



Side steps

Battling infiltration and inflow in side sewers

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The Ronald Wastewater District (RWD) serves about 53,000 customers in northwestern King County, Wash., with a collection system that was installed primarily during the 1950s and 1960s. The district, which was formed in 1951, collects and transfers wastewater to King County Wastewater Treatment Division (KCWTD) and the City of Edmonds (Wash.) Wastewater Treatment Plant.

Throughout the region served by KCWTD, infiltration and inflow (I/I) is a concern. Preventing and removing I/I provides

increased capacity for wastewater in the system, reduces annual operating costs, and can prevent or postpone expansion projects.

I/I reduction efforts typically involve repairing or replacing aging and leaking sewer lines, but one area often overlooked or deemed too difficult to address are side sewers – the portion of the lateral that sits on private property. But as RWD found, replacing side sewers can significantly reduce the I/I in the wastewater system, as well as provide a benefit to the property owner.



By replacing side sewers – the portion of the lateral on private property – the Ronald Wastewater District (Shoreline, Wash.) has achieved great reductions in inflow and infiltration.

Pilot projects

In 2000, KCWTD and 34 local wastewater purveyors, including RWD, began a regional I/I study throughout King County. One of the drainage basins within RWD's service area, RON002, was identified as having excessive I/I – approximately 170,200 L/ha•d (18,200 gal/ac•d).

RWD was familiar with the basin identified because it had recently evaluated it using smoke testing and video inspection of the main line. However, that evaluation identified relatively few faults – certainly not enough to cause such severe I/I.

The district is responsible for maintaining the sewer main line and lateral located within the public right-of-way or easement. A property owner owns and is responsible for the maintenance of the side sewer from the edge of the public right-of-way or easement to the structure. Figure 1 (p. 54) shows an example of a typical situation.

The regional program sought to demonstrate the effectiveness of rehabilitation projects. Local agencies proposed 23 potential projects for consideration; 10 were selected.

RWD proposed a project to replace side sewers, along with the few faults that were identified in main lines in the RON002 basin. This was one of the 10 selected projects. In 2003 and 2004, the district implemented the project, which involved 290 properties. A total of 208 side sewers – most of which were concrete – were replaced with high-density polyethylene pipe installed by pipe bursting. The 82 side sewers that were not replaced were either constructed of newer polyvinyl chloride pipe material that did not need replacement or the property owners did not want their side sewers replaced.

During the winter of 2004–2005, KCWTD measured the success of the RWD's pilot project and identified a 74% reduction in I/I. The flows dropped from approximately 170,200 to 44,900 L/ha•d (18,200 to 4800 gal/ac•d). This project showed that in a drainage basin that had very few main-line faults, the majority of the I/I came from side sewers.

Only two of the 10 pilot projects had higher success rates than this. One rehabilitated all sewer main lines, manholes, laterals, and side sewers in the project basin for an 87% reduction in I/I. The other replaced 100% of the laterals and side sewers and saw an I/I reduction of 76%. Table 1 (p. 55) summarizes the improvements of all three projects.

Armed with the excellent results of the pilot project, RWD set out to see if it would be possible to replace side sewers as part of its ongoing system upgrades. Portions of the district's collection system were approaching 60 years of age, and maintenance in these areas was increasing due to root intrusion and general deterioration of pipe material.

Growing pains

While a good portion of the problems were inside sewer laterals owned by RWD within the public right-of-way, a significant portion also sit on private property.

From 2004 through 2008, the district researched side-sewer replacement options. One option was to require property owners within the district to replace side sewers when their property was sold. Districts in other parts of the United States have successfully implemented such ideas, but RWD recognized that this approach would limit the replacement of side sewers to the time of sale of a property, which had little relationship to the reduction of I/I or the district's maintenance issues. Additionally, this approach would involve the real estate industry, which might oppose the idea.

RWD's second option was to explore other state legislation to require replacement of side sewers statewide with the help of the Washington Association of Sewer and Water Districts (SeaTac, Wash.). But not all members of the association could agree upon the same approach or the timing for side-sewer replacement.

Changing tactics, RWD sought an official opinion from Washington State Attorney General Rob McKenna about shouldering the cost itself. (It should be noted that an official Attorney General Opinion [AGO] is not the law.)

With the help of state representative Ruth Kagi (32nd district), RWD prepared a question regarding the use of public funds to replace private

side sewers. The district provided results from several RWD I/I studies conducted from 1993 to 2000, results from KCWTD's 2000–2001 I/I study, RWD's pilot project results, results from a KCWTD 2004–2005 I/I study, and a letter of support from KCWTD.

The question was, "May a municipal sewer district repair or replace a private side sewer as part of a district-wide infiltration and inflow reduction program where (a) aging and inadequate side sewers are the most significant contributor to the I/I in the district's entire system; (b) the purpose of the program is to benefit the district and public through lower long-term capital and maintenance costs, not private property owners; (c) repair and replacement would be subject to a right of entry from the private property owners; and (d) the program costs will be paid back through the district's bi-monthly sewer rates?"

The attorney general responded with AGO 2009 No. 5, which states: "Municipal sewer districts have statutory authority to use public funds to repair or replace side sewers located on private property if doing so will increase sewer capacity by reducing infiltration and inflow. Use of public funds to do so does not constitute an unconstitutional gift or loan of public funds if the district acts without donative intent and can demonstrate that the action will result in significant benefit to the public."

With a nod of approval, RWD wanted to move ahead. Recognizing it would be hard to prioritize where to replace side sewers, the district amended its rules and regulations to dictate how side sewers would be rehabilitated using public money (see Figure 2, p. 55).

RWD operates an annual sewer rehabilitation program that assigns numerical values to each length of line to help it prioritize where to spend its resources (see sidebar, below.)

Selling the concept

The next step for RWD was coordinating with the property owners. Surprisingly, one of the challenges RWD faces is convincing private

Figure 1. Sewer line ownership and layout



property owners to have their side sewers replaced. While the major benefit of replacing side sewers would be to the local sewer agency and the regional treatment provider, there is incidental benefit to the property owner. Such incidental benefits include

- reducing or eliminating future side-sewer replacement costs to the property owner;
- relief from potential repair or maintenance costs to the property owner from private plumbing companies for repair and/or unclogging of the private side sewer;
- little disruption of the owner's property (by using pipe bursting, holes are dug only adjacent to the structure and near the right-of-way line); and
- increased value to the property because of having a new side sewer with a projected life of 50 years or greater.

The district attempts up to four times – plus one time by the contractor – to get a signed right-of-entry document from the property

Sewer assessment and rehabilitation projects

The Ronald Wastewater District (RWD; Shoreline, Wash.) was formed in 1951, and no district-owned sewer main lines were replaced prior to 2008. Sewer main lines had been added only to the district's collection system.

The district completes cleaning of the entire 306-km (190-mi) sewer system every 3 years and completes video inspection every 8 years. During the inspections, the district crews rate the condition of the sewer pipe.

Rating scale for new pipes

Pipe diameter (mm [in.])	Base score	Pipe material	Base score
200 [8]	180	ABS plastic	230
250 [10]	205	Asbestos	275
300 [12]	203	Clay	275
375 [15]	255	Concrete	275
450 [18]	280	Cast or ductile iron	250–275
600 [24]	330	Polyvinyl chloride	300
		Lining	250

As part of the district's asset management program, every manhole and sewer pipe is assigned a base numerical value depending on the type of pipe material used and size. The table at left shows the rating scale for the base score of each pipe. For example, a 200-mm-diameter (8-in.-diameter) concrete pipe is assigned a base score of 275 + 180 = 455 points.

Points are deducted from the base score according to age – a 1-point deduction per year since the pipe was installed – and specific defects that are observed by field crews during inspection.

As the severity of the pipe defect increases, so do the points deducted. For example, a pipe that has one or two pulled joints in a run loses 20 points; a pipe that has three or more pulled joints loses 30 points. Pipes or manholes that are in serious need of repair can have a negative value based on this scoring system.

Beginning in 2007, RWD began designing repair and replacement projects of the main lines that were identified using the point system. Sewer main lines and manholes with low scores were scheduled for rehabilitation, repair, or replacement. Annual replacement projects – estimated at approximately \$500,000 for construction costs – were identified and scheduled for several years into the future as part of the capital improvement program.

Figure 2. Amended rules and regulations for side-sewer rehabilitation

1. The district may replace or repair private side sewers as part of a district-initiated project to reduce infiltration and inflow.
2. All private side sewers within and limited to the project area are potentially eligible for repair and replacement.
3. Property owners that accept the district's offer to have their private side sewers repaired or replaced must sign a right-of-entry form and accept ownership and maintenance responsibility of the private side sewer.

owner. The right-of-entry document gives RWD permission to access the private property to replace the side sewer:

1. Property owners are provided project information and a right-of-entry document via mail during the design phase of a project.
2. Unresponsive property owners are provided project information and a right-of-entry document a second time via mail during the design phase of a project.
3. Unresponsive property owners are provided project information and a right-of-entry document a third time by leaving a door hanger prior to the project going out for bid.
4. Unresponsive property owners are provided project information and a right-of-entry document a fourth time by a district representative after the contract has been awarded but before construction has commenced.
5. Unresponsive property owners are provided project information and a right-of-entry document by the contractor a couple of days before the work is started on that specific street.

If the property owner does not sign the right-of-entry document, his or her side sewer is not replaced. In these cases, only the district-owned lateral is replaced.

When contacting property owners, the district uses a form letter that includes a right-of-entry document for each specific parcel of land. For future projects, the district is planning a simpler notification letter in hopes that more owners will sign the right-of-entry document sooner.

RWD also has added a video to its Web site, www.ronaldwastewater.org, that shows what is involved in side-sewer replacement by pipe bursting. The hope is that the video will show how minimally invasive the work can be and encourage property owners to accept installations.

Economy of scale

Since August 2009, when the state attorney general issued his opinion, RWD has completed five pipe-bursting projects that included side-sewer replacement. The district has paid for the replacements using public funds. In each of these five projects, the district bid items separately to identify the cost for replacing laterals alone and for replacing laterals and side sewers.

By subtracting the two bid items, the district can determine the cost the contractor has assigned to the additional work to replace the side sewer. For the first five projects, this cost ranged from \$10 to \$1000 per side sewer. The cost of private side-sewer replacement as part of a district sewer main-line and lateral replacement project is about one-tenth the cost of a private property owner having the side sewer replaced at his or her expense.

The district's goal has been to have 100% participation on each rehabilitation project, but, on the first five projects, it has fallen short. Table 2 (below) shows the results so far.

As more property owners are willing to have their private side sewers replaced, greater I/I reduction can be expected. Replacing private side sewers can reduce I/I, which decreases costs to the collection and treatment providers but also benefits the property owner.

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Table 1. Comparison of the three most successful I/I removal projects

	Scope of work				Lines improved	Before rehab (kL/m ² ·d [gal/ac·d])	After rehab, (kL/m ² ·d [gal/ac·d])	Reduction
	Mains	Manholes	Laterals	Side sewers				
Skyway	x	x	x	x	100%	968,200 [63,200]	128,700 [8400]	87%
Kent			x	x	100%	194,500 [12,700]	47,500 [3100]	76%
Ronald			x	x	72%	278,800 [18,200]	73,500 [4800]	74%

I/I = infiltration and inflow.

Table 2. Participation in side-sewer rehabilitation projects

Project name	Year completed	Participation of eligible sites
2007 CIP	2009	89%
2008 CIP	2010	79%
2009 CIP	2010	86%
Briarcrest CIP 1	2011 (nearly complete)	77%
Briarcrest CIP 2	2011 (nearly complete)	91%

CIP = capital improvement program.