

Private Property Infiltration and Inflow



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Infiltration and inflow (I/I) of extraneous stormwater and groundwater to sanitary sewers can overwhelm the conveyance capacity of sewers and is a significant cause of system overflows. Sewer laterals, which connect buildings on private properties to sewer mains, are often a significant source of I/I.

This fact sheet outlines key considerations for municipal utilities establishing a framework for private property I/I (PPII) mitigation activities. Cross references are made to a number of interrelated fact sheets that are either currently available or in development on a range of sanitary sewer I/I topics. The complete set of I/I fact sheets provides comprehensive information on I/I management.

Private Property Program Needs Assessment

A comprehensive I/I reduction program requires effectively addressing PPII sources. Figure 1 identifies potential I/I sources at a typical residential private property. Before embarking on a PPII removal program, which can be costly and challenging, it is important to ask the following questions:

- What is driving the utility to reduce I/I?
- How much I/I needs to be removed? Can it be removed through public system work alone?
- Is the problem system-wide or in specific basins or neighborhoods?
- Is there information to indicate whether the source of the problem is primarily inflow or infiltration?

Answers to these questions will begin to shape the approach and extent of a utility's private property strategy.

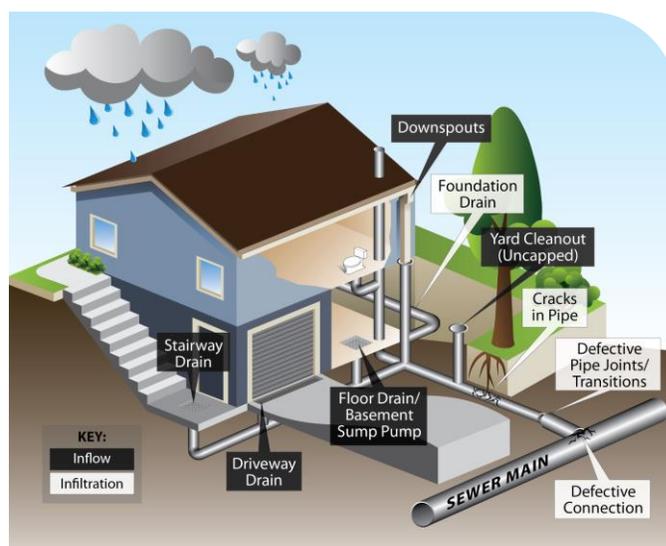


Figure 1. A diagram explaining I/I. Image by Tetra Tech

Program Approaches

There are many programmatic approaches to PPII correction. These include voluntary programs incentivized by utility-funded grants, rebates, or loans; mandatory programs that require action upon hitting certain triggers, such as selling a property; correction work implemented by the utility with permission from the property owner; insurance programs; and a variety of combinations or extensions of these approaches. The Water Environment Federation (WEF) Private Property Virtual Library provides many useful examples of these different approaches.

Policy and Legal Issues

Some of the greatest challenges to removing I/I from private property sources are not technical; rather, they are related to legal and policy issues. Therefore, it is critical for a utility considering PPII removal to involve their legal counsel early on in program development and to take into consideration Internal Revenue Service (IRS) rules.

Limits of Private Ownership

The first step is to understand the limits of private property in one's system; that is, does the utility have legal ownership of any part of the sewer lateral? As such, the following three scenarios are common:

1. The property owner owns and is responsible for the entire lateral from the building to the sewer main,
2. The utility owns the entire lateral, or
3. The utility owns the "lower lateral" from the property line to the sewer main, while the property owner owns the "upper lateral" from the property line to the house.

Scenarios may also include various combinations of easements and ownership, so it is important to first understand the limits of utility ownership and access. Then the utility can make any changes or clarifications needed through ordinance amendments. Regional utilities also may need to work with their satellite agencies to define responsibilities.

Legal Basis for Illicit Inflow Source Disconnection

When requiring a private property owner to disconnect direct I/I sources from the sanitary sewer system, the

utility must have a sound legal basis that clearly states which stormwater (or "extraneous" water) sources are prohibited. This is typically included in the sewer use ordinance. Utility legal counsel should review the ordinance to ensure the utility has the authority to require disconnection of sources such as downspouts, foundation drains, sump pumps, area drains, stairwell drains, and driveway drains.

Use of Public Funds

Any time a utility spends money to correct or improve private property assets, questions will arise regarding the legality and equitability of such public investments. While determinations must be made on a utility-specific basis, it is important to consider whether existing local or state laws restrict use of public funds on private property or the use of utility rates to disproportionately benefit certain customers, such as California's Proposition 218. Some utilities have sought a determination from the state attorney general before embarking on a PPII removal program. If, from a legal standpoint, private owners will derive some benefit from the program—provided that it is incidental to public benefits—utilities may still need to consider the political implications of any perceived fairness issues among customers if funding or resources are made available to some, but not all. If a utility cannot demonstrate a broader public benefit, then public funds should not be expended on private properties.

Additionally, utilities have also sought guidance from the IRS or tax attorneys as to whether grants or other uses of public funds on private properties could be considered taxable. Recent responses to IRS inquiries indicate that determinations must be made on a case-by-case basis.

Right of Access

As with any improvements to private property, whether the utility is performing the work or funding it, access and limits of liability must be considered. Utilities use various strategies to obtain access to private laterals: from temporary easement or ownership of the lateral to a voluntarily signed liability waiver to specifying access rights in the municipal code. The level of permission needed may be dependent on the work performed. For example, some agencies have concluded that property owner permission is required to inspect private laterals. Other agencies require access for inspection as part of their ordinance, yet they seek property owner authorization before performing any work.

Funding

Another PPII removal challenge is funding. Some utilities determine that private property owners should bear the cost of private sewer improvements. Often, utilities determine that it is in their best interest to provide some level of funding to private property sewer improvements. However, some utilities may find it cost-prohibitive to assume responsibility for all PPII improvements while others may not. State and local laws govern how financial assistance can be applied to property owners. While wide policy latitude is often given to municipalities, care should be taken to consider precedent-setting policy decisions. In developing a private property improvement funding program, utilities should consider the following issues.

Purpose

Utilities will want to consider how much funding they provide to support or incentivize private property improvements. Some utilities have covered the full cost of improvements and others offer cost-matching programs where grants cover part of the overall cost. Cost coverage decisions will depend on the utilities' objectives. For instance, is the objective to provide support to customers who want to make the improvements, but do not have sufficient funds? Or is it to entice customers that would not otherwise consider upgrades? Another question could be, how much of a problem is I/I for the utility? The former question lends itself to a partial grant program while the latter two questions may point to full funding.

Funding Sources

Potential funding sources can include user fees, proceeds from bond sales, and program participant fees. Some communities have added a special sewer rate to fund the costs of PPII programs exclusively. State and federal funds may be available for some or all of the costs, including administrative, engineering, and construction costs. For example, some external funds may be available for "in-the-ground" infrastructure improvements, but not for utility staff time to administer the program. However, some state revolving funds may preclude financing of private improvements.

Funding Eligibility

Funding eligibility considers both the types of PPII removal activities that qualify and the level of financial assistance provided by the program. Some communities reimburse infiltration source corrections only while inflow source corrections are the property owner's responsibility. The level of financial assistance also can

be a function of the property owner's financial strength, with some municipalities offering grants or forgivable loans to low-income participants. Municipalities may need a right-of-entry form for full funding.

Reimbursement

It is common to establish reimbursement limits on both types of repairs—inflow source disconnection and private sewer lateral rehabilitation—as well as total property limits. Utilities have allowed participants to repay their required contributions over time and in various ways, including through loans and incremental property assessments.

Cash Flow

The cash flow required for a program depends on a number of factors, including anticipated participation, duration, costs shared by participating property owners, and how costs will be repaid. Some utility PPII removal programs set annual limits on participation using a first-come, first-served approach, with unfunded properties waiting first in line for the subsequent funding year.

Satellite Systems

Funding approaches involving arrangements between a regional utility and satellite agencies also may warrant consideration. An interesting regional example comes from Milwaukee Metropolitan Sewerage District's Basement Connection program. The district established a 10-year, \$62-million program to fund PPII improvements in its 28 satellite municipalities. A policy prescribed certain limits on how the funds must be spent, but decisions on many other details, including property owner financial participation, are the responsibility of the municipalities.

The Hampton Roads Sanitation District in southeastern Virginia elected to fund PPII improvements in 14 satellite agencies. The district's Sewer Lateral Investigation Program's estimated cost is \$200 million. The utility hires the plumbers and inspects the work, the plumber warranties the work, and the property owner signs an agreement for both single-family and commercial properties.



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Communication is critical to PPII removal efforts because direct interface with customers' properties is involved. Image by Tetra Tech

Public Outreach

A communication plan is essential to any successful public program. However, it is critical to PPII removal efforts because direct interface with the customer and his or her property is involved. Public outreach is multifaceted, starts at the conceptual stage, and continues throughout implementation. Once a utility decides to include private property as part of its comprehensive approach to reducing I/I, convincing local elected officials of the need for the project begins, followed closely by efforts to inform the public about what is proposed and why it is important. An informational video distributed via public news and utility outlets is one option to convey the message.

Stakeholder Input

During the program development phase, public meetings and Web sites are useful tools for informing the public about options local elected officials are evaluating. These forums also can serve as a means for gathering feedback to help craft a program that meets residents' needs. Another option is using door-hanger notices to inform residents about program implementation, pending inspections, and any problems that have been identified.

All stakeholders must be identified along with the appropriate form of communication needed to reach those groups. For example, local plumbers are an important stakeholder group. Additionally, if a point-of-sale approach is being pursued in which property owners are required to take action before transferring property titles, local realtors would be an important stakeholder group. In many communities, there is an

existing local association of realtors that meets regularly. A presentation at one of these meetings illustrating key program details would be effective in eliminating confusion and misinformation as a new point-of-sale inspection program begins. If not informed early on in the process, realtors can delay a PPII program.

Once a program is established, a Web site is a good way to inform and educate residents about the program and its progress. It is important that the Web site outlines when and how the program will affect residents and that it be kept up to date to sustain an engaged public outreach program. The utility's ongoing communications program should provide contact information and keep customers informed of successes and changes. In addition to a Web site, bill stuffers can help inform residents of a program's status and the overall progress in eliminating I/I. Program brochures can also be made available at permit counters and community events. Finally, some communities have also used public service announcements on television or radio.



Smoke testing is used to detect sources of I/I. Image by Tetra Tech

Implementation

Identifying and Addressing Defects

Identifying defects on private property that contribute to I/I can be challenging, time consuming, and expensive. In most cases, the owner of the property must give permission for the local utility to access their property. Once that is granted, the local utility can begin the identification process. There are many lateral sewer system evaluation survey methods in use across the country, including, but not limited to, the following: building inspection, smoke testing, dye testing, closed-

circuit television, and wet-weather tests such as rainfall and I/I simulations. Results from these field surveys help identify defects and determine lateral sewer conditions. Subsequently, this information is used to formulate specific improvement plans to cost-effectively remove inflow sources and repair, rehabilitate, or replace lateral sewer systems. Additional resources about identifying and addressing defects are provided at the end of this fact sheet.

Evaluating Effectiveness

Periodic reports on program effectiveness to governance boards that approve funding, or otherwise authorize implementation, will likely be necessary. It is important to consider reporting needs when establishing the supporting flow-monitoring and modeling efforts, program controls, pre- and post-improvement data collection and management methods, and reporting protocols. When initially embarking on a PPII removal effort, many utilities find it useful to perform concentrated, relatively small pilot projects that include efforts to evaluate effectiveness in property owner participation, communication, cost, and I/I reduction. Such pilot projects can yield extremely important initial information to frame the expected long-term program costs and effectiveness.

Technical aspects of flow monitoring and data analysis are important for reliably characterizing the effectiveness of PPII removal. In addition, example programs with effectiveness evaluations can be found through the WEF Private Property Virtual Library, recent WEF conference proceedings, and in the “Additional Resources” section in this fact sheet.

Acknowledgments

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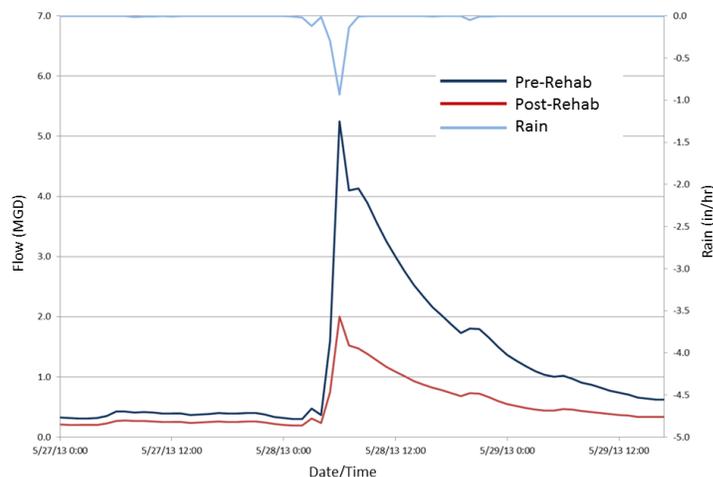


Figure 2. Flow before and after PPII rehabilitation. Image by Brown and Caldwell

Additional Resources

“Sanitary Sewers,” a 2011 fact sheet developed by the WEF Collection Systems Committee

The Private Property Virtual Library, an online database by the WEF Collection Systems Committee

Existing Sewer Evaluation and Rehabilitation, MOP FD-6 (3rd Edition), a 2009 manual by WEF and the American Society of Civil Engineers

“Private Sewer Laterals,” a 2014 resource by the U.S. Environmental Protection Agency (EPA)

State of Technology for Rehabilitation of Wastewater Collection Systems, a 2010 EPA publication. Reference chapter 5 “Sewer Lateral Renewal Technologies.”

Report on Condition Assessment of Wastewater Collection Systems, a 2010 EPA publication

Sanitary Sewer Overflow Analysis and Planning (SSOAP) Toolbox, an online EPA resource

SSOAP Toolbox Enhancements and Case Study, a 2012 EPA publication

“Eliminating Private Sewer Lateral Inflow and Infiltration in Delaware County,” a video by the Delaware County Regional Water Quality Control Authority

Private Sewer Lateral Program, an online resource of the East Bay Municipal Utility District

Also check out the resources of Springfield, Missouri’s Clean Water Services’ Private Sewer Repair Program and the City of South San Francisco, California’s notice of sanitary sewer system service.