

# Inflow and Infiltration Study

## City of Santa Rosa

### **What is inflow and infiltration?**

*Inflow* is typically described as any extra water flowing into the collection system from above ground sources. Inflow is usually a result of storm activity and can enter the system by sheet flow of water over leaky manhole covers and uncovered cleanouts or through private property rain downspouts or cellar, yard, area or foundation drains illegally connected to the sanitary sewer system.

*Infiltration* is typically described as any extra water that enters the wastewater flow from the surrounding soil. Groundwater flows or seeps into the system through cracked pipes and service laterals, separated joints in the pipe, and unsealed or leaky manholes. Pipes in the ground crack for a number of reasons. The older areas of Santa Rosa typically have sewer main constructed of vitrified clay pipe (VCP), a clay tile that was very commonly used for sewer main construction through the early 1970's. VCP is a fairly brittle pipe and ground movement (due to seismic activity, expansive soils and settling) tends to promote joint separation and cracks in the pipe. Once the pipe has even hairline cracks, roots will seek out the moisture inside the pipe and work the cracks larger. Aggressive water seekers will intrude roots into a pipe enough to remove pieces and thoroughly clog the pipe. City maintenance crews regularly use mechanical equipment and chemicals to remove roots from these mains (preventing serious stoppages) but it is a stopgap measure, as the roots return to the water source. The oldest parts of town, with the majority of the VCP pipe, is also the part of town with the largest and most trees.

The effects of inflow show up in the correlation between our plant flow and sustained heavy rain events (<http://ltp/Data-Reclamation/Report.asp>). The effects of infiltration are harder to determine, as groundwater is typically high in the winter when water use is lower and low in the summer when water use rises, making estimating the exact contribution from infiltration difficult.

### **Why is I & I a problem for the City's sewer system?**

Water entering the system from outside the sewer network adds to the total flow reaching the treatment plant. Processing sewage into the plant costs approximately \$xxx per thousand gallons.

Extremely heavy sustained rain can nearly quadruple flow into the treatment plant. For example, in December 2002 after several days of rain, one of which was extremely heavy, (4.23 inches were recorded), flows through the plant averaged 60 MGD (millions gallons per day). The average daily flow in September 2002 was 16.2 MGD.

In addition to the plant costs of processing and sorting the additional flow, the City incurs additional energy costs as sewer lift stations pump continually and risk the possibility of sanitary sewer overflows as the system becomes overloaded.

### **What are we about it?**

Currently, the Utilities Department CIP program is replacing the VCP sewer mains in town. The City's Board of Public Utilities is interested in accelerating the VCP replacement program and fees and rates are expected to be increased with the intention of funding an accelerated program.

The mains with the worst problems – cracked pipe, pipe with missing pieces, pipes with extremely heavy root intrusion – are identified by City crews who inspect the mains with closed circuit television cameras. These mains are priority replacement projects in the ongoing CIP program.

In the meantime, we are exploring a number of different approaches and studies to determine the causes and remedies for I & I.

### **Multi-Faceted Approach:**

#### ***I & I Studies***

We know that I & I contributes a large quantity of unnecessary water to our system each year. In order to plan the most cost effective approach to eliminating this excess flow, we are embarking on two small studies; the Terrace Parsons Area Study and Existing Flow Monitor Verification.

#### ***Public Information***

We are planning a public education campaign about improperly connected house and business surface drains connected to the sewer.

City Code currently disallows such connections; Section 15.16.020 (E) states:

No person shall make connection of roof downspouts, areaway drains, foundation drains, or other sources of surface water runoff or groundwater to a building sewer or sewer service lateral which in turn is connected, directly or indirectly, to a public sanitary sewer.

There are no current enforcement procedures, incentives for removal or penalties for these connections.

Public education efforts will start with a billing insert, and perhaps an information booth at City events. We may want to work with Industrial Waste and/or Stormwater with this program.

Further efforts could include smoke testing parts of town to identify drain and downspout connections and eliminating discovered illegal connections by working with individual property owners.

#### ***Lateral Replacement Program***

We expect that the results of the I & I study area will confirm what other municipalities have discovered – that up to 40% of the I & I entering the system can be attributed to problems with sewer laterals on the private side.

The City has several options to evaluate based on what other municipalities have done. Some cities have budgeted the replacement of private laterals to their own CIP or O&M programs, some have budgeted funds to reimburse qualifying property owners for replacing laterals on their own property, some have simply required property owners to replace deficient laterals. Some do a combination of the above. There are various opinions regarding incentives and penalties for complying or failing to comply with the program.

Albany, Alameda and Vallejo, California, have all instituted programs that require sewer lateral testing, and replacement of deficient laterals, when a home is sold or when a building permit in excess of a certain amount of the home's value is applied for. 1 Albany issues a "Certificate of Compliance" good for 20 years once the lateral has been replaced or rehabilitated.

Vallejo's program includes reimbursement from the City to the homeowner in amounts ranging from \$150 to \$1670 for eligible laterals. Albany, Oregon, has a program where homeowner's can apply to be a part of a City funded lateral replacement program where staff solicits bids and manages the replacement. 2 Mequon, Wisconsin, utilized a CIP program to replace laterals using a City chosen contractor and a

cost share program where the City pays up to \$1000 for repairs. Additional costs and any landscape replacement is at the homeowner's expense. 3 Sarasota, Florida, has embarked on a lateral replacement study where the City hired contractor is using pipe bursting to replace property side laterals. 4

The city of Florissant, Missouri, charges an annual fee of \$28 on the property tax bill that covers the cost of lateral replacement programs. 5

The City of Salem funds a project to replace laterals for lower income property owners.6

We will explore these program options with the idea of presenting a study session to the BPU to solicit input on the various options within the next year.

1 *Trenchless Technology*, June 2003, Trenchless Lateral Replacement, pps 34-36

2 [www.cityofalbany.net/publicworks/sewerlaterals/sewerlateralprogram.htm](http://www.cityofalbany.net/publicworks/sewerlaterals/sewerlateralprogram.htm)

3 [www.mmsd.com/rainwater/page2.asp](http://www.mmsd.com/rainwater/page2.asp)

4 *Cleaner*, March 2002, Crossing the Property Line

5 [www.florissant.com/publicworks/engineer/sewerlateralproject/htm](http://www.florissant.com/publicworks/engineer/sewerlateralproject/htm)

6 [www.pacweb.open.org/cip/sanitary\\_sewer.htm](http://www.pacweb.open.org/cip/sanitary_sewer.htm)