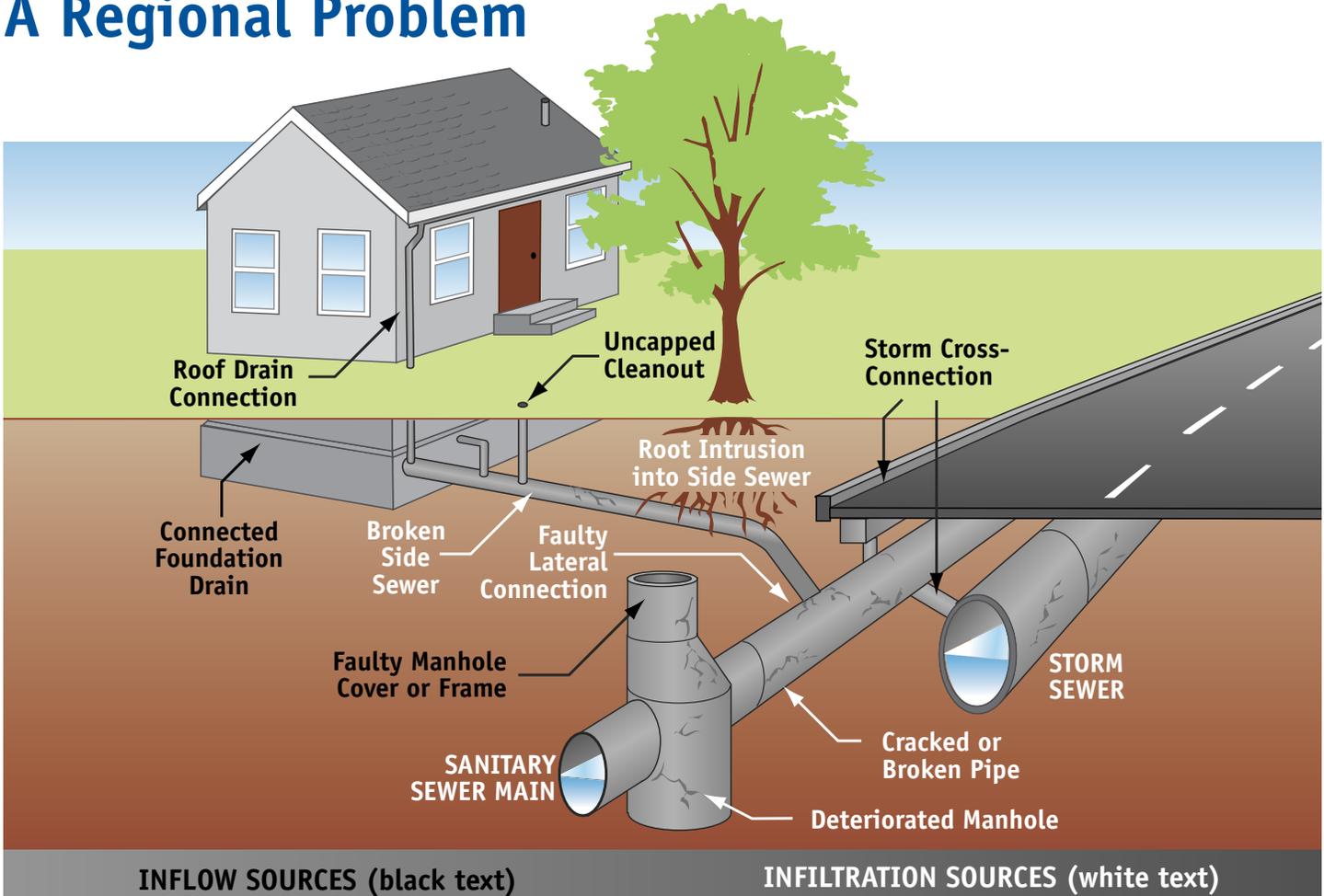




# Storm Water & Ground Water in Sewers: A Regional Problem



## What is Infiltration and Inflow and Why is it a Problem?

Excess water that flows into sewer pipes from groundwater and stormwater is called **Infiltration and Inflow**, or I/I. Groundwater (infiltration) seeps into sewer pipes through holes, cracks, joint failures, and faulty connections. Stormwater (inflow) rapidly flows into sewers via roof drain downspouts, foundation drains, storm drain cross-connections, and through holes in manhole covers. Most I/I is caused by aging infrastructure that needs maintenance or replacement.

The King County Wastewater Treatment Division estimates that I/I makes up 75 percent of peak flows in the sewer system during winter storms – and that much of this I/I originates on private property.

Extra water in the sewer system is a problem because:

- It takes up capacity in the sewer pipes and ends up at the regional wastewater treatment plants where it must be treated like sewage, resulting in higher treatment costs.
- New and larger conveyance facilities are needed to transport larger volumes of flow, resulting in expensive capital projects.
- I/I flows contribute to sewer system overflows into local homes and the region’s waterways, negatively impacting public health and the environment.

Protecting the environment and decreasing wastewater treatment costs are the benefits of a regional I/I control program.

# King County I/I Control Program

In 2000, King County, in partnership with 17 cities and 17 sewer utilities that collect sewage in the King County region, launched a program to develop a cost-effective approach to controlling I/I. An initial phase of the program evaluated alternatives and tested solutions, resulting in the Executive's Recommended I/I Control Program, approved by the King County Council in early 2006.

The purpose of the program is to reduce the amount of peak wet weather flow entering the county's wastewater conveyance system when it is cost-effective to do so. Reduction of I/I in the system has the potential to lower the risk of sanitary sewer overflows and decrease the costs of conveying and treating wastewater.

In accordance with the adopted I/I Control Program, King County will work with the local sewer agencies to:

- Conduct an I/I reduction feasibility analysis in 2007-08 in four candidate project areas, see map.
- Select and implement 2-3 initial I/I reduction projects in 2010-12 to test the cost-effectiveness of I/I reduction on a scale large enough to potentially

offset the need for larger conveyance or storage facilities.

- Analyze the results of these initial projects and make recommendations to the King County Council regarding long-term I/I reduction and control, including applicable changes to policy or code.

## Infiltration



Cracked sewer pipe



Inflow

Downspout connected directly to sanitary sewer

# Initial I/I Reduction Project

In 2011 King County will construct an I/I reduction project in the Skyway Water and Sewer District service area (unincorporated King County). I/I reduction projects were

also planned in Bellevue and Issaquah, however in 2010 King County budget limitations led to a decision not to implement these projects.

The Skyway project will test the cost-effectiveness of I/I reduction on a scale large enough to potentially offset the need for larger conveyance or storage facilities. Reducing the flow of groundwater and stormwater into the sewer system should save public funds by reducing treatment costs and delaying or eliminating the need for expensive capacity expansion projects. Much of this work will focus on repairing private side sewers with the permission and cooperation of private property owners.



## Finding I/I

Flow monitoring and modeling can help identify areas of high flows during wet weather, indicating the presence of I/I. Additionally, sewer system evaluation surveys (SSES) can be used to examine the condition of private side sewers and help to identify likely sources of I/I. SSES methods include smoke testing, closed circuit television (CCTV) inspection, and occasionally dye testing.

**CCTV** cameras can be robotically sent down sanitary sewer lines and along each side sewer to record a video of sewer conditions. CCTV inspections can identify breaks, root intrusion, leaking water and deteriorating conditions.



**Smoke Testing** involves pumping smoke through sewers from manholes in streets and observing where smoke exits. The exiting smoke can indicate a broken pipe or where roof or foundation drains might be illegally connected to the sewer system.



**Dye Testing** involves pouring non-toxic fluorescent colored dye down roof drains or catch basins to see if that dye makes its way into the sewer.

## Fixing I/I

Once an I/I problem has been identified, there are many methods and technologies available to reduce I/I. One primary method focuses on fixing the broken pipes, manholes, and joint connections. Another focuses on reducing the amount of I/I that enters the sewer system from storm events by disconnecting roof drain downspouts and other building or yard drains that may be directly connected to the sewer.

### Trenchless Technologies

Trenchless technology pipe repair methods may include pipe bursting, or cured-in-place pipe (CIPP).



Pipe bursting is a technique that pulls a hardened steel breaker head through the old pipe, breaking it up, and replacing it with a new pipe all in one process.

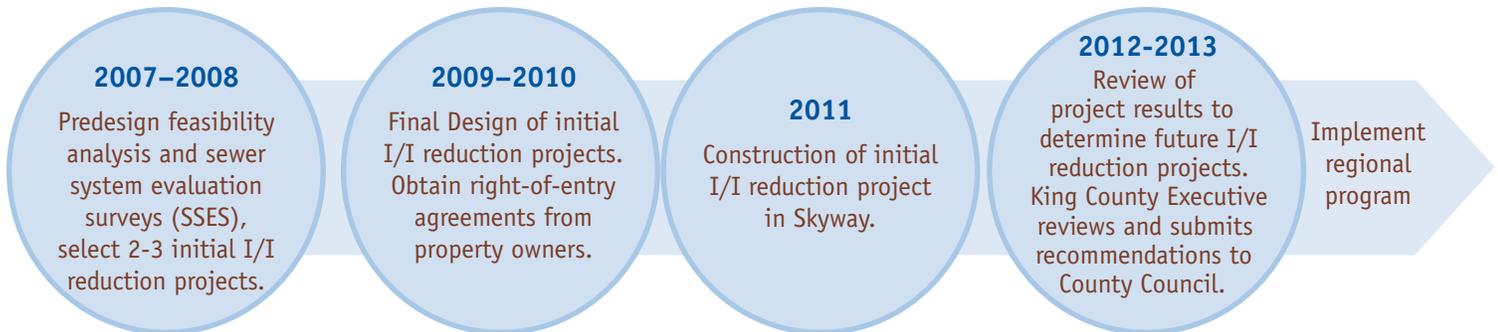
CIPP repair involves pulling a resin-saturated liner through a damaged pipe which is then cured with steam or hot water to form a tight-fitting, jointless replacement pipe. Trenchless repair methods require less digging than traditional “dig and replace” repair methods and minimize damage to yards and landscaping.

### Stormwater Disconnections

Stormwater connections such as roof drain downspouts, yard drains, and sump pumps may be disconnected from the sewer system and redirected to a separate stormwater system.



## Regional Infiltration/Inflow Program Milestones



## Local Agency Involvement

King County and 34 local sewer agencies are working to develop and implement cost-effective I/I management strategies and projects. The cost-effectiveness and feasibility of the initial I/I reduction projects will help determine how a regional I/I program will be carried out in future years. The following is a list of local sewer service providers in the King County regional sewer system:

- |  |  |
|--|--|
| Alderwood Water & Wastewater District      | Olympic View Water & Sewer District                          |
| City of Algona                             | City of Pacific, Public Utilities                            |
| City of Auburn                             | City of Redmond  |
| City of Bellevue, Utility Services         | City of Renton   |
| City of Black Diamond                      | Ronald Wastewater District                                   |
| City of Bothell                            | Sammamish Plateau Water & Sewer District                     |
| City of Brier                              | City of Seattle, Public Utilities                            |
| City of Carnation                          | Skyway Water and Sewer District                              |
| Cedar River Water & Sewer District         | Soos Creek Water & Sewer District                            |
| Coal Creek Utility District                | City of Tukwila  |
| Cross Valley Water District                | Valley View Sewer District (formerly Val Vue Sewer District) |
| Highlands Sewer District                   | Vashon Sewer District  |
| City of Issaquah                           | Woodinville Water District                                   |
| City of Kent                               |  |
| City of Kirkland                           |  |
| City of Lake Forest Park                   |  |
| Lakehaven Utility District                 |  |
| City of Mercer Island                      |  |
| Muckleshoot Indian Tribe                   |  |
| Northeast Sammamish Sewer & Water District |  |
| Northshore Utility District                |  |

## What Can You Do?

- Inspect your roof gutters and downspouts to see if they are connected to the sewer system. If so, have them disconnected. Direct downspouts onto lawn and garden beds, or to rain barrels. Resources: <http://www.kingcounty.gov/environment/stewardship/nw-yard-and-garden/rain-barrels>; <http://www.dcgreenworks.org/LID/downspout.html>
- To get more information about the King County I/I Control Program or the Initial I/I Reduction Projects, contact King County staff:
  - **Maryann Petrocelli**, Community Relations Planner, **206-263-7321**, or [maryann.petrocelli@kingcounty.gov](mailto:maryann.petrocelli@kingcounty.gov)
  - **Erica Jacobs**, I/I Control Project Manager, **206-684-1138**, or [erica.jacobs@kingcounty.gov](mailto:erica.jacobs@kingcounty.gov)
- Visit the King County Web site at [www.kingcounty.gov/environment/wastewater/II/InitialProjects/Skyway.aspx](http://www.kingcounty.gov/environment/wastewater/II/InitialProjects/Skyway.aspx)
- Contact your local sewer service provider. For a list of local agency web sites visit <http://www.kingcounty.gov/environment/wastewater/MWPAAC>



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