

Report

**Inflow and
Infiltration From
Private Property**

**Sanitation District
No. 1 of Northern,
Kentucky**

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Report for
**Sanitation District No. 1 of
Northern, Kentucky**

Inflow and Infiltration From Private Property

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SECTION 1
INTRODUCTION

1.01 BACKGROUND

Strand Associates, Inc. (Strand) was contracted by the Sanitation District No. 1 of Northern Kentucky (SD1) to gather and evaluate information about private source removal programs from around the country. Strand compiled and reviewed information from a variety of sources including:

- The Water Environment Federation (WEF) survey, a nationwide survey of municipalities and sewer districts regarding approaches to control inflow and infiltration from private sources.
- SD1 staff research.
- Conference proceedings.
- Community web sites.
- Discussions with municipal representatives.

In total, the information Strand reviewed reflects information from over 350 communities around the nation.

Inflow and Infiltration (I/I) is defined by the U.S. Environmental Protection Agency (EPA) as:

“Infiltration is the seepage of groundwater into the pipes or manholes through defects such as cracks, broken joints, etc. Inflow is the water which enters the sewer through direct connections such as roof leaders, from storm drains or yard, area, and foundation drains...”.

I/I originates from a variety of sources throughout the collection system, many of which are located on private property and not owned or maintained by the sewer agency. Although I/I includes such things as inflow of creeks and streams into the sewer system and infiltration of groundwater through damaged sewer mains, this report focuses on sources of I/I that exist on private property, but impact the public system.

During rainfall events, downspouts, area drains, and driveway drains connected to the sanitary sewer system (illegally) can direct large amounts of stormwater or “inflow” into the public sewer. Likewise, as rainfall percolates through the soil, or as groundwater tables rise as a result of rainfall, this water can enter a privately owned sanitary sewer lateral through cracked and damaged pipe sections. This is known as “infiltration”.

SECTION 2
SOURCES OF INFILTRATION AND INFLOW

2.01 PRIVATE PROPERTY SOURCES

There are many sources of I/I that can occur on private property such as downspouts, driveway drains, and damaged laterals. Figure 2.01-1 shows several examples of I/I that may exist on private property and illustrates how these sources are connected to the public sewer.

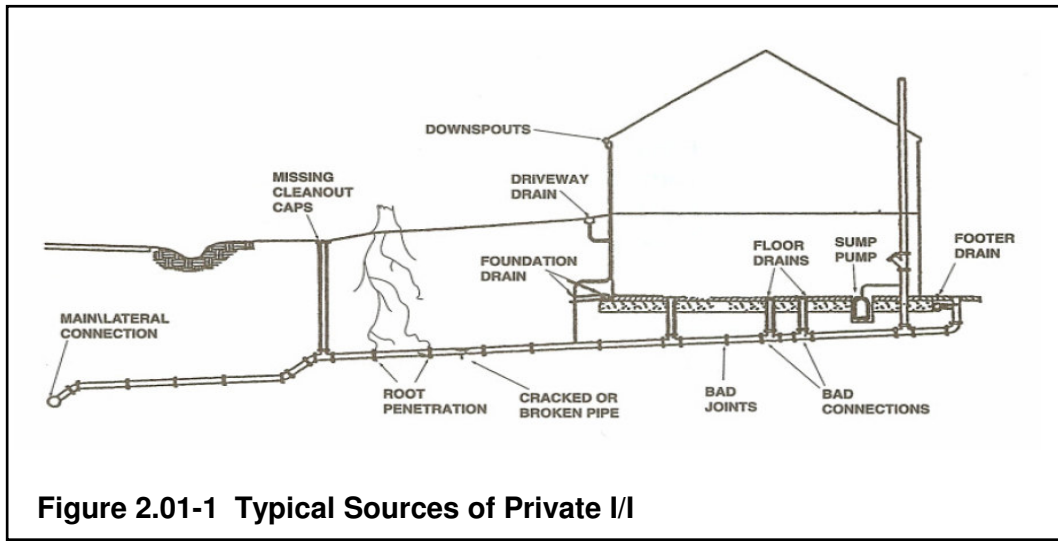


Figure 2.01-1 Typical Sources of Private I/I

Locating sources of inflow is a relatively straightforward process and the impact from these sources can be roughly quantified by measuring the contributing drainage area for each source. Identifying sources of infiltration, such as damaged laterals and estimating their impacts, is considerably more challenging. Variables such as groundwater elevation, antecedent dry period, magnitude and duration of rainfall, and local temperatures can affect infiltration rates and the ability to locate defects in a particular system.

In simple terms, a sanitary sewer system is a system of pipes, manholes, and pump stations designed to collect domestic, commercial, and industrial wastewater and convey this flow to a wastewater treatment plant. One critical, yet often ignored element of the system is the pipe that connects individual properties, known as the sewer lateral, to the sewer main. Although most sewer agencies have a fairly good understanding of the extent and condition of the public system, few agencies have actually located and measured the lateral lines connected to the sewer main. Therefore, most sewer agencies default to the accepted industry standard that the total linear footage of lateral lines connected to the public system is roughly equivalent to the total linear footage of sewer main.

SD1, which defines the public system as the sewer main and the connection tee, owns and operates approximately 1,700 miles of pipe. Based on the above discussed guideline, it can be assumed that there are approximately 1,700 miles (approximately 9 million linear feet) of privately owned laterals that receive virtually no maintenance or upkeep. From this perspective, it is clear that infiltration from private laterals has the potential to be a significant contributor of “clear” water flow to the sewer system.

Many communities around the country have implemented programs aimed at reducing I/I from private property. Strand’s review of the referenced data indicates that I/I from private property as a percentage of total I/I in sewer systems ranges from 20 percent to 80 percent. Table 2.01-1 shows estimated values from five communities.

Community	Percentage of I/I from Private Sources
Lower Paxton Township, PA	60%
Lynchburg, VA	20%
Houston, TX	80%
Columbus, OH	55%
Washington Suburban Sanitary Commission	43%

Table 2.01-1 Estimated I/I Associated with Private Sources

It is important to note that in the WEF survey regarding the percentage of I/I from private property, less than one-third (29 percent) of the respondents based their response on monitored data. However, despite limited monitoring data, the WEF report states that “the common conclusion is that I/I from private property is significant, and some utilities are finding it cost effective to correct the problem to avoid or minimize overflows and reduce capital and operating costs of their collection system”.

2.02 PUBLIC SOURCES

Unlike combined sewer systems, separate sanitary sewer systems were not designed to convey large amounts of stormwater and groundwater. Therefore, if a significant amount of stormwater and/or groundwater is allowed to enter the public system through I/I sources, the capacity of the system is quickly exceeded and often results in sanitary sewer overflows (SSOs) and basement backups. SSOs are prohibited by the Clean Water Act (CWA) and basement backups represent a potential public health threat and a public relations challenge for a sewer agency.

“EPA has successfully brought a number of CWA enforcement actions in recent years to address sanitary sewer overflows. These enforcement actions have eliminated millions of gallons of raw sewage discharges into the nation's waters”.

Additionally, systems impacted by I/I incur additional costs as “clear” water entering the system is ultimately conveyed to the treatment facility where energy and chemical costs are directly related to amount of flow reaching the plant.

Another factor to consider is that a damaged pipe that allows groundwater to enter the public system may also allow wastewater to exfiltrate out of the pipe and into the environment. In some cases, this exfiltrating flow enters the Municipal Separate Storm System (MS4), resulting in illicit discharges and violations of the National Pollutant Discharge Elimination System (NPDES) stormwater permit.

According to the USEPA, the objective of sewer rehabilitation is:

“(1) ensuring its structural integrity; (2) limiting the loss of conveyance and wastewater treatment capacity due to excessive I/I; and (3) limiting the potential for groundwater contamination by controlling exfiltration from the pipe network”.

Many sewer agencies, reluctant to take on the challenges associated with performing work on private property, have attempted to focus their I/I reduction activities on the public system only. Johnson County, Kansas stated that given the chance to start over, they would spend more time and effort focusing on private property; because this is where they saw the biggest results in the reduction of I/I. Rockford, Illinois determined that “Removal of identified public inflow sources would remove approximately 25 percent of total inflow. However, rehabilitation of public sources would achieve less than a 5-year level of protection”. Rockford noted that 75 percent of the inflow identified was from private sources and there was still a significant amount of inflow that was yet to be located and assumed this too will be on private property. Some communities have found that even after spending significant amounts of money improving the public system, I/I entering the public sanitary sewer system from private property remained unacceptably high.

A fairly common practice has been to utilize pipe and manhole lining technologies in an effort to make the publicly owned system as watertight as possible. Researches from the University of Houston indicate that:

“Tests have shown that infiltration from joints and cracks will enter in the annular space between the liner and the host pipe and migrate through this space until an opening is found for it to join the sewage flow. Such openings are regularly found in collection lines where holes are cut into the liner to permit reconnection of the house services to the mainline sewer... The greasy surface of the mainline makes it virtually impossible to obtain a tight, leak-proof seal at the lateral connection”.

Municipalities are aware of the impact that I/I flow is having on their system, but often times they are hard pressed to receive support from the community and local officials to address the growing problem. This is the case in New England, where the Interstate Water Pollution Control Commission (NEIWPCC) states:

“It is often difficult to convince local elected officials that the public health and environmental benefits of private inflow removal outweigh the potential local public outcry often associated with inspection/enforcement on private property”.

“There must be recognition that private inflow control is a complex issue and undertaking which requires a concerted and cooperative effort by a number of stakeholders, including homeowners, municipal officials and local agencies...” NEIWPCC

SECTION 3
PRIVATE SOURCE REMOVAL PROGRAMS

3.01 SEWER AGENCIES’ INVOLVEMENT

As mentioned in Section 1 of this report, sources of I/I from private property include:

- Downspouts.
- Driveway Drains.
- Area Drains.
- Private Laterals.
- Sump Pumps.
- Foundation Drains.

Hundreds of communities have developed and implemented a variety of programs aimed at reducing and/or eliminating sources of I/I from private property with varying degrees of success. Three critical questions that should be addressed in the development of a private source removal program include:

1. Which sources of I/I should be addressed?
2. Who pays for the work?
3. Who performs the work?

A. Which Sources Should Be Addressed?

As shown in Table 3.01-1, sewer agencies have employed a variety of approaches in defining the target sources of their programs. Lateral lines were the most common source of private property I/I addressed, followed by downspouts. See Appendix A for a more detailed description of individual programs.

B. Who Pays for the Work?

The policy regarding how a private source removal program will be funded is a very important decision that has financial, political, legal and public relations challenges. In simple terms, program funding can be characterized into one of four main categories:

1. Sewer agency pays 100 percent of costs.
2. Homeowner pays 100 percent of costs.
3. Homeowner and sewer agency share in costs.
4. Lateral insurance programs.

Source Addressed	Percentage of Communities
Private Laterals	62%
Downspouts	38%
Foundation Drains	34%
Sump Pumps	29%
Areas Drains	24%
Cleanouts	21%
<hr/>	
All Sources	9%
Two or More Sources	42%
Four or More Sources	21%

Table 3.01-1 Sources of Addressed I/I

A review of the referenced studies does not clearly indicate a right or wrong approach. It appears that the success of a particular funding methodology is highly site specific. Johnson County, Kansas, which reimbursed homeowners for 100 percent of the removal costs for all identified sources of I/I, has received significant national attention as a very successful private source removal program. On the other hand, communities such as Miami Dade, Florida, Lansing, Michigan, and Winchester, Kentucky require homeowners to assume all costs associated with rehabilitation/removal of I/I sources and claim successful programs (high participation rates). Other communities such as Lower Paxton Township, Pennsylvania, Normal, Illinois, and Washington County, Oregon met with limited success until they removed all financial responsibility from the homeowner and used public dollars to pay for the rehabilitation. Once the public agency assumed 100 percent of the costs, the program participation rates in these three communities increased dramatically. Cost share programs have proven successful in a number of communities including Florence, Kentucky, which pays the first \$1,000 for removal of I/I sources, excluding laterals and foundation drains, and assumes 50 percent of additional costs up to \$2,000 (i.e. City’s contribution is capped at \$2,000). Pittsburgh, Kansas also has implemented a cost share program that splits the rehabilitation costs with the homeowner up to \$3,000 (i.e. the City’s contribution is capped at \$1,500). The program addresses all sources, but the City focuses on sump pumps and downspouts.

“With regard to public perception issues, spending public money on improvements to private property has the potential to generate a problem if a disgruntled ratepayer were sufficiently motivated to challenge the fairness of the utility’s rate structure. The argument could be made that a rate structure that generates enough money to allow the utility to fund improvements on private property must be over recovering from its customers”.

WEF

See Section 4-Case Studies for more detailed information.

Table 3.01-2 is a summary of the types of funding employed by the 68 programs reviewed by Strand. Only 59 of these communities provided information on program funding. See Appendix A for a more detailed description of individual programs. Two-thirds of the communities with insurance programs are from St. Louis County, Missouri.

Type of Funding	Percentage of Communities
Sewer District Pays (100%)	41%
Homeowner Pays (100%)	27%
Insurance Program	15%
Cost Share Program	17%

Table 3.01-2 Funding For Private Source

A number of communities have developed lateral insurance programs to help fund the challenging issue of defective private laterals. Defective laterals typically come to the attention of a customer in the form of a basement backup. This usually results in a call to the local sewer agency requesting assistance in resolving the problem. Agency staff is then faced with the unenviable task of trying to explain to the irate homeowner, who has sewage in their basement, that the lateral line is not part of the public system and, therefore, the homeowner’s responsibility. This situation becomes even more challenging when the lateral line is under a public street or when it is difficult to pinpoint the exact location of the problem.

To address this complex issue, some sewer agencies have developed lateral insurance programs. A number of communities, particularly in the St. Louis, Missouri area have utilized this mechanism for generating funds to support the repair/replacement of homeowner laterals. In the St. Louis Metropolitan area, 70 of 92 communities have Lateral Insurance Programs. Of these 70 programs, 37 assume 100 percent of the repair cost, while 33 employ a cost share approach. Mishawaka, Indiana added a \$0.50 fee to the sewer utility bill to fund 100 percent of the repair costs over \$250 for all users. Riverton, Wyoming added a \$2.95 fee per month to the sanitary sewer bill to help fund a Sewer Lateral Protection Plan. This lateral program is a voluntary program for all users of the wastewater utility. Please see Appendix B for more detailed information on the lateral insurance programs in St. Louis County.

“...private sewer laterals are viewed by the public and most elected officials as outstandingly trivial and not a public responsibility”.

WEF

C. Who Performs the Work?

There are several different approaches to managing the actual repair/rehabilitation associated with I/I removal programs. Of the 67 programs reviewed by Strand, only 25 provided information relating to the specific methodology for contracting the work. Table 3.01-3 summarizes these findings.

Responsible For Hiring Contractor	Percentage of Communities Who Specified
Homeowner finds their own contractor.	20%
Sewer Agency does work or hires own contractor.	32%
Homeowner solicits bids from private contractor and submits to agency for approval (for programs with reimbursement or insurance programs).	44%
Homeowner is given a list of approved contractors (13% require bids be solicited to specified number of contractors).	8%

Table 3.01-3 Entity that Performs Work

3.02 BENEFITS ACHIEVED FROM PRIVATE SOURCE REMOVAL PROGRAMS

Some of the inherent challenges associated with private source removal programs include:

- Identifying specific sources.
- Managing/performing the repair work.

- Generating and/or collecting funds.
- Enforcing the program.
- Maintaining good customer relations.

Although these challenges should not be underestimated, they must be considered in the context of available alternatives. In reality, if the I/I is not removed, then the only option for a sewer agency is to convey and treat this water. This would require the construction of larger lines and/or storage facilities.

The “right” approach is ultimately system specific and is influenced by such factors as:

- The extent of the I/I problem.
- The types of sources.
- The capacity of the public system.
- The capacity of the treatment plant.
- Regulatory issues.
- Public expectations.

“For example, in 1993, Johnson County received approximately 200 complaints of sewer problems during a storm with a 100-year return period - more than 7 inches of rain in 24 hours. By contrast, in the early 1980s, JCW would have received an equal number of complaints during the 2-year storm (approximately 3.5 inches of rain in 24 hours)”.

Johnson County Web Site

However, when determining which approach is best for a community, it is important to consider the potential benefits associated with repairing private source defects, which include:

- Reduction in the cost of transporting and treating “clear” water.
- Reduction in the number of SSOs.
- Reduction and/or elimination of certain sewer system capacity improvements.

The research performed by Strand indicates that despite the significant amount of time and money spent on implementing private source removal programs, there is limited monitored data available regarding benefits achieved. Table 3.02-1 is a summary of measured I/I reductions achieved by five different municipalities with private source removal programs.

Community	Percentage of I/I Reduction
Prichard, Alabama	33%
Johnson County, Kansas	41.7% - 71.1%
Oak Creek, Wisconsin–5-year Rainfall Dependent I/I	48%
Duluth, Minnesota– 5-year Rainfall Dependent I/I	49%
Salem, Oregon– 5-year Rainfall Dependent I/I	57%
East Bay, California	86%

Table 3.02-1 Measured I/I Reduction

“A study for the EPA, in 1981, noted that many sewer rehabilitation programs eliminated approximately 0 to 30 percent of I/I, despite engineer predictions of 60 to 90 percent I/I removal”. As mentioned above, most cities do not have actual monitored data that shows the reduction in I/I after rehabilitation of the system. The following examples show the type of data collected or situations observed by several communities around the nation. For example, Lexington, Kentucky, has not conducted any flow monitoring; unfortunately, they also do not notice a significant difference in the amount of I/I removed.

In addition, Miami Dade, Florida replaced 3,000 cleanout caps and repaired 1,850 defective risers and 276 laterals. However, there is no data on the effectiveness of their work.

Other communities have seen a positive change in their system due to I/I removal programs. As of December 1996, with part of the private program complete, four subbasins in Lower Paxton, Pennsylvania showed significant flow reductions; 1996 had the most recorded rainfall for Pennsylvania in ten years. Lynchburg, Virginia found that eliminating 75 percent of roof leaders can eliminate 20 percent of the overflow. As of July 2002, 725 homeowners in Duluth, Minnesota participated in the voluntary disconnection/redirection of foundation drains reducing the number of SSOs at the pump station from an average of 7.4 to 1.2 per year, an 83 percent reduction. In Rockford, Illinois post rehabilitation flow monitoring was done in 2000. Analysis showed that the public/private sector program reduced wet weather inflow in excess of 65 percent (public inflow sources accounted for 25 percent of total system inflow).

SECTION 4
CASE STUDIES OF PRIVATE SOURCE REMOVAL PROGRAMS

This section of the report includes specific case studies of private source removal programs that demonstrate the variety of approaches communities have implemented.

4.01 LOWER PAXTON TOWNSHIP, PENNSYLVANIA

Since 1995, Lower Paxton Township had a very extensive I/I removal program that addressed all sources on private property. The Township initially designed a program that required a 50 percent cost share with the homeowners. However, this program met with limited success as only about 22 percent of affected property owners actually performed the required remedial work. The Township then revised the program with the Township assuming 100 percent of the costs of the rehabilitation. The program then achieved a 95 percent participation rate. After a cost benefit analysis, the Township has recently discontinued the I/I removal program and have opted to address I/I issues through wet weather treatment facilities and by replacing areas of clay pipe with PVC (both public and private). Table 4.01-1 summarizes the case study of Lower Paxton Township as well as the other municipalities discussed in this Section.

4.02 JOHNSON COUNTY, KANSAS

Since 1985, Johnson County, Kansas has disconnected 15,600 sources. Table 4.02-1 lists each source and number of disconnections. Of the 50,000 properties requested for inspection, only 15 owners refused access. Eleven of these property owners joined together and the case went to the Kansas Supreme Court; the county won. Due to the resolution, the responsibility of enforcement was transferred to the county code courts. Failure to comply results in an unclassified misdemeanor punishable by a fine not to exceed \$200 for each offense.

Source	Number of Disconnections
Foundation drains	9,204
Basement entry drains	2,808
Sump pumps	2,028
Downspouts	936
Outdoor drains	624

**Table 4.02-1 I/I Sources and Disconnections
 Johnson County, Kansas**

In Johnson County, specifications and set costs were established with local contractors for disconnections. Owners can call the district and request the work be assigned or can proceed with a two bid process of approved contractors.

Johnson County's "...I/I reduction program cost a total of \$60 million. Of that total, the private connection program was the least expensive component, at just under \$10.3 million. Another \$30 million went to collection system improvements, and the remaining \$19.7 million was used to cover program-specific engineering and administrative expenses".

TABLE 4.01-1 SUMMARY OF CASE STUDIES

Municipality	I/I Sources	Payee	Who Performs the Work?
Columbus, Ohio	Downspouts, foundation drains, sump pumps, and laterals.	City pays as part of this Pilot Study.	City is responsible.
Dallas, Texas	Laterals	Property owner.	Property owner responsible for hiring contractor.
Duluth, Minnesota	Foundation drains and sump pumps.	City	Property owner responsible for hiring contractor.
Florence, Kentucky	Cleanouts, area drains, sump pumps, and downspouts.	City pays the first \$1,000 and 50% of the remaining cost up to \$2,000.	Property owner responsible for hiring contractor.
Houston, Texas	N/A	N/A	N/A
Johnson County, Kansas	Foundation drains, basement drains, sump pumps, downspouts, outdoor drains	Homeowner provided maximum reimbursement based on source removed for structures erected before Jan. 1, 1986.	City is responsible.
Lexington, Kentucky	Laterals, area drains, sump pumps, and downspouts.	Cost share program.	City is responsible.
Lower Paxton Township, Pennsylvania	All sources.	Township pays 100% (50% cost share was ineffective).	Township is responsible.
Lynchburg, VA	Downspouts or rain leaders.	City reimburses property owner \$150 per downspout.	Property owner responsible for hiring contractor.
Miami Dade, Florida	Laterals and cleanouts.	Property owner.	Property owner responsible for hiring contractor.
Mobile, Alabama	Laterals	Property owner.	Property owner can use City contractor and will be eligible for a payment plan or owner can use their own plumber and have the work completed in 90 days (this program is not enforced).
Normal, Illinois	Laterals.	City.	Approved list of contractors.
Pittsburg, Kansas	All sources.	50% cost share capped at \$1,500.	Property owner responsible for hiring contractor.
Prichard, Alabama	Laterals	City.	City hires contractor to perform work.
Rockford, Illinois	Downspouts, foundation drains, and area drains.	Homeowner pays 100%.	Property owner is responsible for the work including a re-inspection by a licensed plumber.

4.03 HOUSTON, TEXAS

“Houston is in the process of completing a \$1.4 billion sanitary sewer wet weather overflow control program. Over \$300 million of this sum is targeted for the structural rehabilitation of sewers in public right of ways and easements”. Smoke testing showed a significant amount of the problems came from private laterals. The City made repairs to the laterals from the mainline to right-of-way. “Officially, installation and maintenance of the lateral/service line from the building drain to the main connection is the responsibility of the property owner. The city does not repair or clean the portion of the lateral on private property”. Houston spent most of their time and effort installing larger lines, a wet weather treatment facility and larger pump stations. Houston has no right to enforce any removal programs or spend money on private property.

4.04 FLORENCE, KENTUCKY

Florence has implemented a *Sump Pump Amnesty Program* as part of an I/I removal strategy. Unfortunately, Florence has no idea how many sump pumps exist in the community. During the first phase, 800 letters were sent to property owners. The City did not expect a huge return; 25 calls were received requesting an inspection. Florence is going through the city one sewershed at a time and is attempting to implement the sump pump program.

Florence conducts continuous televising inspections to update the city database. The City has conducted pre-flow monitoring and will conduct post-flow monitoring in the future. Florence conducts smoke and dye testing to find other illegal connections such as area drains and roof leaders. If an illegal connection is found, homeowners are given 60 days to respond with quotes from a licensed plumber. Homeowners are advised to receive two or three quotes for work. Private laterals or foundation drains are not addressed as part of this I/I removal program.

4.05 LEXINGTON, KENTUCKY

Lexington hopes to increase the amount of smoke testing to locate more problem connections. The City has a voluntary sump pump removal program; 748 sumps have been removed. Unfortunately, there is no concept of how many of the 81,000 homes still have connected sump pumps. Lexington is unable to guarantee the sources remain disconnected; sumps at the same location were removed more than once after new owners arrive. Lexington spends approximately \$300,000 per year on sump pump removal.

Source	City Pays
Structural Lateral Repair	\$1,000 max – City pays for sewer and plumbing inspection costs.
Area Drains	50% up to \$250.
Downspout	100% up to \$200.
Sump Pump	\$2,500 max.

**Table 4.05-1 I/I Source Removal Program
 Lexington, Kentucky**

No post rehabilitation flow monitoring was done. Lexington has spent approximately \$2 million per year for the past seven years, plus an additional \$23 million over the last five years on this rehabilitation program. Table 4.05-1 describes Lexington’s I/I removal program per source.

4.06 PITTSBURGH, KANSAS

“More than 700 sources of illegal connections on private property were targeted for action. Approximately 50 percent of the affected property owners elected to correct problems with no further intervention by the City. The other 50 percent pursued reimbursement by the City for the cost of disconnection. Fourteen owners were summoned to appear in municipal court...”

Pittsburgh focused mainly on sump pumps and downspouts. Approximately \$300 to \$400 was spent per home. Missing cleanout caps were a big problem. Completed work has shown a 56 percent reduction in I/I system wide.

4.07 DULUTH, MINNESOTA

In 2002, Duluth began a voluntary foundation drain disconnection/redirection program. Of the 1,141 homes inspected, 761 were found as candidates for disconnection. The disconnection/redirections required installing sump pumps or using gravity discharge; 95 percent (725/761) of the homes participated. In addition, 100 percent of all roof drains were inspected and 95 percent were removed. Combined the work reduced the number of SSOs at the pump station from an average of 7.4 to 1.2 per year, an 83 percent reduction. The program reduced the 5-year peak hour rain dependent I/I (RDII) from 15,400 to 7,800 gallons per day (gpd), a 49 percent reduction. The City’s long-term plan calls for 500 disconnections each year. Based on the results of the Duluth program, the State Legislature adopted legislation that will allow any municipality in the state to use public funds for private I/I. See attached copy of the legislation in Appendix C.

City residents were required to receive three quotes for work from private contractors; the City then reimbursed the homeowner the cost. The average cost of work was \$2,500 per home. Recently, the City began taking bids for the work and the average cost per home dropped to \$1,750.

4.08 MOBILE, ALABAMA

In Mobile, Alabama, approximately 65 percent of the collection system contains old and damaged sewer laterals, accounting for nearly 70 percent of the I/I measured in the area. The lateral is considered private property from the house to the property line. There are no basements in Mobile, therefore the laterals, on average, are four feet deep.

As of May 2001, more than 20,500 linear feet of private laterals were replaced and 10,000 linear feet were identified for replacement. Eighty percent of laterals failed air testing and internal videos. The entire length of the private lateral is replaced; “point repairs are not allowed, because existing defects are precursors to future defects”.

Mobile implemented this program through separately bid contracts that required the homeowner to pay the full cost of the repair. Due to the lack of cooperation by homeowners and the administration costs of the project exceeding the costs of the contractors, Mobile no longer enforces this program. Currently, Mobile is conducting major mainline repair and installing cleanouts at the property line. In addition,

negotiations have allowed Mobile to set aside Supplemental Environmental Project money, from the consent decree, to repair private laterals in low income areas on a priority basis.

4.09 NORMAL, ILLINOIS

“The town of Normal, Illinois found it impractical to hold homeowners responsible for rehabilitating service connections to fix any I/I problem that had no direct negative effect on the homeowner. The town eventually assumed full responsibility for replacing service connections (except for landscape development), with homeowners choosing contractors from a list developed by the Town” (WEF).

4.10 MIAMI DADE, FLORIDA

Miami Dade, Florida uses smoke testing to locate illegal connections; the Agency does not enter the house. Here, 90 percent of the problem is cleanout risers. On average, a defective cleanout riser costs \$150 to \$200 per home; laterals are more expensive. After the agency finds a positive source, the homeowner is issued a *Warning Notice*. The property owner then has 60 days to submit a plan of action for the disconnection. This includes a comprehensive engineering design showing how stormwater will be channeled. A construction schedule is also required. The plans and schedule must be reviewed by the agency before work can begin. If the initial warning is ignored, a *Notice of Violation* is issued, including a \$200 fine, and the owner has an additional thirty days to comply. The Agency can pursue court actions after issuing the *Notice of Violation*. To date, no court actions have been necessary. No data exists on the effectiveness of this program.

Miami Dade has a five-phase action plan to help its municipalities eliminate I/I issues:

1. Evaluation and Minor Repairs
 - a. Measure sanitary sewer system.
 - b. Flow measurement and smoke testing.
 - c. Computation of allowed I/I rate (5,000 gpd per inch per mile of pipe).
 - d. Manhole inspection.
2. Investigation of Point Source Repairs
 - a. If measured rate is greater than allowable rate, locate all point sources of I/I.
 - b. Investigation may include: CCTV, smoke testing, dye testing, and surface investigation.
3. Repairs
 - a. Corrective actions that include: repairing damaged pipes, fixing improper connections, replacing cleanout caps, repairing manholes, etc.
4. Remeasure Flow After Repairs
5. Additional Repairs or Cost Analysis (if necessary)

- a. If remeasured flow is still larger than the allowable rate, additional action shall be taken.
- b. A cost benefit analysis shall be submitted for review.

4.11 LYNCHBURG, VIRGINIA

Lynchburg developed a three-phase program to help eliminate combined sewer overflows (CSOs). The City is working to separate the combined system, to replace the large interceptor pipes, and is working with homeowners to disconnect downspouts. Initially, this is a voluntary program; the homeowners are given instructions on how to properly disconnect the downspout. On average, the City reimburses about \$864 per home. The City is currently seeing 58 percent removal efficiency. Lynchburg plans to begin implementing a treatment charge for those owners who refuse to disconnect.

4.12 ROCKFORD, ILLINOIS

The District focused on three basins that were experiencing frequent basement back-ups during heavy rain. Physical manhole inspections, smoke testing, dye testing, and voluntary building inspections were performed by Rockford. Sources of inflow on private property were due to illegal connections of foundation drains, downspouts, leaking manholes, and sump pumps. These sources accounted for approximately 50 percent of the inflow.

During building inspections "...11 percent (138 buildings), or one of every six residents contacted, refused entry or inspection of the premises. Also, 33 percent of the buildings were not inspected because residents were not home at the time of the initial survey and could not be successfully contacted during subsequent visits, by mail, or by phone" (WEF).

Based on the information presented from the field report the "...District was recommended to rehabilitate any structural defects in the sewer lines regardless of whether they are found to be cost effective, to maintain the hydraulic capacity and integrity of the sewer system", and remove cost effective I/I sources (WEF).

4.13 COLUMBUS, OHIO

The City of Columbus conducted a pilot study of 216 properties and approximately 8,200 feet of public sewer. Columbus used these properties, mostly residential, to assess private source I/I. Columbus plans to use this project to provide a foundation and procedure for repeating similar work across the city.

The city was hoping to televise and clean all of the laterals in order to find improper connections or damaged pipe. There was a 75 percent (162/216) participation rate by the community for this voluntary pilot study. Of the remaining 25 percent, sixteen owners chose not to participate and 38 did not respond to the invitation. Eighty-two of the participating owners complained about the sanitary sewer back-ups in their basements. Root intrusion, offset joints, open joints, deposits, cracks, and sags were found in 90 percent of the televised private laterals.

During water testing, water was poured through area drains and downspouts to imitate heavy rainfall. If water enters the lateral, a positive source of I/I was identified. Testing found that 45 percent of the properties have one or more positive sources of I/I. Foundation drains were the most common improper connection. Private source I/I was found to account for roughly 55 percent of the total I/I. Downspout and sump pump repairs were found to be the most cost effective. The second phase of this pilot study, scheduled for 2006, will be used to remove and rehabilitate the positive sources of I/I from private laterals.

Based on the 75% participation rate in this pilot study, even when Columbus was paying for the inspections and repairs, the City realizes that work in other areas may face more resistance, especially if the property owner is expected to pay.

4.14 PRICHARD, ALABAMA

In 2004, Prichard began smoke testing and televising sewer lines to locate sources of I/I. The City had not done sewer maintenance in almost 20 years. Starting with the easy fixes first, the City replaced a large number of cleanout caps. Fortunately, downspouts and area drains were not found to be an issue in this area.

Prichard has recently replaced/repared over 1,000 laterals, at an average cost of \$600 per lateral. The fact that the properties do not have basements helps with the low cost. Prichard also hires contractors to perform work on multiple properties, in the same area, at the same time, to help control costs. In order to save time and money water meter readers received permission from the homeowners to perform work on private property.

Since 2004, Prichard has spent approximately \$600,000, eliminated five of eight SSOs, and have seen a 33 percent reduction in I/I, based on monitoring. Having only completed half of the work, Prichard hopes to see an increase in the amount of total I/I reduction.

4.15 DALLAS, TEXAS

Dallas uses smoke testing pictures to show homeowners the defects on their property. The City attempted to implement a program requiring the homeowner to bare the full cost of the repairs. The City would then visit the property, up to three times, to make sure the defect was fixed. The City cannot force the homeowner to comply with the repair request.

Dallas has had limited success with this program. Homeowners are made aware of the defect and continuously ignore the City's request to make the repairs. The defects or improper connections are a violation of the plumbing code. Unfortunately this code is not enforced and there are no ultimatums. Dallas only performs about five replacements annually.

SECTION 5
DELINEATION OF THE PUBLIC SYSTEM

5.01 LATERAL OWNERSHIP

Every sewer district faces the challenge of segregating the public system from the private system. This distinction carries significant financial implications. A public agency that assumes responsibility for the entire lateral line is in essence doubling the size of their system.

Currently, SD1 defines the public system as the sewer main and the connection tee.

SD1’s current policy for failed laterals states that the homeowner is responsible for 100 percent of the costs associated with locating the private sewer lateral problem. If it is determined that the defect is located within a public right-of-way and underneath the pavement, after review and approval of a request from the homeowner, the District will reimburse the homeowner for 50 percent of the actual costs associated with the repair up to \$1,500.

“Any persons owning or occupying a tract or parcel of land upon which sanitary sewer service lines are located which flow into public lines in city streets, alleys and easements (including, but not limited to, single-family or duplex residences, mobile homes and/or trailer parks, apartments, places of business, schools, hospitals, churches, structures of any kind, vacant buildings, or vacant land) shall be responsible for the inspection, maintenance, repair and operational integrity of such private sanitary sewer service line” (Friendswood, Tex., Code of Ordinances pt. II, ch. 78, art. III, div, subdiv. II, § 78-147.(a) (1992).

Recently, SD1 staff distributed a questionnaire to a number of local sewer agencies regarding ownership and repair policies for lateral lines. A copy of the questionnaire is included in Appendix D.

A table summarizing the information from the returned questionnaires is included in Appendix E.

In a national survey conducted by WEF, it was determined that 45 percent of responding sewer agencies defined the private system as the section of pipe from the tee to the building, 42 percent defined the private lateral as the section of pipe from the right-of-way (or easement) to the building, and three percent of responding sewer agencies were responsible for maintaining private laterals. Table 5.01-1 provides a summary of this information.

TABLE 5.01-1

PUBLIC VS. PRIVATE SYSTEMS

Sewer Agency	Delineation Between Private and Public System
Lexington, KY	Public ownership from the mainline to the R.O.W. or the edge of the easement (6' off the centerline)
Lower Paxton Twp.	Private ownership from the mainline connection to the house
Johnson County, KS	Private ownership from the mainline connection to the building drain immediately outside the structure
Rockford, IL	Private ownership from the mainline connection to the house
Houston, TX	Private ownership from the building drain to the mainline connection
Columbus, OH	Private ownership from the mainline connection to the house
No. of Communities	St. Louis County, MO (60 of 92 Communities provided information)
53	Private ownership from the sewer to the foundation wall.
6	Private ownership from the main to 5' outside the foundation wall.
1	Private ownership from the ROW to the foundation wall.
Percentage	Summary from WEF Survey (90% of communities provided information)
45	Define private ownership from the tee to the building.
42	Define private ownership from the R.O.W. (easement) to the building.
3	Responsible for maintaining private service laterals.

**SECTION 6
RECOMMENDATIONS**

The WEF survey found that having homeowners participate in voluntary, or even enforced, I/I source removal programs has proven to be somewhat difficult. Municipalities are recommended to use non-confrontational sources, whether through testing results, pictures, or brochures, to inform the homeowners of the negative results of private I/I. All municipalities are encouraged to consult an attorney in the writing of any ordinances “to ensure due process...to protect individual rights and liberties”. Sewer agencies should strive to implement a program that is both fair and flexible to help ensure owner compliance and avoid spending time and money in court or assessing fees.

6.01 RECOMMENDED POLICY

A. What I/I Sources Will the SD1 Private Source Removal Program (PSRP) Address?

Smoke and dye testing conducted by SD1 in the past has indicated a variety of I/I sources from private property impact the public sanitary sewer system. Testing in communities such as Erlanger, Elsmere, Lakeside Park, and Fort Mitchell have indicated that improperly connected downspouts, area drains, driveway drains, stairwell drains, as well as damaged lateral lines, are all significant contributors of I/I. Based on this information, in order for SD1 to effectively address I/I from private property, the policy should address all identified sources. However, as seen in past pilot projects, sometimes removal of a particular source is determined to be cost prohibitive. An example would be a stairwell drain that although improperly connected, may not represent a significant source of inflow. This policy should allow SD1 staff the flexibility to determine the best solution for a particular source, including leaving an improper connection in place.

Proposed Policy:

SD1 PSRP will address all residential sources that SD1 determines to be cost effective to remove/repair including private laterals.

B. Who Will Pay for the Cost of Removal/Rehabilitation of I/I Sources on Private Property?

This seems to be the most controversial and challenging issue associated with private source removal programs. It is important to understand the sentiment of the local customer base as it relates to public agencies requiring work to be done on private property and, furthermore, requiring the homeowner to absorb the costs of this work. This issue represents an obvious public relations challenge.

Based on the information reviewed for this report, it appears that the highest probability for success lies with a program that fully funds the remedial activities and requires no financial commitment from the homeowner. SD1 has implemented a number of programs targeting the removal of private sources of I/I. In 2000, a downspout disconnection program was conducted in Lakeside Park. Under the terms of this program, SD1 assumed all costs for testing and removal of improperly connected downspouts. Although participation rates were very high, 91 percent (53 of 58) of eligible properties, considerable interaction with the public was required. Additionally, some complaints were received after the remedial work regarding wet areas on lawns resulting from roof drains being directed to the surface of the property. Another pilot project that included private source removal was the Fort Wright Illicit Discharge Removal Pilot Project initiated in 2002. This program required that homeowners pay 50 percent of the

cost to repair/replace lateral lines and other improper connections. This effort involved significant public education and meetings with individual homeowners. However, a number of homeowners initially refused entry onto their property for testing. Considerable effort by both the City of Fort Wright and SD1 staff was required and legal action threatened to ultimately obtain access to these properties. In the end, all but one property owner allowed access to their property for testing resulting in a 99 percent (102 of 103) participation rate.

Collecting the homeowner's share of project costs under the District's lateral repair policy as well as the Fort Wright program has proved challenging and has resulted in a considerable administrative burden to the SD1 staff in terms of notifications and other collection-based activities.

In the upcoming years, removal of excess storm water from the sanitary sewer system will be a critical element of SD1's efforts to comply with the requirements of their Consent Decree. It is anticipated that as SD1 attempts to eliminate SSOs and reduce CSOs, drainage basins with high levels of I/I will be identified for remedial activities. SD1 will establish a prioritized listing of "I/I Project Areas" that includes testing, alternatives evaluation, and project implementation.

Existing Policy:

The SD1 Regulations prohibit improper connections of storm water to the sanitary sewer system and provide the authority for SD1 to require the homeowner to remove improper connections at the homeowner's expense.

"No person or public corporation shall make direct connection of roof downspouts, exterior or interior foundation drains, area drains or other sources of surface runoff or groundwater directly to a public sanitary sewer.

Upon discovery of such improper sources, the District may notify the property owner to remove any improper connections within 30 days of notification and return the public sewer and associated appurtenances to a satisfactory condition. Upon completion of the disconnection, the property owner shall notify the District to conduct an inspection of the rehabilitation work." (*Sanitary Rules and Regulations, Article 7, 10/2005*)

Proposed Policy:

It is imperative that the I/I removal program provide the SD1 staff maximum flexibility to implement the most cost effective solution for a particular problem area. Solutions may include:

- Removal of all I/I sources.
- Removal of some I/I sources.
- Remote wet weather storage facilities.
- Convey and treat.
- A combination of the above.

Based on the experiences of SD1, other communities, and the fact that SD1 will soon be subject to requirements of a Consent Decree that has specific performance milestones and schedules that must

be met to avoid stipulated penalties, it is recommended that SD1 fully fund the removal of I/I sources on residential private property in I/I Project Areas. SD1 will reserve the right to leave certain I/I sources connected to the sanitary sewer system, if it is determined that it is not cost effective to remove the source.

C. What is the Definition of a Private Lateral?

Existing Policy:

Currently SD1 defines the private lateral as the segment of the sewer that connects the building to the main line sewer. SD1 is responsible for the connection tee of the two pipes.

Proposed Policy:

No change.

D. Who is Responsible for Maintenance of Private Laterals?

Existing Policy:

Under the current policy, maintenance of the private lateral is the homeowner's responsibility.

Proposed Policy:

No change.

E. Who is Responsible for the Cost of Repairing a Collapsed Lateral?

Existing Policy (7/29/04): (See Appendix F for entire policy.)

The owner of the premises, served by a sewer shall be responsible for all maintenance, operation, cleaning, repair and reconstruction of the building sewer from the building to the point of connection with the public sewer. However, if a property owner conclusively demonstrates, in accordance with the guidelines set out in the Sewer Lateral Repair Policy, that the private sewer lateral is not functioning as a result of a structural problem occurring at a section of the lateral located beneath the public roadway, the Sanitation District will reimburse the property owner the lesser of 50% of the costs associated with this work or \$1,500.

NOTE: The cost sharing aspects of this Policy will only apply to structural problems occurring in the section of the private lateral located beneath the "public roadway." For the purposes of this policy, the "public roadway" is defined as the public road from edge of pavement to edge of pavement, including the street curb, if present, and excluding segments of driveways within the right-of-way.

Ownership and maintenance responsibilities shall remain with the individual property owner from the building to the public sewer, including the length of sewer lateral beneath the public roadway.

Proposed Policy:

If a property owner conclusively demonstrates, in accordance with the guidelines set out in the Sewer Lateral Repair Policy, that the private sewer lateral is not functioning as a result of a structural problem occurring at a section of the lateral located beneath the public roadway, SD1 will be responsible for the costs associated with the structural repair of the lateral from the mainline to the edge of pavement. Edge of pavement will be defined as the back edge of the sidewalk. If no sidewalk is present, the edge of pavement will be the back of the curb or outside edge of the roadway. See Appendix G for examples of ownership delineation.

For a residential property not located within a defined I/I Project Area, SD1 will reimburse the homeowner the lesser of fifty (50) percent of the repair costs or \$1,500 for structural repairs to the segment of the lateral beyond the edge of pavement as defined above.

It should be noted that SD1 will pay all of the costs to perform structural repairs to laterals within a defined I/I Project Area in accordance with paragraph B above.

For a residential property not located within a defined I/I Project Area, where the private sewer lateral is not functioning as a result of a structural problem occurring at a section of the lateral located beneath the public roadway and the defect extends beyond the edge of pavement onto private property, those costs for the repair outside the public roadway will be prorated and reimbursement by the District will be made in accordance with the paragraphs above.

Additionally, SD1 should develop a reimbursement/loan policy that provides relief for low and/or fixed income customers who can demonstrate that paying their portion of the lateral repair costs represents a significant financial hardship.

F. Who Will Perform the Work?

I/I Project Areas

For I/I Project Areas, SD1 staff will manage the projects and utilize a combination of in-house staff and outside contactors to complete the necessary work.

In an effort to minimize issues associated with restoration activities, SD1 or its contractor, will restore a disturbed area to an acceptable standard and upon receipt of a signed waiver from the homeowner, will provide the homeowner with a check for one hundred dollars (\$100) to assume responsibility for watering and establishment of a suitable stand of grass.

Collapsed Laterals Outside a Project Area

For situations outside an I/I Project Area where a private lateral is in need of a structural repair, homeowners will solicit contractor bids. SD1 will provide homeowners with a list of “approved” contactors, but the homeowner is not limited to firms or individuals on this list. Allowing the homeowner the option to solicit independent cost estimates seems to provide a level of credibility to the program. In order to be eligible for reimbursement, SD1 will review and approve costs prior to the initiation of the repair work.

The cost for lateral repair and the quality of the work by specific contractors will be tracked by SD1 staff. SD1 will have the ability to remove a contractor from the approved list at any time based on deficient work product or excessive costs.

Past experience with these types of programs has indicated that if contractors are able to perform work on multiple properties versus individual properties, the associated costs tend to reflect the economies of scale. The development of an approved contractor list should help to control the quality of the work and the associated costs.

SUMMARY OF ADDRESSED I/I SOURCES

	Study Area	Source					Financial Responsibility	
		Foundation Drains	Cleanouts	Laterals	Area Drains	Sump Pumps		Downspouts
1	West Lafayette, IN	•						City / District Pays
4	Fort Worth, TX		•	•				
6	Lower Paxton Township, PA	•	•	•	•	•	•	
7	Johnson County, KS	•	•		•	•	•	
13	Springboro, OH					•	•	
14	Cincinnati, OH	•	•		•	•	•	
21	Normal, IL			•				
22	Washington County, OR							
23	Vallejo, CA			•				
27	East Bay, CA			•				
28	Louisville, KY					•	•	
33	North Olmstead, OH			•				
34	Montgomery, OH	•	•	•	•	•	•	
41	Columbus, OH	•	•	•	•	•	•	
42	Broward County, FL	•	•	•			•	
44	Olympia, WA			•				
45	Tacoma, WA	•				•	•	
46	Duluth, MN	•				•		
49	Beverly Hills, MI					•		
52	Lafayette, LA			•				
57	Detroit, MI						•	
58	Evanston, IL						•	
68	Prichard, AL		•	•				
2	Tulsa, OK			•				Homeowner Pays
3	Dallas, TX			•				
10	Fairfield, OH		•	•	•	•	•	
11	Winchester, KY	•	•	•	•	•	•	
12	Miami-Dade, FL		•	•				
17	Mobile, AL			•				
24	Bellaire, TX			•				
25	Alameda, CA	•		•	•		•	
26	Denver, CO	•			•	•	•	
29	Lansing, MI	•	•		•	•	•	
32	Tahoe City, CA			•				
35	Salem, OR	•		•			•	
37	Alameda, CA	•			•		•	
39	Rockford, IL	•			•		•	
43	Oak Creek, WI	•						
51	West Vancouver			•				
59	Toledo, OH				•		•	

SUMMARY OF ADDRESSED I/I SOURCES

	Study Area	Source					Financial Responsibility	
		Foundation Drains	Cleanouts	Laterals	Area Drains	Sump Pumps		Downspouts
5	McMinnville, OR			•				Cost Share Program
8	Pittsburgh, KS	•	•	•	•	•	•	
9	Lynchburg, VA						•	
16	Lexington Fayette Urban			•				
18	Montgomery, AL			•				
19	Mequon, WI			•				
20	Florence, KY		•		•	•	•	
36	Carmel, IN					•	•	
50	San Luis Obispo, CA			•				
54	Ann Arbor, MI	•					•	
15	Clarkson Valley, MO			•				Insurance Program
60	St. Louis County, MO			•				
61	University City, MO			•				
62	St. Charles, MO			•				
63	Kirkwood, MO			•				
64	Black Jack, MO			•				
65	Mishawaka, IN			•				
66	South Bend, IN			•				
67	Riverton, WY			•				
30	Port Huron, MI	•	•	•	•	•	•	Not Specified
31	Houston, TX							
38	Beverly Mills, MI					•		
40	Nashville, TN			•				
47	Kent Basin King County, WA			•				
48	Skyway WSD			•				
53	Auburn Hills, MI	•						
55	Dearborn Heights, MI	•						
56	Canton Township, MI					•		

SUMMARY OF FINANCIAL RESPONSIBILITY

	Study Area	Financial Responsibility					Explanation
		City/District	Homeowner	Cost Share	Reimbursement	Insurance Program	
1	West Lafayette, IN				•		*100% reimbursement if the homeowner completed the disconnection during the year their home was located in the priority phase, otherwise owner pays * Cost = \$6000 - \$7000 /footer drain
2	Tulsa, OK		•				* Homeowner pays 100% of the cost; are trying to establish a "loan" program
3	Dallas, TX		•				*Cannont enforce owner to fix
4	Fort Worth, TX	•					* Hired public contractors to do the work
5	McMinnville, OR				•		* \$50/month penalty for defects that go uncorrected, potential reimbursement for 10% of pipe repair up to \$250
6	Lower Paxton Township, PA	•					*Initially a 50% reimbursement for repairs to the property owner was est., however, due to non-responsive property owners and plumbers the Township Authority created the current program which has a contractor directly employed by the county and the full cost of the repairs are borne by the authority * Program cost modifications increased participation from 22% - 95%
7	Johnson County, KS				•		* Provided maximum reimbursement based on source removed for structures erected before Jan. 1, 1986 * JCW received almost \$12 million in grant funds and \$18 million in low-interest loans; private l/l expenditures were not grant or loan eligible and were paid with general obligation bonds
8	Pittsburgh, KS			•			* 50% cost share up to \$1500 (even if there is multiple sources)
9	Lynchburg, VA				•		* City offers \$150/ roof leader disconnected; program averages \$864/home
10	Fairfield, OH		•				* If major problem in lateral, they will demand homeowner to fix
11	Winchester, KY		•				
12	Miami-Dade, FL		•				
13	Springboro, OH	•					*City pays maximum of \$2500/property - performed work on 12 properties
14	Cincinnati, OH	•					*Up to a \$3000 maximum
15	Clarkson Valley, MO					•	* Coverage is limited up to \$5000 (homeowner pays \$28 insurance fee)
16	Lexington Fayette Urban County, KY			•			* Up to \$1000 for structural repair per customer; City pays for sewer and plumbing inspection costs (approx. \$450) - using sewer user fee revenue * Property owner pays a 100% of the cost for non-structural maintenance * LFUCG pays 50% up to \$250 to disconnect illegal area drains * LFUCG pay 1005 up to \$200 to disconnect illegal roof drain * Property owner bears 100% of land restoration costs * LFUCG pays up to \$2500 for sump pump removal from system
17	Mobile, AL		•				* Homeowner pays full cost - uses City's contractor and eligible for City finance of 15% down, 10% APR for 5 years

SUMMARY OF FINANCIAL RESPONSIBILITY

	Study Area	Financial Responsibility					Explanation
		City/District	Homeowner	Cost Share	Reimbursement	Insurance Program	
							* Homeowner pays full cost - uses their own plumber and has the work complete in 90 days *This program is not enforced anymore - homeowner is still responsible if they want their lateral repaired
18	Montgomery, AL			•			*Customer capped at \$1200; City pays the rest * 4 year finance plan available
19	Mequon, WI			•			* Lateral repair is covered up to \$1000 * Additional costs including landscaping is charged to the owner
20	Florence, KY			•			* 50% cost share between the City and property owner; costs greater than \$2000 assumed by property owner * Reimbursement received after verifying disconnection has been made
21	Normal, IL	•					
22	Washington County, OR	•					95% participation rate after changed the cost sharing responsibility from 50% to 100%
23	Vallejo, CA	•					* Certification and rehabilitation costs are funded from user fees; \$0.6 to \$1.0 million expended annually until 2008 * All future lateral work is responsibility of owner
24	Bellaire, TX		•				* 20% down payment, 5 years to repay principal and interest at ≤ 10% * Can place lien on property
25	Alameda, CA		•				* Assess abatement cost to property owner; lien placed on property after 30 days if not paid in full; assessment may be paid in 5 annual payments
26	Denver, CO		•				* Lien will be placed on property of uncooperative owner; assess property owner and collect principle and interest in monthly sewer bill
27	East Bay, CA Stege Sanitary District	•					* Required homeowners to spend a total of \$400,000 on repair for private service * District cost savings for capital projects was then "shared with PSRP participants * Where the cost savings to the District through rehabilitation would offset the costs of lateral rehabilitation, the District would pay the lateral rehabilitation costs; cost effectiveness of rehabilitation was measured by the difference in cost between "no-rehab" alternative and "rehab" alternative the difference between the alternatives represented savings * Surface repair and landscape restoration to be made at owner's expense
28	Louisville, KY	•					* MSD will pay for backflow preventers if home inspection is granted
29	Lansing, MI		•				* Owner pays 100% of cost
30	Port Huron, MI						To date no sources have been removed
31	Houston, TX						City built storage facility instead of removing I/I
32	Tahoe City, CA		•				* District has the right to take corrective action and charge the property owner
33	North Olmstead, OH	•					* Lateral and mainline rehab cost City \$15 M
34	Montgomery, OH	•					* City pays first \$3000 of disconnection cost

SUMMARY OF FINANCIAL RESPONSIBILITY

Study Area	Financial Responsibility					Explanation
	City/District	Homeowner	Cost Share	Reimbursement	Insurance Program	
35 Salem, OR		•				
36 Carmel, IN				•		* City reimburses at following rates: sump - \$100; downspout - \$25 * Maximum credit/house = \$200
37 Alameda, CA		•				* Homeowner may reimburse City over 5 years * City can put lien on house if not reimbursed
38 Beverly Hills, MI						
39 Rockford, IL		•				* Homeowner responsible for 100% of the cost including the re-inspection of a licensed plumber after disconnection
40 Nashville, TN						
41 Columbus, OH Clintonville Pilot Study	•					* Columbus will pay for the repairs as part of a larger cost-effectiveness study
42 Broward County, FL	•					
43 Oak Creek, WI 51 Acre Pilot Study		•				* Average cost incurred by homeowner is approx. \$300
44 Olympia, WA	•					
45 Tacoma, WA	•					* Approx. \$1025 per home for cleaning and CIP relining, cleanouts, and post-
46 Duluth, MN				•		City residents were required to receive 3 quotes for work from private contractors, the city would then reimburse the homeowner the cost. The average cost of work was \$2500, recently the city has begun taking bids for the work and the average cost per home dropped to \$1750
47 Kent Basin King County, WA	•					Total cost of construction \$ \$169,100 as of 2002
48 Skyway WSD	•					Total cost of construction \$1,251,000
49 Beverly Hills, MI	•					* Approx. \$1,270 per home for sump pump disconnection (1999)
50 San Luis Obispo, CA				•		* Reimburses homeowners 50% up to \$1000 for the cost of work after the job has been completed and inspected * Program is a first come first served basis; if the City runs out of funds reimbursement will begin after the next fiscal year * City only funds one repair per single family home for the life of the property
51 West Vancouver		•				
52 Lafayette, LA	•					* Cost of lateral rehabilitation is integrated part of total job cost * Approx. \$560/lateral
53 Auburn Hills, MI						
54 Ann Arbor, MI			•			* The basic cost to complete the foot drain disconnection, including private property, will be funded from the sewage collection system user fees - additional features or restorations beyond what is required for basic system operation will be at the owner's expense (approx. \$5000 - \$6000/home)
55 Dearborn Heights, MI						
56 Canton Township, MI						

SUMMARY OF FINANCIAL RESPONSIBILITY

	Study Area	Financial Responsibility					Explanation
		City/District	Homeowner	Cost Share	Reimbursement	Insurance Program	
57	Detroit, MI	•					* Residents provided rights of entry for contractors to enter the property and disconnect downspouts at no cost to them; approx. \$243 to \$278 per disconnected downspout
58	Evanston, IL	•					* The cost associated with the inlet control and overland flow portion of the work averaged out to be about \$2000 to \$3000 per acre
59	Toledo, OH		•				
60	St. Louis County, MO					•	* There is a specified maximum based on the specific cities within the county (some areas are subject to a deductible)
61	University City, MO					•	* The homeowner is responsible for coordinating all repairs and paying a \$300 deductible and a 10% co-payment of the total cost of the City approved repair * Homeowner must also pay a \$50 annual sewer lateral fee to participate
62	St. Charles, MO					•	* Homeowner is responsible for coordinating all repairs; the City will reimburse the owner 80% of the repair cost up to \$5000, less the cost of the camera inspection (approx. \$205) * Homeowner must also pay a \$28 annual sewer lateral fee to participate
63	Kirkwood, MO					•	* Homeowner pays \$400 deposit to cover the cabling and inspection costs * City pays the contractor for 60% of the work; the homeowner is responsible to the contractor for the remaining 40% * Property owner's pay an annual fee of \$28 on property tax bill
64	Black Jack, MO					•	* Property owner's pay an annual fee of \$28 on property tax bill * City pays 100% of the cost up to a maximum of \$2000
65	Mishawaka, IN					•	* Homeowner is responsible for paying a deductible of the first \$250 of the lateral sewer repair and is responsible for all routine cleaning costs
66	South Bend, IN					•	* The homeowner pays a \$500 deductible (\$100 down, remaining of next 12 months) the repair is completed by the private contractor and the repair and costs are monitored and paid by the administrator
67	Riverton, WY					•	*The homeowner will pay a \$2.95 fee per month; this fee may be adjusted annually by the City Council based on the Riverton Municipal Code
68	Prichard, AL	•					*The City hires contractors to perform all of the work

SUMMARY OF LEGAL ISSUES

	Study Area	Year	Legal Issues/Challenges
2	Tulsa, OK	1994	Notice gives owner 7 days to take action - City has authority to assess penalties of up 90 days in jail or up to a \$500 fine for those failing to make repairs Have had to pull 10 meters since 1994 - none recently
3	Dallas, TX	1987	City has used its ordinance twice, threatening to pull 2 meters in the first 9 years of the program - defects were repairs and no meters were pulled
4	Fort Worth, TX		Obtained 1 year ingress/egress easement
7	Johnson County, KS		Less than 0.1% of homeowners initially refused to perform work or allow inspections Of the 50,000 properties requested for inspection, only 15 owners refused; 11 joined together and the case went to the Kansas Supreme Court - the county won Due to the resolution the responsibility of enforcement was transferred to the county code courts; failure to comply results in an unclassified misdemeanor punishable by a fine not to exceed \$200 for each offense
8	Pittsburgh, KS	1989 to 1992 I/I Program	50% of affected property owners corrected problem w/o further intervention 50% pursued reimbursement from the City for the cost 14 owners were summoned to appear in court; only 1 owner was issued a fine and ordered to disconnect
11	Winchester, KY		60 - 180 days to comply; if don't comply \$75/month surcharge; criminal prosecution; termination of all services
12	Miami-Dade, FL	1994	Agency can pursue court actions after Notice of Violation - to date no court actions have been necessary
14	Cincinnati, OH	1991	No program to deal with private laterals - out of jurisdiction Of 9000 properties 10% "dead beats" - wish policy addressed this
22	Washington County, OR	1995	Gaining access to private property was an ongoing problem
23	Vallejo, CA		Initially tried a provision requiring testing of laterals upon sale of property - a strong real estate industry successfully fought this
26	Denver, CO		Recovery of costs was a recurring problem; often took years through resolutions of liens - changed to automatic billing approach All residents refused at first - once they got a court summons they quickly comply
27	East Bay, CA Stege Sanitary District	1980 to 1986	District made the decision to assume temporary ownership and control of the lateral sewer as part of the rehabilitation project
28	Louisville, KY		Request entry to 10,000 homes - 92% denied entry Owner fills out a form regarding property, i.e. location of downspouts - 8% responded
31	Houston, TX		City has no right to enforce or help compensate City cannot spend money on private property

SUMMARY OF LEGAL ISSUES

	Study Area	Year	Legal Issues/Challenges
32	Tahoe City, CA		Mandatory plumbing inspections required at change of property ownership or when plumbing permit is requested If don't comply - \$500 fine, 30 days in jail
37	Alameda, CA		Passed Ordinance 2402 in Oct. 1988 - affects the transferring of title of all property that is sold or otherwise transferred within the City of Alameda; service testing upon sale of house
39	Rockford, IL	1997	1.7% refused entry or inspection at their premises 14.3% of buildings were not inspected b/c the residents were not home during initial survey and could not be successfully contacted during subsequent visits, by mail, or by telephone
41	Columbus, OH Clintonville Pilot Study	1997	Have no jurisdiction beyond the public sewer
44	Olympia, WA		Voluntary program - 11 households didn't participate
46	Duluth, MN	1996	In 1994 the City passed an ordinance dealing with the I/I problem, due to a huge public outcry the City had to rescind the ordinance; the City then appointed a Citizen I/I Task Force that had to review the I/I issues and bring recommendations back to the Council (the citizens accomplished in 3 months what the City tried to do in almost 3 years - City Council accepted the recommendations) City Council unanimously approved the long term plan proposed by the Citizen Task Force; the State Legislature was approached for permission to permanently use public funds for private property corrective work for I/I - based on the results of the Duluth demonstration program the state of MN adopted legislation that would allow any municipality in the state to use public funds for private I/I
49	Beverly Hills, MI	1993	Currently 9000 homes on sump pumps - it would cost \$11.4 M to disconnect them all (1999)
50	San Luis Obispo, CA	1997	City needing to require more funding for lateral program, staff work load has increased due to the number of video inspections being accepted and the increase in lateral repairs in shorter periods of time Repairs have been running well over \$2000, staff is hoping to get a funding increase to encourage more participation
51	West Vancouver	2003	First project on the private property in this municipality, hard to coordinate the activities between homeowners, contractors, and municipality At first 3/37 refused to sign agreement - eventually did
54	Ann Arbor, MI	2001	Task force was created of homeowners from the affected areas, City staff, and experts in the field to focus on the complete analysis of 5 area neighborhoods (account for 50% of backflow problems in Ann Arbor)

SUMMARY OF KNOWN RESULTS

	Study Area	Success/Comments	Measured Success
1	West Lafayette, IN	<p>City conducts basement inspections and rainfall simulation inspections (water on outside of foundation)</p> <p>Foundation drains for all structures tributary to the pumping station will be disconnected from sanitary system (pumps and gravity drains)</p> <p>Reduced the volume of clearwater treated at the wastewater treatment plant</p> <p>Reduced the cost of energy and chemicals for wastewater treatment</p>	Y
6	Lower Paxton Township, PA	<p>Given 6 years to rehabilitate the entire system</p> <p>After rehabilitated the main sewers, approx 90% of remaining I/I private source (60% of total I/I)</p> <p>55% of laterals only need transition replacement</p> <p>Have replaced 500-600 homes</p> <p>Feel that sumps are the most cost effective source to move</p> <p>As of Dec. 1996, w/ part of the private program complete 4 subbasins showed significant flow reductions (1996 most recorded rainfall for PA in 10 yrs)</p> <p>Program cost modifications increased participation from 22% - 95%</p>	Y
7	Johnson County, KS	<p>15,600 sources disconnected (>4000/year); \$11 Mil on PSRP</p> <p>Public response was positive, more confident in process</p> <p>Specs and set costs were established with local contractors for disconnection; owners could call district and request the work be assigned or they could proceed with a 2 bid process of approved contractors</p> <p>Actual I/I reduction for a 10-yr storm for all district phases ranged from 41.7% to 71.1% (greater than projected) based on post-rehabilitation flow monitoring</p> <p>Foundation drain with sump most frequent removed</p> <p>Public sector improvements reduced I/I approx. 30%, however, it was found that the majority of I/I was private source</p> <p>Remove 50% of I/I</p> <p>Have experienced a 20-30 year storm with no backups after rehab; would have resulted in thousands of backups 10 yrs ago</p>	Y
8	Pittsburgh, KS	<p>More than 700 sources of illegal private connections</p> <p>Primarily sumps and roof leaders</p> <p>1500-2000 homes needed rehab (\$300-\$400/home)</p> <p>56% reduction in I/I system wide</p> <p>Missing cleanout caps were a big problem</p>	Y
9	Lynchburg, VA	<p>Eliminating 75% of roof leaders can eliminate 20% of the overflow</p> <p>Currently seeing a 58% removal efficiency</p> <p>Water added to the surface currently goes to a combined system eventually they want to completely separate</p> <p>4000 homes disconnected by 1998</p>	Y
10	Fairfield, OH	<p>Have seen 90% reduction in dry weather flow in some areas</p> <p>System wide - 35% reduction in I/I</p>	Y
11	Winchester, KY	<p>Based on smoke testing and basement inspections</p> <p>Can't quantify reduction in I/I</p> <p>Service laterals more expensive than downspouts</p>	N
12	Miami-Dade, FL	<p>90% of problem is cleanout risers</p> <p>Only smoke testing - do not enter house</p> <p>3000 missing cleanout caps; 1850 defective risers</p> <p>499 defective laterals - 276 repaired</p> <p>In 1999, 33 basins were selected for a pilot program to determine if house laterals are responsible for the I/I the program should be complete in 2006</p> <p>No data on effectiveness</p>	N
17	Mobile, AL	<p>As of May 2001 more than 20,500 linear feet of private laterals have been replaced and 10,000 linear feet have been identified for replacement</p> <p>80% of laterals failed air testing and internal videos as of May 2001</p> <p>Due to lack of homeowner response and administration costs being more than contractor costs this program is no longer enforced</p>	Y

SUMMARY OF KNOWN RESULTS

	Study Area	Success/Comments	Measured Success
27	East Bay, CA Stege Sanitary District	Greater reduction in infiltration in subbasin when upper lateral rehabilitation was used (R.O.W. to the house) along with the lateral between the main sewer and R.O.W. District made the decision to assume temporary ownership and control of the lateral sewer as part of the rehabilitation project Decided on a slip lining rehab for both main line and laterals - most cost effective After 2 complete years with the rehabilitated system no service calls have been reported Project certification testing in 1988-89 required by Clean Water Grant showed 86% of I/I volumes had been removed from area	Y
35	Salem, OR	30 days to remove connection 57% reduction in 5 year peak hour RDII (gpad) - replaced 58% of mainline sewers and 58% of service laterals	Y
39	Rockford, IL	Approx. 83% of primary structures (984 out of 1186) were entered during the building inspection program Found 100 illegal connections Disconnection program in 1999 - 100% compliance level Post rehabilitation flow monitoring was done in 2000 - analysis showed that the public/private sector program reduced wet weather inflow in excess of 65% (public inflow sources accounted for 25% of total system inflow)	Y
42	Broward County, FL	Inspected 1.6 M feet of pipe - a total of 7,796 cost effective repairs were recommended at a cost of \$25 M (both public and private repairs) County implemented 4,345 repairs by 2001 at a cost of \$10.5 M Approx. 2.8 mgd of I/I has been eliminated to date (2,316 repairs complete)	Y
43	Oak Creek, WI 51 Acre Pilot Study	The City installed a 6" drain on both sides of the street and homeowners were required to re-direct flow from their foundation drains (172 homes) Additional work is being considered to repair private laterals 48% reduction in 5 year peak hour RDII (gpad) Pre and post-rehabilitation analysis showed a 0.15 mgd reduction in peak hourly RDII flow equaled or exceeded once in 10 years	Y
44	Olympia, WA	In 180 acre basin Phase I - replaced main sewers and the portion of building sewers in the ROW - the I/I reduction for 10 year event was 17%; Phase II - replaced private sewers from property line to the house - the total I/I reduction was than 67% for 10 year event; removed approx 2.0 mgd Another basin replaced 64 of 334 private connections, 20% of side sewers replaced resulted in approx. 50% reduction in I/I for 10 yr event; removed approx. 0.35 mgd	Y
45	Tacoma, WA	For smaller storms the project decreased the flow by about 15%; however the peak flows measured during a major rain event was essentially the same as before rehabilitation Rehabilitation of laterals to reduce I/I in the private portion of lateral Relined 140 laterals and installed a new cleanout	Y/N
46	Duluth, MN	761 of 1141 homes were found as candidates for disconnection of foundation drains which included installing sump pumps or gravity discharge Voluntary program - as of July 2002 725 homes have participated in the disconnection/redirection The program reduced the 5 year peak hour RDII from 15,400 to 7,800 gpad, 49% reduction 100% of all roof drains were inspected and 95% were removed The work reduced the number of SSOs at the pump station from an average of 7.4 to 1.2 per year, 83% reduction City Council unanimously approved the long term plan proposed by the Citizen Task Force; the State Legislature was approached for permission to permanently use public funds for private property corrective work for I/I - based on the results of the Duluth demonstration program the state of MN adopted legislation that would allow any municipality in the state to use public funds for private I/I	Y

SUMMARY OF KNOWN RESULTS

	Study Area	Success/Comments	Measured Success
47	Kent Basin King County, WA	Replacement of all mainline pipe, manholes, and building service laterals Use of models to simulate response from long term rainfall record indicated reductions in the 5 yr peak hourly RDII flow of 78%	Y
48	Skyway WSD	Replaced all mainline sewers and building service laterals using the pipe bursting construction technique 20 of 160 lateral connections were stopped short of the house connection to avoid damaging decks, patios, etc. Project achieved 85% reduction in 20 yr recurrence peak hourly RDII flow	Y
49	Beverly Hills, MI	142 sump pumps out of 173 homes were removed The percent capture was found to decrease from 1.8% to 0.5% after sump pump removal - estimated sanitary inflow of 6,400 gallons per sump pump per year for the study area (74.5 acre) Inconsistent and varying data from flow meters	N
50	San Luis Obispo, CA	Laterals are privately owned from the residence to the cities mainline Voluntary service lateral rehabilitation program Video inspection of the homeowner's lateral and technical assistance and guidance from the City are part of the program No appreciable decrease in RDII has been detected in the collection system; this is a long term, customer oriented program that coupled with the City's mainline repair and replacement is anticipated to reduce RDII Response to the program is very positive - utilized by more homeowners annually	N
53	Auburn Hills, MI	Monitoring of flows before any disconnections will be compared with flows after 25%, 50%, 75%, and 100% of homes have been disconnected After 50% of the project had been completed results showed that a 60% reduction in I/I had been achieved	Y
56	Canton Township, MI	Installed more than 2500 sump pumps to address basement backup and SSO problems using township utility staff - since installation the town no longer has significant backup problems	Y
57	Detroit, MI	Voluntary pilot program to disconnect downspouts Monitored two test sites for 2 years to collect baseline data then one site had downspouts disconnected and the other was used as a hydrological control - both test sites were maintained for 6 months. to a year to measure the effects Household participation was 62% downspouts disconnected (577 out of 927) Pilot project results show downspout disconnection will reduce the percentage of Directly Connected Impervious Area (DICA) b/n. 40% to 44% Using 36 years of historical rainfall data the conditions after the downspout disconnection were modeled and wet weather runoff dropped 5000 MG/yr, overflow dropped 2000 MG/yr and WWTP flow dropped 3000 MG/yr	Y
58	Evanston, IL	Combined sewer system - inlet control and overland flow approach 10 phase program to be finished in 12 years Inlet control devices were required on the upstream half of the system and downstream street inlets were redirected to new relief sewers One basin completed in 1991 has been inlet restricted for 8 years (as of 1999) the expected number of backups under pre-rehabilitation conditions for this period is approx. 5,400 incidents; using customer interviews and surveys after every major storm event during this period it was found that their have only been 2 backups - after further investigation it was found that these 2 backups were caused by tree root clogged survive lines The residents have been fully accepting of the overland flow in the area - they feel the overland flow occurs primarily during periods when it is raining to hard for them to drive Catch basins must be kept clean for the inlet control devices to work	Y
68	Prichard, AL	Started the project in 2004 - have spent approx. \$600,000, eliminated 5 of 8 SSOs (haven't had one in a year), and have see a 33% reduction in I/I overall based on flow monitoring and have only done half the work (repaired/replaced over 1,000 laterals)	Y

SUMMARY OF RESPONSES

	Study Area		Success/Comments	Fees			
				City/District	Homeowner	Cost Share	Reimbursement
2	Tulsa, OK	80%	Approximately 80% of the defects are corrected on first notice Notice gives owner 7 days to take action - City has authority to assess penalties of up 90 days in jail or up to a \$500 fine for those failing to make repairs		•		
3	Dallas, TX	-	Homeowners ignore City's recommendations to make repairs Only perform about 5 lateral replacements annually		•		
4	Fort Worth, TX	80%	Voluntary program - 80% participation Successfully completed 95% of the repairs	•			
6	Lower Paxton Township, PA	95%	Have replaced 500-600 homes Program cost modifications increased participation from 22% - 95%	•			
7	Johnson County, KS	+	15,600 sources disconnected (>4000/year); \$11 Mil on PSRP Public response was positive, more confident in process				•
8	Pittsburgh, KS	+	50% of affected property owners corrected problem w/o further intervention 50% pursued reimbursement from the City for the cost			•	
9	Lynchburg, VA		Currently seeing a 58% removal efficiency Voluntary program 4000 homes disconnected by 1998				•
11	Winchester, KY	99%	99% cooperation 60 - 180 days to comply; if don't comply \$75/month surcharge; criminal prosecution; termination of all services		•		
12	Miami-Dade, FL	+	Agency can pursue court actions after Notice of Violation - to date no court actions have been necessary 499 defective laterals - 276 repaired		•		
14	Cincinnati, OH	90%	Of 9000 properties 10% "dead beats" - wish policy addressed this	•			
22	Washington County, OR	95%	95% participation rate after changed the cost sharing responsibility from 50% to 100%	•			
26	Denver, CO	+/-	City relies on voluntary compliance of property owner - will enter property w/ "administrative" warrant if needed All residents refused at first - once they got a court summons they quickly comply		•		
28	Louisville, KY	<8%	Passive/voluntary program - moving toward forced compliance Less than 8% of people canvassed allowed MSD to inspect their homes and make the cost free disconnection	•			
29	Lansing, MI	88%	Achieved voluntary removal of 88% of identified sources - 97% of properties free of inflow)		•		
33	North Olmstead, OH	+	3,030 homes tested - 1,322 discharging SW into sanitary system 90,000 feet of sewer lateral were sealed; 28,000 feet replaced	•			
35	Salem, OR		57% reduction in 5 year peak hour RDII (gpad) - replaced 58% of mainline sewers and 58% of service laterals		•		

SUMMARY OF RESPONSES

	Study Area		Success/Comments	Fees			
				City/District	Homeowner	Cost Share	Reimbursement
39	Rockford, IL	100%	Approx. 83% of primary structures (984 out of 1186) were entered during the building inspection program Found 100 properties had improper connections Disconnection program in 1999 - 100% compliance level 30 days to remove connection		•		
40	Nashville, TN		Rehabilitation of over 5000 service laterals (to the property line or easement line) - defective laterals contribute 20%-25% of I/I and must be repaired in conjunction with work on public sewers				
41	Columbus, OH Clintonville Pilot Study		Homeowners were interviewed about history of sanitary and storm plumbing and about surface drainage on their property; a description of the testing was given - owners were asked to sign a permission form allowing entry for testing (75% of property owners participated)	•			
42	Broward County, FL		Inspected 1.6 M feet of pipe - a total of 7,796 cost effective repairs were recommended at a cost of \$25 M (both public and private repairs) County implemented 4,345 repairs by 2001 at a cost of \$10.5 M Approx. 2.8 mgd of I/I has been eliminated to date (2,316 repairs complete)	•			
46	Duluth, MN		761 of 1141 homes were found as candidates for disconnection of foundation drains which included installing sump pumps or gravity discharge Voluntary program - as of July 2002 725 homes have participated in the disconnection/redirection 100% of all roof drains were inspected and 95% were removed				•
49	Beverly Hills, MI		142 sump pumps out of 173 homes were removed	•			
50	San Luis Obispo, CA	+	Voluntary service lateral rehabilitation program Response to the program is very positive - utilized by more homeowners annually				•
51	West Vancouver	+/-	37 laterals in pilot area - 16 replaced, 16 were CIP lined, 2 were new, 4 denied permission to repair		•		
53	Auburn Hills, MI		Monitoring of flows before any disconnections will be compared with flows after 25%, 50%, 75%, and 100% of homes have been disconnected After 50% of the project had been completed results showed that a 60% reduction in I/I had been achieved				
56	Canton Township, MI	+	Installed more than 2500 sump pumps to address basement backup and SSO problems using township utility staff - since installation the town no longer has significant backup problems				
57	Detroit, MI	62%	Voluntary pilot program to disconnect downspouts Household participation was 62% downspouts disconnected (577 out of 927)	•			

SUMMARY OF WHO PERFORMS THE WORK

	Study Area	Owner Hired Contractor	Bidding	Approved List of Contractors	City Contractor
3	Dallas, TX	•			
4	Fort Worth, TX				•
5	McMinnville, OR				•
6	Lower Paxton Township, PA				•
7	Johnson County, KS		•	•	
14	Cincinnati, OH			•	
17	Mobile, AL				•
21	Normal, IL				•
24	Bellaire, TX		•		
25	Alameda, CA		•		
26	Denver, CO		•		
37	Alameda, CA	•			
39	Rockford, IL	•			
40	Nashville, TN				•
46	Duluth, MN		•		•
57	Detroit, MI				•
61	University City, MO	•			
62	St. Charles, MO	•			
63	Kirkwood, MO	•			
64	Black Jack, MO	•			
66	South Bend, IN	•			
68	Prichard, AL				•

St. Louis Metropolitan Municipal Sewer Lateral Insurance Program Overview	
Number of municipalities in St. Louis area	92
Population range of municipalities	2,191 - 352,572
Number of municipal sewer lateral programs	70
Program funding from:	
Real Estate Tax	65
Trash Bill	1
Sewer Bill	2
Range of property owner's annual contribution	\$28 - \$50
Range of how much is collected annually	\$6,000 - \$2.8M
Written application required	64
Range of application fee/deductible	\$150 - \$740
Range of how much residents are reimbursed	\$500 - \$15,000
What portion of the lateral is covered by the program:	
Private ownership from the sewer to the foundation wall	53
Private ownership from the main to 5' outside the foundation	6
Private ownership from the ROW to the foundation wall	1
CCTV Inspection coverage:	
Reimbursement Provided	23
City Does Video	5

Minnesota Statutes 2005, 471.342

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[Minnesota Statutes 2005, Table of Chapters](#)

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471.342 Inflow and infiltration program.

Subdivision 1. **City.** In this section, "city" means a home rule charter or statutory city.

Subd. 2. **Inflow and infiltration.** In this section, "inflow and infiltration" means water other than wastewater that enters a sanitary sewer system, including sewer service connections, from the ground through defective pipes, pipe joints, connections, or manholes, or from sources such as, but not limited to, roof borders, cellar drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers, catch basins, cooling towers, storm waters, surface runoff, street wastewaters, or drainage.

Subd. 3. **Program authority.** A city may establish an inflow and infiltration prevention program and provide loans and grants to property owners to assist the owners in financing the cost of abating inflow and infiltration on their property.

Subd. 4. **Program guidelines.** The city shall establish guidelines to govern the program. The guidelines shall establish criteria for program eligibility and standards for compliance with the program. Prior to adoption of the program guidelines, the city council must conduct a public hearing on the proposed guidelines after giving at least ten days' published notice of the hearing.

Subd. 5. **Program financing.** The city may finance the program with federal, state, private, or city funds. City funds include, but are not limited to, general fund appropriations, sanitary or storm sewer utility funds, and fees or charges.

APPENDIX D
SANITATION DISTRICT NO. 1 QUESTIONNAIRE TO
LOCAL SEWER AGENCIES



Sanitation District No. 1

2006 Sewer Lateral Survey

Please provide the following:

Utility Name: _____

Contact Name: _____

Contact Title: _____

Contact Phone Number: _____

Contact Email Address: _____

Please answer the following:

- 1.) Approximately how many customers are served by your utility?
- 2.) Approximately how much money is spent annually on lateral repairs?
- 3.) Approximately how many lateral repairs on average are performed a year?
- 4.) Approximately how much money is spent annually on lateral cleaning?
- 5.) Approximately how many lateral cleanings on average are performed a year?
- 6.) Where do the funds come from to perform lateral repairs (sewer fees, road funds, other, etc.)?
- 7.) Where do the funds come from to perform lateral cleanings (sewer fees, other, etc.)?
- 8.) Are clean-outs installed by the utility on existing construction (circle one)? YES NO
If you circled YES...
 - a. Under what circumstances are clean-outs installed?
 - b. Where is the clean-out located?
 - c. Who pays for the clean-out installation?
 - d. Approximately how many clean-outs are installed annually?

See Page 2

Please answer the following:

- 9.) Are clean-outs required by the utility on new construction (circle one)? YES NO
If you circled YES...
a. Who is responsible for installing the clean-out?
b. Where is the clean-out located?
c. Who pays for the clean-out installation?
- 10.) Does your utility offer any kind of lateral insurance policy? YES NO If so, may we view a copy? YES NO
- 11.) Does your utility have a serious I / I problem caused by private source? YES NO
- 12.) Could we view a copy of your lateral policy if you have one? YES NO

Please circle "P" for Private Property Owner or "M" for Municipality:

- | | | |
|--|---|---|
| 1.) Who has ownership of Sewer Lateral... | | |
| From Building to Right of Way | P | M |
| From Right of Way to Edge of Pavement | P | M |
| From Edge of Payment to Public Sewer | P | M |
| 2.) Who is responsible for cleaning the Sewer Laterals... | | |
| From Building to Right of Way | P | M |
| From Right of Way to Edge of Pavement | P | M |
| From Edge of Payment to Public Sewer | P | M |
| 3.) Who is responsible for repairing Sewer Laterals... | | |
| From Building to Right of Way | P | M |
| From Right of Way to Edge of Pavement | P | M |
| From Edge of Payment to Public Sewer | P | M |

Thank you for your time!

APPENDIX E
SUMMARY OF QUESTIONNAIRE RESPONSES

Private Lateral Survey
June 2006

	Ashland, KY	Cincinnati, OH	Lexington, KY	Louisville, KY	Paducah, KY
Contact Information					
Formal Utility Name	Sanitation District No. 4	City of Cincinnati, MSD	Lexington-Fayette Urban Co. Gov.	Louisville & Jefferson Co. Metropolitan	Paducah McCracken Joint Sewer Agency
Contact Person	Gaylord Crum	Jerry Weimer	Charles H. Martin/Rick Bowman	Julia Miller	John Hodges, P.E.
Contact Title	GM, Superintendent	Supervisor	Director	GIS Services and Records Manager	Engineering and Operations Director
Phone	606-928-3936	513.352.4207	859.425.2255	502.540.6343	270.575.0056
Email	sd4mgr@netacs.net	jerry.weimer@cincinnati-oh.gov	cmartin@lfucg.com	muller@msdlouky.org	jhodges@jointsewer.com
Customer Base	2,000	800,000	500,000	220,000	17,300
Lateral Repair & Cleaning Information					
\$ spent annually on lateral repairs	\$8,000	\$7,300,000 avg. cost 10,600/ lateral	\$2,700,000*	\$1,656,285*	\$100,000
Lateral repairs performed annually	50	700 (691 in 2005)	0--do not perform lateral, only main repair to ROW	1,081 annually*	25
\$ spent on lateral cleaning	\$6,000	\$0	0--do not perform lateral, only main cleaning to ROW	24,000*	0--do not perform lateral, only main cleaning
Lateral cleanings performed annually	25	MSD does not clean laterals. Homeowner is responsible for maintaining entire lateral, as far as cleaning is involved.	0	787 annually*	0
Lateral repair funding source	Sewer Fees	Sewer Fees	Sewer Fees	Sewer fees	Rates
Lateral cleaning funding source	Sewer Fees	N/A	Sewer Fees	Sewer fees	N/A
Clean-Out Information for Existing Construction					
Clean-Outs installed by utility on existing construction?	Yes	Yes	Yes	Yes	Yes
Circumstances for installation of clean-outs	During construction	For access for MSD to check for repair in ROW	If it benefits the urban co. gov.	When there is a repair and we have to dig up the property service connection	During repair work & during construction of new sewer taps for customers
Location of clean-outs	At property line or center of easement.	On existing stack pipe, if possible	Within the ROW	At the property line, the ROW line or at the easement line	R/W line or easement line
Funding source for clean-outs	Customer (tap fee)	MSD	Urban Co. Gov.	MSD	Repair work – JSA; for new taps that have existing laterals – a private plumber installs paid for by customer; for new taps with no existing lateral built to R/W or easement line – JSA builds and pays for, but customer pays a \$625 lateral construction fee to help cover costs.
Clean-Outs installed annually	15	180 annually	60 annually	800 annually	Aprox. 25
Clean-Out Information for New Construction					
Clean-Outs required on new construction?	Yes	No	Yes	No	Yes
Responsible party for installation of clean-out	Construction Contractor	N/A	Developer	N/A	Utility Construction Contractor
Location of clean-outs	At property line or center of easement.	N/A	Edge of ROW	N/A	At easement line
Funding source for clean-outs	Customer (tap fee)	N/A	Developer	N/A	Developer of JSA (depending on sponsor of project)
Lateral Insurance Policy					
Does your utility offer any kind of lateral insurance policy?	No	No		No	No
I/I Information					
Does your utility have a serious I/I problem caused by private source?	No	Yes		Yes	We have clay lines = I/I

Private Lateral Survey
June 2006

	Ashland, KY	Cincinnati, OH	Lexington, KY	Louisville, KY	Paducah, KY
Contact Information					
Copy of lateral policy					
May we view a copy of your lateral policy?	Do not have a formal policy	Yes		We do not have a policy.	Facility Extension Policy located on www.jointsewer.com
Ownership of Sewer Lateral					
Building to Right of Way	P	P	P	P	P
Right of Way to Edge of Pavement	M	P	M	M	M
Edge of Payment to Public Sewer	M	P	M	M	M
Cleaning Responsibilities					
Building to Right of Way	P	P	P	P	P
Right of Way to Edge of Pavement	M	P	M	M	P
Edge of Payment to Public Sewer	M	P	M	M	P
Repair Responsibilities					
Building to Right of Way	P	P	P	P	P
Right of Way to Edge of Pavement	M	M	M	M	M
Edge of Payment to Public Sewer	M	M	M	M	M
Legend					
P - Private Property Owner					
M - Municipality					
1. Cost for repairs: Range \$8,000 to \$1,656,285 annually					
2. Cost for cleanings: Range \$6,000 to \$24,000 annually					
3. Cleanouts for existing construction = All Yes, Range 15 to 800 annually					
4. Insurance Policy = All No					
* This information includes work on the public portion of the lateral only (from the mainline to the easement or right-of-way).					

SANITATION DISTRICT NO. 1

SEWER LATERAL REPAIR POLICY

Background

Since the consolidation of the sanitary sewer system in 1995, the Sanitation District No. 1 (the "District") policy relating to ownership and maintenance of building sewers (also known as sewer laterals) was stated in Article 7, Section 701.1.G. of the District's Rules and Regulations:

The owner of the premises, served by a sewer shall be responsible for all maintenance, operation, cleaning, repair and reconstruction of the building sewer from the building to the point of connection with the public sewer.

This regulation fully complies with Kentucky law. Nevertheless, the result of this regulation was that in certain instances, property owners were being required to perform excavation and repair work beneath public roadways. Accordingly, the District will provide some assistance to property owners faced with this difficult and costly situation.

At the July 29, 2004 Board Meeting, the Board of Directors adopted, as an interpretation of Section 701.1.G, the following sewer lateral policy:

Amended Policy (7/29/04):

The owner of the premises, served by a sewer shall be responsible for all maintenance, operation, cleaning, repair and reconstruction of the building sewer from the building to the point of connection with the public sewer. **However, if a property owner conclusively demonstrates, in accordance with the guidelines set out in the Sewer Lateral Repair Policy, that the private sewer lateral is not functioning as a result of a structural problem occurring at a section of the lateral located beneath the public roadway, the Sanitation District will reimburse the property owner the lesser of 50% of the costs associated with this work or \$1,500.**

NOTE: The cost sharing aspects of this Policy will only apply to structural problems occurring in the section of the private lateral located beneath the "public roadway." For the purposes of this policy, the "public roadway" is defined as the public road from edge of pavement to edge of pavement, including the street curb, if present, and excluding segments of driveways within the right-of-way.

Ownership and maintenance responsibilities shall remain with the individual property owner from the building to the public sewer, including the length of sewer lateral beneath the public roadway.

1. Problem Identification:

The property owner is responsible for hiring a licensed plumber to identify the location of the lateral line and, specifically, the location of the structural defect. Locating of the defect should be done with the use of a “locating device.” Measuring distances to the defect is not considered adequate, in terms of locating the problem. Once the location of the defect has been identified, the plumber should clearly mark the location of the defect on the surface of the ground with spray paint or other appropriate means.

If requested, the plumber will provide the District with a videotape of the sewer lateral, which clearly shows the structural problem causing the sewer lateral malfunction. However, it is recognized that this is not always possible.

Note: In all cases, the property owner is responsible for 100% of the costs associated with locating the private sewer lateral problem.

2. District Review:

The District will review the available information, including the plumber’s estimates to perform the work and determine if the information provided is in accordance with the requirements of this policy. If the information is sufficient, the District will approve the project for reimbursement. If additional information is required, District representatives will notify the property owner of the additional requirements.

Note: In those instances where the lateral damage extends beyond the public roadway as defined in this policy, the Homeowner is solely responsible for the costs associated with the repair work outside the “public roadway” as defined above.

In all cases, the District reserves the right to require the installation of a vertical cleanout riser at the edge of pavement.

3. Notification

The Homeowner will notify the District at least twenty-four hours in advance of any work being done to allow the District adequate time to schedule an inspection of the work, should it be deemed necessary. The performance of the inspections will be at the sole discretion of the District. If the main sewer line is exposed, an inspection by a District representative is mandatory.

4. Payment

Upon completion of the lateral repair work beneath the public roadway, the property owner will provide the District a copy of the plumber's invoice for the completed work. Upon approval of the invoice by the District, the District will reimburse the Homeowner for the lesser of 50% of the actual costs associated with the work in the public roadway or \$1,500.

There are special conditions that could exist (depth of sewer, excessive utilities, etc.) that would cause the cost of the project to be inflated. If any of these conditions are experienced, then the District should be notified and the conditions will be verified. The Board, at its discretion and on a case-by-case basis, can exceed the maximum contribution as outlined in the Policy, to accommodate extenuating circumstances such as very deep public sewer lines or conflicts with other utility lines.

Note: If the necessary work to repair the damaged lateral extends beyond the "public roadway" as defined above, the District will determine the costs eligible for reimbursement by prorating the total costs of the project based on the total length of lateral repaired compared to the linear feet of lateral within the "public roadway" that was repaired.

For example: If 100 feet of lateral is repaired and 10 feet of the lateral is within the "public roadway," the District will reimburse the Homeowner for the lesser of 5 percent (5%) of the total invoice or \$1,500.00.

5. Indemnity:

The Homeowner agrees to, and does hereby, indemnify and hold the District harmless from any causes of action, claims, liability, judgment or expenses, including reasonable attorney's fees and the costs of investigation and litigation, arising out of the project.

6. Authorization:

This policy only applies when the District has been notified by the property owner that the sewer lateral is not functioning properly and that it is conclusively demonstrated to the District, in accordance with the provisions of this policy, that the malfunction is a result of a structural failure of the private sewer lateral at a point beneath the public roadway.

I _____, the property owner
(Print Name)

of _____,
(Print Address)

understand the above stated policy and agree to only request reimbursement from the District for the costs associated with the repair of the section of my private sewer lateral located beneath the public roadway, in accordance with the provisions of this Policy.

Property Owner's Signature

Date

Daytime Phone Number

APPENDIX G
DELINEATION OF SEWER LATERAL REPAIR RESPONSIBILITIES

Delineation of Sewer Lateral Repair Responsibilities

The following photographs provide examples of the three possible definitions of “edge of pavement”. The edge of pavement determines the start of private ownership of the sewer lateral.

1. Sidewalk Present



2. No Sidewalk, Curb Present



3. No Sidewalk or Curb Present



REFERENCES

REFERENCES

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Strand Associates, Inc. Contact Reports

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Sanitation District No. 1 Sanitary Lateral Repair Policy