

GETTING TOUGH ON I&I

A Pennsylvania township makes big inroads against clear water in sewers with a program of lateral testing, inspection and repair

By Mary Shafer



Suburban Unity Township, Pa., has cut inflow and infiltration (I&I) by nearly 40 percent in several portions of its collection system over the last decade with asset inventory, flow measurement, phased mainline rehabilitation, and mandatory repair or replacement of private laterals. Technology has played a major part in every stage of the program, and recent legislation has given enforcement some teeth.

By the early 1990s, the Unity Township Municipal Authority (UTMA), just east of Pittsburgh, knew it was in trouble. An untenable volume of I&I was threatening to overburden the township's wastewater treatment plants. In 1993, the state Department of Environmental Protection (PDEP) issued a Corrective Action Plan for the Pleasant Unity treatment plant to bring its capacity in line with the significantly increasing flow. It was time to take bold steps toward reducing clear water.

Based on a report from Gannett-Fleming Engineering Consultants in Harrisburg that said up to 80 percent of I&I came from the private sector in most municipal collection systems, UTMA officials suspected that much of the clear water in their system was origi-



nating with residential laterals. They immediately initiated a survey of portions of the 140-mile sewer system. The results proved the origins of I&I and justified mandatory lateral repair and replacement at homeowner expense.

The law catches up

At that time, no state or local ordinances allowed sewer inspectors to test and inspect private laterals. At UTMA's urging, township officials adopted a resolution requiring smoke and dye testing of laterals at the time of home sale or refinancing. The resolution requires that UTMA be notified at least seven business days before a property closing so that inspectors can pay a visit.

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Mike Henry

Usually, the mortgage lender notifies UTMA. If the inspection shows that the lateral needs repair, the homeowner must make and pay for them. “I thought some people might complain about the cost, but I think it hasn't happened because we were successful in our education efforts before we even got started,” says operations manager Mike Henry.

“I think people grasp the long-term savings, even when they are forced to spend now. I think the key to any program is education of the public. Communicate the benefit and your program will be successful.”

In new developments, contract field inspectors check laterals while the pipe is being laid, and they revisit when the home is connected to the mainline. A video inspection completes the work.

Gearing up

To pinpoint problems in pipes, UTMA invested in inspection equipment. Eight-inch sewer mains are inspected with a zoom pan-and-tilt camera mounted on a TR2000 tracked transporter from

Technician Robert Paul (left) feeds cable to John Rosko as he lowers a SeeSnake Plus camera to inspect a private lateral.

PROFILE:
Unity Township
Municipal Authority
Latrobe, Pa.

CUSTOMERS:
6,100 (water and sanitary sewer)

TOWNSHIP AREA:
69 square miles

ANNUAL BUDGET:
\$3.5 million

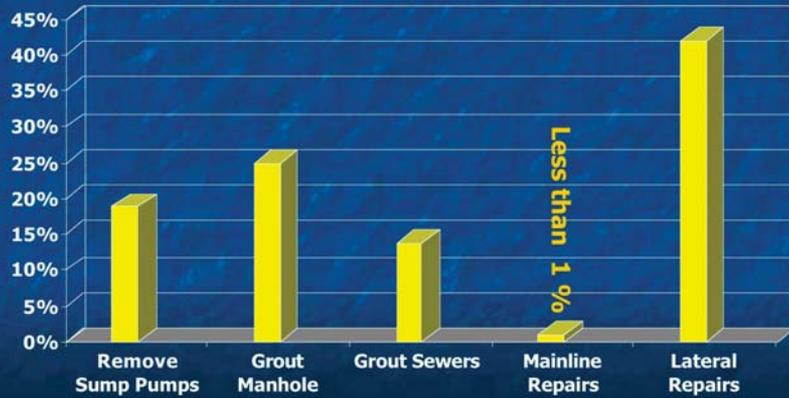
INFRASTRUCTURE:
4,000 manholes, 140 miles of gravity sewer

WASTEWATER:
830,000 gpd processed at two plants; 1.1 mgd collected for transport to two contracting plants

WEB SITE:
www.unitytownship.org

Summary of I & I Quantities by Source

I & I Percentage (%) Before Groundwater Migration



The graph at the left illustrates the high percentage of inflow and infiltration tracked to private laterals in the preliminary data collection stage of Unity Township's I&I removal program.



INFLOW PREVENTION

The Man-Pan from Camtek Construction Products Corp. prevents stormwater inflow to sewer systems by sealing between the manhole frame and cover. It also helps keep out sand, dirt, and other debris and controls the escape of odor. The unit can easily be removed with a lifting lug using a standard J-hook. It is made of non-corrosive thermoplastic materials. For more information: 724/327-3400; www.themanpan.com.

Aries Industries. This system is used where lines are expected to be intact and not in need of major repairs. When repairs are expected, Henry subcontracts mainline televising so that both inspection and repair can be done in one visit.

To televise laterals with inspection tees (those installed after 1979), UTMA personnel use a RIDGID SeeSnake Plus push camera from Ridge Tool Co. Inspections of laterals from older homes without tees are contracted, because the city could not justify buying the necessary equipment and training its people need to use it, Henry says. Crews also can inspect laterals from mains using an Aries Lateral Evaluation Television System (LETS) camera, which piggybacks on the main camera, and can be launched via guide cable off the mainline up to 80 feet into the lateral.

Henry directed development of a map to track the condition of the entire wastewater collection system. College interns — computer science or civil engineering students — served as field

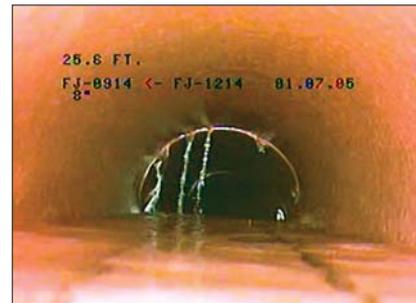
technicians. They used a Trimble digital GPS surveying transit.

A strong foundation

To begin the asset inventory, all 4,000 manholes were located and their coordinates fed into ESRI ArcGIS and Geoplan Geographic Informational System software. Each location was then downloaded to the integrated ArcView GIS mapping module, which generates visual maps based on operator-selected data sets.

The next step was flow measurement. Flow data was collected using flow meters from Badger Meter and Sigma 980 flow meters from Hach Co. Integrated software monitors the meter, and data is uploaded to laptop computers. Flow data was correlated to rainfall measured at a digital weather station at the Pleasant Unity treatment plant.

Field investigations supplement the flow data. During substantial rainfalls, field technicians uncover manholes to observe I&I, determine the intensity of peak flows, and witness any anomalies.

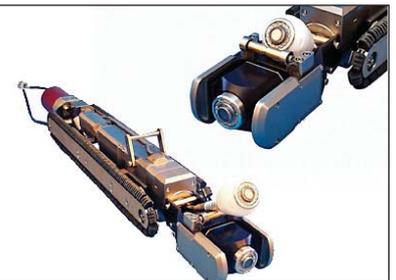


A camera inside an 8-inch main shows root intrusion and infiltration.

Flow measurements are ported from the laptop computer, and the weather system downloads data directly to UTMA computers, which consist of a main server and 10 desktop PC workstations. Eight full-time operators staff the UTMA plant and field operations.

Working with the public

Final findings from these studies confirmed Henry's belief that private connections were the biggest I&I source. Forty-two percent of clear water



LATERAL INSPECTION

The Lateral Evaluation Television System (LETS) from Aries Industries is a tractor-mounted system that enables inspection of sewer laterals from the mainline. The camera operates up to 800 feet in 8-inch and larger mainlines and inspects 3-, 4- and 6-inch service laterals. All laterals from manhole to manhole can be inspected with a single mainline setup.

The lateral camera can travel 80 feet. Pipe locations are identified with a built-in locator beacon. The system comes in portable or truck-mounted configurations. A fingertip controller allows for easy operation, and LED lighting heads provide long-lasting operation. Lateral footage is displayed onscreen. For more information: 800/234-7205; www.ariesindustries.com.

ELIMINATING LATERAL DEFECTS

The following table indicates the most common defects found in private sewer laterals, along with the repair costs. The costs depend on extent of repair and who does the repair — in-house crews or contractors.

DEFECT	REPAIR	COST
Missing/broken CO cap	Replace cap	\$2 - \$100
Broken riser	Replace riser	\$50 - \$200
Defective service lateral	Replace lateral	\$1,000 - \$5,000
Area stairwell drain connected to sewer	Disconnect from sanitary sewer	\$50 - \$250
Downspout piped into sewer	Disconnect from sanitary sewer	\$50 - \$250
Sump pump connected to sewer	Disconnect from sanitary sewer	\$200 - \$2,000

was entering through broken laterals and 19 percent from sump pumps illegally connected to the sewer system. Less than one percent came from fractured mains, 14 percent from pipe joints and 25 percent from manholes.

Henry now had to concentrate on compliance with the DEP Corrective Action directive. To prepare the public for what they might perceive as an assault on their pocketbooks, he arranged a series of meetings with developers and homeowner associations, explaining that it would be cheaper to remove clear water from the sewers than to expand the treatment plant. Either way, he emphasized, sewer users bear the cost.

He added that root intrusions into broken laterals would eventually clog them and cause sewage to back up into the homes. "It's a good motivator," he chuckles.

Henry then used triage to prioritize efforts to stop I&I. The most serious problems — laterals in imminent danger of backup — were attended to first. Repairs were logged into the mapping system.

Fixing the mains

UTMA's program is not limited to inspections triggered by home sale or refinancing. Ongoing work on private laterals is covered by a local resolution that allows UTMA to send a 30-day notice of upcoming inspection, either from the main line or from the property's inspection tee. If the lateral fails, the property owner receives a written notice allowing 60 days to make repairs. UTMA works with homeowners who need extensions.

Sewer main inspections of course are included in UTMA efforts against I&I. Henry and his staff try to televise 10 miles annually. Crews repair manhole leaks in low areas using The Man-Pan inflow preventer from Camtek Construction Products Corp. Made of plastic composite with a thick rubber gasket in the same diameter as the manhole, the units form a positive seal when the weight of the cover is re-applied. Main line spot repairs and CIPP lining service are contracted.

Henry says the program's biggest challenge was "collecting all the data. I've only typically got two guys in the field, and they can only do X-amount of work. I sometimes have to slow down the schedule because I only have the staff I've got. From an implementation viewpoint, it's a challenge to educate



Top photo: The 200,000 gpd Wimmerton Sewage Treatment Plant has a present flow of 160,000 gpd. Flow monitoring indicates severe infiltration in the collection system. Lower photo: Technician John Rosko watches the service truck monitor as Robert Paul feeds the camera into a lateral.



"You need to keep track of all your flow monitor and televising records," Henry emphasizes. "You definitely need to do an excellent job of keeping track of that data. Without that documentation, you couldn't make sure all the work was done and how it was performed. The data also backs up the need for any work you've required of developers and homeowners." ♦

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our governing authority and the public on issues that need to be corrected."

Timing was another issue. "I didn't realize when we started the program how long it would take from the start of flow monitoring through the end," Henry says. "I thought it would take a year and a half in each study area of approximately 200 to 300 homes, but it took twice that long. Looking back, I wouldn't even start out on a program like this without a good GIS software program to handle all the data."

Measurable outcomes

Realistic, measurable results were Henry's goal. "I was hoping for a 30- to 40-percent reduction in overall I&I. We got pretty close," he says. "Long term, I'm hoping that with the new lines and with inflow protectors in place, 20 years down the road, the township won't be dealing with the same I&I issues we are today."

He cautions prudence in planning for those considering similar projects. "You've really got to keep your study area manageable," he says. "One of the things we learned was to keep it to less than 100 homes at a time.

MORE INFO:

- 10** **Aries Industries**
800/234-7205
www.ariesindustries.com
- 218** **Badger Meter**
800/876-3837
www.badgermeter.com
- 219** **Camtek Construction Products Corp.**
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